Socialist Republic of Viet Nam

Preparatory Survey on the Project for Strengthening Can Tho University in Viet Nam to be an Excellent Institution of Education, Science Research and Technology Transfer

Final Report

September 2014

JAPAN INTERNATIONAL COOPERATION AGENCY

Ernst & Young Sustainability Co., Ltd.
PADECO Co., Ltd.
NIHON SEKKEI, INC.

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Abbreviations

ABET	Accreditation Board for Engineering and Technology
ADB	Asian Development Bank
ASEAN	Association of South-East Asian Nations
AUN	ASEAN University Network
AUNQA	AUN Quality Assurance
BiRDI	Biotechnology Research Development Institute
CAAB	College of Agriculture and Applied Biology
CAF	College of Aquaculture and Fisheries
CENRes	College of Environment and Natural Resources
CEOC	Common Equipment Operation Center
CICT	College of Information & Communication Technology
CoET	College of Engineering Technology
CoNS	College of Natural Science
CRD	College of Rural Development
CTU	Can Tho University
DOST	Department of Science Technology
EFQM	European Forum of Quality Management
FDI	Foreign Direct Investment
FIRST	Fostering Innovation through Research, Science and Technology
GIS	Geographic Information System(s)
HRDMP	Human Resource Development Master Plan
HRDS	Human Resource Development Strategy
IETC	International Education Training Center
JICA	Japan International Cooperation Agency
JIRCAS	Japan International Research Center for Agricultural Sciences
LRC	Learning Resource Center
MDGs	Millennium Development Goals
MDI	Mekong Delta Development Research Institute
MDR	Mekong Delta Region
MHO	(Name of Project in Dutch)
MOET	Ministry of Education and Training
MONRE	Ministry of Natural Resources and Environment
NEDO	The New Energy and Industrial Technology Development Organisation
ODA	Official Development Assistance

PCR	Polymerase chain reaction
QA	Quality Assurance
QATC	Department of Quality Assurance and Testing Center
SEBA	School of Economics & Business Administration
SEDP	Socio-Economic Development Plan
SEDS	Socio-Economic Development Strategy
SoE	School of Education
SoL	School of Law
SoPS	School of Political Science
SoPU	School of Pre-University
SSSH	School of Social Science & Humanity
UNDP	United Nations Development Programme
UNSECO	United Nations Educational, Scientific and Cultural Organization
USAID	United States Agency for International Development
UV-VIS	Ultraviolet･Visible Absorption Spectroscopy
ViFiNET	Viet Nam Fisheries and Aquaculture Institution Network
VIIP	Viet Nam Inclusive Innovation Project
VLIR-ICU	(Name of project in Flemish)

Executive Summary

1. Background of the Survey

Becoming an industrialized country by 2020 and maintaining economic growth are national goals of the Government of Viet Nam (hereinafter referred to as "the Government"). To achieve the goal, the Government has set policies for industrialization and prioritized industries, and focused on development of industrial human resources and enhancement of scientific research capacity.

To deal with such challenges within the education sector, the Government developed the concept of 'development of new model universities' which was initiated in 2006. Ministry of Education and Training (MOET) selected four (4) large universities from different regions to provide them extensive financial and educational support through the state budget and donors. This enables the universities to develop as internationally acknowledged universities and function as archetypes for other standard universities after 2020.

To realise this concept, the Government requested the Japanese Government support in upgrading Can Tho University (CTU), one of the four model universities, to become an excellent and internationally recognized universities, focusing on three fields, agriculture, fisheries and aquaculture and environment. In response, the Japanese Government decided to conduct this Preparatory Survey on the Project for Strengthening Can Tho University in Viet Nam to be an Excellent Institution of Education and Research and Technology Transfer (hereinafter referred to as "the Survey") in October 2013.

The Survey aims to examine items necessary for appraisal of the JICA loan project (hereinafter referred to as "the Project"). They include objectives, outlines, and costs estimation of the Project, Project implementation schedule, Project implementation methods (procurement/ construction), Project management and implementation arrangements, operation and maintenance system, social and environmental considerations, and proposed capacity development necessary for realizing effects of the Project. In addition, the Survey will examine contents of a technical cooperation project to effectively and efficiently implement the proposed Project.

The survey was conducted from the middle of March 2014 till the end of September 2014.

2. Necessity and Justification of the Project

Country context. Viet Nam's socio-economic development and planning framework is composed of the Socio-Economic Development Strategy 2011–2020 (SEDS) and Socio-Economic Development Plan 2011–2015 (SEDP). Becoming an industrialized country by 2020 is a national goal and one of the main focuses is on rapid development of high quality human resources through quality enhancement of education and training and development of scientific, technological and intellectual economy.

With regard to education and training, it focuses on the needs of restructuring and reforming the education and training system. Pertaining to the development of scientific, technological and intellectual economy, the SESDP identifies challenges: (i) investment in science-technology and, basic research in natural science and practical research, (ii) enhancement of scientific level and position of Viet Nam in sectors the country is strong in, (iii) enhancement of research capacity, (iv) strengthening of technological application and renovation in industry, and (vi) development of skills of choosing industrial and service sectors with high level of technology.

The Human Resources Development Strategies 2011-2020 (HRDS) and Human Resource Development Master Plan 2011-2020 (HRDMP) give specific targets for human resources development. The HRDS plans to increase the percentage of trained labourers to total labour forces in the agriculture, forestry and fisheries sector to 50% in 2020 from 15% as of 2010. The HRDMP emphasizes higher education and vocational training above the intermediate level because they directly contribute to socio-economic development and sets targets in teachers' quality which affects quality of education and requests more teachers in higher education to get higher academic degrees.

Regional context. CTU is located in Mekong River Delta (MRD), south of Viet Nam, and the area is full of agriculture and fishery industries. The MRD has 27.2% of the nation's agricultural land areas, and produces 53.4% of the nation's rice and 90% of rice exports. It occupies 70% of the nation's inland water areas for aquaculture, responsible for 58.7% of the nation's production of aquaculture and fisheries and 80% of shrimp export. Considering these roles of Mekong River Delta in national economy, it has potential for development of agricultural machinery and food processing in agriculture and fisheries which are two of the prioritized areas underlined in the Government's industrialization strategies.

However, as the National Strategy for Climate Change mentions, the MRD is assessed as one of the most vulnerable river deltas in the world together with the Nile River Delta in Egypt and the Gages Delta in Bangladesh. It actually has faced some serious issues such as water pollution and rise in sea level affected by clime change, which directly relates to agriculture and aquaculture productions.

Despite the Government's efforts, the MRD continues to be poor and many of the social development indicators are far from satisfactory. To reduce the poverty in the region, the Government has developed 'the Master Plan on Socio-Economic Development of the Mekong River Delta through 2020'[1] which presents various policy targets to be achieved by 2020. The Master Plan also sheds light on the insufficient number of higher education institutes and presents a long term direction which designates the CTU as the regional center university to help improve the average quality of the education institutes in the MRD.

Sector context. The Government developed the concept of 'development of new model universities' which was initiated in 2006.[2] MOET selected four (4) large universities from different regions to provide them extensive financial and educational support both through the state budgets and donors. This enables the universities to develop as internationally acknowledged universities and function as archetypes for other standard universities after 2020.

While there are some distinctive differences among the 4 model universities, MOET issued the guiding principles for implementation of the New Model University concept in 2011 by establishing the steering committee.[3] The first model university project was started in 2010 in HCMC supported by the Government of Germany and the WB[4] and the second model

[1] Socialist Republic of Viet Nam. 2012. Prime Minister's Decision No. 939/QD-TTg of 19 July 2012 approving the Master Plan on the Socio-Economic Development of the Mekong River Delta through 2020. Hanoi.
[2] Socialist Republic of Viet Nam. 2006. Prime Minister's Decision No.145/2006/QD-TTg on Major Guidelines and Orientation on Establishing Viet Nam's University of International Standards approved on 20 June 2006. Hanoi.
[3] Socialist Republic of Viet Nam. 2011. Prime Minister's Decision No.891/2011/QD-TTg on Establishment and Regulations on functions, responsibilities, authorities and organizational structure of the Steering Committee for Establishing Universities of Excellence approved on 8June 2011. Hanoi.
[4] World Bank. 2010. Program Document for A Proposed Credit to the Socialist Republic of Viet Nam for A Model University Project. Washington D.C.

university project in 2011, supported by the Government of France and ADB.[5] In accordance with this recent development, CTU is also preparing to receive support from Japan.

Alignment with Japan's ODA policy. The Project is closely linked with two priority areas of Japan's ODA policy: (i) promotion of growth and strengthening of competitiveness and (ii) mitigation measures against vulnerability. Under the area of promotion of growth and strengthening of competitiveness, a market-oriented economic system is strengthened and industry and industrial human resources are developed to achieve sustainable development through strengthened international competitiveness. On the other hand, mitigation measures against vulnerability deals with environmental issues associated with rapid urbanization and industrialization along with threats caused by disasters and climate change.

3. Overall Project Scope

3.1 Project Objectives

The long-term objective is to strengthen CTU as an excellent, internationally recognized institution in agriculture, aquaculture and environment and other interrelated fields, which will also contribute to the socio-economic development of the MRD and the country as a whole.

The short-term objective is to strengthen CTU's capacity to deliver high quality academic and research works in three fields (agriculture, fisheries/aquaculture and environment) and interdisciplinary fields, which will result in contributing to climate change issues and adding value to agriculture and aquaculture of the MRD.

3.2 Overall Project Scope and ODA Schemes

To achieve the project objectives, an overall project scope is developed and appropriate ODA schemes are examined. To effectively and efficiently implement the Project (JICA loan project), the JICA study team has also proposed a technical cooperation project. The overall project scope and demarcation of the JICA loan project and the technical cooperation project are shown in Table 1.

[5] ADB. 2010. Report and Recommendations of the President to the Board of Directors: Proposed Loan to the Socialist Republic of Viet Nam for the University of Technology and Science Hanoi (New Model University) Development Project. Manila.

Table 1: Overall Project Scope and Appropriate ODA Schemes

Project Scope	Japan's ODA Schemes		Remarks
	Technical Cooperation	ODA Loan	
1. Human Resource Development in Research Activities			
1-1 Scientific Training in Japan		✔	
1-2 Overseas Short-term Research Training		✔	
1-3 Joint Research Studies with Japanese Partner Universities	✔	✔	The technical cooperation project is responsible for research capacity development of CTU in the three fields while the Project is responsible for providing research project budget and supporting CTU in managing research activities.
2. Improvement in Graduate Programs			
2-1 Establishment of Graduate Programs	✔		
2-2 Provision of Model Lectures in Graduate Programs	✔		
2-3Obtaining Accreditation of Graduate Programs	✔		
3. Strengthened University Governance and Management			
3-1 Strengthened Private-Public-Academia Collaboration including patent management	✔		
3-2 Strengthened Research Policy and Management	✔		Incorporated into 1-3 above of the technical cooperation project.
3-3 Quality Assurance Expansion	✔		Included in 2-3 above.
3-4 Establishment of Graduate Programs	✔		Including in 2-1 above.
3-5 Supporting Unit staff Capacity Development in areas of 3-1 to 3-4	✔	✔	The technical cooperation project covers most of the training while the Project is responsible for master's degree training.
4. Improvement in Academic and Research Environment			
4-1 Construction of Buildings for Practice, Research Studies, Lectures, International Conferences		✔	
4-2 Provision of Practice and Research Equipment	✔	✔	CTU procures research equipment through the Project while the technical cooperation project provides minimum equipment for its implementation.
4-3 Overseas Short-term Training for O&M of Practice and Research Equipment	✔		
5. Strengthened Capacity of Project Implementation Unit for Effective and Good Quality Project Implementation and M&E			
5-1 Establishment of Project Implementation unit, Preparation of Project implementation plan and Monitoring and Evaluation (M&E) plan		✔	
5-2 Short-term training on Project Implementation and M&E	✔		Country Specific Training Courses on Project Management of JICA Loan Projects will be launched, getting PMU members of all new JICA loan projects in Viet Nam.

Source: JICA Study Team

4. Contents of the Project (JICA Loan Project)

4.1 Human Resources Development

To develop human resources in research activities, the Project will support long-term degree training (PhD study in Japan, Master's study in Japan) and short-term research training. A total of 107 staff will receive long-term degree training in Japan while 135 staff will receive short-term research training in Japan in the three fields as shown in Table 2.

Table 2: The Number of Long-term Degree Training and Short-term Research Training

Target Fields	Quality (persons)
Agriculture	
Short-term research training	**50**
Long-term degree training (PhD study in Japan)	**25**
Aquaculture and Fisheries	
Short-term research training	**18**
Long-term degree training (PhD study in Japan)	**24**
Environment	
Short-term research training	**39**
Long-term degree training (PhD study in Japan)	**14**
Governance and Management	
Long-term degree training **(Master's study in Japan)**	**9**
Total (Short-term research training)	**107**
(Long-term degree training	**135**

Source: JICA Study Team

Moreover, the JICA study team has examined points to be considered during implementation such as utilization of Program 911, comprehensive support for training in Japan, reimbursement of scholarship and domestic financial mechanism and other related issues.

4.2 Research Project

To develop human resources in research activities, the Project will also support research activities of CTU in the three fields. In particular the Project will expect that CTU's human resources will be enhanced through joint researches with Japanese universities.

For implementation, sixteen (16) research themes in agriculture, eight (8) research themes in Aquaculture and fisheries, and twelve (12) research themes are prioritized. In addition, management procedures of research activities and disbursement mechanism are proposed.

4.3 Facility Development

To improve academic and research environment, the Project will support construction of the facilities as shown in Table 3.

Table 3: List of the Proposed Facilities

No.	Building Name	Building Area (m2)		Total Floor Area (m2)		No. of Floors	No. of Designed Occupancies (persons)
1	Advanced Technology Laboratory		3,238		16,654	6/7 Floors	750 persons
	Research Laboratory Complex		6,627		25,713		
2	Bio-Tech Wing	3,153		12,706		4/5 Floors	500 persons
3	CAF Wing						
4	CENRes Wing	3,474		13,007		3/5Floors	500 persons
5	CoET Wing						
6	International Education Training Center		2,290		10,419	1/7 Floors	3,600 seats
7	Field Test Facility (Greenhouse/Net house)		8,400		8,400	1 Floor	-
8	Hatcheries		2,700		2,700	1 Floor	-
9	Upgrading Infrastructure in Campus 2		-		-	-	-
10	Hoa An Campus		3,629		6,888		
	Center for Technology Transfer	1,629		4,888		3 Floors	
	Field Test Facility	2,000		2,000		1 Floor	-
	Total		**26,884**		**70,774**		

Source: JICA Study Team

4.4 Research Equipment

To improve academic and research environment, the Project will also support procurement of research equipment. Table 4 shows the number of equipment procured by grades.

Table 4: Grouping of Equipment Procured by Grades

No	Grouping	Unit Cost Range	Number of Items
1	Basic research equipment	< One million JP Yen	3,001
2	Research equipment	> One million JP Yen < 5 million JP Yen	613
3	Advanced research equipment	≧5 million JP Yen	64
4	Others (IT, Governance, and IETC)	-	666
		Total	4,344

Source: JICA Study Team

Basic research equipment is defined as simple experimental equipment such as water bath, stirrer, microscopes; the estimated cost is less than one million JP yen. Research equipment is basically defined as electrically driven and requiring periodical checks, costing more than one million JP yen. Among research equipment the items costing more than 5 million JP yen is regarded as advanced research equipment.

5. Procurement Package and Consulting Services

5.1 Procurement Plan

The JICA study team has proposed the procurement plan as shown in Table 5.

Table 5: Proposed Procurement Plan

Package	Component Cost (JP Yen million)	Procurement	Implementation	Procurement Method
Package-1 Facility Construction	5,321	June, 2016 to December, 2017	January, 2018 to August, 2020	ICB with P/Q
Package 2-1: Equipment work-1 (IT& Basic Equipment)	1,930	June, 2016 to December, 2017	February, 2018 to July, 2020	ICB with P/Q
Package 2-2: Equipment work-3 (Research equipment)	2,005	July, 2018 to October, 2019	December, 2019 to August, 2020	ICB with P/Q
Package 3 Consulting Services	1,093	October 2014 to September 2015	October 2015. to December 2021	QCBS (80:20)

Source: JICA Study Team

5.2 Consulting Services

To ensure timely and quality implementation of the Project, consulting services will be provided to help CTU. The consulting services will cover the following areas: overall project management, academic and research coordination between CTU and Japan partner universities, facility design and construction supervision and equipment design and installation supervision. To provide the required consulting services, 22 international consultants with a total of 259 person months and 32 national consultants with a total of 602 person months including supporting staff are required.

6. Total Cost of the Project (JICA Loan Project)

The total Project cost is estimated based on prerequisites defined by JICA's Loan Project General Standards in 2014 as shown in Table 6.

Table 6: Estimation of Total Project Cost

Breakdown of Cost	Foreign Currency Portion (JP Yen in million)			Local Currency Portion (VND in million)			Total (JP Yen in million)		
	Total	JICA Portion	Others	Total	JICA Portion	Others	Total	JICA Portion	Others
Human Resource Development	639	639	0	0	0	0	639	639	0
Research Project	0	0	0	81,633	81,633	0	400	400	0
Facility Construction Work	532	532	0	977,327	977,327	0	5,321	5,321	0
Research Equipment Work	3,542	3,542	0	80,286	80,286	0	3,935	3,935	0
Price Escalation	468	468	0	268,388	268,388	0	1,783	1,783	0
Physical Contingency	259	259	0	70,382	70,382	0	604	604	0
Consulting Services	933	933	0	39,272	39,272	0	1,125	1,125	0
Land Preparation, Relocation, etc.	0	0	0	43,802	0	43,802	215	0	215
Administration Cost	0	0	0	143,082	0	143,082	701	0	701
VAT	0	0	0	263,203	0	263,203	1,290	0	1,290
Import Tax	0	0	0	29,393	0	29,393	144	0	144
Tax on Consulting Service	0	0	0	34,442	0	34,442	169	0	169
Interest during construction	590	590	0	0	0	0	590	590	0
Front End Fee	29	0	29	0	0	0	29	0	29
Total	6,991	6,962	29	2,031,209	1,517,286	513,923	16,944	14,397	2,547

Source: JICA Study Team

7. Contents of Technical Cooperation Project

The technical cooperation project is designed to effectively and efficiently implement the Project.

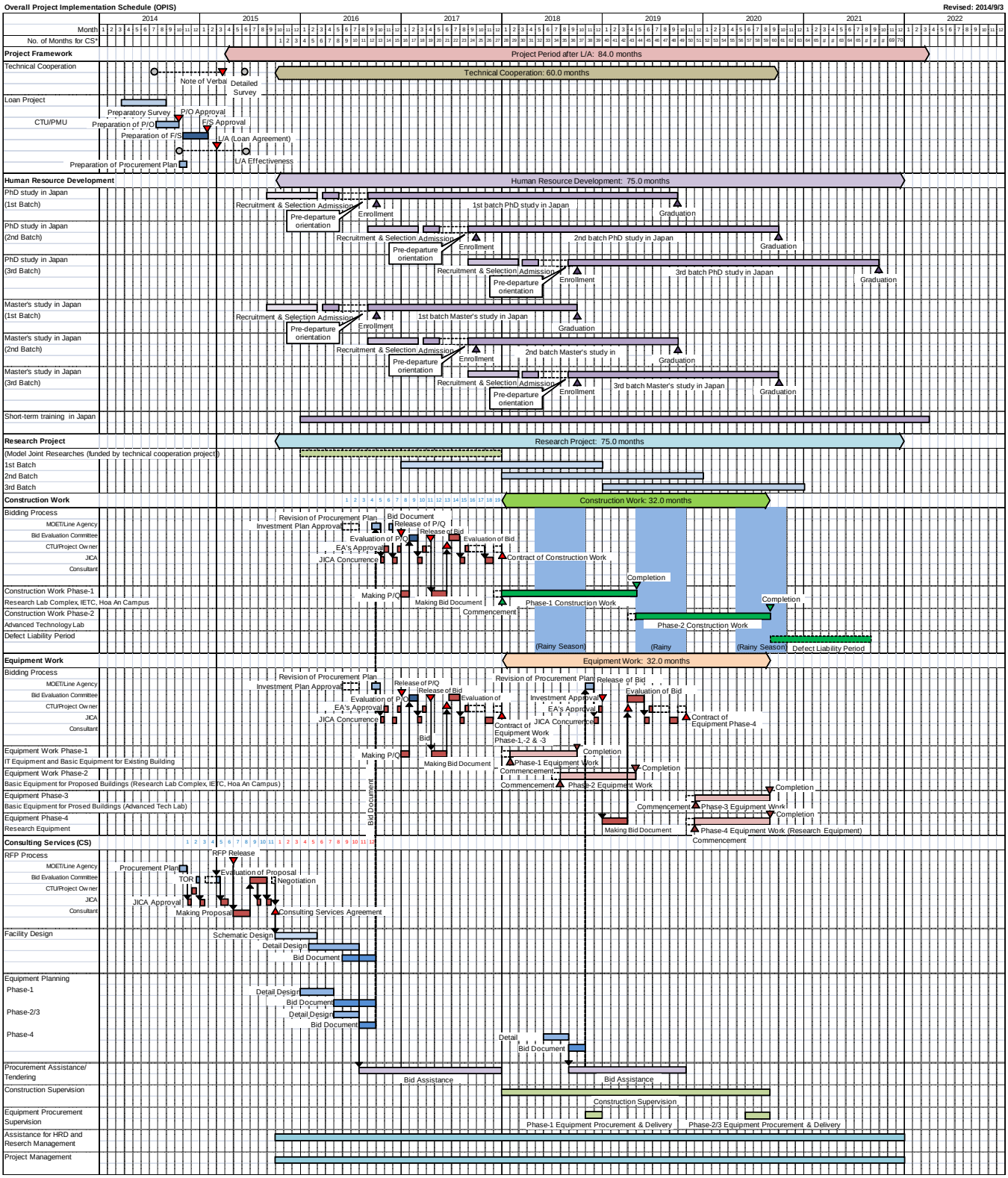
The overall goal of the technical cooperation project is to strengthen CTU's capacity to deliver high quality academic and research work in three fields (agriculture, fisheries/ aquaculture and environment) and interdisciplinary fields, which will result in contributing to climate change issues and adding value to agriculture and aquaculture of the MRD.

The purpose of the technical cooperation project is that a mechanism to enhance education and research capacity of CTU is established in agriculture, aquaculture/fisheries, environment, and the interdisciplinary fields, in order to be internationally recognized.

To achieve the project purpose, three outputs are identified. Output-1 is that research capacity in 3 fields of CTU is enhanced. Output-2 is that education capacity in 3 fields of CTU is enhanced. Outputs-3 is that governance capacity of CTU necessary for enhancement of research and education is strengthened. Other information including activities, indicators, inputs from Japanese and Vietnamese sides and important assumptions are examined and incorporated into Project Design Matrix (PDM) with Plan of Operation. The PDM with Plan of Operation is attached in the main text of the report.

8. Project Implementation Schedule

The overall project implementation schedule of the Project is show in Figure 1.



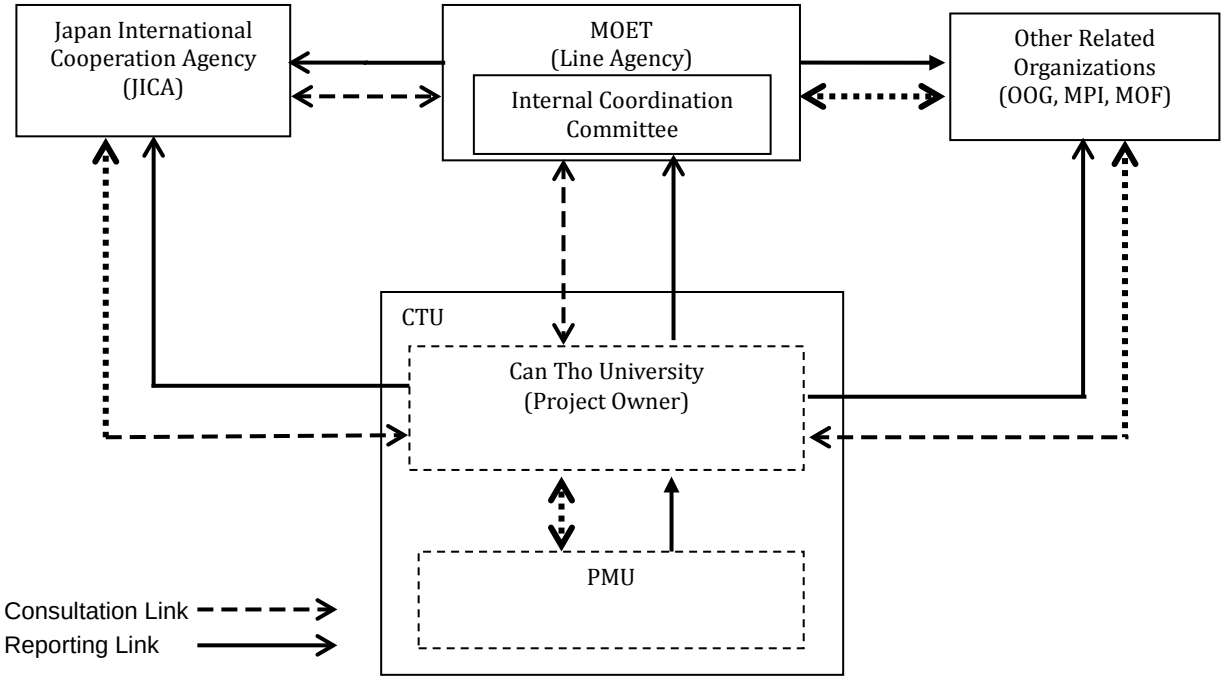
Source: JICA Study Team

Figure 1: Overall Project Implementation Schedule

9. Project Management and Implementation Arrangements and Maintenance and Operation System

9.1 Project Management and Implementation Arrangements

To select the most feasible framework, different types of project implementation arrangements will be compared and examined. The analysis will be made based on the following points:(i) lessons learned from the issues faced in the Higher Education Development Support Project on ICT[6]; (ii) challenges faced by other New Model University Projects[7], (iii) assessment of project implementation and management capacity of Can Tho University (CTU); and (iv) Vietnamese regulations and practices related to ODA project management[8]. Based on the comparisons and analysis, the JICA study team has proposed the Project organization structure, roles and responsibilities of each organization along with Project Management Unit's (PMU's) organization chart and PMU staffing. Figure 2 and Figure 3 shows the Project organization structure and PMU organization chart respectively.



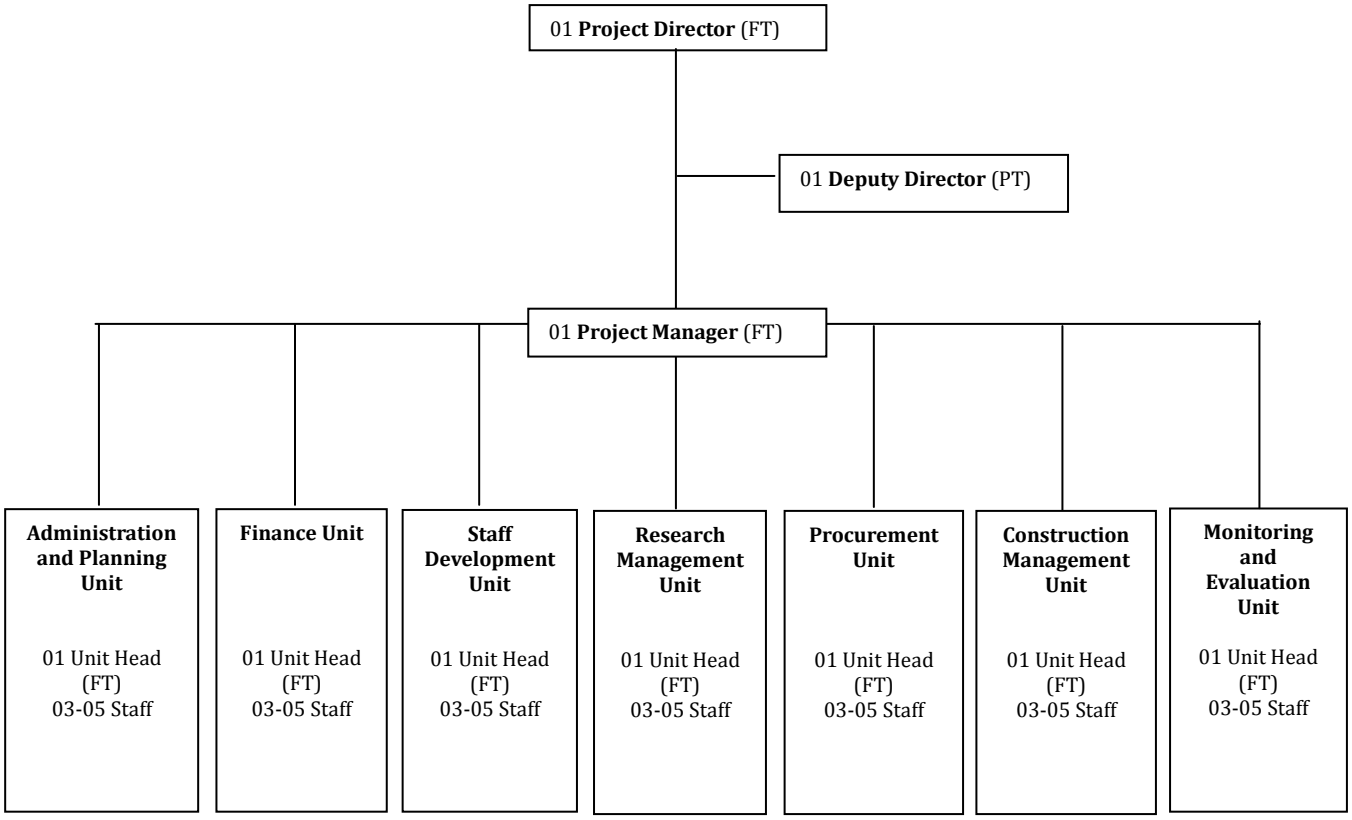
Source: JICA Study Team

Figure 2: Project Organization Structure

[6] Higher Education Development Support Project on ICT in Viet Nam (JICA loan project, 2006-On-going)

[7] New Model University Project in Viet Nam (WB loan, 2010-On-going), University of Science and Technology of Ha Noi (New Model University) Project in Viet Nam (ADB loan, 2010-On-going)

[8] They include Law on Public Investment dated June 18, 2014 (No.49/2014/QH13), Public Procurement Law approved November 26th, 2013 (No.43/2013/QH13), Decree on Management and Use of Official Development Assistance (ODA) and Concessional Loans of Donors dated April 23rd, 2013 (No. 38/2013/ND-CP), and Circular Guiding Implementation of Decree No. 38/2013/ND-CP dated January 09th, 2014 (No. 01/2014/TT-BKHDT).



Source: JICA Study Team

Figure 3: Organization Chart for Project Management Unit

9.2 Maintenance and Operation System for Advance Research Equipment

The JICA study team has proposed a joint use system for advanced research equipment. The merits of joint use are: (1) to enable rise in operation ratio, and (2) to enable sharing of the most expensive running cost among users. One type is to install advanced equipment in advanced research laboratories in the Advanced Technology Laboratory Building for its joint use, in such way that allows joint research works to be conducted together with researchers inside and outside CTU. Another type is a system which allows joint use of the equipment in a Common Equipment Operation Centre (CEOC) established in the Advanced Technology Laboratory Building. If advance equipment is used less frequently by the faculty alone, such items should be installed in the CEOC so that the operation cost can be shared among the CTU.

10. Monitoring and Evaluation

Considering long-term as well as short-term Project objectives, the following quantitative and qualitative indicators for Monitoring and Evaluation (M&E) are proposed as shown in Table 7, Table 8 and Table 9. The quantitative indicators include operation indicators and effect indicators[9].

[9] Operation indicators are indicators to quantitatively measure operational status of the Project. Effect indicators are indicators to quantitatively measure production of effects of the Project. Both indicators in ODA loan projects are indicators basically at the outcome level.

Table 7: Operation Indicators

Operation Indicators	Present (2014)	Target (2025)	Data source
1) Number of teaching staff acquiring Ph.D. through the project	0	63	PMU Report
CAAB	0	25	
CAF	0	24	
CENREs	0	14	
2) Number of teaching staff acquiring MSc. through the project	0	9	PMU Report
Governance	0	9	
3) Number of papers published (about 30% international papers)	0	2,075	PMU Report
CAAB	0	1,480	
CAF	0	240	
CENREs	0	355	

Source: CTU

Table 8: Effect Indicators

Effect Indicators	Current (2014)	Target (2025)	Data source
1) University ranking in Asia Pacific	454	Within Top 200	Webmetrics website[10]
2) Ratio of Ph.D. holders among the Teaching Staff of the three targeted Faculties			PMU Report
CAAB	52%	80%	
CAF	56%	82%	
CENREs	35%	88%	
3) Ratio of Master's holders among the Teaching Staff (reference information)*	13%	19%	PMU Report

*3) The Project does not contribute much to the ratio of master's holders, but it is provided as reference to see the balance between Master's and doctorate degree holders.
Source: CTU

Table 9: Qualitative Indicators

Qualitative indicators	Data source
Research quality of CTU will be improved.	- Interview with joint research partner and other relevant stakeholders. - Interview with companies where graduates are working (*)
Research results or outcome will benefit local community.	- Comments from users ―who engaged in technology transfer - Comments from local government to CTU (*)

(*) This information is supposed to be collected through the assessment for AUN accreditation
Source: JICA Study Team

11. Social and Environmental Considerations

11.1 Procedures for Environmental and Social Consideration

According to Viet Nam's relevant environmental regulation (Decree No. 29/2011/ND-CP, Providing Strategic Environmental Assessment, Environmental Impact Assessment and Environmental Protection Commitment, Appendix II), it is necessary to go through the environmental assessment process as the proposed buildings include laboratories.

Campus-2

Since the proposed facilities have some laboratories with hazardous waste produced due to research activities, CTU should go through the EIA Process. CTU will hire a consulting firm who has capability to obtain the EIA permission. According to CTU's previous project

[10] Webometrics: http://www.webometrics.info/en/Asia_Pacifico/South%20East%20Asia

experience, it takes about one month to obtain the EIA permission. CTU plans to submit it a couple of months before construction works start.

11.2 Procedures for Building Permit

Construction of new buildings at each campus will require undergoing the following permission processes.

Campus-2

CTU obtained in 2009 a 1/500 Detailed Master Plan for Campus-2 from Can Tho City's Department of Construction (DOC). There are two options of acquiring permission for the proposed buildings, depending on the designs of the proposed buildings.

- Option-1
  In case the proposed buildings follow the major urban norms (functions, the number of floors, footprint shape, etc.) of the Master Plan, it is not necessary to obtain another building permit.
- Option-2
  In case the proposed buildings exceed the major urban norms of the Master Plan, it is necessary to obtain another building permit. CTU should issue an official letter explaining the aspects different from the Master Plan to the DOC (Department of Construction), Can Tho City, and obtain DOC's permission.

The proposed buildings follow the number of floors, but their footprint (shape of the ground floor) is different from that in the Master Plan. Therefore, it is necessary to apply to DOC, Can Tho City, for the modification of the Master Plan.

Hoa An Campus

CTU has obtained a 1/2000 Zoning Master Plan from Hau Giang Province, and it is necessary to obtain the modification of Master Plan for the proposed facilities.

1. Introduction

1.1 Study Background

The Government of Viet Nam (hereinafter referred to as "the Government") has set a goal as a long term national policy to become an industrialized country by 2020 and maintain economic growth by introducing the Social-Economic Development Strategy (2011–2020). By breaking away from the economic model based on cheap labor forces, and transiting from primary to secondary, and secondary to tertiary industry, the government has focused on developing industrial human resources to cater to the skills required in these new industries by increasing both quality and quantity of higher educational institutions and reinforcing research capability of universities. Given the situation, the Government planned "Framework of establishing International Model University" in 2006 to establish four model universities of international standards to serve as role models of better education and research in Viet Nam. Can Tho University (CTU) has been chosen as one of the four candidates of international model universities and the request for assistance was submitted to the Japanese government.

CTU is located in Mekong Delta Region (MDR), south of Viet Nam, and the area is active with agriculture and fishery industries which account for 25% of GDP in Viet Nam. The region has people who work for the primary industry; however, there are some serious issues, such as water pollution due to climate change and rise in sea level, which directly affect agricultural production. MDR has potential to develop food processing and agricultural machinery - two of the six prioritized fields in the industrialization strategy which is part of the industrial policy promoted by the Government. CTU is expected to realize the educational and research achievements by conducting researches which address such issues in Mekong delta, aiming to reinforce international competitiveness to gain recognition as a research based university and improve education, research, and management capability.

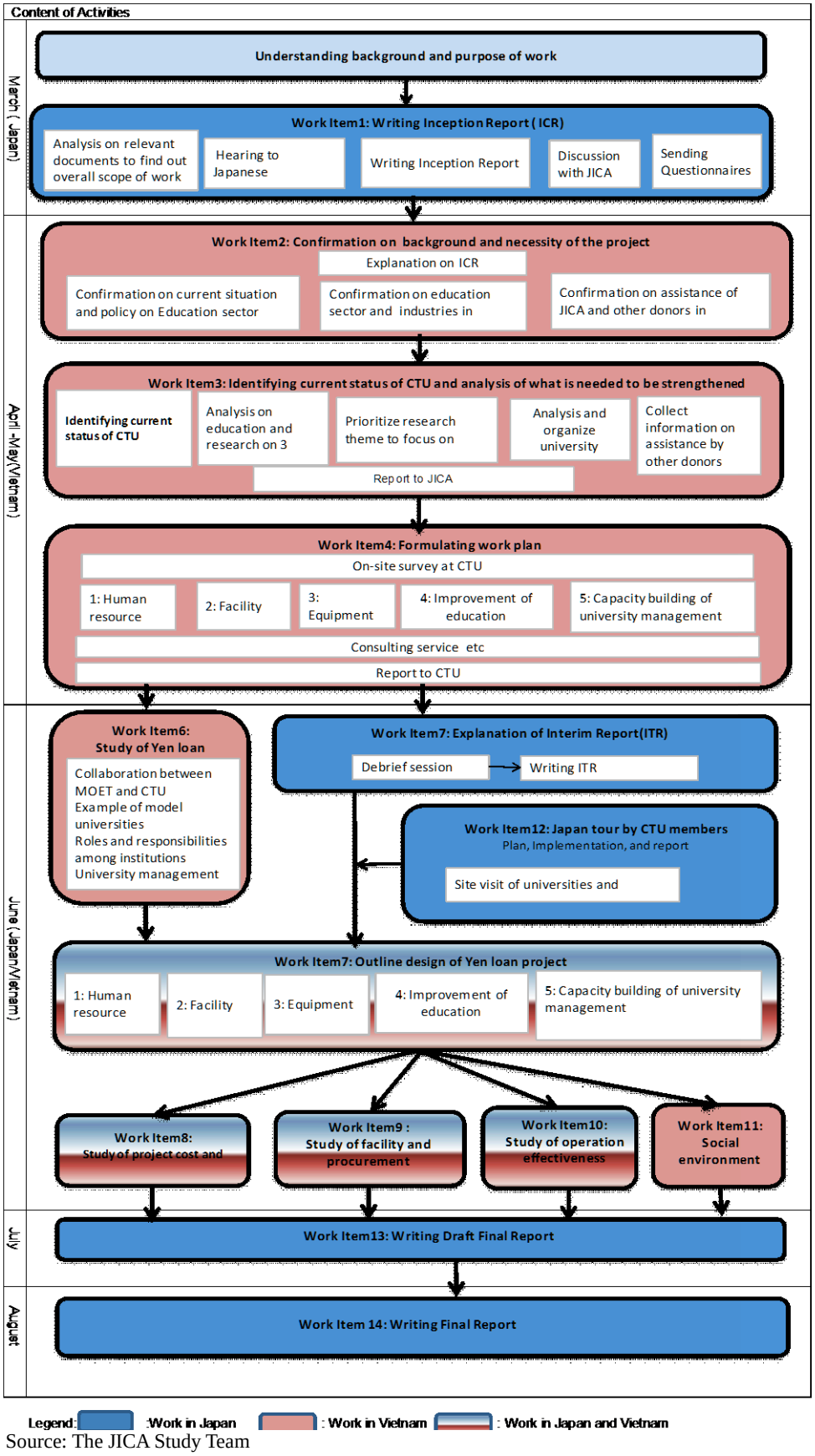
1.2 Study Description

1.2.1 Purpose of the Study

The Project Preparatory Survey on Strengthening Can Tho University to be an Excellent Institution of Education, Scientific Research and Technology Transfer (hereinafter referred to as "the Study") sets a goal to strengthen education and capability in CTU by training industrial human resources and researchers, upgrading industry in agriculture, fishery and aquaculture, and addressing environmental issues in MDR. In order to realize this goal, the Study examines 1) Capacity building of education, research, technology transfer/ regional and social contributions in each field of agriculture, fishery and aquaculture, and environment, 2) improvement of governance management, and 3) consistency of policy and plan of educational/research institution, and equipment and its maintenance. The Study evaluates the purpose of the upcoming Yen loan project, "Strengthening Can Tho University to be an Excellent Institution of Education, Scientific Research and Technology Transfer" by conducting survey on the project outline, the budget, the implementation schedule, implementation methodology on procurement and construction, the implementation structure, the operation and maintenance structure, and the consideration of environment and social impact. The Study also aims to examine the effective Yen loan proposal and the screening system to be approved.

1.2.2 The Study Flow

Figure 1-1 shows the Study Flow during the study period.



Source: The JICA Study Team

Figure 1-1: Study Flow

1.2.3 Reports

The JICA study team prepared reports and addressed the concerns shown in Table 1-1.

Table 1-1: Reports and Time of Submission

Report/Consultation Meeting	Contents/Agenda	Time of Submission
Inception Report	Discussions on ICR (English/Japanese) including i) study outlines, ii) major study items and methodology, iii) table of contents of study reports (initial version), iv) JICA consultant team's request for support from MPI and MOET	End of March 2014
Interim Report	Interim Report (English/Japanese) including survey items ii)–iv) of the first field survey	Beginning of June, 2014
Draft Final Report	Draft Final Report (English/Japanese) including draft of all findings, proposals and recommendations	End of July, 2014
Final Report	Final Report (Vietnamese/English/Japanese) including all findings, proposals and recommendations, reflecting comments from Vietnamese and Japanese sides	September 5th, 2014

Source: The JICA Study Team

1.2.4 Team Members

The Study was conducted by 13 international consultants and 5 national staff and coordinators. Name and position title of the members are shown in Table 1-2.

Table 1-2: Team Members

Name	Position
Hiroyuki Kanzaki	Team Leader/Project Planning for Higher Education
Hiromi Takagi	University Management/ Governance/ Evaluation
Masako Kishimoto	Human Resource Development
Kojiro Yoshioka	Assistant to Human Resource Development
Kyoko Nakano	Education and Research (Agriculture)
Junko Toyoshima	Education and Research (Aquaculture)
Noriko Kono	Education and Research (Environment)
Ryoji Harada	Equipment Plan/O&M
Yo Takahashi	Equipment Procurement/ Cost Estimates
Satoshi Okamoto	Facility Planning/O&M / Cost Estimates
Seichi Nakamura	Facility Planning/M&E Planning / Environment Consideration/ O&M
Ryoki Nishimoto	Facility Planning/ Construction Planning
Ryo Saito	Study Tour in Japan/Coordinator
Nguyen Thi Le Huong	University Policy/Management
Nguyen Thi Hong Yen	Monitoring and Evaluation / Financial Management
Nguyen Ba Can	Procurement/Cost Estimates for University Equipment
Nguyen Duy Phuc	Facility Coordinator
Le Viet Dung	Environment Coordinator

Source: The JICA Study Team

1.3 Site-Survey Program in Japan

During this preparatory survey project, there was a site-survey program; seven members from CTU were invited to Japan for a week to survey four universities (Kyushu University, Nagasaki University, Tokyo University of Marine Science and Technology, and Tokyo University of Agriculture and Technology) and one equipment factory (SHIMADZU).

The list of invited members from CTU is attached in Appendix 1-1 along with the detailed schedule for the site-survey program. The purpose of the visit is to reflect the plan and component of Yen loan project by observing laboratories in three fields, advanced equipment, university management, roles of supporting unit, and industry-academic collaboration in Japanese universities and equipment facility. At the end of each site visit, there were wrap-up and Q&A sessions, and CTU members had a chance to discuss issues such as how to take initiative to become an internationalized university in terms of management, education, and research view points, management of research team, operations and framework of maintaining research equipment and its budget, fund acquisition, introduction of IT and so on.

Each university was well-prepared and made proper arrangements to welcome the CTU members. Since there was limited time, some of the sites were not visited; however CTU members asked many questions and tried their best to learn from the experience.

On the last day of the site-survey program, CTU members presented the result of the site-survey to JICA and the advisory group in the viewpoint of the university management and three academic fields.

1.4 Report Composition

After the introduction, the report gives a big picture of the current status of industrialization and human resources in Viet Nam, and narrows it down to project needs by providing national policy and the current situation in higher education in Viet Nam. Based on the site surveys, the report deals with the current situation and issues in CTU such as priority of research theme in each field, university management, CTU's cooperation with other aid donors, facilities, and equipments. After providing current status, issues, background data of CTU, the report gives detail information with regard to JICA Loan Project in aspects of Human Resource Development, Research Project, Facility Development, and Research Equipment. Based on study by the consultants, the report elaborates procurement package and consulting services along with total cost of the Project. Furthermore, the report develops into the content of technical cooperation project, the proposal of Project management and Maintenance and Operation system. Then project concludes with important aspects such as Monitoring & Evaluation and Social & Environmental Considerations.

2. Project Context and Necessity

2.1 Current Situation and Issues in Nation's Development Strategies and Plan and Higher Education Sector

2.1.1 Viet Nam's Development Strategies and Plan

Viet Nam's socio-economic development and planning framework is composed of the Socio-Economic Development Strategy 2011–2020 (SEDS) and Socio-Economic Development Plan 2011–2015 (SEDP). The SEDS is approved by the Communist Party and presents a vision (overall objectives) along with the main objectives and directions to achieve the vision. To implement its strategies, the SEDP is prepared by the Government of Viet Nam, which is more action-oriented.

The SEDS, approved by the Communist Party in January 2011, acknowledges the need to move beyond the current economic model, which is based on low labor costs and intensive capital investment, and move towards higher efficiency, productivity, and competitiveness as the core of growth.

The SEDS envisions that the country will become a modern industrialized nation and sets "Education and training, and science and technology are to meet the requirements of the country's industrialization and modernization" as one of the main objectives. The SEDS also specifies economic and social development indicators to be achieved by 2020 with the economic performance indicators, such as an average annual Gross Domestic Product (GDP) growth and the percentage of trained workforce over total labor force.

To achieve the objectives, the SEDS provides directions to promote development, renovation of growth model, and economic restructuring and selects three key course of actions: (i) improvement of the socialist oriented market economy institution, (ii) a rapid development of high quality human resources, and (iii) development of a synchronous and modern infrastructure system.

The SEDP approved by the Government in 2011, sets key targets of socio-economic development and environment over the span of five years up to 2015 and provides detailed guidance to implement the three orientations which the SEDS provides. For rapid development of high quality human resources, the SEDP emphasizes the enhancement of quality of education and training and the development of scientific, technological and intellectual economy. With regard to education and training, it focuses on the needs of restructuring and reforming the education and training system. Pertaining to the development of scientific, technological and intellectual economy, it illustrates several challenges: (i) to enhance investment in science-technology to raise labor productivity, (ii) to continue to invest in basic research in natural science and practical research, (iii) to increase scientific level and position of Viet Nam in sectors the country is strong in, (iv) to enhance research capacity, (v) to strengthen technological application and renovation in industry, and (vi) to develop skills of choosing industrial and service sectors with high level of technology. The SEDP also mentions that the Human Resource Development Strategies 2011–2022 (HRDS) and Human Resources Development Master Plan 2011–2022 (HRDMP) should be efficiently implemented to rapidly produce high quality human resources.

The HRDS was approved in April 2011 by the Prime Minister. It is to make Vietnamese human resources the foundation and the most advantageous factor for sustainable development of the country, international integration, and social stability and to raise the competitiveness of Vietnamese human resources to the level similar to that in advanced countries. In this context,

the HRDS identifies the challenges and bottlenecks in HRD, and proposes remedial actions to tackle these constraints along with more detailed qualitative and quantitative targets for HRD to be achieved.

The HRDS sets nine time-bound targets up to 2015 and 2020: six targets under "Raising of intellectual power and working skills" and three targets under "Raising of physical strength of human resources" as shown in Table 2-1.

Table 2-1: Specific Targets in the Human Resources Development Strategy 2011–2020

Targets	2010	2015	2020
I. Raising of intellectual power and working skills			
1. Rate of trained laborers (%)	40.0	55.0	70.0
2. Rate of vocationally trained laborers (%)	25.0	40.0	55.0
3. Number of university and college students per 10,000 people (number of students)	200	300	400
4. Number of international-standard vocational schools (number of schools)	-	5	More than 10
5. Number of international-standard excellent universities (number of universities)	-	-	More than 4
6. Highly qualified human resources in breakthrough fields (number of persons)			
• State management, policy making and international law	15,000	18,000	20,000
• University and college lecturers	77,500	100,000	160,000
• Science-technology	40,000	60,000	100,000
• Medicine, health care	60,000	70,000	80,000
• Finance-banking	70,000	100,000	120,000
• Information technology	180,000	350,000	550,000
II. Raising of physical strength of human resources			
1. Average life expectancy (years)	73	74	75
2. Young people's average height (m)	More than 1.61	More than 1.63	More than 1.65
3. Malnutrition rate among under 5 children (%)	17.5	Less than 10.0	Less than 5.0

Source: Strategy on Development of Vietnamese Human Resources During 2011–2020 (Decision No.579/QD-TTg, April 19, 2011), Hanoi

The HRDMP includes (i) statistics on the number of laborers by each economic sector in 2011 and the percentage of those trained in their respective field, (ii) estimated requirements of laborers in each sector by 2015 and 2020, (iii) percentage targets of individuals to be trained for each sector by 2015 and 2020, and (iv) estimated investment in human resource development by 2015 and 2020.

According to Table 2-2, the HRDMP plans to increase the percentage of trained laborers to total labor forces in the agriculture, forestry and fisheries sector to 50% in 2020 from 15% as of 2010. It is realistic to assume that support from aid donors is essential in addition to fully utilizing existing resources to achieve targets.

Table 2-2: Percentage of Trained Laborers to Total Labor Forces by Economic Sector in 2010, 2015 and 2020

Economic Sector	2010	2015	2020
Whole Economic Sector	40%	55%	70%
Agriculture, Forestry and Fishery Sector	15.5%	28%	50%
Industry Sector	78%	82%	92%
Construction Sector	41%	60%	65%
Service Sector	67%	80%	88%

Note: Figures in 2015 and 2020 are estimates in the HRDMP.
Source: Master Plan on Development of Viet Nam's Human Resources During 2011–2020 (Decision No.1212/QD-TTG, dated July 22, 2011) Hanoi, except for shares of whole economic sector which comes from Human Resources Development Strategy 2011–2020

The HRDMP emphasizes higher education after upper secondary education and vocational training above the intermediate level in human resources development because they directly contribute to socio-economic development. In this context, it sets targets in teachers' quality which affects quality of education and requests more teachers in higher education to get higher academic degrees as shown in Tables 2-3.

Table 2-3: Number of and Percentage of Teachers and Percentage of Holding Higher Degree by Education Level in 2015 and 2020

	2015		2020	
Education Level	Number of teachers (person)	Percentage of holding higher degrees (%)	Number of teachers (person)	Percentage of holding higher degrees (%)
Professional Secondary Schools	38,000	30	48,000	38.5
Colleges	33,500	6	44,200	8.0
Universities	62,100	23	75,800	30.0

Note: "Higher Degree" means master's degree and higher degrees in teachers at professional secondary schools and doctoral degree in teachers at colleges and universities.
Source: Master Plan on Development of Viet Nam's Human Resources During 2011–2020 (Decision No.1212/QD-TTG, dated July 22, 2011), Hanoi

2.1.2 Current Situation and Challenges in the Higher Education Sector in Viet Nam

Under the planned economy, the major function of the higher education institutes in Viet Nam was to produce enough human resources necessary to work for the central and local government agencies after graduation. In connection to this, many state universities, in particular the ones located in the provinces, were founded as provincial colleges which originated from the provincial Teacher Training Schools and/or the Agricultural Institutes. In accordance with the expansion of primary and secondary education, even in the rural areas, much more than secondary school graduates now hope to continue to study in the post-secondary education institutes and so, provincial colleges have gradually expanded to general universities including graduate schools/research centers. In addition to the country's socialistic political system where the social services, including education, are considered as a priority investment option, the Confucianism deeply rooted in the Vietnamese culture help the Vietnamese people believe in the value of education and as a result, the average public education expenditure per student in Viet Nam is considerably higher than that in the other developing countries at a similar level of the GDP per capita. Especially, the primary and lower secondary education are already comparable to the universal level.[11] One of the most important policy targets in the education

[11] Socialist Republic of Viet Nam. 2011. *Education Sector Strategic Development 2011–2020*. Hanoi.

sector in Viet Nam is universalization of upper secondary education and enhancing of both quality and access of higher education.

For higher education in Viet Nam, in alliance with the Education Sector Strategic Development (ESSD) 2011–2020[12], the Ministry of Education and Training (MOET) has developed 'Higher Education Sector Master Plan 2002–2010' in assistance with the World Bank (WB).[13] Unlike the Secondary Education Sector Master Plan supported by the Asian Development Bank (ADB)[14] which has been updated by ADB every 5 years, the progress and achievements under the Higher Education Sector Master Plan was not updated or reviewed in 2005 in form of interim review. Instead, MOET developed the first Higher Education Law again in assistance with WB. This is the first regulatory framework for higher education which had not had any specialized law for a long time and now functions as the basis for planning and management for the sector. Another base policy for higher education is the Comprehensive Education Renovations approved by the National Assembly in November 2013.[15] The direction and targets set out in the section of higher education under this Comprehensive Education Renovations are the priority areas for the investment in higher education.

According to the annual statistics for 2012 of the General Statistics Office of Viet Nam,[16] currently the total number of higher education institutes in Viet Nam is about 750 and the enrollments are about 2,180,000. In the past, access to higher education was limited to a small number of advantaged groups and university graduates considered as the very elite class of the society having a promising future. However now, private universities have drastically increased and the net enrollment rate for higher education has already reached 24.6%. This means, higher education in Viet Nam is now in the transitional period from the European-style of higher education where the purpose of higher education is to serve the public through high-level research and education to the American-style of higher education where university graduates are produced in mass. On the other hand, many of the universities in Viet Nam have not been accredited by the external accreditation organization such as the ASEAN University Network (AUN). Also, majority of newly established private universities are often pointed out for their weak financial foundation and poor quality of education. Also, according to the 2014 Annual Education Statistics issued by the United Nations Educational, Scientific and Cultural Organization Institute of Statistics[17], it is observed that many high school graduates like to major in law and business in universities, rather than engineering and agriculture which directly contributes to the industrialization of the country. The Government considers that it is necessary to develop a strategy for high-level human resources development for industry and agriculture sectors. Higher education institutes are also expected to meet the local needs in their respective areas and address the socio-economic challenges such as poverty in the rural agricultural/fishery areas and global issues such as the environment and climate change issues. However, in the school year of 2014, only 24.0% of the total university students are majoring in engineering and 6.2% of the students are studying agriculture; expansion of the program of these core fields of study and improvement of the quality of education programs of engineering and agriculture are urgently needed.

[12] *ibid.*
[13] Ministry of Education and Training 2002. *Higher Education Sector Master Plan 2002–2010*. Hanoi.
[14] Ministry of Education and Training. 2012. *Secondary Education Sector Master Plan 2011–2015*. Hanoi.
[15] Socialist Republic of Viet Nam. 2013. *Comprehensive Education Renovations*. Hanoi.
[16] General Statistics of Viet Nam. http://www.gso.gov.vn/default_en.aspx?tabid=474&idmid=3&ItemID=14018
[17] United Nations Educational, Scientific and Cultural Organization Institute for Statistics. 2014. http://www.unis.unesco.org/Pages/default.aspx. Montreal.

One of the potential solutions for these issues is the concept of 'development of new model universities' started in 2006.[18] This is a priority project in the higher education sector. MOET selects 4 large universities from different regions and gives intensive financial and educational support both from the state budgets and donors to help them to develop as internationally acknowledged universities and to function as the ideal model for other standard universities after 2020. According to the Prime Minister's Decision in 2006, four criteria of 'new model universities' are specified as follows:

- The universities lead higher institutions, providing training at undergraduate, post-graduate and doctoral levels, conducting science and technology research with high quality and reaching advanced levels within the region and the world.
- The universities are average in size and concentrate on developing focal and leading industries that directly contribute to the enhancement of the economy's competitiveness.
- The universities shall test new models of universities, apply modern methodologies, ideologies and methods in educational activities and research, in organization, management and human resource of the universities based on competitive principles for the assessment of development per society and the not-for-profit principle. The universities are granted high autonomy and accountability in the management, training, science research, personnel organization and financial issues.
- The universities have close relationships with and make full use of the aggregated strength of facilities, leading science staff as well as management staff of higher institutions, research institutions, key laboratories, and firms in and outside the country. The universities are the destination to attract Vietnamese living overseas, foreign professors and researchers to come to work.
- The universities have training and research links with leading higher institutions in the world, and the training curriculum of these universities can be linked with international standard universities. These universities participate in the accreditation and qualification peer-recognizing system with international standard universities.

The Decision also shows two options to establish "new model universities": setting up absolutely new institutions or utilizing established institutions as basis.

In the beginning, the concept did not fully work due to the financial constraint of the Government. However, since MOET identified the selected key donor partners which have professional expertise in the development of higher education to support these 4 universities one on one, the 4 model university projects have started. While there are some differences and specific features among 4 model universities, MOET issued the guiding principles for implementation of the New Model University concept in 2011 by establishing the steering committee[19]. The members of the committee consist of the Vice Prime Minister, Minister of MOET, and Vice ministers or representatives from relevant organizations which aims of assisting the Prime Minister in steering the establishment of 'universities of excellence'. The first model university project was started in 2010 in HCMC supported by the Government of Germany and the WB[20] and the second model university project in 2011, supported by the

[18] Socialist Republic of Viet Nam. 2006. Prime Minister's Decision No.145/2006/QD-TTg on Major Guidelines and Orientation on Establishing Viet Nam's University of International Standards approved on 20 June 2006. Hanoi.
[19] Socialist Republic of Viet Nam. 2011. Prime Minister's Decision No.891/2011/QD-TTg on Establishment and Regulations on functions, responsibilities, authorities and organizational structure of the Steering Committee for Establishing Universities of Excellence approved on 8 June 2011. Hanoi.
[20] World Bank. 2010. Program Document for A Proposed Credit to the Socialist Republic of Viet Nam for A Model University Project. Washington D.C.

Government of France and ADB.[21] In accordance with this recent development, CTU is also preparing to receive support from Japan.

2.2 Current Situation of Viet Nam's Higher Education and Industrial Structure in Mekong River Delta

2.2.1 Current Situation and Prospects in Human Resources Development in Mekong River Delta

Mekong River Delta has a population of 17.4 million[22] which makes the area one of the largest labor markets in Viet Nam. However, it lacks socioeconomic development in terms of human resources due to the following reasons:

(i) Labor forces are occupied with lower skilled laborers who engage in primary industries such as rice product, aquaculture and fisheries
(ii) Population of ethnic minorities who are behind socio-economic development is relatively large.
(iii) Private sector development which utilizes high quality of education and vocational training lags behind.

In this regard, the Government of Viet Nam has considered the region as one of the prioritized areas for support and investment. The Government provides a framework in human resources development in the region through the HRDMP mentioned in section 2.1.1. As shown in Table 2-4, it aims to increase trained labors in agriculture, forestry and fisheries to 2.5 million in 2020 from 1 million in 2015 and increase those in industry and construction to 2 million in 2020 from 1 million in 2015.

Table 2-4: Forecasted Demands of Trained Labor Forces of Economic Sectors by Region in 2015 and 2020

	Agriculture, Forestry, Fisheries		Industry and Construction		Services	
Regions	**2015**	**2020**	**2015**	**2020**	**2015**	**2020**
Northern Midland and Mountainous	1,200,000	1,900,000	850,00	1,400,000	1,100,000	1,200,000
Red river Delta	2,000,000	3,800,000	3,600,000	4,700,000	3,700,000	4,500,000
Northern and Coastal Central	2,000,000	3,000,000	2,000,000	3,000,000	2,000,000	2,500,000
Central Highlands	580,000	780,000	340,000	520,000	390,000	452,000
Eastern South Viet Nam	500,000	1,000,000	3,200,000	4,500,000	3,100,000	4,300,000
Mekong River Delta	1,000,000	2,500,000	1,000,000	2,000,000	2,000,000	2,000,000
Total	7,280,000	12,980,000	10,990,000	16,120,000	12,290,000	14,952,000

Source: Master Plan on Development of Viet Nam's Human Resources During 2011–2020 (Decision No.1212/QD-TTG, dated July 22, 2011) Hanoi

Based on the HRDMP, the Government requests each People's Committee and line agency to prepare human resource development plan for each region and sector. For Mekong Delta River, the Development of Education, Training and Vocational Training in the Mekong River Delta

[21] ADB. 2010. Report and Recommendations of the President to the Board of Directors: Proposed Loan to the Socialist Republic of Viet Nam for the University of Science and Technology Hanoi (New Model University) Development Project. Manila.
[22] General Statistics Office of Viet Nam. http://www.gso.gov.vn/default_en.aspx?tabid=474&idmid=3&ItemID=1401

during 2011–2015[23] was approved in June 2011 which shows goals of human resource development in the region. It specifies the prioritized solutions in higher education as follows:

(i) To enhance physical foundations and equipment to improve higher education in the region as a whole
(ii) To strengthen university networks by establishing universities and colleges
(iii) To consider CTU as a leading university and support it to modernize physical foundations and develop lecturers and academic programs up to the level of developed countries
(iv) To build dormitories to accommodate students including ethnic people
(v) To support linguistics programs at Nha Trang University and Tra Vinh University to preserve ethnic language and culture

The Master Plan on Socio-Economic Development of the Mekong River Delta through 2020[24] mentions strategies to supply human resources in the sections of human resource solutions and scientific and technological solutions to meet demands presented in the Development of Education, Training and Vocational Training in the Mekong River Delta during 2011–2015. In principle, it aims to enhance the quality of human resources in the region by intensifying investment in education and vocational training. In addition, it presents necessities of attracting capable human resources outside the region by improving life conditions and research and education environments. Furthermore, it emphasizes strengthened scientific research capacity, development of scientific technology to enhance productivities in agriculture and other local industries, and efficiencies in business and public sectors, and promote scientific research activities for environment protection and sustainable development.

2.2.2 Viet Nam's Strategies for Industrialization

Supported by the Government of Japan, the Government of Viet Nam has been developing its industrialization strategies under which it aims to become an industrialized country by 2020. Up to now, it selected (i) Electric/Electronics, (ii) Shipbuilding, (iii) Agricultural Machinery, (iv) Food Processing in Agriculture and Fisheries, (v) Automobile, and (vi) Environment/ Energy Saving as prioritized industries. It is preparing action plans to develop these industries by 2020.

Mekong River Delta is one of the important areas for agriculture in Viet Nam, having 27.2% of the nation's agricultural land areas, and producing 53.4% of the nation's rice and 90% of rice exports. It also plays an important role in aquaculture and fisheries. It occupies 70% of the nation's inland water areas for aquaculture, responsible for 58.7% of the nation's production of aquaculture and fisheries and 80% of shrimp export.

Considering these roles of Mekong River Delta in national economy, it has potential for development of agricultural machinery and food processing in agriculture and fisheries in relation to the industrialization strategies mentioned above. Through the development of these industries, qualitative and quantitative impacts are expected as shown in Table 2-5.

[23] Government of Viet Nam. 2011. The Prime Minister's Decision No.1033/QD-TTg approved on 30 June 2011 on Development of Education, Training and Vocational Training in the Mekong River Delta During 2011–2015. Hanoi.
[24] Government of Viet Nam. 2012. The Prime Minister's Decision No.939/QD-TTg approved on 19 July 2012 Approving Master Plan on Socio-Economic Development of the Mekong River Delta Through 2020. Hanoi.

Table 2-5: Qualitative and Quantitative Impacts of Development of Agricultural Machinery and Food Processing in Agriculture and Fisheries

Name of Prioritized Industries	Qualitative and Quantitative Development Impacts
Agricultural Machinery	• Agricultural machinery as industry does not have much impact quantitatively; however, if agricultural machineries are widely diffused to the farmers, who make up 70% of the total population, it will greatly contribute to the improvement of agricultural productivity. • If agricultural productivity is increased, more workers are expected to shift from agriculture to industrial areas.
Food Processing in Agriculture and Fisheries	• One of the top shares of industrial products is foods and drinks. Main export products are fishery products and rice. • Taking particular note of affluent agricultural and fishery products, food processing, and exporting have increased. It is also expected that there will be increased value added products for domestic market.

Source: JICA

2.2.3 Private-Academic and Public-Private-Academic Partnerships in the Mekong River Delta

There is a relatively small number of the higher education institutes in the Mekong River Delta and CTU is pretty much the only university known for its quality education. As explained more in detail in the later Chapter of this report, the CTU is composed of 15 Colleges, 88 educational programs and the total number of students of over 31,000 which is the largest resource university in the region. Many CTU graduates have worked for the provincial/district governments, public agencies, and the major private firms in the Mekong River Delta.

The Public-Private Partnership and Public-Private-Academic Partnership have increasingly become popular in Japan, particularly in the private sector, local governments and the engineering colleges of the local universities. The partnerships are expected to develop a win-win relationship among stakeholders – the partnerships may give rise to innovative solutions for the various issues that the local governments and private firms have faced and the proposed mitigation measures can address the immediate needs in the local context while the universities can apply their knowledge to the actual and practical issues in the society while improving access to research grants and job opportunities for students provided by the local governments and firms.

Such a win-win partnership is also considered to be applicable to CTU and Mekong River Delta and some trials have already been carried out. For instance, Yammer Holdings Co. has opened its office in the 2nd CTU Campus and plans to open a demonstration site in the 4th Campus, which will be the platform to display the firm's agricultural machinery and products. Honda Motors Co. Ltd. has also established an office in CTU and prepares to provide practical technical training programs to the students. In addition to these firms, some other Japanese firms including Hitachi, Ltd., KOBELCO, and some liquor companies are interested in future partnership with CTU[25]. Appendix 2-1 presents some of the existing partnership between CTU and private institutions.

2.2.4 Human Resources Needs for the Direct Japanese Investors in Viet Nam

Viet Nam is a young country where more than 50% of the total population is below the age of 33. Viet Nam is one of the attractive labor markets in the world due to the following reasons: it is rich in cheap labor, politically Viet Nam is very stable, the people are sympathetic to the

[25] Interview with CTU

Japanese culture, and the people are in general hard-working. Foreign Direct Investments (FDI) from Japanese firms have increased since Viet Nam introduced the Doimoi ("Renewal") Policy since mid-1990.

According to the analysis[26] done by a Japanese research company based on the 2014 National Annual Statistics by the General Statistics Office of Viet Nam, FDI from Japanese firms in 2013 is summarized as follows: the amount of investment was about USD 142 million; the amount of additional investment on top of the existing FDI was about USD 73 million and in total, USD 216 million was increased by 54.5% compared to 2012. On the other hand, the actual amount of investments was USD 115 million compared to 2012 which was increased by 9.9%. The number of new investments was 208 for 2011, 317 for 2012 and 291 for 2013. According to the chambers and commerce of the Japanese firms in Viet Nam, the total number of Japanese firms which operate in Viet Nam reached about 1,200 as of December 2013, which follows Thailand in rank.

Among the recipient provinces, Thai Nguyen province ranked 1st receiving USD 34 million and Thanh Hoa province ranked 2nd receiving USD 29 million followed by Hai Phoung City receiving USD 26 million. In the Mekong River Delta, the number of the Japanese investors has gradually increased and a few firms have already started operations in Long Anh and Bac Leiu provinces where the industrial zone was developed. In April 2014, the Economic Committee of the Mekong River Delta, under the Chambers and Commerce of Japan and Tokyo, sent the delegation to Viet Nam and assessed the Mekong River Delta as one of the most resourceful areas for food security in Asia[27]. While the Mekong River Delta is rich in natural resources and adjacent to HCMC, the area is socio-economically behind partially due to the delay in human resource development. The central and local governments in the Mekong River Delta hope to attract more Japanese investors by developing skilled, high-level laborers. The proposed project will meet the needs of the Japanese firms through (1) development of the agricultural and fishery products with additional values and reliability in natural disasters; and (2) development of human resources that have professional and technical knowledge and managerial skills, who are currently lacking in the region.

2.3 Donor Partners' Support in Viet Nam's Higher Education Sector

2.3.1 Japan's ODA Policy for Viet Nam and Past and On-going Projects in Higher Education in Viet Nam

The current Japanese Country Assistance Policy for Viet Nam was prepared in December 2012.[28]. It aims to support Viet Nam in achieving its goals of becoming an industrialized country by 2020. Under this principle, it specifies three priority areas for Japanese ODA support: (i) promotion of growth and strengthening of competitiveness; (ii) mitigation measures against vulnerability and (iii) strengthening of governance.

The requested project aims to strengthen education and research capacity of the CTU in agriculture, aquaculture, fisheries, environment and other interdisciplinary fields through development/improvement of human resources, academic programs, university, governance and management and academic and research environments. The realization of the aim leads to the resolution of issues Mekong River Delta has faced/will face such as environmental issues and threats by climate change.

[26] Vina BiZ. http://www.vina-finance.com/jpsp/

[27] The Japan- Mekong Business Cooperation Committee, Mekong Delta Environment Investment Site Survey Mission Briefing Report, May 8th, 2014

[28] http://www.mofa.go.jp/mofaj/gaiko/oda/seisaku/houshin/pdfs/Viet Nam-1.pdf

Considering the project objective, the requested project is in line with Japan's ODA policy. In fact, the project is closely linked with two priority areas of Japan's ODA policy mentioned above: (i) promotion of growth and strengthening of competitiveness and (ii) mitigation measures against vulnerability.

In the area of promotion of growth and strengthening of competitiveness, the Government of Japan supports to strengthen a market-oriented economic system and develop industry and industrial human resources to achieve sustainable development through strengthened international competitiveness. On the other hand, mitigation measures against vulnerability deals with environmental issues associated with rapid urbanization and industrialization along with threats caused by disasters and climate change. Table 2-6 shows major projects of Japan's ODA in the higher education sector in Viet Nam.

Table 2-6: Major Projects of Japan's ODA in Higher Education Sector in Viet Nam

Project Names	ODA Schemes	Project Period
The Project for the Improvement of the Facilities and Equipment of the Faculty of Agriculture, Can Tho University	Grant Aid	1993
Improvement of Environmental Education in Agricultural Sciences	Technical Cooperation Project	1999-2002
Higher Education Development Support Project on ICT	ODA Loan Project	2006–On-going
Capacity Building of Ho Chi Minh City University of Technology to Strengthen University-Community Linkage (Phase 1)	Technical Cooperation Project	2006–2009
Capacity Building of Ho Chi Minh City University of Technology to Strengthen University-Community Linkage (Phase 2)	Technical Cooperation Project	2009–2012
Strengthening the Capacity of ITSS Education at Hanoi University of Technology (Phase 1)	Technical Cooperation Project	2006–2008
Strengthening the Capacity of ITSS Education at Hanoi University of Technology (Phase 2)	Technical Cooperation Project	2009–2012

Source: JICA Study Team

2.3.2 Supports from Donor Partners

The Government of Viet Nam has given high priority to human resource development through education as one of three drivers of the country's development in the Socio-Economic Development Strategy. In particular, higher education is considered important as it directly contributes to economic growth. In terms of donor support, however, higher education is not receiving a larger scale of ODA compared to other subsectors in education such as primary education or technical and vocational education and training. The reasons for limited donor support for higher education includes the following reasons: (1) higher education is not included in the Millennium Development Goals (MDGs) unlike primary education to which the donor support is massively allocated; (2) higher education is technically very sophisticated and needs professional expertise in designing and monitoring, so that only selected donors which can have rich experiences and resources are able to support; (3) target universities should have the capacity for coordination and collaboration with the MOET and other governmental agencies; and (4) to ensure quality control and sustainability, long-term commitment is needed, both from the donors and the Government.

Currently the leading donor for the higher education sector is the WB. WB started its first loan in 1998[29]. Since then, WB has provided a wide range of support to higher education including development of the Higher Education Law, development of the national higher education accreditation system, provision of the research grants, capacity development of the MOET and the selected universities and research institutes, and the computerization of the universities. WB has funded a total of 4 projects whose total estimated cost sums up to USD 473 million, including the ongoing projects. WB-funded projects are summarized in the table below:

Table 2-7: World Bank Support in Higher Education Sector in Viet Nam

No	Project Names	Approved year	Project Budget (USD Million)
1	Higher Education Project	1998	83.3
2	Second Higher Education Project	2007	59.4
3	Higher Education Development Policy Reform(1)	2009	50.0
	Higher Education Development Policy Reform(2)	2010	50.0
	Higher Education Development Policy Reform (3)	2013	50.0
4	New Model University Project	2010	180.4
		Total	473.1

Source: JICA Study Team

Apart from WB, ADB also supports one of the model university projects together with the Government of France whose beneficiary is the University of Science and Technology Hanoi. Yet, this is the only university project in Viet Nam for ADB and all other ADB-funded education projects are targeting sub-sectors other than higher education. Other key donors active in higher education other than WB and ADB are mainly bilateral donors. Apart from 2 countries which help the model university projects with WB and ADB – Germany and France, United States Agency for International Development (USAID) supports the networking of some engineering universities of the country and the Government of Australia and the Government of Belgium have provided scholarships to the Vietnamese students who study in universities in their own countries. As for the donor coordination framework, the Education Sector Group (ESG) which is chaired by UNSECO Viet Nam Office, calls donor meetings intermittently, but there is no official donor coordination framework for higher education where the donors can share the lessons learned from their projects and coordinate support of the donors for higher education. To share other donor experiences in the model university project, it is necessary to meet respective donors intensively for information sharing.

[29] World Bank. 1998. Program Document for A Proposed Credit to the Socialist Republic of Viet Nam for A Modal University Project. Washington D.C.

3. Current Situation of Mekong River Delta and Roles and Issues of CTU

3.1 Needs and Issues of Mekong River Delta

3.1.1 Geographical Conditions

The Mekong River Delta is one of the administrative regions in Viet Nam and as of April 2014, it comprises 12 provinces and the Can Tho City. 12 provinces include the following: Long An, Dong Thap, An Giang, Tien Giang, Vinh Long, Ben Tre, Kien Giang, Hau Giang. Tra Vinh, Soc trang, Bac Lieu, and Cau Mau. According to the 2012 national statistics book[30], the Mekong River Delta has a population of 17.4 million people, accounting for 22% of the national population. The total land area of the Mekong River Delta is about 40,553.1 km^2 with a population density of 429.0 (person/kms). The Mekong River Delta is known as one of the most fertile river deltas in the world and the biggest rice production area in the country[31]. However, agricultural productivity is relatively low partly due to the severe natural and climatic conditions including the annual floods which often make about 2 million hectares of the region inundated from August to December every year. Climate changes and poor living conditions promote urbanization in the areas and large-scale domestic migrants from the Mekong River Delta to Ho Chi Minh City have deteriorated the annual population growth rate of the Mekong River Delta to only 0.8%, which is lower than the national average of 1.04%. The coastal areas of Southeast Asia, including the Mekong River Delta are often rich in biodiversity. However, it is clearly observed that the damages caused by natural disasters have been more serious in recent years due to climate change[32] and such environmental issues in the region are considered to be a serious threat to the lives and assets of the people in the region. Natural disasters, which include flooding, increased salinity rates, decreased water quality / water supply, ecological hazard, and heavy annual rainfall which can reach 1,520–1,580 mm, are one of the challenges that needs to be addressed most urgently.

3.1.2 Socio-Economic Conditions

The Mekong River Delta is considered as one of the most disadvantaged regions in Viet Nam in addition to the Northern Mountainous Region and the Central Highland. Resultantly, the Government and donor partners have granted a priority area for support and investment to these regions. As the Mekong River Delta is close to the border with Cambodia, there are many different ethnic minority groups including the Khmer and Cham groups. About 8% of the region's population is made up of ethnic minority groups. Mekong River Delta is abundant in natural resources including oil, natural gas, limestone, and peat and it is expected to explore and utilize them for economic development of the region in the future. However, inadequate human resources make it difficult to link rich natural resources to income generation and employment opportunities. As a result, the poverty rate remains at 11.6% according to the national statistics of 2012, considerably higher than that in urban areas.

Despite the Government's efforts, the Mekong River Delta continues to be poor and many of the social development indicators are far from satisfactory. To reduce the poverty in the region, the Government has developed 'the Master Plan on Socio-Economic Development of the

[30] General Statistics Office of Viet Nam. http://www.gso.gov.vn/default_en.aspx?tabid=474&idmid=3&ItemID=14018

[31] In 2012, rice production in MDR was 24.3 million tons which contributed 55.6% to the total rice production in Viet Nam (43.7 million tons). The second biggest contributor is Red River Delta, producing 6.9 million tons according to General Statistics Office in Viet Nam.

[32] According to the National Strategy for Climate Change (Decision No.2139/QD-TTg on 5 December 2011), the Mekong River Delta is assessed as one of the most vulnerable river deltas in the world together the Nile River Delta in Egypt and the Ganges Delta in Bangladesh.

Mekong River Delta through 2020'[33] which presents various policy targets to be achieved by 2020. They include (1) reduced malnutrition rate among 5-year-old children to less than 12%, (2) reduced infant mortality rate to less than 0.75 %, (3) increased primary education enrollment rate to 99%, (4) increased lower secondary enrollment rate to 85%, (5) increased upper secondary enrollment rate to 60%, (7) reduced unemployment rate to less than 3%–5%, and (8) increased ratio of trained labor to total workforce to 50%–55%. The Master Plan also sheds light on the insufficient number of higher education institutes and presents a long term direction which designates the CTU as the regional center university to help improve the average quality of the education institutes in the Mekong River Delta.

3.1.3 Industrial Conditions

Agriculture, fisheries and aquaculture are the major industries in the Mekong River Delta. The Mekong River Delta has a labor force of 10,000 thousand people, accounting for 19.7% of the national labor force, of which about 66% of the labor force are engaged in agriculture, which is considerably higher than the national average of 52.6%. The Mekong River Delta produces rice at 23,269.5 thousand tons in 2011, accounting for 55% of the nation's production. The total catch of fish was about 3,169,715 tons in 2011, accounting for 59% of the nation's production and about half of fish processing factories in the country are located in the region. Fisheries and marine products are major exports of the country. For instance, frozen fish fillets of catfish are exported mainly to Europe and the United States while vannamei is mainly exported to Japan. Aquaculture production in the Mekong River Delta reached 2,128,956 tons in 2011, accounting for 73% of the national aquaculture production of Viet Nam. As mentioned above, the Mekong River Delta plays a significant role in the primary industry of Viet Nam. However, the ratio of trained labor to total labor force was 8.6% in 2012, considerably lower than the national average of 15.4%. This indicates that the quality of labor force needs to be improved. The Government is shifting the industrial structure from agriculture to industrial and service sectors in the long run. However, in reality it is not easy to create new employment opportunities due to the immature private sector. The Government aims to add value to the current agriculture and aquaculture and fisheries sectors while resolving environmental issues. Currently, one of the main goals of the regional development plan is to establish high value-added sectors of fisheries and aquaculture and agriculture. At the same time, it is requested to urgently solve environmental problems which pose a threat to the economy and industries of the region.

3.2 Current Situation and Needs of CTU

3.2.1 CTU's Profile

CTU was originally named Can Tho Institute and was established in 1966 with four faculties, Sciences, Law and Social Sciences, Literature and Vietnamese Linguistics, and Education[34]. At that time, the number of students was around 4,000. CTU was restructured in 1994 and 1995, increasing the scope of education with the founding of larger schools and colleges as seen presently.

In 2004, CTU was approved as one of the 14 key universities[35] by the Prime Minister (No: 1269/CP-KG) (Appendix 3-1). CTU is expected to support other universities in the region as the key university and to improve its education and training, research activities, and human resource development. CTU is the largest and the only multi-disciplinary international university in the MDR, serving the needs of nearly 20 million inhabitants in the region.

[33] Socialist Republic of Viet Nam. 2012. Prime Minister's Decision No. 939/QD-TTg of 19 July 2012 approving the Master Plan on the Socio-Economic Development of the Mekong River Delta through 2020. Hanoi.
[34] CAN THO INSTITUTE (1966–1975) , CTU Website, http://www.ctu.edu.vn/en/intro_det.php?mn=2&id=35
[35] The key universities increased one in 2008, and another in 2011; currently Viet Nam has 16 key universities.

Reviewing the recent statistical data of CTU, the number of students at CTU increased over 30,000 in 2013, which is 7 times more than the starting period. The fields of study (school/college) also increased to 15 disciplines. CTU offers 88 Bachelor's, 31 Master's, and 13 Doctorate programs as of 2014. The strength of CTU is as follows.

Table 3-1: The Number of CTU Students by Discipline and by Level of Study (as of December 31, 2013)

	Training unit	Under-graduate	Master	Doctor	Total
1)	College of Agriculture and Applied Biology	2,960	434	77	3,471
2)	College of Aquaculture and Fisheries	1,449	185	39	1,673
3)	College of Environment and Natural Resources	1,116	235	37	1,388
4)	College of Engineering and Technology	4,692	9	-	4,701
5)	College of Information & Communication Technology	1,557	97	-	1,654
6)	College of Rural Development	1,933	-	-	1,933
7)	College of Natural Sciences	1,305	341	-	1,646
8)	School of Economics and Business Administration	4,498	895	36	5,429
9)	School of Political Science	384	-	-	384
10)	School of Social Sciences and Humanities	2,135	31	-	2,166
11)	School of Law	1,285	133	-	1,418
12)	School of Education	3,744	360	-	4,104
13)	Department of Physical Education	327	-	-	327
14)	Biotechnology Research and Development Institute	687	98	32	817
15)	Mekong Delta Development Research Institute	54	140	5	199
	Total	28,126	2,958	226	31,310

Source: CTU Statistics

The organization of CTU is divided into two large groups, one is the academic unit and the other is the supporting unit. Basically, the academic units have some students and provide education/ research activities, while the supporting unit mainly performs administrative functions for CTU. As of December 2013, the number of CTU staff is 2,024 in total, out of which 874 are female staff (43.1% of the total). 1,197 or around 60% of the staff are teaching staff. The ratio of Ph.D. holders among the teaching staff is 264, around 22%, and that of Master's holders is 55% as of December, 2013. The staff information of each unit is seen in Appendix 3-2. Some administrative staff are assigned in each school/ college who work for the supporting unit. The structure is shown as Appendix 3-3.

CTU currently consists of 3 campuses in Can Tho City (Campus-1, -2 and -3), Hoa An Campus (which is located 30 km southwest of Can Tho City, in Haugiang Province) and other 3 auxiliary campuses. Table 3-2 shows the outline of each campus.

College of Information & Communication Technology (CICT), which is located at Campus-3, will be relocated to the existing Administration Building in Campus-2 after the Administration department is moved to a new Headquarter building (which will be operating from the end-2014).

Table 3-2: Outline of CTU's Current Campuses

Campus	Location	Site Area (Ha)	Building Area (m^2) / Floor Area (m^2)	No. of Students / No. of Staff	Major Function & Roles
Campus 1 An Phu	Street 30/4 Can Tho	6.23	14,611 20,042	- -	Department of Publishing House, Center of Foreign Languages,Public House & Guest House
Campus 2 Xuan Khanh	Street 3/2 Can Tho	80.95	82,522 158,270	24,731 1,524	Main Campus: CAAB, CAF,COET, CENRes, CONS, SEBA, SOE, Graduate School, SoL, SoPU, SSSH, BiRDI & other institutes
Campus 3 Hung Loi	Ly Tu Trong Street Can Tho	0.55	2,163 3,970	1,700 80	College of Information & Communication Technology (CICT) & Software Center
Hoa An	Phung Hiep District, Haugiang	111.29	7,198 7,770	2,320 69	College of Rural Development. For field training and biodiversity experiment scientific research & National Defense Education
Vinh Chau	Vinh Phuoc, Vinh Chau, Soc Trang	17.11	237 237	- -	Artemia experimental farm and aquaculture
Cai Rang	Tan Phu, Cai Rang District, Can Tho	2.37	60 60	- -	Experimental farm and aquaculture
An Binh	An Binh, Can Tho	0.03	100 100	- -	Community House of CENRes

Source: Department of Facility Management, CTU

3.2.2 Summary of the Strategic Plan for Development of CTU 2007–2020

CTU published its Strategic Plan for Development of CTU 2007–2020, and MOET approved it on September 21, 2007. According to the plan, by 2020 CTU will become a vital multi-disciplinary university within the country; the aim is to not only become the best university in Viet Nam, but to be recognized throughout Asia-Pacific as one of the leaders in education, research and development. Its concrete targets are explained in CTU documents as follows.

By 2020, CTU aims to reach the following goals[36]:

- 50%–60% of faculties will obtain Ph.D. and be fluent in a foreign language, preferably English;
- Approximately 20% of students will be taking graduate programs (both master's and Ph.D.s);
- International students (both degree and non-degree seeking) account for 10% of total students;
- 30%–40% of teaching staff will publish papers on international peer review journals;
- Be in the top 250 universities of the Asia-Pacific region.

Some parts of the Strategic Plan for Development of CTU 2007–2020 has been revised as of April 2014, and will be submitted to MOET for approval, as the Strategic Plan for Development of CTU 2014–2022. CTU's goals (target indicators) are mentioned previously. However, these concrete targets do not match those of the official document. For example, the ratio of teachers with Ph.D. in 2020 was revised from 45% to 56.4%, and the ratio of Master's degree holding teachers in 2020 was revised from 50% to 39.7%. The number of undergraduate students was 25,000 and graduate students was 5,000 in the Strategic Plan for Development of CTU (2007–2020), which was revised to 38,852 undergraduate students, and 4,965 graduate students. Those two target numbers are not exactly the same as mentioned above. The target numbers for other three indicators, also, are not found in both Strategic Plans. It seems that CTU has changed the target numbers accordingly. The indicators for the Strategic Plan for CTU (2007–2020) and that of (2014–2022) are given in Appendix 3-4. In the Strategic Plan for Development of CTU 2014–2022, some other information are added, such as CTU organizational model, training programs, scientific research, international training, instructors and instructor-assistants

[36] Those target goals are mentioned in the CTU presentation, and also seen in the CTU website. http://ctu.edu.vn/en/intro_det.php?mn=2&id=13&p=13

planning, and funding sources, based on the government and MOET regulation, and CTU's condition.

Through the ODA project CTU aims to become an internationally recognized university. According to the Minutes of Meetings between CTU and JICA, on April 25, 2014, CTU defines "internationally recognized institution" as follows, and set up goals to be achieved by 2020.

- 18 programs are accredited by external organizations, such as AUN and ABET
- CTU is ranked within top 200 in Asia and Oceania
- International students' ratio goes up to 10%.
- 500 international journals are published; 30% are International peer reviewed.
- Number of patent application reaches 40

The target ranking of 200 in Asia Oceania is higher than 250 mentioned earlier. In addition, the new indicators are added for this project purpose, such as the number of accredited programs, international journal publications along with international peer reviewed ratio, and the number of patent applications.

The status, as of April 2014, for those target goals are as follows:

- Ph.D. ratio of faculties is 22.1%, according to the CTU statistics, December 2013.
- Graduate student ratio is 10.1%, according to the CTU statistics, December 2013.
- International students' ratio is not yet counted by CTU officially, since each college/ school deals with international students, and those are mostly short-short term training students.
- The number of teaching staff who publish papers is not identified yet and needs to be determined before the project starts.
- In 2013, CTU ranked 413 in Asia-Pacific and 39 in South East Asia according to Webometrics[37].
- Two undergraduate programs of CTU were externally assessed by AUN, out of which one was accredited by AUN.
- International journal publication and proceedings are 197 as of 2013. The data for international peer reviewed journals is not compiled, and needs to be determined before the project starts.
- CTU had applied for two patents as of April 2014.

3.3 Needs of Mekong River Delta and Related Programs at CTU

3.3.1 Agriculture

CTU, a university located in MDR, has particular advantages in agricultural education and research from several viewpoints. CTU's strength among four strong agricultural universities of Viet Nam, namely Hanoi University of Agriculture, Hue University of Agriculture and Forestry, Nong Lam University, and CTU, also relates to its geographical and socioeconomic circumstances. Yet innovations in agriculture, such as production management that introduce information and communication technologies (ICT) and quality improvements of agricultural products through application of molecular biology, are anticipated. Details are as described below.

[37] Webometrics website (2013) http://www.webometrics.info/en/Asia_Pacifico/South%20East%20Asia

(1) Rice Production

Viet Nam is the world's second largest rice exporter[38], exporting 7.7 million tons of rice in 2012[39]. In 2012, rice production in MDR was 24.3 million tons and contributed 55.6% to the total rice production in Viet Nam, which was 43.7 million tons[40]. MDR is also known for exporting paddies. It is estimated that MDR has accounted for approximately 90% of the total rice exports in recent years[41].

Demographically, MDR embraces an employed population of 10.5 million, which makes up 19.7% of the total employed population of Viet Nam. Among 10.5 million, 52% work in the agriculture, forestry, and fishing sectors as of 2012[42]. These data show that rice production is also significant from the viewpoint of labor force absorption in MDR.

Meanwhile, from the viewpoint of global food security, dearth of food is predicted[43] to be more serious in the near future, not only as a result of rising human population but also due to the increase of food consumption that recent economic growth begets and the negative impacts of climate change. Issues of rice production in MDR that contributes 20% to the world rice exports[44] may affect global food security and should therefore be understood from global viewpoints.

Agriculture is, in brief, the most important industry in MDR, with a focus on rice production, and, hence, should be strengthened in terms of both quality and quantity, considering the global food security and impacts to MDR's socioeconomic development.

(2) Adaptation to Climate Change in MDR

It is well known that climate change, such as warmer air temperatures, increased rainfall, and rise in sea level, gravely impacts agricultural production[45]. Materializing adaptations to climate change is hence one of the urgent issues in MDR where agricultural production is highly vulnerable to climate changes. Saline soil is one of the problems that is induced due to rise in sea level and related hydrological conditions in MDR. Emerging diseases and increasing stressors of local plants and animals are also partly due to warmer air temperatures. Genetic studies for improved crop varieties with higher salinity tolerances, plant protection, and production system improvement, including soil remediation, help adapt to such climate changes.

(3) National Policy for Agriculture Field

Agriculture Development Program of Hi-tech Application of the National Program of Hi-tech Development through 2020 (hereinafter referred to as Agriculture Development Program), approved by the Prime Minister on December 17, 2012, aims at establishing comprehensively-developed agriculture through the application of high quality technologies. During the period of

[38] Viet Nam Trade Promotion Agency (http://www.vietrade.gov.vn/en/index.php?option=com_content&id=2027:vietnams-rice-export-for-the-first-6-months-of-2013&Itemid=232), IRRI (http://irri.org/our-work/locations/Viet Nam)
[39] Viet Nam Food Association (http://vietfood.org.vn/en/default.aspx?c=108)
[40] *Statistical Yearbook of Viet Nam 2012*, 2013, General Statistics Office of Viet Nam, pp. 380–385
[41] Ramsar Convention (http://www.ramsar.org/pdf/cop11/Pre%20COP11%20Asia%20Reg%20mtg%20PDFs/Presentations/48-%20Mekong%20Delta%20Wetlands_Huynh%20Tien%20Dzung%20_WWF%20Vietnam.pdf), Katie Padilla, 2011, "The Inventory of Conflict and Environment (ICE) case studies No.265: The Impacts of Climate Change on the Mekong Delta," American University (http://www1.american.edu/ted/ICE/mekong-migration.html)
[42] *Report on Labour Force Survey, First 9 months of 2012*, 2012, General Statistical Office of Viet Nam, p. 8
[43] FAO, 2012, *The State of Food and Agriculture*, PP. 99-106
[44] USDA, 2014, *World Production, Markets and Trade Reports*, p. 14
[45] E.g. Mackay, P. et al., 2011, "ADB Technical Consultant's Final Report: Climate Change Impact and Adaptation Study in the Mekong Delta (Project Number 43295)," Asian Development Bank, p. xxi

2016 to 2020, two (2) to three (3) new varieties of each crop and animal, which have high yields, good quality, and outstanding resistance to diseases are expected to be developed.

Hi-tech applications unique to MDR are expected to materialize adaptation to climate change and contribute to sustainable socio-economic development of MDR.

In this context, it must be recognized that MDR's contribution to the total industrial output in 2011 was 9.8%[46]. Considering that Agriculture Development Program eventually anticipates 200 hi-tech applied agricultural enterprises, innovation of agricultural production technologies is yet pursued in MDR, especially at CTU. Developing value adding technologies and obtaining intellectual property rights are challenging tasks of CTU, taking into consideration the industrialization strategy of Viet Nam.

(4) Resources for High Technologies

Universities are expected to provide resources for hi-tech solutions to problems in MDR and for the development of human resources that introduce high technologies for this purpose. In this context, among 4 (four) state universities that have strengths in agricultural education and research in Viet Nam, CTU is the only institution that explicitly recognizes contribution to the socio-economic development of MDR as one of the major missions. It is likely that each university has its unique mission depending on geographical and/or historical backgrounds. In terms of development of new varieties, CTU could focus more on improving the quality of rice as export goods and increasing tolerance to saline or acidic soil.

(5) Technology Transfer to Communities

Gene banks are indispensable not only for improved plant varieties but also for good farming systems. It is CTU's advantage that Mekong Delta Development Research Institute of CTU (hereinafter referred to as MDI) has a gene bank and conserves more than 2,000 kinds of rice germplasm, including those collected before 1975. This collection is particularly diversified, compared to the one that Mekong Delta Rice Research Institute of Ministry of Agriculture and Development (hereinafter referred to as MARD) possesses. MDI reproduces rice seeds every five (5) years at original lands of each germplasm in cooperation with Rice Seed Center of each province in MDR.

CTU also contributes to improved farming performances, by providing local industries, such as biopesticide and biofertilizer companies, with manpower and technologies.

Close relationships with local farming communities and industries is another advantage that CTU has established.

3.3.2 Fisheries and Aquaculture

(1) Fisheries and Aquaculture in MDR

Mekong Delta serves as a center of aquaculture production in Viet Nam, supporting both food production and economy of the whole country. This is due to its geographical setting which provides vast inland water area suitable for aquaculture fields. Aquaculture of freshwater fishes has been developed in inland area, while aquaculture of marine and brackish water species, such as shrimps and eels, has been developed in the coastal area. Today, in MDR alone, 30% of fishery products and 70% of aquaculture products are produced each year.

[46] *Statistical Yearbook of Viet Nam 2012*, 2013, General Statistics Office of Viet Nam, pp. 486-488

In parallel with development of fisheries and aquaculture, the aquatic food processing industry has also been developed. At present, around 50% of aquatic food processing factories in Viet Nam is concentrated in the MDR. These aquatic food products are commercially important and are major export items for the country. For example, frozen catfish fillet is exported mainly to Europe and US, and shrimp is mainly exported to Japan. Table 3-3 summarizes global ranking of Viet Nam in terms of aquatic food production.

Table 3-3: Global Position of Viet Nam in Aquatic Food Production 2011

Items	Ranking
Farmed *Pangasius* catfish	1st
Farmed shrimp	3rd
Aquaculture production	3rd
Seafood export value	5th
Total seafood production	7th

Source: Dr. TN Hai, CAF

However, aquaculture industry in MDR has already reached its peak with little available land for expansion. Therefore, it is necessary to develop more efficient and profitable aquaculture techniques, or convert to more sustainable aquaculture techniques to reduce environmental impacts. Another challenge is adaptation to the effects of global climate change such as elevated water temperature and increased frequency of natural disasters. Since MDR is situated in the area with high biodiversity[47], the research on conservation and wise use of biological resources is also needed. Lastly, research on marine fishery is relatively underdeveloped and issues such as marine resource management and prevention of overfishing need to be addressed.

(2) National Policy for Fisheries and Aquaculture

The Vietnamese national strategy for development of fisheries and aquaculture (Decision No. 1690/QD-TTg and Decision No. 332/QD-TTg) is to industrialize and modernize the fisheries sector and comprehensively and sustainably continue developing it into a large commodity production industry with rational structures and forms of production, high productivity, quality, efficiency, prestigious brands, and competitiveness while steadily integrating into the world economy. It is a national target for the fisheries economy to make up 30%–35% of GDP and seafood export turnover to reach USD 8–9 billion. The total fisheries output is expected to reach 6.5–7 million tons out of which aquaculture accounts for 65%–70%. The following species are specifically chosen to be economically important; Asian catfish, brackish water shrimp, mollusks, marine fish, seaweed, and blue-legged prawn.

To work towards the abovementioned goal, the following tasks are set forth by the national policy, to which CTU can contribute through education and research.

1. Development of production of breeds: To improve the system for research, production and supply of aquatic animal breeds from the central to local levels. By 2015, to supply 100% of aquatic animal breeds to aquaculture farms; 70% of supplied breeds of major cultured aquatic species (common tiger prawn, while-legged green prawn, Tra catfish, blue-legged prawn, tilapia and mollusks) will be disease-free.

2. Development of aquaculture: To expand areas for intensive aquaculture with high yield and to apply clean and environmentally friendly technologies. To raise yield and output of existing zones for extensive aquaculture on the basis of upgrading the irrigation system and widely

[47] MDR is a part of Indo-Burma Biodiversity Hotpot. (http://www.conservation.org/where/priority_areas/hotspots/asia-pacific/Indo-Burma/Pages/default.aspx)

applying advanced technologies. To develop and widely apply technologies to rear aquatic animals in cages and rafts suitable to environmental and socio-economic conditions of coastal areas, islands and reservoirs.

3. Production of feed, biological preparations, supplies and equipment for aquaculture: To rapidly develop the industry producing feed, biological preparations, supplies and equipment for aquaculture combined with building zones for rearing aquatic animals for use as processing materials, and at the same time assure high quality and reasonable prices of products.

4. Reorganization of production: To properly implement the master plan on aquaculture in compliance with regulations on requirements on production and assurance of food hygiene and safety, and at the same time create a close link between aquaculture and processing and sales.

(3) CTU's College of Aquaculture and Fishery-CAF

College of Aquaculture and Fishery (CAF) of CTU was first established in 1979, and since then it has supported local fishery and aquaculture industries through education and research. Its mission is to contribute directly to the development of MDR by developing and transferring fishery and aquaculture knowledge and technologies to the local communities. It has strong cooperative relationships with around 100 local companies and industrial groups. On the other hand, CAF is also active in strengthening academic collaboration with international institutions. Research on marine aquaculture and fishery is a relatively new area for CAF and needs to be strengthened further.

Nationally, CTU is a proactive participant of a network of universities called Viet Nam Fisheries and Aquaculture Institution Network (ViFiNET, see Appendix 3-5). Among the participating institutions, Hanoi National University, Hue University and Nha Trang University mainly work on fishery and aquaculture in Northern and Central Viet Nam. Non Lam University in Ho Chi Min is responsible for Northern MDR, while CTU serves as a center of education and research in fishery and aquaculture of Southern MDR.

3.3.3 Environment

(1) Local Environmental Problems concerning MDR

One distinct geographical trait of CTU in terms of the environment field is that it is situated in the MDR and CTU needs to find the solutions for the issues. Looking at the environmental issues locally, flooding, salinity, degradation of water quality/water supply, and ecosystem endangerment are the main issues associated with the regional environmental problems. Intensive agriculture and aquaculture, and land use cause soil degradation, water pollution, and upstream-downstream water resource competition. Rapid change in land use leads to reduced bio-diversification, loss of species, and increased invasive species. Industrialization and urbanization increases land and water demands, resulting in more pollution (water, soil, air, etc). Over exploitation of ground water (especially along coastal area) creates ground water depletion and saline intruded.

(2) Regional and Global Environmental Problems concerning MDR

Focusing on wider areas of environmental problems, trans-boundary issues and future threats affect the livelihood of the MDR and surrounding population as well as the area's agriculture, aquaculture, and ecosystem. For example, upstream development (hydropower dams, upstream irrigation projects) changes water resources of the Mekong Delta (both quantitative and qualitative). Climate change alters rainfall pattern and temperature across seasons. Accumulation affect of sea level rise + climate change + upstream development reduce inflow,

increase saline intrusion (dry season) and flood (rainy season), increase river bank erosion and reduce sedimentation.

Regarding climate change, Ministry of Natural Resources and Environment (MONRE) of Viet Nam Government envisages (Table 3-4) that the MDR will be affected widely in these scenarios, as the rise in temperature, change in rainfall patterns, and rise in sea levels are expected to have a huge impact on the physical conditions of Mekong Delta[48]. In fact, Mekong Delta ranks among the top 5 deltas in the world that tends to be severely affected by climate change.[49]

Table 3-4: Characteristics of Climate Change Scenarios in Viet Nam

	Moderate Scenarios		Higher Scenarios	
	2050	**2100**	**2050**	**2100**
Increase in wet season flow	No change	10%	0%–10%	20%–50%
Increase in wet season rainfall	0%–5%	5%–10%	10%–20%	10%–30%
Dry season flow	+/− 5% (higher or lower)	5% higher or 15% lower	10%–30% lower	30%–60% lower
Decrease in dry season rainfall	0%–10% less	5%–15% less	10%–20 % less	20%–40% less
Increase in salinity intrusion	Slight	Moderate	Moderate	Dramatic
Sea level rise	20–40 cm	57–73 cm	40–60 cm	78–95 cm

Source: MONRE 2012

(3) National Policy for Environmental Field

In 2011, Prime Minister announced: *The national strategy for climate change* (promulgated together with the Prime Minister's Decision No. 2139/QD-TTg) as one of the most important environmental policy of the country. The strategy warns the country's vulnerability to climate change. In addition, the aim for a modernity-oriented industrial country by 2020, strongly increases energy production and consumption activities, and it will accelerate the increase in GHG emissions to the atmosphere.

On the other hand, GHG emission reduction policies are taking place globally and it will create new trading barrier and Viet Nam is aware that it also needs to harmonize these world trends. The government came up with these strategic objectives.

i. To bring into play national capacity; carry out simultaneous measures of climate change adaptation and GHG emission reduction to assure safety of people and properties for sustainable development goals.
ii. To strengthen human and natural system resilience to climate change, develop a low-carbon economy to protect and enhance quality of life, ensure national security and sustainable development in the context of global climate change, and actively join the international community to protect the earth's climate system.

The strategy defines the following three specific objectives: 1) To assure food security, energy security, water source security, hunger eradication and poverty reduction, gender equality, social security, community health, improve living standards and protect natural resources in the context of climate change. 2) To enhance low-carbon economy and green growth as well as GHG emission reduction and absorbability 3) To raise climate change awareness to the public

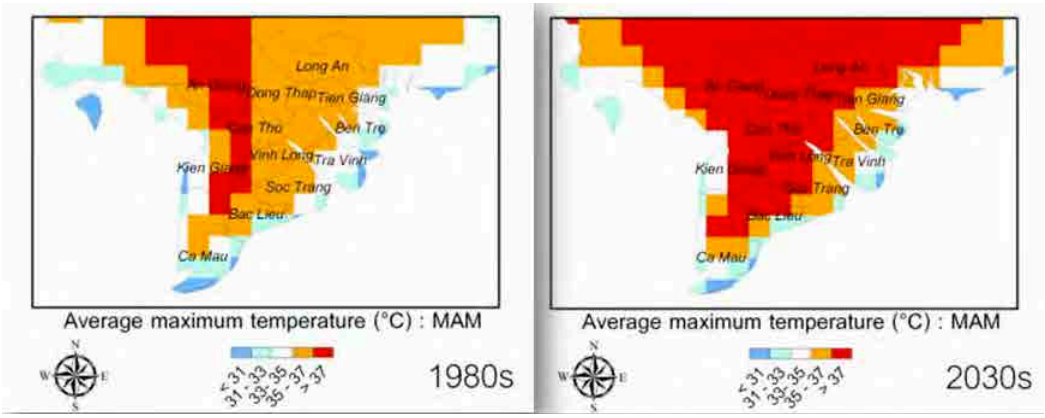
[48] Partners of Water. 2013. Mekong Delta Plan
[49] Stewart, M. A; Coclanis, P. A, 2011

and to develop human resource quality in the field; and 4) To actively join international communities in responding to climate change.

(4) CTU's College of Environment – CENRes

CTU needs to research both regional and global environmental challenges. In fact, CTU has always paid good attention to these issues and these actions play important roles in CTU, not only in the field of environment but also agriculture, aquaculture, engineering and social science.

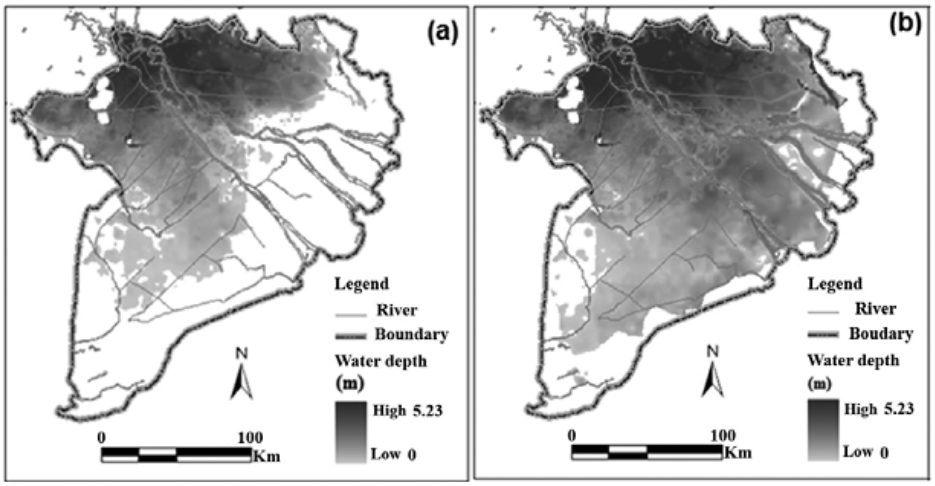
College of Environment and Natural resources – CENRes is in charge of environment field forecasts and Figure 3-1 indicates the temperature change by climate change in MD. In the 1980s, cool climate is relatively observed to be prevalent in coastal areas, and the average maximum temperature of above 37 °C is recorded only the inland part of the western location. However, in the 2030s, most of the inland shows the average maximum temperature of and above 37 °C, which can be taken as significant temperature rise.



Source: Van Pham Dang Tri 2014

Figure 3-1: Climate Change in MDR March–May Temperature (1980 and 2030)

In CENRes, the status of flood in usual scenario and drastically changed scenario are studied as shown in Figure 3-2 respectively. As it can be clearly seen in figure b, expansion in the area affected by flood is predicted.



Source: Van Pham Dang Tri, Ngyen Hieu Trung, and Vo Quoc Thanh 2012

Figure 3-2: MDR Area Peak Flood Time as (a) Usual Scenario and (b) the Most Affected Scenario

Consequently, research activities of climate change in MDR at CENRes CTU have become one of the most important adaptation guidelines of these phenomena.

In CENRes, simultaneously, on top of the international research mentioned above, continuous social contribution to local farmers/fishermen and poor communities, are pursued through student activities[50]. On the other hand, it is difficult for CTU to collaborate with private sectors, as the Vietnamese companies' interests are usually not in line with the protection of environment or minimum impact to surrounding habitat[51].

With regard to Vietnamese universities prominent in environmental fields other than CTU, there are three universities: University of Natural Resources and Environment, HCMC, Nong Lam University HCMC, and University of Technology HCMC. Comparing CTU with these universities, CTU CENRes has advantage in terms of proximity to MDR, as one of the best fields to study both regional and global environmental challenges and weaknesses in providing engineering solutions such as introduction of new technology and scientific countermeasures to pollution[52].

3.4 Detailed Analysis of Related Programs at CTU

3.4.1 Outline of Related Program and Positioning at CTU

The following institutions are relevant to the 3 fields of study that are targets of the project.

- CAAB (Agriculture)
- CAF (Fisheries and Aquaculture)
- CENRes (Environment)
- BiRDI (Agriculture)
- MDI (Agriculture and Environment)

The details of activities of each institution are described in the sections below. Among these institutions, CAAB, CAF, and CENRes are the main actors of this project.

The Tables 3-5 and 3-6 show amount of research fund acquired and number of research projects by the 3 colleges. CAAB has the biggest share in terms of funding and number of research projects.

Table 3-5: CTU Research Fund Acquisition by Year and by 3 Main Colleges

Unit: thousand VND

Colleges	2008	2009	2010	2011	2012	2013
CAAB	6,008,468	7,631,976	6,025,625	10,470,080	6,393,191	7,051,116
CAF	2,783,300	2,327,822	6,904,183	3,171,488	5,441,763	3,886,632
CENRes	−	1,507,000	1,188,003	1,692,230	1,257,474	3,998,347
others	5,538,400	4,916,638	14,038,848	21,752,145	20,627,487	11,556,442
Total	**14,330,168**	**16,383,436**	**28,156,659**	**37,085,943**	**33,719,915**	**26,492,537**

Source: Data from Department of Research Affairs

[50] Interview with CENRes, April 2014
[51] *ibid.*
[52] *ibid.*, consultants in other fields, April 2014

Table 3-6: The Number of CTU Research Project by Year and by 3 Main Colleges

	2008	2009	2010	2011	2012	2013
CAAB	36	41	47	46	70	58
CAF	15	15	40	25	21	20
CENRes	-	9	9	14	15	20
others	43	128	78	109	104	139
Total	**94**	**193**	**174**	**194**	**210**	**237**

Source: Data from Department of Research Affairs

Tables 3-7 and 3-8 show number of journal publications by 3 colleges accepted by national and international scientific journals.

Table 3-7: CTU International Journal Publication and Proceedings by Year and by 3 Main Colleges

	2008	2009	2010	2011	2012	2013*
CAAB	-	-	-	27	30	13/24
CAF	-	-	-	20	24	13/20
CENRes	-	-	-	2	15	12/15
others	-	-	-	53	75	105/138
Total	**146**	**155**	**56**	**102**	**144**	143/**197**

* The number of 2013 shows “the number of first author journal”/ “total number”
** The number is not categorized by College 2008-2010.
Source: Data from Department of Research Affairs

Table 3-8: CTU National Journal Publication and Proceedings by Year and by 3 Main Colleges

	2008	2009	2010	2011	2012	2013*
CAAB	-	-	-	148	151	87/94
CAF	-	-	-	37	41	27/27
CENRes	-	-	-	38	13	19/21
others	-	-	-	237	188	130/206
Total	**85**	**192**	**562**	**460**	**393**	263/**348**

* The number of 2013 shows “the number of first author journal”/ “total number”
** The number is not categorized by College 2008-2010.
Source: Data from Department of Research Affairs

Table 3-9 shows amount of research fund acquired and number of research projects carried out by the 3 colleges. CAAB has the biggest share in terms of funding and number of research projects.

Table 3-9: CTU Number of Degree Programs by 3 Main Colleges

	Bachelor	Master	Doctor
CAAB	12[*1]	7	4
CAF	5	2	1
CENRes	4[*2]	3	1
Total	**21**	**12**	**6**

Note *1: Five (5) programs provide "on-service" lectures to some students at remote sites. All practical education is given at the CAAB laboratories.
*2: There will be one another program made during 2014 and it will become five eventually.
Source: JICA Study Team

The current number of students in each College is shown in Table 3-1. The number of teaching staff and their educational background is shown in Appendix 3-2.

3.4.2 Agriculture

(1) Undergraduate and Postgraduate Education

Postgraduate education of CTU in the field of agriculture possesses high potential and advantages. However there are several agendas that CTU has to handle in order to become an internationally recognized research university. The most urgent issue is to increase the number of Ph.D. holders among young teaching staff members in order to update education contents. Improving research facilities and equipment should be comprehensive with this human resources development. Details are as described below.

1) Programs and Education

The College of Agriculture and Applied Biology (hereinafter referred to as CAAB) currently offers seven (7) master's programs (Soil Science, Crop Science, Plant Protection, Animal Science, Veterinary Medicine, Food and Beverage Technology, and Post-harvest Technology) and four (4) doctoral programs (Soil Science, Crop Science, Plant Protection, and Animal Science), covering most fields of agriculture, including basic genetics, veterinary sciences, and food technologies[53]. As one of the units that conduct education and research in agricultural fields, Biotechnology Research and Development Institute (hereinafter referred to as BiRDI) focuses more on molecular biology and offers a master's program in biotechnology and a doctoral program in microbiology besides the three (3) bachelor programs[54]. MDI also offers integrated graduate programs in agriculture-related fields: a master's program that integrates rural development and farming system studies of undergraduate programs and a doctoral program that introduces policy studies for solving existing issues such as climate change.

Many alumni of postgraduate programs of CTU work for higher education institutes and enterprises in MDR.

While CTU offers considerable number and kinds of agricultural education programs, no bachelor's program, except the agricultural economics of School of Economics and Business Administration, has received AUN-QA or other international quality assurance certificates. Considering that CAAB aims to contribute to the development of MDR by nurturing human resources for high quality research and to ensure that majority of the master's students of CAAB graduate from bachelor's programs of the same college, insufficient quality assurance of undergraduate education, in terms of equipping students with basic knowledge and scientific thinking methods, is a disadvantage for postgraduate programs of CAAB.

2) Teaching Staff and Learning Resources

CAAB has four (4) professors, 25 associate professors, and a total number of 61 Ph.D. holders[55] (as of Dec. 2013, Appendix 3-6); 50.4% of 121 teaching staff members[56] of CAAB hold Ph.D. degrees, which is a little lower than College of Aquaculture and Fisheries but still distinguishable at CTU. It is also an advantage that 51 among 61 Ph.D. holders of CAAB have obtained degrees at universities abroad, including 11 Japanese universities. BiRDI has 11 Ph.D. holders including one (1) professor and seven (7) associate professors, among 22 teaching staff

[53] Department of Food Technology of CAAB is to be moved to BiRDI in the near future.
[54] BiRDI offers an advanced bachelor program in biotechnology, which was supported by the MHO project of the Netherlands. BiRDI is preparing for AUN-QA.
[55] Researchers paid by own funds of CAAB projects are excluded from these numbers.
[56] The total number of professors, associate professors, and lecturers of CAAB is 121 as of December 2013.

members. At MDI, eleven (11) among 16 teaching staff members are Ph.D. holders, including three (3) associate professors. These data suggest that the teaching staff of CTU has good potential.

However, nearly half or more Ph.D. holders of CAAB are in their fifties as shown in Table 3-10 and will retire in the near future. This is especially serious in the field of crop science and veterinary science. Supporting doctoral studies of young teaching staff is a priority issue.

Table 3-10: Number of Ph.D. Holders of CAAB by Age (April 2014)

	Ph.D. Holders by Age				
Department	**30–40**	**41–50**	**51–60**	**>60**	**Total**
Soil Science	3	4	3	0	10
Agricultural Genetics and Breeding	2	1	2	0	5
Crop Science	1	0	4	1	6
Physiology and Biochemistry	1	1	4	0	6
Plant Protection	2	1	3	1	7
Animal Production	3	2	8	1	14
Veterinary medicine	1	1	5	0	7
Food Technology	3	3	3	0	9
Total	**16**	**13**	**32**	**3**	**64**

Source: CAAB

Access to international academic journals from Learning Resource Center is limited; Scopus and papers published in the Elsevier journals are not accessible to students. This situation is a serious disadvantage for postgraduate students and teaching staff in terms of quality of education, since research outputs of international levels cannot be produced without learning from advanced research. CTU should recognize this situation and allocate appropriate budget that enables access to international journals, provided that CTU intends to contribute to the development of MDR by producing quality research outputs.

3) Curricula and Research Based Education[57]

CAAB does not offer part-time programs at postgraduate levels. All postgraduate students stay on campus and are allowed to participate in his/her supervisor's research projects from the second semester of the master's program. The cost associated with the research is financed through research funds acquired by supervisors. Furthermore, nearly 50% of the new master's students are fresh graduates of the undergraduate programs[58] in recent years.

Students, who are to proceed to the master's program right after graduation, conduct graduation thesis work, in most cases, under the supervision of a teaching staff member who is expected to be his/her supervisor at graduate school. This situation is advantageous for master's thesis work. Appendix 3-7 shows a sample of courses that a student may take, assuming he/she immediately proceeds to a master's program. Annual intakes of new master's students vary from 150 to 180[59], while approximately 30 students are newly enrolled in doctoral programs. It is not usual that graduates of CAAB's master's programs start doctoral studies straightaway.

[57] Research Based Education aims at equipping postgraduate students, especially master's students, with research capabilities. Research Based Education therefore requires teaching staff, namely supervisors of master's students, to establish a research team that includes master's students and give clear assignments to each master's student. The hierarchical structure of a research team helps postgraduate students conduct research smoothly and produce quality research outputs as research team members.

[58] Based on the information obtained through interviews to CAAB faculty members.

[59] The intake depends on the MOET's policy of the year.

CAAB requires master's students to obtain 50 or more credits, among which ten (10) credits are for master's thesis work. Though the number of credits that should be acquired by lab work is relatively small compared to those obtained by classroom work, as long as the master's students are involved in a research project that his/her supervisor manages as research members, research based education can be introduced. In this regard, it is CAAB's advantage that the master's students join a research team from the second semester and co-author academic papers as part of their master's work.

The structure of curricula is similar at most graduate schools. However, in Japan and some other countries, master's students are involved in research activities with his/her supervisors' research team members throughout the study program. Standardization of curricula and lectures is pursued at postgraduate schools in Japan; yet stories about advanced research outputs and future perspectives enthusiastically told by the teaching staff always make classes attractive and vibrant. Weaknesses of the postgraduate education of CAAB may come from syllabi and/or lecture contents that do not measure up to research activities of international levels.

(2) Research

Agricultural research has advantages owing to geographical and socio-economic circumstances as stated in 3.3.1. In terms of research capabilities in the field of agriculture, disadvantages such as inadequacy in international journal publications should be offset by strengthening human resources and facilities. Enhancing global and interdisciplinary research scopes and responding to geographical and socioeconomic situations of MDR will upgrade research performances and contribute to innovations. CTU should actively introduce interdisciplinary research themes as a part of its efforts to become an internationally recognized research university and take an important role in MDR. Raising awareness and skills on the management of intellectual property rights is anticipated from the viewpoint of expanding joint research and industrial cooperation. Details are as given below.

1) Research Team and Human Resources for Research

Research at CAAB, BiRDI, and MDI is conducted by research teams, which consist of teaching staff members, researchers, and postgraduate students. Different from Japanese universities where research teams make organizational units of the school[60], research teams are established based on research projects or financial resources. Laboratories, which are physical spaces for experiments and research work, are usually managed by the teaching staff who leads research teams in the relevant field; postgraduate students use their supervisors' laboratories for research work in most cases. For example, departments, laboratories, and research field of research teams are structured as shown in Table 3-11 and are expected to be reorganized for more research-oriented activities.

[60] Structural arrangements differ by faculty/school and department. What is often called "the course-based system" (Koza-sei) is not always introduced, while merits of this system is reappraised from the viewpoint of efficiency of research team work.

Table 3-11: Structure of Departments and Laboratories at CAAB

Existing Laboratory (CAAB)	Future Laboratory Plan	Field of Research Teams
Dep. Soil Science		
Soil Chemistry Lab	(A) Soil Chemistry Lab	Sustainable Production of Tropical Plants and Animals
Soil Physics Lab	(A) Soil Physics Lab	Sustainable Production of Tropical Plants and Animals
Soil Microbiology Lab	(A) Soil Microbiology Lab	Sustainable Production of Tropical Plants and Animals
(New)	(A) Soil Classification and Micromorphology Lab	Sustainable Production of Tropical Plants and Animals
Dep. Agricultural Genetics & Breeding		
Plant Genetics Lab	(A) Plant Molecular Genetics Lab	Genetics and Breeding for Plants
Electrophoresis Lab	(A)	
Plant Breeding Research Lab	(A) Plant Breeding	Genetics and Breeding for Plants
(New)	(A) Seed Technology	Genetics and Breeding for Plants
Dep. Crop Science		
Crop Science Lab	(C) Horticulture Science Lab	Sustainable Production of Tropical Plants
(New)	(A) Rice Research Lab	Sustainable Production of Tropical Plants
(New)	(A) Edible and Pharmaceutical Mushroom Lab	Sustainable Production of Tropical Plants
Dep. Plant Physiology & Biochemistry		
Plant Physiology Lab	(C) Plant Physiology Lab	Genetics and Breeding for Plants
Biochemistry Lab	(C) Plant and Animal Biochemistry Lab	Genetics and Breeding for Plants and Animals
Tissue Culture Lab	(A) Cell Biotechnology Lab	Genetics and Breeding for Plants and Animals
(New)	(A) Applied Biological Science Lab	Genetics and Breeding for Plants and Animals
Dep. Plant Protection		
Plant Pathology Lab	(C) Plant Pathology Lab	Sustainable Production of Tropical Plants
Entomology Lab	(C) Entomology Lab	Sustainable Production of Tropical Plants
Biological Control Lab	(C) Biological Control Lab	Sustainable Production of Tropical Plants
(New)	(A) Biological and Chemical Technology in Plant Protection Lab	Sustainable Production of Tropical Plants
Dep. Animal Sciences		
Anatomy Lab	(C) Animal Anatomy and Physiology Lab	Genetics and Breeding for Animals
Animal Physiology Lab		
Genetics & Animal Breeding Lab	(C) Animal Nutrition and Feed Technology Lab	Genetics and Breeding for Animals
Animal Feed Lab		
Animal Nutrition Lab		
Apiculture Lab	(C) Non-ruminant Animal Production Techniques Lab	Genetics and Breeding for Animals
Dep. Veterinary Medicine		
Obstetrics & Artificial Insemination Lab	(C) Veterinary Bacteriology and Mycology Lab	Sustainable Production of Tropical Animals
Microbiology & Immunology Lab		
Animal Pathology Lab		

Existing Laboratory (CAAB)	Future Laboratory Plan	Field of Research Teams
Parasitic Disease Lab	(C) Parasitology Lab	Sustainable Production of Tropical Animals
Infection & Parasitic Disease Lab		
Clinical Diagnostic Lab	(A) Animal Clinic and Virology Lab	Sustainable Production of Tropical Animals
Dep. Food Technology		
Food Technology Lab	(B) Food Technology Lab	Food Technology and Post-harvest Technology
Postharvest Technology Lab	(B) Postharvest Technology Lab	Food Technology and Post-harvest Technology
Food Process Engineering Lab	(B) Food Process Engineering Lab	Food Technology and Post-harvest Technology
Food Biotechnology Lab	(B) Food Biotechnology Lab	Food Technology and Post-harvest Technology
(New)	(B) Food Nutrition Lab	Food Technology and Post-harvest Technology
(New)	(B) Food Chemistry Lab	Food Technology and Post-harvest Technology

Source: CAAB, edited by JICA Study Team

As already described in 3.4.2 (1) 3), master's students participate in their supervisors' research team from the second semester of the program, after looking for a supervisor/research team that caters to his/her research concern. This situation is advantageous in terms of structural research management and research based education for postgraduate students.

Research teams are led by Ph.D. holders and need qualified research members. If the research capacity of team leaders is not good enough to conduct research at international levels, CTU would not be able to offer postgraduate education that could be internationally recognized nor produce research outputs of international levels. It is yet anticipated that young teaching staff members nurture capacities to plan and carry out innovative research by obtaining Ph.D. degrees at universities in Japan. It is also indispensable for this purpose that CTU keeps motivating young research team leaders to make more innovations after coming back to CTU; For example, CTU should provide young Ph.D. holders with a system for sharing research outputs and creative research culture with other researchers and postgraduate students at CTU, simultaneously developing a research environment that enables further expansion of their research at CTU.

2) Research Funds and Facility

Securing financial resources of research activities is one of the fundamentals for high quality research. CAAB received research funds of VND 7,051,116,200 in 2013 from central governments, CTU[61], private companies, and majorly from local governments. This amount is about 27% of CTU's total external research funds and suggests CAAB's relative strength in research. More than 50% of local authorities' research funds are given to CAAB, which also implies CAAB's prominent contributions to local communities. CAAB has also participated in 33 international projects in the last five years, among which few provide CAAB with research grants[62].

Lab equipment is currently shared by undergraduate students, postgraduate students, and teaching staff. Practical activities of bachelor students are given more priority over research

[61] CTU offers internal competitive research grants to 110 research teams. The amount of each grant is about USD 2,500.

[62] According to the information obtained through interviews, most of international projects support cooperation among universities and/or methods of strengthening education programs such as curriculum development.

activities of teaching staff members and postgraduate students at CAAB, BiRDI, and MDI; this situation is extremely disadvantageous in terms of research performances of international levels.

3) Research Themes

Research team based activities are widespread in the agricultural fields of CTU; however, research themes that encompass two or more research concerns are yet to be pursued. For instance, BiRDI has published considerable number of papers regarding functions of bacteria living in MDR and firmly underlies potential interdisciplinary research activities, while applications of new methodologies such as live imaging could be considered. Research on stem cell applications should be linked to veterinary science teams of CAAB. Application-oriented research themes of food technologies could be made innovative through the introduction of ICT.

One direction, in a practical sense, is to fully utilize research resources of CTU's agricultural fields; for example, research teams of BiRDI may take part in a molecular biological aspect of research in crop and animal sciences. The other is to introduce new disciplines such as computational simulations of engineering fields and environmental digital data collections that are available at CTU. Collaborative work for innovative problem solutions, especially for climate changes in MDR through interactive information exchanges with environment and aquaculture research teams is anticipated. Interdisciplinary research collaboration may provide researchers with more opportunities for international journal publications.

4) Dissemination of Research Output

The number of paper publications of each department of CAAB and BiRDI in the last five years is given in Table 3-12, which suggests that CAAB's paper publication in international journals is not improving. Considering the number of Ph.D. holders, paper publication in genetics and breeding is more prevalent.

Table 3-12: Number of International Journal Publications of CAAB and BiRDI

Department of CAAB/Institute	2009	2010	2011	2012	2013
Soil Science	1	2	3	1	0
Agricultural Genetics and Breeding	10	12	10	8	8
Crop Science	3	1	3	1	2
Physiology and Biochemistry	0	0	2	2	2
Plant Protection	0	3	3	3	1
Animal Production	21	10	8	7	11
Veterinary medicine	1	6	4	7	8
Food Technology	1	1	0	0	5
BiRDI	2	6	3	5	4

Note: The data indicate the numbers of academic papers, to which one or more teaching staff members of each department have contributed either as the first author or as one of co-authors, and include duplicated numbers[63].
Source: CAAB and BiRDI

CTU gives incentives to teaching staff members who have published international journal papers; one international journal paper is equivalent to 80 hours of teaching hours[64]. Increased number of international journal papers is one of the priority targets of CAAB.

There are a number of papers published at international conferences, especially those given at CTU. CTU also publishes a domestic journal and supports teaching staff members' publication

[63] Method of counting the number of papers that an institution (department) is involved in follows Monbukagakusho –Kakenhi's policy (http://www.mext.go.jp/b_menu/shingi/gijyutu/gijyutu4/030/gijiroku/1334396.htm)
[64] In the case where there are two or more authors, the hours are shared by co-authors.

fees. This arrangement somehow discourages international journal publications, while providing postgraduate students and teaching staff members with opportunities to be eligible for Ph.D. degrees at CTU and research funds that CTU receives.

However, in order to achieve the increased number of international journal papers, it is essential that the teaching staff of CTU conducts novelty research learning from advanced research, and keeps producing research outputs of international levels and that CTU invests more in such activities of researchers.

5) Technology Transfer and Intellectual Property Rights Management

CTU's Technology transfer to local communities has been highly active in the field of agricultural. Dissemination of production technologies and improved seeds is an established technology transfer skill at CTU. Workshops are given at CAAB, while practical technology transfer is mainly provided by College of Rural Development[65] at the Hoa An Campus. Improved seeds that the gene bank of MDI develops/preserves are disseminated to farmers in cooperation with rice seed centers of provinces in MDR.

As for collaboration with private industries, one of the largest agricultural companies of Viet Nam, An Giang Plant Protection Joint Stock Company (AGPPS) benefits from biocontrol technology of CTU. Former teaching staff of CTU is leading research at AGPPS; most of his technical staff is from CAAB and BiRDI. DASCO, a subsidiary company of Don Thap Trading Joint Stock Company, has commercialized CTU's biofertilizer technology; one of DASCO's directorate board members has a master's degree in agronomy of CTU.

In this context, CTU, as a prospective research university, is expected to be more aware of the necessity of intellectual property managements[66]. CTU should also understand that offering technologies to local communities would not be hindered by patent applications and recognize that Viet Nam is a TRIPS[67] member country.

3.4.3 Fisheries and Aquaculture

(1) Undergraduate and Postgraduate Education

CAF currently encompasses 6 academic departments, 113 teaching staff, 1449 undergraduate students, 185 master's students, and 39 doctorate students.

1) Programs and Education

As of spring 2014, the following academic programs are being offered.

- **Bsc. Programs (5)**
  - Aquaculture (Aquaculture; Marine aquaculture and aquatic resources conservation; Advanced program in aquaculture Transferred program in Aquaculture)
  - Aquatic animal pathology

[65] According to the interview, a person in charge of a certain field who develops technology, the same person disseminates the technology transfer, while there are personnel have been assigned for technology transfer in College of Rural Development.

[66] Patent application based on research outputs financed by government research funds is conducted at Ho Chin Minh City University of Technology (HCMUT). HCMUT has applied for more than 60 patents (invention). Application processes take a few months. Request of registration can be made within 42 months after the application with the National Office of Intellectual Property (NOIP) in Ho Chi Minh City. Examinations for registration take a year or more. Patents must be applied for before publishing papers; balancing patent applications and paper publications is needed.

[67] Agreement on Trade-Related Aspects of Intellectual Property Rights. Viet Nam has been a member of this agreement since 2006.

- Fisheries product processing technology (Transferred program in fisheries product processing technology)
- Fisheries economics
- Aquatic resources management

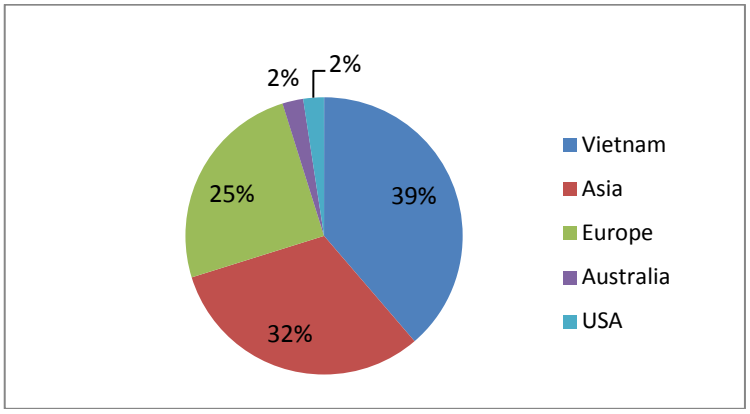
- **Msc. Programs (2)**
  - Aquaculture
  - Aquatic Resources Management
- **Ph.D. Program (1)**
  - Aquaculture

The number of graduate programs is limited compared to undergraduate courses, so the opportunity for undergraduate students to continue their research at graduate level may be limited.

Typical career paths for the graduates of CAF with master's or doctorate degrees are to work for academic institutions, local government, or private fishery and aquaculture companies in MDR. Few graduates work for NGOs/NPOs. In any case, most of the alumni stay in Mekong Delta and contribute to regional development of fisheries and aquaculture.

2) Teaching Staff and Learning Resources

As mentioned above, CAF has 113 staff members. Approximately 31% of them are Ph.D. holders and 34% are M.Sc holders. Sixty percent of the staff has obtained their postgraduate degrees abroad (Figure 3-3). Among the countries from where they obtained their postgraduate degrees, Belgium is the most popular destination, followed by Thailand, Malaysia, and Japan. Many of the teaching staff received undergraduate education at CTU and then went abroad for higher degrees. Alternatively, some staff members are studying and working as supporting staff or lecturers at CAF at the same time. The average age of CAF staff is around 40.



Source: CAF

Figure 3-3: CAF Staff Members Graduated MSc or Ph.D. Degrees from Different Regions

3) Curricula and Research Based Education

Curricula of undergraduate and graduate degree programs are attached in Appendix 3-8. Advanced program in aquaculture is a unique undergraduate program which is offered in collaboration with Auburn University in the United States. The lectures are taught in English (some of the lectures are taught by visiting professors from Auburn University), and students are required to write their theses in English.

Opportunities for research-based education are provided as Bachelor's and Master's Thesis research and Doctoral Dissertation research. The number of research credits is the same as other Colleges. The students can select their supervisor according to their academic interest.

(2) Research

1) Research Team and Human Resources for Research

Each research project is conducted by a research team, which comprise of one team leader (who is an academic staff of CAF) and 2–8 team members (including researchers from outside). Graduate students are not counted as members of research teams, but can conduct research under the supervisors and publish papers in academic journals under their name. Graduate students may receive financial support depending on the conditions of funding source.

At present, the following laboratories belong to CAF. These laboratories are used for multiple purposes including undergraduate practical courses, postgraduate research, and research by teaching staff members.

- Zoo-Physiology Laboratory
- Aquatic Pathology Laboratory
- Water and sediment analysis Laboratory
- Laboratory for live food and invertebrate biodiversity
- Fisheries Resources Laboratory
- Food Safety Laboratory
- Genetic Laboratory
- Freshwater Hatchery
- Brackish Water Hatchery and Wet Labs

Table 3-13 shows the lab and department relationship in CAF.

Table 3-13: Structure of Departments and Laboratories in CAF

Existing Laboratory	Future Laboratory Plan	Education Program	Research Program
Department: Aquatic Nutrition and Products Processing			
Fish Nutrition Basic Lab	Fish Nutrition Basic Lab	BSc in Aquaculture, Aquatic product processing, Aquatic animal pathology	Theme I, II, IV
Fish Physiology Basic Lab	Fish Physiology Basic Lab	BSc in Aquaculture, Aquatic animal pathology	Theme I, II, IV
Microbiology Basic Lab	Microbiology Basic Lab	BSc in Aquatic product processing; MSc and PhD in Aquaculture	Theme IV
Food Safety Basic Lab	Food Safety Basic Lab	BSc in Aquatic product processing	Theme IV
Aquatic Product Processing Basic Techniques (CAF Area)	Aquatic Product Processing Basic Techniques (CAF Area)	Same as above	Theme IV
(New)	Fish Nutrition Research Lab	MSs and PhD in Aquaculture, Aquatic product processing	Theme I, II, IV
(New)	Fish Physiology Research Lab	Same as above	Theme I, II, IV

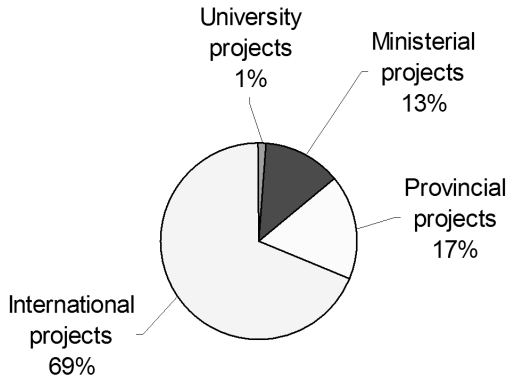
Existing Laboratory	Future Laboratory Plan	Education Program	Research Program
(New)	Microbiology Research Lab	Same as above	Theme IV
(New)	Food Safety Research Lab	Same as above	Theme IV
(New)	Aquatic Product Processing Techniques Research Lab (CAF Area)	Same as above	Theme IV
Department: Aquatic Pathology			
Bacteriology Lab	Bacteriology Lab	BSc in Aquaculture, Aquatic animal pathology; Fisheries management; MSc, PhD in Aquaculture, Fisheries management	Themes I, II, IV
Histology Lab	Histology Lab	Same as above	Themes I, II, IV
Mycology Lab	Parasitology and Mycology Lab	Same as above	Themes I, II, IV
Virology Lab	PCR and Virology Lab	Same as above	Themes I, II, IV
Biotecnology Lab			
(New)	Immunology and Tissue Culture Lab	Same as above	Themes I, II, IV
(New)	Basis Lab	Same as above	Themes I, II, IV
Department: Applied Hydrobiology			
Plankton and Invertebrate Lab	Algae Toxins & Plankton/ Periphyton Biodiversity Lab	BSc in Aquaculture, Aquatic animal pathology, Fisheries management; MSc and PhD in Aquaculture; Fisheries management	Themes I, II, V, VII
Live Food Study Lab	Live Food Study Lab	BSc in Aquaculture, Aquatic animal pathology; MSc and PhD in Aquaculture	Themes I, II, V
Probiotics Study Lab	Probiotics Study Lab	Same as above	Themes I, II, V
Marine Biology Lab	Marine Biodiversity & Bioactive Products Lab	BSc in Aquaculture, Aquatic animal pathology, Fisheries management; MSc and PhD in Aquaculture; Fisheries management	Themes I, II, III, VI
Shrimp/Fish Taxonomy Lab			
Water Quality Study Lab	Water Quality/Aquatic Invertebrate/Fish Taxonomy Basic Lab	Same as above	Themes I, II, III, V
(New)	Aquaculture Ponds Water/ Sediment Lab	Same as above	Themes I, II, V, VII
Department: Fisheries Management and Economics			
Fish Collection Room	Fish Collection Room	BSc in Fisheries resources management; Aquaculture; MSc and PhD in Fisheries resources management; Aquaculture	Themes I, II, III, VII
(New)	Fish Biology Lab	Same as above	Themes I, II, III, VII

Existing Laboratory	Future Laboratory Plan	Education Program	Research Program
(New)	Fish Distribution and Migration Lab (Fisheries Resources Lab)	Same as above	Themes I, II, III, VII
(New)	Fish Stock Assessment and Management Lab (Fishing Technology and Management Lab)	Same as above	Themes I, II, III, VII
(New)	Fish Population Dynamics Lab	Same as above	Themes I, II, III, VII
Department of Coastal Aquaculture and Department of Freshwater Aquaculture			
Brackish Water Wetlabs (Hatcheries)	Brackish Water Wetlabs (Hatcheries)	BSc in aquaculture, fisheries resources management, aquatic animal pathology, fisheries economics; MSc and PhD in aquaculture, fisheries resources management, aquatic animal pathology	Themes I, II, III, VII
Freshwater Wetlabs (Hatcheries)	Freshwater Wetlabs (Hatcheries)	Same as above	Themes I, II, III, VII
(New)	Other Research and Practice Wetlabs	Same as above	Themes I, II, III, VII
College of Natural Sciences			
Department: Biology			
(New)	Advanced Equipments Lab	MSc and PhD in aquaculture, fisheries resources management, seafood processing	Themes, IV, VI
(New)	Bioassay Lab	Same as above	Themes, IV, VI
(New)	Natural Products Chemistry Lab	Same as above	Themes, IV, VI

Source: CAF, edited by JICA Study Team

2) Research Fund and Facility

CAF acquires research funding from different sources on project basis. Main funding sources are ministerial (MOET and other central ministries), provincial, international, and internal research funds of CTU itself. CAF acquired research funds of USD 3.48 million in total from 2010 to 2013. As shown in the Figure 3-4 below, 'international projects' is the largest category in terms of the amount, making up 69% of all research funds. CTU's internal research fund makes only 1% of the total research fund at CAF.



Source: CAF

Figure 3-4: CAF Research Fund by Funding Sources

3) Research Themes

Majority of the research themes in CAF is directly linked to development and improvement of aquaculture techniques in MDR. The main target species are commercially important species such as crustaceans (e.g. shrimps and crabs) and fishes (e.g. snakehead fish and eel). Some examples of international collaboration projects are on biodiversity and its wise use of aquatic species in MDR in collaboration with Nagao Foundation, on culture techniques of *Artemia spp.* supported by Belgium, and Interdisciplinary Project on Climate change in Tropical Aquaculture supported by Denmark. Most of the research at CAF is applied, and relatively few basic or theoretical researches have been done. Interdisciplinary research, such as socio-economics of fishery and aquaculture is also conducted at CAF.

4) Dissemination of Research Output

The output of research is published in national and international journals as well as presented at international conferences. The number of articles published in national and international journals in the period of 2007–2012 is shown in the table below. A full list of publications is attached in Appendix 3-9.

Table 3-14: The Number of CAF Articles Published in National and International Journals in the Period of 2007–2012

Year	National journals	International journals
2007	5	14
2008	39	10
2009	35	18
2010	77	32
2011	91	17
2012	115	24
Total	**362**	**115**

Source: CAF

CAF researchers also actively participate in numerous national and international academic conferences where they present their research outcomes to the scientific community. For example, CAF hosted International Fisheries Symposium in 2012, in 8 universities belonging to ASEAN countries participated in order to strengthen collaboration in education, research and information exchange in aquaculture and fisheries.

5) Technology Transfer and Intellectual Property Rights Management

Technical development may be discussed at seminars and trainings for local communities. CTU regards technology transfer as the most important mission of the University, so seminars and trainings are organized very often. For years 2010–2014, CAF hosted a total of 59 national training courses in which 2,968 trainees participated, and 15 international training courses in which 42 trainees participated. Most of these trainings are held in classrooms and wetlabs of CAF building. Some technical transfers are also carried out at Vinh Chau Research Station which is located about 100km south of the main campus. Five of international training courses were held overseas.

As the purpose of their research is to contribute to the development of local industry by disseminating their knowledge, their research outcomes are rarely protected by patents.

3.4.4 Environment

(1) Undergraduate and Postgraduate Education

1) Programs and Education

Postgraduate education of environment in CTU is mainly pursued at College of Environment and Natural Resources – CENRes. It was founded in 2008, originated from a combination of Department of Environmental Engineering and Water Resources (College of Technology) and Department of Environment and Natural Resources Management (College of Agriculture and Applied Biology).

In 2010, a new department, Department of Land Resources, branched out from a unit of the Department of Soil Science (College of Agriculture and Applied Biology). CENRes contains 4 departments:

- Department of Environmental Sciences
- Department of Environmental and Natural Resources Management
- Department of Environmental Engineering
- Department of Land Administration

Presently, the CENRes possesses a building with an area of 4,200 m^2 comprising 9 laboratories which are:

- Environmental Toxicology Laboratory
- Environmental Biology
- Chemical Environmental Engineering Laboratory
- Biological Environmental Engineering Laboratory
- Environmental Quality Laboratory
- Wastewater Treatment Laboratory
- Solid wastes Treatment Laboratory
- GIS and Remote sensing Laboratory
- Hydraulic Laboratory

In terms of connectivity to undergraduate study, CENRes questionnaires show that about 10-20 % of the undergraduates at CTU will proceed to the masters program (Table 3-15). The reason for decrease in this number from 2012 is the growing number of students from other universities. More connectivity of undergraduate and graduate programs at CTU CENRes can be pursued by increase of internal undergraduates.

Table 3-15: Percentage of Undergraduate Finishers Going to Graduate School of CTU CENRes

Department/ Year	2013	2012
Env. Management	8	24
Env. Sciences	15	32

Source: CENRes 2014

2) Teaching Staff and Learning Resources

Currently CENRes has 61 staff, including 1 Professor, 8 Associate Professors, 33 lecturers, 15 Ph.D. pursuers and 8 others. The staff education level is: 19 Ph.D. holders, 34 master's holders, 6 bachelor's holders, and 2 others (below bachelor's level). Ph.D. ratio of the teaching staff is 33.3 %. Research Institute for Climate Change known as Dragon Institute, which closely works with CENRes, has one staff with a master's degree.

One crucial issue at CENRes is the shortage of human resources. The table below shows the current age distribution of CENRes teaching staff. According to CENRes representatives, the core lecturers are in their fifties and reaching their retirement age but the next generation of human resources is yet to be developed.

Table 3-16: Teaching Staff's Current Age Distribution of CENRes

Gender/Age	26-30	31-40	41-50	51-60
Male	1	21	7	9
Female	3	10	7	4

Source: CENRes 2014

3) Curricula and Research Based Education

Curriculum for CENRes is shown in Appendix 3-10. The courses are categorized into two parts: R: Required course credits; and S: Selective course credits. The two categories also need specific hours which are T: Theory hours; P: Practice hours and F: Fieldtrip hours. There is a requirement for Pr: Prerequisite course. For example, to get a degree of Master of Science: Curriculum_Env. Management_English_CENRes needs 32 required course credits; and S: 22 Selective course credits. The CENRes syllabus is supposed to be under review every two years in order to get new insight from the real world.

Several departments using laboratories are seen to work on their research in form of teams. For example, laboratories like GIS & Remote Sensing Laboratory and Hydraulic Laboratory engage in research of analyzing data, and these laboratories possess full-time researchers who engage in laboratory management and some research work. These arrangements are efficient in organizing research teams. On the other hand, laboratories like Environmental Toxicology Laboratory, Environmental Biology, and Chemical Environmental Engineering Laboratory are used for graduate and undergraduate experiments for both research and education. Therefore, these laboratories are not thought as research teams but as the places for experiments.

(2) Research

Like the agriculture and aquaculture fields, environmental related researches have advantages due to geographical and socio-economic circumstances as stated previously. Concerning research capabilities in the fields of environment, shortage in human resources and inadequacy of international journal publications is conspicuous, partly because it is a relatively newer field compared to the other two. It can be offset by providing research experiences and strengthening facilities and equipment with a long-term vision, and it is indispensable to plan human resources

and facilities to be developed as a research oriented university. Environmental fields have been intensively engaged in global and interdisciplinary research, responding to geographical and socioeconomic situations of MDR, and more and more mutual engagement should be enhanced with related fields, such as agriculture, aquaculture and fishery, engineering and economics. Details are as given below.

1) Research Team and Human Resource for Research

Most of the core researchers are getting old and there exist some concern of lack of human resources. There are issues of shortage of PhD degree holders. PhD is a qualification of indicator of an appropriate researcher. The PhD holders of CENRes occupy 33.3% and it is lower than the other two: CAAB: 50.4% and CAF 56.1%. However, compared to the level of PhD holders' ratio of the whole universities being 21.7%, CENRes level is relatively high.

Table 3-17 shows 9 existing laboratories and 7 new laboratories as along with their assigned department and division. The table also shows the present use of education and research at different levels of education (undergraduate, master, and doctorate). Some laboratories can be referred as being research teams but others, which are used for both education and research purposes, can only be referred to as places for experiments. It is needed to have clear demarcation between education and research when creating new laboratories.

Table 3-17: Structure of Departments and Laboratories in CENRes

UG-undergraduate, M=master, and D=doctorate

Department name	Division name	Names of "Laboratories" as space New Lab *	Education (Present)	Education (Future)
CENREs				
Environmental Sciences	Environmental Quality	Soil and Water Environment	UG, M, D	UG, M, D
		Environmental Toxicology	UG, M, D	UG, M, D
	Environmental Ecology	Environmental Biology	UG, M, D	UG, M, D
		*Advanced Techniques	-	Special arrangement *1
Environmental Engineering	Water supply and waste water treatment	Wastewater Treatment	UG, M, D	UG, M, D
		Chemical Environmental Engineering	UG, M, D	UG, M, D
		Solid Waste Treatment	UG, M, D	UG, M, D
		*Air pollution control		UG, M, D
		*Center for demonstration pilot technologies		This center will be in Hoa An (51m^2 office and opened space
Land Resources (Administration)	Natural Resource Conservation	GIS and Remote Sensing	UG, M	UG, M, D
		Land Resource	UG, M	UG, M, D
Environmental and Natural Resources Management	Environmental Management	Hydraulics	UG, M	UG, M, D
		* Environmental modeling	-	UG, M, D
	Natural Resource Management	* Climate change and Environmental Observation	-	UG, M, D
College of Engineering and Technology- CoET				
Department of Automation Technology		* Automation in Agriculture and Environment	-	UG, M

Department name	Division name	Names of "Laboratories" as space New Lab *	Education (Present)	Education (Future)
Department of Electrical Engineering		* Renewable and green energy	-	UG, M
School of Economic - Business Administration - SEBA)*2				
Department of Natural Resource and Environmental Economics		* Lab of Environment and Behavioral Economics	-	M, D

Note *1 It is used for more profound research purpose because of only high tech equipment here. This lab will be operated as common used lab like what C/P have learnt from Japan training. Online booking for using equipment will be developed. Consultancy with Japanese Universities is needed.
Note *2 Department of Agricultural Economics also involves in this lab.
Source: CENRes 2014

1) Research Team and Human resources

Shown in previous table of the age distributions of CENRes teaching staff, core researchers are reaching their retirement age. Low rate of Ph.D. holders is also an issue. As a researcher, a Ph.D. degree serves as a means of determining if a person can pursue sound researches. The rate of CENRes Ph.D. holders is 33.3%, and compared to the teaching staff of the other two fields, 50.4% in agriculture and 56.1% in aquaculture, the level is comparatively low. However, as the rate of Ph.D. holders in the total teaching staff is 21.7%, CENRes's rate is higher than the average.

2) Research Fund and Facility

According to CENRes representative, some supervisors will support students who want to participate in their supervisor's project activities. Generally students need to personally cover the costs of projects they are interested in (students may get funds from their office).

In 2013, the fund acquisition of CENRes was VND 3,998,347. As seen in 3.5.1, the amount of CENRes research fund has been inconsistent over the years. Funding from international organization accounted for 67.6%, CTU funding 5.4% and MOET 27%. It is hard to get private sector funds from Vietnamese enterprises as their interest in environmental conservation is low.

3) Research Themes

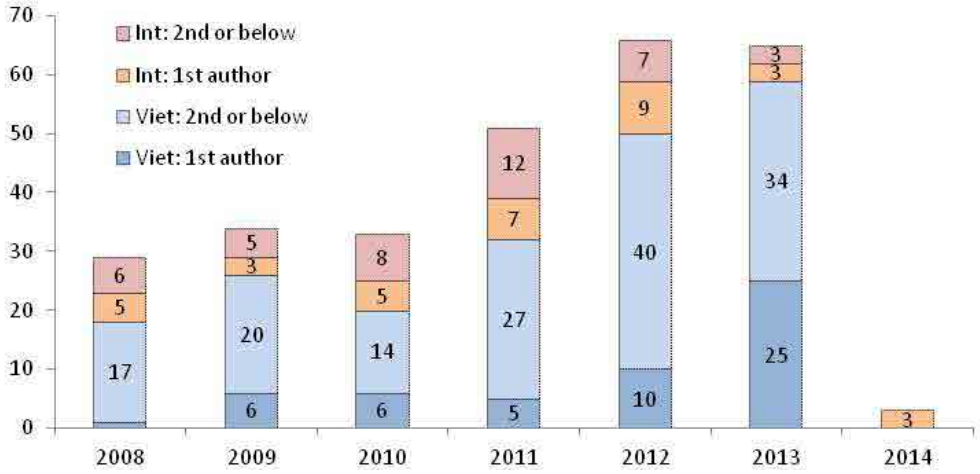
Research Themes of CENRes are deeply rooted in MDR activities as previously mentioned and they are also linked to trans-boundary issues of surrounding areas. These issues pave way for urgency, potential for future development, direct beneficiary for MDR, contributions to global environmental challenges, high possibility for interdisciplinary research, collaboration potentials with Japanese university, and sustainability.

4) Dissemination of Research Output

Figure 3-5 shows publications made by CENRes during 2008–2014. Though international papers are smaller in number, it has been successful in publishing more and more Vietnamese language papers.

Representative of CENRes CTU raised a point that some staff as prospective Ph.D. holders tend to produce a lot of international papers through their process of writing dissertation, but they stop doing that after their completion of Ph.D. This is because they do not find time to pursue research due to daily tasks as educators and administrators at CTU.

In order to conquer this issue, some incentives to writing international journals are made. Researchers, who have published an international paper, can decrease their teaching hours, depending on the level of involvement (first author, second and other author)[68]. Regardless of these incentives, it is still very hard for them to produce international papers due to daily tasks as educators and administrators. Some drastic policies to promote international research should be taken to increase the number. For instance, long-term sabbatical leaves given according to the served years and opportunities for researching abroad can be the options.



Source: CENRes 2014

Figure 3-5: Publication of CENRes

5) Technology Transfer and Intellectual Property Right Management

With regard to technology transfer in the field of environmental education, there is involvement of Hoa An campus. Hoa An was used as a place of demonstration for biodiversity related research. Dragon Institute presently has interaction with Hoa An campus through bio-gas and irrigation method adapted to climate change (Alternative Wet / Dry System).

Soil of Hoa an campus is acidic and the location is ideal to study acidic soil. Also it is considered to be a good place to study fruit production for CAAB. However Hoa an campus is physically quite far from campus III. If the area close to Campus III could provide similar facilities, it would be a good place for technology transfer. The intellectual property management is not yet an issues in the environmental field, but it is necessary to continue managing them precedent of agriculture and aquaculture.

3.4.5 Hoa An Technology Transfer Center

CTU has played an important role in technology transfer and tremendously contributed to the development of technology in agricultural production in Mekong Delta River. To strengthen the function, the Hoa An Technology Transfer Center was established in 2011, located 40 kilometers from Can Tho City because installing new animal and field test facilities is difficult in the city center due to environmental issues.

In addition to offering academic programs, the Center is used mainly for CAAB, CAF, CENRes, and College of Rural Development (CRD) to conduct testing of research findings in the field conditions, demonstrations, and, training and transfer of new technologies to extension workers, farmers and local government officers.

[68] Interview with CENRes, April 2014

The Center has offered 7–8 undergraduate programs since 2011. At present it does not offer any graduate programs, however a number of graduate students are using the Center's facilities for studying, practicing, and preparing thesis. Two master's programs in Agriculture Extension and Agriculture Business will be offered in 2017 and 2020 respectively.

In order to improve qualifications and knowledge of officers and farmers in Mekong Delta River, short training courses have been organized by the CRD itself or cooperation with other colleges at the Center. The list of training courses the CRD directly organized are showed in Table 3-18.

Table 3-18: List of Training Courses Organized by the CRD from 2011–2013 in Mekong Delta River

Name of Training Courses	Location/ Local authorities	Year	Training Period (days)
Upgrade knowledge and skills in Agricultural extension	Hau Giang	2011	5
New Rural Village model development	Soc Trang	2011	3
Rice Breeding	Vinh Long	2012	60
Enhancing knowledge & skills for implementing New Rural Village model	Can Tho City	2012	84
Participatory Technology Development (PTD)	Hau Giang	2012	3
Participatory Technology Development (PTD)	Dong Thap	2012	3
Methodology for Enhancing agricultural production and farmer incomes	Can Tho City	2013	42
Planning & method for New Rural Village model development	Tien Giang	2013	10
Research proposal and data analysis	Ben Tre	2013	7
TOT- Household Economic Management	Tra Vinh	2013	7
TOT- Household Economic Management	Ben Tre	2013	7
TOT- Household Economic Management	Tien Giang	2013	7
Assessment of livelihood vulnerability	An Giang	2013	3
Impact pathway analysis for CLUES technologies in An Giang	An Giang	2014	3

Source: CRD

The Center has also provided services for consultancy and technology transfer for local authorities through research findings. The research projects and technology transfer organized by the CRD are shown in Table 3-19.

Table 3-19: List of Research Projects and Technology Transfer that Organized by the CRD from 2007 to 2013 in Mekong Delta River

Research and Technology transfer	Location/ Local authorities	Year	Value (USD)
Planning for New Rural Village model development (5 villages)	Tien Giang	2013	39,750
Study on urban agriculture models at Soc Trang City, Soc Trang Province	Sóc Trăng	2012–2015	31,905
Master plan for socio-economic development of Mang Thit district, Vinh Long province towards 2020	Vinh Long	2010–2012	17,750
Building up the linkage of production and consumption for high quality rice towards GAP standard in Dong Thap	Đồng Tháp	2010–2012	41,515
Study on "New Rural Village" model for Khmer ethnic at Long My, Hau Giang	Hậu Giang	2010–2012	15,000
Investigation, selection, and identification of source of trees and techniques for increasing yield and quality of "Dau Ha Chau"	Cần Thơ	2009–2011	30,000
Trial artificial production *Cirrhinus jullieni*	An Giang	2009–2011	21,106
Purification and demonstration and multiplication of specially rice variety of Nep Than, Nanh Chon, Tau Huong		2007–2011	19,700
Vulnerability assessment of livelihoods in Lower Mekong Basin: Adaptation options for enhancing capacity of people living in the most vulnerable flood-prone areas in Cambodia and Viet Nam	SUMERNET – Sweden	2011–2012	50,000
Investigation of organization forms for rice production and agricultural mechanization in Mekong Delta	IDE, JETRO, Japan	2011	10,000
Participatory Agricultural Extension in Southern Viet Nam (PAEX)	VVOB – Belgium	2008–2012	120,000
Study on sustainable agricultural production models in fresh water zone Go Cong	Tien Giang	2009	15,000
Study on the local community institutions to cope with flood situation in the Mekong region	SUMERNET – Sweden	2008	50,000
Livelihoods and resources use strategies in the Mekong Delta	SUMERNET – Sweden	2007	10,000
Mekong Delta Agricultural Extension Project (MDAEP)	VVOB – Belgium	2001–2007	140,000

Source: CRD

3.5 Priority of Research Programs in CTU's Agriculture, Aquaculture, and Environment Faculties

3.5.1 Agriculture

16 research sub-programs under three (3) research programs that should be strengthened are shown in Table 3-20. (Appendix 3-11: Detailed list of themes and descriptions). The selection of the research themes are done based on the consultation of the JICA Study Team and advisory group meetings held in April 2014. The key concepts for selection are: beneficiaries to MDR and response to climate change.

In the process of scoring each theme, priorities are given from the viewpoints of advantages and potentials of CTU as a resource university in the MDR, urgencies such as adaptations to climate change, feasibilities in terms of producing international publications, and sustainability at CTU as well as consistency with government policies and potential contributions to MDR; A is prioritized over B. In terms of value adding technology development, introducing more

engineering knowledge such as sensors for non-destructive evaluation of agricultural products is strongly recommended.

Interdisciplinary research activities are also anticipated at CTU in order to become an internationally recognized university. In this regard, all themes in the agricultural research field respond to climate changes and hence introduce collaborative analysis, simulation, and evaluation with environmental researchers.

Table 3-20: List of Research Themes and Priority in Agriculture

Program 1: Plant and Animal Genetics and Breeding	
Plant genetics and breeding	
A	Plant resources collection, evaluation and development (rice, other crops, animal forages, etc.)
A	Application of genetic, breeding and cell culture technologies for new varieties of rice and other crops with improved quality and adaptability to climate changes and other environmental stresses
Animal genetics and breeding	
B	Collection, evaluation and development of native animal breeds
A	Application of genetic and breeding technologies for new livestock varieties with improved quality and adaptability to climate changes and other environmental stresses
Program 2: Sustainable Production of Tropical Plants and Animals	
Crop production	
B	Developing integrated crop management (ICP) for improvement of product quality and adaptation to climate changes
Plant protection	
A	Studies on insect pests and diseases and development of alternative plant protection technologies
Soil management	
A	Studies on bio-remediation of MDR problem soil under impacts of climate change
B	Studies on sustainable soil uses
Animal production	
A	Improve animal production systems for higher quality and safety of products
Animal health management	
A	Molecular studies for detection and identification of animal diseases in MDR
A	Microbial and pharmaceutical studies for animal disease treatment
Agricultural modelling	
A	Simulation of metal-organic frameworks (MOFs)
A	Agricultural machineries
Program 3: Food Technology and Post-harvest Technology	
Post-harvest and Logistics	
A	Studies and development of post-harvest technologies for rice, plant and crop based-food products in MDR
Food Processing	
A	Development of value added food products from agricultural products and by-products in MDR
Food Safety and Quality Management	
A	Studies on food pathogens and antibiotics resistant bacteria

Note: A is prioritized over B.
Source: CAAB, edited by JICA Study Team

Additionally, relationships of each research theme to MDR are explained as below.

Table 3-21: Research Themes in Agriculture Field and Relation to MDR

Research Themes		Relation to MDR
1. Plant and Animal Genetics and Breeding		
1.1	Plant resources collection, evaluation and development (rice, other crops, animal forages, etc.)	New varieties of plants are expected by MARD. This research theme pays special attention to climate-change-induced problems in MDR and aims at contributing to enhancement of food security by diversifying plant genetic resources in MDR.
1.2	Application of genetic, breeding and cell culture technologies for new varieties of rice and other crops with improved quality and adaptability to climate changes and other environmental stresses	This research theme aims at developing new varieties that are adaptable to problems caused by climate change in MDR. Adaptation to increased salinity of soil is one of the most urgent issues in MDR in terms of sustainable crop production. This research also aims to increase values of agricultural products according to MARD's development program.
1.3	Collection, evaluation and development of native animal breeds	This research theme contributes to improved animal production through diversification of animal breeds in MDR. Breeding technologies such as applying animal cell technology to sperm studies are to be introduced.
1.4	Application of genetic and breeding technologies for new livestock varieties with improved quality and adaptability to climate changes and other environmental stresses	This research develops reproduction technologies that enable adaptation to climate change and hence contributes to sustainable agricultural productions in MDR. High quality dairy cows and beef cattle production is one of the high-technology applications that MARD's development program anticipates.
2. Sustainable Production of Tropical Plants and Animals		
2.1	Developing integrated crop management (ICP) for improvement of product quality and adaptation to climate changes	This research theme aims to enhance climate-change-adaptability of rice production and other crop production such as fruit, vegetables, and pharmaceutical plants. This research also studies alternative strategies for rice and crop production to avoid serious impacts of climate change in MDR.
2.2	Studies on insect pests and diseases and development of alternative plant protection technologies	Biological impacts of climate change in MDR are gravely serious. This research theme develops biopesticides and other new compounds for crop protection in MDR. The research also studies newly emerging insect pests, prediction and forecast of the outbreak of important plant diseases in MDR.
2.3	Studies on bio-remediation of MDR problem soil under impacts of climate change	High salinity and acidity are serious problems of the MDR soil, partly due to climate change. This research theme includes development of microbial environmental management and application of microbial enzymes for soil remediation.
2.4	Studies on sustainable soil uses	This research pursues morphological studies and classification of the MDR soil for sustainable soil uses in MDR. This research theme also develops organic and bio-fertilizers based on the characteristics of the MDR soil.
2.5	Improve animal production systems for higher quality and safety of products	Enabling adaptation to the environmental stresses is indispensable for animal production in MDR. This research theme includes improvement of animal feed and production systems for better production performance and environmental safety. High-tech applications to livestock are also anticipated by MARD.
2.6	Molecular studies for detection and identification of animal diseases in MDR	This research theme studies emerging diseases, which are induced by climate change in MDR and/or unique to MDR. One of the expected outputs of this research theme is a database of pathogens in MDR.

Research Themes		Relation to MDR
2.7	Microbial and pharmaceutical studies for animal disease treatment	Based on the molecular studies on animal diseases in MDR, this research studies host-pathogen interactions that are vulnerable to climate change and/or other environmental stresses in MDR. The research also conducts screening of indigenous microbial extracts and plant materials for treating animal diseases in MDR.
2.8	Simulation of metal-organic frameworks (MOFs)	Simulation of climate change is intensively conducted at CENRes; joint work is anticipated. This research theme aims at developing agricultural models that relate to CO_2 adsorption and hence contributes to solving environmental problems in MDR.
2.9	Agricultural machineries	This research is jointly conducted with researchers of College of Engineering Technology and produces basic farm machineries for agricultural production in MDR. Machine designs depend on physical conditions such as hydraulics and land levels that are unique to MDR.
3. Food Technology and Post-harvest Technology		
3.1	Studies and development of post-harvest technologies for rice, plant and crop based-food products in MDR	This research theme includes kinetic modeling of food quality attributes for agricultural products of MDR. Simulation of 3D product temperature distribution aims to improve post-harvest technologies for the MDR food.
3.2	Development of value added food products from agricultural products and by-products in MDR	Agricultural products and by-products are vulnerable to environmental stresses including those caused by climate change. This research theme therefore aims to identify nutritional effects and functional components of agricultural products and applies genetics and biochemistry of useful microbes in MDR.
3.3	Studies on food pathogens and antibiotics resistant bacteria	This research aims at identifying pathogens and antibiotic-resistant bacteria, which could be impacted by climate change in MDR. Research outputs should actualize and sustain the quality management of food in MDR.

Source: JICA Study Team

3.5.2 Aquaculture

The following 8 research themes were identified as priority in CTU's CAF. The selection of the research themes are done based on the consultation of the JICA Study Team and advisory group meetings held in April 2014. The key concepts for selection are: beneficiaries to MDR and response to climate change.

In accordance with Meeting Minutes between JICA Advisory Mission and CTU, the priorities were given based on factors such as the degree of urgency, contribution to economic and social development of MDR, and response to global environmental issues. As a result, Theme 1 was agreed to be the most prioritized. The following list is in order of priority.

In terms of consideration for interdisciplinary research, the selected research themes included numerous interdisciplinary themes such as adaptation to climate change, environmental monitoring, engineering and information technology, and socioeconomics (See table below). The detailed description of each theme and expected output is attached in Appendix 3-12.

Table 3-22: List of Research Themes in Fisheries and Aquaculture

I	Climate change: Impacts and adaptation in aquaculture and Fisheries
	1. Impacts of environmental changes on aquatic animal life history, biology, physiology, nutritional value, and health
	2. Adaptation measures to climate changes through selective breeding, environmental manipulation, nutrition and feed improvement, and health management
II	Green technology innovation for aquaculture
	1. Green technology innovation for seed production and farming systems of marine aquaculture
	2. Green technology for seed production and farming systems of for sustainable inland aquaculture
III	Fisheries Resources management and Conservation
	1. Ecophysiology of endangered and stressed species and conservation
	2. Monitoring biodiversity in Mekong Delta and Phu Quoc Island
	3. Sustainable capture fisheries management
IV	Quality improvement of fisheries/aquaculture products
	1. Establishment of evaluation systems for aquatic products safety
	2. Quality improvement of aquatic products in cold chain transportation system
	3. Applied biology in aquatic product processing
	4. Quality improvement of aquatic products by supplementation of natural antioxidants
V	Environmental monitoring for aquaculture and fisheries
	1. Monitoring and management of water and sediment quality (physical-chemical-biological factors) for inland aquaculture in Mekong Delta
	2. Monitoring and management of water quality (physical-chemical-biological factors) for marine aquaculture
VI	Biochemistry and pharmaceutical science in aquaculture and fisheries
	1. Development of eco-friendly supplements to reduce drugs and chemicals used for aquaculture
	2. Development of natural bioactive products as functional food for human and for aquaculture
VII	Engineering and information technology development and application in aquaculture and fisheries
	1. Development and application of engineering equipments and materials for aquaculture and fisheries
	2. Development and application of IT (software, data base and networks) for aquaculture and fisheries
VIII	Fisheries socioeconomics and management
	1. Impacts of environmental changes on socioeconomics of aquaculture activities in Mekong Delta region
	2. Evaluation on the impacts and roles of policies on sustainable development of aquaculture and fisheries
	3. Value chain in aquaculture and fisheries

Source: CAF

Additionally, the relationship with MDR with each research theme is explained below.

Table 3-23: Research Themes in Fisheries and Aquaculture Field and Relation to MDR

Research Themes	Relation to MDR
I. Climate change: Impacts and adaptation in aquaculture and Fisheries	
1 Impacts of environmental changes on aquatic animal life history, biology, physiology, nutritional value, and health	The overall objectives of the research are to enhance capacity of understanding and adaptation solutions to climate change for sustainable development of aquaculture and fisheries in MDR. The research themes address a global environmental issue while promoting adaptation to climate change at a local level. It also takes an interdisciplinary approach.
2 Adaptation measures to climate changes through selective breeding, environmental manipulation, nutrition and feed improvement	
II. Green technology innovation for aquaculture	
1 Green technology innovation for seed production and farming systems of marine aquaculture	The overall objectives of the research are to develop and apply advanced and environmental friendly technology for seed production and farming in order to contribute to innovation and sustainable development of aquaculture in MDR. It will also contribute to environmental protection in MDR.
2 Green technology for seed production and farming systems of for sustainable inland aquaculture	
III. Fisheries Resources management and Conservation	
1 Ecophysiology of endangered and stressed species and conservation	The objective is to assess and better understand ecophysiology of endangered and stressed species for conservation. It will contribute to biodiversity conservation in MDR.
2 Monitoring biodiversity in Mekong Delta and Phu Quoc Island	The objective is to evaluate and monitor biodiversity and gene pools of aquatic species in MDR and marine protected area (including Phu Quoc)
3 Sustainable capture fisheries management	The objective is to evaluate and recommend solutions for sustainable capture fisheries management in MDR. Capture fisheries is still under development in MDR, so the necessity of the research is high.
IV. Quality improvement of fisheries/aquaculture products	
1 Establishment of evaluation systems for aquatic products safety	The overall objectives of the research themes are to strengthen the fisheries products processing sector and enhance food safety management to support the sustainable growth of this important industry in MDR.
2 Quality improvement of aquatic products in cold chain transportation system	
3 Applied biology in aquatic product processing	
4 Quality improvement of aquatic products through provision of natural antioxidants	
V. Environmental monitoring for aquaculture and fisheries	
1 Monitoring and management of water and sediment quality (physical-chemical-biological factors) for inland aquaculture in Mekong Delta	The objective is to assess and improve monitoring and management of water and sediment quality (physical-chemical-biological factors, including disease pathogens) for inland aquaculture in MDR. It will enhance capacity in monitoring and managing the aquatic environment in order to ensure sustainable development of aquaculture in the MDR.
2 Monitoring and management of water quality (physical-chemical-biological factors) for marine aquaculture	The objective is to assess and improve monitoring and management of water and sediment quality (physical-chemical-biological factors, including disease pathogens) for marine aquaculture in MDR. It will enhance capacity in monitoring and managing the aquatic environment in order to ensure sustainable development of aquaculture in the MDR.

Research Themes		Relation to MDR
VI. Biochemistry and pharmaceutical science in aquaculture and fisheries		
1	Development of eco-friendly supplements to reduce drugs and chemicals used for aquaculture	The research objective is to develop and apply eco-friendly supplements to reduce drugs and chemicals used for aquaculture. It will contribute in promoting effective and sustainable development of aquaculture and fisheries in MDR.
2	Development of natural bioactive products as functional food for human and for aquaculture	The research objective is to develop and apply natural bioactive products as functional food for human and for aquaculture. It will contribute in promoting effective and sustainable development of aquaculture and fisheries in MDR.
VII. Engineering and information technology development and application in aquaculture and fisheries		
1	Development and application of engineering equipments and materials for aquaculture and fisheries	The objective is to study, develop and apply engineering technology, automatic equipments and advanced materials for aquaculture and fisheries. It is an interdisciplinary study with engineering. It will help mechanize and modernize aquaculture and fisheries in MDR.
2	Development and application of IT (software, data base and networks) for aquaculture and fisheries	The objective is to study, develop and apply IT (software, database, monitoring and warning systems, GIS and remote sensing and communicate networks) for aquaculture and fisheries management. It is an interdisciplinary study with information technology. It will help mechanize and modernize aquaculture and fisheries in MDR.
VIII. Fisheries socioeconomics and management		
1	Impacts of environmental changes on socioeconomics of aquaculture activities in Mekong Delta region	The overall research objectives are to assess the existing socio-economic status of aquaculture and fisheries; roles of aquaculture and fisheries; impacts of environmental changes such as climate change on aquaculture and fisheries socio-economic and to recommend establishing strategies and solutions for sustainable fisheries sector development in the MDR.
2	Evaluation on the impacts and roles of policies on sustainable development of aquaculture and fisheries	
3	Value chain in aquaculture and fisheries	

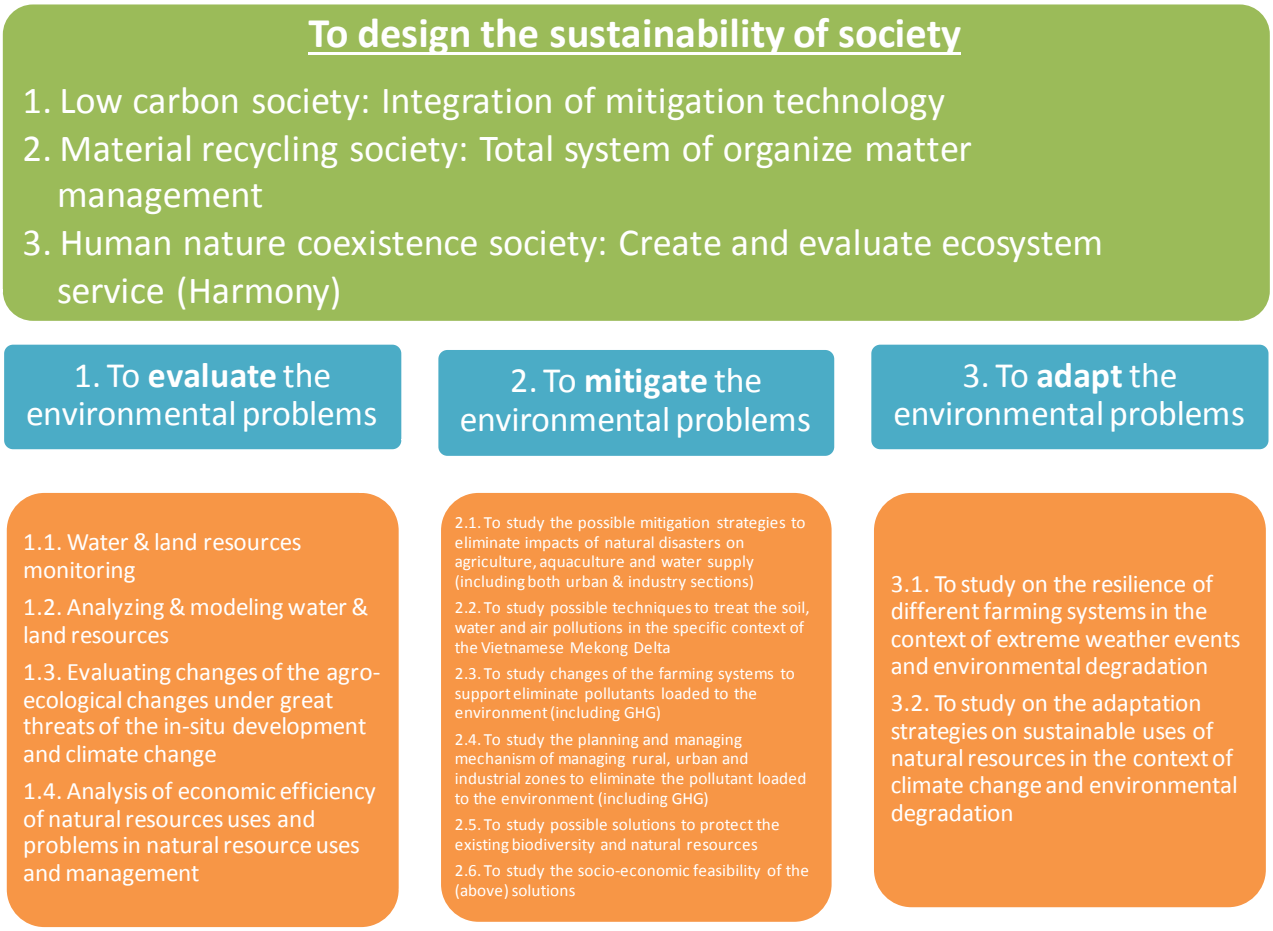
Source: JICA Study Team

3.5.3 Environment

The Environment field of CTU has selected the following 12 research themes. The selection of the research themes are done based on the consultation of the JICA Study Team and advisory group meetings held in April 2014. The key concepts for selection are: beneficiaries to MDR and response to climate change. First they set an overall goal of the environment field of CTU. Then they developed 12 concrete research themes, also categorized under the three large categories (Figure 3-6).

In terms of consideration for interdisciplinary research, the environment fields can play a center role in bridging not only the other two fields in question, but also other related fields such as engineering, environmental economics and social science.

For example, the Environment field suggests the overall goal as overarching research goals which can be applied for even the other two fields (Figure below). Considering the promotion of interdisciplinary research is one of the most important concerns for the study, these themes should be taken as focal issues of research collaboration among the three fields.



Source: CENRes 2014

Figure 3-6: Research Theme of Environment Field of CTU

Table 3-24 shows outline and priority submitted by the CENRes of CTU. Some of the themes have already produced publications while others are yet to produce papers. Appendix 3-13 shows more details on the conditions of each theme.

These priorities are given from the viewpoints of advantages, potentials, and sustainability at CTU as well as consistency with government policies and potential contributions to MDR.

Table 3-24: Research Themes and Priority of Environment Field of CTU

Research Themes		Priority
1. To recognize current problems, evaluate impacts and project trends of changes in the field environment and natural resources in the Vietnamese Mekong Delta		
1.1	Water & land resources monitoring	10
1.2	Analyzing & modelling water & land resources	10
1.3	Evaluating changes of the agro-ecological changes under great threats of the in-situ development and climate change	9
1.4	Analysis of economic efficiency of natural resource uses and problems in natural resource uses and management	8
2. To study the mitigation of environmental impact		
2.1	To study potential mitigation strategies to eliminate impacts of natural disasters on agriculture, aquaculture and water supply (including both urban & industry sections)	8
2.2	To study possible techniques to treat soil, water and air pollution in the specific context of the Vietnamese Mekong Delta	10
2.3	To study changes of the farming systems to support elimination of pollutants added to the environment (including GHG)	10
2.4	To study the planning and managing mechanism of rural, urban and industrial zones to eliminate the pollutant added to the environment (including GHG)	9
2.5	To study possible solutions to protect the existing biodiversity and natural resources	8
2.6	To study the socio-economic feasibility of the (above) solutions	8
3. To study the resilience and adaptive capacity of local residents in the context of environmental changes		
3.1	To study the resilience of different farming systems in the context of extreme weather events and environmental degradation	8
3.2	To study the adaptation strategies on sustainable uses of natural resources in the context of climate change and environmental degradation	9

Source: CENRes, edited by JICA Study Team

Additionally, the relationship with MDR with each research theme is explained below.

Table 3-25: Research Themes in Environment Field and Relation to MDR

Research Themes		Relation to MDR
1. To recognize current problems, evaluate impacts and project trends of changes in the field environment and natural resources in the Vietnamese Mekong Delta		
1.1	Water & land resources monitoring	The research theme uses remote sensing technologies and it monitors MDR from the viewpoints of numerous regional and global environmental problems in soil, water, air and so on. Therefore, it is of great benefit to MDR. CTU has ample experience in this theme and the joint research with Japanese university is beneficial to MDR as CTU can use better data.
1.2	Analyzing & modeling water & land resources	The research theme uses the data from 1.1 and it analyzes and models the water and soil resources. It is of great benefit to MDR as it can propose the base for the solutions to MDR's environmental issues. It has interdisciplinary traits among the other two fields in question. CTU CENRes has ample experience in this theme and joint research with Japanese universities is beneficial.
1.3	Evaluating changes of the agro-ecological changes under great threats of the in-situ development and climate change	The research theme evaluates the agro-ecological changes affecting the crop conditions caused by global environmental challenges. It includes interdisciplinary research with agriculture field. It mostly uses MDR for field studies, which are expected to be of great benefit to MDR.

Research Themes		Relation to MDR
1.4	Analysis of economic efficiency of natural resource uses and problems in natural resource uses and management	The research theme focuses on economic efficiency of natural resources and its use/management. It contains interdisciplinary research with agriculture, aquaculture/fishery, economics, and soil fields. For pursuing this theme, here MDR is used for ideal field studies, as MDR is full of various natural resources.
2. To study on the mitigation of environmental impact		
2.1	To study potential mitigation strategies to eliminate impacts of natural disasters on agriculture, aquaculture and water supply (including both urban & industry sections)	The research theme aims to eliminate impacts of natural disasters such as record heats, droughts, storms, floods, and fires etc., occurring in the fields of agriculture, aquaculture/fishery, and water resources in MDR, and it is beneficial in catering to these issues. It is an interdisciplinary research among agriculture, aquaculture/fishery, and environment. The theme targets the urban areas, a newer field to be enhanced for the college.
2.2	To study possible techniques to treat soil, water and air pollution in MDR	The research theme is to study the technologies to upgrade environmental conditions in MDR. MDR possesses a great variety of natural resources and the theme is important for the enhancement of the engineering field. CTU CENRes's achievements in this field in the past are larger than other themes.
2.3	To study changes of the farming systems to support elimination of pollutants added to the environment (including GHG)	The research theme aims the environmental-friendly farming systems and it shows an ideal collaboration of environment and agriculture fields. The theme is highly important for local environmental issues and MDR as well as global environmental challenges.
2.4	To study the planning and managing mechanism of rural, urban and industrial zones to eliminate the pollutant added to the environment (including GHG)	The research theme aims to mitigate GHG emissions and environmental pollutants in MDR. As it tries to reduce GHG emissions and the environmental pollutants in the area, the benefits to MDR are sought. Collaboration with the agriculture field is needed and is beneficial for global environmental issues.
2.5	To study possible solutions to protect the existing biodiversity and natural resources	The research theme focuses on solutions for protecting biodiversity and natural resources. MDR needs to face various environmental challenges such as record heats, droughts, storms, floods, and fires etc. Therefore the theme is important in terms of MDR beneficiaries, and interdisciplinary research possibilities. CENRes's experiences in this theme in the past are relatively small. The theme in the past dealt with an invasive plant.
2.6	To study the socio-economic feasibility of the (above) solutions	This research theme focuses on the socio-economic feasibility of the solutions mentioned in 2.5. CENRes and other environmental fields in CTU have no achievement so far on this theme. Collaboration with the field of economics is about to begin.
3. To study the resilience and adaptive capacity of local residents in the context of environmental changes		
3.1	To study on the resilience of different farming systems in the context of extreme weather events and environmental degradation	The research theme deals with the resilience of agriculture in the context of adaptation issues applied to MDR. It anticipates collaboration with the agriculture (and some aquaculture/fishery) fields and it is highly important as it responds to the changes in food production, land use, and other socio-economic aspects and it contributes to the further development of MDR.

Research Themes	Relation to MDR
3.2 To study on the adaptation strategies on sustainable uses of natural resources in the context of climate change and environmental degradation	The research theme looks at the sustainable uses of natural resources and it answers the adaptation issues applied to the MDR. It shows large contributions to adaptation issues such as changes in food production/land use, and other socio-economic related issues and it contributes to the further development of MDR. The collaborations with Japanese universities are useful in terms of data sharing.

Source: CENRes 2014

3.6 University Management

3.6.1 University Management

In Viet Nam, there seems to be a trend of decentralization in the higher education sector, as a form of university autonomy. MOET is also promoting university autonomy to all universities under MOET. CTU also requested MOET to expand their autonomy (Appendix 3-14). University autonomy is in-process by degrees at CTU as well, as most decisions regarding university management are made by the Rectorate Board. MOET's authority in the past is transferring to the Rectorate Board. As of April 2014, CTU management is mainly functioning by the Rectorate Board, composed of a Rector and five Vice Rectors of CTU. In addition, CTU set up the Academic and Science Board as Advisory Committees. The Academic and Science Board (Advisory Committees) advise Rector Board for their decisions. The Board consists of 25 members; some are members of CTU, others are outside CTU, such as the representatives from industries and community (see Appendix 3-15).

According to the Strategic Plan for Development (2007–2020), University Council for CTU will be established, and the decision making function will be transferred from the Rectorate Board to the University Council in the future.

According to the interviews with Graduate School, some items listed below are time consuming since they cannot decide only by the CTU Rectorate Board and Advisory Committee. MOET's approvals are necessary to decide such issues.

- Establishing new programs
- Increase tuition and salary standards

Establishing new programs requires a large amount of time in general; however, CTU had some experience in establishing new programs including advanced program in the past. On the other hand, CTU has no experience in changing the university financial base, such as tuition and salary standards. This type of revision, fundamental change in university financial base, might be considered in the future to implement CTU's education and research activities at international levels.

For revenue of the current CTU, around 50% is own income such as tuitions and others, and around 50% is subsidized from MOET. Research funds gained from outside are not included in the CTU revenue account. External research funding was approximately 10%–17% of CTU's own income in 2009–2012, but was equivalent to about 7% in 2013. Approximately 30% of the current CTU expenditure is made up of labor costs. The breakdown of CTU expenditure other than labor cost is as follows: about 30% is ordinary expenses, 10%–20% is construction costs, equipment costs make up 5%–8%, and about 2% is expenditures for operation and maintenance cost.

To be an internationally recognized university, CTU is striving to enhance education/ training and research capacity. During the survey term, the university management and governance team highlighted the following three items; quality assurance, research management and technology transfer, and education program development management. In addition, supporting staff has less opportunity to join training and study abroad; they consider that the supporting staff capacity needs to be improved.

3.6.2 Human Resources Management and Development

(1) CTU's Strategy and Vision for Human Resource Development

Based on the "CTU Overall Strategic Development Plan 2007–2020", approved by MOET, CTU created the "Human Resource Development Plan 2008–2015", aiming to develop global standard human resources to extend the scale and improve the quality of the education of CTU. Furthermore, on that basis, each college and school created their own development plans. In 2013, CTU started creating the 2014–2022 version by making small adjustments to the "CTU Overall Strategic Development Plan 2007–2020" to conform to the actual situations; however, CTU has not submitted it to MOET yet.

CTU aims to improve the quality of its staff members, by increasing the proportion of teaching staff with graduate degrees (doctorate degrees, in particular), and improving foreign language skills, especially English. It aims to increase the proportion of teaching staff with graduate degrees up to at least 97% by 2022 from the current level of 77.5%. In particular, the percentage of teaching staff with doctorate degrees is aimed to increase to 62% by 2022 from the current level of 22%.

CTU plans to achieve the goals by sending its teaching staff abroad to acquire graduate degrees, in addition to promoting acquisition of degrees in Viet Nam. In particular, CTU plans to send 546 teaching staff members abroad to acquire graduate degrees from 2014 to 2022 (428 teaching staff members for Ph.D. study). Total cost for sending these members abroad is estimated to be 409,080 million VND. The main resource for sending staff abroad other than this JICA ODA loan project is Program 911 which is a Vietnamese Government scholarship program, targeting university lecturers. However, the scholarship is open for the whole country and quotas cannot always be allocated and guaranteed to CTU. Destinations to study abroad under Program 911 are not fixed to just Japan, but many countries in Europe, North America and Asia.

Furthermore, CTU aims to increase the number of staff members to 2,174 by 2022 from the current level of 1,673 (as of December 2013).

As recent progress of these development plans, for example, 42 teaching staff members acquired graduate degrees in 2013, and its rate increased by 3.8%. However, in order to achieve CTU's objective by 2022, 775 more teaching staff members, which are approximately four times higher than the current number of Ph.D. holders at CTU, need to acquire Ph.D. degrees by 2022. This means that every year approximately 86 teaching staff members have to acquire Ph.D. degrees, and its pace is two times faster than that of 2013. It is difficult to achieve the objectives with only CTU's resources, and thus support from abroad is needed.

(2) Personnel System

In accordance with the "Advanced Promotion Procedure of CTU Lecturers," a code of the CTU based on the Vietnamese Government's decision (Decision No.58/2010/QD-TTg), teaching staff of CTU are required to acquire master's degrees starting from 2014, and furthermore, teaching staff under 41 years of age are required to acquire doctorate degrees (5870/QĐ-ĐHCT).

In addition, it requires sufficient English skills and information skills to meet the qualification standards of teaching staff. The Vietnamese Government also sets requirements for supporting staff at universities on the same decision. According to a requirement, the respective head of four departments at the supporting unit, namely, Academic Affairs, International Relations, Scientific Research Management and Personnel, are required to be a lecturer with at least 5 years working experiences. To be a lecturer, it is required to hold a Master's degree as mentioned above. Therefore, CTU needs to train potential human resources in the departments by promoting acquisition of Master's degree. The Vietnamese Government requires universities to lay out recruitment and training plans for their supporting staff to meet the above-mentioned requirements. Training of supporting staff is also a pressing need for CTU.

CTU guarantees minimum wage depending on the positions in accordance with the CTU's code, the "Internal Expenditure Regulation of CTU" (Decision 6294/QĐ-ĐHCT dated 31/12/2013), however, the wage for associate professors is, for example, still about 520 USD on a monthly basis. While the retention rate of staff members is high, because of low wage, some members quit to join the private sector after obtaining doctorate degrees, especially in the engineering field. The salary of teaching staff is determined based on the standards of MOET, and it cannot be changed at the discretion of CTU. However, CTU is considering increasing the salary together with the tuition fees in the future.

The term of employment contract for a new teaching staff member will be extended in incremental steps, starting from the probationary period, which lasts for 3 months, and the period of contract becomes longer, from one year, three years to permanent. When a non-permanently employed staff member goes abroad to study, an employment contract with a longer period than the period of study will be made before studying abroad. After returning to Viet Nam, the staff member is required to stay at CTU at least three times the period that he/she stayed abroad to study according to the regulations of the Vietnamese Government.

The interval between personnel changes is relatively long, and it is not so uncommon to work at the same section for 10 years. The term of the rector is five years. The current Rector Toan took office in 2012 so his term of office is until 2017.

There are some cases in which teaching staff members are transferred to the Supporting Unit as managers. In such cases, a portion of teaching is decreased, yet they are still required to handle both teaching/research and administrative work. Managers originally from faculties and currently in charge of administration are not always specialized in governance and management of university, therefore, they are striving to manage administrative and management works in their own ways.

(3) English Proficiency

The result of the field survey showed that English proficiency of staff members in the 3 targeted faculties were relatively high as nearly half of them had IELTS score of 6.0 or equivalent which are the minimum requirements for Ph.D study in Japan.

(4) Study Abroad Experiences

Belgium has been the most popular destination among CTU staff members studying abroad according to statistics collected by CTU since 2001 (Table 3-26). Many staff members studied and earned a Ph.D. degree in the country while a project was undertaken by the country and CTU from 1998 to 2008. Belgium was the most popular destination in the field of agriculture and aquaculture, while Thailand hosted the largest number of staffs members for environment related studies (Table 3-27). Japan hosted the second largest number (12 people) of staffs in agriculture after Belgium. Overall, a majority of CTU staffs studied in European countries such

as Belgium and Netherlands and Asian and Oceanian countries such as Thailand, Australia, and Japan.

Table 3-26: Top 10 Popular Destinations among CTU Staff Members Studying Abroad (Statistics since 2001)

		Already acquired			On going			
Rank	**Country**	**Ph.D.**	**MSc**	**Total**	**Ph.D.**	**MSc**	**Total**	**Total**
1	Belgium	22	29	51	27	2	29	80
2	Australia	7	34	41	21	6	27	68
2	Thailand	7	47	54	8	6	14	68
3	Netherlands	26	31	57	9	0	9	66
4	France	20	19	39	15	3	18	57
5	Japan	17	15	32	10	6	16	48
6	Taiwan	6	14	20	7	16	23	43
7	Korea	9	12	21	11	4	15	36
8	Germany	10	8	18	7	2	9	27
9	U.S.A	4	11	15	9	0	9	24
10	Malaysia	6	7	13	0	1	1	14

Source: CTU Statistics

Table 3-27: Top 3 Popular Destinations among CTU Staff Members Studying Abroad in the Three Fields

Rank	**CAAB**		**CAF**		**CENRes**	
1	Belgium	25	Belgium	20	Thailand	15
2	Japan	12	Thailand	17	Netherlands	14
3	Germany/Sweden	7	Malaysia	10	Denmark/Germany	8

Source: CAAB, CAF, CENRes

(5) Available Scholarship Programs

As shown in Table 3-28, many scholarship programs are available at CTU. The highest number of staff members have been sent out so far by a scholarship program “Program 911” offered by the Vietnamese Government, followed by the second popular program offered by Australia, Australia Development Scholarship “ADS.” In addition to regular scholarship programs, CTU utilizes the scholarship programs associated with some projects with foreign countries. Through such programs, some staff members have studied in Belgium and Netherlands in the past. MHO, a project co-sponsored with Netherlands, has already completed in 2004. The next phase of “VLIR” a project co-sponsored with Belgium, is planned to focus on the establishment of international programs of Master’s and Doctoral levels in the fields of Fisheries and Food technology, and studying abroad is not included in the project activities. Any of the scholarship programs listed in Table 3-28 is highly competitive, and it is expected to be difficult to achieve the goal of the CTU Overall Development Plan 2014–2022, which is to increase the percentage of teaching staff with doctorate degrees to 62% by 2022, based only on these programs.

Table 3-28: Available Scholarship Programs at CTU

Name	Provider	Dispatch destination	Field of study	Degree	Project Period
Project 911	VN government	All countries	All fields	Doctors	2010–2020
ADS Scholarship	Australian Government	A11 Australian universities	All fields	Doctors, Masters	Quotas every year
Fulbright Scholarship	US government	All American universities	Economics, Chemistry, Pharmacy	Doctors, Masters	Quotas every year
Lotus	Europe	Belgian, Dutch, German, British, French, Portuguese universities	All fields	Doctors, Masters	Quotas every year
MEXT Scholarship	Japanese Government	All Japanese universities	All fields	Doctors, Masters	Quotas every year
JDS	JICA	8 Japanese universities	7 fields	Masters	2013–2016
Scholarship of two government agreement	Hungary	Hungary	All fields	Doctors, Masters	Quotas every year
Scholarship of two government agreement	Romania	Romania	All fields	Doctors, Masters	Quotas every year
NZAID scholarship	New Zealand Government	New Zealand	All fields	Doctors, Masters	Quotas every year
NUFFIC Scholarship	Dutch Government	Dutch	Economics, English, Education	Doctors, Masters	Quotas every year

Source: CTU Department of Personnel

(6) Internal Training Programs in CTU

CTU provides its own internal training programs for human resource development. For instance, it offers English training for those who want to get a graduate degree, and management training for newly promoted managers. For English training, outstanding young CTU staff members are selected to take free English lessons in the Center for Foreign Language on campus for three months.

3.6.3 Quality Assurance

Quality Assurance (QA) is one of the target processes for CTU to be recognized as an institution which offers programs of international standards. CTU established Quality Assurance and Testing Center (QATC) in 2006, to work on EFQM (European Forum of Quality Management) and other international standards. Originally, internal assessment was conducted based on MOET-QA; CTU started internal assessment in 2008. Then, CTU introduced AUN-QA system in 2009. Since 2010, CTU has focused on ASEAN University Network Quality Assurance (AUN-QA); it is assumed that CTU presently targets the level of standard of Asia. The standard of AUN-QA and MOET-QA can be seen in Appendix 3-16. All the internal assessments till 2013 are of undergraduate level. CTU is planning to conduct internal assessment for graduate level programs in 2014.

Table 3-29: CTU Internal Assessment for QA

Academic Years Program	2008	2009	2010	2011	2012	2013
MOET QA	15	15 (*)	0	0	0	0
AUN QA	0	12	16	11	12 (**)	13

Source: PPT by QATC

(*)15 programs were externally assessed by Vietnamese experts, and accredited with MOET Standards.

(**) 2 programs with good results were externally assessed by AUN-QA

In 2012, CTU conducted external assessment for two programs as seen in the following list. The programs assessed by external members were those with good scores in the CTU internal assessment. The programs receiving a score of 4.0 or more by external members meet the standards of accreditation. Agricultural Economics Program met the standard, but the Electrical Engineering Program has not yet. The number of accredited programs at CTU is just one as of 30 April 2014; moreover, AUN accredited only three universities in Viet Nam, VNU-Hanoi, VNU-HoChiMinh, and CTU.

Table 3-30: CTU External Assessment Results by AUN QA

Name of Program	Providing School/ College at CTU	Result of external assessment of AUN
Bachelor of Science, Electrical Engineering Program	College of Engineering Technology	3.9/7.0 (Not yet accredited)
Bachelor of Science, Agricultural Economics Program	School of Economics & business administration	4.0/7.0 (Accredited)

Source: interview with QATC

CTU is planning to conduct an external assessment in 2014 of the following two programs.

1) Advanced Aquaculture Programme (BSc)
2) Advanced Biological Programme (BSc)

As the future plan in the presentation document from QATC, CTU will conduct internal assessment for 10 programs per year, and 2 out of the 10 programs will be externally assessed each year. In addition, CTU targets 18 programs to be accredited by external organizations such as AUN and ABET by 2020[69].

3.6.4 Scientific Research Management and Technology Transfer

Scientific research should be the core activity of CTU in order to become a research university. It is expected to increase the number of research activities, as well as journal publications, especially at international levels. In addition, it is ideal that the outputs of the research be utilized in technology transfer. The current condition at CTU is as follows:

(1) Competitive Research Fund at CTU

CTU has acquired research funds from external sources, the amount of which has increased along with the number of the researches compared to 5 years ago. Reviewing the research fund of the last 6 years, the major source is local government, which accounts for around 50-80% of the total amount of external research fund.

CTU receives competitive research funds from government, MOET, DOST from Mekong regional provinces mainly, and companies. Based on Tables 3-20, 3-21, and 3-22, the facts are as follows.

- Last year (2013), the external fund was VND20,589,640,200 or USD 980,459
- The highest amount between 2008–2013 was VND32,028,643,000 or USD 1,525,173.48 (2011), and the lowest VND14,042,068,000 or USD 668,669.90 (2008)
- The average amount gained last 6 years (2008–2013) was VND22,564,982,533 or USD 1,074,522.98

[69] Minutes of Meetings between CTU and JICA, April 25, 2014, p.2

- Around half of the research fund depends on 3 main colleges, CAAB, CAF, and CENRes.

In addition to external funds, CTU allocates some budget for CTU research activities (Appendix 3-17).

Table 3-31: CTU Research Fund by Year and by Source

Unit: thousand VND

		2008	2009	2010	2011	2012	2013
External	National Fund	-	2,570,000	4,203,000	3,333,000	4,480,000	500,000
	Ministries	2,119,000	6,053,660	8,438,595	16,343,070	9,914,860	6,251,549
	Local Government	11,629,400	8,355,572	17,866,314	15,685,573	16,867,129	13,918,912
	Company	293,668	466,164	132,750	-	634,500	419,179
External Fund Total		**14,042,068**	**14,875,396**	**26,437,659**	**32,028,643**	**27,416,489**	**20,589,640**
CTU Research Fund		288,100	1,508,040	1,719,000	5,057,300	6,303,426	5,902,897
Total Research Fund		**14,330,168**	**16,383,436**	**28,156,659**	**37,085,943**	**33,719,915**	**26,492,537**

Source: Data from Department of Research Affairs

(2) Journal Publication

To become a research university, CTU has increased the number of international journal publications. Reviewing the last three years' journal publication information, the number[70] of international journal publications and proceedings increased, while, that of national decreased.

In 2013, the first author journals by CTU staff are around 72.5% (143 out of 197) for international, and 75.5% (263 out of 348) for national journals and proceedings.

As for the number of three main colleges, CAAB, CAF, and CENRes[71], the number of international journal publications has been almost the same from 2011-2013, while, that of national has decreased. The three main colleges make up around 50% of the annual total number of journals at CTU, in both national and international journals.

(3) Patent

As of April 2014, CTU has 13 copyrights, and most of them are software. CTU has no patent registration. CTU applied for two patents for items related to the field of agricultural as mentioned below and is waiting for the results;

1) Sugar processing from juice of palm flower;
2) Multi-nutrient cake for animal feeding (cow and buffalo).

According to CTU Department of Research Affairs, CTU did not think of acquiring patents, since it is costly and time consuming. CTU has several license agreement contracts with companies for the invention of CTU, and would like to further continue to do so. CTU would like to continue as it is, serving local people, while, CTU's Research Affairs Department needs the patent numbers, as it is important in being recognized as a research university. The Department will work for patent application for the future.

[70] The number is the journals and proceedings qualified the standards of CTU, counted by Department of Research Affairs; some numbers maybe different from that of from School/ College.
[71] CENRes: 2 international journals in 2011, but 15 journals in year 2012 and 2013.

(4) Technology Transfer

The function of Department of Technology Transfer used to be a part of the Department of Research Affairs. In 2012, CTU established the Department of Technology Transfer, focusing on the services and training for those not enrolled at CTU. The Department is a part of the university's income generating functions, along with the Publishing House. In the future, the Department may work to promote university products. The current main task of this Department is to summarize financial records based on all activities at CTU, and report to CTU. All the units have to report their financials to the Department of Technology Transfer at the end of the fiscal year. The net income by technology transfer and training is allocated to university (60%) and the offering department[72] in school (40%). University counts the amount as university income. The department can use the fund for their own purpose, such as maintenance, salary for contract staff, equipment and so on. The total net income in 2010–2013 was around USD 700,000 (VND12–13 billion); around USD 420,000 was included as university income. (Detail is given in Appendix 3-18).

The people outside CTU can contact and request activities either through their school/college or Department of Technology Transfer of CTU. Promotional activities are also supposed to be conducted by the Department of Technology Transfer, but CTU does not yet promote their inventions systematically.

Hoa An Center for Technology Transfer requesting assistant from JICA will function in a way similar to the Department of Technology Transfer. According to the interview at CTU, however, Hoa An Center for Technology Transfer work for both research activity and technology transfer, and the targeted fields are agriculture, aquaculture and environment, and the activity of interdisciplinary field, which is also the target of establishing College of Rural Development. On the other hand, Department of Technology Transfer will handle all other fields, focusing on technology transfer, training, and services. Therefore, CTU stated that the function of Hoa An Center will not overlap with others.

3.6.5 Education Program Development and Management

The Education Program needs to be developed to meet the requirements of being an international level, research focused university. CTU is planning to improve graduate programs. At the same time, CTU is also considering upgrading undergraduate programs from the point of view of laying the foundation for graduate level studies.

Graduate School at CTU takes care of graduate level education programs, while Department of Academic Affairs at CTU takes care of undergraduate education programs. Common facts in education programs in both graduate and undergraduate levels are as follows:

- Revise curriculum every 3–5 years; minor revisions, such as change of subject name, lecturers, and credit hours, can be revised every year.
- Utilize credit system
- Introduce some compulsory subjects[73] to abide by MOET regulation
- Assign each academic department in preparing contents and syllabus, which is then modified by the department

[72] The all net income for Department of Technology Transfer is transferred to CTU, since their main activities are considered for CTU.

[73] Compulsory subjects required by MOET for undergraduate programs are 1) military training, 2) physical education, 3) foreign language, 4) basic science and 5) political science (philosophy: Marxism-Leninism 1 & 2, Ho Chi Minh thoughts, Revolutionized way of Vietnamese Communist Party). Political science (philosophy) is also the requirement for graduate programs.

Establishing a new program (at graduate and undergraduate levels) takes around 1–2 years from the preparation stage till approval is obtained from MOET. CTU has some experience in setting up new programs in the past, including advanced programs and foreign degree programs in Viet Nam. (The short summary is seen Appendix 3-19)

3.6.6 Strengths and Weaknesses of CTU

Based on the Previous Section, the JICA team the strengths and weaknesses of CTU.

(1) Strengths

1) Quick and strong decision making process

Quick and strong top-down decision making process is also an advantage for efficient decisions. The Rectorate Board adequately manages the CTU staff of around 2,000 members. More things are decided and managed at university level; autonomy is not affected within the current organization structure.

2) Research fund allocation

CTU is preparing and implementing some actions in order to become a research university. Reviewing CTU's status of research fund acquisition, university research fund allocation by internal fund, and staff evaluation policy (Appendix 3-20) based on output of research and education activities, it is clearly seen that CTU is planning and moving towards becoming a research university.

3) Basis for implementation of human resources development program.

CTU has the following advantages in implementing a human resources development program. It means that CTU has a basis for smoothly carrying out the program.

1. CTU has actively tried to promote internationalization of university as relatively many teaching staff members have obtained a Master's or Ph.D. degree abroad.
2. Based on networks of personal contacts, CTU has strengthened the networks and cooperation with foreign universities including ones in Japan.
3. Some teaching staff members have experience of studying abroad in Japan including the Vice Rector Dung.
4. A number of study abroad programs are available, and CTU has actively worked with other donors.
5. CTU is active in sending teaching staff members abroad as well as accepting foreign experts through its cooperation with other donors.

(2) Weaknesses

Reviewing the CTU policies and information, CTU is clearly moving towards a research university; however, some activities have just started and not much output can be seen at this moment, such as patent application and other IPR and technology transfer, educational quality assurance, and staff quality in administration.

1) Patent and other IPR management and technology transfer

Patent application has not been an item of focus as yet. Department of Research Affairs recognizes its importance, and set up the goal to acquire 40 patents (assuming from the number of applications) by 2020, but the steps towards achieving the target number have not been taken.

2) AUN-QA

Preparing AUN quality assurance activities has just started recently; so far, only one program was externally accredit by AUN in 2014. CTU will work actively from now on to prepare documents for several basic inquiries related to education and research activities.

In AUN-QA standards, some viewpoints are evaluating supporting units, such as supporting staff quality, library facility, student assessment, and stakeholders' satisfaction.

3) Standards for Admin Staff

Compared to the teaching staff, the administrative staff has no standards for evaluation of their work load. The teaching staff has standardized scale to demonstrate their workload and/ or output in education and research activities.

4) Lack of human resource

1. The proportion of teaching staff members currently holding a Ph.D. degree is inadequate to achieve CTU's strategic development plan 2014–2022.
2. There is a small middle age group among faculty members with disparate age composition.
3. There is a small number of highly professional supporting staff members who specialize in the field of public administration or management.
4. Faculty members are sometimes assigned administrative tasks in addition to teaching, as a result, they spend less time in research and publication work.

3.7 Facilities – Current Situations and Issues

3.7.1 Outline of CTU's Current Campuses

CTU currently consists of 3 campuses in Can Tho City (Campus-1, -2 and -3), Hoa An Campus (which is located 30 km southwest of Can Tho City, in Haugiang Province) and other 3 auxiliary campuses. The following section describes the current situations of Campus-2 and Hoa An Campus, which will be improved by the Project.

3.7.2 Current Situation of Campus-2

(1) Number of Students and Academic Staff Members

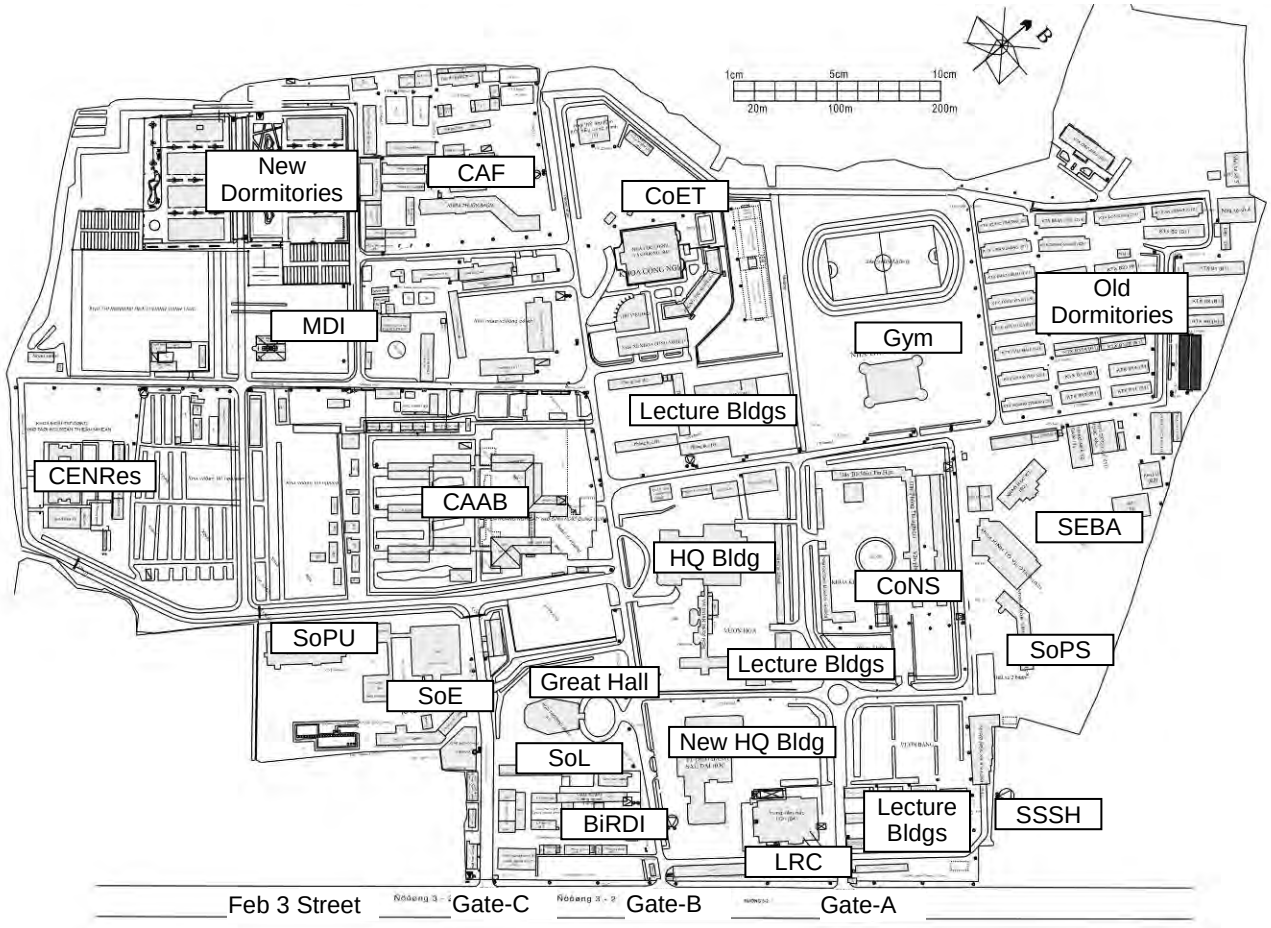
Table 3-32: Number of Students and Academic Staff of Each Faculty

		No. of Students			No.of Academic/ Administration Staff	Total
	Faculty/School	Under-graduate	Master	Doctor		
College	Agriculture & Applied Biology (CAAB)	2,960	434	77	162	3,633
	Aquaculture & Fisheries (CAF)	1,449	185	39	68	1,741
	Environmental & Natural Resources (CENRes)	1,116	235	37	61	1,449
	Engineering & Technology (CoET)	4,692	9	0	194	4,895
	Natural Sciences (CoNS)	1,305	341	0	122	1,768
School	Education (SoE)	3,744	360	0	207	4,311
	Law (SoL)	1,285	133	0	67	1,485
	Political Science (SoPS)	384	0	0	37	421
	Social Science & Humanities (SSSH)	2,135	31	0	97	2,263
	Economics & Business Administration (SEBA)	4,498	895	36	131	5,560
	Pre-university (SoPU)	95	0	0	14	109
	Graduate	0	0	0	10	10
Department	Physical Education	327	-	-	22	349
Institute	Biotechnology Research & Development (BiRDI)	687	98	32	30	847
	Mekong Delta Development Research	54	140	5	19	218
Others	Administration Staff	-	-	-	283	283
Total		24,731	2,861	226	1,524	29,342

Source: CTU

(2) Existing Facilities

Figure 3-7 shows major existing buildings and Table 3-33 shows their outlines. New Headquarters (Administration Building) funded by MOET is now under construction and is scheduled for operation from the end of 2014.



Source: JICA Study Team

Figure 3-7: Existing Facility Layout, Campus-2

Table 3-33: Major Buildings of Each Faculty, Campus-2

Faculty/School	Floor Area (m^2)	No. of Floors	Construction Year	Faculty/School	Floor Area (m^2)	No. of Floors	Construction Year
CAAB	13,107	1F, 2F, 3F	1996 - 2010	BiRDI	3,870	1F, 2F, 3F	1975 - 2003
CAF	10,309	1F, 2F, 4F ,5F	1978 - 2010	MDI	3,841	1F, 2F, 3F	1986 - 2011
CENRes	4,983	1F, 3F	2006 - 2011	LRC	7,560	4F	2,005
CoET	19,836	1F, 2F, 3F, 4F	1978 - 2012	CSTT	1,756	1F, 3F	1998 - 2011
CoNS	9,649	1F, 2F, 3F	1997 - 2010	Lecture Bldg	15,308		
SoE	6,257	3F	2003, 2006	Headquarter	5,771	2F	1,992
SoL	1,200	2F	2000	Great Hall	2,200	2F	1,989
SoPS	3,011	3F	2006	Gymnasiums	4,965	1F, 2F	1991, 2012
SSSH	2,331	3F	2011	Old Dormoitories	13,531		
SEBA	5,551	1F, 2F	1996 - 2000	New Dormitories	14,004		1999 - 2003
SoPU	3,086	3F	2013	Others	4,571		
Graduate School	1,574	2F	2001				Total 158,270

Source: CTU

(3) Current Situations of the Infrastructure

Electricity

- Can Tho City's electric company's overhead power lines (22 kV, 50 Hz) are installed in the campus. The high-voltage power is transformed to low-voltage power at 13 transformers located within the campus, and distributed to each building.
- The high-voltage power lines and transformers are owned by the electric company, and secondary (low-voltage) power lines are owned and managed by CTU.
- Only the Main Auditorium, Headquarters Building (IT department) and Learning Resource Center (LRC) have emergency generators.

Telephone

- The telephone company's overhead lines are installed in the campus, and telephone and LAN lines are provided only to necessary buildings from those overhead lines.

Water Supply

- There are 6 tapping points from the city water main along the main street, and 2 along the northeast road. Supply water quality is managed by the Can Tho City water authority. The water supply is sometimes suspended by damage of underground supply pipes within the campus.
- Each building has its own reservoir tanks, pumps and elevated tanks.
- There are exterior fire hydrants within the campus, and they are directly connected to the water supply main. Relatively new buildings have fire hydrant systems, and LRC has sprinkler systems. There is no central hot-water supply system in the campus.

Drainage

- Wastewater, along with rain water, is discharged to open ditches after being treated at each septic tank. The open ditches are connected to the city drainage main pipe and Zang Xang Canal.
- Water in the open ditch is stagnant, and some portions are covered with aquatic plants.
- Laboratory wastewater is discharged after neutralization treatment at each building. The CAAB's treatment plant is out of order. Primary waste is collected by a specialized company.

Air-conditioning

- Only limited rooms have air-conditioning systems, and most of the lecture rooms have ceiling fans. Air-cooled air-conditioning systems are commonly used, and there is no centralized cool water supply system.

Waste Disposal

- General waste is collected by private companies at each collecting point every day, and there is no incinerator inside the campus.
- Laboratory waste is regularly collected by Sao Viet Co. (in Ho Chi Minh City).

(4) Current Situation of the Relevant Faculty

College of Agriculture & Applied Biology (CAAB)

- Number of Students and Academic Staff Members

Founded in 1968, CAAB is the oldest faculty in CTU. CAAB consists of 8 departments and accepts approximately 700 undergraduates and 180 post-graduate students per year. Table 3-34 shows the current number of undergraduate and post-graduate students of each course.

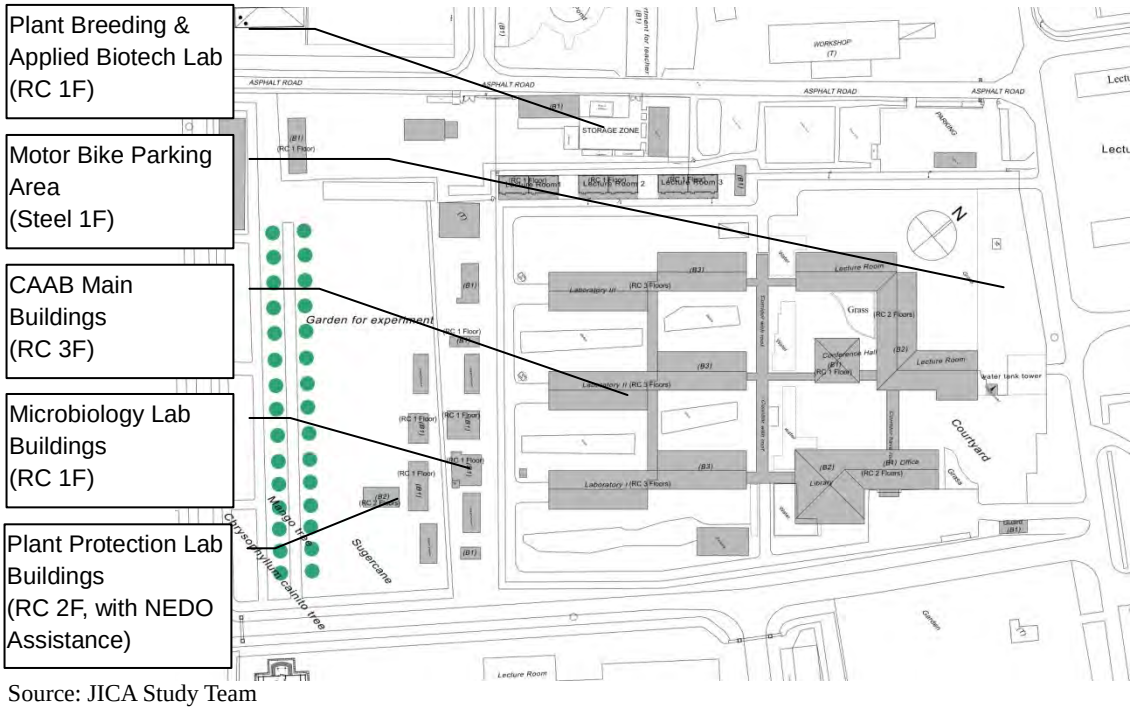
Table 3-34: Number of Students and Academic Staff, CAAB

College	Course/Research Field	Number of Students 2013 (Current)		
		Enrollment per Year	Length of Course	Total
CAAB	Undergraduate Program			2,820
	1 Animal Science	80	4 Years	320
	2 Animal Breeding Technology	40	4 Years	160
	3 Food Technology	50	4 Years	200
	4 Crop Science	30	4 Years	120
	5 Plant Breeding Technology	40	4 Years	160
	6 Organic Agriculture	50	4 Years	200
	7 Horticulture and Landscape Architecture	40	4 Years	160
	8 Agronomy	100	4 Years	400
	9 Plant Protection	50	4 Years	200
	10 Soil Science	60	4 Years	240
	11 Veterinary Medicine	100	5 Years	500
	12 Veterinary Pharmacology	40	4 Years	160
	Graduate Program			278
	1 Crop Science	36	2 Years	72
	2 Animal Science	20	2 Years	40
	3 Soil Science	9	2 Years	18
	4 Veterinary Medicine	27	2 Years	54
	5 Plant Protection	23	2 Years	46
	6 Food Technology	19	2 Years	38
	7 Post-harvest Technology	5	2 Years	10
	PhD Program			105
	1 Animal Science	5	3 Years	15
	2 Plant Protection	5	3 Years	15
	3 Soil Science	5	3 Years	15
	4 Crop Science	10	3 Years	30
	5 Food Technology	5	3 Years	15
	6 Pathology and Therapeutics for Animals	5	3 Years	15

Source: CTU

- Existing Facilities

CAAB mainly uses 3-story buildings (approximately 11,000 m^2), which were constructed under a Japanese Grant Aid in 1996. There are some smaller buildings, greenhouses and net houses constructed by MOET and other donor funds (including NEDO in Japan).



Source: JICA Study Team

Figure 3-8: Existing Facilities, CAAB

- Current Situation of Grant Aid Building

Buildings constructed under the Japanese Grant Aid in 1996 are generally maintained and operated well despite almost 20 years passing since their completion.

A single-corridor layout with deep eaves and pitched roof maintains natural ventilation, and CTU highly evaluates the layout.

However, the size of the buildings (total floor area: 11,000 m^2) are physically insufficient to accommodate more than 4,500 students (total of undergraduates and post-graduates). Most departments conduct student practice and research activities at the same laboratory; furthermore, there are no researchers' and post-graduates' research offices, which results in difficulties in carrying out appropriate research activities.

College of Aquaculture & Fisheries (CAF)

- Number of Students and Academic Staff Members

Founded in 1979, CAF consists of 7 departments and accepts approximately 500 undergraduates and 70 post-graduate students per year. Table 3-35 shows the current number of undergraduate and post-graduate students of each course.

Table 3-35: Number of Students and Academic Staff, CAF

College	Course/Research Field	Number of Students 2013 (Current)		
		Enrollment per Year	Length of Course	Total
CAF	Undergraduate Program			2,080
	1 Aquaculture	80	4 Years	320
	2 Marine Aquaculture Technology	40	4 Years	160
	3 Aquaculture Environmental Management	40	4 Years	160
	4 Advanced Program in Aquaculture	20	4 Years	80
	5 Transferred Program in Aquaculture	40	4 Years	160
	8 Aquatic Animal Pathology	60	4 Years	240
	9 Fisheries Management	50	4 Years	200
	10 Fisheries Management & Economics	60	4 Years	240
	11 Aquatic Products Processing	100	4 Years	400
	12 Transferred Program in Aquatic Product Processing	30	4 Years	120
	Graduate Program			118
	1 Aquaculture	45	2 Years	90
	2 Fisheries Management	14	2 Years	28
	PhD Program			30
	1 Aquaculture	10	3 Years	30

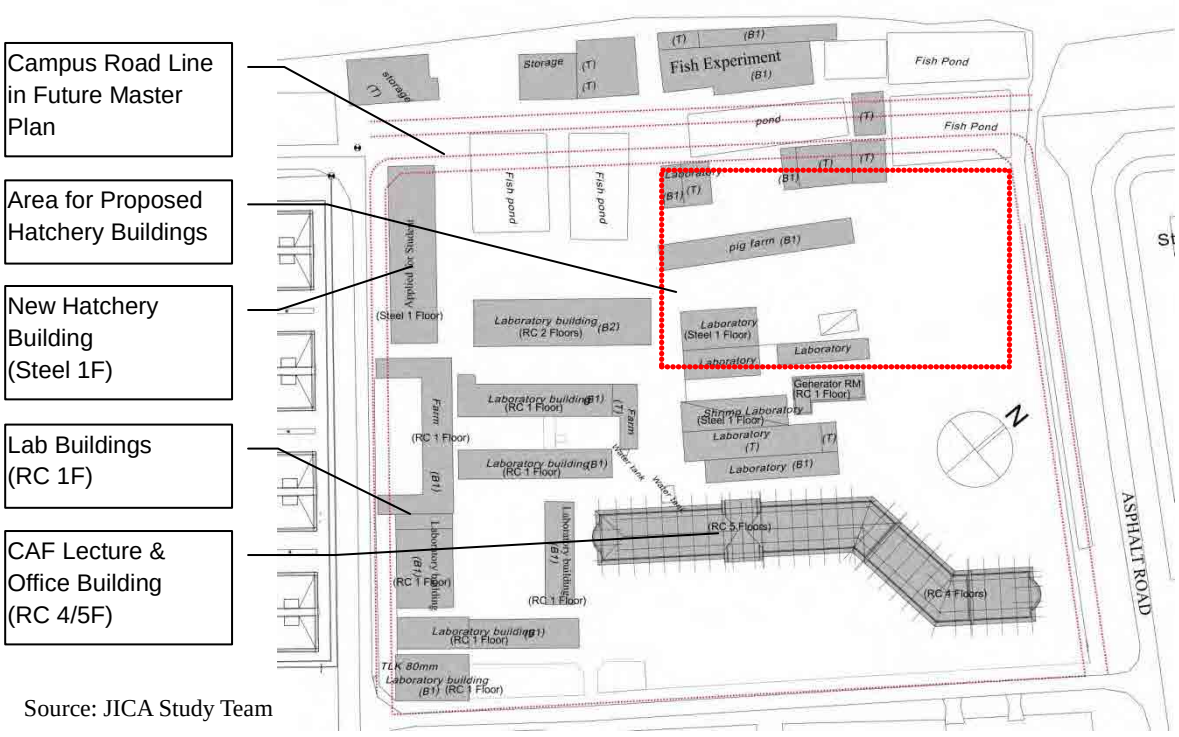
Source: CTU

- Existing Facilities

Except for a 4/5-story lecture/administration building, which was constructed in 2009, most of the existing buildings of CAF are old and deteriorated. In particular, most laboratories are located at old, single-story buildings and do not meet CAF's research activities requirements.

A new hatchery facility (single-story steel structure with 1,000 m^2) was constructed in 2012, north of the block.

The area where the existing old hatchery facilities are located will be used for the newly proposed hatchery facilities, in case the project includes those facilities.



Source: JICA Study Team

Figure 3-9: Existing Facilities, CAF

College of Environment & Natural Resources (CENRes)

- Number of Students and Academic Staff Members

Founded in 2008, CENRes consists of 4 departments and accepts approximately 400 undergraduates and 100 postgraduate students per year. Table 3-36 shows the current number of undergraduate and post-graduate students of each course.

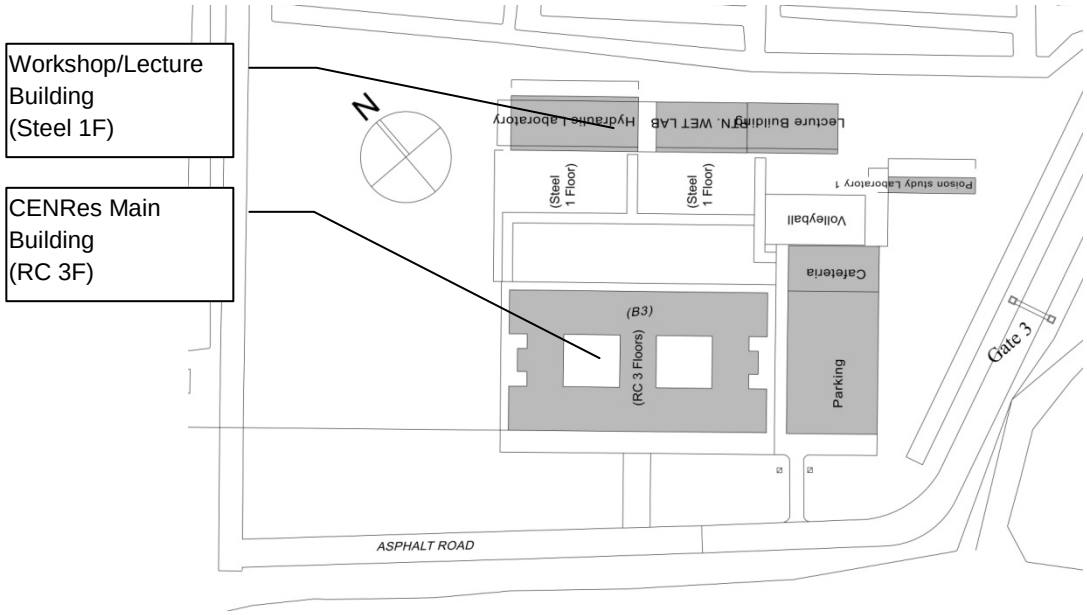
Table 3-36: Number of Students and Academic Staff, CENRes

College	Course/Research Field	Number of Students 2013 (Current)		
		Enrollment per Year	Length of Course	Total
CENRes	Undergraduate Program			1,440
	1 Environmental Science	80	4 Years	320
	2 Environmental Engineering	80	4 Years	320
	3 Environmental & Natural Resources Management	80	4 Years	320
	4 Land Resource Management	80	4 Years	320
	5 Forestry	40	4 Years	160
	Graduate Program			226
	1 Environmental Sciences	44	2 Years	88
	2 Natural Resources and Environmental Management	27	2 Years	54
	3 Land Management	42	2 Years	84
	PhD Program			30
	1 Soil & Water Environment	5	3 Years	15
	2 Land Management	5	3 Years	15

Source: CTU

- Existing Facilities

CENRes mainly uses a 3-story building (approximately 4,000 m^2), which was constructed in 2008. Besides this building, there is a workshop/lecture building and a field experiment facilities in the block.



Source: JICA Study Team

Figure 3-10: Existing Facilities, CENRes

Biotechnology Research & Development Institute (BiRDI)

- Number of Students and Academic Staff Members

Founded in 1995, BiRDI consists of 2 departments and accepts approximately 200 undergraduates and 50 postgraduate students per year. Table 3-37 shows the current number of undergraduate and post-graduate students of each course.

Table 3-37: Number of Students and Academic Staff, BiRDI

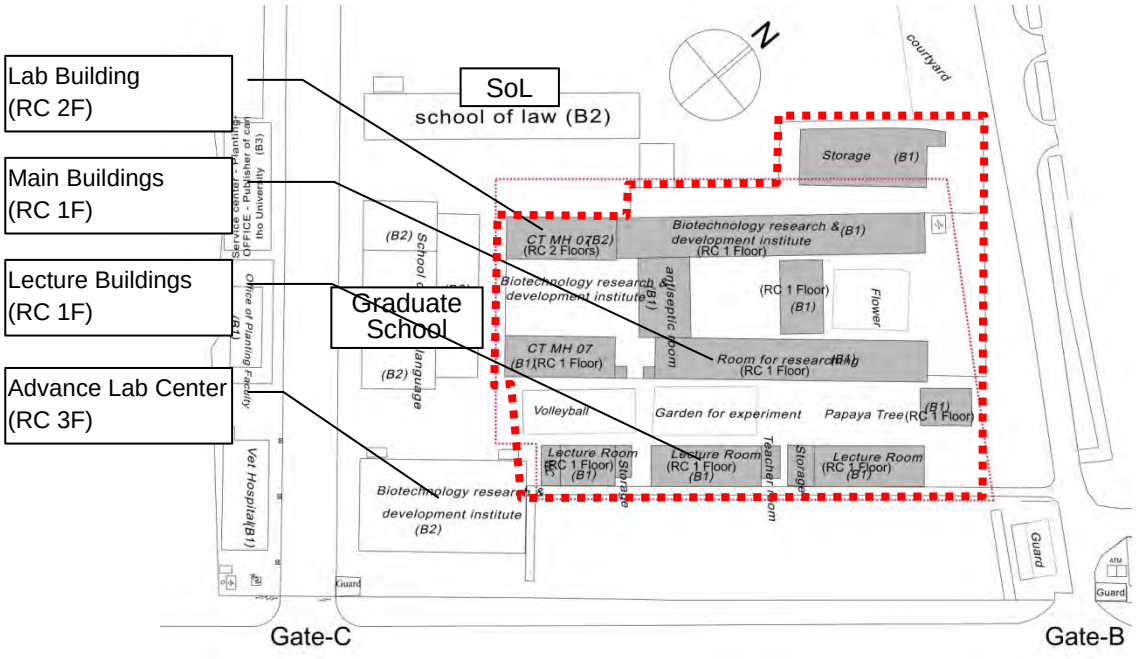
College	Course/Research Field	Number of Students 2013 (Current)		
		Enrollment per Year	Length of Course	Total
BiRDI	Undergraduate Program			963
	1 Microbiology	68	4 Years	272
	2 Regular Biotechnology	124	4 Years	496
	3 Advanced Biotechnology (Taught in English)	39	5 Years	195
	Graduate Program			90
	1 Biotechnology	45	2 Years	90
	PhD Program			30
	1 Microbiology	5	3 Years	15
	2 Biotechnology	5	3 Years	15

Source: CTU

- Existing Facilities

BiRDI mainly uses the former Medical College's buildings, which were left after the Medical College was separated from CTU in 2000. Most of the existing buildings are old and run down, and do not meet BiRDI's research activity requirements.

BiRDI uses the right-half portion of the Advance Laboratory Center (3-story) to fulfil a shortage of lecture rooms and laboratories.



Source: JICA Study Team

Figure 3-11: Existing Facilities, BiRDI

Great Hall (Turtle Hall)

The Great Hall is called "Turtle Hall" because of the unique shape of its outline, and is popular among students and alumni. The building construction was started in 1970, and competed in 1980 after periodical suspensions during the Viet Nam War.

Total floor area is approximately 2,200 m^2 (2 story), and the total number of seats is about 1,400 (950 on the ground floor and 450 on the second floor).

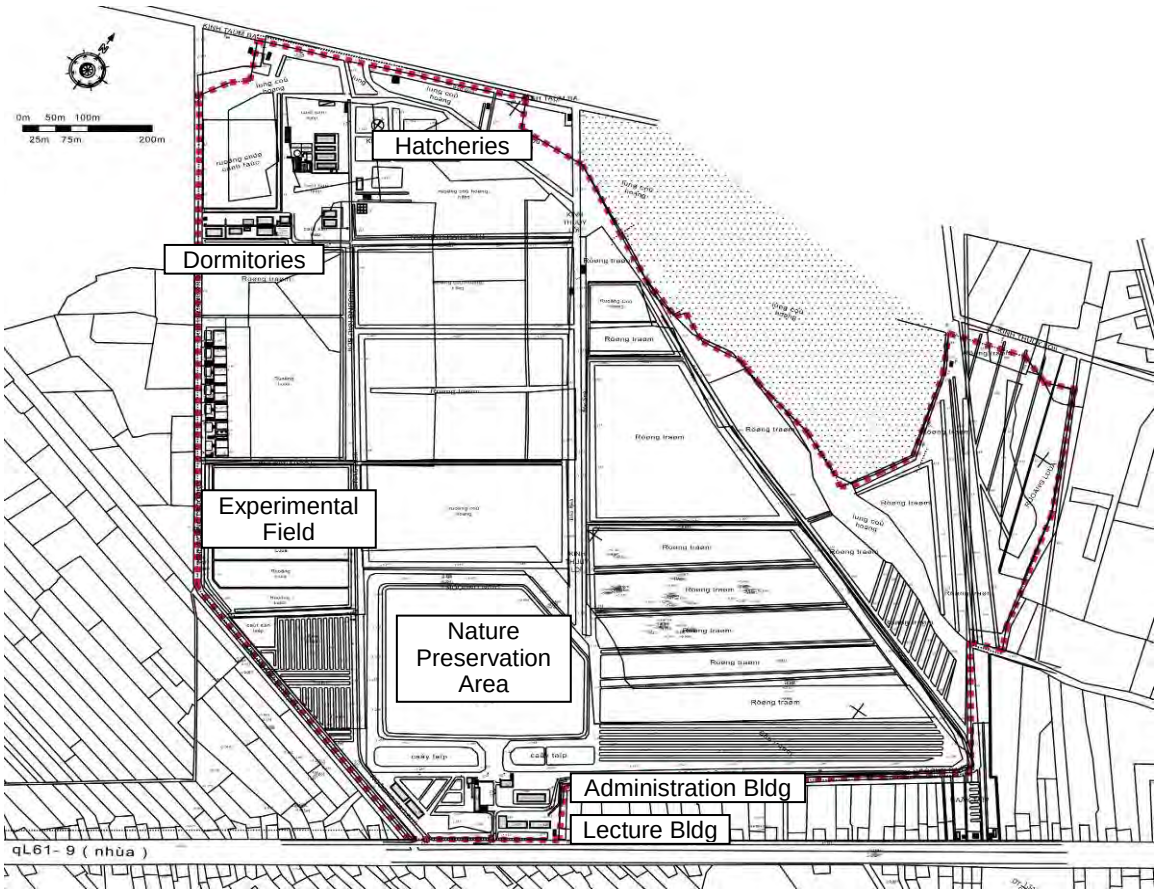
Most of the interior walls are finished with wood materials, and there is no smoke/fire detector system or sprinkler system in the building. It is necessary to refurbish those fire-protection systems if CTU plans to use this building for a substantial period of time in the future.

8 outdoor-unit-embedded air-conditioning units are installed on the exterior walls to provide cooled air to the hall. Noise from the outdoor units penetrates into the hall, and spoils the acoustic environment of the hall.

3.7.3 Current Situation of Hoa An Campus

Hoa An Campus is located 40 km southwest of Can Tho City, in the Phung Hieop District in Haugiang Province.

(1) Existing Facilities and Layout



Source: JICA Study Team

Figure 3-12: Existing Facility Layout, Hoa An Campus

Hoa An Campus has approximately 111 ha land area, and most of it was used as a natural preservation area and experimental paddy fields. Administration office and lecture buildings are located at a block near the entrance gate, and animal nursery/hatchery facilities and dormitories are located north of the campus.

(2) Current Situations of the Infrastructure

Electricity

Haugiang Province's electricity company's overhead power line is connected at the Administration Building, located at the south, and other line is connected at the livestock facilities, located north of the site, respectively. An electricity meter is also installed separately.

Telephone

An overhead telephone line is connected at the Administration Building, located south of the site.

Water Supply

- There are 3 tapping points from the city water main along the main street. The amount of water from the city water main is not sufficient to cover the demand; therefore the campus uses well water and canal water after proper treatment.
- The Dormitory buildings have their own reservoir tanks to fulfill demand changes.
- There are exterior fire hydrants within the campus, and they are directly connected to the water supply main.

Drainage

- There is no public sewerage line.
- Wastewater, along with rain water, is discharged to open ditches after being treated at each septic tank. The open ditches are connected to the canal.
- Rainwater penetrates into the soil.

Air-conditioning

- Only limited rooms have air-conditioning systems, and most of the lecture rooms have ceiling fans. Air-cooled air-conditioning systems are commonly used, and there is no centralized cool water supply system.

Waste Disposal

- Each building has garbage packets to collect waste separately (blue: garbage, yellow: other general waste).
- Haugiang District Company collects waste two times a week.

3.7.4 Review of the Issues the Existing Facilities Face

The Study team reviews challenges and issues that CTU's existing facilities have based on the survey results. Table 3-38 shows the results.

Table 3-38: Challenges and Issues the Existing Facilities Face

Component	Item	Challenges/Issues
Faculty Facilities	Shortage of Research Labs	• Sharing student practice lab and research lab in the same room prevents continuous researches. • Sharing different research fields in one lab causes lack of proper research space.
	Insufficient Quality of Research Labs	• Some institutions' labs were converted from office or lecture rooms, and their layout and utility systems do not match the required lab functions. • Some institutions' labs have significantly low construction quality, such as a partially collapsed floor (CENRes) and deteriorated conditions of the lab (CAF). • Most lab wastewater is not properly treated. The CAAB's treatment plant has been left out of order. • Most lab exhaust is not properly treated. Even CAAB has no scrubber unit to treat exhaust from the fume hood.
	Shortage of Research Office Space	• Existing labs have no adjacent documentation area, which is adversely affecting report making. • Existing faculty buildings have no research offices for researchers and postgraduate students, and fewer rooms for academic staff. These situations prevent effective research activities.
Campus Infrastructure	Inappropriate Drainage System	• Wastewater, along with rain water, is discharged into open ditches in the campus after being treated at each block's septic tank. Most wastewater is stagnant within the campus and not discharged outside properly.

Source: JICA Study Team

In general, floor area per student of CTU's existing facilities is approx. 4.0 m^2/ student (Japan's MEXT University Establishment Standard defines approx. 17.0 m^2/ student). CTU faces significant shortage of facility space.

3.8 Equipment – Current Situation and Issues

3.8.1 Current Situation of Existing Equipment

Since existing equipment is qualitatively and quantitatively deficient, sufficient practical training for undergraduates and research works cannot be carried out.

The constraints concerning the existing equipment currently faced in each field is described hereunder:

(1) CAAB

Present status and problems:

- Since many items of equipment are not functioning, undergraduates and researchers cannot perform advanced experiments and research works.
- Since the laboratory has a restriction for equipment use, researchers cannot carry out practical training.
- Since undergraduates utilize most of the equipment, the time left for researchers to study is quite limited.

(2) CAF

Present status and problems:

- Many items of existing equipment are not updated and thus the reliability of data is low.

- The undergraduates of the facility and the master's course students use most of the equipment for practical training, therefore, research time is quite limited.
- There exists shortage of human resources who can maintain experimental equipment, and insufficiency of funds to cover the operation and maintenance expenses, which lead difficulty to replace the obsolete equipment with the new ones. Therefore, many items of equipment are not in working condition, and fixing them is probably not possible.
- As for the hatchery, the present laboratory is narrow, obsolete and scattered, and the place is not wide enough to carry out research works and experiments sufficiently.

(3) CENREs

Present status and problems:

- There is a laboratory that many items of equipment are not repairable,
- Data precision of many equipment such as the titration unites, is low and their quantity is also limited, and
- Equipment is mainly used by undergraduates of the faculty for training and education and by students of master's course to conduct practical training.
- It is difficult for researchers to perform practical training as the number of undergraduates' increases.

(4) Supporting Fields (CoET, CoNS, and CoICT)

Engineering field for CAAB and Aqua-cultural engineering

Present status and problems:

- Though many items of existing equipment have been obsolete, including items which were manufactured during 70's and 80's, they have not been updated yet.
- Existing equipment is used mainly for the training of undergraduate students, and thus is not applicable to research works.
- With old models of equipment, it is difficult to undertake research works adapting to the surrounding conditions and environment which are consistently changing.

(5) IT Management

Present status and problems:

- In most of the CTU faculties, since they do not have a common database for other activities, research works of the faculty personnel are performed on each PC.
- Due to restriction of hardware and software, it is not possible to accommodate simultaneous users.
- Almost all the equipment including a server and network equipment is superannuated, and thus the present system cannot meet the present demands or that of future education, management, and research works.

Remarks: Please refer to Appendix 3-21 for more detailed explanation for the current status of the existing equipment.

3.8.2 Operation and Maintenance System and Current Financial Status

(1) Operation and Maintenance System

The Department of Facility Management is responsible for asset management of the whole CTU.

The functions of the department are described as follows:

- To submit CTU asset management report annually to MOF and MOET, and
- To procure, inspect, maintain and dispose of equipment and maintain building and facility.

The headquarters of the department, which is located at the existing administration building, has six personnel, that is, a chief, a deputy chief, a mechanical engineer, an IT engineer, an accountant and a clerk.

The functions and activities of the department are described hereunder:

The facility management department is located at the headquarters which is located at the ground floor of the administration building. The headquarters has 5 personnel, namely, a chief, an IT engineer, a mechanical engineer, an accountant, and a clerk.

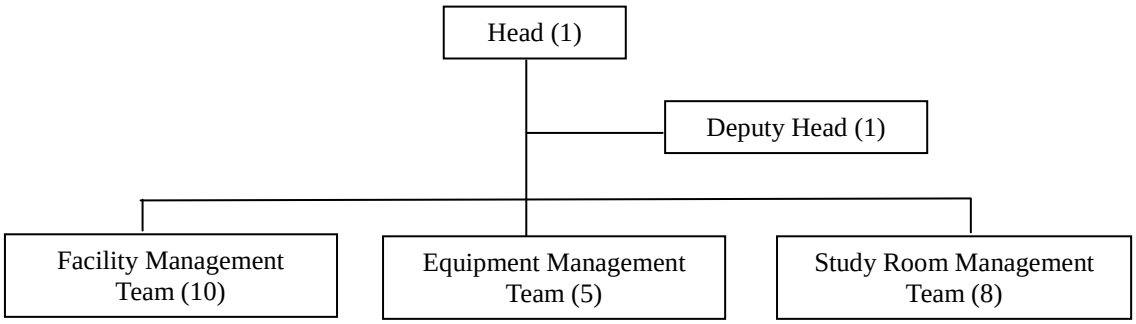
The functions and the activities of the department are described hereunder:

i) Asset database: It is introduced to simplify a complicated annual report for MOET and is released by the web of CTU. The department has been renting some extra items of equipment to other public universities without charging.

ii) Inspection of purchased equipment: The staff members stand for inspection of newly purchased equipment together with personnel of the recipient faculty.

iii) Dealing with equipment failure: In case of serious equipment failure the mechanical engineer of the facility management department will inspect the equipment failure and judge whether to call for services from equipment agents or other private workshop. CTU does not have a workshop with full-time maintenance engineers and technicians, which would otherwise cost personnel expenses. Instead of such a system, the chief of laboratory or the lecturer is responsible for daily equipment management as front-line maintenance; only in case of serious equipment failure, will the service be outsourced.

As the organizational structure shown in Figure 3-13 below, the department has 3 management teams of facility, equipment and study room. The teams work for both procurement and maintenance in their fields to cover all the colleges/schools/institutes of CTU.



Note: ( ) indicates numbers of staff members.
Source: CTU

Figure 3-13: Organization Chart of Facility Management Department

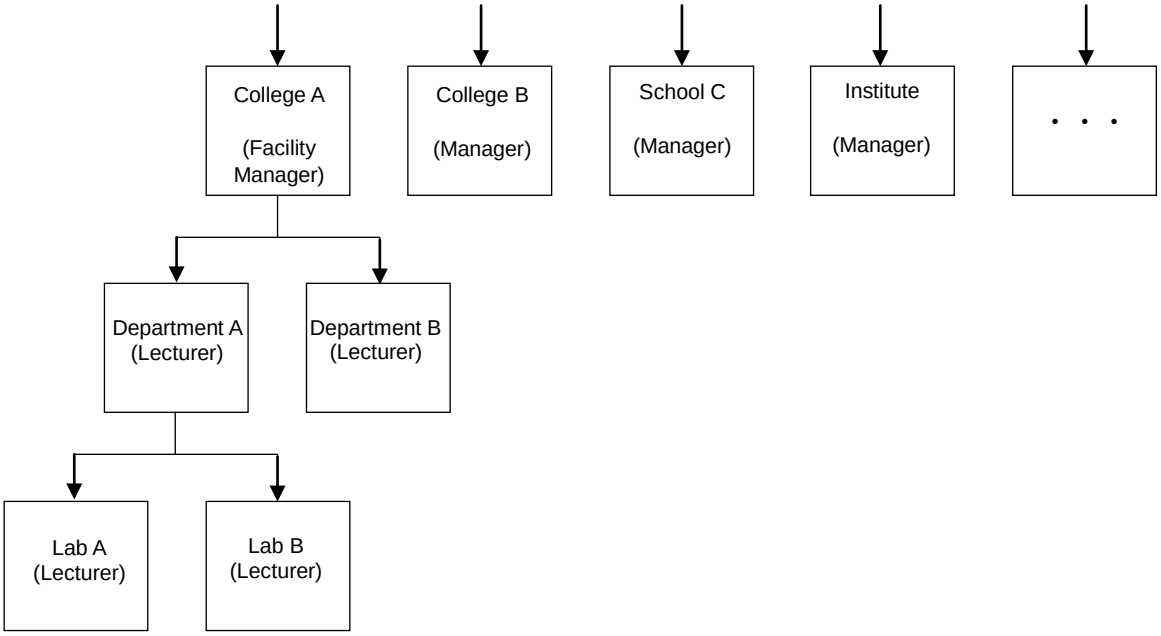
The functions of each management team are described as follows:

Table 3-39: Functions of Maintenance Management Teams

Name of Teams	Functions
Facility Management Team	Implementing the management – development – use – maintenance – protection and repair for facilities.
Equipment Management Team	Implementing the management – development – use –maintenance – protection, shopping – shopping advice and repairs – repairs counseling for equipment
Study Room Management Team	The team is responsible for managing study rooms about preservation and cleaning.

Source: Department of Facility Management, CTU

Each college/school/institute has assigned one facility manager for equipment and material procurement at college level and one manager/lecturer at department level, and one lecturer/head at laboratory level. The lecturer/laboratory head is responsible for management of laboratory equipment and its daily maintenance.



Source: CTU facility management department

Figure 3-14: Procurement and Management System of College/School/Institute

(2) Current Status of Balance between Budget and Expenditures

CTU budget has been increasing relatively firmly these 5 years. The main sources of revenue are subsidy of MOET and tuition fee. In recent years, the subsidy of MOET increased by about 40%, and there is increase in income from tuition due to increase in the number of students. However, simultaneously, there is also an increase in expenditure on CTU personnel, experimental material, and so on.

As for the operation and maintenance expense of CTU against operation expenditure (= overhead expense + equipment purchase-expenses + other expenses) of fiscal year 2011 is 4.4%; 4.0% for l year 2012 and 3.7% for fiscal year 2013. Thus, the operation and maintenance expense has been very stable at 4% in general, with little variation every fiscal year.

3.8.3 Equipment Operation and Maintenance Related Issues

According to the facility management department, there have not been so many serious cases of equipment failure in the past since lecturers are responsible for taking care of laboratory equipment and conducting operation check before and after its operation in CTU. For some precision equipment, engineers from equipment agents sometimes visit CTU to check the delivered equipment. In case of failure or when mechanical engineers of the facility management department cannot fix the issue, each college/institute calls for an equipment agent and determines the price quotation for repair service. The college has some budget for maintenance and the dean makes judgment regarding the acceptance of the repair service. In case the estimated cost is higher than the budgeted amount, the CTU rector board will make the final judgment whether to budget for the service based on the report prepared by the college/institute. If the board judges that the service is not cost effective there happened that the repair service has not been done in such a case of the LC-MS/MS of CAF.

It is hard to mention that the capability is enough to carry out maintenance management for the most advanced equipment appropriately under the present circumstances. Taking advantage of the said lessons, with emphasis on preventing serious troubles, operation and maintenance system for this project should be strengthened so that preventive service may be performed periodically. For especially advanced research equipment, it is essential to carry out the maintenance management service regularly by the specialist engineer of a local equipment agent. Also in this project, securing research expense is essential when the labs are formulating annual research plans. It is desirable to accumulate research expenses, such as experimental materials, chemicals, reagents and to have enough operation and maintenance budget for the next fiscal year.

3.9 CTU's Cooperation with Other Aid Donors and Universities/ Institutions in Other Countries

3.9.1 Influential Donors' Assistance in the Past

In the past, CTU conducted three big grant projects supported by other countries/ donors. The main influential projects are as follows:

Table 3-40: Influential Donor's Assistance in the Past

Netherlands	MHO[74]	1995–2000 (I) 2000–2004 (II)	EUR 15, 882,070 (USD 21.6 million[75])	Governance, Curriculum, Teaching methods, staff training (38 Ph.D., 211 master's, 382 short term, 300 invitation to VN) establish new department (Natural Science)
World Bank	1)Quick Quality Improvement Grant (QIG)[76] 2)Training Research Improvement Grant (TRIG)[77]	1) 2000–2007 2) 2008–2012	1) USD4.8 million 2) USD 3.8 million	1) enhance research and teaching in Biotech, ICT, Aquaculture 2) Governance, research and education, staff training (15 Ph.D.[78], 20 master's, more than 100 short term training)
Belgium	VLIR-IUC	1998–2003 (I) 2003–2008 (II)	EUR 6,778,863 (USD 9.5 million[79])	Distance Education, Curriculum, Research activity in aquaculture, biotech, soil dynamic and aquatic environment, Staff training (12 Ph.D., 46 master's, 71 short term training, 120 staff exchange)

Source: summarized by JICA Study Team

Common characteristics of influential projects are 1) long-term project of 2 phases of around 5-year project term[80], 2) sending of staff for Ph.D. and Master's degrees, 3) equipment including research activities, and 4) assistance to improve education. In addition, the same framework of the governance and university management section in the JICA proposal was used in MHO and World Bank projects.

During the interview with CTU members, the JICA team often heard about those three projects. The projects were apparently influential in raising CTU to the current status. The MHO project first introduced an IT network to CTU and established the Natural Science Department. In addition, introducing EFQM made it possible for CTU to work according to international standards. The World Bank produced current Deans and Vice Deans in several academic schools/ colleges of CTU. The budget only allowed 15 staff to go abroad for studies; however, 3 additional teaching staff received Doctoral degrees with the support of partner universities during the project. This indicates positive project impact as well as strong ties with partner universities. In addition, CTU learned the procedure of procurement, proposal writing, and project implementation by themselves with the World Bank projects. The VLIR-ICU[81] project indicates Mekong Delta's potential and CTU's role in its development. Their report states that a "win-win situation is always established during project implementation based on the needs and interests of both parties." The assistance was also fruitful to Belgium partners. The new phase of

[74] Name of the project in Dutch

[75] Rate as of 31 Dec. 2004 by OANDA http://www.oanda.com/lang/ja/currency/converter/ 1 Euro = 1.364 US dollar: EUR 15, 882,070 = USD 21,663,100

[76] Under "Higher Education Project", USD 103.7 million (including WB USD 83.3 million loan) (1999–2007).

[77] Under "Second Higher Education Project," USD 70.5 million (including WB USD 59.4 loan, and PHRD co-finance 4.8m of Japanese Grant) (2007–2012)

[78] Additional 3 Ph.D. degree holders were produced by partner universities' support.

[79] Rate as of 31 Dec, 2008 by OANDA http://www.oanda.com/lang/ja/currency/converter/ 1 Euro=1.409 US dollar: EUR 6,778,863=USD 9,555,010

[80] Asian Development Bank (ADB) has projects more than 10 years, but the activities were mainly for School of Education. The 3 ADB projects are as follows: 1) Upper Secondary Education Development (2002–2008): USD 32,500, 2) Second Upper Secondary Education Development Project (2012–2019): USD 500,000, 3) Upper Secondary and Professional Teacher Development Project (2007–2013): USD 1,000,000.

[81] The abbreviation means Flemish inter-university council.

VLIR, "VLIR Network University Cooperation[82]" started in 2013. Phase I (2013–2019) is for biosciences for food, and CTU is expecting phase II (2019–2025). In Phase II, CTU expects to organize the doctoral school and MSc program in English on specialization of aquaculture and food technology, and double and joint decree/diploma will be granted with Flemish universities in Belgium.

3.9.2 On-going International Projects

The ongoing international projects as of April 2014, rated by the budget size of the country, are listed below. The biggest budget in terms of total project amount is Australia, followed by Denmark. The budget sizes are almost the same, and those two are the top donor countries at CTU presently. Japan is the third largest collaborating country in 8 countries, majority of them are European countries. Most of the projects are related to Mekong Delta and Climate Change. CAF is conducting a research project on the effects of climate change on physiology of fish in cooperation with Denmark, which may be related to the prioritized research theme for this project. As of April 2014, there are 14 official ongoing projects. Some projects are not in the list, such as NAGAO project in aquaculture field, and phase I of VLIR Network University Cooperation, since they cannot provide official documents such as Project Outline, Project Proposal, Financial Plan, Management System, Implementation Schedule or budget information. MOET instructed CTU to treat such projects as internal (unofficial) projects.

Japan should show long-term commitment to work with CTU, not only with ODA, but also with private companies and/or universities, by setting branch offices or sending staff regularly at CTU. That will lead to positive impact of Japanese assistance. Currently, CTU does not have any ongoing JICA projects, however, JIRCAS (Japan International Research Center for Agricultural Science) and Yammer (private company) are working with the university staff and students, which demonstrate Japanese presence.

The details of 33 recent projects are attached in the Appendix 3-22, including those projects which ended in 2013 or early 2014. The list does not include two Word Bank projects, since CTU is still considering applying for them, VIIP (Viet Nam Inclusive Innovation Project), and FIRST (Fostering Innovation through Research, Science and Technology).

Table 3-41: Summary of On-going International Projects by Country (as of April 30, 2014)

	Country/ Donor	Total budget in USD [83]	No. of project	Fields of activity
1.	Australia	1,457,455 (AUSD 1,557,311)	4	Mekong Delta related topics (environment, livelihoods, agriculture), Climate change
2.	Denmark	1,454,600 (DKK 7,929,677)	3	Aquaculture fishery, Business, Environment
3.	Japan	443,507	2	Environment
4.	Belgium	136,723 (Euro 99,850)	1	Aquaculture under VLIR
5.	Netherlands	53,607 (Euro 39,150)	1	Climate Change
6.	Philippines	30,000	1	Environment
7.	Sweden	12,000	1	Environment
8.	Canada	11,044.3 (CAD 12,000)	1	Water management

Source: summarized by JICA Study Team

[82] While VLIR-IUC targeted only CTU, VLIR-Network University Cooperation is targeted several Vietnamese Universities including CTU.

[83] Exchange rate by 19 May 2014, OANDA, http://www.oanda.com/lang/ja/currency/converter/

3.10 Analysis of the Major Constraints of the CTU and Proposed Solutions

In this section, the major issues in the fields of Agriculture, Fisheries and Aquaculture, and Environment faced by CTU and the approaches on how to address these issues are discussed. The analysis is summarized in Table 3-42. The following Chapter 4 proposes the basic project design which will help resolve the challenges categorized and discussed here.

Table 3-42: Issues of the Programs of Agriculture, Fishery and Aquaculture, and Environment of the CTU and the Proposed Solutions

Issues	Proposed Solutions
I. Limited Quality and Number of the Human Resources in the Research Activities	
• There is an urgent need to satisfy the requirement set out by MOET that CTU should increase the number of professors with Ph.D. degree from the current 22% to 62% by 2022. The target seems difficult to achieve as many of the professors with Ph.D. degrees are in their mid-fifties and close to retirement. Hence, it is necessary to help young professors with Master's degrees obtain Ph.D. degrees. • Since there are limited opportunities of joint-research studies and professional training with overseas universities and academic institutes, many professors in CTU are not very familiar with the international trends and methodologies in their fields of study. • Due to limited opportunities of information sharing and exchange with different academic fields and scarce financial resources for research activities, it is rather difficult for the researchers in CTU to propose and conduct the inter-disciplinary academic programs. • Since the budget for accessing the database of international research studies and the support for drafting research papers are very limited, CTU has not fully developed the academic environment where the researchers are able to produce numerous research papers which meet the international quality standards.	• To address the current key concern of lack of good quality human resources to lead research activities due to the expected retirement of many professors in their fifties. Through internationally reputable Ph.D. programs offered by selected Japanese universities, it is expected that the scholars will obtain in-depth knowledge regarding the approaches and methodologies for research studies and foster working ethics and code of conduct as professional researchers. The degree programs and participation in the academic associations will help the scholars develop professional networks with famous foreign scholars in their respective fields, relevant universities and institutes, and the private sector. • Targeting mid-level instructors with Ph.D. degrees, the short-term overseas research training programs will be offered which aim to give them the opportunity to be exposed to the hottest international academic research studies which would help them understand the methodologies and approaches. • To conduct joint-research with selected Japanese universities and to implement and monitor the research activities which will help the University broaden the boundary of their research topics and push them towards other inter-disciplinary fields. Joint research studies with Japanese universities will also strengthen the capacity of the University in developing good quality academic reports and presenting them in academic journals and conferences.
II. Limited Graduate Education Programs Meeting the International Standards	
• Majority of the graduate education programs are offered in the Vietnamese language in CTU. As a result, it is difficult for the University to arrange exchange programs with overseas universities and institutes and accept international students. • The Environmental Study Programs have recently been getting popular and the number of applicants has drastically increased. To meet the demand and the expectation, new education programs urgently need to be established and developed. • Compared to the under-graduate programs, the graduate programs are limited in	• To establish the new graduate programs in the fields of Agriculture, Fishery/Aquaculture and Environment which will help the University be recognized as an internationally reputable research university in the future. To provide technical support to CTU to help develop suitable curriculum and syllabus of the newly established programs.

Issues	Proposed Solutions
number and fields. Many students hope to continue the graduate study in CTU, but because of the limited variety of the education programs available in CTU, they often have to move to other universities which offer them the programs which are more appealing.	
• The teaching style of the graduate courses (both the Master's and the Ph.D. degree programs) is often not appealing enough to the students and fails to stimulate their academic interests. • The capacity of senior fellows of CTU in leading and guiding the research study teams tends to be limited which results in the weak capacity of graduate students participating in the team.	• To provide model lectures with the help of Japanese university professors which can improve CTU professors' quality of teaching. Later joint-lectures will be provided to the students by the Japanese and CTU professors which will explain more clearly about the progress and achievements of their ongoing researches.
• There have been no education programs in the fields of the Agriculture, Fisheries/Aquaculture, and Environment accredited by the international quality control organization for higher education such as the ASEAN University.	• With a wide range of advisory support from the Japanese professors who have experience in university program accreditation by external quality control organization for higher education, the selected graduate programs in CTU in the 3 fields will be accredited.
III. Limited Capacity in Management and Governance of the University	
• There is a limited number of supporting unit staff who can effectively and efficiently help the academic unit and their researches. • Adequate management and implementation framework for the supporting unit, which can ensure the motives of the supporting unit staff including the standard performance evaluation criteria, regular training opportunities, and the action plan showing the mission statement and long-term direction of the supporting unit of CTU, have not been developed yet. • There is not enough supporting unit staff who are familiar with the necessary procedures and requirements of acquiring the certificate of accreditation of the education programs by the external quality control organizations for higher education institutes. • There are not many researchers who are active in acquiring patents which results in low external acknowledgement and recognition of the academic achievements of CTU.	• To provide the supporting unit staff short- and long-term university administration and governance training programs on planning, implementation and monitoring of university management which are essential for CTU's sustainable development as an international level university. • To provide a specialized training program to the supporting unit staff who are expected to effectively help the academic unit get the selected education programs to be accredited by the AUN. • To provide a specialized legal training program to the supporting unit staff who are expected to effectively help the researchers who are active in acquiring patents.
IV. Poor Academic and Research Environment	
• The same laboratories have to be shared and used for both educational experiments conducted by undergraduate students and the research experiments carried out by professors/graduate students. Further, some departments share the same laboratories even if their research themes are different. In result they cannot secure sufficient	• To build new facilities for the experiments and research with enough space and function in order to support the professors' research and teaching activities.

Issues	Proposed Solutions
space for laboratory experiments. Also occasionally some departments utilize the spaces in the buildings made for non-laboratory use (such as for lecture rooms, offices, etc.) as laboratories. Therefore they do not fulfill the functions of the research laboratories. • Teachers' offices and research space for graduate schools are insufficient. There is no paper-writing space where the researchers and graduate students can write the research papers based on the experiments in the laboratory. • The education facilities in CTU are outmoded and the drainage and air circulation of the laboratories are not properly managed. • There is not enough space where international conferences can be organized leading to limited opportunities of presentation of research achievements and networking within CTU. • The lecture halls and classrooms are limited in number.	
• After primary treatment at the processing tanks in the block, sewage from each undergraduate facility, is drained with stormwater in open ditch drainage in the campus, and it stays in the drainage ditch. • Infrastructure for equipment, including electricity, air circulation and gas, are not safely provided and it does not secure the safety of the researchers and the conditions for safe use of the equipment.	• To improve the drainage system in the campus as necessary
• The researchers encounter difficulty in carrying out research activities as intended due to limited number and quality of experimental equipment. It is also observed that the equipment is not managed through ICT. • Research plans are often limited by the quality, grade and number of available research equipment. Some equipment is already outmoded and cannot function properly.	• To provide research and experimental equipment and facility at appropriate level as needed.
• Administration and management of facilities and equipment and regular repair of articles of research laboratory, classroom, electricity, water, and education are carried out. However, as opportunities to receive specialist training on such activities is small and the response to problems is delayed, the process is resultantly inefficient.	• To provide short-term training program on operations and maintenance of the equipment to the academic and supporting unit staff in charge of the Research Management. The training programs aim to help develop the participants' capacity in better and appropriate usage of the equipment procured by the Project. Also it will give the participants a learning opportunity to understand how to jointly manage such sophisticated equipment for high-level research studies.

Source: JICA Study Team

4. Examination of the Proposed Scope and Design

4.1 Project Objectives

The long-term objective is to strengthen CTU as an excellent, internationally recognized institution in agriculture, aquaculture and environment and other interrelated fields, which will also contribute to the socio-economic development of MDR and the country as a whole.

The short-term objective is to strengthen CTU's capacity to deliver high quality academic and research works in three fields (agriculture, fisheries/aquaculture and environment) and interdisciplinary fields, which result in contributing to climate change issues and value-added agriculture and aquaculture of Mekong Delta River.

4.2 Proposed Project Components

4.2.1 Human Resources Development

(1) Needs for Human Resource Training

As analyzed in the previous chapter, the biggest bottleneck for CTU in achieving the objective of becoming an internationally recognized institution by 2022 is lack of human resources for advanced research in terms of both its quality and quantity. The main problems for the lack of human resources are as follows: (a) Young researchers do not have Ph.D. degrees which meet the international standards; they also lack the capacity to conduct advanced researches. (b) There are only a few faculty members in the middle age group and they do not get many chances of being involved in international research activities. They also lack the capacity to supervise young researchers and lead advanced research activities. (c) As a whole, the graduate school of CTU has limited opportunities for joint researches with foreign universities or research institutes, exchanging opinions in academic fields and know-how for writing papers for international journals. This project aims to support the most effective way of developing human resources for solving these problems.

(2) Comparison of Human Resource Training Schemes

While many types of human resource training programs can be implemented based on a variety of needs, the most appropriate human resource training schemes for the three abovementioned problems were considered, as shown in the table below. Seven potential training schemes (long-term degree-seeking training in a Japanese university; "sandwich program" containing course work in a Japanese university and training in Viet Nam; degree-seeking training in Viet Nam; short-term research training in a Japanese university; short-term training in a Japanese university, training in joint research in a Japanese university; and short-term training in Viet Nam) were evaluated based on the four criteria (suitability; synergic effects with other components; advantage of the Japanese university; and cost borne by the CTU). The schemes were compared to one other, and feasibility was determined in a comprehensive manner.

Table 4-1: Results for the Comparison of Human Resource Training Schemes

	Human resource training scheme	**Intended researchers**	**Suitabil -ity**	**Synergic effect**	**Japanese univ. advantage**	**Cost borne by CTU**	**Key consideration**	**Comprehensive evaluation**
1	Long-term degree training	Young researchers	⊙	⊙	⊙	△	Suitable for international level degrees and researches	To be implemented
2	Sandwich program	Young and mid-career researchers	△	○	○	△	Low efficiency	×
3	Degree program in Viet Nam	Young researchers	×	×	×	○	Unable to assure international quality levels	×
4	Short-term research training	Mid-career researchers	⊙	⊙	○	⊙	Can cover wide areas of research	To be implemented
5	Short-term training	Teaching and supporting staffs of the supporting unit	○	○	○	△	Sufficient outcome is not expected by its sole implementation	To be implemented with conditions
6	Joint research	All researchers	⊙	○	⊙	○	Directly connected to international level of research	To be implemented
7	Short-term training in Viet Nam	All researchers	△	△	×	⊙	Suitable for studying phenomena unique to Viet Nam, but low significance of Japanese involvement	×

Source: JICA Study Team

As shown in the table, long-term degree training, short-term research training and joint research are the three programs with the highest necessity and expected effectiveness.

In the areas of university management/governance, the CTU initially requested to implement a 3-month short-term training and a 2-week study tour in Japanese universities in addition to a long-term degree training for human resource development. However, unlike research training, resources of Japanese universities are relatively limited for these programs. For the fundamental reform and human resource development of the university management, it is desirable to provide CTU with long-term support through on-the-job-training by sending experts instead of just implementing short-term training, while also keeping the long-term degree-seeking training for this project. Effective follow-up before and after the training in Japan is possible by sending Japanese experts to Viet Nam to offer technical advice, and if needed, combining that with short-term training in Japan. To conclude, the short-term training and study tour in the areas of university management/governance, which is necessary for enhancing CTU's research capacity, shall be implemented under the technical cooperation project as mentioned in the later section.

Short-term training in Viet Nam requested by CTU to implement may be suitable for studying phenomena unique to the region, such as identification of fish species. However, it is difficult to add value by having Japanese experts involved in the training and making evaluations after the

training. Therefore, the short-term training program in Viet Nam shall not be included in the project.

(3) Long-Term Degree Training

The long-term degree training aims to train researchers and promote acquisition of doctoral degrees through the enrollment of doctoral programs in Japanese universities, and to enhance the capacity for university management and governance by attending master's programs in Japanese universities.

1) Basic policies

- To train researchers who can play leading roles in Mekong Delta studies
- To increase the number of doctoral degree holders
- To train potential candidates for executive positions of supporting unit
- To build a bridge between Japanese universities through the training program

2) Points to note in implementing programs

- Utilization of Program 911

During discussions on the draft final report of this survey in Viet Nam, MOET proposed to send the planned 63 CTU staff members for doctoral courses in Japan by the Program 911, instead of sending them by using ODA loan of the Project. However it is important to achieve the Project objectives by ensuring human resources development and other activities such as education/research, facility and equipment to function in a coordinated manner in the Project. Since utilization of Program 911 may affect those linkages, JICA requested MOET to satisfy some conditions to secure the close linkages among the Project components. MOET replied that some of the conditions were not easy to satisfy. In conclusion, both sides agreed to keep the program (study for doctoral courses in Japan) under the Project and use the ODA loan. Furthermore, both sides agreed to look for collaboration between two programs to maximize the outcome of the Project.

- Comprehensive support starting prior to leaving for Japan until after returning to Viet Nam

In order to successfully implement the training program as planned, it is essential to provide consistent, comprehensive support for trainees, including selection of trainees and training institutions, admission applications, visa arrangements and acquisition before visiting Japan, along with guidance around the time of visiting Japan, and advice and support during the program until returning to Viet Nam. In doctoral courses, in particular, it sometimes takes longer than three years to finish and acquire the degree. Therefore, a domestic support system should be considered such as periodical monitoring meeting between trainees and consultant while also dealing with cases where students have not completed the program to acquire degrees within the prescribed period. In the implementation phase, a staffing plan should be formulated to ensure that CTU's system is not shorthanded. Accepting universities are supposedly national universities in Japan. It is necessary to share the information on the deadline of selection of trainees, timing of admission applications, timings for the payment of exam fees and enrollment fees among the concerned parties to prevent delays. Further, preliminary guidance, including a Japanese language training course to get ready for the training program, is requested by CTU and accepting universities, as period of research students in Japan will not be provided prior to enrollment.

- Roles, responsibilities and use of human resources after studying abroad

The human resource development plan of CTU has been created in accordance with the priority of research topics in each field. As it is required to have at least three PhD holders in each of the graduate programs planned to be newly introduced, CTU plans to send the teaching staff members belonging to these fields to Japan. Once young teaching staff members have obtained doctoral degrees in Japan, they are required to return to CTU to add value to CTU. It is necessary to clarify the roles expected of them after their return to Viet Nam, and let trainees know in an explicit manner before they leave for Japan. Furthermore, CTU needs to put the right person in the right position, and work in a coordinated manner with education/research and facility/equipment components to create appropriate education/research environment in order to allow the teaching staff to make full use of what they have learned from the training program.

- Reimbursement of scholarship and domestic financial mechanisms

After returning to Viet Nam, the staff members are required to work in the public sector for at least three times the period that they stayed abroad to study according to the regulations of the Vietnamese Government (No 143/2013/ND-CP). Those who fail to continue to work in the public sector for the said period will have to reimburse the cost of studying in Japan. To prevent these issues from happening, it is preferred to sign a pledge to comply with and fulfill the necessary conditions and responsibilities during and after study in Japan between CTU and trainees before leaving for Japan.

In relation to the reimbursement of scholarship, discussions may arise on which domestic financial mechanisms should be used in the Project, on-lending or on-granting. As this is a non-profit education project, it is not appropriate to apply for the on-lending scheme.

If CTU teaching staff members do not follow their obligations mentioned above, such teaching staff members simply repay the costs of the study in Japan to the Government of Viet Nam directly or through CTU. To prevent CTU staff members from failing to follow Government regulations, CTU will consider the possibility of making agreement documents with those who will join the program for doctoral courses in Japan.

- Regulations for the Scholarship Program in Viet Nam and Provision of Campus Housing

When trainees study in Japan under the ODA loan, 1,200 dollars per month of scholarship is provided to each student in addition to the provision of tuition fees, according to the regulations of Vietnamese Government. This is however less than the amount provided for the Japanese government-sponsored international students by about 20,000 to 30,000 yen. In Tokyo and other big cities, private apartment rents are expensive, and initial expenses such as deposits and key money are also high when moving into a new place. Therefore, it is desirable for the universities to offer housing at least for six months to one year after the enrollment.

Once a year, CTU will directly deposit the scholarship money into the bank account of the international student in Japan. The enrollment and tuition fees to be paid to the accommodating university will be directly paid by CTU to the designated bank account of the university after signing a contract regarding the amount and date of payment. It is essential for the CTU to respond in a timely manner for smooth payment arrangements without delay.

- Handling of tuition fees of accepting universities

The JICA Study Team has identified differences in handing tuition fees in Japanese universities when they accept students from CTU through the project.

It is found that majority of the Japanese universities do not intend on exempting tuition fees or need further consideration. On the other hand, a university answered that it is possible to exempt the tuition fees, because the MOU with the CTU specifies such arrangements in association with student exchange. It is found that several Japanese universities have, in fact, discounted tuition fees for foreign students sent through other scholarship programs of the Vietnamese Government, such as the Mekong 1000 project, in the past. However, even some of those universities have been hesitant in discounting tuition fees for students of this project.

Student exchange agreement is originally to exempt tuition fees in both universities for exchanging students. Under this project, however, students are supposed to be sent mainly from the Viet Nam side, and thus, it is not quite advantageous for Japanese universities if tuition is only discounted from their side. Furthermore, discount or exemption of tuition fees by some universities may lead the selection of the Japanese universities to be based on the amount of tuition rather than their educational programs or the areas of research needed be strengthen through the exchange. As a result, the project could deviate from its original objectives during implementation. Given the situation, it is advisable to estimate the budget based on regular tuition fees in order to ensure sufficient budget for human resource development under the project.

3) Selection of students and universities accepting students

After the candidate who meets the requirements to participate in the program has obtained a recommendation of the department dean, he/she undergoes an approval process by the Rectorate Board. Eligible trainees for long-term training programs (doctoral and master's programs) are planned to be young teaching and supporting staff who are 40 years old or younger, with English skills of 6.0 or higher for doctoral programs and 5.5 or higher in IELTS for master's programs.

Japanese universities that will accept CTU students are going to be selected mainly from the nine universities that have already closely worked with CTU. They will mainly be selected from the nine universities that are members of the advisory group. Based on the information provided by the consultants on research topics acceptable by each university and the person in charge of admission procedures of each university, students will contact universities by themselves, undergo the selection process and obtain admission. For CENRes and other fields in which the opportunities for cooperation with Japanese universities has been limited, or in case research topics deviate from the interest of the nine advisory group universities, the consultants will support the matching process.

4) Number of plans

Under the program for doctoral courses in Japan, 25, 24 and 14 teaching staff members will be sent in the areas of agriculture, fisheries/aquaculture and environment, respectively, and nine supporting staff members will be sent in the area of university management and governance for master's courses (See Appendix 4-1). According to the development plans of the CTU, 123 teaching and supporting staff members are supposed to obtain graduate degrees for the period of three years, from 2019 to 2021 in the entire CTU, and if nine supporting staff members who will study in the area of university management and governance are added, this project will cover about 60% of the total.

Under the program for doctoral courses in Japan, teaching staff will be sent in three batches. The study in the doctoral course will start after the fall admission in 2016, and the last 3rd batch will be sent in the fall of 2018, the third year of the project. For one year period between the fall of 2018 and fall of 2019, all 63 teaching staff members being sent from the CTU to Japan will be studying in Japan; therefore, consideration should be given to staffing plan for teaching staff

in the CTU during this period to avoid being shorthand. In doctoral degree programs, it sometimes takes longer than three years to finish and acquire the degree. Therefore, consideration should be given to possible cases of additional budgeting associated with students enrolling another year, and the completion timing of the project.

Master's courses in Japan usually take two years to complete. Nine supporting staff members will be sent in three batches with each batch consisting of around three people. The 1st batch will be sent in September, 2016 for the fall admission, and the last 3rd batch will be sent in the fall of 2018. It is desirable to have basic knowledge of each field and an idea for fundamental reform of CTU's management and governance system before studying in Japan, by getting technical advice from Japanese experts who will be sent under the technical cooperation project.

If the study proceeds as planned, 63 and 9 teaching and supporting staff members will obtain doctoral degrees and master's degrees in fall 2021, respectively.

(4) Short-term Research Training

The participants of the short-term research training aim to learn advanced research skills through three months of short-term research in Japanese universities.

1) Basic policies

- To learn advanced research skills through short-term research training
- To supplement wide research areas that cannot be covered by the study program for doctoral degrees
- To build the foundation of cooperative research between universities in Japan

2) Points to note in implementing programs

- Thorough preparation and support for the execution of the plan

Due to a large number of training programs, research periods, research details, supervisors, joint research coordination and many other issues need to be checked, requiring preliminary arrangements with the accepting universities. For this reason, thorough preparation and adjustments are necessary. Therefore, it is important for the consultants to work together to support smooth execution of the plan.

3) Selection of trainees and universities accepting trainees

Each department dean and supervisor select trainees, and approvals are obtained from the Rectorate Board. Eligible trainees for short-term research training include doctoral degree holders. Primarily staff members who obtain degrees in Viet Nam are sent to Japan to learn analytical techniques in laboratory and research methodology by exposing themselves to cutting-edge technologies, and further improve teaching methods and raise awareness after returning to Viet Nam.

The consultants will provide information on possible research topics acceptable by each accepting university, likewise in the long-term training. Trainees will contact universities by themselves, and acquire admission. Japanese universities will accept them as Foreign Intern Researchers for three months.

4) Number of plans

Under the short-term research training programs, 50, 18, and 39 teaching staff members will be sent in the areas of agriculture, fisheries/aquaculture, and environment, respectively (See

Appendix 4-1). If the programs proceed as planned, 107 members will participate in the short-term research training programs in Japan by the end of the project.

4.2.2 Joint Research

(1) Key Principles

Joint research is one of the most effective tools for transferring research capabilities, or what is called "the research culture," from Japanese partners to CTU researchers. The research culture that always requests researchers to pursue quality research outputs is not yet nurtured at CTU. At the same time, research topics and concerns that CTU is to deal with should be invaluable for Japanese researchers in terms of expanding research fields and human networks. In this regard, joint research is conducted for mutual benefit.

In order to enhance human resource development of the Project, degree programs and short-term training programs should be part of the joint research; teaching staff members who participate in these programs conduct some part of joint research at Japanese partner's labs. However, CTU must understand that degree programs are more for attaining research culture of the partner lab and therefore the dissertation itself does not necessarily have to be the same as the joint research topic. Short-term programs may be used for acquiring knowledge and/or skills that directly relate to the joint research.

(2) Time Schedule

Human resource development should preferably be completed by the time CTU's new research facilities and equipment are available so that the investment produces sufficient output as expected.

In this regard, it is strongly recommended that joint research partly starts before the Project is implemented through a technical cooperation project to establish model joint research(es). Subsequently, The Project will continuously support joint research by expanding the established model. This arrangement may enable careful selection of participants of short-term and degree programs and lead to effective and efficient investment in CUT's human resources.

(3) Outputs of Joint Research

Based on the enhanced research culture that enables CTU to conduct self-sustainable research activities as an internationally recognized research university, the following are expected as outputs of the joint research:

- International journal papers
- Patent applications*
- Ph.D. degrees obtained at partner universities
- Publication of research results through seminars and/or workshops
- Plan of incubating research outputs with industries

*Agreements on intellectual property rights should be made between CTU and the Japanese partner university before starting joint research. Note that patent applications must be accepted at the Branch Office of National Office of Intellectual Property in Ho Chi Minh City before any publication of the research. Examination of the patent applied for can be requested within 19 months after the application and may take more than several years.

Outputs should be annually monitored and evaluated. Those that have not produced sufficient research outputs will be terminated or reconsidered regardless of the research period.

(4) Selection of Research Themes

The steps to select and identify research themes and Japanese partner universities are explained as follows.

Step 1) The selection criteria of researches will be developed by the Committee and opened internally on the Project website. The Committee will include Vice Rector in charge (Chair), a unit head of Research Management Unit of Project Management Unit (PMU), representative from colleges recommended by CTU such as CAAB, CAF and CENRes, representative from supporting units recommended by CTU, representative from Japanese Advisory Group and academic coordinator from the Consultant of the consulting services.

Step 2) The research team leaders will prepare concept paper and then concrete research plans. Each research team leader should first create a patent map[84]of the target research field. Then leaders prepare concrete research plans, using formats that are to be given by the Project. Research plans should include items such as necessity, methods and materials, time schedule, research members and assignments, equipment to be used, budget, plans of patent application and publications, methods of application to communities and/or industries, and expected impact to the socio-economic development of MDR.

Step 3) The Committee will evaluate each research plan based on the determined criteria.
The proposed criteria include:

- Urgencies and sustainability in terms of adaptation to climate change in MDR;
- Feasibility from the viewpoints not only of research team's capacity, team members' past achievements, and facilities/equipment;
- Impact to the MDR communities/industries;
- Potential international journal publications (in terms of becoming an internationally recognized research university);
- Introduction of interdisciplinary research approaches; and
- Availability of Japanese partner universities.

Some should be accepted as proposed, while some leaders may have to revise their plans so they become more feasible and efficient. The selection process must be transparent; selection criteria should be kept public internally on the Project website.

Step 4) Japanese partner universities are assigned to selected research projects. Agreements between each CTU research team and Japanese partner universities are signed.

Step 5) Selected research projects are disclosed internally on the Project website.

(5) Funding Sources

As shown in Table 4-21, the technical cooperation project and the Project will cover joint research activities. First, the technical cooperation project will start and cover the budget for joint research activities to develop model joint research(es) before the Project starts. Following the technical cooperation project, the Project will start and continuously support the budget for

[84] Patent maps should be prepared through searching patents at the United States Patent and Trademark Office (USPTO); http://www.uspto.gov/patents/process/search/index.jsp. Researchers make a list of patent applications that are closely related to his/her research topic and find out that his/her research plan is new; namely research outputs are patentable. Otherwise, the research won't be able to find out anything new to the world and therefore cannot be published in any international journals.

CTU's research activities (mainly joint researches with Japanese partner universities) to expand the established model through Research Project component of the Project.

(6) Disbursement Mechanism

The disbursement mechanism of loan proceeds under Research Project is illustrated in section 6.1.

4.2.3 Facility Development Plan

(1) Study of Design Policies

Basic Policy

The priorities of the faculty components and design requirements should be determined to meet the following purposes of the project:

- To establish an international-standard education and research organization
- To develop inter-disciplinary research activities focused on the MDR
- To improve post-graduate courses

Natural Conditions

- Temperature and Humidity
  Can Tho City has a tropical monsoon climate. The proposed buildings shall be planned on an east-west axis, and most rooms shall face southward or northward in order to minimize heat gain by direct solar radiation. The rooms facing southward shall be provided with louvers to prevent direct sun exposure and to reduce the heat load caused by solar radiation. Air-conditioners shall be installed in the rooms where the research activities require temperature control.
- Precipitation
  Rainfall in Can Tho is concentrated, therefore the proposed buildings' roof slope, downspout pipe sizes, and overflow devices shall be designed to deal with the concentrated amount of rainfall. An exterior drainage plan within the premises shall also be designed carefully.
- Wind Direction and Velocity
  In Can Tho, the prevailing winds blow from southwest throughout the year. The opening of the proposed building shall be designed to utilize natural ventilation in accordance with the prevailing wind directions.

Construction/Procurement Circumstances and Construction Period

Local construction companies carry out the construction work of many large-scale construction projects in Can Tho, and there are many available, experienced and skilled laborers. The capabilities of local construction companies and local laborers shall be utilized to reduce construction costs by coordinating the design of the proposed facilities to meet the capabilities of local construction methods. However, the capability of the local subcontractors' construction management shall be carefully assessed for the laboratory buildings, as the utility work in the research laboratories will require a relatively high technical skill level.

- Construction Schedules
  CTU plans to construct Advanced Technology Laboratory Building at the existing BiRDI site after the existing buildings are demolished. Its construction work cannot start until the Bio-tech Building is completed and all BiRDI functions move there.

Therefore, the project's construction schedule should consist of two phases. Phase-1: Constructing Bio-tech (Laboratory Complex) and Phase-2: Constructing Advanced Technology Lab.

To Set Standards and Grade of the Facilities

The criteria for facility design shall basically conform to those set by the Vietnamese government.

- MOET, Circular No. 57/2011/TT-BGDDT
- MOET, Circular No. 20/2012/TT-BGDDT
- MOC, TCVN 3981-1985
- Decree No. 29/2011/ND-CP
- CTU Campus-2 Master Plan 2009 (Can Tho City)

Standards to design research laboratories shall conform to the Building Standard Regulations in Japan, JIS and other relevant industrial standards in Japan in order to maintain the international quality required for research activities of the project.

A part of the project's research includes microbiology and bio-hazardous activities; it is recommended to set appropriate Bio-safety Levels (BSLs) of those laboratories based on WHO's Bio-safety Guidelines.

(2) Master Plan of Each Campus

Campus-2

A 1/500 Detailed Master Plan for Campus-2 was approved by Can Tho City's Department of Construction (DOC) in 2009. The Master Plan defines the following components:

- Block plan layout
  Functions of major block (use of the buildings, footprint and the number of floors) are defined as Can Tho City's urban norms. When the newly planned building complies with the conditions of the Master Plan, the next step is to obtain the building permit again.

- Road system
  Major campus roads are classified as 26 meters, 19 meters and 14 meters wide roads depending on the required traffic.

- Infrastructure
  The plan includes the improvement of the electric power supply, water supply, and rainwater and soil water drainage systems inside Campus-2.

As long as the proposed facilities comply with the basic conditions defined in the Master Plan, CTU will only need to apply for permission for modifications of the original Master Plan.

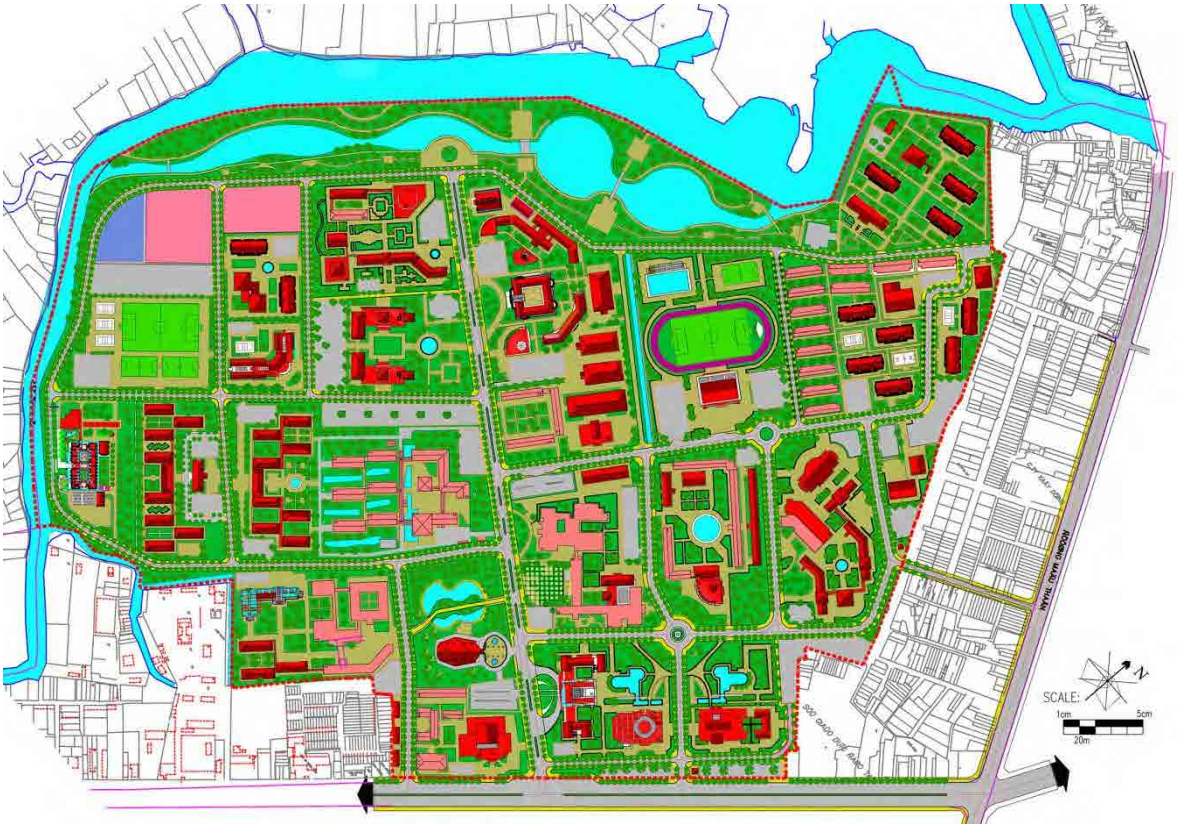


Figure 4-1: Campus-2 Master Plan

Hoa An Campus

Hau Giang Province made 1/2000 Zoning Master Plan. It is necessary to obtain permission for modification of Master Plan for new construction.

(3) Study of Facility Component's Priorities

CTU's Original Request

CTU's facility proposal and priority of each component proposed during JICA's Advisory Mission are shown in Table 4-2.

Table 4-2: CTU's Original Requests and their Promontories

Pri-ority	Facility Component	Total Floor Area (m^2)	Functions
1	Laboratory of Advanced Technology	19,600	Advance Laboratory, Sharing equipment
2	Biotech (Biotech, Food Science)	11,945	Research Lab, Basic Lab, Office, Lecture rooms, discussion room
3	International Education and Training Center (IETC)	8,600	International students study. Lecture rooms, discussion rooms, conferencing
4	Laboratory for Aquaculture	4,000	Research Lab for aquaculture area
5	Laboratories for Environment	4,000	Research Labs for environment
6	Headquarters building of Hoa An Campus and Technology Transfer	7,200	Research Lab., Basic Lab, Office, Lecture rooms, discussion room
7	Upgrading infrastructure of Campus II		Upgrading the transport system (roads), etc

Priority	Facility Component	Total Floor Area (m^2)	Functions
8	Laboratories for Engineering	4,000	Research Labs support activities for 3 research topics
9	Upgrading and Equipping the Main Auditorium		Furniture, Multimedia, etc.
10	Hatcheries, Research stations	3,000	For aquaculture
11	10 net house (green house)	10,000	For three areas research
12	Upgrading infrastructure of Campus IV (Hoa An)		Transport system (road), internet system, etc.
13	Dormitory (guesthouse) for Hoa An	1,800	Trainee, lecturers, experts
14	Research center Phu Quoc	4,600	For three areas

Source: CTU

Study Policy of Facility Priority

As a result of discussions with CTU, CTU decided to review the original priority order according to 4 priority criteria: (i) direct contributions to the project goals which CTU discussed with JICA mission in April 2014, (ii) urgency and non-existence of alternative facilities, (iii) Synergies with other inputs, and (iv) Difficulties to find other financial sources.

In addition, JICA Study Team requested CTU to prepare additional information to examine justification of International Education and Training Center (IETC) and Hoa An Center for Technology Transfer as follows.

IETC

i) Usage plan of IETC related to the project goals
ii) Justification of additional conference rooms (alternative facilities (existing / under construction) for conference rooms, past and future plans for conference)
iii) Justification for additional lecturer rooms (calculation for additional lecturer rooms according to curriculum)

Hoa An Center for Technology Transfer

i) Usage plan of Hoa An related to the project goals and activities of the three fields
ii) Selection of some activities and prioritization of the proposed activities in response to the usage plan

Study Result of the Facility Components

Table 4-3 shows the study results of the facility components and their priorities.

Table 4-3: Study Results of Facility Component's Priorities

Components to be Covered by the Project

Priority	Building Name		Total Floor Area (m^2)	Remarks
1	Advanced Technology Laboratory		16,654	
2	Bio-Tech Wing	Research Laboratory Complex	12,706	
3	CAF Wing		13,007	
4	CENRes Wing			
5	CoET Wing			
6	International Education Training Center		10,419	
	Tranche-1 Sub-total		52,786	
7	Field Test Facility		8,400	Greenhouses & Net house
8	Hatcheries		2,700	Aquaculture tank facilities
	Tranche-2 Sub-total		11,100	
9	Upgrading Infrastructure in Campus 2			IT-LAN cable connection for proposed buildings
10	Hoa An, Center for Technology Transfer		4,888+2,000	Office, Lecture & Seminar Rooms, etc + Greenhouse
	Tranche-3 Sub-total		6,888	
Grand Total (Buildings to be covered by the Project)			**70,774**	

Components NOT Covered by the Project

11	Phu Quoc Island Marine Research Center		Management facility & Filed Lab
12	Upgrading Utility System in Main Auditorium		Furniture & multimedia system
13	Upgrading Infrastructure in Hoa An Campus		Road, LAN system
14	Hoa An Campus, Dormitory & Guesthouse		Dormitory in Hoa An Campus

Source: JICA Study Team

CAAB, CAF, CENRes and other related research laboratories, which significantly contribute to the objectives of the Project (development of inter-disciplinary research activities focused on the MDR and improvement of post-graduate courses), are given higher priorities; other components are given lower priorities. The results of the review undertaken by the study team are as follows:

- Priority-1: Advanced Technology Laboratory
  This building is indispensable for educational and research activities of the Project. It also meets the objectives of the Project, and therefore constructing this building component as a part of the Project is reasonable and important.

- Priority-2 to 5: Research Laboratory Complex
  The buildings are indispensable for educational and research activities of the Project. They also meet the objectives of the Project, and therefore constructing these building components as a part of the Project is reasonable and important.

- Priority-6: International Education and Training Center (IETC)
  This component consists of lecture rooms for undergraduate and master's course students of CAAB, CAF, CENRes and BiRDI. The existing buildings of CAAB and CENRes have few lecture rooms, and it is necessary to provide 16 number of 60-seat, 18 number of 80-seat and 10 number of 120-seat lecture rooms to cater to the expected increase in needs by 2020.
  IETC assists in the improvement of theoretical subjects and contributes to online research activities with Japanese and other foreign universities by using video conference systems. In addition, conference rooms will be used for holding international conferences for research studies, which helps CTU expand research networks with foreign universities and research institutes.

- Priority-7: Field Test Facilities (Greenhouses and Net houses)
  These facilities are indispensable for educational and research activities of the Project. They also meet the objectives of the Project, and therefore constructing these building components as a part of the Project is relatively reasonable and important.
  Those facilities are necessary to carry out prioritized research activities of agriculture (such as Program-1 Plant and animal genetics and breeding, Program-2 Sustainable production of tropical plants and animals).

- Priority-8: Hatcheries
  These facilities are indispensable for educational and research activities of the Project. They also meet the objectives of the Project, and therefore constructing these building components as a part of the Project is relatively reasonable and important.
  These facilities are necessary to carry out prioritized research activities of aquaculture and fisheries (such as Program-1 Climate change: Impacts and adaptation in aquaculture and fisheries, Program-2 Green technology innovation for aquaculture, Program-3 Fisheries management and conservation and Program-4 Fisheries socioeconomic and management).

- Priority-9: Infrastructure of the Campus-2
  The Project will only provide the LAN cable connections between the proposed buildings and CTU's new headquarters building (where new central server systems are installed). As a result, academic and research environment will be improved. For instance, the results of research activities (GIS data, satellite image, remote sensing, weather data, etc.) can be put in CTU's data center and then professors, researchers and students from environment and other fields can connect to the data center and use them for their research and training activities. Appendix 4-2 shows the LAN cable network system in Campus-2 which is to be provided by the Project and CTU.

- Priority-10: Hoa An Technology Transfer Center
  CTU asserts that Hoa An Campus is important and inevitable to CTU's educational and research activities for the following reasons:
  - Because Campus-2 is located in the center of Can Tho City, installing new animal and field test facilities is difficult due to environmental issues. Those functions are being transferred to Hoa An Campus.
  - There are shortages of facilities for testing research results in the fields, demonstrating research results and transferring technology of tested research results.

  Constructing lecture, office, and seminar rooms at the existing Hoa An Campus to strengthen the functions as a part of the Project is relatively reasonable and important. The Technology Transfer Center will include not only a lecture office and seminar rooms but also provide field research office functions for CAAB, CAF and CENRes. The Center will also include an outreach center to transfer the result of the Project's research to farmers, extension workers and local government officers. Appendix 4-3 shows how the improved facilities are utilized in relation to the prioritized research theme of CAAB, CAF and CENREs.

The Project will not include the following components.

- Priority-11: Phu Quoc Island Marine Research Center
  CTU agreed to exclude Phu Quoc Island Marine Research Center from the project components because of the following reasons:

  - CTU will be able to find financial assistance from the Government of Viet Nam (i.e. Ministry of Science & Technology) to construct the Marine Research Center facilities in the future.

- Obtaining EIA permission to meet project implementation schedule seems very difficult. Any construction in Phu Quoc Island (which is located in the Nature Preservation Area) will be classified into Category B, according to JICA's Environmental and Social Consideration Guidelines; it is necessary to obtain EIA permission before the project's formality is finalized.
- Obtaining land use permission to meet project implementation schedule seems very difficult.

During the Field Survey period, the study team did not receive details of construction sites for Phu Quoc Island Center, and appropriate review of CTU's proposal for the Center reached an impasse.[85]

- Priority-12: Upgrading Utility System in the Main Auditorium
  The Main Auditorium (turtle hall), which was constructed in 1970's, has no proper fire protection system (such as sprinklers and fire detectors). A large-scale renovation work will be needed to meet the current functional and fire protection requirements, and therefore constructing new auditorium is recommended from cost-benefit point of view.
  However, constructing a new auditorium is not directly related to the research activities of the Project. CTU agreed to exclude this component from the Project.

- Priority-13: Infrastructure in Hoa An Campus
  This component is not related to the objective of the Project, and therefore, the study team concluded not to include this in the Project.

- Priority-14: Dormitories in Hoa An Campus
  CTU plans to construct new 400-bed student dormitories with financial assistance from Hau Giang Province, and CTU agreed to exclude those components (except for Technology Transfer Center) from the Project.

(4) Study of Project's Construction Sites

Campus-2

- Advanced Technology Laboratory
  There are existing BiRDI's buildings (1 and 2-story RC structures, total floor area: approx. 3,200 m^2) on the proposed construction site for Advanced Technology Laboratory, and the Vietnamese side should demolish the existing buildings and any underground structures, and level the land before the construction work is commenced.
  A 1/500 Master Plan allows up to 7-story buildings on the site.

- Research Laboratory Complex
  There are existing CoET's workshop buildings (1-story steel structures, total floor area: approx. 5,100 m^2) on the proposed construction site for Research Laboratory Complex, and the Vietnamese side should demolish or relocate the existing buildings and any underground structures, and level the land before the construction work is commenced.
  A 1/500 Master Plan allows up to 5-story buildings on the site.

[85] Site of Phu Quoc Island Center: Suoi Lon Resettlement Area: 2 Ha land to build Center for sea training, research & economic development and Khu Rach Vem District: 25 Ha land to build scientific research center. It is expected to receive detailed land use information from Kien Giang Province People's Committee. However, those detailed information has not been provided during the Survey period. As for Khu Rach Vem district, it has been designated as "Tourist arrangement area", and permission to land purchase is under consideration.

- IETC
  There are existing lecture buildings (1-story RC structures, total floor area: approx. 2,300 m^2) on the proposed construction site for IETC, and the Vietnamese side should demolish the existing buildings and any underground structures, and level the land before the construction work is commenced.
  A 1/500 Master Plan allows up to 7-story buildings on the site.

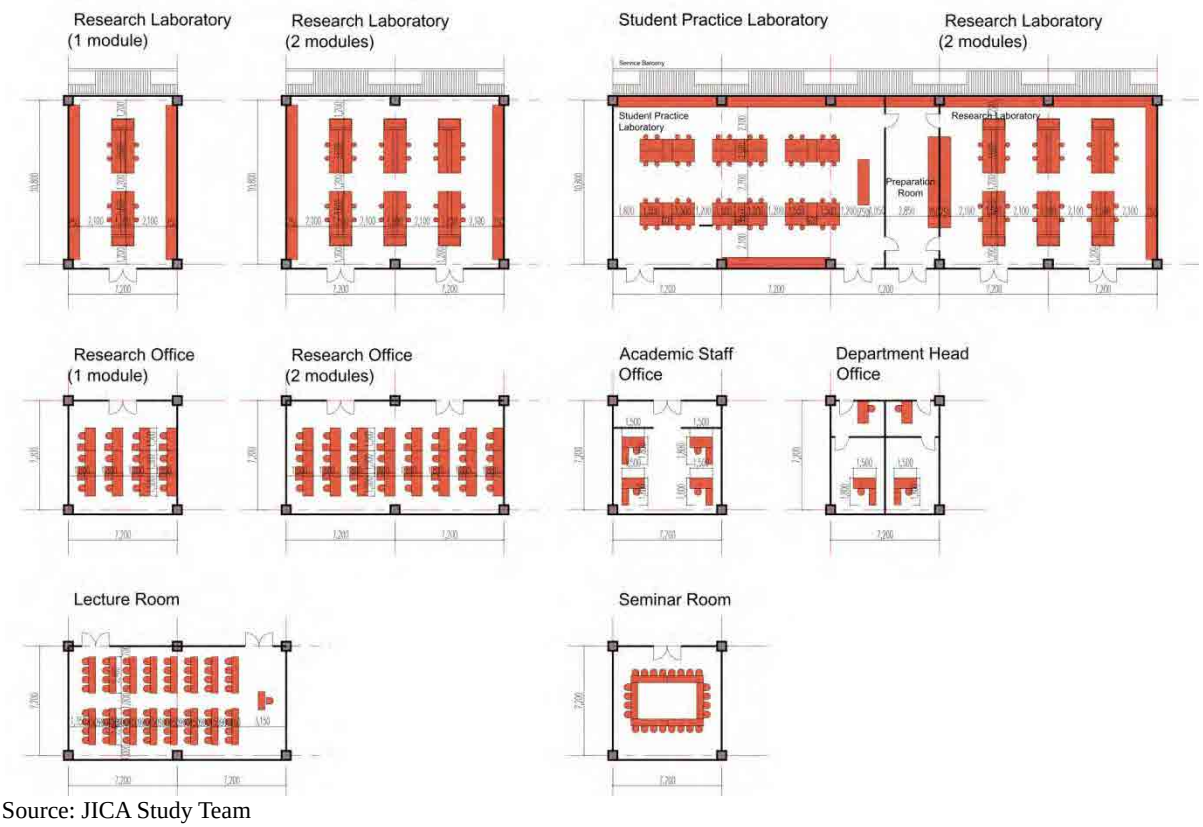
Hoa An Campus

CTU plans to construct the proposed Technology Transfer Center building on the southwest portion of the Hoa An Campus. The proposed portion is basically flat, except for a small pond, and there is an old lecture building, which should be demolished before construction work starts. CTU plans to construct field test facilities (greenhouse and net house) on the northwest portion of the Campus. Proposed construction areas are shown in Appendix 4-4.

(5) Study of Design Requirements

Research Laboratory – Study of Standard Room Modules

The study team proposes standard laboratory and research office modules shown in Figure 4-2, based on design standards commonly used in Japan and international research institutions.



Source: JICA Study Team

Figure 4-2: Standard Room Modules

- Laboratory
  The laboratory standard size (module) is 10.8 meter-deep x 7.2 meter-wide. Necessary number of modules is calculated to meet research activities and the equipment layout. The student practice lab has 3 modules including a preparation room.

- Research Office
  The research office standard size (module) is 7.2 meter-deep x 7.2 meter-wide. The necessary number of modules is calculated based on the number of academic staff, researchers and post-graduate students.

Study of Necessary Room Type Modules for Each Faculty

Table 4-4 shows the necessary number of laboratory/research office modules calculated based on research activities of each faculty. Detailed room allocation tables (Functional Space Program) is shown in Appendix 4-5.

Table 4-4: Number of Necessary Room Modules by Faculty

Room Type	Advance Tech	CAAB	BiRDI	CAF	CENRes	CoET
7.2 x 10.8	71.0	29.5	41.5	28.0	27.0	22.0
7.2 x 7.2	117.5	13.5	42.5	12.0	14.0	20.0

Source: JICA Study Team

Lecture Rooms – Study of Necessary Room Type

Necessary number and types of lecture rooms are calculated based on CTU's educational activities (the number of undergraduate/post-graduate students of each faculty/course) in 2020. The number of students of each course is basically either 60 or 80 (and their multiple), and 40, 60, 80 and 120-seat lecture rooms are considered as standard modules.

CTU's standard credit system defines that undergraduate student obtains 145 credits in 4 years (approx, 36 credits per year) and master degree student obtains 30 credits in 2 years (15 credits per year). Therefore, undergraduate students should attend 18 lecture-hours/ week and master degree students should attend 8 lecture-hours/ week for each semester.

Table 4-5 shows the result of necessary number of lecture rooms in 2020 calculated based on those conditions. PhD student will use seminar rooms in the proposed facilities, and their lecture-hours are not included in this calculation.

The existing CAAB building has 13 lecture rooms, CAF 25 rooms and CENRes 3 rooms, those rooms will be continuously used as lecture rooms. The necessary lecture rooms at IETC will be 16 number of 60, 18 number of 18 and 10 number of 120-seat rooms.

Table 4-5: Number of Necessary Lecture Rooms at IETC

College	Course/Research Field	Number of Students						Necessary Lecture Hours of Each Room per Week/Semester			
		2013 (Current)			2020 (Target Year)						
		Enrollment per Year	Length of Course	Total	Enrollment per Year	Length of Course	Total	40 seats	60 seats	80 seats	120 seats
CAAB	Undergraduate Program	680		2,820	1,450		5,910				
	1 Animal Science	80	4 Years	320	140	4 Years	560			144	
	2 Animal Breeding Technology	40	4 Years	160	60	4 Years	240		72		
	3 Food Technology	50	4 Years	200	160	4 Years	640			144	
	4 Crop Science	30	4 Years	120	100	4 Years	400				72
	5 Plant Breeding Technology	40	4 Years	160	60	4 Years	240		72		
	6 Organic Agriculture	50	4 Years	200	80	4 Years	320	144			
	7 Horticulture and Landscape Architecture	40	4 Years	160	50	4 Years	200		72		
	8 Agronomy	100	4 Years	400	110	4 Years	440				72
	9 Plant Protection	50	4 Years	200	120	4 Years	480				72
	10 Soil Science	60	4 Years	240	60	4 Years	240		72		
	11 Veterinary Medicine	100	5 Years	500	110	5 Years	550				72
	12 Veterinary Pharmacology	40	4 Years	160	60	4 Years	240		72		
	13 Post-harvest Technology	-		-	150	4 Years	600			144	
	14 Animal Husbandry Products	-		-	80	4 Years	320	144			
	15 Applied Biology	-		-	50	4 Years	200		72		
	16 Soil Microbiology	-		-	60	4 Years	240		72		
	Graduate Program	139		278	250		500				
	1 Crop Science	36	2 Years	72	40	2 Years	80	16			
	2 Animal Science	20	2 Years	40	20	2 Years	40	16			
	3 Soil Science	9	2 Years	18	40	2 Years	80	16			
	4 Veterinary Medicine	27	2 Years	54	30	2 Years	60	16			
	5 Plant Protection	23	2 Years	46	60	2 Years	120		16		
	6 Food Technology	19	2 Years	38	30	2 Years	60	16			
	7 Post-harvest Technology	5	2 Years	10	30	2 Years	60	16			
	PhD Program	35		105	35		105				
	1 Animal Science	5	3 Years	15	5	3 Years	15				
	2 Plant Protection	5	3 Years	15	5	3 Years	15				
	3 Soil Science	5	3 Years	15	5	3 Years	15	Using Seminar Rooms in the Proposed Buildings			
	4 Crop Science	10	3 Years	30	10	3 Years	30				
	5 Food Technology	5	3 Years	15	5	3 Years	15				
	6 Pathology and Therapeutics for Animals	5	3 Years	15	5	3 Years	15				
BiRDI	Undergraduate Program	231		963	310		1,270				
	1 Microbiology	68	4 Years	272	60	4 Years	240		72		
	2 Regular Biotechnology	124	4 Years	496	160	4 Years	640			144	
	3 Advanced Biotechnology (Taught in English)	39	5 Years	195	30	5 Years	150	72			
	4 Biological Engineering	-		-	60	4 Years	240		72		
	Graduate Program	45		90	90		180				
	1 Biotechnology	45	2 Years	90	30	2 Years	60	16			
	2 Biotechnology (Taught in English)	-		-	15	2 Years	30	16			
	3 Microbiology	-		-	30	2 Years	60	16			
	4 Microbiology (Taught in English)	-		-	15	2 Years	30	16			
	PhD Program	10		30	14		42				
	1 Microbiology	5	3 Years	15	5	3 Years	15				
	2 Biotechnology	5	3 Years	15	5	3 Years	15	Using Seminar Rooms in the Proposed Buildings			
	3 Biotechnology (Taught in English)	-		-	2	3 Years	6				
	4 Microbiology (Taught in English)	-		-	2	3 Years	6				
CAF	Undergraduate Program	520		2,080	680		2,720				
	1 Aquaculture	80	4 Years	320	80	4 Years	320			72	
	2 Marine Aquaculture Technology	40	4 Years	160	40	4 Years	160	72			
	3 Aquaculture Environmental Management	40	4 Years	160	50	4 Years	200		72		
	4 Advanced Program in Aquaculture	20	4 Years	80	30	4 Years	120	72			
	5 Transferred Program in Aquaculture	40	4 Years	160	40	4 Years	160	72			
	6 Animal Nutrition & Feeding	-		-	50	4 Years	200		72		
	7 Ornamental Aquaculture	-		-	40	4 Years	160	72			
	8 Aquatic Animal Pathology	60	4 Years	240	100	4 Years	400				72
	9 Fisheries Management	50	4 Years	200	50	4 Years	200		72		
	10 Fisheries Management & Economics	60	4 Years	240	60	4 Years	240		72		
	11 Aquatic Products Processing	100	4 Years	400	100	4 Years	400				72
	12 Transferred Program in Aquatic Product Processing	30	4 Years	120	40	4 Years	160	72			
	Graduate Program	59		118	180		360				
	1 Aquaculture	45	2 Years	90	40	2 Years	80	16			
	2 Fisheries Management	14	2 Years	28	30	2 Years	60	16			
	3 Aquatic Animal Disease Diagnosis and Treatment	-		-	40	2 Years	80	16			
	4 Aquatic Products Processing Technology	-		-	30	2 Years	60	16			
	5 Fisheries Management & Economics	-		-	20	2 Years	40	16			
	6 Advanced Program in Aquaculture	-		-	20	2 Years	40	16			
	PhD Program	10		30	17		51				
	1 Aquaculture	10	3 Years	30	10	3 Years	30				
	2 Fisheries Management	-		-	4	3 Years	12	Using Seminar Rooms in the Proposed Buildings			
	3 Advanced Program in Aquaculture	-		-	3	3 Years	9				
CENRes	Undergraduate Program	360		1,440	480		1,920				
	1 Environmental Science	80	4 Years	320	80	4 Years	320			72	
	2 Environmental Engineering	80	4 Years	320	80	4 Years	320			72	
	3 Environmental & Natural Resources Management	80	4 Years	320	80	4 Years	320			72	
	4 Land Resource Management	80	4 Years	320	80	4 Years	320			72	
	5 Forestry	40	4 Years	160	0	4 Years	0				
	6 Environmental Economics	-		-	80	4 Years	320			72	
	7 Water Resource Engineering	-		-	80	4 Years	320			72	
	Graduate Program	113		226	120		240				
	1 Environmental Sciences	44	2 Years	88	30	2 Years	60	16			
	2 Natural Resources and Environmental Management	27	2 Years	54	30	2 Years	60	16			
	3 Land Management	42	2 Years	84	30	2 Years	60	16			
	4 Environmental Engineering	-		-	30	2 Years	60	16			
	PhD Program	10		30	10		30				
	1 Soil & Water Environment	5	3 Years	15	5	3 Years	15				
	2 Land Management	5	3 Years	15	5	3 Years	15	Using Seminar Rooms in the Proposed Buildings			

Calculation of Necessary Number of Lecture Rooms	40 seats	60 seats	80 seats	120 seats
Total Lecture Hours/Week	1,040	952	1,080	432
Necessary Number of Rooms (Maximum Usable Lecture Hours: 54 hours/week, Occupancy Rate: 80%)	24	22	25	10

Existing Lecture Rooms					
	CAAB	8	4	1	0
	CAF	20	0	5	0
	CENRes	0	2	1	0

IETC's Necessary Number of Lecture Rooms	**0**	**16.0**	**18.0**	**10.0**

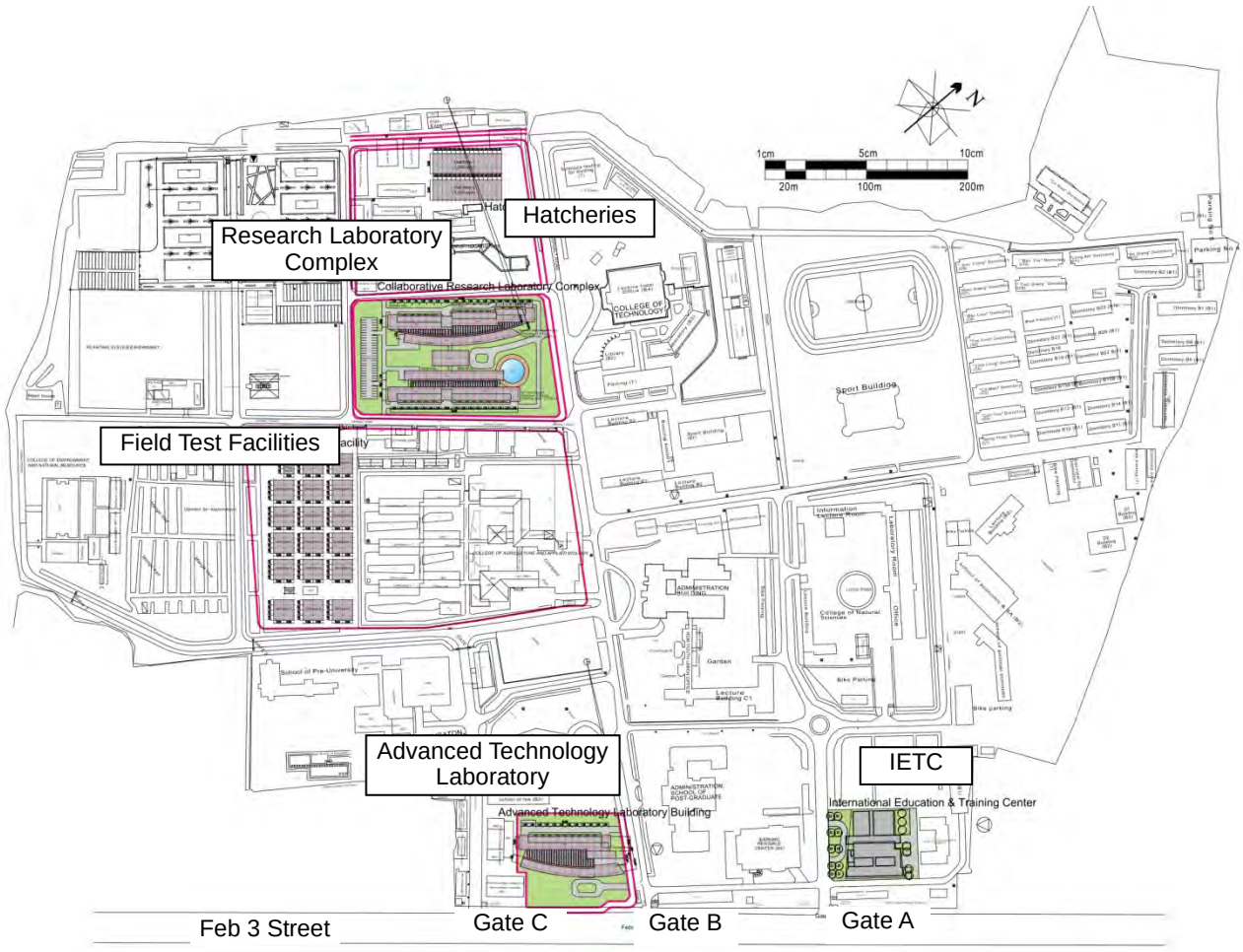
(6) Outline of the Proposed Facilities

Block Plan Layout, Campus-2

Block plan of the proposed facilities to be constructed in Campus-2 is show in Figure 4-3.

Advanced Technology Laboratory will be constructed in the block west of the Gate-B, and IETC will be constructed in the block east of the Gate-B. Both blocks are facing February 3rd Street. Research Laboratory Complex will be constructed in the block between the existing CAAB and CAF premises in the center of the campus.

Proposed facilities comply with the urban norms of the 1/500 Master Plan.



Source: JICA Study Team

Figure 4-3: Block Plan Layout of Campus-2

Architectural Plan

Table 4-6 shows the building area, the total area and the number of floors of the proposed facilities. Total floor area per student will be increased from 4 m^2/ student (current) to approx. 12 m^2/ student by constructing the proposed facilities. The Project will significantly contribute to improve study/research environment of CTU.

Table 4-6: List of the Proposed Facilities

No.	Building Name	Building Area (m^2)		Total Floor Area (m^2)		No. of Floors	No. of Designed Occupancies (persons)
1	Advanced Technology Laboratory		3,238		16,654	6/7 Floors	750 persons
	Research Laboratory Complex		6,627		25,713		
2	Bio-Tech Wing	3,153		12,706		4/5 Floors	500 persons
3	CAF Wing						
4	CENRes Wing						
5	CoET Wing	3,474		13,007		3/5Floors	500 persons
6	International Education Training Center		2,290		10,419	1/7 Floors	3,600 seats
7	Field Test Facility (Greenhouse/Net house)		8,400		8,400	1 Floor	-
8	Hatcheries		2,700		2,700	1 Floor	-
9	Upgrading Infrastructure in Campus 2		-		-	-	-
10	Hoa An Campus		3,629		6,888		
	Center for Technology Transfer	1,629		4,888		3 Floors	
	Field Test Facility	2,000		2,000		1 Floor	-
	Total		**26,884**		**70,774**		

Source: JICA Study Team

- Advanced Technology Laboratory Building

This building is to be constructed at a block (where the existing BiRDI buildings occupy) facing the February 3rd Street and located west of Gate-B.

Source: JICA Study Team

Figure 4-4: Exterior View of Advanced Technology Laboratory

The building mainly consists of CAAB's research laboratories and other faculties' support laboratories. CEOC (Common Equipment Operation Center), where advanced research equipment shared by all the faculties will be installed, is also to be located on the ground floor.

Since the building is constructed at a block where the existing BiRDI buildings occupy, its construction work cannot start until BiRDI's entire functions move to the proposed Bio-tech building.

- Collaborative Research Laboratory Complex

CTU agreed to integrate the Bio-tech building (laboratories for CAAB and BiRDI) and laboratories for CAF, CENRes and CoET to create a more effective and collaborative research laboratory complex. Integrating laboratories on one large floor plate enables reduction in the number of staircases, elevators and other circulation areas, and enables generation of extra areas for common amenity spaces (such as library, auditorium and canteen).

A Japanese style garden and related design element will be introduced at the atrium and the main approach of the building complex. These elements will help visitors understand the complex is constructed with Japanese ODA loan.

This building is to be constructed at a block between CAAB and CAF, specified as a site for the Bio-tech Building in the Master Plan. There are some existing workshops belonging to CoET in the site, and those buildings should be demolished/relocated before the construction work begins.

Source: JICA Study Team

Figure 4-5: Exterior View of Research Laboratory Complex

- International Education & Training Center

This building is to be constructed at a block facing the February 3rd Street and located east of Gate-A.

Source: JICA Study Team

Figure 4-6: Exterior View of IETC

- Field Test Facilities

CTU plans to install 4,600 m^2-greenhouses, 3,500 m^2-net house and some phytotrons (total area: approx. 8,400 m^2) for CAAB's Crop Science, Plant Protection and other related departments.

Those greenhouse and net house will follow the technical specifications of similar facilities at Agricultural High-tech Park in Ho Chi Minh City (Netafim Corporation's greenhouse systems with automatic irrigation system).

- Hatcheries

CTU plans to install three 900 m^2-hatcheries (for blackish water, fresh water and aquatic nutrition and processing), where hatchery tanks are installed.

- Hoa An Technology Transfer Center

Table 4-7 shows the education activities of College of Rural Development (CRD) in 2013 and 2020 (Target Year).

Table 4-7: Education Activities of CRD in 2013 and 2020

College		Course/Research Field	Number of Students					
			2013 (Current)			2020 (Target Year)		
			Enrollment per Year	Length of Course	Total	Enrollment per Year	Length of Course	Total
CRD	Undergraduate Program				2,640			3,360
	1	Agronomy	80	4 Years	320	80	4 Years	320
	2	Rural Development (Agricultural Extension)	80	4 Years	320	80	4 Years	320
	3	Aquaculture	60	4 Years	240	60	4 Years	240
	4	Agricultural Business		4 Years	0	60	4 Years	240
	5	Agricultural Extension		4 Years	0	60	4 Years	240
	6	Rural Development (Social Work)		4 Years	0	60	4 Years	240
	7	Business Administration	80	4 Years	320	80	4 Years	320
	8	Administration Law	100	4 Years	400	100	4 Years	400
	9	English	100	4 Years	400	100	4 Years	400
	10	Civil Construction	80	4 Years	320	80	4 Years	320
	11	Information Technology	80	4 Years	320	80	4 Years	320

Source: CRD

Hoa An Technology Transfer Center will significantly contribute to the Project research fields by promoting joint research projects with CAAB, CAF and CENRes. Table 4-8 shows samples of joint research projects and required facilities.

Table 4-8: Sample Joint Research Projects and Required Facilities

Field	Research Project	Existing Facility	Proposed Facility
CAAB	• Application of high agricultural technology for better production of new varieties of rice and other crops • Studies on plant responses and adaptation to environmental stresses in MD • Developing integrated management systems to improve the productivity and quality of rice, fruit trees, vegetables, pharmaceutical plants and industrial trees • Studies on alternative strategies for production of rice and other crop plants under climate change impacts in the MD • Developing management technologies for soil nutrition and soil remediation for crop production in the MD	• Paddy fields • Dyke systems • Wetland area	• Research office • Practice Lab • Net house • Greenhouse
CAF	• Green technology for seed production and farming systems for sustainable inland aquaculture • Monitoring and management of water and sediment quality (physical-chemical-biological factors) for inland aquaculture in MD	• Hatchery • Fish pond • Wet land	• Research office • Practice Lab • Net house • Greenhouse
CENRes	• Study and demonstration of possible techniques to treat the soil, water and air pollutions in the specific context of the MD • Study and demonstration of changes of the farming systems to support elimination of pollutants loaded to the environment (including GHG)	• Paddy fields • Husbandry farm • Wetland area	• Research office • Practice Lab • Net house • Greenhouse

Source: CRD

Preliminary layout plans are attached in Appendix 4-6.

Structural Design

- Status of Soil Conditions
  As a result of soil investigations, the geological status of the proposed project sites is appropriate to construct the proposed buildings. The summary of the soil investigation is attached in Appendix 4-7. The details are as follows:
  - Campus-2
    According to the bore hall test at Campus-2, a soft clay layer with an N-value of less than 5 is deposited at depth up to around 30 meters below the ground surface. Under that layer, a silty clay layer mingled with sand with N-value of around 20 is deposited at depth up to around 50 meters. A sandy soil layer with N-value of more than 50 and more than 5 meters thick is deposited under that layer. A silty clay layer mingled with sand with N-value of around 20 and 5 to 10 meters thick is deposited under that layer. A sandy soil layer with N-value of more than 50 appears under that layer.
    The water level is around - 0.6 m from the ground level.
    According to the plate loading test at 0.5 meter below the ground surface, the ultimate strengthen is 125 to 300 kN/m^2, settlement is 10 to 20 mm and allowable soil bearing capacity is 66.7 kN/m^2.
  - Hoa An Campus
    According to the bore hall test at Hoa An Campus, a soft clay layer with an N-value of less than 3 is deposited at depth up to around 30 meters below the ground surface. Under that layer, a sandy layer mingled with clay with N-value of 10 to 20 is deposited at depth up to around 60 meters. Under that layer, a clay layer mingled with sand with N-value of 20 to 30 is deposited at up to 75 meters. A sandy layer with N-values of more than 50 appears at depth of around 75 meters below the ground surface.
    The water level is around 1.0 meter from the ground level.
    According to the plate loading test at 0.5 meter below the ground surface, the ultimate strengthen is 100 kN/m^2, settlement is 6 mm and allowable soil bearing capacity is 50.0 kN/m^2.

- Foundation Plan
  The proposed buildings will be designed with pile foundations. Supporting layer is the sandy soil layer with N-value of more than 50 and more than 5 meters thick at depth of around 50 meters below the ground surface at the site of Campus-2.

- Superstructure Plan
  The main structure of the proposed buildings should be reinforced concrete which is locally common. The frame type should be a rigid frame structure that enables flexible planning. A part of the structure with long span (such as roof of atrium) should be steel. Expansion joint should be used at appropriate places to accomplish reasonable structures.

- Design Load
  Table 4-9 shows designed live load and load factor. Live load of Machine room should be readjusted according to the actual machine layout.

Table 4-9: Designed Live Load and Load Factor

Room Name	Live Load (N/m^2)	Load Factor
Research Office	2,000	1.2
Administration Office	2,000	1.2
Lecture Room	2,000	1.2
Research Lab	5,000	1.2
Exhibition Space/Atrium	4,000	1.2
Auditorium	4,000	1.2
Canteen	2,000	1.2
Machine Room	7,500	1.2
Roof (non-access)	750	1.2

Source: JICA Study Team

Utility Design – Electrical System

- Design Policies
  The following three basic design policies will be applied to the electrical system of the Project:
  - Using locally available equipment and materials for easier maintenance
  - Selecting energy effective equipment (such as LED lights)
  - Installing generators to ensure emergency power for research purpose

- Power Supply System
  The proposed buildings will receive high-tension electricity (22 kV) from the electric company's power grid located along the major roads inside the campus. Each building will have transformers to receive high tension electricity and transformed low tension electricity will be supplied to each portion of the building.
  A new generator system is installed where research activities require it.

- Lighting/Receptacle
  The proposed buildings will use fluorescent lighting fixtures in principle and use LED lighting system partially to increase energy efficiency. Local switches will be installed for turning lights on/off to utilize daylight effectively.
  Receptacles for laboratory use are separated from general use in order to improve the stability of power supply for laboratory use.

- Telecommunication & LAN System
  The proposed buildings will have the Main Distribution Frame (MDF) for telephone lines and LAN and equipped with conduit/cable racks to outlet at necessary locations.

- Fire Alarm System
  Fire alarm systems are installed to comply with local fire regulations.

Utility Design – Mechanical System

- Design Policies
  The following three basic design policies will be applied to the mechanical system of the Project:
  - Applying simple mechanical systems for easier maintenance and lower running cost
  - Reducing air-conditioned rooms as much as possible
  - Treating laboratory wastewater and exhaust properly to protect users and environment

- Water Supply System
  The water supply is led from underground city main line (installed along the main street inside the campus) at each boiling, stored at receiving tank and delivered via an elevated tank. The size of the receiving tank will be determined to meet local water supply conditions. The receiving tank will be equipped with a proper sterilization treatment system.

- Drainage System
  There is no effective drainage system inside the campus, and rainwater and wastewater are collected in open ditch drainage —, and discharged to public drainage system.
  Each proposed building will have wastewater treatment system (tank), and wastewater will be discharge after primary treatment. The wastewater treatment system will have aerated wastewater treatment system.
  Original laboratory wastewater should be corrected by specific company, and secondary wastewater should have neutralization/sterilization treatments wherever necessary.

- Hot-water Supply System
  An electric water heater with storage tank will be installed wherever necessary.

- Sanitary Fixtures
  Western style, water flush closets with necessary accessories are installed in the toilet booth. Wall-mounted automatic water flush faucets will be installed. Sinks will have automatic water control system.

- Fire fighting System
  Necessary fire fighting systems will be installed to comply with Vietnamese Fire Regulation. The proposed buildings will have fire hydrants with hose reel and fire extinguisher.

- Air-conditioning System
  Only laboratories and research rooms required by research activities will have air-conditioning systems. The proposed building will have air-cooled heat pump air-conditioning systems, which have higher controllability, flexibility and durability.
  Laboratories and research office will have ceiling-mounted air-conducting units. Large auditoriums at IECT will have an air-conditioning system to deal with the designed number of seats, but lecture rooms will have only fans to follow the conditions of the existing facilities.

- Ventilation System
  Rooms without air-conditions will not have mechanical ventilation system. Rooms with air-conditions will have mechanical ventilation with total heat exchange systems.

<u>Operation and Maintenance Cost of the Proposed Facilities</u>

Facility's operation and maintenance consist of running costs (electricity, telephone and water charges) and building maintenance costs (cost for building maintenance and purchasing spare parts of mechanical systems, etc.). Total annual operation and maintenance costs for major buildings at Campus-2 are estimated at VND 8,246 million /year (JP Yen 40,406,000).

- Building Running Cost
  Annual running costs for Advanced Technology Lab, Research Laboratory Complex and IETC are calculated based on the situation and charge system of existing buildings. CTU makes a fixed rate telephone charge contract with Telephone Company, and telephone

charge is kept separate from building running cost. Building running costs are covered by CTU budget.

- Building Maintenance Cost
  Building maintenance costs (maintenance fees of exterior wall, roof, etc.) and mechanical system maintenance costs (purchasing spare parts of utility systems) are calculated based on the current situations. Approx. 70% of the building maintenance cost is covered by CTU budget and 30 % by MOET budget.

The breakdown of estimated annual operation and maintenance cost is shown in Table 4-10. Estimated annual operation and maintenance cost in Campus-2 is approximately 8,246 million VND (approximately 40 million JPY)

Table 4-10: Estimated Annual Operation and Maintenance Costs

Cost	Item	Cost (VND)
Running Cost	Electricity charge	6,300.934,000
	Power generator fuel cost	66,090,,000
	Water charge	503,118,000
Building Maintenance Cost	Building maintenance cost	1,270,779,000
	Elevator maintenance contract fee (3 elevators)	105,180,000
	Total	8,246,101,000

Source: JICA Study Team

4.2.4 Equipment Plan

(1) Consideration of Design Policy

i) Basic policy toward equipment plan

The equipment plan is limited to highly demanded and essentially required fields of research for this project. Priority of procurement is provided to the items of equipment which satisfy the following criteria.

Table 4-11: Equipment Selection Criteria

No.	Items	Standard
1	Grades of equipment	To select essential items of equipment to perform research plans to be carried out by graduate students of master's course and Ph.D courses.
2	Possibility of common use	To share advanced and high precision equipment as common equipment as much as possible in the light of frequency of use and its operation cost.
3	Operation and maintenance capability	To select items of equipment, which CTU can maintain sufficiently in bearing operation and maintenance cost to secure sustainability of this project, taking into consideration the present maintenance capability, and personnel assignment to operate the equipment sufficiently.

Source: JICA Study Team

ii) Basic policy toward equipment procurement situation

- It is desirable to prioritize products of manufacturers who have local agents near the site of this project especially for precision equipment which need regular maintenance service, such as accuracy control, and supply of consumables such as reagents.
- Coincidently, there exist many manufacturing agents for major precision equipment including Japanese manufacturer in Ho Chi Minh City, and thus competitiveness can be also be secured.

- Therefore, the products of equipment manufacturers who have local agents in Viet Nam should be given priority in selection of research equipment.

iii) Basic policy on utilization of local companies

- There exist a lot of equipment agents/dealers in Viet Nam and it is possible to utilize their services such as basic operation and maintenance training in equipment installation and periodical maintenance service. It is judged appropriate to utilize their services to secure the sustainability of this project.
- However, it is found that there are some agents that have no capability to carry out after care services such as periodical check and trouble–shooting services properly due to poor technical levels and thus careful considerations are required when utilizing the local agents.

iv) Basic policy on capability of operation and maintenance

- The operation expenses increased due to equipment procurement will be calculated as trial considering the current status of the operation and maintenance budget, and whether the amount can be financially borne by CTU will be examined.

A proper financial plan should be properly formulated taking into consideration, transition of operation and maintenance budget, securing the required maintenance budget of CTU by MOET, and increase of income by acquisition of the competitive research fund of CTU based on the CTU strategy plan (2006).

(2) Targeting Fields of This Project

In the original request from CTU, targeting fields include CAAB, CAF, CENREs, supporting fields (CoET, CoNS), IT, Management & Governance, IETC, Hoa An center, and Phu Quoc Center.

As the result of a series of discussions the procurement will be considered for the following fields in this project: CAAB, CAF, CENREs, supporting fields (CoET, CoNS), IT, Governance, IETC, and Hoa An center.

(3) Summary of Draft Equipment Plan

i) Justification of equipment procurement

For this equipment procurement plan, it is planned to prioritize the items which contribute directly to researches of the 3 fields. In examining requested items of equipment, they are prioritized based upon the following categories.

(A) Essential items to carry out research plans,
(B) Necessary items, and
(C) Desirable items

In addition, the following factors are taken into consideration:

1. Possibility of common use for a plurality of request
2. Frequency of its use,
3. Degree of difficulty of operation & maintenance, and,
4. Limitation of total volume determined by space allocated for each lab and budget allocation for equipment procurement.

The said factors are used for comprehensive judgment in devising the equipment plan. In the process of inspection of equipment procurement justification, CTU consulted the advisory

group of Japanese universities for draft equipment plan to submit the draft research plans and proposed equipment plan. The advisory group provided some comments on the said data and the comments are reflected in the plan. The following table shows the summary of the comments from the advisory group and results of review by CTU.

Table 4-12: Summary of Comments from the Advisory Group and Review by CTU

1) CAAB

No.	Research equipment	Comments from advisory group of Japanese universities	Reflection of comments in to the plan by CTU
1	DNA Sequencer of next generation	A sequencer of next generation is not determined in the plan. As it is essential to analyze genome we recommend that you procure one unit of the device if the operation budget allows. However we should take into consideration that the device will cost you very high running cost.	A DNA Sequencer is added to equip 39. Molecular Biology Lab as it is required to train young researchers.
2	LC/MS	Seemingly LC/MS/MS requested by CAF will be used for identification of proteins. It is desirable that CAAB also has the same device. We recommend the LC/MS you procure be models such as AB SCIEX TOF/TOF5800 since it would be difficult to operate it smoothly. For 2D electrophoresis, some items are overlapping and numbers need to be reconsidered if possible.	An LC/MS is added to equip 38. Food Biotechnology Lab.
3	2D-electrophoresis	Since there is some overlapping for this device the numbers may be reduced if possible.	One unit of 2D-electrophoresis is removed and two units are kept considering frequency of use.
4	HPLC	It is recommended that numbers may be reduced depending upon frequency of use. You may share the device in case the labs that use it are located nearby and samples are similar.	Considering its disposition and the frequency of use, 3 units of HPLC are kept in the plan, and 5 units are deleted from the original plan. (12. Biological and Chemical Technology in Plant Protection 18. Horticulture Science 27. Veterinary Pharmacology, 32. Food Nutrition)
5	Nano drop	The device is requested by Soil Microbiology, Animal Biotechnology and Molecular Biology, Hygiene and Safety of Animal-based Food, Histology and Molecular Pathology. Though the device may be installed in each lab we should examine the possibility of sharing the device depending upon the frequency of use.	Considering frequency of use, 1 unit of Nano drop is eliminated while the other three remain.
6	Freezer (-80 C)	There are some freezers requested and you may use freezer (-20 C) according to use. You may need to reduce the numbers.	Reviewed and revised the numbers and six are eliminated and, 12 are kept for 45 Labs.

No.	Research equipment	Comments from advisory group of Japanese universities	Reflection of comments in to the plan by CTU
7	Spectrophotometers and Centrifuges	You may reduce the numbers as the labs located nearby can share such devices.	These equipment items are frequently used and necessary for daily works at any labs in the agriculture field. We have 45 labs in total. The numbers are kept as they are.
8	Water Purification System	As it is essential to conduct experiments for molecular Biology and Biochemistry, it is desirable that this device be installed in each floor and building. Same goes for ice makers.	Revised the equipment plan to install them by floor and building basis.
9	Gas chromatography with ECD detector (GC-ECD), GC-MS	Use of these machines differ depending on kinds of detection system. Post-harvest Technology Lab requested GC-MS and may need the GC with ECD. It is recommended to choose if both devices will be installed as common equipment or GC-ECD will be installed in each lab and MS as common equipment.	Post-harvest Technology Lab will invest the GC-ECD. Ruminant Animal Production Techniques Lab will do the GC-MS.
10	LC/MS, and LC/MSMS	This device is used as common equipment in Japan as it is commonly used, large scaled and the most expensive. It is desirable that one set of the device be equipped for common use. However, we should confirm if different kinds of detectors are required depending upon the use of machine and analysis of compounds or that of proteins.	Revised to invest 2 LC/MS for Soil Microbiology Lab and Food Biotech Lab. Instead, LC/MS/MS is deleted as it is expensive.
11	Realtime PCR and accessories、Real-time PCR system	Seemingly both machines are for the same use. Realtime PCR of CAAB 10, 7500 Fast Dx Real-Time PCR of CAAB 39, Realtime PCR and accessories of CAAB 26 are for the same use. Please consider again whether you will install it in each lab or labs located nearby share the device as common equipment.	2 Real-time PCR units are deleted from the list (CAAB 10 & CAAB 26), and one 39. Molecular Biology Lab is kept.

2) CAF

No.	Research equipment	Comments from advisory group of Japanese universities	Reflection of comments in to the plan
1	Fisheries Resources Labs:	1) Outline of research plan Will you please explain which equipment in the list will be used in each research plan and also what purpose the equipment is used for as your research plan data do not clearly mention. 2) Cars (pick up) Will you explain the purpose of using Cars (pick up)?	1) The equipment in the Fisheries Resources Labs are used for research on fish biology, taxonomy, morphology, ecology, distribution, population dynamics, fishing techniques. Especially in this ODA project, these labs will support research themes 3 and 1 and others (see attached) 2) 2) The cars were planned for purchase for fieldworks and sampling. They have been deleted from the list of CAF.

No.	Research equipment	Comments from advisory group of Japanese universities	Reflection of comments in to the plan
2	A. Lab for advanced Information Technology for Aquaculture and Fisheries: Software for aquaculture database management	Will you provide a more concrete idea about the 5 kinds of software for aquaculture database management which will be developed?	It could be: Database for profiles of fish and aquatic animals in the Mekong Delta Database for aquaculture and fisheries status and plan in the Mekong Delta Database for water quality and environment in the Mekong Delta Database for scientific research and technology transfer of CAF Database for academic management of CAF
3	Fish Pathology Laboratory: Bio analyzer	For each theme I. Climate change: Impacts and adaptation in aquaculture and Fisheries, II. Green technology innovation for aquaculture, and III. Fisheries Resources management and Conservation, seemingly 3 units are requested for procurement. Will you consider realizing the goal using just one unit?	Considering the frequency of its use, the original quantity of 3 sets is reduced to one set after compromising considerably.
4	Bio-Chemi-Pharma Technology Laboratory: Atomic Absorption Spectrophotometer and LCMS/MS (2)	The joint research of CNS and CAAB is assumed to undertake this research theme. Considering the frequency of use and operation and maintenance cost for (1) AA-7000 Atomic Absorption Spectrophotometer and (2) LCMS/MS it should be shared with other colleges instead of monopoly of this unit by CAF.	This lab and machines are planned to be placed at the Advanced Lab Center of CTU, not at CAF building. This lab will be worked jointly with CoNS and CoET.
5	Automatic histological processing system, Paraffin embedding machine, tissue slide stainer.	It seems to be unnecessary since the sample preparation should be done manually.	This unit is deleted from the equipment plan.
6	DNA Sequencer	It is considered necessary to conduct genetic analysis.	CAF – CTU has one at the Fish Pathology Labs.
7	Advanced equipment (HPLC, LC/MS, AAS, Amino acid analyzer, DNA Sequencer, and qPCR and so on)	The items requested by multiple fields should be shared and used as common equipment. It is desirable that advanced and expensive equipment such as HPLC, LC/MS, AAS, Amino acid analyzer, DNA sequencer and qPCR be used as common equipment. We recommend that some specialist researchers or technical officers attend to the machines to undertake their management and maintenance with responsibility and at the same time organize the system to consult researchers for proper use in operation	Such equipment will be equipped with the Advanced Technology Laboratory (ATL) and will be shared to use as common facility in such a way that the labs will accept researchers out of CTU as well as those of CTU and conduct joint research.

No.	Research equipment	Comments from advisory group of Japanese universities	Reflection of comments in to the plan
		of such equipment and conduct research works effectively together.	
8	Atomic Absorption Spectrophotometer (AAS)	This model is ranked as one of the highest grades. As both items of equipment are requested by CAF, it is recommended that this item be procured for common use.	This lab and its machines are planned to be placed at the Advanced Lab Center of CTU, not at CAF building. This lab will jointly work with CoNS and CoET.
9	HPLC	One common type of HPLC system may be installed in each lab.	Yes, CTU has reviewed the plan in such a way to screen the equipment plan to reduce numbers of overlapping items and the most expensive ones will be placed at the Advanced technology Lab building.
10	A. Hatcheries (CAF): Wet-Labs (Including Brackish water Seed Production; Freshwater Seed Production; and Other Research & Practice):	Taking into consideration the difficulty of continuous fresh sea water supply to the wet lab, which you plan to set up at CAF area of Campus Ⅱ, it seems to be very doubtful to implement properly the study on marine seed production. Principally shouldn't such facilities be located at coastal areas?	CAF has several wet labs – hatcheries at Campus II. The labs have played very important roles in education, research, and developing and transferring technology of seed production and farming of many species including freshwater and brackish/marine water species. (PDF file attached). For brackish water research and production, we will simply ask the supplier to supply brine water (100-130ppt) from salt pan in Bac Lieu province to Can Tho with chief cost. This brine water will be diluted to different salinity for research and production. Since the hatcheries in CAF is now degraded, we would like to build new hatcheries to support education, research and technology transfer of not only freshwater/ brackish/ marine aquaculture, but also many other fields of study offered by CAF.

3) CENREs

No.	Research equipment	Comments from advisory group of Japanese universities	Reflection of comments in to the plan
1	TOC Analyzers	Overlapping items of equipment. We should consider if each laboratory should be equipped with such items or shared and used in a common equipment operation center. CTU has requested to procure 2 units of TOC Analyzers for 2 laboratories. How about decreasing the number to 1 and it will be used as common equipment installed in the common equipment operation center.	For TOC, a total of 4 units are proposed in the CENREs list which has been decided to be reduced to 2. As TOC is used more often in CENRes research. Therefore it is preferred to manage this equip in CENREs's labs. Another one can be installed in the common center.

Source: Related Faculties of CTU and the Advisory Group of Japanese Universities

As a result of the above-mentioned consideration, a draft final equipment plan is summarized hereunder.

Table 4-13: Summary of Equipment Plan

Fields	Summary of equipment
CAAB	Basic and research equipment for agricultural field, And biology (BiRDI)
CAF	Basic and research equipment for Aqua-cultural field
CENREs	Basic and research equipment for Environmental field
CoET	Engineering equipment to support the three fields
IETC	Audio-visual equipment, Multi-media, Video-conferencing equipment, e-learning equipment
IT	IT equipment to cover mainly three fields
Management	Subscription for e-books and e-journal
Hoa An Center	Basic research equipment for agriculture and aqua culture

Source: JICA Study Team

The draft equipment plan shows the details of the plan and the relationship between facility, labs and equipment and is attached as Appendix 4-8 at the end of this report.

Remarks: Though the procurement of transportation is originally requested as a part of management equipment, in this project this portion is suggested not to be included as the transportation does not directly enhance the capability of research work for the three research fields.

Procurement for subscription to e-journals and Ezproxy software in order to access the server for e-books and e-journal references will be implemented as follows:

The budget for each year is divided into three parts.

- The 1st portion will be spent to subscribe to 3 academic e-journal databases that have high academic value in fields of Environment, Agriculture and Fishery (Each e-journal database includes around 200 to 1000 journals (titles)). Each journal includes many articles and is published monthly or every two or three months.
- The 2nd portion will be invested to subscribe to e-books (600-1000 titles) that are related to three fields, mentioned above, and
- The 3rd portion will be used to procure printed books (500 titles), because many books are not in digital format. CTU plans to subscribe to e-journals in the said manner and continue to do so for 8 years from 2015 to 2023.

ii) Equipment disposition plan

Equipment procured through this project will be installed at the new administration building under construction, existing buildings such as the CAAB building, and new buildings such as Advanced Tech Lab Building, and Research Lab building. A summary of the disposition plan is attached as Appendix 4-9 at the end of this report.

iii) Relationship between the research themes and laboratories/equipment

The table showing the relationship between the research themes and equipment is attached as Appendix 4-10 at the end of this report.

iv) Dividing of basic research equipment and advanced research equipment

Basic research equipment is defined as simple experimental equipment such as water bath,

stirrer, microscopes and the cost estimate is less than one million yen. Research equipment is basically defined as electrically driven, requiring periodical checks, and costing more than one million yen. Among research equipment the items costing higher than 5 million yen is regarded as advanced research equipment and are desirably used as common equipment by other institutes as well as colleges of CTU and thus will be installed in the common equipment operation center.

Table 4-14: Division of Equipment by Grades

No	Division	Unit cost range	Nos of items
1	Basic research equipment	< One million Yen	3,001
2	Research equipment	> One million Yen < 5 million Yen	613
3	Advanced research equipment	≧5 million Yen	64
4	Others (IT, Governance, and IETC)	-	666
		Total	4,344

Source: JICA Study Team

Remarks: Equipment (1 to 3) consists of CAAB, CAF, CENREs, Supporting fields and Hoa An center.

v) Major equipment and the laboratory functions

The Relationship between major equipment and the laboratory functions is attached as Appendix 4-11.

vi) Common use of advanced equipment

In case of advanced equipment, such items are usually installed in the facility, called a common equipment operation centre (CEOC) in Japanese universities, to be jointly used by both researchers in and outside of the universities.

The merits of joint use are: 1) to enable rise in operation ratio, and 2) to enable sharing of the most expensive running cost among users. It is planned to introduce a similar structure in this project as well as CTU understands the said merits. In this project, one option is to install advanced equipment in advanced research labs of the Advanced Technology Laboratory Building for its joint use, in such way that allows joint research works to be conducted together with researchers inside and outside of CTU. Another option is a system which allows joint use of the equipment in the CEOC. The difference between the 2 options is the frequency of use in the faculty. If it is used less frequently by the faculty alone, such items should be installed in the CEOC so that the operation cost can be shared among the CTU. It is necessary for CTU to learn how to manage the CEOC, and get trained in maintaining such advanced equipment. This project will implement short term training courses which CTU researchers can take to learn about CEOC management, maintenance of advanced equipment, and operation skills in the HRD component. CTU plans to assign 2 staff members, one manager and one technician, among the present staff members of the Facility Management Department.

The proposed items for common use are shown as follows:

Table 4-15: Summary of Advanced Equipment for Common Use

ATL: Advanced Technology Lab.
CEOC: Common Equipment Operation Center

a) CAAB

No	Equipment	Location
1	Real-time PCR system	ATL
2	TOC analyzer	ATL
3	LC/MS	ATL
4	X-ray diffractor	CEOC
5	DNA Sequencer	CEOC

b) CAF

No	Equipment	Location
1	Cryopreservation system	CEOC
2	Bio-analyzer	CEOC
3	Micro plate reader	CEOC
4	HPLC with DAD	CEOC
5	Preparative LC (UV-Vis / ELSD)	ATL

c) CENREs

No	Equipment	Location
1	Chromatography ion machine	CEOC
2	ICP-MS	CEOC
3	Element analyzer and Isotope Ratio Mass Spectrometer (EA-IRMS)	CEOC
4	TOC analyzer	CEOC

Source: JICA Study Team

(4) Equipment Installation Works

There are various factors to determine the schedule for equipment installation works as follows:

i) Basic and research equipment

Equipment to be procured through this project can be divided into 2 categories, namely basic research equipment and research equipment based on its function.

In basic research equipment it is considered possible to determine the specifications irrespective of the contents of the research plans and thus the detailed design (D/D) can be commenced soon after L/A is concluded. For research equipment, especially advanced equipment, detailed specifications including its composition will be determined in the process of preparatory works for joint research with Japanese universities, when CTU and Japanese researchers review and elaborate the research plans prepared by CTU researchers. Moreover, most of equipment will be introduced into newly constructed buildings. Therefore, it is assumed that the D/D for such research equipment will be conducted around 3 years after conclusion of the L/A.

The equipment installation work will be conducted in a phased manner depending upon where to be installed, or existing building and new buildings.

ii) IT equipment

It is planned to be installed in the new administration building, which is scheduled to be completed at the end of 2014.Thus the D/D will be started at the same time of the D/D of the basic research equipment.

iii) IETC and Hoa An Technology Transfer center

The D/D of equipment for IETC and Hoa An T/T center will be commenced to synchronize the progress of new building construction.

(5) Review of Operation and Maintenance System

i) Personnel plan for this project

CTU has proposed personnel plan to strengthen research capability in human resources for this project as shown in Table 4-16. The number of teaching staff (professors, associate professors and lecturers) in the three fields will increase to 285 in 2020 from 232 in 2014. In total, 52 teaching staff will increase. This increased number of teaching staff is not of much significance as teachers in the three fields have increased by a larger number in the past.

Table 4-16: Personnel Increase Plan for Each Faculty

1. Personnel plan for CAAB

Staff members	Present numbers (2014)	Future numbers (2020)
Professors	4	23
Associate professors	25	33
Lecturers	93	88
Total	122	144

2. Personnel plan for CAF

Staff members	Present numbers (2014)	Future numbers (2020)
Professors	1	12
Associate professors	12	20
Lecturers	42	51
Total	55	83

3. Personnel plan for CENREs

Staff members	Present numbers (2014)	Future numbers (2020)
Professors	1	6
Associate professors	8	17
Lecturers	46	35
Total	55	58

Source: Relevant faculties of CTU

ii) Organization modification of laboratories related to this project

The present status and future plan of the organization by College/School/Institute is attached as Appendix 4-12. Some of the present labs are merged and some new labs will be newly established toward the implementation of this project. The required manpower will be recruited according to the said personnel plan.

iii) Organization for maintenance and operation system for this project

In this project the operation and maintenance system will be strengthened, however there will be no change in its organization. In terms of necessity of a maintenance workshop in CTU, CTU does not think that it should be established within its premise. That is because CTU has to bear the personnel cost for engineers and technicians in case that the workshop is set up and the present system is functioning in such a way that a lecturer of each lab is managing research equipment necessary for every day practice as front-line maintenance. They manage equipment operation by keeping a registration book to record the operation time (in and out), who operated and which item of equipment was used along with the condition.

iv) Equipment operation training before installation

In this project it is planned to include some research equipment training for its operation and daily maintenance for a short term before its installation. This training will be carried out in the training facility of equipment manufacturers. Besides, it is planned that researchers will get trained for application and maintenance training as said earlier. The candidate equipment for the training are selected and listed as Appendix 4-13.

v) Financial plan

- CTU has obtained a subsidy from MOET and the tuition received by CTU itself is the major source of income. Equipment operation and maintenance cost has been covered mainly by the subsidy of MOET, and the budget has been allotted to each faculty. Consumables, such as a reagent required for equipment operation, are considered as regular cost. Maintenance cost is a part of the regular cost, and expenditure of the maintenance cost in 2013 was USD 488,000, which is appropriate for check/repair expense of defective equipment.
- Although consumables need to be regularly supplied for operation of research equipment and increase in operation cost is expected due to equipment procurement through this project implementation, Vietnamese government thinks highly of higher education development and thus MOET has expressed strong support also in terms of increase of required operation cost.
- Furthermore, it has expressed that CTU corresponds to increase of maintenance cost by acquisition of a competitive research fund.
- In this project, it is decided to make a financial plan based on operation cost basically required for development of the research and education-related activities in the three research fields.
- Reviewing the annual expenditures of CTU in the past 5 years, operation cost seems to be about 32% of total expenditure while personnel cost seems to be relatively stable.
- MOET has delivered the subsidy to CTU, and the increase ratio of 2013 is 60% against the previous year and 55% in 2011 against the previous year, reflecting the priority of development of CTU.
- It is quite important to secure enough budget to cope with the increase in operation cost accompanying procurement of equipment in implementation of this project.
- For the revenue of this financial planning, it is essential to continue the subsidy containing the operation and maintenance cost which MOET supports, and continue the tuition fee of CTU, and to raise its amount of research funds.
- For expenditures, it is required to enhance financial management to control personnel expenses for school staff employment, research costs such as experimental material expenses, etc.
- The basic policy for financial planning is to make sure that CTU can secure enough budget to carry out research plans sufficiently.

Table 4-17: CTU Revenue and Expenditures

Unit: USD 1,000

No		2020	2013	2012	2011	2010	2009
A	**Total Revenue (I+II)**	**19,422**	**29,259**	**20,276**	**18,648**	**13,586**	**12,480**
I	**Revenue of CTU (1+2)**		**14,392**	**11,026**	**9,304**	**7,525**	**6,590**
1	Tuition		12,506	9,645	7,928	5,323	4,010
2	Other income		1,886	1,381	1,376	2,202	2,580
II	**MOET Subsidiary**		**14,867**	**9,250**	**9,345**	**6,061**	**5,890**
B	**Expenditures (1+2+3+4)**	**19,422**	**28,613**	**20,483**	**16,098**	**13,868**	**10,371**
1	Personnel expenses		9,204	7,743	5,275	4,107	3,328
2	Regular expenses		8,467	7,870	5,360	4,845	4,439
-	Maintenance cost		488	432	348	254	256
3	Equipment purchase		1,454	1,226	901	1,119	811
4	Other expenses		7,795	3,212	4,214	3,543	1,537

Remarks: The figure of 2020 in VND is predicted by the Strategic Plan for Development of CTU 2007-2020. The figure is converted into USD by using an exchange rate (USD/VND=21,036). According to CTU, this figure was underestimated when CTU prepared the Strategic Plan in 2006. CTU is revising the plan and will request for MOET's approval soon.
Source: CTU financial department

1) Revenue

a) Estimation

According to the balance sheet of the past 5 years, the amount of tuition collected in 2010 was 12,506 (1000 USD). The tuition is under the control of MOET, and thus no large change is assumed by regulation of the MOET.

b) Estimation by CTU strategy plan

The appendix of CTU strategy plan in 2006, predicted the revenue and expenditures of CTU as shown in the above table.

Major income sources of CTU are MOET subsidy and tuition collection, which will be very stable and fundamental for the CTU financial plan. CTU expects the growth of revenue through research funds, which will be offered by Can Tho city and surrounding local governments, to bear some part of research expenses.

2) Expenditures

a) Estimation

The expenditure of CTU is classified into personnel expenses, operational expenses (a regular cost, equipment purchase expenses, other expenses.), and capital increment investment.

The items which are assumed to increase, for example, research expenses, personnel expenses for staff salary, utility cost such as electricity and water fee, and experimental material, are mentioned.

The cost of items which can be predicted are indicated as follows.

a)-1 Increased amount of operation and maintenance cost: ¥ 83,600,000

For research equipment, it is essential to budget the operation and maintenance cost to obtain consumables such as a reagent and a glass ware to run the experimental and measurement equipment, and replacement-parts, and labor cost for maintenance services by a specialist engineer for smooth operation of these equipment. As for operation and maintenance cost,

according to the average of the O & M costs of items selected at random from the equipment list of this project, it turns out that the ratio of O&M cost against the equipment cost is 3.8% (Please refer to Appendix 4-14). Assuming that the research equipment which needs operation and maintenance management would cost one million yen or more, a trial calculation of the operation and maintenance cost is carried out. To the estimate O&M cost, the estimated cost of equipment excluding basic items is multiplied by the said coefficient or 3.8%:

¥ 220 million yen X 0.038 = ¥ 83,600,000

Note: The basic items are defined to be the one costing less than one million yen. The coefficient is trial-calculated by averaging the % (Operation and maintenance cost / Equipment cost) of items picked at random from each amount range.

a)-2 Increased amount of personnel expenses: ¥ 84,417,000
According to the personnel plan for this project the personnel expenses in year 2020 is calculated as trial as follows:

Table 4-18: Trial-Calculation of Personnel Fee after the Project Implementation

Million VND

Fields	Present amount (2013)	After Yr. 2020
CAAB	6,895	15,467
CAF	3,087	8,880
CENREs	2,953	6,175
Total	12,935 (¥ 62,088,000)	30,522 (¥ 146,505,000)

Source: Related Faculties of CTU

The breakdown of the personnel expenses is attached in Appendix 4-15.

(6) Necessary Measures for Financial Management

The impact on management of CTU as a result of new buildings and research equipment procurement is examined using trial calculation of expenditures and assumptions of the CTU strategy plan. As mentioned above, the personnel expenses and operation and maintenance fee will be increased due to the implementation of this project. The expected amounts of increase are described hereunder:

i) Increase of personnel expense: ¥ 84,417,000
ii) Increase of maintenance expense: ¥83,600,000

For the increased personnel expenses, CTU can allocate necessary budget for at least 52 teaching staff as such personnel increases are considered in the Strategic Plan for Development of CTU 2014-2022. It plans to increase the number of teaching staff to 1,609 in 2020 from 1,341 in 2014, though it still awaits approval from MOET.

For maintenance expenses, according to CTU, the basic research equipment will be used for practical purpose. Therefore, the operation costs will be allocated from practical budget of CTU and maintenance costs will be covered by CTU's budget. Some of the advanced research equipment requires higher running costs as shown in Appendix 4-16. According to CTU, the cost basically will be covered by the research fund (1% of the research fund is collected for the O&M fee, which account for approximately 10 % of the O&M fee), tuition fee (0.3% of the tuition fee is allocated for O&M fee, which account for about 35%) and user fee of those

advanced equipment (initial estimation shows that it will cover approximately 60 % of the O&M fee). It is also advised that MOET will also allocate some part of O&M fee to secure CTU's research activities so as to contribute to strengthening of CTU.

(7) Equipment Maintenance

It is planned that the equipment supply contract will include periodical check service, for 3 years after handing over the research equipment. The said service will cover the service for equipment function check, calibration, if necessary, and submission of a service report, which will be conducted by a specialist engineer of local agents every quarter. In case defects are discovered during the check service, which needs to be repaired, an equipment agent will submit the cost estimate which adds up expenses of spare parts, engineering, etc. with the briefing to the person in charge of CTU.

The CTU management covers such repair expenses from the maintenance management budget, after the contents are examined and it is judged appropriate according to the procedure of intramural equipment maintenance management. Since the planned service contents are exactly what the equipment agents dealing with analysis and experimental equipment in Viet Nam are actually carrying out for periodic check service it is judged that it will function sufficiently also in this project.

4.2.5 Improvement of Education Program

This component aims to solve the problem of lack of international programs in the fields of agriculture, fisheries/aquaculture, environment, and intends to improve graduate programs to the appropriate level for a research-oriented international university.

It aims to achieve this purpose by practicing the following three subcomponents.

(1) Establishment of a new graduate program,
(2) Implementation of model lectures,
(3) Certification programs by international certification bodies

Three Ph.D. holders are needed at the least to open a new graduate program. CTU intends to send the teaching staff of prospective graduate programs to Japan through this project. In this respect, it is necessary to pay attention to the timing of improving the educational program component and the human resource development component. As the two components are closely related, if they succeed in becoming capable of conducting innovative research abroad and in presenting the achievements in academic/international journals, significant contribution can be made in improving the quality of education programs.

(1) Establishment of New Graduate Program[86]

In CTU, in order to shift from undergraduate education oriented university to research oriented university, one of the long-term goals is the expansion of the graduate school. Each department is considering new programs and has set a target value with respect to the percentage of graduate students against the whole student body[87] that is to be achieved by 2020. Toward this goal, teaching staff members of three fields (agriculture, aquaculture, and environment) plan to add the following graduate programs.

[86] According to minutes of JICA mission and CTU in April 2014, JICA's emphasis is on graduate education and undergraduate level education might be considered only if the budget can be secured. Therefore here it will deal with only graduate education.
[87] CAAP now has 10.0 % and it intends to increase 14.3% by 2020.

Table 4-19: New Graduate Programs to be Established

Fields	Prospected Courses
Agriculture*	(Master's) Agricultural Biotechnology, Tropical Agriculture, Food Technology
	(Doctorate) Agricultural Biotechnology, Tropical Agriculture, Food Technology
Aquaculture	(Master's) Disease Diagnosis and treatment, Aquatic product processing technology
	(Doctorate) Living aquatic resources management, Disease Diagnosis and treatment, Aquatic product processing technology
Environment	(Master's) Environmental Engineering, Climate Change, Integrated Coastal Zone Management
	(Doctorate) Land Administration

Note*: Concrete course name unidentified.
Source: JICA Study Team

This sub-component selects some of the new programs of master's and doctorate degrees, and it supports the creation of curriculum/syllabus required for the new programs. Japanese universities are expected to conduct technology transfer of skills and knowledge of these two categories.

1. How to conduct research that is novel and logical and
2. How to encourage graduate students to gain research experience under the graduate education program of research universities.

Additionally, introduction of interdisciplinary perspectives is desired.

Similarly, it is preferable to perform self-evaluation of educational outcomes using number of publications by graduate students. Moreover, teaching staff members, based on self-assessment, should carry out improvement of research and education, and quality of research and education will improve autonomously if the outcome is evaluated by the university management. In consideration of the above, the teachers of Japanese universities will provide technology transfer advice in supporting the following CTU activities.

a. With the support of partner universities of Japan, CTU selects new graduate programs
b. CTU will review the conditions of MOET for the prospective graduate program (the ability of CTU, demands for new programs).
c. CTU will develop a new curriculum.
d. CTU, upon the approval of MOET, places the teachers in new graduate programs, and appointed teaching staff develops new syllabus.
e. CTU performs the self-evaluation of educational outcomes, and CTU improves the graduate programs.

In this sub-component implementation, it should be noted that the approval of the new program by the MOET usually takes 1–2 years.

The opening procedure for new programs is explained in below. There are six steps in this process, and numerous procedures need to be taken undertaken by universities and the central government in accreditation. The original document translated in English can be found in Appendix 4-17.

I. Assessment of opening course conditions by Undergraduate training unit (TU)
II. Compilation of proposal for opening course by TU
III. Assessment of proposal dossier by Graduate School (GS)
IV. Capacity assessment of training facility

V. Assessment of training programs
VI. Submission of proposal to Ministry of Education and Training

(2) Implementation of Model Lectures

Most of the current graduate programs of CTU are offered in Vietnamese, in an old-fashioned lecture style, so it is difficult to motivate learning among graduate students, or encourage a wider scope of interest. As higher quality of graduate students who will lead the study of CTU in the future are linked directly to the bottom-up research level, in this sub-component, the model lectures are given by professors of Japanese university. Subsequently, the quality of lectures of CTU will be improved through joint lecture with the university teaching staff. Specifically, CTU teaching staff members will attend the model lectures by Japanese professors, and then CTU teaching staff will give joint lectures with the teaching staff of the University of Japan referring to the model lectures. Introduction of research outcome and future outlook by teachers themselves will attract and stimulate graduate students. For example, there are many joint research projects on climate change with overseas universities and institutes in the environmental field, so ideally lecture materials should be derived from the latest study outcomes. Improvement of the quality of lectures will be monitored using indicators such as learning achievement and the degree of satisfaction of the students.

(3) Accreditation of Graduate Programs by the International Certifying Organizations

This sub-component aims at education programs for master's and doctoral degrees of CTU to be authenticated by international certifying organizations such as the AUN. CENRes intends to obtain certification of graduate programs such as Environmental Sciences, Land Administration, Environmental Management, and Environmental Engineering in addition to undergraduate programs. CAAB and CAF intend to obtain certification for their undergraduate programs.

QA standards cover all university activities including education and service, and such standards require the process of collecting and recording information and evaluating their condition periodically, along with the contents of evaluation. In addition, it is mandatory to collect data for report writing. As for AUN QA, 15 criteria are set up for its evaluation, including education programs, service, stakeholder evaluation, and outputs. The two types of assistance considered are in the areas of contents of education programs and services and the process of data collection and management.

The contents for education programs and service should be developed by CTU with the support of Japanese experts. Some workshops are supposed to be conducted by CTU to learn from the strengths of other universities. It will be helpful to CTU if some Japanese university professors can join the workshop as a panel for education and services. Japanese universities do not apply AUN QA standards; however, the contents of programs are developed by themselves. Therefore, Japanese experts can provide assistance in program development.

As for the data collection and management process, Japanese universities can introduce some samples of data organization and management, and their internal assessment procedures of some standards. Japanese universities do not apply AUN standards, but some apply JABEE. Some universities update their university information periodically, and some collect students' assessment data, or graduates' information. To learn such procedures, short-term trainings could be introduced with Japanese university management experts.

4.2.6 Improvement of University's Governance and Strengthens of University's Social Responsibilities

In order for CTU to become a research-oriented university with high international reputation, it is also necessary for the administrative section that supports research activities to develop the capacity of carrying out assigned work. As mentioned earlier, the current support unit (1) has less administrative staff with expertise of university administration and management to support the research and education program more efficiently and effectively, (2) frameworks to motivate supporting staff, such as work load, service standards, evaluation criteria, problem solving skills, and opportunities for training, are not yet established, (3) not many teaching and supporting staff are familiar with quality assurance procedures and contents yet, and (4) CTU has applied few patents; CTU's awareness of the research outputs are still low. As a result, those issues brought weakness in research section.

The training institutions and/or know-how to help with the capacity building of higher education institutions are limited in Viet Nam; CTU is not a special case. Possible ways of developing CTU's capacity are to send departments heads and young permanent staff to training seminars at Japanese universities, and /or to conduct OJT with Japanese staff in Viet Nam or at Japanese universities.

Necessary knowledge for university operations varies, such as financing, human resource management, entrance examination reform, ICT, public relations, social contribution activities, and fund-raising activities. However, the JICA team limited some effective fields, which are assumed to contribute directly to the project goal of "strengthening research capacity of CTU to be an internationally recognized university." The supporting fields are (1) Industry-Public-Academia collaboration including areas of intellectual property rights, and patent application and acquisition, (2) research policy and management, (3) quality assurance activities, (4) new education programs, and (5) development of administrative staff capacity in (1) to (4). The current status and necessary activities to support CTU are summarized in the table below:

Table 4-20: Current Status and Necessary Actions by the Fields to be Improved

	Fields	Current Status	Necessary Action to Support CTU
1	Industry-Public-Academia collaboration, intellectual property rights, Patent application and acquisition	No model of Industry-Public-Academia collaboration, applying 2 patents, more application necessary to reach the target 40 application by 2020	• Assisting in preparing/ revising internal policy to promote Industry-Public-Academia collaboration • Assisting in establishing mechanisms of Industry-Public-Academia collaboration (matching needs with seeds, contract management, relationships with supporting units and colleges, preparation of product catalogue, and exhibition of products) • Assisting in strengthening internal policy on patent • Assisting in understanding patent application and its procedure, including conflict of interest policy, financial distribution between university and individual or department.
2	Research policy and management	Research policy not fitting regional and national demands, little cooperation among different disciplines	• Assisting in revising internal policies and strengthening internal processes to decide the implementation of researches • Establishing opportunities where researchers with different disciplines exchange their expertise

	Fields	Current Status	Necessary Action to Support CTU
3	Quality Assurance expansion	1 program assured by AUN -QA, more programs should be approved with AUN standards	• Supporting in regularly conducting internal assessment Support in organizing CTU data, and activities of supporting units, such as students', graduate's and companies' satisfaction.
4	Establishment of new education program(s) *	CTU has 2 advanced programs at the bachelor's level, it is also necessary at the master's level.	• Support in improving processes of assessing needs and results for/of new education programs • Support for teaching contents • Support in document preparation to get MOET's approval
5	Admin Staff Capacity Development in areas above	Lack of basic knowledge of science and technology for university management and management capacity development through OJT Lack of the number of administrative staff that meet MOET's requirements	• Providing short term training for staff for the areas above. • Providing master's degree training to meet MOET's requirements

* Please refer to "improvement in graduate program" in project component.
Source: summarized by JICA Study Team

4.2.7 Analysis of Appropriate ODA Schemes for Project Implementation

(1) Consideration of Appropriate ODA Scheme

CTU and JICA discussed Japan's ODA schemes for project implementation and both sides had the following consensus before the commencement of this survey.

- A combination of ODA Loan and Technical Cooperation should be considered to smoothly and successfully implement the Project.
- Initial ideas about project components and activities each ODA scheme takes care of were shared, considering advantages of each ODA scheme.
- A lead time before the commencement of an ODA loan project should effectively be utilized.
- A technical cooperation project will possibly strengthen institutional foundations of CTU.
- A technical cooperation project will possibly support capacity enhancement of education and research of CTU.
- ODA loan project will possibly support scale-up of activities.

Based on such mutual understanding, first, the JICA Study team examined appropriate ODA schemes for the proposed project components and activities mentioned above. Table 4-21 shows the results of the examinations.

Table 4-21: Summary of Analysis of Appropriate ODA Schemes by Project Component

Project Components・(Outputs)	Japan's ODA Schemes		Remarks
	Technical Cooperation	ODA Loan	
1. Human Resource Development in Research Activities			
1-1 Scientific Training in Japan		✔	
1-2 Overseas Short-term Research Training		✔	
1-3 Joint Research Studies with Japanese Partner Universities	✔	✔	The technical cooperation project is responsible for research capacity development of CTU in the three fields while the JICA loan project is responsible for providing research project budget and supporting CTU in managing research activities.
2. Improvement in Graduate Programs			
2-1 Establishment of Graduate Programs	✔		
2-2 Provision of Model Lectures in Graduate Programs	✔		
2-3Obtaining Accreditation of Graduate Programs	✔		
3. Strengthened University Governance and Management			
3-1 Strengthened Private-Public-Academia Collaboration including patent management	✔		
3-2 Strengthened Research Policy and Management	✔		Incorporated into 1-3 above.
3-3 Quality Assurance Expansion	✔		Included in 2-3 above.
3-4 Establishment of Graduate Programs	✔		Including in 2-1 above.
3-5 Supporting Unit staff Capacity Development in areas of 3-1 to 3-4	◎✔	✔	The technical cooperation project covers most of the training while the loan project is responsible for master's degree training.
4. Improvement in Academic and Research Environment			
4-1 Construction of Buildings for Practice, Research Studies, Lectures, International Conferences		✔	
4-2 Provision of Practice and Research Equipment	✔	✔	CTU procures research equipment through the JICA loan project while the technical cooperation project provides minimum equipment for its implementation.
4-3 Overseas Short-term Training for O&M of Practice and Research Equipment	✔		
5. Strengthened Capacity of Project Implementation Unit for Effective and Good Quality Project Implementation and M&E			
5-1 Establishment of Project Implementation unit, Preparation of Project implementation plan and Monitoring and Evaluation (M&E) plan		✔	
5-2 Short-term training on Project Implementation and M&E	✔		Country Specific Training Courses on Project Management of JICA Loan Projects will be launched, getting PMU members of all new JICA loan projects in Viet Nam.

Source: JICA Study Team

Second, the JICA Study Team has developed draft contents of the technical cooperation project and consulting services of the JICA loan project with the following considerations. Contents of the technical cooperation project are show in the next section and section 5.4 shows contents of the consulting services.

- Differences in the contents of the technical cooperation project and the ODA loan project should be clear.
- The relationships or synergies between the technical cooperation project and the ODA loan project should be clear.
- The technical cooperation project should utilize the research budget the ODA loan project will cover.
- The technical cooperation project should support the capacity development of lecturers/staff receiving training/scholarship through the ODA loan project.
- There should be no duplication of equipment purchased by the ODA loan project and the technical cooperation project.
- The technical cooperation should fully contribute to effective and efficient usage of equipment and facilities the ODA loan project will improve.

(2) Contents of Technical Cooperation Project

For the technical cooperation project, the Project Design Matrix (PDM) with Plan of Operation has been developed as shown in Appendix 4-18.

5. Procurement and Consulting Services

5.1 Procurement Procedures

5.1.1 Facility Construction

Procurement method for the facility construction will be through ICB (International Competitive Bidding). The proposed construction work is relatively large scale, and functional and technical conditions required as research laboratory is very high. The contractor's workmanship and construction management capabilities required for the Project are also high. It is therefore desirable to implement P/Q (pre-qualification) to review candidate contractor's technical capability and financial viability.

The type of contract for construction works will be lump-sum.

5.1.2 Equipment

It is required to utilize Yen loan, noting efficiency, transparency during procurement process, and fairness among qualified tenderers for supply contract. For procurement of equipment, it is necessary to use International Competitive Bidding (ICB) procedures for this project, since ICB is the most appropriate way to satisfy the following requirements. Schedule for equipment procurement will include detailed design, prequalification (P/Q), Tendering and evaluation, procurement, and supervision of equipment installation work according to ICB procurement procedures. Since a major part of equipment procurement for this project is research equipment, which is expected to contribute to joint research work with Japanese universities, it is desirable to appoint an international consultant who possesses enough knowledge and experience for selection and planning of Japanese research equipment. Since most of the research equipment is not manufactured in Viet Nam, the equipment is planned to be procured from Japan and/or the other foreign countries. The equipment plan includes high-precision equipment, which needs periodical maintenance and regular supply of spare parts and consumable items. In order to maintain such equipment it is desirable that the manufacturers of such equipment have already established local agents in Viet Nam or in its neighboring countries, which can perform maintenance services properly. It is also recommended that the equipment procurement range be limited to DAC member countries in order to secure accuracy and quality of such precision equipment.

5.1.3 Consulting Services

A consulting firm will be recruited to assist with project implantation in technical management areas. All JICA-financed international and national consultants will be selected and engaged by the Government through a firm, using quality – and cost-based selection (80:20 ratio) and in accordance with JICA's "Guidelines for the Employment of Consultants under Japanese ODA Loans" (April 2012, as amended from time to time).

5.2 Procurement Package

JICA study team proposes the following packages for the ODA Loan portion, after considering contents of the Project and its components, and their relationship with reasonable procurement methods.

- Package-1: Facility Construction
- Package-2-1: Equipment work-1
- Package-2-2: Equipment work-2
- Package-3: Consulting Services

Table 5-1 shows the procurement schedule of each package.

Table 5-1: Procurement Schedule of Each Package

Package	Component Cost (JP Yen million)	Procurement	Implementation	Procurement Method
Package-1 Facility Construction	5,321	June, 2016 to December, 2017	January, 2018 to August, 2020	ICB with P/Q
Package 2-1: Equipment work-1 (IT& Basic Equipment)	1,930	June, 2016 to December, 2017	February, 2018 to July, 2020	ICB with P/Q
Package 2-2: Equipment work-3 (Research equipment)	2,005	July, 2018 to October, 2019	December, 2019 to August, 2020	ICB with P/Q
Package 3 Consulting Services	1,093	October 2014 to September 2015	October 2015. to December 2021	QCBS (80:20)

Source: JICA Study Team

5.3 Work to be Borne by the Vietnamese Side

Table 5-2 shows work demarcation between Japanese ODA Loan portion and Vietnamese side work.

Table 5-2: Work Demarcation

Item		ODA Loan Portion		Vietnamese Side Work
		Facility Work	Equipment Work	
Land Preparation	Securing the Site			○
	Demolishing/Relocating Existing Buildings			○
	Relocating Existing Utility Pipes			○
	Installing Fences & Gate within Block			○
Building Permission	Obtaining Building Permissions			○
	Obtaining EIA & Other Related Process			○
Relocation of Services	Moving Equipment & Services to New Buildings			○
Renovation of Existing Buildings	Connecting Ducts to Fume Hoods & Safety Cabinets to be Provided by Project			○
	Strengthening Load Capacity of Lab Floor			○
Laboratory Fixtures	Laboratory Work Table		○	
	Cabinets & Other Laboratory Furniture		○	
	Fume Hood & Safety Cabinets		○	
	Roof Top Scrubber Unit	○		
	Foundation for Special Equipment	○		
	Laboratory Wastewater Treatment	○		
	Laboratory Gas Supply System	○		
	Emergency Generator System	○		
	UPS, AVR	○		
	Disposing Existing Research Equipment			○
General	General Furniture			○
	Blinds & Curtains			○
	Lecture Tables, Chairs & White Board	○		
	Audio-visual System		○	
IT	LAN Connection between Proposed Buildings & HQ	○		
	LAN Connection between Other Buildings & HQ			○
	Cable Rack inside Proposed Building	○		
	IT Equipment inside Proposed Buildings		○	
	LAN Cable inside Proposed Buildings		○	

Source: JICA Study Team

5.3.1 Land Preparation

Before/during the proposed facility construction work in both Campus-2 and Hoa An Campus, demolishing work of the existing buildings should be carried out by the Vietnamese Side (CTU). Those demolishing works affect the schedule of construction of the proposed facilities, installation of research equipment and implementation of joint research projects. To secure smooth implementation of the project, it is important for CTU to conduct those demolishing works without delay as summarized in Table 5-3.

CTU also agreed to move BiRDI's research laboratories, equipment and furniture from the existing buildings to new Research Laboratory Complex building, and demolish the existing BiRDI buildings on schedule.

Table 5-3: Schedule to Demolish/Relocate Existing Buildings

Proposed Building	Buildings to be Demolished	Deadline
Research Laboratory Complex	Existing CoET Workshop buildings	By November, 2017
IETC Building	Existing Lecture buildings	By November, 2017
Field Test Facilities (CAAB)	Existing Laboratory buildings and greenhouse	By November, 2017
Hatcheries (CAF)	Existing Hatchery buildings	By November, 2017
Hoa An Campus	Existing Lecture buildings	By November, 2017
Advanced Technology Building	Existing BiRDI buildings	From May to June, 2019

Source: JICA Study Team

5.3.2 Building Permissions

It is important to obtain building permissions to start facility construction work on schedule, and CTU agreed to confirm the further actions summarized in Table 5-4.

Table 5-4: Schedule to Obtain Building Permissions

Type of Permission	Authority	Relevant Campus	Deadline
Modification of 1/2000 Master Plan Approval	Department of Construction, Haugiang Province	Hoa An Campus	Apply: November 2014 Obtain: April 2015
Modification of 1/500 Master Plan Permission	Department of Construction, Can Tho City	Campus-2	Apply: February 2015 Obtain: April 2015
Technical Design Permission	MOET	Campus-2 and Hoa An Campus	Apply: June 2016 Obtain: September 2016

Source: JICA Study Team

5.3.3 Renovation of Existing Buildings

As proposed research equipment to be installed in the existing buildings need physical, electrical and mechanical requirements, CTU may need to renovate some existing buildings as follows:

1) Design and ducting work necessary for machines which need exhausting, such as fume hoods and clean benches to install at existing facilities,
2) Structural design work for strengthening of foundation to install heavy machineries to Existing facilities such as Hydraulics related machines for CENREs, and
3) Any other equipment related works which are not covered by the Japanese ODA loan portion.

5.4 Contents of Consulting Services

5.4.1 The Scope of Consulting Services

To ensure timely and quality implementation of the Project, consulting services will be provided to help CTU. The consulting services will cover the following areas: overall project management, academic and research coordination between CTU and Japan partner universities, facility design and construction supervision and equipment design and installation supervision. The services, which the Consultant is responsible for and on behalf of and in collaboration with the Project Management Unit, are illustrated in Appendix 5-1 in detail.

5.4.2 Necessary Experts and Assignments

To provide the required consulting services described above, 22 international consultants with a total of 259 person months and 32 national consultants with a total of 602 person months including supporting staff are required as shown in Tables 5-5 and 5-6. The major tasks and qualification of key consultants and the consulting services manning schedule are attached in Appendix 5-1.

Table 5-5: Estimated Person-Months for International Professionals

No.	Positions of Professionals	M/M
1	Project Management	40.0
2	Academic Coordinator in Viet Nam	7.0
3	Academic Coordinator in Japan	16.0
4	Facility Design Team Leader	31.0
5	Architect-1	11.0
6	Architect-2	8.0
7	Laboratory Design Specialist	4.0
8	Interior Designer	4.0
9	Landscape Architect	4.0
10	Structural Engineer	11.0
11	Electrical Engineer	11.0
12	Mechanical Engineer	11.0
13	Cost Expert-1	7.0
14	Cost Expert-2	4.0
15	Tender Document Specialist	8.0
16	Construction Supervision Specialist	32.0
17	Equipment Planning Team Leader	25.0
18	Equipment Planner (Agriculture and other concerning field)	7.0
19	Equipment Planner (Aquaculture, Fishery and other concerning field)	7.0
20	Equipment Planner (IT)	2.0
21	Cost Expert	3.0
22	Installation Supervisor	6.0
	Total	259

Source: JICA Study Team

Table 5-6: Estimated Person-Months for National Professionals

No.	Positions of Professionals	MM
1	Project Finance and Disbursement Management Specialist	5
2	Monitoring and Evaluation Specialist	4
3	Procurement Management Specialist	10
4	Facility Team Leader	51.5
5	Architect-1	17.5
6	Architect-2	6.0
7	Landscape Architect	6.0
8	Senior Structural Engineer	8.5
9	Structural Engineer	11.5
10	Senior Electrical Engineer	8.5
11	Electrical Engineer	11.5
12	Senior Mechanical Engineer	8.5
13	Mechanical Engineer	11.5
14	Civil Engineer	9.0
15	Quantity Surveyor-1	43.5
16	Quantity Surveyor-2	4.0
17	CAD Operator-1	44.0
18	CAD Operator-2	12.0
19	CAD Operator-3	9.0
20	CAD Operator-4	9.0
21	Inspector-1	34.0
22	Inspector-2	32.0
23	Equipment Planning and procurement	25.0
24	Equipment Planner (Agriculture and other concerning field)	7.0
25	Equipment Planner (Aquaculture, Fishery and other concerning field)	7.0
26	Equipment Planner (IT)	2.0
27	Cost Expert	3.0
28	Inspector	6.0
29	CAD Operator	13.5
30	Management Assistant	32.5
31	Office Manager	75
32	Office Supporting Staff	75
	Total	602.5

Source: JICA Study Team

6. Total Cost and Financial Plan

6.1 Project Cost Estimate for Total Cost

6.1.1 Project Cost Estimate and Prerequisites

Total Project cost was estimated based on the following prerequisites defined by JICA's Loan Project General Standards in 2014.

- Benchmark of the estimation: June, 2014
- Applicable currency : Foreign currency: Japanese Yen and US dollar
  Local currency: Viet Nam Dong
- Currency exchange rate: USD 1=JP Yen 102.6, USD 1=VND 21,036
  VND 1= JP Yen 0.0049
- Price escalation: Foreign currency portion: 2.0 %/year
  Local currency portion: 4.7%/year
- Physical contingency: 5.0%
- Taxes: VAT: 10.0%, Import tax[88]: 3.0%
  Tax on Consulting Service: 15.0%
- Interest during project: HRD Portion: 0.3%/year, Others: 1.4 %
  Consulting Service: 0.01%
- Front-end fee: 0.2%/year

6.1.2 Result of Project Cost Estimate

Table 6-1: Overall Project Cost Estimate

Breakdown of Cost	Foreign Currency Portion (JP Yen in million)			Local Currency Portion (VND in million)			Total (JP Yen in million)		
	Total	JICA Portion	Others	Total	JICA Portion	Others	Total	JICA Portion	Others
Human Resource Development	639	639	0	0	0	0	639	639	0
Research Project	0	0	0	81,633	81,633	0	400	400	0
Facility Construction Work	532	532	0	977,327	977,327	0	5,321	5,321	0
Research Equipment Work	3,542	3,542	0	80,286	80,286	0	3,935	3,935	0
Price Escalation	468	468	0	268,388	268,388	0	1,783	1,783	0
Physical Contingency	259	259	0	70,382	70,382	0	604	604	0
Consulting Services	933	933	0	39,272	39,272	0	1,125	1,125	0
Land Preparation, Relocation, etc.	0	0	0	43,802	0	43,802	215	0	215
Administration Cost	0	0	0	143,082	0	143,082	701	0	701
VAT	0	0	0	263,203	0	263,203	1,290	0	1,290
Import Tax	0	0	0	29,393	0	29,393	144	0	144
Tax on Consulting Service	0	0	0	34,442	0	34,442	169	0	169
Interest during construction	590	590	0	0	0	0	590	590	0
Front End Fee	29	0	29	0	0	0	29	0	29
Total	6,991	6,962	29	2,031,209	1,517,286	513,923	16,944	14,397	2,547

Source: JICA Study Team

[88] Human Resource Development is exempt from Import tax.

6.1.3 Project Cost Breakdown

(1) Human Resources Development

The cost breakdown of human resources development is shown in Table 6-2.

Table 6-2: Cost Breakdown of Human Resources Development

Agriculture	Unit Price		Quantity		Total (JPY)
Short Training Course	1,641,000	×	50	=	82,050,000
PhD Study	6,693,000	×	25	=	167,325,000
Sub Total					249,375,000
Aquaculture and Fisheries	Unit Price		Quantity		Total
Short Training Course	1,641,000	×	18	=	29,538,000
PhD Study	6,693,000	×	24	=	160,632,000
Sub Total					190,170,000
Environment	Unit Price		Quantity		Total
Short Training Course	1,641,000	×	39	=	63,999,000
PhD Study	6,693,000	×	14	=	93,702,000
Sub Total					157,701,000
Governance and Management	Unit Price		Quantity		Total
Master Study	4,655,000	×	9	=	41,895,000
Sub Total					41,895,000
			Total		**639,141,000**

Source: JICA Study Team

(2) Research Project

1) Cost Breakdown

The cost of breakdown of research project is shown in Table 6-3.

Table 6-3: Cost Breakdown of Research Project

Research Theme	**Amount (JPY)**
A. Agriculture	
Program 1: Plant and Animal Genetics and Breeding	
1-1 Plant genetics and breeding	
Plant resources collection, evaluation and development (rice, other crops, animal forages, etc.)	6,875,000
Application of genetic, breeding and cell culture technologies for new varieties of rice and other crops with improved quality and adaptability to climate changes and other environmental stresses	6,875,000
1-2 Animal genetics and breeding	
Collection, evaluation and development of native animal breeds	6,875,000
Application of genetic and breeding technologies for new livestock varieties with improved quality and adaptability to climate changes and other environmental stresses	6,875,000
Program 2: Sustainable Production of Tropical Plants and Animals	
2-1 Crop production	
Developing integrated crop management (ICP) for improvement of product quality and adaptation to climate changes	6,875,000
2-2 Plant protection	
Studies on insect pests and diseases and development of alternative plant protection technologies	6,875,000
2-3 Soil management	
Studies on bio-remediation of MDR problem soil under impacts of climate change	6,875,000

Research Theme		Amount (JPY)
	Studies on sustainable soil uses	6,875,000
2-4	Animal production	
	Improve animal production systems for higher quality and safety of products	6,875,000
2-5	Animal health management	
	Molecular studies for detection and identification of animal diseases in MDR	6,875,000
	Microbial and pharmaceutical studies for animal disease treatment	6,875,000
2-6	Agricultural modelling	
	Simulation of metal-organic frameworks (MOFs)	6,875,000
	Agricultural machineries	6,875,000
Program 3: Food Technology and Post-harvest Technology		
3-1	Post-harvest and Logistics	
	Studies and development of post-harvest technologies for rice, plant and crop based-food products in MDR	6,875,000
3-2	Food Processing	
	Development of value added food products from agricultural products and by-products in MDR	6,875,000
3-3	Food Safety and Quality Management	
	Studies on food pathogens and antibiotics resistant bacteria	6,875,000
	Sub Total	110,000,000
B.	**Fisheries**	
1.	Climate change: Impacts and adaptation in aquaculture and Fisheries	30,000,000
2.	Green technology innovation for aquaculture	30,000,000
3.	Fisheries Resources management and Conservation	25,000,000
4.	Quality improvement of fisheries/aquaculture products	25,000,000
5.	Environmental monitoring for aquaculture and fisheries	20,000,000
6.	Biochemistry and pharmaceutical science in aquaculture and fisheries	12,000,000
7.	Engineering and information technology development and application in aquaculture and fisheries	5,000,000
8.	Fisheries socioeconomics and management	5,000,000
	Sub total	152,000,000
C.	**Environment**	
1.	To recognize current problems , evaluate impacts and project trends of changes in the field of environment and natural resources in the Vietnamese Mekong Delta	50,000,000
1.1	Water & land resources monitoring	
1.2	Analyzing & modelling water & land resources	
1.3	Evaluating changes of the agro-ecological changes under great threats of the in-situ development and climate change	
1.4	Analysis of economic efficiency of natural resource uses and problems in natural resource uses and management	
2.	To study the mitigation of environmental impact	50,000,000
2.1	To study potential mitigation strategies to eliminate impacts of natural disasters on agriculture, aquaculture and water supply (including both urban & industry sections)	
2.2	To study possible techniques to treat soil, water and air pollution in the specific context of the Vietnamese Mekong Delta	
2.3	To study changes of the farming systems to support elimination of pollutants added to the environment (including GHG)	
2.4	To study the planning and managing mechanism of rural, urban and industrial zones to eliminate the pollutant added to the environment (including GHG)	
2.5	To study possible solutions to protect the existing biodiversity and natural resources	
2.6	To study the socio-economic feasibility of the (above) solutions	
3.	To study the resilience and adaptive capacity of local residents in the context of environmental changes	38,000,000

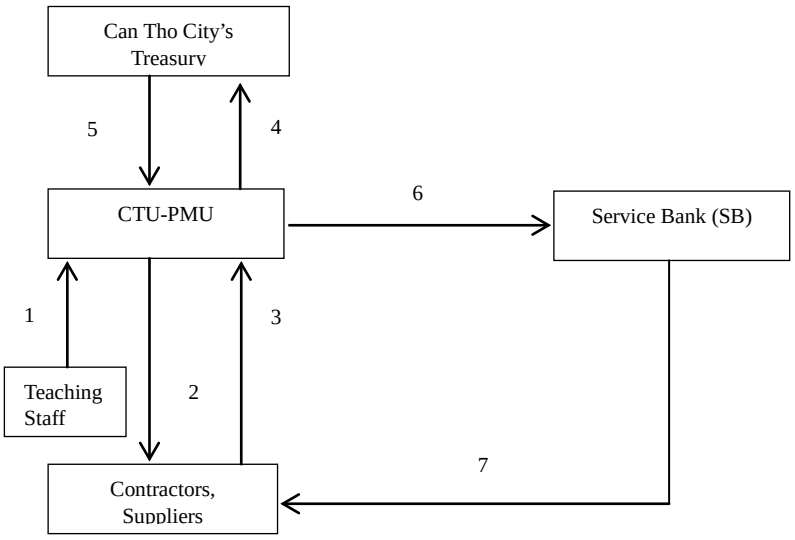
Research Theme		Amount (JPY)
3.1	To study the adaptation strategies on sustainable uses of natural resources in the context of climate change and environmental degradation	
3.2	To study the resilience of different farming systems in the context of extreme weather events and environmental degradation	
	Sub total	138,000,000
	Ground Total	400,000,000

Source: JICA Study Team

The costs will cover the following items mainly for joint research activities: consumable items, small goods purchase, registration fees, research paper submission fees for journals, fees for documents, books, papers and data, travel fees, outsource fees, and analytical equipment utilization fees.

2) Disbursement Mechanism

The JICA study team has proposed that the loan proceeds of Research Project should be disbursed by Special Account (S/A) Procedure in accordance with JICA's regulations. After CTU as project owner set a special account, CTU will make payment from the account as shown in Figure 6-1.



Source: JICA Study Team

Figure 6-1: Payment from Special Account

Teaching staff at CTU claim purchase requests of goods and services to CTU-PMU (Finance Unit). On receipt of the requests, CTU-PMU will check whether the requests are in line with financial plans in the approved research plans and then send the requests for order to contractors or suppliers. In response to the order, the contractors or suppliers will send invoices to CTU-PMU (Finance Unit). CTU-PMU (Finance Unit) will request Can Tho City's Treasury for the approval of the payments with supporting documents and then on receipts of the treasury's approval, CTU-PMU (Finance Unit) will send payment requests to Service Bank. Finally Service Bank will mail payment orders from the special account for contractors or suppliers.

The JICA study team has also proposed that the Statement of Expenditures (SOE) method should be used. CTU should maintain SOE records and supporting documents and make them readily available whenever JICA requests their submission. In addition, CTU needs to receive

independent audit for supporting documents and submit auditing reports to JICA every six month.

(3) Facility Construction

The Study team estimated the construction cost of the buildings to be covered by the Project based on the following methodologies:

Amount of materials and laborers for each part of the building categorized according to priority from 1 to 6 were calculated based on their plans and other drawings, and total direct construction costs were calculated using the Ministry of Construction's (MOC's) unit costs. Indirect construction costs were also calculated by using MOC's specified rates (5.5% for indirect expenses and 6.3% for overhead fee).

Construction costs of Field Test Facilities and Hatcheries were calculated by using the unit cost of similar existing facility samples.

Table 6-4: Cost Estimate of Facility Components

Priority	Building Name	Total Floor Area (m^2)	Estimated Cost (JP Yen)	Unit Cost (JP Yen/m^2)
1	Advanced Technology Laboratory	16,654	¥1,381,041,000	
2	Bio-Tech Wing (Research Laboratory Complex)	12,706	¥1,208,835,000	
3	CAF Wing (Research Laboratory Complex)			
4	CENRes Wing (Research Laboratory Complex)			
5	CoET Wing (Research Laboratory Complex)	13,007	¥1,118,411,000	
6	International Education Training Center	10,419	¥991,137,800	¥ 89,028 m^2
	Tranche-1 Sub-total	52,786	¥4,699,424,800	
7	Field Test Facility (Greenhouse & Net house)	8,400	¥126,000,000	¥15,000 /m^2
8	Hatcheries	2,700	¥108,000,000	¥40,000 /m^2
	Tranche-2 Sub-total	11,100	¥234,000,000	
9	Upgrading Infrastructure in Campus 2		¥1,000,000	
10-1	Hoa An, Center for Technology Transfer	4,888	¥366,600,000	¥75,000 /m^2
10-2	Hoa An, Field Test Facilities	2,000	¥20,000,000	¥10,000 /m^2
	Tranche-3 Sub-total	6,888	¥387,600,000	
	Grand Total (Buildings to be covered by the Project)	70,774	¥5,321,024,800	¥75,183 /m2

Source: JICA Study Team

(4) Research Equipment

The Study team estimated the equipment procurement cost of the existing and new facilities to be covered by the Project based on the following:

The equipment costs were calculated based on CTU cost proposals and were examined and reviewed by the study team by means of comparing with cost estimates of local equipment agents and manufacturers.

Table 6-5: Table Cost Breakdown of Research Equipment

Targeting Fields and Department	Equipment Cost (Million JPY)
CAAB	1,257.3
CAF	1,042.7
CENREs	1,044.5
CoET	116.1
IETC	124.8
IT	231.0

Governance	36.3
Hoa An Center	82.4
Total cost (Million JPY)	3,935.1

Source: JICA Study Team

(5) Consulting Services

The cost is estimated based on the assigned schedule of consultants shown in Appendix 5-1.

The unit costs of professionals are as follows.
Foreign Professional: 2,895 thousand JPY/MM
Local Professional (B1): 54 million VND/MM
Local Professional (C): 17 million VND/MM

The cost breakdown of the consulting services is shown in Table 6-6.

Table 6-6: Cost Breakdown of Consulting Services

Item	Quality	Amount ('000 JPY)
(1) Remuneration		
Foreign Professional(A)	259.0 MM	749,805
Local Professional (B)	260.5 MM	68,928
Local Professional (C)	342.0 MM	28,489
	Subtotal of (1)	847,222
(2) Direct Cost		
Travel Cost		18,460
Accommodation Allowance		39,051
Office Rent		13,132
Expense for Academic Coordinator in Japan		61,890
Miscellaneous cost		8,277
	Subtotal of (2)	140,810
Total (1)+(2)		**988,032**

Source: JICA Study Team

7. Project Implementation Schedule

7.1 Prerequisites

Overall project implementation schedule was studied based on the following prerequisites.

- Project milestone
  - Pledge: Mid-October, 2014
  - Signing of L/A: March, 2015

- Selection of the consultant Total 19 months
  - Revising PP, Making TOR & EOI, JICA concurrence: 6 months
  - Releasing RFP, making proposal (by consultant): 2 months
  - Evaluating submitted proposals (QCBS), JICA concurrence: 2 months
  - Negotiations, JICA concurrence & consulting agreement: 1 month

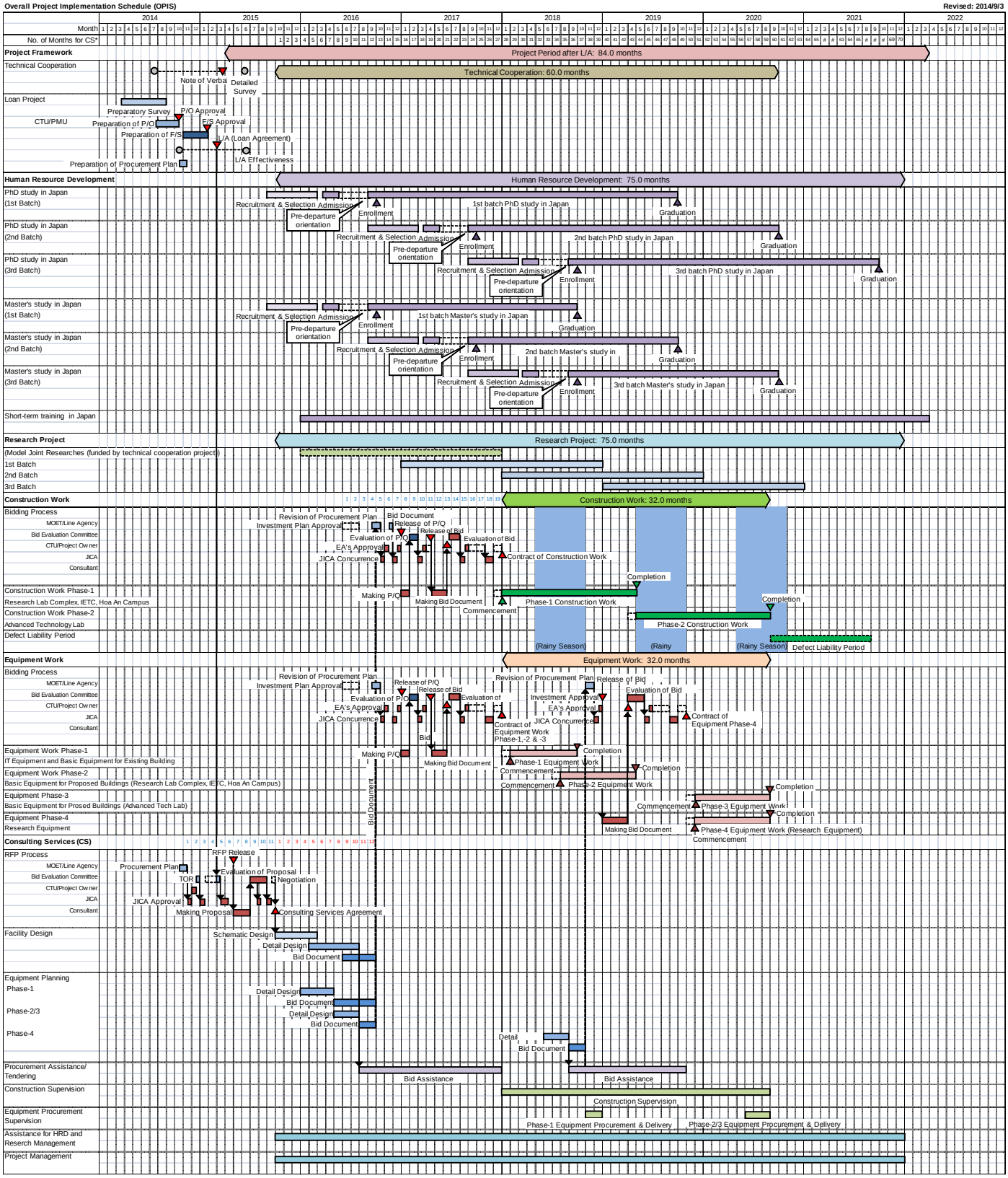
- Detailed design Total 12 months (including overlaps)
  - Schematic design: 5 months
  - Detailed design 6 months
  - Tender document: 4 months

- Construction and equipment procurement contract Total 19 months
  - Obtaining Investment approval, revising PP & tender document 4 months
  - Approving PP & tender documents, JICA concurrence: 3 months
  - Releasing P/Q, making P/Q (by contractor) & evaluating P/Q, JICA concurrence: 3.5 months
  - Releasing tender document & making tender (by contractor) 2.0 months
  - Evaluating submitted tenders & JICA concurrence: 3.5 months
  - Negotiations, JICA concurrence & awarding contract 3.0 months
  - Issuing L/C, etc. 1.0 months

- Construction work
  In general, facility construction schedules are affected significantly by geological and climatic conditions of the proposed site. Therefore, it is desirable to determine a realistic schedule after reviewing local contractor's capability to deal with the aforementioned conditions.
  There are some existing buildings on the proposed sites, and the Project's construction schedule should reflect the necessary period for their demolition or relocation.

7.2 Implementation Schedule

Figure 7-1 shows the overall project implementation schedule (OPIS) of the Project.



Source: JICA Study Team

Figure 7-1: **Overall Project Implementation Schedule (OPIS)**

7.3 Schedule of Each Project Component

7.3.1 Human Resources Development

In the long-term training program, the teaching staff will be sent in three batches. The study in the doctoral course and master's course will start in the 2016 fall admission, and the last 3rd batch will be sent in the fall of 2018, the third year of the project. It is necessary to discuss and decide the overall schedule, criteria, handling of the tuition fee, and payment method of scholarship of HRD program before starting the recruitment of the 1st batch. Pre-departure orientation including Japanese language course takes at least two months. In doctoral degree programs, it sometimes takes longer than three years to finish and acquire the degrees. Therefore, consideration should be given to possible cases of additional budgeting associated with students enrolling another year, and the completion timing of the project. If the study proceeds as planned, 63 staff members will obtain doctoral degrees and 9 will obtain master's degrees in fall 2021, respectively.

As for the short-term training, the enrollment period is not fixed. Candidates need to consult the accepting university regarding the basic points for implementing the training such as research periods, research details, supervisors, joint research coordination and many other issues. The short term training will start from January, 2016 and finish in March 2022. Japanese universities are usually busy for entrance examination from January to the end of March. Therefore, April to December is the most suitable period for the short term training. If the programs proceed as planned, 107 members will participate in the short-term research training programs in Japan by the end of the project.

7.3.2 Research Project

The research project is divided into three batches. The first batch, the second batch and third batch will start in 2017, 2018 and 2019 respectively, following the development of model joint research(es) by the technical cooperation project in 2016 and 2017.

7.3.3 Facility Construction Work

Since Advanced Technology Laboratory building is planned to be constructed in the block where the existing BiRDI buildings are, its construction work cannot start until BiRDI's entire functions move to the proposed the Research Laboratory Complex (Bio-tech) building and the existing buildings are demolished.

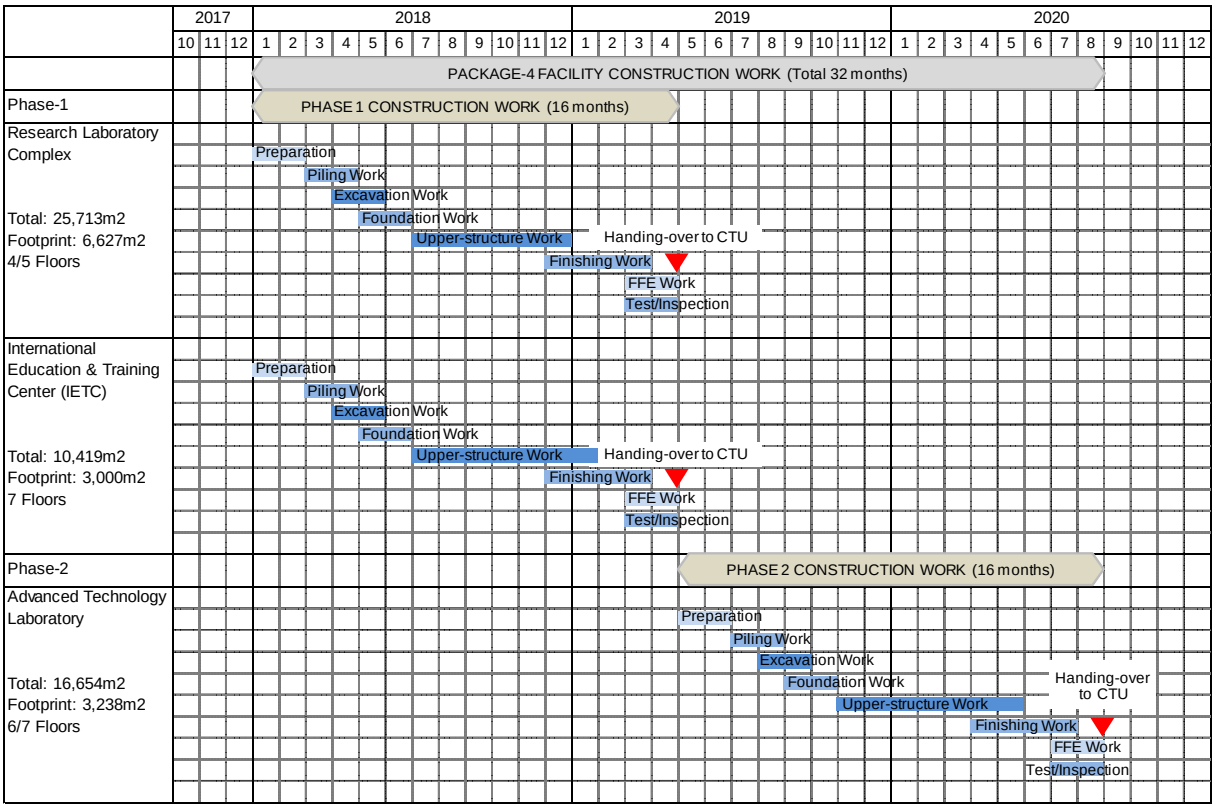
Construction schedule of the proposed buildings at Campus-2 needs careful studies to reflect the following conditions:

- Soil conditions: Campus-2 is located at the mouth of the Mekong Delta region, and its soil condition is generally soft and fragile. The proposed buildings need deep piling work, and this will affect the construction schedule.
- The number of floors: Advanced Technology Laboratory and IETC have 7 floors, and their superstructure work may need more than 7 months.

Therefore, it is recommended to allocate 32 months in total for the two-phase construction works (16 months for each phase). Facilities to be constructed at each phase are:

- Phase-1: Research Laboratory Complex, IETC, Field Test Facilities, Hatcheries and Hoa An Technology Transfer Center
- Phase-2: Advanced Technology Laboratory Building

Figure 7-2 shows the detailed construction schedule of major facilities.



Source: JICA Study Team

Figure 7-2: Facility Construction Schedule

7.3.4 Research Equipment

It is planned to divide the equipment work into 2 packages, i) IT and Basic research equipment, and ii) Research equipment and others.

Table 7-1: Schedule of Equipment Work

Packages	Equipment	Places to install	Procurement schedule
Phase 1	IT equipment & Basic research equipment	Data center, New administration building, which will be completed by the end of 2014, and Each existing building (CAAB, CAF, CoET and other buildings)	The Detailed Design work will be started soon after L/A. The equipment will be installed to the new administration building and the existing building 36 months after the D/D is started.
Phase 2	Research equipment, and others	New buildings (Advance Technology Laboratory Building, and Research Complex, IETC, and Hoa An T/T center)	For research equipment after the formulation of the research plans and equipment specifications, the D/D will be commenced. The installation work will be completed 27 months after D/D is started.

Source: JICA Study Team

7.3.5 Consulting Services

It will take 11 months to recruit a consultant to implement the consulting services. After the selection, the consulting services will start in October 2015 and end in December 21 for 70 months.

8. Project Implementation Arrangement

8.1 Analysis on the Most Appropriate Project Implementation and Management Framework

Whether the proposed project will be successfully implemented and achieve the expected impact, outcome and outputs depends not only on the quality of the design but also the appropriateness of the options of project implementation and management framework. This section will discuss the suitable framework and arrangement which will help carry out project implementation and management in a timely, effective and transparent manner. To select the most feasible framework, different types of project implementation arrangements will be compared and examined. The analysis will be made based on the following points:(i) lessons learned from the issues faced in the Higher Education Development Support Project on ICT[89]; (ii) challenges faced by other New Model University Projects[90], (iii) assessment of project implementation and management capacity of Can Tho University (CTU); and (iv) Vietnamese regulations and practices related to ODA project management including the Law on Public Investment, Public Procurement Law, Decree on ODA Management and Guiding Circular of ODA Management[91]. The complete report is presented in Appendix 8-1.

8.2 Proposed Organization Chart of Project Management and Implementation Arrangements

Based on the discussions in the previous sections, the JICA Study Team proposes: (1) roles and responsibilities of project implementation organizations and (2) project organization structure including PMU's organization chart.

(1) General Roles and Responsibility

The following table shows the general roles and responsibilities of project implementation organizations.

Table 8-1: Project Implementation Organizations–Roles and Responsibilities

Project Implementation Organization	Roles and Responsibilities
Line Agency (LA)	• To approve the overall implementation plan of the Project, collect data on budget allocation and approve the annual budget allocation plan of the Project • To supervise and assess the project implementation situation, to ensure the project is in line with the schedule and quality and reaches set targets • To take responsibility for loss, waste, corruption and wrongdoings or violations in the management and use of ODA loan under their management competence • To perform other tasks and powers as prescribed by law, international treaties on ODA and concessional loans of the Project

[89] Higher Education Development Support Project on ICT in Viet Nam (JICA loan project, 2006-On-going)
[90] New Model University Project in Viet Nam (WB loan, 2010-On-going), University of Science and Technology of Ha Noi (New Model University) Project in Viet Nam (ADB loan, 2010-On-going)
[91] They include Law on Public Investment dated June 18, 2014 (No.49/2014/QH13), Public Procurement Law approved November 26th, 2013 (No.43/2013/QH13), Decree on Management and Use of Official Development Assistance (ODA) and Concessional Loans of Donors dated April 23rd, 2013 (No. 38/2013/ND-CP) (hereinafter "Decree 38"), and Circular Guiding Implementation of Decree No. 38/2013/ND-CP dated January 09th, 2014 (No. 01/2014/TT-BKHDT) (hereinafter "Circular 01").

Project Implementation Organization	**Roles and Responsibilities**
Internal Coordination Committee (ICC)	• The ICC, consisting of representatives of the MOET including the Department of Higher Education, Department of Educational Facilities, Department of Planning and Finance, International Cooperation Department, Department of Overseas Training, and Department of Science, Technology and Environment shall be chaired by a Vice Minister of MOET and set-up within MOET. ICC shall be responsible for sharing the information on the Project among different departments in MOET, so as to promptly provide support to PO whenever needed.
Project Owner (PO)	• To organize the units for management and performance of the Project based on the decision of LA • To develop and submit overall implementation plan of the Project to LA, develop and submit annual implementation plan of the Project to LA which becomes a foundation for LA to approve annual budget allocation plan • To formulate an action plan for each quarter in order to serve the administration, supervision and assessment over the Project period • To organize appraisal and approval of technical design, total estimation and estimation of work items (for the Project which includes investment in construction work) • To perform the tender as prescribed by the current public procurement law • To negotiate, conclude, supervise the performance of contracts and handle violations of contracts • To coordinate with the local authorities to perform compensation, assistance and resettlement as prescribed by law, specific International treaties on ODA and concessional loans of the Project which includes investment in construction work • To supervise the Project aiming to ensure that the Project is performed in line with the schedule, quality and reaches the targets as set out • Under their management competence, to take responsibility for loss, waste, corruption and wrongdoings or violations in the management and performance of the Project causing socio-economic or environmental damages or influence to the target and general effectiveness of the Project • Other task and powers as prescribed by law, international treaties on ODA and concessional loans of the Project • Establish the PMU to support the management and implementation the Project.
Project Management Unit (PMU)	• The PMU shall be responsible for Project implementation, including procurement, planning, budgeting, monitoring, coordinating, retaining supporting documents, submitting required documents including annual reports and financial statements, establishing and maintaining accounts. Tasks and duties of the PMU are indicated in Item3 of Article 40 of Decree 38 as follows. ➢ To assist the PO in develop overall implementation plan and annual implementation plan of the Project ➢ To support the PO in preparation for implementation and implementation of the Project ➢ To support the PO in performance of tender activities and contract management ➢ To support the PO in the disbursement work, and financial and asset management of the Project ➢ To follow up and assess the situation of performance of the Project ➢ To prepare for acceptance and handing over of the output of the Project by the PO after completion, finishing of the audit work, handing over of assets of the Project, creation of the completion report and finalization of statements of the Project ➢ To perform other tasks in the framework of the Project assigned by the PO.

Project Implementation Organization	Roles and Responsibilities
Japan International Cooperation (JICA)	• JICA shall (i) oversee project implementation, (ii) ensure compliance with the Loan Agreement, (iii) ensure the expected outputs and outcomes, safeguards and anti-corruption measures, (iv) provide concurrence for procurement activities and withdrawal applications, (v) disburse funds for allowable expenditures, and (vi) conduct evaluations

Source: JICA Study Team

(2) Roles and Responsibilities of LA and PO in Major Project Activities

The following shows the roles and responsibilities of MOET (LA) and Can Tho University (PO) in major project activities: construction of facilities, equipment procurement, Ph.D and short-term studies, and research support activities. Attachment 2 and Attachment 3 analyze responsibilities in procurement procedures in goods, civil works and services and disbursement flow.

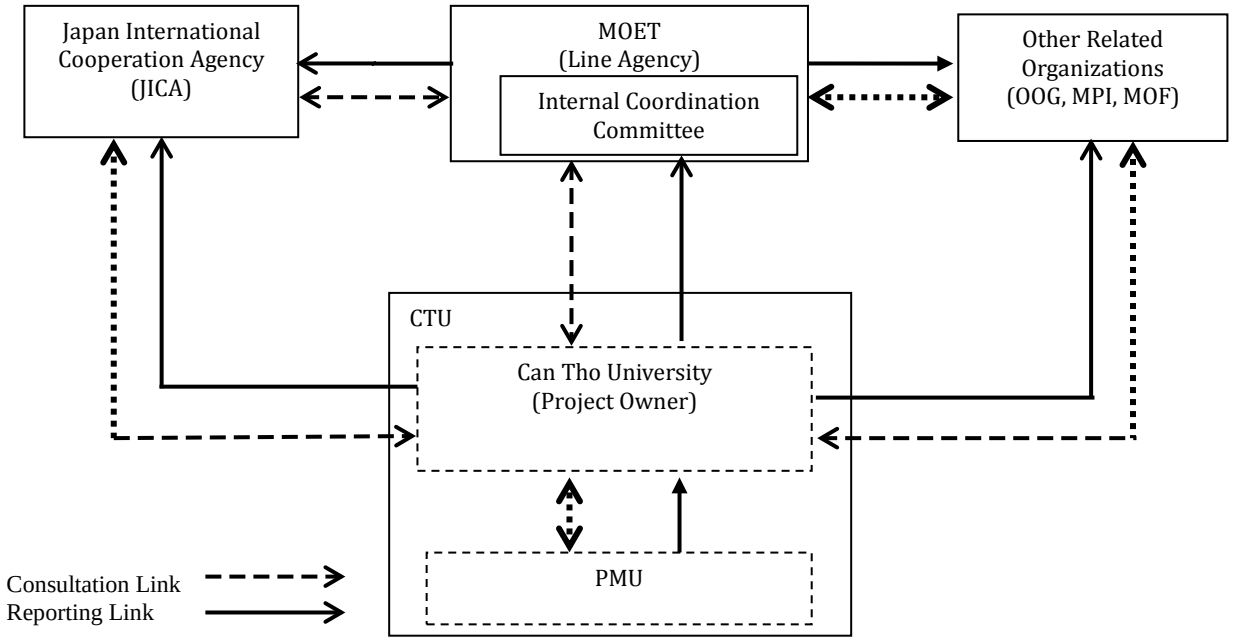
Construction of facilities
Total cost to be approved by MOET at the approval process of Investment Plan. Construction process is managed by Project Owner.

Equipment procurement
Total cost will be approved by MOET at the approval process of Investment Plan, and detailed items will be designed by Project Owner. Procurement process is managed by Project Owner.

Ph.D and short-term studies
Total number of personnel (=total cost) to study in Japan will be approved by MOET based on Vietnamese F/S developed from M/D for appraisal, and after selection, it will be managed by Project Owner.

Research support activities
Total cost for research support activities will be approved by MOET based on Vietnamese F/S developed from M/D for appraisal, and detailed funding process will be managed by Project Owner.

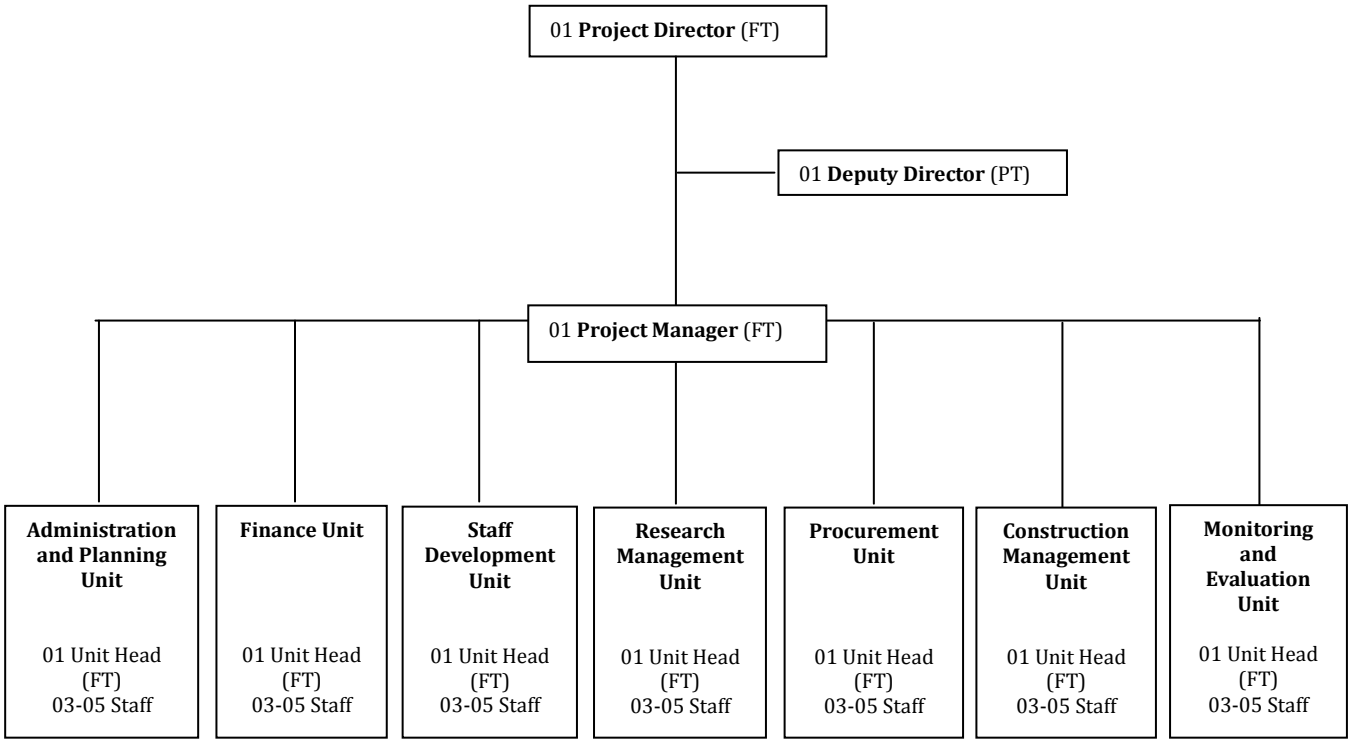
(3) Project Organization Structure



Source: JICA Study Team

Figure 8-1: Project Organization Structure

(4) Organization Chart for Project Management Unit



Source: JICA Study Team

Figure 8-2: Organization Chart for Project Management Unit

9. Monitoring and Evaluation System and M&E Impact Indicators

9.1 Monitoring and Evaluation System

Once project starts, Monitoring and Evaluation should be conducted periodically by PMU and the results should be shared among the concerned Actually, The Monitoring and Evaluation Unit of PMU members should be in charge of the internal monitoring activities on daily basis and provide relevant information to CTU. The sample monitoring schedule is proposed by the JICA study team as follows:

Table 9-1: Proposed Monitoring Schedule

Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
◆		○		●		○		●		○	

◆ : CTU and CTU/PMU: Setting up Target for this year, and reviewing the results of previous year, adjustment of target if necessary.
○ : CTU: PMU activity review
● : CTU/PMU Member: mid-term review, discussion issues and problems

Source: JICA Study Team

9.2 M&E Indicators

Considering the long-term as well as short-term project objectives described in Chapter 4, the following quantitative and qualitative indicators are proposed as M&E indicators.

The target figures are set up for year 2025, which is three years after the completion of the yen loan project, since the ex-post evaluation by JICA will be conducted around that time.

(1) Quantitative Indicators

Quantitative indicators are categorized into two indicators, namely operation indicators and effect indicators[92].

The operational indicators, based on the CTU proposal and agreement with the JICA study team, are shown in Table 9-2.

Table 9-2: M&E Indicators: Operational Indicators

Operational Indicators	Present (2014)	Target (2025)	Data source
1) Number of teaching staff acquiring Ph.D. through the project	**0**	**63**	**PMU Report**
CAAB	0	25	
CAF	0	24	
CENREs	0	14	
2) Number of teaching staff acquiring MSc. through the project	**0**	**9**	**PMU Report**
Governance	0	9	
3) Number of papers published (about 30% international papers)	**0**	**2,075**	**PMU Report**
CAAB	0	1,480	
CAF	0	240	
CENREs	0	355	

Source: CTU

[92] Operation indicators: indicators to quantitatively measure operational status of the project.
Effect indicators: indicators to quantitatively measure production of effects of the project. Both indicators in ODA loan projects are indicators at the outcome level.

The effect indicators are described in Table 9-3.

Table 9-3: M&E Indicators: Effect Indicators

	Current (2014)	Target (2025)	Data source
1) University ranking in Asia Pacific	454	Within Top 200	Webmetrics website[93]
2) Ratio of Ph.D. holders among the Teaching Staff of the three targeted Faculties			PMU Report
CAAB	52%	80%	
CAF	56%	82%	
CENREs	35%	88%	
3) Ratio of Master's holders among the Teaching Staff (reference information)*	13%	19%	PMU Report

*3) the project does not contribute much to the ratio of master's holders, but it is provided as reference to see the balance between Master's and doctorate degree holders.
Source: CTU

(2) Qualitative Indicators

In addition to the quantitative indicators above, the following effects or impacts will be measured as qualitative indicators.

Table 9-4: M&E Indicators: Qualitative Indicators

Qualitative indicators	Data source
Research quality of CTU will be improved.	- Interview with joint research partner and other relevant stakeholders. - Interview with companies where graduates are working (*)
Research results or outcome will benefit local community.	- Comments from users —who engaged in technology transfer - Comments from local government to CTU (*)

(*) This information is supposed to be collected through the assessment for AUN accreditation
Source: JICA Study Team

[93] Webometrics: http://www.webometrics.info/en/Asia_Pacifico/South%20East%20Asia

10. Environmental and Social Consideration

10.1 Procedures for Environmental and Social Consideration

In Viet Nam, all development projects need to obtain an environmental permit (such as environmental license) prior to construction works. The project owner should initiate the environmental application process by submitting either an Environmental Protection Commitment (almost equivalent to IEE study report) or an EIA report, depending on the significance of the positional environmental impact caused by the project, to the Environmental Appraisal Committee at either the district or the central government level.

According to Viet Nam's relevant environmental regulation (Decree No. 29/2011/ND-CP, Providing Strategic Environmental Assessment, Environmental Impact Assessment and Environmental Protection Commitment, Appendix II), it is necessary to go through the environmental assessment process as the proposed buildings include laboratories.

Campus-2

Since the proposed facilities have some laboratories with hazardous waste produced due to research activities, CTU should go through the EIA Process. CTU will hire a consulting firm who has capability to obtain the EIA permission. According to CTU's previous project experience, it takes about one month to obtain the EIA permission. CTU plans to submit it a couple of months before the construction works start.

10.2 Procedures for Building Permit

Both CTU's Campus-2 and Hoa An Campus have already obtained Master Plan Approvals; constructing new buildings at each campus will require undergoing the following permission processes.

Campus-2

CTU obtained in 2009 a 1/500 Detailed Master Plan for Campus-2 from Can Tho City's Department of Construction (DOC). There are two options of acquiring permission for the proposed buildings, depending on the designs of the proposed buildings.

- Option-1
  In case the proposed buildings follow the major urban norms (functions, the number of floors, footprint shape, etc.) of the Master Plan, it is not necessary to obtain another building permit.
- Option-2
  In case the proposed buildings exceed the major urban norms of the Master Plan, it is necessary to obtain another building permit. CTU should issue an official letter explaining the aspects different from the Master Plan to the DOC (Department of Construction), Can Tho City, and obtain DOC's permission.

The proposed buildings follow the number of floors, but their footprint (shape of the ground floor) is different from the Master Plan's, it is necessary to apply to DOC, Can Tho City, for the modification of the Master Plan.

Hoa An Campus

CTU has obtained a 1/2000 Zoning Master Plan from Hau Giang Province, and it is necessary to obtain the permission for modification of Master Plan for the proposed facilities.

Appendices

Appendix 1-1

Site Survey Program

MEMBERS OF CAN THO UNIVERSITY DELEGATION TO JAPAN FROM JUNE 22ND TO JUNE 28TH, 2014

1. A/Prof. Le Viet Dung, Vice Rector for International Relations and Scienctific Research
2. A/Prof. Tran Trung Tinh, Vice Rector for Facilities Management
3. Dr. Nguyen Van Be, Director, Department of International Relations
4. A/Prof. Ly Nguyen Binh, Vice Dean, College of Agriculture and Applied Biology
5. A/Prof. Tran Ngoc Hai, Vice Dean, College of Aquaculture and Fisheries
6. A/Prof. Nguyen Van Cong, Vice Dean, College of Environment and Natural Resources
7. Mr. Duong Thanh Long, Director, Department of Administration and Planning

Site-Survey Program in Japan
2014/6/22-2014/6/28

Date	date	Start	End	Site	Item	Person	Language	Address	Transportaion	Accomodation
2014/6/21										
2014/6/22	Sun	7:30			Transport by Train				Airport to Hanata	Toyoko-INN Hakata-guchi ekimae2 092-437-1045
		18:00			Welcome Party by Kyushu University					
2014/6/23	Mon	8:30	9:00		Transport by bus	N/A	N/A			Toyoko-INN Nagasaki ekimae 095-825-1045
		9:00	10:00	Kyushu University (Hakozaki Campus)	**Courtesy visit to Director**	N/A	English	6-10-1 Hakozaki Higashi-ku Fukuoka 812-8581		
					Intro to Faculty of Agriculture	Dr. Nakamura	English			
					Intro to Kyushu University	Dr. Hiramatsu	English			
					Intro to Agriculture research	Dr. Ogata	English			
					Basic plan of relocation	Dr. Yoshimura	English			
		10:00	10:45		**Center for Advanced Instrumental and Educational Supports**	Dr.Sakai	English			
		10:45	11:45		Transport by Bus	N/A	N/A		Chartered bus	
		12:00	13:00		Lunch	N/A	N/A			
		13:00	14:00	Kyushu University (Ito Campus)	**Visiting lecture hall Courtesy visit to Vice President**	Dr. Hiramatsu	English	744 Motooka Nishi-ku Fukuoka 819-0395		
		14:00	14:30		**Central Analysis Center**	Dr. Ogata	English			
		14:30	15:00		**AgriBio**	Dr. Nakamura	English			
		15:00	16:00		Transport by bus	N/A	N/A		Chartered bus	
		16:00	18:30		Transport by Train	N/A	N/A		Hakata to Nagasaki Kamome 33	
		19:00			Welcome Party by Nagasaki University	N/A	N/A			
2014/6/24	Tue	8:30	9:00		Transport by Bus	N/A	N/A			Sunsine City Price Hotel 3-1-5 Higashi Ikebukuro Toshima, Tokyo
		9:00	11:00	Nagasaki University (Hakozaki Campus)	**Intro to Nagasaki University**	Dr. Kato	English	1-14 Bunkyo-machi Nagasaki City,		
					Research activities on aqua culture	Dr. Hagiwara	English			
					Research activities on environment	Dr. Miyanishi	English			
					IT utilization on academic management		Japanese			
		11:00	11:30		**Multidisciplinary educational research center**	Dr. Hagiwara	English			
		11:30	12:45		Lunch	N/A	N/A			
		13:00	13:30		**Courtesy visit to President (with Vietnamese ambassador)**		English			
		13:30	14:00		**Presentation by JICA**					
		14:00	15:00		**Library ICT center**		Japanese			
					Faculty of Environment	Dr. Miyanishi	English			
		15:00	15:30		Transport by bus	N/A	N/A		Chartered bus	
		15:30	17:00	Nagasaki University (Research Center)	**Facility site visit**	Dr. Ishimatsu	English	1551-7 Taira Nagasaki City		
					Cost of research activity	Dr. Ishimatsu	English			
					Student body (Japanese and International)	Dr. Ishimatsu	English			
					Frame work of centralization of research center	Dr. Ishimatsu	English			
		17:00	17:30		**Kakuyoumaru ship visit**	Dr. Ishimatsu	English			
		17:30	17:55		Transport by ship	N/A	N/A		Togitsu to Airport	
		19:00	20:40		Transport by Airplane	N/A	N/A		ANA:HN670	
		21:00			Transport by Bus	N/A	N/A		Haneda to Ikebukuro	
2014/6/25	Wed	9:30	10:00	Tokyo University of Marine Science and Technology	Transport by Train	N/A	N/A	4-5-7,Konan,Minato-ku,Tokyo	Ikebukuro to Shinagawa	Sunsine City Price Hotel 3-1-5 Higashi Ikebukuro Toshima, Tokyo
		10:30	10:50		**Introduction**		E/J			
		10:50	11:50		**Facility site visit (dormitory, library)**		Japanese			
		11:50	13:00		Lunch	N/A	N/A			
		13:00	15:20		**Facility site visit (Research center, industry collaboration)**		E/J	4-5-7,Konan,Minato-ku,Tokyo		
		15:20	16:20		**Exchange opinions with faculty head**		Japanese			
		16:30	17:10		**Courtesy visit to President**		Japanese			
		17:30	19:30		Welcome Party by TUMSAT		Japanese			
		19:30			Transport by train	N/A	N/A		Sshinagawa to Ikebukuro	
2014/6/26	Thu		9:50	Tokyo University of Agriculture and Technology	Transport by Train	N/A	N/A	3-5-8 Saiwaicho Fuchu, Tokyo	Ikebukuro to Fuchu	Sunsine City Price Hotel 3-1-5 Higashi Ikebukuro Toshima, Tokyo
		10:00	11:00		**Environment research facility and equipment site visit**	Dr. Okayama				
		11:00	11:30		**Gene testing site visit**	Dr. Sasaki				
		11:40	12:15		**Lunch**	N/A	N/A			
		12:30	15:00		**Agriculture research site visit**	Dr. Kanekatsu		3-5-8 Saiwaicho Fuchu, Tokyo		
		15:10	15:30		**Information center and shared equipment facility site visit**	Dr. Arie				
		15:40	16:00		**Global Information office**					
		16:30	17:30		**Q & A session**					
		17:30	19:00		Welcome Party by TUAT	N/A	N/A			
		19:00			Transport by Train	N/A	N/A		Fuchu to Ikebukuro	
2014/6/27	Fri	7:22	9:00	Equipment training Center (Shimazu)	Transport by Train			380-1 Hadano, Kanagawa	Ikebukuro to Shibusawa	Sunsine City Price Hotel 3-1-5 Higashi Ikebukuro Toshima, Tokyo
		9:00	10:30							
		10:30	12:00		Transport by Train				Shibusawa to Kojimachi	
		12:00	13:00		Lunch					
		13:00	15:00	JICA	**Meeting with CTU**		English	5-25 Nibancho Chiyoda, Tokyo		
		15:00			**Back up time**		English			
					Transport by Train	N/A	N/A		Kojimachi to Ikebukuro	
		18:00			Welcome Party by Consultant	N/A	N/A	To be determined	Ikebukuro	
2014/6/28	Sat		7:30		Transport by Bus	N/A	N/A		Ikebukuro to Narita Airport 6:15 departure	
		9:30	14:00		Transport by Airplane	N/A	N/A			

Appendix 2-1

List of On-going Collaboration with Private Sector in Three Fields

List of Some of Ongoing Collaboration with Private Sector in Three Fields

Name of Company	Technology Transfer and Research Collaboration	Status	Belongings
Dong Thap Company Limited One member Agricultural Development Services (DASCO)	Microorganism fertilizer Stimulating growth for rice	On-going	Biotechnology Research and Development Institute
Asia Veterinary Medicine Company Limited	Medicine for pigs	On-going	CAAB
An Phu Nong Kien Giang Joint Stock Company for Investment and Development	Organic Fertilizer	Contract Signed. A plant is under construction.	Advance Laboratory of CTU
Ca Mau Nitrogen Plant	Processing Nitrogen Fertilizer	On-Going	CTU involving many colleges and staffs
Thuan Hung Company – Hau Giang province	Transferring modern farming system of catfish (VIDATEC)	On-going	CAF
CASEAMEX – Can Tho city	Transferring technology of farming system of catfish (SUPA)	On-going	CAF
Long Phu Company- Hau Giang Province	Transferring technology of farming system of catfish (SUPA)	On-going	CAF
AFIEX Company- An Giang	Transferring Feeding technology for snake-head fish	On-going	CAF
Hoang Long Company– Dong Thap	Transferring Feeding technology for snake head fish	On-going	CAF
Uni President Company	Transferring Feeding technology for snake head fish	On-going	CAF
Hung Duong Company	Transferring technology of seed production of Catfish	Finished 2014	CAF
Truc Anh Company	Transferring technology of super-intensive shrimp farming	Under discussions	CAF
TEXCHEM Company - Malaysia	Transferring technology of Mud crab seed production and culture	Under discussions	CAF
ENOVIK Company	Trials on Feeding of white leg shrimps and catfish	On-going	CAF
DASCO	Microorganic fertilizer (DASVILA)	On-going	BiRDI
Province Seed centers (13 provinces in Mekong delta)	Rice cultivars	On-going	MDI
Bui Van Ngo (VITALIS)	Bought and distribution of rice product	Under-discussion	Prof. Vo Cong Thanh, Department of Agricultural Genetics & Breeding, CAAB
Long An Department of Science & Technology	Rice (aromatic, acid sulphate soil, saline tolerance)	On-going (doing research)	Prof. Vo Cong Thanh, Department of Agricultural Genetics & Breeding, CAAB

Name of Company	Technology Transfer and Research Collaboration	Status	Belongings
GREENFEED Animal Feed Company	Feed, animal breed, product quality and performance	On-going	Department of Animal Science, CAAB
CARGILL Animal Feed company	Feed, animal breed, product quality and performance	On-going	Department of Animal Science, CAAB
DE HEUS Animal Feed company	Feed, animal breed, product quality and performance	On-going	Department of Animal Science, CAAB
EMIVEST Animal Feed company	Feed, animal breed, product quality and performance	On-going	Department of Animal Science, CAAB
CP Group Animal Feed company	Feed, animal breed, product quality and performance	On-going	Department of Animal Science, CAAB
Hau Giang Department of Science and Technology	Selection of some local chicken breeds (Tau Vang, Sao) with good growth and high meat quality	On-going	Department of Animal Science, CAAB
Bac Lieu Department of Science and Technology	Modeling of livestock farms	Under discussions	Department of Animal Science, CAAB
Ca Mau Department of Science and Technology	Genetic resources conservation of local chickens and dogs	On-going	Department of Animal Science, CAAB
Dong Thap Department of Science and Technology	Cooperation in Agriculture development	Under discussions	Department of Animal Science, CAAB
Soc Trang Department of Science and Technology	Modeling of dairy farm system	On-going	Department of Animal Science, CAAB
Vinh Long Department of Science and Technology	Modeling of beef cattle production	Under discussions	Department of Animal Science, CAAB
An Giang Department of Science and Technology	Modeling of beef cattle production	Under discussions	Department of Animal Science, CAAB
Ben Tre Department of Science and Technology	Cooperation in agriculture development	Under discussions	Department of Animal Science, CAAB
Kien Giang Foodstuff Canning Joint Stock Company	+ Heat penetration test. + Temperature distribution in retort.. + Calculation processing tine for current products. + Processing time determination for new products. + Energy saving and improve quality of canned products.	On-going	Prof. Vo Tan Thanh – Department of Food Technology, CAAB
Huong Giang Co., Ltd (Kien Giang province)	+ Heat penetration test. + Temperature distribution in retort. + Calculation processing tine for current products.	On-going	Prof. Vo Tan Thanh – Department of Food Technology

Name of Company	Technology Transfer and Research Collaboration	Status	Belongings
	+ Processing time determination for new products. + Energy saving and improve quality of canned products.		
Khanh Hoa Canned Food Co., Ltd	+ Heat penetration test. + Temperature distribution in retort.. + Processing time .determination for new products. + Energy saving and improve quality of canned products.	On-going	Prof. Vo Tan Thanh – Department of Food Technology
Tin Thinh Co., Ltd (Khanh Hoa province)	+ Heat penetration test. + Temperature distribution in retort.. + Calculation processing tine for current products. + Processing time determination for new products. + Energy saving and improve quality of canned products.	On-going	Prof. Vo Tan Thanh – Department of Food Technology
Special Aquatic Products Joint-Stock Company SEASPIMEX VIETNAM (Ho Chi Minh city)	+ Heat penetration test. + Temperature distribution in retort. + Calculation processing tine for current products. + Processing time .determination for new products. + Energy saving and improve quality of canned products.	On-going	Prof. Vo Tan Thanh – Department of Food Technology
West Food Company (Can Tho city)	+ Heat penetration test. + Temperature distribution in retort. + Calculation processing tine for current products. + Processing time .determination for new products. + Training course on BPCS (*Better Processing Control School*) for technical persons	On-going	Prof. Vo Tan Thanh – Department of Food Technology
Vivian Company Ltd.(Vinh Long province)	+ Heat penetration test. + Temperature distribution in retort. + Calculation processing tine for current products. + Processing time .determination for new products.	On-going	Prof. Vo Tan Thanh – Department of Food Technology

Name of Company	Technology Transfer and Research Collaboration	Status	Belongings
Cuu Long Seaproducts Company (Tra Vinh province)	+ 3D airspace and product temperature distribution in frozen storage room. + Determination the well mixed zone in 3D space of storage room. + Modeling to determination air flow pattern in 3D space of frozen storage room. + Air space and product temperature distribution in IQF. + Temperature distribution during steaming of shrimp.	On-going	Prof. Vo Tan Thanh – Department of Food Technology
To Chau Joint Stock Company (Dong Thap province)	+ 3D airspace and product temperature distribution in frozen storage room. + Determination the well mixed zone in 3D space of storage room. + Modeling to determination air flow pattern in 3D space of frozen storage room. + Air space and product temperature distribution in IQF.	On-going	Prof. Vo Tan Thanh – Department of Food Technology
SEAPRIMEXCO Vietnam (Ca Mau province)	+ 3D airspace and product temperature distribution in frozen storage room + Determination the well mixed zone in 3D space of storage room + Modeling to determination air flow pattern in 3D space of frozen storage room + Temperature distribution during steaming of shrimp	On-going	Prof. Vo Tan Thanh – Department of Food Technology
Rang Dong Company	+ High-Tech cultivation using artificial lighting systems	On-going	Department of Plant Physiology & BioChemistry
DOMESCO	Herb production: + Seeding + Planting technology + Storing technology	On-going	Departments of CAAB
An Giang Plant Protection Joint Stock Company (AGPPS)	Trico-DHCT (Bio-fertilizers)	On-going	Department of Plant Protection

Note 1 : YANMAR CO., LTD. is collaborating with College of Technology in CTU.
Note 2: COBELCO collaborated with College of Agriculture and Applied Biology from 2012 to 2014.

Appendix 3-1

Completing the Network of Universities and Colleges (Decision No. 1269/ CP-KG of Viet Nam's Prime Minister, September 6, 2004)

CHÍNH PHỦ ************	**CỘNG HOÀ XÃ HỘI CHỦ NGHĨA VIỆT NAM** **Độc lập - Tự do - Hạnh phúc** ************

Số: 1269/CP-KG
V/v tiếp tục hoàn thiện mạng lưới các trường đại học, cao đẳng

Hà Nội, ngày 06 tháng 9 năm 2004

Kính gửi:
- Bộ Giáo dục và Đào tạo,
- Bộ Kế hoạch và Đầu tư,
- Bộ Nội vụ,
- Bộ Tài chính,

Xét đề nghị của Bộ Giáo dục và Đào tạo tại tờ trình số 2293/KHTC ngày 25/3/2004 về kế hoạch triển khai Quyết định số 47/2001/QĐ-TTg ngày 04/4/2001 về quy hoạch mạng lưới các trường đại học và cao đẳng Việt Nam giai đoạn 2001 - 2010, Thủ tướng Chính phủ có ý kiến như sau:

1. Đồng ý xây dựng một số cơ sở đại học trọng điểm như sau:

- Đại học Quốc gia Hà Nội,

- Đại học Quốc gia thành phố Hồ Chí Minh,

- Đại học Thái nguyên,

- Đại học Huế,

- Đại học Đà Nẵng.

- Trường Đại học Sư phạm Hà Nội,

- Trường Đại học Sư phạm thành phố Hồ Chí Minh,

- Trường Đại học Bách khoa Hà Nội,

- Trường Đại học Nông nghiệp I Hà Nội,

- Trường Đại học Kinh tế quốc dân Hà Nội,

- Trường Đại học Y Hà Nội,

- Trường Đại học Kinh tế thành phố Hồ Chí Minh,

- Trường Đại học Y thành phố Hồ Chí Minh,

- Trường Đại học Cần Thơ.

2. Bộ Giáo dục và Đào tạo

a. Chỉ đạo xây dựng đề án đổi mới giáo dục đại học, trong đó quy định các tiêu chí cụ thể của các trường đại học trọng điểm, khoa, ngành trọng điểm; có kế hoạch chỉ đạo triển khai cụ thể.

b. Chỉ đạo, hướng dẫn các trường đại học, cao đẳng, chọn lọc đưa vào thí điểm đào tạo một số chương trình và giáo trình tiên tiến, hiện đại thuộc các ngành khoa học tự nhiên, kỹ thuật - công nghệ và quản lý kinh tế đang được giảng dạy ở các trường đại học nước ngoài phù hợp với yêu cầu phát triển của Việt Nam.

c. Chủ trì, phối hợp với Bộ Kế hoạch và Đầu tư xây dựng và triển khai thực hiện đề án "Đổi mới phương pháp giao chỉ tiêu tuyển sinh đại học, cao đẳng hàng năm" gắn với điều kiện bảo đảm chất lượng đào tạo của trường, khả năng đáp ứng của ngân sách nhà nước, nhu cầu sử dụng nhân lực và yêu cầu học tập của xã hội.

3. Về mạng lưới trường đại học, cao đẳng:

a. Về đại học:

- Thành lập một số trường đại học thuộc một số lĩnh vực (đặc biệt trong lĩnh vực xã hội) đang có nhu cầu cấp bách về cán bộ nhưng chưa có trường đào tạo.

- Thành lập một số trường đại học dân lập ở một số tỉnh đã có điều kiện phát triển, có nhu cầu đào tạo nhưng chưa có hoặc có ít trường đại học, cao đẳng.

- Khuyến khích các trường liên kết đào tạo với các cơ sở đào tạo có chất lượng cao của nước ngoài trong lĩnh vực khoa học - công nghệ.

- Thí điểm thành lập một số trường đại học tư thục.

- Đối với một số tỉnh ở các vùng theo quy hoạch về lâu dài cần có trường đại học như trước mắt còn khó khăn, Bộ Giáo dục và Đào tạo nghiên cứu giao cho một số trường đại học mạnh, dựa vào các cơ sở đào tạo sẵn có ở địa phương, chuẩn bị các điều kiện làm cơ sở để phát triển thành trường đại học vào giai đoạn 2006 - 2010.

b. Về cao đẳng:

- Đồng ý thành lập mới một số trường cao đẳng ở các địa phương, đặc biệt là những địa phương khó khăn. Tiến hành tổng kết mô hình trường cao đẳng cộng đồng để có thể nhân rộng mô hình này.

- Đồng ý thí điểm thành lập một số trường cao đẳng tư thục.

4. Bộ trưởng Bộ Giáo dục và Đào tạo chỉ đạo triển khai các công việc nói trên theo quy định hiện hành và thường xuyên báo cáo Thủ tướng chính phủ kết quả thực hiện.

KT. THỦ TƯỚNG CHÍNH PHỦ
PHÓ THỦ TƯỚNG

Phạm Gia Khiêm

(Translation)

PRIME MINISTER
****

SOCIALIST REPUBLIC OF VIETNAM

Independence – Freedom – Happiness
****

No: 1269/CP-KG
V/v completing the network of universities and colleges

Hanoi, September 06th 2004

To: - MOET;
- MPI;
- Ministry of Finance;
- Ministry of Home Office,

Considering the Proposal of the Ministry of Education and Training at the Statement No.2293/KHTC dated 25/3/2004 on implementation plan of Decision No.47/2001/QĐ-TTg dated 04/4/2001 on planning the network of universities and colleges period 2001 - 2010, Prime Minister has the following comments:

1. Agree to build some major universities as below:

- Vietnam National University – Hanoi,
- Vietnam National University – Ho Chi Minh City,
- Thai Nguyen University,
- Hue University,
- Da Nang University.
- Hanoi University of Education,
- Ho Chi Minh City University of Education,
- Hanoi University of Science & Technology,
- Hanoi University of Agriculture I,
- Hanoi National Economics University,
- Hanoi Medical University,
- University of Economics, Ho Chi Minh City,
- Ho Chi Minh City Medical University,
- Can Tho University.

2. MOET

a. To direct the project formulation of the innovation of higher education, in which stipulates the specific criteria of the major universities, faculties, fileds; have plans to direct a specific implementation.

b. To direct, guide the universities, colleges, select to implement the pilot training of some advanced and modern programs and curriculums in the fields of natural science, technology - technical and business management being taught in a foreign university in accordance with the requirements of development of Vietnam.

c. To chair and coordinate with the Ministry of Planning and Investment in the establishment and implementation of the project "Renewal methods of annual enrollment allotment of universities, colleges" associated with conditions that ensure the training quality of schools ability to meet the state budget, needs of human resources use and learning requirements of society.

3. Network of universities, colleges:

a. For universities:

- Establish some universities in fields (particularly in social sectors) are in urgent need of staff but have not yet the training schools.

- Establish some private universities in several provinces have developed conditions, training needs but they have not got or got few universities and colleges.

- Encourage the joint training with high-quality training institutions of foreign countries in the scientific - technology field.

- Pilot establishment of several private universities.

- For some provinces in the region under long-term planning needed university but still got some difficulties, the Ministry of Education and Training assigned the strong universities, based on the available institution in the localities, to prepare conditions as the basis for university development in the period 2006 – 2010.

b. For colleges:

- Agree the new establishment of colleges in some localities, especially the disadvantaged areas. Conduct a model of community college to be able to replicate this mode.

- Agree the pilot establishment of private colleges.

4. Ministry of Education and Training directs the implementation of the above works under the current regulations and regularly reports to the Prime Minister about the results.

P/P PRIME MINISTER
DEPUTY PRIME MINISTER

Phạm Gia Khiêm

Appendix 3-2

CTU Staff Strength (As of December 31, 2013)

CTU Staff Strength

<Units with students>

No	Unit	All Staff Total by Degree	Doctor	Master	BSc & College	Other	Teaching Staff Total by Title	(Prof.)	(A/Prof.)	(Senior Lecturer)	(Lecturer)	Ph.D ratio of teaching Staff (%)
1	College of Agriculture and Applied Biology	162	61	61	9	31	121	4	24	20	73	50.4
2	College of Aquaculture and Fisheries	68	32	24	7	5	57	1	12	11	33	56.1
3	College of Environment and Natural Resources	61	19	34	6	2	57	1	8	5	43	33.3
4	College of Engineering and Technology	194	20	91	65	18	161		1	21	139	12.4
5	College of Information & Communication Technology	78	14	32	28	4	60		2	10	48	23.3
6	College of Rural Development	48	3	14	21	10	31		2		29	9.7
7	College of Natural Sciences	122	18	59	27	18	93		2	22	69	19.4
8	School of Economics and Business Administration	131	19	73	37	2	124		5	9	110	15.3
9	School of Political Science	37	5	21	9	2	31			9	22	16.1
10	School of Social Sciences and Humanities	97	7	60	29	1	94			21	73	7.4
11	School of law	67	5	22	39	1	60			2	58	8.3
12	School of Education	207	26	124	50	7	184		6	51	127	14.1
13	Department of Physical Education	22	1	15	4	2	18			4	14	5.6
14	Biotechnology Research and Development Institute	30	11	9	7	3	22	1	7		14	50.0
15	Mekong Delta Development Research Institute	19	10	5	2	2	16		3	2	11	62.5
16	National Defense Education Center	21			20	1	19				19	0.0
17	School of Pre-University	14		10	1	3	9			2	7	0.0
	Units with Students Total	1378	251	654	361	112	1157	7	72	189	889	21.7
	<Units without students>											
18	Research Institute for Climate Change	1		1			0					-
19	Graduate School	10	2	3	4	1	4		1		3	50.0
20	Center for Foreign Language	11	1	9	1		9			4	5	11.1
21	Cooperative Training Center	4		1	3		0					-
22	Software Center	2		2			2			1	1	0.0
23	Learning Resource Center	41		7	22	12	1				1	0.0
24	Quality Assurance and Testing Center	9	1	3	5		3				3	33.3
25	Information and Network Management	14		3	11		1				1	0.0
25	Center for Services &Technology Transfer	3	1		2		1			1		100.0
26	CTU Publishing House	6	1		2	3	1		1			100.0
28	Administration and Planning Department	36		1	5	30	0					-
29	Personnel Department	29		2	10	17	2			1	1	0.0
30	Finance Department	16		3	7	6	1			1		0.0
31	Facility Management Department	24		1	7	16	1				1	0.0
32	Academic Affairs Department	11	1	2	7	1	2		1	1		50.0
33	Research Affairs Department	8	3	2	3		4		2		2	75.0
34	International Relations Department	11	3		8		3		1	1	1	100.0
35	Student Assistance Department.	18	1	2	12	3	0					-
36	Political Affairs Department	8		1	4	3	0					-
37	Legality Department	4			4		1				1	0.0
38	Construction Management Office	6		2	4		2			2		0.0
39	High School Teacher Practice	12		8	2	2	0					-
40	Communist Party, unions and Associations Office	10		1	9		2				2	0.0
41	Office of Institutional Council for Professor Title & Emulation and Reward	1		1			0					-
	Unit without Students Total	295	14	55	132	94	40	0	6	12	22	
	Total	1673	265	709	493	206	1197	7	78	201	911	22.1

Contract staff paid by the units: 351

Note:

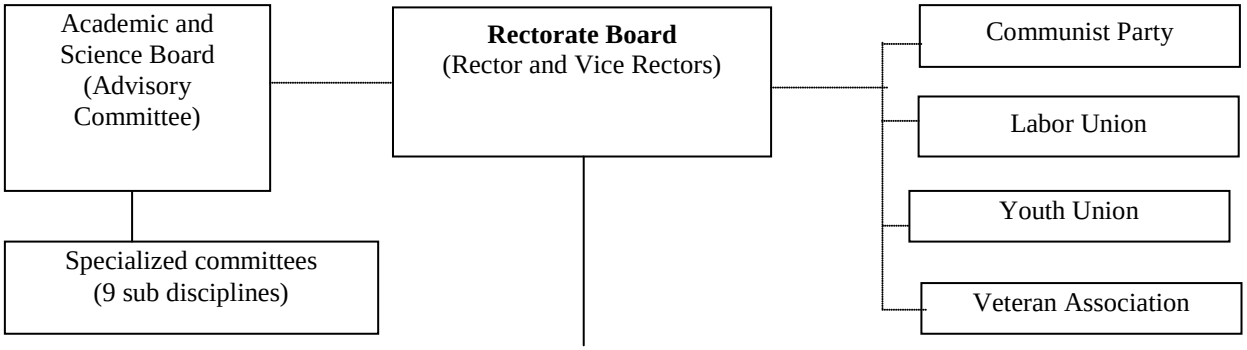
- The number of teaching staff (with PhD holders) is including Prof. and A. Prof. (O is including K and L).

- There are 267 PhD holders including 264 teaching staff and 1 admin. staff (Student Assistance Department) and 2 researchers (one person works in College of Agriculture and Applied Biology and one person works in Software Center. Both of them receive salary from their College and Center so they were not counted in this file. 1673 staff in this file receive salary from CTU)

Appendix 3-3

Organization Structure of CTU

STRUCTURE OF CAN THO UNIVERSITY IN 2013



COLLEGES/SCHOOLS	INSTITUTES/ CENTERS	DEPARTMENTS/ OFFICES
College of Agriculture & Applied Biology	Biotechnology Research and Development Institute	International Relations Department
College of Aquaculture & Fisheries	Mekong Delta Development Research Institute	Administration and Planning Department.
College of Engineering Technology	Research Institute for Climate Change	Academic Affairs Department
College of Environment & Natural Resources	Cooperative Training Center	Facility Management Department
College of Natural Sciences	CTU Lab School	Finance Department
School of Economics & Business Administration	Information and Network Management	Legality Department
Graduate School	Learning Resource Center	Personnel Department
School of Education	Quality Assurance and Testing Center	Political Affairs Department
School of Law	Center for Services and Technology Transfer	Research Affairs Department
School of Political Science		Student Assistance Department.
School of Pre-University		Construction Management Office
School of Social Sciences & Humanities		Office of Institutional Council for Professor Title & Emulation and Reward
Department of Physical Education		
College of Information & Communication Technology	Software Center	
College of Rural Development	Center for Foreign Language	CTU Publishing House

Campus 3

Hoa An (Campus 4)

Campus 1

RECTORATE BOARD
Assoc. Prof. Dr. Ha Thanh Toan, Rector
Assoc. Prof. Dr. Tran Thi Thanh Hien, Vice Rector
Assoc. Prof. Dr. Le Viet Dung, Vice Rector
Assoc. Prof. Dr. Do Van Xe, Vice Rector
Prof. Dr. Nguyen Thanh Phuong, Vice Rector
Assoc. Prof. Dr. Tran Trung Tinh, Vice Rector

UNIONS
Mr. Nguyen Van Linh, Head of Labor Union
Mr. Le Thanh Son, Head of Youth Union
Assoc. Prof. Bui Van Trinh, Head of Veteran

ACADEMIC UNITS
College of Agriculture and Applied Biology: The college offers education programs.
Assoc. Prof. Dr. Le Van Hoa, Dean
Assoc. Prof. Dr. Ly Nguyen Binh, Vice Dean
Assoc. Prof. Dr. Nguyen Minh Thuy, Vice Dean
Dr. Nguyen Van Hon, Vice Dean

College of Aquaculture and Fisheries: The college offers education programs.
Assoc. Prof. Dr. Truong Quoc Phu, Dean
Assoc. Prof. Dr. Tran Ngoc Hai, Vice Dean
Assoc. Prof. Dr. Vu Ngoc Ut, Vice Dean
Dr. Nguyen Thanh Long, Vice Dean

College of Engineering Technology: The college offers education programs.
Dr. Nguyen Chi Ngon, Dean
Dr. Truong Chi Thanh, Vice Dean
Dr. Nguyen Van Cuong, Vice Dean
Dr. Tran Thanh Hung, Vice Dean

College of Environment and Natural Resources: The college offers education programs.
Assoc. Prof. Dr. Nguyen Hieu Trung, Dean
Assoc. Prof. Dr. Nguyen Van Cong, Vice Dean
Dr. Nguyen Xuan Hoang, Vice Dean
Mr. Le Hoang Viet, Vice Dean

College of Information & Communication Technology: The college offers education programs.
Assoc. Prof. Dr. Tran Cao De, Dean
Assoc. Prof. Dr. Huynh Xuan Hiep, Vice Dean
Dr. Ngo Ba Hung, Vice Dean
Mr. Doan Hoa Minh, Vice Dean

College of Natural Sciences: The college offers education programs.
Assoc. Prof. Dr. Bui Thi Buu Hue, Dean
Dr. Nguyen Thanh Tien, Vice Dean
Dr. Ngo Thanh Phong, Vice Dean
Dr. Nguyen Huu Hoa, Vice Dean

College of Rural Development: The college offers education programs.
Assoc. Prof. Dr. Nguyen Duy Can, Dean
Assoc. Prof. Dr. Nguyen Ngoc De, Vice Dean
Dr. Cao Quoc Nam, Vice Dean

School of Economics and Business Administration: The school offers education programs.
Assoc. Prof. Dr. Vo Thanh Danh, Dean
Assoc. Prof. Dr. Le Khuong Ninh, Vice Dean
Assoc. Prof. Dr. Luu Thanh Duc Hai, Vice Dean
Assoc. Prof. Dr. Truong Dong Loc, Vice Dean

School of Education: The school offers education programs.
Dr. Trinh Quoc Lap, Dean
Assoc. Prof. Dr. Nguyen Van No, Vice Dean
Dr. Tran Van Lua, Vice Dean
Dr. Nguyen Thi Thu Thuy, Vice Dean
Mr. Nguyen Thanh Binh, Vice Dean

School of Graduate : In charge of administrative work for graduate programs
Assoc. Prof. Dr. Mai Van Nam, Dean
Mr. Nguyen Vinh An, Vice Dean
Dr. Dang Thi Ngoc Lan, Vice Dean

School of Law: The school offers education programs
Dr. Le Thi Nguyet Chau, Dean
Mr. Diep Thanh Nguyen, Vice Dean
Dr. Phan Trung Hien, Vice Dean

School of Political Science : The school offers education programs. It has its own students. In additional it teaches courses realted to political sciences for all education programs at CTU.
Dr. Le Duy Son, Dean
Dr. Tran Van Hieu, Vice Dean
Dr. Le Ngoc Triet, Vice Dean

School of Social Sciences and Humanities: The school offers education programs.
Dr. Thai Cong Dan, Dean
Dr. Dao Ngoc Canh, Vice Dean
Dr. Diep Kien Vu, Vice Dean
Dr. Nguyen Kim Chau, Vice Dean

School of Pre-University: In charge of training for pre- university courses, and candidates in disadvantage areas to prepare basic knowledge to meet requirements to enter university.
Mr. Dang Van Thuan, Dean
Mr. Son Chanh Da, Vice Dean

Department of Physical Education: The department offers physical education program. It has its own students. In additional it teaches courses realted to physical education for all education programs at CTU.
Mr. Nguyen Van Hoa, Director
Ms. Tran Thi Xoan, Deputy Director
Mr. Nguyen Van Thai, Deputy Director

Biotechnology Research and Development Institute: It is research institute. However, it also offer education programs in Biotechnology, Microbiology. It has its own students.
Assoc. Prof. Dr. Tran Nhan Dung, Director
Assoc. Prof. Dr. Nguyen Van Thanh, Deputy Director
Assoc. Prof. Dr. Ngo Thi Phuong Dung, Deputy Director

Mekong Delta Development Research Institute: It is research institute only. However, it also offer education programs in Rural Development. Its has its own students.
Assoc. Prof. Dr. Nguyen Van Sanh, Director
Dr. Vu Anh Phap, Deputy Director
Dr. Dang Kieu Nhan, Deputy Director

Research Institute for Climate Change: It is research institute only. It does not have its own students.
Prof. Dr. Le Quang Tri, Director
Dr. Le Anh Tuan, Deputy Director

Center of Foreign Languages: The center offers languages courses (English and French) with certificates for CTU students and others.
Dr. Luu Nguyen Quoc Hung, Director
Mr. Nguyen Buu Huan, Deputy Director
Mr. Tran Quoc Hung, Deputy Director

Center of National Defense Education: The center offers courses on National Defense Education to all CTU students.
Assoc. Prof. Dr. Ha Thanh Toan, Director
Mr. Nguyen Vinh Ninh, Deputy Director
Mr. Cao Ngo Bau, Deputy Director

Cooperative Training Center: In charge of administrative work for informal (in service) undergraduate programs, including distant education programs.
Mr. Pham Phuong Tam, Director
Ms. Pham Thi Ngoc Suong, Deputy Director
Mr. Trinh Trung Hung, Deputy Director

Learning Resource Center: In charge library, university learning resource
Mr. Nguyen Hoang Vinh Vuong, Director
Ms. Nguyen Thi Tuyet Trinh, Deputy Director

SUPPORTIVE UNITS
Construction Management Board: *Website: http://websrv2.ctu.edu.vn/dept/dcm*
Functions and tasks: To advise the Rectorate Board in management of all new construction works towards overall development planning cases. Test the quality of materials, building components, installed equipments as required by the design and the approved standards.
Dr. Tran Trung Tinh, Director
Mr. Tran Van Phan, Deputy Director

Department of Academic Affairs: *Website: http://websrv2.ctu.edu.vn/dept/daa*
Functions and tasks: To help the Rector in orientating, developing of training programs, training plans, managing of regular bachelor programs about teaching and learning, curriculum work; to advise the Rector in solving problems arising in the process of training.
Mr. Nguyen Minh Tri, Director
Ms. Vo Thi Ngoc My, Deputy Director

Department of Administration and Planning: *Website: http://websrv2.ctu.edu.vn/dept/dap*
Functions and tasks: to help the Rector and the Rectorate Board in organizing and operating all administrative and clerical activities. To advise the Rectorate Board in planning, monitoring of the performance of plans of the university.
Mr. Duong Thanh Long, Director
Mr. Trinh Ngoc Hoa, Deputy Director
Mr. Nguyen Trong Hieu, Deputy Director

Department of Facility Management: Website: http://websrv2.ctu.edu.vn/dept/dfm
Functions and tasks: to advise the Rectorate Board in planning, management the use of University facilities. Manage and supervise the regularly repairing of houses – structural objects, electric - water - phone systems; monitor, manage the asset procurement and disposal in the University.
Mr. Le Phi Hung, Director
Mr. Le Thanh Phieu, Deputy Director

Department of Financial Affairs: *Website: http://websrv2.ctu.edu.vn/dept/dfa*
Functions and tasks: to advise the Rector on orientations and measures of financial management regulations, take the financial decision of the Rector. Implement the procedures for financial transactions with organizations and individuals inside and outside of University; inspect and control the implementation of the financial management regulations.
Mr. Nguyen Van Duyet, Director
Mr. Vu Xuan Nam, Deputy Director

Department of International Relations: *Website: http://websrv2.ctu.edu.vn/dept/dir*
Functions and tasks: To advise the Rector and the Rectorate Board in the management, implementation of the work of international cooperation of the University. Support professional knowledge and provide information for the University's units to draw up plans, projects and to manage the projects which are being done.
Dr. Nguyen Van Be, Director
Mr. Pham Xuan Binh, Director

Department of Legality: *Website; http://websrv2.ctu.edu.vn/dept/dl*
Functions and tasks: To advise and assist the Rector in implementing the State's inspection authority within the University to promote effective management, ensure and improve the quality of education and training of the University. To ensure that the University will operates under the laws and follow the rule of legislation.
Mr. Vo Xuan Thang, Director
Mr. Tran Van Phuoc, Deputy Director
Mr. Le Van Lam, Deputy Director

Department of Personnel: *Website: http://websrv2.ctu.edu.edu.vn/dept/dp*
Functions and tasks: To help the Rector in the management, planning, training and retraining of staffs, officers and consolidating the organizing of the apparatus; ensure correctly and timely in implementing of the policies of the State for staffs and officers; effectuate the security and order in the University campus.
Mr. Nguyen Van Tri, Director
Ms. Nguyen Thi Kim Loan, Deputy Director

Department of Political Affairs: *Website: websrv2.ctu.edu.vn/dept/dpa*
Functions and tasks: understand the political and ideological situation of the staffs and students, recommend to the Rector guidelines and measures for this work. Organize students and staffs for learning current political issues and news. Coordinate with other units to build a healthy educational environment.
Mr. Tran Thien Binh, Deputy Director
Mr. Vo The Nam, Deputy Director

Department of Research Affairs: *Web: http://websrv2.ctu.edu.vn/dept/dra*
Functions and tasks: To help the Rector and the Rectorate Board in managing the scientific and technological activities of the University. Develop plans, orient in developing of scientific research work and plans of scientific and technological activities of the University. Manage the transfer of scientific advance and enforcement of intellectual property rights.
Assoc. Prof. Dr. Le Van Khoa, Director
Dr. Le Nguyen Doan Khoi, Deputy Director

Information and Network Management Center: *Website: http;//inac.ctu.edu.vn/*
Functions and tasks: To advise the Retorate Board in the building, management and development of the infrastructure of the computer system, services and applications on the network and the Website of the University. Publish scientific journal of the University. Manage and develop the Network Operation Center of Mekong Delta Region (NOC-CT) on the Vietnam Research and Education Network (VINAREN-TEIN2).
Mr. Luu Trung Duong, Director
Mr. Tran Thanh Dien, Deputy Director

Department of Student Affairs: *Website: http://websrv2.ctu.edu.vn/dept/dfa*
Functions and tasks: To advise the Rectorate Board in the management of students, implement the policies of the State, the rules of the University to students. To advise the Board in management all aspects of activities of students' lives.
Dr. Nguyen Thanh Tuong, Director
Mr. Pham Van Hien, Deputy Director
Mr. Phan Quang Vinh, Deputy Director

Quality Assurance and Testing Center : In charge of quality assurance application, several types of university evaluation activities, including by students, staff, and companies
Dr. Phan Huy Hung, Director
Mr. Nguyen Khanh Son, Deputy Director

Center for Services and Technology Transfer : In charge of education service and technology transfer and related finance Dr. Le Thanh Phong, Director
Mr. Dang Van Bach, Deputy Director
Mr. Le Trung Hieu, Deputy Director

Software Center: In charge of developing software for selling or for CTU
Mr. Nguyen Hoang Viet, Director
Mr. Nguyen Phu Truong, Deputy Director
Mr. Le Hoang Thao, Deputy Director

Can Tho University Publishing House: In charge of printing, editing books/ journals for selling
Assoc. Prof. Bui Van Trinh, Director
Mr. La Huu Chau, Deputy Director

Office of Institutional Council for Professor Title & Emulation and Reward: Functions and tasks: to track, manage, organize and advise and assist the Rector in the work related to consideration of the title Professor, Associate Professor of the University. Track, manage, organize and advise and assist to the Rector in the work related to emulation and generally in the University.
Mr. Truong Chi Hai, Director

Appendix 3-4

Some Target Indicators in CTU Strategic Plan 2007–2020, CTU Strategic Plan 2014–2022

(Unofficial Translation)

MINISTRY OF EDUCATION AND TRAINING **SOCIALIST REPUBLIC OF VIETNAM**

No.: 6004/QD-BGDDT **Independence – Freedom – Happiness**

Ha Noi, September 21st, 2007

DECISION
Approving "Overall developing Can Tho University Plan toward 2020" Project

MINISTER OF EDUCATION AND TRAINING

Pursuant to Decree No. 86/2002/ND-CP on November 5th, 2002 of Central Government stipulating the function, responsibility and authority of Ministry, Ministerial agency and Governmental agency;

Pursuant to Decree No. 85/2003/ND-CP on July 18th, 2003 of Central Government stipulating the function, responsibility and authority and structure of Ministry of Education and Training;

Pursuant to Decision No. 121/2007/QD-TTg on July 27th, 2007 of the Prime Minister about approving the planning of university and college network period 2006 – 2020;

Pursuant to Resolution of Central Government No. 14/2005/NQ-CP on November 12th, 2005 about renewing basically and completely the university education of Vietnam period 2006 – 2020;

Pursuant to Decision No. 20/2006/QD-TTg on January 20th, 2006 of the Prime Minister about Education, training and vocational development in the Mekong Delta region toward 2010 and orientation toward 2020;

Considering the recommendation of Director General of Planning-Finance Department,

DECISION:

Article 1: Approving "Overall developing Can Tho University Plan toward 2020" with the main contents as following:

1. General objectives:

Improving Can Tho University toward 2020 to be a major university of interdisciplinary and multisector; centre for education, scientific and technology transfer of the Mekong Delta region; a high prestige name among industrial sector and entrepreneurs.

2.4. Facilities

The overall plan of the University toward 2020 includes 190 ha, in which 128 ha is used for education and research purposes; 51 ha is the public area and 11 ha is used for building of dormitory for teachers and university officials, divided as:

- Operation center: main functions are: management, training, development research (Rectorate building, conference halls, lecture halls, classrooms, education department, laboratories, electronic library, graduate school, etc.);
- Research zone and technology transfer (including institutes, research and technology transfer centers)
- Workshops, stations, experimental farms;
- Sport center, culture center, military training center;
- Dormitory

2.5. Budget

The total budget for implementing the plan until 2020 is 5,900 billion VND, which is divided as following:

- State budget: 3,100 billion VND, accounting for 52.5%;
- Generating from education, research and technology transfer activities: 1,800 billion VND, accounting for 8.5%
- From other sources: 500 billion VND, accounting for 8.5%

3. Implementation:

The following actions have to carry out in order to accomplish the mentioned above objectives and implement Resolution No. 14 of Central Government about renewing basically and completely the university education of Vietnam toward 2020:

3.1. The university should focus in improving the capacity and number of lecturers, management officials and scientific research; recruiting excellent students to improve the quality of lecturers; encouraging for higher education of officials and lecturers by grants from different sources; improving policy to attract more national and international experts to participating in teaching at the university.

- The university should pay more attention in capacity building for the lecturers, officials and researchers.

4. Phases of the Project:

4.1 Period 2007 – 2010:

- Completing land planning, maintaining and upgrading existing structures and buildings; constructing new lecture halls, classrooms, offices, library of colleges, established research institutes; prompting the planning and completing project of new areas; paying special attention on biotechnology, post harvest technology, environment and natural resource management, etc.

- Starting construction of new structures such as working place of College of Aquaculture and Fisheries; Center for Graduate education; Building 1 – College of Economics and Business Administration; Biotechnology Research and Development Institute; School of Pre-University; College of Information and Communication Technology; Building 2 – working place of Department of Marx – Lenin; 3 dormitories and canteens.

- Investing and completing existing laboratories.

- Adjusting budget for capacity building of lecturers which would be 70% of lecturers holding graduate degree (PhD – 25%, Msc – 45%) in 2010. Every year, 100 lecturers and researchers would be appointed for higher education nationally and internationally (in which 20% would study by different grants).

4.2 Period 2011- 2015:

- Maintaining and constructing other classrooms, offices, library and laboratory of each college; constructing Mekong Delta Development Research Institute, School of

Social Sciences and Humanities, School of Economics and Business Administration, School of Natural Sciences, School of Aquaculture and Fisheries and College of Engineering Technology, Sport center and swimming pool, 5 dormitories and 3 canteens.

- Constructing new offices so each professor, associate professor and doctor having individual work place in the university.

- Investing in facilities for laboratories.

- Adjusting budget so that 85% of lecturers holding graduate degree (PhD – 40%, Msc – 45%) in 2015.

3. Department of Personnel is responsible for monitoring the implementation of development of lecturers and officials from 2007 to 2020 at Can Tho University; assessing and guiding the implementation the enhancement of Can Tho University lecturers and officials.

4. Department of University and Graduate Education is responsible for monitoring the implementation of advance courses of Can Tho Universtiy, building up advance teaching methodology; guiding the university in preparation for developing to a excellence university belonging to the top 10 Universities of Asia in 2020.

5. Department of Science and Technology is responsible for monitoring and helping in the implementation of research in application new technology into teaching, especially in Biotechnology, Material technology; giving priority for scientific research in term of budget.

6. Department of International Relation is responsible for monitoring and creating favorable conditions for the University to develop the cooperation in education and research with other prestige universities in the region and on the world; cooperating with the 322 project for capacity building of lecturers and official through higher education in other advanced countries; cooperating with the University and related Departments for policy making in order to attract scientists to come for teaching and research at the Can Tho University.

Article 3: Chiefs of Offices and Head of related Department named in the Article 2, Ministerial Departments and Rector of Can Tho University are **responsible** for implementing this Decision./.

Recipients:
- As Article 3;
- Prime Minister, Deputy Prime Ministers;
- Office of the Government;
- Southwest Steering Committee;
- Ministry of Planning & Investment;
- Ministry of Finance;
- Ministry of Internal Affairs;
- People's Committee of Can Tho City;
- People's Committee of Mekong Delta Provinces;
- Deputy Ministers

On behalf of The Minister

Permanent Deputy Minister

(Signed)

Banh Tien Long

Some Indicators from CAN THO UNIVERSITY – DEVELOPMENT PLAN TO 2020

Table 1: Undergraduate education plan to 2010, 2015 và 2020

	2006	2007	2008	2009	**2010**	**2015**	**2020**
Undergraduate	17,590	19,780	21,490	23,180	**24,560**	**26,674**	**25,000**
Increase rate (%)		12.5	8.6	7.9	**6.0**	**0.993**	**0.987**
Master	1,250	1,434	1,631	1,928	**2,087**	**3,326**	**5,000**
Increase rate (%)		14.7	13.7	18.2	**8.2**	**7.9**	**6.8**
Total	**18,840**	**21,214**	**23,121**	**25,108**	**26,647**	**30,000**	**30,000**

Table 2: Recruiment and total students in different levels and education types

Education levels and types	Year 2010		Year 2015		Year 2020	
	Recruitment	Total students	Recruitment	Total students	Recruitment	Total students
Undergraduate	6,230	24,560	6,184	26,674	5,654	25,000
Master	698	2,087	1,180	3,326	1,744	5,000
Total (Full time)	**6,928**	**26,647**	**7,364**	**30,000**	**7,398**	**30,000**
Per-request	180	180	280	280	280	280
Pre-University	160	160	260	260	260	260
Second Diploma	200	800	200	800	200	800
Tranferred Programs	400	1,000	400	1,200	400	1,200
Working-study part time	4,500	15,200	5,000	19,400	5,000	20,000
Distance Learning	300	600	650	2,650	900	3,950

Table 3: Education scales by colleges

College	Year 2010		Year 2015		Year 2020	
	Undergr	Grad.	Undergr	Grad.	Undergr	Grad.
+ School of Education	3,320	282	3,490	412	3,060	494
+ College of Engineering Technology	3,810	60	4,570	266	4,689	758
+ School of Economics and BA	3,600	180	3,289	194	2,590	253
+ College of Agriculture & Applied Biology	3,380	487	4,060	721	3,650	896
+ College of Natural Sciences	840	435	1,030	437	760	738
+ College of Aquaculture & Fisheries	1,840	120	1,600	204	1,400	285
+ College of ICT	1,220	60	1,250	214	1,250	265
+ School of Law	1,000	54	1,100	96	800	120
+ School of Political Science	360	0	850	54	1.200	120
+ College of Information technology	1090	0	1070	18	1194	120
+ College of social-science and humanities	1420	100	2020	262	2307	342
+ College of Environment & Natural Resource	1090	180	1055	294	1100	355
+ College of Physical Education	200	0	200	0	200	0
Other Units						
+ Mekong Delta Development Research Institute	390	62	400	68	280	94
+ Learning Resource Center	300	0	290	18	240	60
+ Biotechnology Research & Development Inst	400	67	400	68	280	100
Sub-total	**24,260**	**2,087**	**26,674**	**3,326**	**25,000**	**5,000**
Total in CTU	**26,347**		**30,000**		**30,000**	
+ School of Pre-University	340		540		540	

b) Research scales

TT	Types of research projects	2006-2010	2011-2015	2016-2020
		# projects	# projects	# projects
01	Bilateral government collaboration	6	10	15
02	Strengthening scientific research	2	4	15
03	National	2	6	10
04	Ministerially focused	15	25	30
05	Misnisterial	150	200	250
06	Trial production	4	6	10
07	Provincial	100	120	200
08	Technology incubator park	6	10	15
	Total:	**285**	**381**	**545**

b) International training:

Unit: foreigner participants

TT	Types of training	2007	2010	2015	2020
1	Short training	150	300	600	1000
2	Long-term training	10	50	300	500
Total:		**160**	**350**	**900**	**1500**

Table 4: Requirement of staff number to 2020

Year	Total number of students	Staff groups			
		Instructors	Instructor Assistant	Adminis. staff	Total
2007	20,914	952	232	232	1,417
2008	22,821	1,001	254	254	1,508
2009	24,808	1,051	276	276	1,602
2010	**26,347**	**1,100**	**293**	**293**	**1,685**
2011	27,639	1,168	307	307	1,782
2012	28,659	1,236	318	318	1,873
2013	29,466	1,304	327	327	1,959
2014	29,852	1,372	332	332	2,035
2015	**30,000**	**1,440**	**333**	**333**	**2,106**
2016	29,964	1,472	333	333	2,138
2017	29,964	1,503	333	333	2,169
2018	29,964	1,535	333	333	2,201
2019	30,000	1,566	333	333	2,233
2020	**30,000**	**1,598**	**333**	**333**	**2,265**

Table 5: Post-graduate training plan to 2020 for instructors

Year	# Instructors	Lecturers at posgradute degrees					
		Ratio (%)	Number	Ph.D		Master	
				Ratio (%)	Number	Ratio (%)	Number
2006	*902*	*54,4*	*491*	*13,6*	*123*	*40,8*	*368*
2007	952	58	552	16	152	42	400
2008	1,001	62	621	19	190	43	430
2009	1,051	66	693	22	231	44	462
2010	**1,100**	**70**	**770**	**25**	**275**	**45**	**495**
2011	1,168	73	853	27	315	46	537
2012	1,236	76	939	29	358	47	581
2013	1,304	79	1030	31	404	48	626
2014	1,372	82	1125	33	453	49	672
2015	**1,440**	**85**	**1224**	**35**	**504**	**50**	**720**
2016	1,472	87	1280	37	544	50	736
2017	1,503	89	1338	39	586	50	752
2018	1,535	91	1397	41	629	50	767
2019	1,566	93	1457	43	674	50	783
2020	**1,598**	**95**	**1518**	**45**	**719**	**50**	**799**

Table 6: Development plan for instructors (Inst.) and instructor-assistants (Inst. Ass.) in colleges

Colleges/Schools	Year 2010		Year 2015		Year 2020	
	Inst.	Inst. Ass.	Inst.	Inst. Ass.	Inst.	Inst. Ass.
+ School of Education	168	13	219	15	229	15
+ College of Engineering Technology	124	74	177	94	227	94
+ College of ICT	49	22	56	22	64	22
+ College of Agriculture & Applied Biology	131	59	185	74	196	74
+ College of Aquaculture & Fisheries	65	29	69	29	73	29
+ College of Natural Sciences	157	24	204	24	233	24
+ School of Economics and BA	95	4	105	2	93	2
+ School of Law	38	2	51	2	47	2
+ School of Political Science	64	3	99	3	123	3
+ College of Information technology	35	21	39	21	54	21
+ School of Social Sciences and Humanities	39	2	71	3	88	3
+ College of Environment & Natural Resource	43	19	50	20	51	20
+ College of Physical Education	31	2	40	3	44	3
Other units						
+ Biotechnology Research & Development Institute	16	7	18	7	17	7
+ Mekong Delta Development Research Institute	15	7	18	7	17	7
+ Learning Resource Center	7	3	10	4	10	4
+ Can Tho Center of National Defense Education	23	2	29	3	32	3
Sub-total	**1,100**	**293**	**1,440**	**333**	**1,598**	**333**
Total:	**1,393**		**1,773**		**1,931**	

Table 7: Total number of students and staff members in CTU

YEAR	Undergraduates	Graduate students	Staff members			
			Instructor	Inst. Ass.	Admin. staff	Total
2010	**24,260**	**2,087**	**1,100**	**293**	**293**	**1,686**
2015	**26,674**	**3,326**	**1,440**	**333**	**333**	**2,106**
2020	**25,000**	**5,000**	**1,598**	**333**	**333**	**2,264**

a) Income funding sources *(Million VND)***:**

Funding sources	Total 2006 - 2010	Total 2011 - 2015	Total 2016 - 2020	Total 2006 - 20	Ratio (%)
1. State budget	**773,574**	**1,204,042**	**1,126,643**	**3,104,258**	**52.57**
1.1 For undergraduate education	313,215	393,815	389,000	**1,096,030**	
1.2 For post-graduate education	33,140	58,032	88,484	**179,655**	
1.3 For staff training	51,327	61,784	20,790	**133,901**	
1.4 For scientific research	36,000	85,000	178,500	**299,500**	
1.5 For infrastructure	280,932	542,916	338,984	**1,162,833**	
1.6 For targer programs	58,959	62,496	110,885	**232,339**	
2. Education activities	**321,657**	**651,959**	**799,521**	**1,773,136**	**30.03**
2.1 Tution fees from full time programs	155,983	325,661	428,517	**910,161**	
2.1.1 Fulltime undergraduate	139,424	268,426	330,183	**738,033**	
2.1.2 Postgraduate	16,559	57,235	98,334	**172,128**	
2.2 Tution fees from part time programs	135,120	274,800	298,800	**708,720**	
2.3 Collaborative research with provinces	20,000	40,000	60,000	**120,000**	
2.4 Research and production services	10,554	11,499	12,204	**34,256**	
3. Sponsor fundings	**180,320**	**196,120**	**146,560**	**523,000**	**8.86**
4. Other sources	**143,403**	**258,861**	**102,383**	**504,647**	**8.55**
4.1 For infrastructure	106,041	194,716	86,260	**387,018**	
4.2 For targer programs	37,361	64,144	16,123	**117,629**	
Total	**1,418,953**	**2,310,982**	**2,175,107**	**5,905,042**	**100.00**

b) Budget required *(Million VND)*:

Expense	Fungding source	Total 2006-10	Total 2011 - 15	Total 2016-20	Total
1. Full time undergraduate education	State budget	310,215	388,815	384,000	**1,083,030**
	Education activities	104,568	201,319	247,637	**553,524**
	Sub-total	*414,783*	*590,134*	*631,637*	***1,636,554***
2. Post graduate education	State budget	33,415	57,984	88,052	**179,450**
	Education activities	12,419	42,926	73,751	**129,096**
	Sub-total	*45,834*	*100,910*	*161,802*	***308,546***
3. Working-study part time	Education activities	*135,120*	*274,800*	*298,800*	***708,720***
4. Training staff	State budget	51,327	61,784	20,790	**133,901**
	Education activities	22,000	25,000	12,191	**59,191**
	Sub-total	*73,327*	*86,784*	*32,981*	***193,092***
5. Research	State budget	36,000	85,000	178,500	**299,500**
	Education activities	20,000	40,000	60,000	**120,000**
	Sub-total	*56,000*	*125,000*	*238,500*	***419,500***
6. Infracstructure	State budget	280,932	542,916	338,984	**1,162,833**
	Education activities	14,587	37,962	59,019	**111,568**
	Other funding sources	106,041	194,716	86,260	**387,018**
	Sub-total	*401,560*	*775,595*	*484,263*	***1,661,419***
7. Equipment and facilities	State budget	58,959	*62,496*	*110,885*	**232,339**
	Education activities	8,087	*30,000*	*48,555*	**86,642**
	Other funding sources	37,361	*64,144*	*16,123*	**117,629**
	Sub-total	*104,408*	*156,640*	*175,563*	***436,611***
8. Library	State budget	3,000	5,000	5,000	**13,000**
	Education activities	4,600	0	0	**4,600**
	Sub-total	*7,600*	*5,000*	*5,000*	***17,600***
10. Sponsor funding	Staff training	101,760	108,960	46,560	**257,280**
	Equiqment and research activities	78,560	87,160	100,000	**265,720**
	Sub-total	*180,320*	*196,120*	*146,560*	***523,000***
Total budget	State budget	**773,849**	**1,203,994**	**1,126,211**	**3,104,053**
	Education activities	**298,707**	**584,045**	**692,379**	**1,575,131**
	Sponsor funding	**180,320**	**196,120**	**146,560**	**523,000**
	Other sources	**143,403**	**258,861**	**102,383**	**504,647**
	Total	***1,418,953***	***2,310,982***	***2,175,107***	***5,905,042***

Some Indicators from "Proposal on Overall Development Plan for Can Tho University by 2022" (Information As of April 2014)

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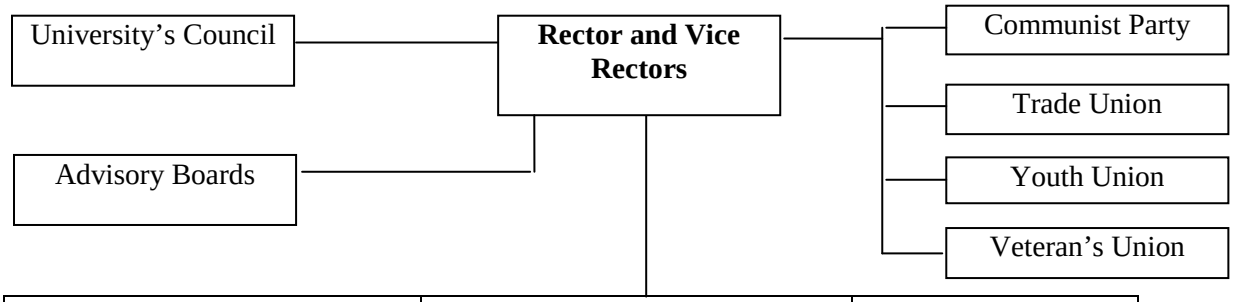
ORGANIZATIONAL STRUCTURE OF CTU BY 2017



Colleges/Schools	Institutes & Centers	Supporting Units
College of Agriculture & Applied Biology	Biotechnology Research & Development Institute	Department of Administration and Planning
College of ICT	Mekong Delta Development Research Institute	Department of Academic Affairs
School of Political Science	Research Institute for Climate Change	Department of Finance
School of Economics and Business Administration	Center of Foreign Languages	Department of International Relations
College of Natural Sciences	Center for Scientific Information and Technology	Department of Personnel
School of Technology (Construction Consultancy and Testing Center + Center for Services and Technology Transfer + Electricity and Electronics Center)	Center for Services and Technology Transfer	Department of Legality
College of Education (Center for Teaching Training)	Center for National Defense Education	Department of Facility Management
College of Aquaculture & Fisheries (Center for Technology Application and Transfer in Fisheries)	Quality Assurance and Testing Center	Department of Student Affairs
School of Law	Learning Resources Center	Department of Political Affairs
College of Social-Science and Humanities	**Center for Chemical Analysis of Environment and Foods**	Department of Scientific Research Affairs
College of Environment & Natural Resource	Cooperative Training Center	Office of Construction Management
School of Pre-University	**Center for Research and Technology Transfer**	Publishing House
College of Rural Development	Software Center	
Graduate School	**Center for Student Assistance**	
Department of Physical Education	**Center for Student Consultancy**	
School of Foreign Languages	**Center for Training, Research and Development of Marine Economics of Mekong Delta**	
	Center for Foreign Language Educational Testing	
	Hoa An Center	
	High School for Teaching Practice	

*** New school/ center/ school are in bold letters**

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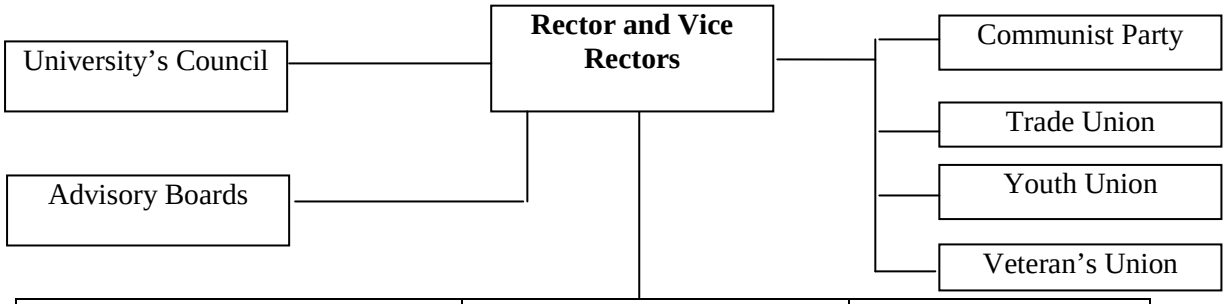
ORGANIZATIONAL STRUCTURE OF CTU BY 2022



Colleges/Schools	Institutes & Centers	Supporting Units
College of Agriculture & Applied Biology	Biotechnology Research & Development Institute	Department of Administration and Planning
College of ICT	Mekong Delta Development Research Institute	Department of Academic Affairs
School of Political Science	Research Institute for Climate Change	Department of Finance
School of Economics and Business Administration	Center of Foreign Languages	Department of International Relations
College of Natural Sciences	Center for Scientific Information and Technology	Department of Personnel
School of Technology	Center for Services and Technology Transfer	Department of Legality
College of Education	Center for National Defense Education	Department of Facility Management
College of Aquaculture & Fisheries	Quality Assurance and Testing Center	Department of Student Affairs
School of Law	Learning Resources Center	Department of Political Affairs
College of Social-Science and Humanities	Center for Chemical Analysis of Environment and Foods	Department of Scientific Research Affairs
College of Environment & Natural Resource	Cooperative Training Center	Office of Construction Management
School of Pre-University	Center for Research and Technology Transfer	Publishing House
College of Rural Development	Software Center	
Graduate School	Center for Student Assistance	
School of Physical Education	Center for Student Consultancy	
School of Foreign Languages	Center for Training, Research and Development of Marine Economics of Mekong Delta	
	Center for Foreign Language Educational Testing	
	Hoa An Center	
	High School for Teaching Practice	

*** New school/ center/ school are in bold letters**

Table 1: Undergraduate education plan by 2010, 2015 and 2020

	2007	2008	2009	**2010**	**2015**	**2020**
College					**204**	
Undergraduate (*all forms of training*)	19,780	21,490	23,180	**24,560**	**41,691**	**54,772**
Undergraduate (*enrollment through the national entrance exam*)	19,780	21,490	23,180	**24,560**	**33,322**	**38,852**
Undergraduate (*excluding students of 2nd diploma and the unconditionally admitted)*	19,780	21,490	23,180	**24,560**	**36,541**	**44,522**
Undergraduate (*excluding students of 2nd diploma)*	19,780	21,490	23,180	**24,560**	**37,791**	**50,272**
Postgraduate	1,434	1,631	1,928	**2,087**	**2,629**	**4,965**
Total number of students of university and college training (excluding students of 2nd diploma) and postgraduate training	**21,214**	**23,121**	**25,108**	**26,647**	**41,790**	**55,343**

Note: 2nd diploma means part time program (not formal program).

Table 2: Enrollment and education plan by different levels of training

Levels and forms of training	2010		2015		2020	
	Enrollment	Total students	Enrollment	Total students	Enrollment	Total students
Undergraduate (*enrollment through the national entrance exam)*	6,230	24,560	8,230	33,322	9,310	38,852
Postgraduate	698	2,087	1,393	2,629	2,357	4,965
2nd diploma	200	800	600	1,500	1,000	2,900
Transferred Programs (From College training to University Training)	400	1,000	150	250	300	550
Nomination	180	180	200	609	300	1150
Pre-university	160	160	250	860	400	1400
Working and studying	4,500	15,200	6,300	19,100	7,800	27,550
Distance Learning	1,859	1,859	5,600	15,900	7,100	20,400

Table 3: Education plan by colleges / schools

No	College / School	2010		2015		2020	
		Under graduate	Post graduate	Under graduate	Post graduate	Under graduate	Post graduate
1	College of Engineering Technology	3,810	5,722	1060	6,680	39040	5,722
2	College of ICT	1,220	1,951	10910	2,000	22029	1,951
3	College of Natural Sciences	840	1,561	2480	1,510	43330	1,561
4	School of Political Science	360	652	00	960	200	652
5	College of Social-Science and Humanities	1,420	100	2,180	600	2,800	2150
6	School of Economics and Business Administration	3,600	180	4,707	440119	4,920	760220
7	College of Aquaculture & Fisheries	1,840	120	1,787	17544	2,240	30079
8	School of Law	1,000	54	1,387	700	2,580	1600
9	College of Environment & Natural Resource	1,090	180	1,654	19439	2,240	26449
10	College of Agriculture & Applied Biology	3,380	487	4,139	360126	4,512	500209
11	College of Education	3,320	282	3,605	28815	3,120	48072
12	College of Rural Development			2,331	00	2,800	600
13	Department of Physical Education	200	0	364	00	600	0
14	Mekong Delta Development Research Institute	390	62	345	10015	320	18020
15	Biotechnology Research & Development Institute	400	67	937	7041	1,240	16040
	Total	**24,260**	**2,087**	**33,322**	(2,220409) **2,629**	**38,852**	(4,177788) **4,965**
	Total number of students	**26,347**		**36,167**		**35,951**	

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b) Scope of human resource is identified based on Decision No 711/QD-TTg dated 13th June 2012 of the Government; Decision No 795/QD-BGDDT dated 27th February 2010, Circular No 57/2011/TT-BGDDT dated 2nd December 2011 of Ministry of Education and Training guiding the calculation of number of student per number of lecturers and the decrease in number of student per number of lecturers for some fields of study, specifically:

No	Fields of study at CTU	2013	2015	2017	2020	2022
1	Engineering, technology, agriculture, forestry, fisheries, water resources, natural sciences, transport, construction	≤ 25	≤ 24	≤ 23	≤ 21	≤ 20
2	Economics, finance, banking, culture, tourism, journalism, library, social-science and humanities, legal affairs, administration	≤ 25	≤ 25	≤ 25	≤ 25	≤ 25
3	Pedagogy, physical education	≤ 25	≤ 24	≤ 23	≤ 21	≤ 20

The percentage of Teaching Assistants / Supporters and Administrative staff is decreased gradually from 40% per current total number of lecturers (in which Teaching Assistants / Supporters account for 23% and Administrative staff account for 17%) so that by 2022 the percentage of Teaching Assistants / Supporters and Administrative staff per total number of lecturers is 30% at maximum (in which Teaching Assistants / Supporters account for 17.5% and Administrative staff account for 12.5%)

c) Scope of human resources development

Table 5: The postgraduate training plan for lecturers by 2022

Year	No of lecturers	Lecturers having postgraduate degree					
		Percentage (%)	Number	PhD		Master	
				Percentage (%)	Number	Percentage (%)	Number
Sept 2012	1,185	73.9	876	18.8	223	55.1	653
Dec 2012	1,203	73.7	886	19.4	233	54.3	653
Sept 2013	1,214	76.0	923	20.6	250	55.4	673
Dec 2013	1,197	77.5	928	22.4	268	55.5	665
2014	1,341	82.6	1,108	25.8	346	56.8	762
2015	1,410	88.4	1,246	29.4	415	59.0	831
2016	1,440	92.4	1,330	31.5	453	60.9	877
2017	1,499	94.2	1,412	36.8	551	57.4	861
2018	1,540	94.5	1,455	42.8	659	51.7	796
2019	1,566	95.0	1,488	49.1	769	45.9	719
2020	1,609	96.1	1,546	56.4	908	39.7	638
2021	1,639	96.3	1,578	60.2	986	36.1	592
2022	1,672	96.9	1,621	62.3	1,043	34.6	578

Table 6: The development plan in number of lecturers in colleges / Schools

Colleges/Schools	Dec 2013	2015	2017	2020	2022
College of Engineering Technology	169	196	204	197	197
College of ICT (from Software Center)	64	78	87	88	87
College of Natural Sciences	94	123	132	144	156
College of Environment & Natural Resource	59	56	59	69	69
College of Agriculture & Applied Biology	125	127	136	144	143
College of Education	202	208	208	208	225
College of Aquaculture & Fisheries	57	55	58	74	75
College of Social-Science and Humanities	103	124	123	138	142
School of Economics and Business Administration	130	141	157	173	188
School of Law	64	72	84	100	108
School of Political Science	32	46	55	62	63

Colleges/Schools	Dec 2013	2015	2017	2020	2022
Department of Physical Education	18	22	27	32	36
College of Rural Development	23	45	44	48	48
School of Foreign Languages (from the College of Education, College of Social-Science and Humanities, Center of Foreign Languages)					
Mekong Delta Development Research Institute	16	18	22	25	24
Biotechnology Research & Development Institute	22	27	31	32	33
Total:	**1,134**	**1,338**	**1,427**	**1,534**	**1,594**

Note:

- From 2013 to 2017 the School of Foreign Languages will be established.
- The percentage of teaching for other units is calculated as follows:

+ The field of study in which lecturers of School of Political Science teach students of other colleges/schools: 30% of the School of Political Science, 70% of the colleges/schools managing that field of study.

+ For National Defense Education: 30% of the Center of National Defense Education, 70% of the colleges/schools managing that field of study.

+ English language (not specialized English): 50% of the teaching colleges/schools (mainly the College of Social-Science and Humanities, and 50% of the colleges/schools managing that field of study.

+ Basic informatics: 50% % of the teaching colleges/schools (mainly the College of Natural Sciences) and 50% of the colleges/schools managing that field of study.

- In College of Rural Development, for the components/fields of study established by the College but managed by other specialized College, then the number of students is added for the specialized College to calculate number of lecturers.
- Number of lecturers and students of the Software Center is added to the number of the College of ICT.

Table 7: Total number of students, officers and lecturers of CTU

Year	Undergraduate	Master	PhD	Officers and Lecturers			
				Lecturers	Supporting staff	Administrative staff	Total
Sept 2013	**28,238**	**2,763**	**162**	**1,214**	**279**	**200**	**1,693**
Dec 2013	**32,679**	**2,763**	**162**	**1,197**	**275**	**201**	**1,673**
2014	32,992	1,939	319	1,341	280	203	1,824
2015	**33,526**	**2,220**	**409**	**1,410**	**282**	**204**	**1,896**
2016	34,760	2,719	520	1,440	283	205	1,928
2017	**35,598**	**3,120**	**624**	**1,499**	**284**	**206**	**1,989**
2018	36,915	3,472	692	1,540	286	207	2,033
2019	37,937	3,853	746	1,566	288	208	2,062
2020	38,522	4,177	788	1,609	289	209	2,108
2021	38,852	4,327	813	1,640	290	210	2,144
2022	**39,062**	**4,352**	**821**	**1,642**	**291**	**211**	**2,174**

Note:

- Administrative staff have personnel classification scale from technician, official and accountant.
- Number of undergraduate is the number of enrollment from the national entrance exam. Number of students at college degree is converted into number of students at university degree, in which 01 student at college degree is equivalent to 0.8 student at university degree.

Appendix 3-5

ViFiNET (Vietnam Fisheries and Aquaculture Institution Network)

ViFINET International Aquaculture Workshop
December 5-8, 2008
Can Tho University, Vietnam

ViFINET
(Vietnam Fisheries and Aquacultute Institution Network
http://www.vifinet.vn/

I. Introduction:

ViFINET is founded 2 April 2005 to promote among Viet Nam Fisheries and Aquaculture Institution Network in oder to research and develop fisheries and aquaculture sustainability in Viet Nam.

2. ViFINET courterpart: 8 members

1. Can Tho University
2. Nha Trang University
3. Nong Lam University
4. Hue University of Agriculture and Forestry
5. Research Institute For Marine Fisheries
6. Research Institute Aquaculture 1
7. Research Institute Aquaculture 2
8. Research Institute Aquaculture 3
9. More,….

3. ViFINET activities:

- Collaboration on training and research;
- Sharing humman capacity;
- Sustainable development;
- Fund to share network`s members.

4. Responsibilities and Benefits of the Network's members:

a. Responsibilities
   - Execute annual action plan approved by the Network. For each term, each members appoint one person to join the Secretariat Board and one joint The Steering Committee.
   - Share operational cost of the Network. All eight members of the Network contribute VND 10 million, plus VND 2 million annually. New members will contribute the same amount as for the founders when joining the Network. The Steering Committee will decide how to use this budget.
   - Facilitate and support training and/or research activities of other members by sharing available resourses where possible.
   - Keep other Network's members informed about on-going or tentative training and research programs at the host insitution .

b. Benefits
   - Access to relevant information and activities of the Network.
   - Receive supports from the Network for training and research activities at the host institution.

- Participate in training or research programs, both national and international, developed by the Network.

5. ViFINET activities:

a. VIFINET hosts Asian-Pacific Aquaculture meeting in Hanoi (2007)

VIFINET, the Vietnamese Fisheries and Aquaculture Institutes Network hosted the Asian-Pacific Aquaculture 2007 meeting in Hanoi, August 2007 The Asian-Pacific Chapter of the World Aquaculture Society partnered with the Ministry of Fisheries, Vietnam to host the event. Dr Le Thanh Luu (RIA No 1) and Professor Patrick Sorgeloos (Ghent University, Belgium) were the Co-Chairs for the Conference Steering Committee and Dr Nguyen Van Hao (RIA No 2) and Dr Graham Mair (Flinders University, Australia) were the Program Committee Co-Chairs.

The conference and trade show were held at the Melia Hanoi Hotel and over 1100 delegates attended, approximately 30% from Vietnam and the rest from over 40 different countries throughout the world. Delegates included farmers, researchers, equipment and service suppliers to the industry, government officers and representatives of all other sectors of the aquaculture industry. The conference included a very comprehensive technical program covering all major aquaculture industries in Vietnam. There were 27 individual sessions with 290 oral presentations and 140 poster presentations. The trade show held 83 booths with representatives from major industry suppliers.

b. ViFINET International Aquaculture Workshop, 5 - 8 December, 2008, Can Tho City, Vietnam

c. Workshop on evaluating and exchanging expreriences (22 July 2011 at CTU)

1.Purpose of workshop

(1) Review activities of the project
(2) Exchange experiences between ViFINET members on the new teaching and training methods via the LMS
(3) Lessons learned and directions

2.Tentative time

The workshop scheduled on 22 July 2011 at CTU

3.Participants

(1) Representative of BTC
(2) Representative of International Cooperation Department, MoET
(3) Leaders, technical staff and teaching staff from ViFiNET members (See **Appendix 2**: Participants of ViFiNET members).
(4) CTU leaders, staff involved project.(5) Guests from CTU (teaching staff and students).

d. E-learning system for ViFINET at CTU 2010

6. Aquaculture organisations & Networks

Acquacoltura
Italian site dedicated to aquaculture

American Fisheries Society (AFS)
A professional society representing fisheries scientists

Aqua
New England aquaculture educators network

Aqua Biotechnology (AquaBio)
Focusing on recirculation in aquaculture

Aqua Farm
Commercial website directory for fish farming, seafood and aquatic species

Aqua.cl
Portal to Aquaculture in Chile (content in Spanish)

Aquaculture Association of Canada (AAC)
The goal of the Aquaculture Association of Canada is to foster an aquaculture industry in Canada, to promote the study of aquaculture and related science in Canada, to gather and disseminate information relating to aquaculture, and to create public awareness and understanding of aquaculture.

Aquaculture Development Program, (ADP)
Department of Agriculture, State of Hawaii

Aquaculture Engineering Society (AES)
... provides a means by which its members can come together to discuss engineering problems related to aquaculture.

Aquaculture Institute for South Africa (AISA)
A coordinating body for Aquaculture in South Africa to promote the integrated development of a sustainable and equitable Aquaculture sector for all South Africans

Aquaculture online
A service providing current information to the worldwide aquaculture community

Aquaculture.com
Links aquaculture professionals by providing content, a supportive community and commerce opportunities

Aquafeed.Com
Uniting feed manufacturers with science, academia, aquaculture farmers and the supply trade

Aquaflow
European Network for the dissemination of Aquaculture RTD information

AquaGuide
Italian site focused on aquaculture and aquarium topics

Aqualog
Books, news...(in french)

Aquamedia
Delivers accurate and up-to-date information about aquaculture in 13 European languages.Aquamedia is being developed by the Federation of European Aquaculture Producers (FEAP) and is also supported by important businesses that operate in the aquaculture sector.

AquaNet
Canada's research network in Aquaculture aims to foster a sustainable aquaculture sector in Canada through high quality research and education.

AquaNIC
The Aquaculture Network Information Center is a gateway to the world's electronic resources for aquaculture

AquaSearch
A targeted search engine related to aquaculture, seafood and fisheries industries

AquaStore
Online store for aquatic productsfeaturing books, software, videos, equipment, supplies, seafood and more

Aquatext
Aquaculture dictionary

Aquatic Network
Information Service for the Aquatic World. Subject areas covered include aquaculture, conservation, fisheries, marine science and oceanography, maritime heritage, ocean engineering, and seafood

AquaTT
The European Aquaculture Training and Technology Transfer Network

Arizona Aquaculture
Information on aquaculture in Arizona

Ascot International Fish Database (Aquafind)

Asian Fisheries Society (AFS)
The Asian Fisheries Society is a scientific society organized in 1984 for fishery professionals in Asia to communicate, share information and cooperate with each other.

Biofilter.Com
BioFilter.Com is an index of aquatic and aquaculture information found on the Internet. We review each article/site submitted to us for relevance, place it into an appropriate category, provide you with the opening paragraph of the document and its active hyperlink. We manually sort the sites because people understand aquaculture much better than search engines do! The information stored here is based upon all of our collective knowledge.

Brazilian Association of Shrimp Producers
In Portuguese

Canadian Aquaculture Industry Alliance (CAIA)
A national organization, a federation of regional and sectoral associations working with and for individuals, business and associations whose work is related to aquaculture

Canarian Association of Fish Farmers (CAFF)

Coastal guide
The largest European website on coastal issues

CONSENSUS
A Multi-Stakeholder Platform for Sustainable Aquaculture in Europe, wishes to ensure that sustainability becomes normal practice in the aquaculture industry in terms of the environment, social contribution and economic success into the future. Another major role of CONSENSUS is to demonstrate to consumers the health benefits of eating fish and shellfish grown in sustainable conditions.

EastFish
Project that supports the development and modernization of the aquaculture and fish processing sectors in Central and Eastern Europe

European Aquaculture Society (EAS)
An international, non-profit association offering services in all fields related to aquaculture

European Association of Fish Pathologists (EAFP)

European Centre for Information on Marine Science and Technology (EurOcean)
Eurocean is an internal portal for sharing information and creating synergy in Europe. It contains a database of the Marine Science and Technology Projects Funded under FP6.

European Fish Ageing Network (EFAN)
Aims to develop, conduct and co-ordinate collaborative research and training, and thereby ensure that age determination becomes a reliable element of the assessments underlying the scientific management advice on fisheries and environmental resources.

European Union for Coastal Conservation (EUCC)
The largest European coastal network

Federation of European Aquaculture Producers (FEAP)
Contains information on European aquaculture production and a variety of linked topics concerning this important sector, and includes data on number of projects developed by the FEAP to assist the progression of European aquaculture.

Fish Info Service (FIS-net)
Provides information from around the world on topics related to fishing Industry, Aquaculture and Seafood

Fish Link Central
A website for aquarium hobbyists with a lot of links to websites about aquariums, aquaculture, all kinds of fish, ...

Fisheries Society of the British Isles (FSBI)
Catering for the interests of professional fish biologists and fisheries managers

Fishfarms.com
Huge list of links to aquaculture sites, classified per species

Fishing for information
Contains links to Internet resources in aquatic science with particular emphasis on aquaculture and fisheries, including fish farming, the culture of shrimp, other crustacea, shellfish and seaweed, capture fisheries, aquariums, angling, marine science, freshwater studies, aquatic environments, toxicology, earth science, water resources and links to relevant business and commercial services

Fishjobs
The seafood industry jobs network

Fishlink
This commercial European service has succeeded to gather a quite extensive number of names and addresses of institutes, companies and organisations in the field of aquaculture and fisheries.

Food and Agriculture Organisation - Fisheries (FAO - Fisheries)
Food and Agriculture Organisation - Fisheries Department

Fundacion Chile

Global Aquaculture Alliance (GAAlliance)
GAA is a nonprofit trade association dedicated to advancing responsible aquaculture. Its FREE NEWSLETTER and Codes of Practice promote environmental sustainability, social responsibility and food safety.

Global Program of Action (GPA)
Global Program of Action for the Protection of the Marine Environment from Land-based Activities

INFOFISH
Intergovernmental organization for marketing information and technical advisory services for fishery products in the Asian and Pacific region

International Aquaculture Webring
Is a webring that has been set up to link as many high quality, aquaculture related websites as possible from around the world.

International Council for the Exploration of the Sea (ICES)
The international science organization studying and helping to safeguard North Atlantic marine ecosystems and the living resources they sustain

International Fishmeal and Oil Manufacturers Association (IFOMA)
International Fishmeal and Oil Manufacturers Association

International Foundation for Science (IFS)
"Is an NGO providing research grants for young scientists from developing countries to perform research in the field of ""Aquatic Resources"""

International Society for Salt Lake Research (ISSLR)
ISSLR was founded to establish effective liaison between persons interested in any aspect of inland saline waters, to encourage these interests, and to educate the public in the scientific use, management,and conservation of salt lakes

International Veterinary Information Service (IVIS)
A not-for-profit organization established to provide information to veterinarians, veterinary students and animal health professionals world wide.

Japanese International Food and Aquaculture Society (Jifas)

Marine Aquarium Council (MAC)
Is an international, not-for-profit organization that brings marine aquarium animal collectors, exporters, importers and retailers together with aquarium keepers, public aquariums, conservation organizations and government agencies

Monitoring and Regulation of Marine Aquaculture (MARAQUA)
This project reviews existing information and the establishment of agreed guidelines for the monitoring and regulation of marine aquaculture

National Shellfisheries Association (NSA)
An international organization of scientists, management officials and members of industry, all deeply concerned with the biology, ecology, production, economics and management of shellfish resources

National Shellfisheries Association (NSA)

Network of Aquaculture Centres in the Asia-Pacific (Naca)
An intergovernmental organization that promotes rural development through sustainable aquaculture. NACA seeks to improve rural income, increase food production and foreign exchange earnings and to diversify farm production. The ultimate beneficiaries of NACA activities are farmers and rural communities.

Northern Aquaculture
Is a monthly publication about cold water aquaculture in North-America, but offers also a lot of other

internet services

Norwegian Herring Oil and Meal Industry Research Institute (SSF)

OneFish
Internet portal providing access to information on fisheries and aquatic research and development

Permanent Advisory Network for Diseases in Aquaculture (PANDA)
Development of a permanent network of experts on infectious diseases of aquaculture species for providing scientific advice on EU policy

PiscesTT
the European forum for Aquaculture Education and Training

Salmon Growing BC
British Columbia salmon farmers association (Canada)

Salt Institute
Source of authoritative information about salt and its uses

Sea-Mart
A website with links to other aquaculture related websites and an aquaculture company database

Southern Regional Aquaculture Center (SRAC)
Is one of five regional aquaculture centers established by Congress

The Aquaculture Knowledge Environment Government Documents Library (Aqua KE)
an information and communication resource designed to help advance knowledge and balanced information sharing on the science, policy, and practice of aquaculture.

The International Foundation for the Conservation of Natural Resources (IFCNR)
A range of individuals, academic institutions, corporations, associations, industries, cultures, non-governmental organizations and government agencies bound together by the desire to promote responsible, sustainable, environmentally compatible, and socially just use and conservation of the Earth's natural resources

The Tropical Fishfarming Site

U.S. Department of Agriculture - Aquaculture Production (LDP-AQS)
Examines the U.S. aquaculture industry, including production, inventory, sales, prices, inputs, and trade of catfish, trout, tilapia, salmon, mollusks, crawfish, shrimp, ornamental fish and new species.

UK Sea Fish Industry Authority (SeaFish)
Promotes the efficiency of the sea fish industry and serves the interests of that industry and the consumers of sea fish and sea fish products

US Trout Farmers Association (USTFA)

VESO Vikan Akvavet
Norwegian centre for veterinary contract research and commercial servicesdistribution of vaccines, research for fish diseases

Washington Fish Growers Association (WFGA)
(USA) the major trends worldwide affecting the production and consumption of seafood

Western European Fish Technologists Association (WEFTA)
Provides technical assistance to those part of the fish industries that handled, processed and marketed fish and fishery products.

World Aquaculture
Dynamic database of information pertaining to aquaculture

World Aquaculture Society (WAS)
The World Aquaculture Society

World Fish Net
Linking to the most important fish related sites and databases around the world.

Appendix 3-6

Staff Members of CAAB in 2014

See Appendix 3-2 for Staff of CAAB as of 2013.

Staff Members of CAAB in 2014

Department Organization	Number of Academic Staff Members in 2014					
	Professor/ Assoc. Professor	Lecturer	Researcher	Others	Administ-rative Staff	**Total**
Administration Office				16	5	21
Agri. Genetics & Breeding	1	7	3	5		16
Animal Sciences	6	11	5	4		26
Crop Science	3	8	7	1		19
Food Technology	4	21	9	2		36
Plant Biochemistry & Physiology	3	10	5	7		25
Plant Protection	2	12	13	7		34
Soil Science	3	10	20	4		37
Veterinary Medicine	6	14	4	3		27
Experimental Unit	1			11		12
Total	29	93	66	60	5	**253**

Source: CAAB

Appendix 3-7

Example of Undergraduate Study in Food Technology of CAAB (for the case of continuing postgraduate study in Food Technology)

Example of Undergraduate Study in Food Technology of CAAB

(For students who are to continue to the master's program in Food Technology of CAAB)

* Compulsory Subject

(*) Virtual Compulsory Subjects (Optional subjects but no other options for these credits)

Subject		Credit
Basic Subjects		
Military Science	*	8
Basic Information Technology	*	1
Practice of Basic Information	*	2
Marxism-Leninism 1	*	2
Marxism-Leninism 2	*	2
Ho Chi Minh Thought	*	2
Revolutionary Way of Vietnamese Communist Party	*	3
Basic Law	*	2
Basic Calculus	*	4
Fundamental Thermomechanics	*	2
Fundamental Thermomechanics Practice	*	1
General Chemistry	*	3
General Chemistry Practice	*	1
Analytical Chemistry	*	3
Analytical Chemistry Practice	*	1
Biochemistry	*	2
Production Management	*	2
Engineering Drawing	*	2
Fluid Mechanics	*	2
Mass and Heat Transfer	*	2
Thermodynamics	*	2
Engineering Electricity	*	2
Fundamental Microbiology	*	2
Food Physiochemistry	*	3
Mass & Heat Balance	*	2
Laboratory of Fundamental Food Engineering	*	2
Physical Training 1	(*)	3
Basic English 1	(*)	4
Basic English 2	(*)	3
Basic English 3	(*)	3
Basic Sociology (or other social science)		2
Basic Knowledge		
Statistics	*	2
Industrial Practice of Food Engineering	*	2

Subject		Credit
Human Nutrition	*	2
Methods of Scientific Research in Food Science and Technology	*	2
Food Chemistry Practice	*	1
Food Microbiology	*	2
Food Microbiology Practice	*	1
Food Quality Management & Legislation	*	2
Principles of Food Preservation and Processing	*	2
Food Processing Technology Essay	*	2
Food Chemistry	*	3
Food Evaluation	*	2
Laboratory of Food Evaluation	*	1
Industrial Food Technology Practice	*	3
Food Machinery	Note 1	2
Bioprocessing Engineering		2
Security and Pollution in Food Production		2
Food Specialized English		2
Specific Subjects		
Food Thermal Processing	*	2
Food Cooling and Freezing	*	2
Postharvest Engineering of Fruit, Vegetables and Cereals	*	3
Fermentation Engineering	*	2
Laboratory of Food Engineering	*	2
Laboratory of Food Technology	*	2
Technology of Vietnamese Traditional Food	Note 2	2
Technology of Milk and Dairy products		2
Technology of Animal Products		2
Functional Food		2
Thesis	*	10
Total Credit		141

Note 1: Other optional subjects

Measuring Tools for Food Technology, Industrial Supply and Waste Water Treatment, Computer Application for Food Technology, Food Physical Properties, Food Additives, Food Packaging, Food Specialized French

Note 2: Other optional subjects

Technology of Sugar, Confectionary and Bakery, Technology of Fishery Products, Technology of Rice and Rice Products, Technology of Edible Oil and Fat Products, Technology of Tea, Coffee and Cocoa, New Food Product Development

Source: Prepared by JICA Study Team from the curriculum table of the Food Technology Program in 2014

Appendix 3-8

Curricula for Undergraduate and Graduate Degree Programs of CAF

Curriculum
Advance Aquaculture Program (BSc)

Study field: Aquaculture **Chuyên ngành: Advance Aquaculture program**

No	Code	Name of courses	Cre-dits	Obl.	Opt.	Lecture	Practice	Requiste	Term
Khối kiến thức Giáo dục đại cương *(General courses)*									
	QP001	Giáo dục quốc phòng *(Millitary training) (*)*	6	6		115	50	Do trường bố trí	
	TC000	Giáo dục thể chất 1 *(Physical fitness training) (*)*	1		1		45		I, II, H
	TC013	Bơi lội *(Physical fitness training)* (*)	1	1			30		I, II
	AQ100	Anh văn tăng cường *(English bridging program)*	12 (+8)	12		180			I, II
	TN051	Hóa đại cương I *(Fundamental of chemistry I – inorganic)*	2	2		30			I, II
	TN052	TT Hóa đại cương I *(Fundamental of chemistry Lab I – inorganic)*	1	1			30		I, II
	TN053	Hóa đại cương II *(Fundamental of chemistry II – organic)*	2	2		30			I, II
	TN054	TT Hóa đại cương II *(Fundamental of chemistry Lab II – organic)*	1	1			30		I, II
	TN055	Hoá phân tích *(Analytical chemistry)*	2	2		30			I, II
	TN056	TT Hoá phân tích *(Analytical chemistry Lab)*	1	1			30		I, II
	TN057	Sinh học đại cương *(Principles of biology)*	2	2		30			I, II
	TN058	TT Sinh học đại cương *(Principles of biology Lab)*	1	1			30		I, II, H
	TN059	Toán cao cấp *(Calculus)*	3	3		45			I, II
	ML009	Những nguyên lý cơ bản của chủ nghĩa Mác-Lênin 1 *(Basic Principles of Marxism – Leninism 1)*	2	2		30			I, II, H
	ML010	Những nguyên lý cơ bản của chủ nghĩa Mác-Lênin 2 *(Basic Principles of Marxism – Leninism 2)*	3	3		45			I, II, H
	ML006	Tư tưởng Hồ Chí Minh *(Ho Chi Minh's ideas)*	2	2		30			I, II, H
	ML011	Đường lối cách mạng của Đảng CS Việt Nam *(Revolution line of Vietnam Communist Party)*	3	3		45			I, II, H
	KT101	Kinh tế đại cương *(Principles of Economics)*	2	2		30			I, II, H
Cộng: 47 TC									
Khối kiến thức Cơ sở ngành *(Aquaculture fundamental)*									
	AQ201	Tiếng Anh nâng cao I *(Advanced English I)*	3	3		45			I, II
	AQ202	Tiếng Anh nâng cao II *(Advanced English II)*	3	3		45			I, II
	AQ203	Tiếng Anh Nuôi trồng thủy sản I *(English for Aquaculture I)*	3	3		45			I, II
	AQ204	Tiếng Anh Nuôi trồng thủy sản II *(English for Aquaculture II)*	3	3		45			I, II
	AQ205	Vi sinh *(Microbiology)*	3	3		30	30		I, II
	AQ206	Nhập môn Khoa học nghề cá *(Introduction to fish science)*	3	3		30	30		I, II
	AQ207	Khoa học môi trường nước *(Water science)*	3	3		45			I, II
	AQ208C	Phân loại học đại cương *(General ichthyology)*	4	4		45	30		I, II
	AQ209C	Ao hồ học *(Limnology)*	4	4		45	30		I, II
	AQ210	Sinh thái học đại cương *(Principles of ecology)*	2	2		30			I, II

No	Code	Name of courses	Cre-dits	Obl.	Opt.	Lecture	Practice	Requiste	Term
	AQ211C	Sinh lý động vật thủy sản *(Aquatic animal physiology)*	4	4		45	30		I, II
	AQ212C	Dinh dưỡng động vật thủy sản *(Aquatic Animal nutrition)*	4	4		45	30		I, II
	AQ213	Nguyên lý nuôi trồng thủy sản *(Principles of Aquaculture)*	3	3		45			I, II
	AQ214	Thống kê và phép thí nghiệm *(Statistics and experimental design)*	3	3		30	30		I, II
	AQ215	Nghệ thuật giao tiếp *(Public Speaking)*	2	2		30			I, II
	AQ216	Phương pháp nghiên cứu khoa học *(Scientific Research Methodology)*	2	2		30			I, II
Cộng: 49 TC									
Khối kiến thức Chuyên ngành *(Aquaculture courses)*									
	AQ301	Kỹ thuật nuôi thủy sản *(Aquaculture production)*	4	4		60			I, II
	AQ302	Quản lý trại giống cá *(Finfish hatchery operation and management)*	4	4		30	60		I, II
	AQ303C	Kỹ thuật nuôi giáp xác và nhuyễn thể *(Shellfish aquaculture)*	4	4		60			I, II
	AQ304	QL trại giống giáp xác và nhuyễn thể *(Shell hatchery operation and management)*	4	4		30	60		I, II
	AQ305	Đại cương về bệnh thủy sản và phương pháp chẩn đoán *(Introduction to fish health and clinical fish disease diagnosis)*	3	3		30	30		I, II
	AQ306	Bệnh Thủy sản *(Fish and shell fish diseases)*	4	4		45	30		I, II
	AQ307	Cải tiến di truyền và quản lý nguồn lợi *(Fish Genetic Enhancement and Resources Management)*	3	3		45			I, II
	AQ308	Sinh học và quản lý nguồn lợi Thủy sản *(Fisheries Biology and Management)*	3	3		30	30		I, II
	AQ309	Thiết bị và công trình thủy sản *(Facilities for Aquaculture)*	3	3		45			I, II
	AQ310	Sản xuất thức ăn tươi sống *(Live food production)*	2	2		30			I, II
	AQ311	Qui hoạch phát triển thủy sản *(Aquaculture planning and management)*	2	2		30			I, II
	AQ312C	Kinh tế thủy sản *(Aquaculture economic)*	3	3		45			I, II
	AQ313	Luật thủy sản *(Fisheries law)*	2	2		30			I, II
	AQ314	Khuyến nông *(Agriculture extension)*	2	2		30			I, II
	AQ315	Thuyết trình *(Seminar/sepcial topics)*	1	1			30		I, II
	AQ401	Luận văn tốt nghiệp *(Graduation thesis)*	10	10			300		I, II
Cộng: 54TC									
Tổng cộng- 150 TC (+8 TC Bridge English)									

Ngày tháng năm 2009

Phê duyệt của Ban Giám hiệu
P.HIỆU TRƯỞNG

Đỗ Văn Xê

Phê duyệt của HĐ.KHĐT
CHỦ TỊCH

Lê Quang Trí

Thủ trưởng đơn vị

Nguyễn Thanh Phương

CURRICULUM FOR MASTER'S DEGREE PROGRAM IN
FISHERIES RESOURCE MANAGEMENT
Code: 60620305

No	Course Code	Course Title	Credits	Core	Elective	Semester
Prerequisite courses			**3**	**3**		
1	ML605	Philosophy	3	3		I, II
2		English				
Fundamental courses			**10**	**6**	**4**	
3	TS624	Scientific Research Methodology	3	3		I
4	TS625	Ichthyology	3	3		I
5	TS605	Aquatic ecology	2		2	I
6	TS626	Marine biology	2		2	I
7	TS628	Water quality management in aquaculture ponds	2		2	I
8	TS645	Water environment biomonitoring	2		2	I
Major courses			**30**	**20**	**10**	
9	TS629	Surveys of Fisheries resources	2	2		I
10	TS630	Fisheries resources Biodiversity and Conservation	3	3		II
11	TS631	Aquatic resource assessment	3	3		II
12	TS632	Aquatic resource management	2	2		II
13	TS633	Fisheries planning and management	2	2		II
14	TS634	Fisheries legislation and policy analysis	2	2		II
15	TS635	Fisheries economics	2	2		I
16	TS637	Fisheries resource management practices	4	4		I
17	TS638	Fish Genetic and Enhancement Resources Management	2		2	I
18	TS636	Seminar/special topics	2		2	
19	TS639	English for Fisheries resource management	2		2	I
20	TS640	Preparation and appraisal of fishery projects	2		2	I
21	TS641	Coastal aquaculture	2		2	II
22	TS642	Freshwater aquaculture	2		2	II
23	TS643	Fishing Technology	2		2	II
24	TS602	Aquatic animal physiology	2		2	I, II
27	TS647	Aquatic seed production	2		2	II
25	TS648	Aquaculture Trade	2		2	II
26	TS649	Application of GIS for fisheries resource management	2		2	II
Graduation course			**10**	**10**		
28	TS900	MSc Thesis	10	10		II
		Total	**53**	**39**	**14**	

CURRICULUM FOR MASTER'S DEGREE PROGRAM IN
Aquaculture
Code: 60620301

No	Course Code	Course Title	Credits	Core	Elective	Semester
Prerequisite courses			**3**	**3**		
1	ML605	Philosophy	3	3		I, II
2		English				
Fundamental courses			**13**	**9**	**4**	
3	TS601	Principles of aquaculture	2	2		I
4	TS602	Aquatic animal physiology	2	2		I
5	TS603	Aquatic animal nutrition and feed technology	3	3		I
6	TS604	Experimental design and scientific writing	2	2		I
7	TS605	Aquatic ecology	2		2	I
8	TS606	Anatomy and population genetics	2		2	I
9	TS607	Eco-toxicology	2		2	I
10	TS645	Water environment biomonitoring	2		2	I
Major courses			**28**	**18**	**10**	
11	TS608	Water quality management in aquaculture ponds	2	2		II
12	TS609	Aquaculture genetics	2	2		II
13	TS610	Brackish water aquaculture production systems	3	3		II
14	TS611	Freshwater aquaculture production systems	3	3		II
15	TS612	Aquatic animal health management	3	3		I
16	TS614	Aquaculture economics	2	2		I
17	TS615	Aquaculture practices	3	3		I
18	TS616	Aquatic resource assessment and management	2		2	II
19	TS613	Aquaculture Planning and Management	2		2	I
20	TS617	English for aquaculture	2		2	II
21	TS618	Water recirculation in aquaculture	2		2	I
22	TS619	Aqua-food safety	2		2	I
23	TS620	Molecular epidemiology	2		2	I
24	TS621	Advances in immunology	2		2	I
25	TS644	Advances in Eco-toxicology	2		2	I
26	TS646	Application of probiotics for Water quality management	2		2	I
27	TS648	Aquaculture Trade	2		2	I
Graduation course			**10**	**10**		
28	TS900	MSc Thesis	10	10		II
		Total	**54**	**40**	**14**	

DOCTORAL PROGRAM IN AQUACULTURE
Code: 62 62 03 01

Applicants need to prepare a research proposal. The research topic must be relevant to a research domain in the list of research orientations provided by the University of Cantho.

Part 1: Coursework

1.1 Courses for holders of a BSc degree in:

- Aquaculture, Aquatic Pathobiology, Aquatic Resources Management, Agronomy, Fishing Technology *(required 30 credits, in which 26 Core credits + 4 Elective credits)*
- Animal Science, Biology education, Bachelor of sciences in biology, Biological and Agricultural Engineering, Environmental Sciences *(required 36 credits, in which 26 Core credits + 10 Elective credits).*

No	Course Code	Course Title	Credits	Core	Elective
1.	ML605	Philosophy	3	x	
2.	TS601	Principles of aquaculture	2	x	
3.	TS602	Aquatic animal physiology	2	x	
4.	TS603	Aquatic animal nutrition and feed technology	3	x	
5.	TS604	Experimental design and scientific writing	2	x	
6.	TS605	Aquatic ecology	2		x
7.	TS606	Anatomy and population genetics	2		x
8.	TS607	Eco-toxicology	2		x
9.	TS608	Water quality management in aquaculture ponds	2	x	
10.	TS611	Freshwater aquaculture production systems	3	x	
11.	TS612	Aquatic animal health management	3	x	
12.	TS615	Aquaculture practices	3	x	
13.	TS610	Brackish water aquaculture production systems	3	x	
14.	TS609	Aquaculture genetics	2		x
15.	TS613	Aquaculture Planning and Management	2		x
16.	TS614	Aquaculture economics	2		x
17.	TS616	Aquatic resource assessment and management	2		x
18.	TS617	English for aquaculture	2		x
19.	TS618	Water recirculation in aquaculture	2		x
20.	TS619	Aqua-food safety	2		x
21.	TS620	Molecular epidemiology	2		x
	Total		**30-36**	**26**	**4-10**

1.2 Courses for holders of an MSc degree in Agricultural Systems, Environmental Sciences, Environmental Management, Ecology, Veterinary Medicine, Biotechnology and holders of MSc degrees in related fields who graduated more than 10 years ago. These students are required to achieved 10 credits from the following list of courses

No	Course Code	Course Title	Credits	Core	Elective
1	TS601	Principles of aquaculture	2		x
2	TS602	Aquatic animal physiology	2		x
3	TS603	Aquatic animal nutrition and feed technology	3		x
4	TS608	Water quality management in aquaculture ponds	2		x
5	TS610	Brackish water aquaculture production systems	3		x
6	TS611	Freshwater aquaculture production systems	3		x
7	TS612	Aquatic animal health management	3		x
8	TS613	Aquaculture Planning and Management	2		x

Part 2. PhD courses, PhD research projects and a literature review

2.1. PhD courses *(8 credits)*

No	Course Code	Course Title	Credits	Core	Elective
1.	TS901	Aquatic animal endocrinology	2	x	
2.	TS902	Application of biotechnology in aquaculture	2	x	
3.	TS903	Cell culture technique	2		x
4.	TS904	Immunology	2		x
5.	TS905	Water quality biomonitoring	2		x
6.	TS906	Freshwater biodiversity and conservation	2		x
7.	TS908	Integrated management of Coastal zone	2		x
8.	TS909	Advances in methodology for socio-economic study in fisheries	2		x
9.	TS910	Appraisal of fishery projects	2		x
	Total		**8**	**4**	**4**

2.2. PhD research projects

- Number of PhD research projects: 2 (6 credits)
- Implementation time period:
  + 1st PhD research project: Second year
  + 2nd PhD research project: Second year

2.3. Literature review

- Implementation time period: Second year

Part 3: Scientific research and Doctoral dissertation

1. Scientific research: Third year or Fourth year
2. Doctoral dissertation: Third year or Fourth year

Appendix 3-9

List of Publication: CAF 2005–2014

LIST OF PAPERS PUBLISHED BY

COLLEGE OF AQUACULTURE AND FISHERIES

CAN THO UNIVERSITY 2005-2014

1. Nguyen Thanh Phuong and **Truong Hoang Minh** (2005). An overview of aquculture sector in Vietnam. Publication online on NACA. pp. 1-14.
2. **Van, M.V**., Abol-Munafi, A.B., Effendy, A.W.M., Asmanelli. (2005). Development of Trypsin and Chymotrypsin During Early Larvae Stage of Marble Goby (*Oxyeleotris marmoratus*). Proceeding of the Kustem 4th Annual Seminar on Sustainability Science and Management on 2-5 May, 2005. At the Primula Beach Resort, Kuala Terengganu, Terengganu, Malaysia. 302-306.
3. **Van, M.V.,** Abol-Munafi, A.B., Effendy, A.W.M., and Liem, P.T. (2005). Development of the Digestive System of Marble Goby (*Oxyeleotris marmoratus*) Larvae. Proceeding of the Kustem 4th Annual Seminar on Sustainability Science and Management on 2-5 May, 2005. At the Primula Beach Resort, Kuala Terengganu, Terengganu, Malaysia. p.79.
4. Hai, T. N and A. Yakupitiyage (2005).The effects of the decomposition of mangrove leaf litter on water quality, growth and survival of black tiger shrimp (Penaeus monodon Fabricius, 1798). Aquaculture, 250 (3-4) 700-712.
5. Phu, T.Q., Yang Yi (2005).The effects of catfish cage-culture on water quality in Hongngu District, Dongthap Province. Scientific Journal of Can Tho University 2005:3 247-258. (Full paper in Vietnamese).
6. Tran Thi Thanh Hien, Tran Ngoc Hai, Nguyen Thanh Phuong, Hiroshi Y. Ogata and Marcy N. Wilder (2005). The effects of dietary lipid sources and lecithin on the production of giant freshwater prawn Macrobrachium rosenbergii larvae in the Mekong Delta region of Vietnam. Fisheries Science 2005; 71 : 279–286.
7. Tran TT Hoa, Richard AJ Hodgson, Dang TH Oanh, Nguyen T Phuong, Nigel J Preston and Peter J Walker (2005). Genotypic Variations in Tandem Repeat DNA Segments between Ribonucleotide Reductase Subunit Genes of White Spot Syndrome Virus (WSSV) Isolates from Vietnam. Diseases in Asian Aquaculture V, 2005, pp. 339-351.
8. Vu Nam Son, Yang Yi & Nguyen Thanh Phuong (2005). River pen culture of giant freshwater prawn Macrobrachium rosenbergii (De Man) in southern Vietnam. Aquaculture Research, Volume 36 Issue 3 Page 284-291, February 2005.
9. Van, M.V, A.B. Abol-Munafi, A.W.M. Effendy, M. Awang Soh (2005). The effect of different diets on proteolytic enzymes activity of early marble goby (oxyeleotris marmoratus) larvae. Journal of Animal Veterinary Advances 4(10): 835-838, 2005.
10. Truong Hoang Minh. (2006). Rotation farming of rice and shrimp in the Mekong Delta, Vietnam. Publication online on CIB. pp. 1-20
11. Phu, T.M., T.L.C. Tu, and T.T.T. Hien (2006). Trials on intensive culture system of Climbing perch (*Anabas testudineus*) using different protein pellets. Scientific Journal of Can Tho University, Specific Issue on Aquaculture and Fisheries 2006(2): 104-109. (Full paper in Vietnamese).
12. Sinh, L.X., D.M. Chung, P.T.N. Khuyen and T.T. Truyen (2006). Social impacts of coastal aquaculture in the Mekong Delta. Scientific Journal of Can Tho University, Specific Issue on Aquaculture and Fisheries 2006(2): 220-234. (Full paper in Vietnamese).
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Total 316 papers

Appendix 3-10

Curriculum of CENRes (Master of Environment and Natural Resources Management)

MASTER PROGRAM Field of Study: Environment and Natural Resources Management
Code: 60 85 01 01

No.	Course Code	Course Title	Credits	R	E	T	P	F	Pr	Semester
Conditional Courses			**4**	**4**	**0**					
1	ML601	Philosophy	4	x						I
2		English (B1 level according to the Can Tho University regulation)								I
Basic Courses			**12**	**8**	**4**					
3	MT 614	Environmental Scientific Research Methodology	2	x		20	20			I
4	MT615	Statistics and Experimental Design in Environmental Science	3	x		30	30			I
5	NNN736	GIS and Remote Sensing	3	x		30	30			I
6	MT616	Environmental Modelling	2		x	20	20			I
7	KT607	Natural Resources and Environmental Economics	2		x	20	20			I
8	MT617	Environmental Sociology	2		x	20		40		I
9	MT618	Special English for Natural Resources and Environment Management	2		x	30				I
Specialized Courses			**28**	**20**	**8**					
10	M619	Environmental Planning	2	x		20		40		II
11	MT620	Soil and Water Management	3	x		30		30		II
12	MT621	Ecology and Wetlands Management	2	x		20		40		II
13	MT622	Institutional Arrangement and Policies for Environmental Management	2	x		20		40		II
14	MT606	Environmental impact Assessment	2	x		20		40		II
15	MT623	Environmental Management for Agriculture and Rural Areas	2	x		20		40		II
16	MT611	Climate Change and Adaptation	2	x		20		40		II
17	MT625	Environmental Monitoring	3	x		30	30			II
18	MT626	Field-trips and Seminar	2	x				120		I
19	MT627	Environmental Management for Industrial Zones	2		x			40		I
20	MT628	Water Supply and Drainage	2		x	20		40		I
21	MT629	Integrated Coastal Resources Management	2		x	20		40		I
22	MT630	Socio-economic Analysis for Intergrated Coastal Resources Management	2		x	20		40		I
23	MT361	Community-Based for Coastal Resources Management	2		x	20		40		I
24	MT632	Flood Management and Mitigation	2		x	20		40		I
Master Thesis/courses			**10**	**0**	**10**					
25	MT900	Thesis	10		x					I,II
26	MT898	Assignment no. 1	5		x					I,II
27	MT899	Assignment no. 2	5		x					I,II
Total			**54**	**32**	**22**					

Notes: R: Required course; S: Selective course; T: Theory hours; P: Practice hours; F: Fieldtrip hours; and. Pr: Prerequisite course

Appendix 3-11

Research Themes in Agriculture Field

Program 1: Plant and Animal Genetics and Breeding

		Research Theme	Laboratory (Research Team)
1.1		**Plant genetics and breeding**	
1.1.1		**Plant resources collection, evaluation and development (rice, other crops, animal forages, etc.) (A)**	
	1	Collecting plant resources for evaluation and development (rice, other crops, animal forages, etc.)	Seed Technology, Molecular Biology, Gene bank, Animal Biotechnology and Molecular Biology
1.1.2		**Application of genetic, breeding and cell culture technologies for new varieties of rice and other crops with improved quality and adaptability to climate changes and other environmental stresses (A)**	
	2	Genetics and breeding of major crops adapted to climate change and other environmental stresses	Plant Molecular Genetics, Molecular Biology, Cell Biotechnology
	3	Application of new technologies to enhance nutrient values of seeds and seed quality planted in problem soils	Plant Breeding, Seed Technology, Plant Physiology, Plant and Animal Biochemistry
	4	Bioinformatics applications to plant genetics and breeding	Plant Molecular Genetics, Molecular Biology
	5	Development of plant cell culture technologies for MD	Cell Biotechnology
	6	Studies on plant responses and adaptation to environmental stresses in MD	Molecular Biology, Plant and Animal Biochemistry, Applied Biological Sciences, Plant Pathology, Entomology, Biological Control
	7	Studies on natural biological active compounds and proteins/enzymes in agricultural production, pharmaceutical, and medical applications	Protein Technology & Natural Products, Stem Cell, Plant and Animal Biochemistry, Applied Biological Sciences, Biological and Chemical Technology in Plant Protection
1.2		**Animal genetics and breeding**	
1.2.1		**Collection, evaluation and development of native animal breeds (B)**	
	8	Collecting animal resources for evaluation and development of native animal breeds	Experimental Animal Farm, Animal Biotechnology and Molecular Biology
1.2.2		**Application of genetic and breeding technologies for new live stock varieties with improved quality and adaptibility to climate changes and other environmental stresses (A)**	
	9	Genetics and breeding of animals for improving growth and reproduction performance, product quality, and disease resistance	Experimental Animal Farm, Animal Biotechnology and Molecular Biology, Advance Testing, Histology and Molecular Pathology
	10	Applications of stem cells in breeding and conservation of animal resources	Stem cell, Experimental Animal Farm
	11	Bioinformatics applications to animal genetics and breeding	Experimental Animal Farm, Animal Biotechnology and Molecular Biology, Molecular Biology

Program 2: Sustainable Production of Tropical Plants and Animals

		Research Theme	Laboratory (Research Team)
2.1		**Crop production**	
2.1.1		**Developing integrated crop management (ICP) for improvement of product quality and adaptation to climate changes (B)**	
	12	Developing integrated management systems to improve rice productivity and quality	Plant Breeding, Molecular Biology, Plant and Animal Biochemistry, Plant Physiology, Plant Pathology, Entomology, Biological Control, Rice Research
	13	Developing integrated management systems to improve the productivity and quality of fruit trees, vegetables, pharmaceutical plants and industrial trees	Horticulture Science, Edible Pharmaceutical Mushroom, Veterinary Pharmacology
	14	Studies on alternative strategies for production of rice and other crop plants under climate change impacts in MD	Molecular Biology, Plant and Animal Biochemistry, Plant Physiology, Plant Pathology, Entomology, Biological Control, Horticulture science, Edible Pharmaceutical Mushroom, Rice Research

Research Theme			Laboratory (Research Team)
2.2		**Plant protection**	
2.2.1		**Studies on insect pests and diseases and development of alternative plant protection technologies (A)**	
	15	Development of plant protection technologies; biopesticides and newly synthesized compounds for crop protection	Plant and Animal Biochemistry, Molecular Biology, Plant and Animal Biochemistry, Plant Pathology, Entomology, Biological Control
	16	Studies on interaction changes among insect pests, crops and beneficial organisms under climate change impacts	Entomology, Biological Control, Biological and Chemical Technology in Plant Protection
	17	Studies on newly emerging insect pests, prediction and forecast of the outbreak of important plant diseases	Plant Pathology, Entomology, Biological and Chemical Technology in Plant Protection
	18	Studies on induced resistance in plants against insect pests and diseases	Molecular Biology, Biological and Chemical Technology in Plant Protection
	19	Identification and application of insect semiochemicals, pathogenic inhibitors and plant-origin pesticidal compounds for plant protection	Biological and Chemical Technology in Plant Protection
	20	Application of molecular techniques in detection/identification of pathogens, insect pests, and beneficial organisms on plants	Molecular Biology, Biological and Chemical Technology in Plant Protection
2.3		**Soil management**	
2.3.1		**Studies on bio-remediation of MD problem soil under impacts of climate change (A)**	
	21	Developing microbiological environmental management technologies for soil nutrition and soil remediation for crop production in MD	Soil Classification and Micromorphology, Soil Microbiology, Soil Chemistry, Soil Physics
	22	Identification of impacts of climate change on soil properties, greenhouse gas emission and soil use in MD toward new cropping systems	Soil Microbiology, Soil Chemistry, Soil classification & micromorphology, Plant Breeding
	23	Identification and application of enzyme activities of microorganisms in the MD soil toward soil pollution remediation	Soil Microbiology, Soil Chemistry, Molecular Biology, Protein Technology, Natural Products
	24	Studies on interaction between soil micro-organisms and plants on soil nutrition enhancement and plant growth stimulation	Soil Microbiology, Soil Microbiology
2.3.2		**Studies on sustainable soil uses (B)**	
	25	Morphological studies and classification of MD soil for sustainable soil uses	Soil Classification and Micromorphology, Soil Physics and Soil chemistry
	26	Development and application of high performance organic and bio-fertilizers	Soil Microbiology, Soil Microbiology, Soil Physics, Molecular Biology
2.4		**Animal production**	
2.4.1		**Improving animal production systems for higher quality and safety of products (A)**	
	27	Enhancement of nutrient values of animal feeds and efficiency of feed conversion for improving quality of animal products	Experimental Animal Farm, Non-ruminant Animal Production Techniques, Animal Nutrition and Feed Technology, Advance Testing
	28	Improvement of animal production systems towards biosafety and environmental challenges	Experimental Animal Farm, Non-ruminant Animal Production Techniques, Advance Testing
	29	Physiological studies on characteristics of animals under different feeding conditions and environmental stresses	Experimental Animal Farm, Animal Anatomy and Physiology
	30	Studies on ruminant animal production systems for Improving production performance and reducing greenhouse gas emission and environmental pollution	Experimental Animal Farm, Ruminant Animal Production Techniques, Advance Testing
2.5		**Animal health management**	
2.5.1		**Molecular studies for detection and identification of animal diseases in MD (A)**	
	31	Studies on disease control systems for improving animal health: all types of pathogenic agents including bacteria, viruses, parasites and fungi	Veterinary Bacteriology and Mycology, Parasitology, Animal Clinic and Virology, Food of Animal Origin Hygiene and Safety, Histology and molecular pathology, Immunology and Epidemiology, Veterinary Pharmacology, Experimental Animal Farm

		Research Theme	Laboratory (Research Team)
	32	Application of molecular techniques in detection/identification of pathogens and beneficial micro-organisms on animals	Molecular Biology, Veterinary Bacteriology and Mycology, Animal Clinic and Virology, Experimental Animal Farm, Histology and Molecular Pathology, Food of Animal Origin Hygiene and Safety, Experimental Animal Farm
	33	Studies on animal tissues for disease diagnosis by histological analysis and molecular techniques (developing a database for diagnosis)	Histology and Molecular Pathology, Food of Animal Origin Hygiene and Safety, Experimental Animal Farm
2.5.2		**Microbial and pharmaceutical studies for animal disease treatment (A)**	
	34	Pharmacological screening of microbial extracts (including *escherechia.coli*) and plant materials for treating animal diseases	Veterinary Pharmacology, Experimental Animal Farm
	35	Studies on antibiotic residues in food-producing animals and antimicrobial resistance in the context of a food chain	Food of Animal Origin Hygiene and Safety, Experimental Animal Farm
	36	Epidemiology, immunobiology and diagnostic aspects of animal viral, bacterial and parasitic infections and principles of host-pathogen interactions	Immunology and Epidemiology, Experimental Animal Farm
2.6		**Agricultural modelling**	
2.6.1		**Simulation of metal-organic frameworks (MOFs) (A)**	
	37	Simulation, modelling and calculation on environmental chemistry, MOFs based materials for storage and adsorption of CO2 and materials for hydrogen energy	Materials and Molecular Modelling
2.6.2		**Agricultural Machineries (A)**	
	38	Mechanical designing and manufacturing for farm machineries	Agricultural Automatic Machinery, Hear Treatment and Material Technology

Program 3: Food Technology and Post-harvest Technology

		Research Theme	Laboratory (Research Team)
3.1		**Post-harvest and Logistics**	
3.1.1		**Studies and development of post-harvest technologies for rice, plant and crop based-food products in MD (A)**	
	39	Studies and modelling of kinetic changes of quality attributes of food	Postharvest Technology, Food Nutrition, Food Technology, Food Chemistry, Food Engineering
3.2		**Food Processing**	
3.2.1		**Development of value added food products from agricultural products and by-products in MD (A)**	
	40	Studies and modelling of kinetic changes of quality attributes of food	Food Technology, Food engineering, Food Tech Food Microbiology, Food Nutrition
	41	Value added products from by-products of food processing	Food Technology, Food Chemistry
	42	Modelling to control 3D product temperature distribution in process room (heating, cooling....)	Food Engineering, Postharvest
	43	Identifying nutritional effects and developing functional food	Food Nutrition, Food Chemistry, Food Tech, Human Nutrition
	44	Identification of functional peptide	Food Biotechnology
	45	Purification and application of enzyme for food processing	Food Biotechnology
	46	Studies on physiology, genetics, biochemistry, and behavior of useful microorganisms in food products of MD	Food Microbiology, Food Biotechnology, Molecular Biology
	47	Studies on probiotics and prebiotics in food products	Food Microbiology, Protein Technology & Natural Products
3.3		**Food Safety and Quality Management**	
3.3.1		**Studies on food pathogens and antibiotics resistant bacteria ()**	
	48	Identification and treatment of food pathogens: pathogens and antibiotic resistant bacteria	Food Microbiology, Molecular Biology

Appendix 3-12

Research Themes in Aquaculture and Fisheries Field

PROGRAM 1	**Climate change: Impacts and adaptation in aquaculture and Fisheries**
1 OVERALL OBJECTIVES	The overall objectives of the program are to enhance capacity of understanding and adaptation solutions to climate change for sustainable development of aquaculture and fisheries
2. SPECIFICIC OBJECTIVES	- To evaluate the impacts of environmental changes on aquatic animal life history, biology, physiology, nutritional value, genetics and health - To find out adaptation measures to climate changes through selective breeding, environmental manipulation, nutrition and feed improvement , health management
3. EXPECTED OUTPUTS	- Scientific data and information about the impacts of environment changes on aquatic animal life history, biology, physiology, nutritional value, genetics and health - At least 5 scientific and technical solutions to adapt to climate changes to through selective breeding, environmental manipulation, nutrition and feed improvement , health management - Workshops, training and technique transfer for 500 persons organized. - 50 scientific paper and 3 books published (30% internationally) - 15 MSc and 3 PhD students involved/graduated (national and international students) - 5 national and international workshops, conferences organized
4. ACTIVITIES	*Joint activities with Japanese experts and students in:* - Conducting in-depth studies on the effects of different environment factors (temperature, salinity…) aquatic animal life history, biology, physiology, nutritional value, and health - Conduct experiments and trials on the feasibility of different technical methods (selective breeding, environmental manipulation, nutrition and feed improvement , health management) for improving aquaculture and fisheries production under environmental changes. - Supervising students doing thesis researches - Organizing workshops, training courses of developed technologies to local people - Publishing scientific papers and books
5. DURATION	8 years (2015-2023)
6. ESTIMATED BUDGET	400,000 USD

PROGRAM 2	**Green technology innovation for aquaculture**
1 OVERALL OBJECTIVES	The overall objectives are to develop and apply advanced and environmental friendly technology for seed production and farming in order to contribute to innovation and sustainable development of aquaculture in Mekong Delta region.
2. SPECIFICIC OBJECTIVES	The specific objectives are: - To develop and apply successfully green technology for seed production (broodstock management and domesticaion, larval rearing technology) and farming systems (recirculating systems, modern marine cage culture, integrated mariculture, sea ranching) of marine and brackish water species (such as marine fish, mollusks, crustacean) in order to contribute to inovation of marine aquaculture – a new and very potential area in the Mekong Delta - To develop and apply successfully green technology for seed production (broodstock management and domesticaion, larval rearing technology) and farming systems (integrated farming systems, recirculating systems, water–reuse aquaculture, bioflocs…) of freshwater water species for sustainable development of inland aquaculture.
3. EXPECTED OUTPUTS	- Successfully breeding 5 new indigenous species, especially marine fish, mollusc, crustacean. - Broodstock management and domestication strategies for 5 species. - Successfully developing and applying 5 modern aquaculture systems such as pond intensive culture, super-intensive recirculating tank culture, bioflocs

	aquaculture systems, integrated aquaculture systems and marine cage culture of important species (freshwater and marine). - Successfully developing and applying 5 farming systems for newly bred species. - Organizing national and international workshops, training and culture technique promotion to 500 people. - Publishing of 40 journals (30% internationally) - Publishing of 3 major books. - Applying 1 patern - Advising to 30 master and Ph.D. thesis, national and international
4. ACTIVITIES	*Joint activities with Japanese experts and students in:* - Studying on artificial seed production of new species, especially marine species. - Studying and developing different modern and environmental friendly aquaculture systems for important cultured species and new species - Applying for effective practice culture (demonstration). - Training and technique promotion. - Publishing to references. - Applying for patern - Advising to student graduate thesis.
5. DURATION	7 years (from 2015 to 2023)
6. ESTIMATED BUDGET	400,000 USD

PROGRAM 3	**Fisheries Resources Management and Conservation**
1 OVERALL OBJECTIVES	The overal objectives are to have better understanding about freshwater and marine aquatic resources, fishing technology and management in order to contribute to development of strategies for sustainability uses, management and conservation of fisheries resources in the Mekong Delta.
2. SPECIFICIC OBJECTIVES	The specific objectives are - To assess and understand on ecophysiology of endangered and stressed species and conservation - To evaluate and monitor on biodiversity and genes pools of aquatic species in Mekong Delta and marine protected area (Phu Quoc,…) - To evaluate and recommend solutions for sustainable capture fisheries management in the Mekong Delta
3. EXPECTED OUTPUTS	- Database on biodiversity, distribution and population dynamics of aquatic species, especially endangered species and marine species. - Status of capture fishing technology and management - Recommendations for sustainable use, management and conservation of aquatic and fisheries resources - 5 training courses for fish stock assessment, fishing techniques and fisheries management for about 200 persons. - Organizing 3 workshops, conferences - 30 scientific papers (30% internationally) - 2 specialist books - 20 post-graduate students
4. ACTIVITIES	*Joint activities with Japanese experts and students in:* - Study on biodiversity and population dynamics of aquatic species - Study on status of capture fisheries technology, socio-economic and management - Workshop and training on fisheries resources management. - Scientific publication - Guide students to carry out research on fish stock assessment and fisheries management
5. DURATION	7 year, 2015-2023

6. ESTIMATED BUDGET	350,000 USD

PROGRAM 4	**Quality improvement of fisheries/aquaculture products**
1 OVERALL OBJECTIVES	The overall objectives of this program are to strengthen the fisheries products processing sector and enhance food safety management to support the sustainable growth of this important industry in the Mekong Delta
2. SPECIFICIC OBJECTIVES	The specific objectives of the program are - To evaluate and recommend for improvement of the evaluation systems for aquatic products safety - To evaluate and recommend for quality improvement of aquatic products in cold chain transportation system - To apply biotechnology in aquatic product processing - To improve the quality of aquatic food products.
3. EXPECTED OUTPUTS	The expected achievements of the program are: - Database on current status of evaluation systems for aquatic products safety and recommendation for improvement of the systems - Database on current status of cold chain transportation system of aquatic products and recommendation for further improvement. - Two (at least) processing protocols (high-tech) of selected aquatic products. - Recommended procedures for evaluation systems for aquatic products safety and cold chain transportation system of aquatic products - Supply of certain natural antioxidant to farmed fish and shrimps to prevent postharvest quality deteriorations, - 50 student thesis involved/graduated; - 30 scientific papers and 1 book published (30% internationally) - 3 workshops, conferences
4. ACTIVITIES	*Joint activities with Japanese experts and students in:* - Study on the status of evaluation systems for aquatic products safety and recommendation for improvement of the systems - Study on the current status of cold chain transportation system of aquatic products and recommendation for further improvement. - Study on application of biotechnology in processing of added of selected aquatic products - Supervision of student thesis researches; transfer of developed processing technologies and analysis protocol to end-users; and publication of scientific papers and book. - Study on the application of natural antioxidants for controlling oxidative deterioration in aquatic food products
5. DURATION	7 years (2015-2023)
6. ESTIMATED BUDGET	300,000 USD

PROGRAM 5	**Environmental monitoring for aquaculture and fisheries**
1 OVERALL OBJECTIVES	The overall objectives are to enhance capacity in monitoring and managing the aquatic environment in order to ensure sustainable development of aquaculture in the Mekong Delta
2. SPECIFICIC OBJECTIVES	The specific objectives are to - To assess and improve monitoring and management of water and sediment quality (physical-chemical-biological factors, including disease pathogens) for inland aquaculture in Mekong Delta - To assess and improve monitoring and management of water quality (physical-chemical-biological factors including disease pathogens) for marine aquaculture

3. EXPECTED OUTPUTS	- Database on aquatic environment (water, sediment and biotic components) of inland and marine aquaculture areas in the Mekong Delta - Procedures for monitoring of aquatic environments for aquaculture areas. - Warning and recommended measures for sustainable management of aquatic environments for aquaculture - 40 papers published (30% internationally) - 2 books on aquatic environment monitoring and management in the Mekong Delta 20 MSc and PhD students participating in graduation theses - Workshop and training for 400 peoples
4. ACTIVITIES	*Joint activities with Japanese experts and students in:* - Studying, monitoring and building database water, sediment and biotic components in inland and marine aquaculture areas of the Mekong Delta - Warning and recommendation on aquatic environment for aquaculture - Conducting training and technology transfer in environmental monitoring and management - Publish papers and books
5. DURATION	7 years, 2015-2023
6. ESTIMATED BUDGET	300,000 USD

PROGRAM 6	**Biochemistry and pharmaceutical science in aquaculture and fisheries**
1 OVERALL OBJECTIVES	The overall objectives are to develop and apply of biochemistry-pharmaceutical science and technologies to promote effective and sustainable development of aquaculture and fisheries in the Mekong Delta.
2. SPECIFICIC OBJECTIVES	The specific objectives are - To develop and apply eco-friendly supplements to reduce drugs and chemicals used for aquaculture - To develop and apply natural bioactive products as functional food for human and for aquaculture
3. EXPECTED OUTPUTS	- 5 products and 5 effective technology processes of extraction and formulation of nutraceuticals, cosmaceuticals and pharmaceuticals, fine chemicals from aquaculture sources for human. - 5 products and 5 effective production technologies of natural derived pharmaceuticals for different sources for aquaculture. - Publishing 30 papers (30% internationally) - 2 books in the field of biochemistry-pharmaceutical technologies for sustainable aquaculture (especially with Japanese partners) - 50 students take part in researches (30% from oversea, especially from Japan). - Applying 1 patern - 5 conferences and training in biochemistry-pharmaceutical technologies for sustainable aquaculture.
4. ACTIVITIES	*Joint activities with Japanese experts and students in:* - To research and develop technological processes for the production of bioproducts from aquaculture sources for human. - To research and develop technological processes for the production of natural derived products for aquaculture. - Technology transfer. - To supervise graduate and undergraduate students doing graduation researches - Publishing research results - Conference attending and organization
5. DURATION	7 years (2015–2023)
6. ESTIMATED BUDGET	200,000 USD

PROGRAM 7	**Engineering and information technology development and application in aquaculture and fisheries**
1. OVERALL OBJECTIVES	The overall objectives are to develop and apply engineering and information technologies to mechanize and modernize aquaculture and fisheries in the Mekong Delta
2. SPECIFICIC OBJECTIVES	The specific objectives are - To study, develop and apply of engineering technology, automatic equipments and advanced materials for aquaculture and fisheries - To study, develop and apply IT (software, database, monitoring and warning systems, GIS and remote sensing and communicate networks) for aquaculture and fisheries management
3. EXPECTED OUTPUTS	- 10 new products produced and 10 technological protocols of production which are applied effectively to aquaculture and fisheries. - Publish 20 papers (30% internationally) - Publish 4 books in technology for aquaculture. - Supervise 100 undergraduate students, postgraduate students for their thesis. - 2 paterns - Workshop, trainining for 400 people
4. ACTIVITIES	*Joint activities with Japanese experts and students in:* - Study on development of engineering technology and information technology in aquaculture - Producing products - Application to aquaculture and fisheries - Organizing training, workshop - Publishing papers and book - Application for patern - Supervise graduate/undergraduate students
5. DURATION	7 years, 2015–2023
6. ESTIMATED BUDGET	200,000 USD

PROGRAM 8	**Fisheries socioeconomics and management**
1 OVERALL OBJECTIVES	The overall objectives are to assess the existing status socio-economic of aquaculture and fisheries; roles of aquaculture and fisheries; impacts of environmental changes on aquaculture and fisheries socio-economic and to recommends for building up strategies and solutions for sustainable fisheries sector development in the Mekong Delta
2. SPECIFICIC OBJECTIVES	The specific objectives are - To evaluate status and roles of aquaculture and fisheries in socio-economics - To evaluate the impacts of environmental changes on socio-economics of aquaculture activities in Mekong Delta region - To evaluate the impacts and roles of policies on sustainable development of aquaculture and fisheries - To evaluate and improve the value chain in aquaculture and fisheries
3. EXPECTED OUTPUTS	- Reports on evaluation of status and roles of aquaculture and fisheries in socio-economic and recommendation for improvement - Reports on evaluation of the impacts of environmental changes on socio-economics of aquaculture activities in Mekong Delta region and recommendation for improvement - Reports of roles of policies on development of aquaculture and fisheries and recommendation for improvement - Reports on value chains and recommendation for improvement - 10 workshops, training courses, sharing information a among stakeholders (producers, traders, managers and scientists) - 20 scientific papers on the above aspects - 03 books of socio-economics and management in fisheries - 50 theses of Bachelor, Master and PhD students

4. ACTIVITIES	*Joint activities with Japanese experts and students in:* - Investigating on the current status and trends of aquaculture and capture fishery development - Providing useful information and recommending for aquaculture and fisheries socio-economic management and development - Publishing papers and books - Organizing training courses, workshops and conferences - Supervising under graduate and graduate students to conduct their researches
5. DURATION	7 years, 2015–2025
6. ESTIMATED BUDGET	USD 100,000

Appendix 3-13

Research Themes in Environment Field

LIST OF PROJECTS IN ENVIRONMENT-RELATED FIELDS CATEGORIZED BY 12 RESEARCH THEMES (SINCE 2008)

1USD=21.000 VND

No.	Related to research topics(*)	Project title	Period (start-end)	Budget (USD)	Sponsor	Partners
1. To recognize current problems, evaluate impacts and project trends of changes in the field environment and natural resources in the Vietnamese Mekong Delta (VMD) 1.1. Water & land resources monitoring						
	Dept.					
1	***Environment and Natural Resources (CENRes)***	Community-based environmental monitoring using social media for the Mekong Delta – a salinity monitoring prototype	2011 - 2014			USAID, USGS, IUCN
2		To investigate sediment flux through the Song Hau mouth and adjacent tidal channels	2012 - 2013			Washington University, The United States
3		Community-based climate change adaptation in the Ca Mau province	2012			World Vision Vietnam
4		Flood dynamics and damages of the flood in the study area of the Mekong Delta in 2011	03 - 09/2012			Jircas, Japan
5		Current situation on dyke systems in Dong Thap and An Giang provinces	07 - 12/2012			Jircas, Japan
6		Multi-level adaptation to floods and the governance of risk in the Mekong Delta, Vietnam	2007- 2008			M-POWER
7	***Environmental Sciences (CENRes)***	Assessing the impacts of flood control systems to soil fertile, loading capacity of water sources and community health for sustainable agricultural development	2013-2015	61.640	Department of Natural Resources and Environment of An Giang province	
8		Assessing the residues of organophosphate, carbamate and pyrethroid in main rivers and canals in HauGiang province	2012-2015	29.871	Department of Science and Technology of Hau Giang province	
9		Assessing the Arsenic (As) pollution in the Mekong delta	2012-2015	4.599	Vietnamese Ministry of Education and Training	
10	***Land Resources (CENRes)***	Application of GIS in database management for socioeconomic & environmental resources in HauGiang				
11		Climate change and rice monitoring for enhancing food security: A case study from Mekong Delta, Vietnam				
12		The Remote sensing-based Information and Insurance for Crops in Emerging economies				
1. To recognize current problems, evaluate impacts and project trends of changes in the field environment and natural resources in the Vietnamese Mekong Delta (VMD) 1.2. Analyzing & modelling water & land resources						
13	***Environment and Natural Resources (CENRes)***	Climate change affecting land use in the Mekong Delta: Adaptation of rice-based cropping systems	2011 - 2014			ACIAR, IRRI

No.	Related to research topics(*)	Project title	Period (start-end)	Budget (USD)	Sponsor	Partners
	Repeated	To investigate sediment flux through the Song Hau mouth and adjacent tidal channels	2012 - 2013			Washington University, The United States
1. To recognize current problems, evaluate impacts and project trends of changes in the field environment and natural resources in the Vietnamese Mekong Delta (VMD) 1.3. Evaluating changes of the agro-ecological changes under great threats of the in-situ development and climate change						
14	***Environment and Natural Resources (CENRes)***	Adaptation to climate change: Land-use innovative models applied to environmental management	2012 - 2014			Peers, France
15		Climate change affecting land use in the Mekong Delta: Adaptation of rice-based cropping systems	2011 - 2014			ACIAR, IRRI
16		To develop climate change adaptation strategies in the coastal areas of the Vietnamese Mekong Delta: The case study of the TràVinh province	2012 - 2013			HSF
17	***Land Resources (CENRes)***	Climate change and rice monitoring for enhancing food security: A case study from Mekong Delta, Vietnam				
1. To recognize current problems, evaluate impacts and project trends of changes in the field environment and natural resources in the Vietnamese Mekong Delta (VMD) 1.4. Analysis of economic efficiency of natural resources uses and problems in natural resource uses and management						
18	***Environment and Natural Resources (CENRes)***	Assessing economic and welfare values of fish in the Lower Mekong Basin: To establish a coordinated monitoring of fish resources through a network of universities	2012 - 2015			Worldfish, ICLARM
19	***Land Resources (CENRes)***	Wise use of tropical peatlands: focus on Southest Asia				
20		Study on the current status and potential for exploitation of clay resource in the Mekong delta (University study)				
2. To study on the mitigation of environmental impact 2.1. To study the possible mitigation strategies to eliminate impacts of natural disasters on agriculture, aquaculture and water supply (including both urban & industry sections)						
21	***Environment and Natural Resources (CENRes)***	Rainwater harvesting in the Can Tho City, Vietnamese Mekong Delta	02 - 12/2013			CtC and CCCO
22		An integrated approach for risk assessment in the coastal agro-ecological zone of the Bến Tre province				
23		Project 1: Climate adaptation through sustainable urban development with the case study on urban water systems in Can Tho, Vietnam	2010 - 2012			CSIRO, Australia
24	***Natural Sciences College***	A Study towards the Effect of Antioxidants on Vietnamese Catfish Fat Biodiesel. Researcher: Nguyen Van Dat	Jan. 15, 2010 –Mar. 15, 2010	Invited by New Energy Foundation (NEF), Japan	New Energy Foundation (NEF) Japan	National Institute of Advanced Industrial Science and Technology (AIST)

No.	Related to research topics(*)	Project title	Period (start-end)	Budget (USD)	Sponsor	Partners
25		Potential of Utilizing Some Biomass Sources as a Feedstock for Biodiesel and Oxidation Stability of Biodiesel-Diesel Blends (The collaborative research activities with National Institute of Advanced Industrial Science and Technology under the Asia Biomass Energy Researchers Invitation Program 2010). Researcher: Nguyen Van Dat	Sep. 13. 2010 –Dec. 12. 2010	Invited by New Energy Foundation (NEF), Japan	New Energy Foundation (NEF) Japan	National Institute of Advanced Industrial Science and Technology (AIST)
26		Studies on the Oxidation Stability of Coconut Based Biodiesel And Coconut – Jatropha Biodiesel Blends (The collaborative research activities with National Institute of Advanced Industrial Science and Technology under the Asia Biomass Energy Researchers Invitation Program 2010). Researcher: Dr. Bui ThiBuu Hue	Dec. 1, 2010 –Feb. 25, 2011	Invited by New Energy Foundation (NEF), Japan	New Energy Foundation (NEF) Japan	National Institute of Advanced Industrial Science and Technology (AIST)
27		Biofuel Research Principal Investigator: Bui ThiBuu Hue	Dec. 1, 2013 – ongoing research	28,000	Yanmar Japan	Yanmar Agriculture Research Institute in Cantho
28	***Land Resources (CENRes)***	Application of GIS technology to track and predict the migration of pest presence of rice in Mekong Delta				
29		The Remote sensing-based Information and Insurance for Crops in Emerging economies				
30		Climate change and rice monitoring for enhancing food security: A case study from MD, VN				
2. To study on the mitigation of environmental impact 2.2. To study possible techniques to treat the soil, water and air pollutions in the specific context of the Vietnamese Mekong Delta						
31	***EnviEng (CENREs)***	Promotion of biogas appliation in the Mekong Delta of Vietnam	2009 - 2012	50.000	TRIG project - Vietnamese Ministry of Education & Training	Technical University of Braunschweig - German
32		Design and implementation of biogas lighting	2010 - 2011	5.000	JIRCAS - Japan	JIRCAS
33		Design and implement the Arsenic removal unit for groundwater at TraVinh province	2009 - 2010	5.000	Provincial budget	
34		INVENT: Integrated Waste Management modules for different courses of graduate studies	2007 - 2009		Funded by Asia-Link project	Bremen University, Dresden University - German, King Mong Kut Uni - Thailand, National University of Laos, Royal University of Agriculture - Cambodia

No.	Related to research topics(*)	Project title	Period (start-end)	Budget (USD)	Sponsor	Partners
35		SANSED: Closing nutrient cycles in decentralised water treatment systems	2003 - 2008		Funded by BMBF	Bonn University, Bochum University - German
36		Wastewater treatment by wetland system	2003 - 2008		Funded by VLIR-A21	Catholic University of Leuven - Belgium
37	***ChemEng (CoET)***	Research and development of polymer composite materials based on natural fibre	2007-2009		MOST – Vietnam and BelSpo - Belgium	MTM – KULeuven, Polymer Center – Hanoi University of Technology
38		Improvement of the processing of natural fibres for composites and development of natural fibre composite applications	2009-2011	70.000	MOST – Vietnam and BelSpo	MTM – KULeuven, Polymer Center – Hanoi University of Technology
39		Completing the extraction technology, perform technology from coconut fibers and applications for composite	2014 -2016	175.000	MOST – Vietnam and BelSpo	MTM – KULeuven, Polymer Center – Hanoi University of Technology
40		Research and development of composite reinforced with coconut fibres	2010	1.500	Can Tho University	
41	***EnviSci (CENRes)***	Technical effects of Chlorella sp. and Spirulina sp. biomass in catfish ponds	2011-2012	2.142	Cantho University	
42		Study of using bazan soil to remove phosphorous in the seafood processing wastewater	2011-2011	2.797	Cantho University	
43		Using the wastewater from catfish ponds to grow Spirulina sp. for fish fingerlings	2013-2015	1.422	Cantho University	
44		Using Ozone to treat Arsenic in groundwater	2009-2010	711	Cantho University	
45		Effects of man-made materials to treat nitrogen and phosphoros in wastewater from food processing factories	2009-2012	4.619	Vietnamese Ministry of Education and Training	
46		Water resources management for long-term sustainability in climate change context: Treatment and reuse aquaculture water by eco-technology in the coastal zones of the Mekong Delta, Vietnam	2012-2014	10.920	IFS (Sweden)	Aquaculture College (CTU), Aarhus University (Denmark)
47		Integrated constructed wetlands in recirculation aquaculture system in the Mekong Delta	2010-2011	4.000	PhysCAM Project (DANIDA)	Aquaculture College (CTU), Aarhus University (Denmark)
48	***Land Resources (CENRes)***	Evaluate potential fertility and the limiting factor on rice paddy and fruit garden in HauGiang				

No.	Related to research topics(*)	Project title	Period (start-end)	Budget (USD)	Sponsor	Partners
49		Development of new technologies and their practice for sustainable farming systems in the Mekong delta				
50		Improving quality and productivity of pineapple in Go Quao, KienGiang				
51		Study on New alkaline fertilizer for acid soil reclamation in the MD				
2. To study on the mitigation of environmental impact 2.3. To study changes of the farming systems to support eliminate pollutants loaded to the environment (including GHG)						
	Environment and Natural Resources (CENRes)	Adaptation to climate change: Land-use innovative models applied to environmental management	2012 - 2014			Peers, France
2. To study on the mitigation of environmental impact 2.4. To study the planning and managing mechanism of managing rural, urban and industrial zones to eliminate the pollutant loaded to the environment (including GHG)						
52	***Environment and Natural Resources (CENRes)***	Rainwater harvesting in the Can Tho City, Vietnamese Mekong Delta	02 - 12/2013			CtC and CCCO
53	***Environmental Sciences (CENRes)***	Assessing the status of managing sewage sludge in Cantho city	2008-2009	711	Cantho University	
54		Study of using sewage sludge to produced organic fertilizers in Cantho city	2012-2014	23.233	Department of Science and Technology of Hau Giang province	
55		Flood and urban erosion management based on community in Cantho city	2013-2014	31.165	ISET-Rockefeller (USA)	
56		Sustainable biogas production from waste rice straw	2012-2016	443.834	DANIDA-Denmark	
57		Study of feasibility of rural development projects based on cleaner development mechanisms in the Mekong delta	2008-2016	365.373 (2008-2013)	JICA-Japan	
2. To study on the mitigation of environmental impact 2.5. To study possible solutions to protect the existing biodiversity and natural resources						
58	***Environmental Sciences (CENRes)***	Study of solutions to control Mimosa pigra	2008-2010	1.422	Vietnamese Ministry of Education and Training	
2. To study on the mitigation of environmental impact 2.6. To study the socio-economic feasibility of the (above) solutions						
3. To study on the resilience and adaptive capacity of local residents in the context of environmental changes 3.1. To study on the resilience of different farming systems in the context of extreme weather events and environmental degradation						
59	***Environment and Natural Resources (CENRes)***	Adaptation to climate change: Land-use innovative models applied to environmental management	2012 - 2014			Peers, France

No.	Related to research topics(*)	Project title	Period (start-end)	Budget (USD)	Sponsor	Partners
60		Water governance and gender in the context of climate change in the coastal area of Mekong Delta, Viet Nam	01 - 12/2013			MPOWER
61		An integrated approach for risk assessment in the coastal agro-ecological zone of the Bến Tre province				
3. To study on the resilience and adaptive capacity of local residents in the context of environmental changes 3.2. To study on the adaptation strategies on sustainable uses of natural resources in the context of climate change and environmental degradation						
62	***Environment and Natural Resources (CENRes)***	Rainwater harvesting in the Can Tho City, Vietnamese Mekong Delta	02 - 12/2013			CtC and CCCO
63	***Environmental Sciences (CENRes)***	Using cholinesterase to assess contaminated water by agro-chemicals and effects of these chemicals to snakehead fish (Channastriata)	2010-2013		Department of Science and Technology of Hau Giang province	
64	***Land Resources (CENRes)***	Using multispectral and multispatial remote sensing images to monitor shifting of aquaculture system on coastal wetlands in the MD				

Note: *Classification of research topics have to be cited in uniform manner as number below

1. To recognize current problems, evaluate impacts and project trends of changes in the field environemt and natural resources in the Vietnamese Mekong Delta (VMD)

1.1. Water & land resources monitoring
1.2. Analyzing & modelling water & land resources
1.3. Evaluating changes of the agro-ecological changes under great threats of the in-situ development and climate change
1.4. Analysis of economic efficiency of natural resources uses and problems in natural resource uses and management

2. To study on the mitigation of environmental impact

2.1. To study the possible mitigation strategies to eliminate impacts of natural disasters on agriculture, aquaculture and water supply (including both urban & industry sections)
2.2. To study possible techniques to treat the soil, water and air pollutions in the specific context of the Vietnamese Mekong Delta
2.3. To study changes of the farming systems to support eliminate pollutants loaded to the environment (including GHG)
2.4. To study the planning and managing mechanism of managing rural, urban and industrial zones to eliminate the pollutant loaded to the environment (including GHG)
2.5. To study possible solutions to protect the existing biodiversity and natural resources
2.6. To study the socio-economic feasibility of the (above) solutions

3. To study on the resilience and adaptive capacity of local residents in the context of environmental changes

3.1. To study on the resilience of different farming systems in the context of extreme weather events and environmental degradation
3.2.To study on the adaptation strategies on sustainable uses of natural resources in the context of climate change and environmental degradation

Appendix 3-14

Proposal of Autonomy Transfer to Can Tho University (No. 627/ ĐHCT-KHTH CTU Rector, April 17, 2013)

(Unofficial Translation)

MINISTRY OF EDUCATION AND TRAINING
SOCIALIST REPUBLIC OF VIETNAM

CAN THO UNIVERSITY **Independence – Freedom – Happiness**

N^0: 627/ ĐHCT-KHTH *Can Tho, April 17, 2013*

Ref: Proposal of autonomy transfer to Can Tho University

To: **Ministry of Education and Training**

On March 20, 2013, the Prime Minister and the delegation of Ministries and Agencies paid a visit to Can Tho University (CTU). At the meeting, on behalf of the Ministry of Education and Training (MoET), Vice Minister Bui Van Ga, upon the recommendations and suggestions from CTU, confirmed the strong support on CTU institutional autonomy and self responsibility. Therefore, CTU has to take initiative on detailed planning and submit it to MoET.

After that working session, the Government Office has publicized an announcement Ref. 146/TB-VPCP dated on April 1st, 2013 of the Prime Minister's conclusion upon the official visit to Can Tho University. In this official dispatch (clause 3 term a), the Prime Minister approved CTU to be a nationally leading university on focus, and to have the autonomy and self-responsibility; assigning MoET to consider, solve specific proposals on autonomy.

According to the announcement from the Government Office and the policy from MoET on strengthening the autonomy and self-responsibility; following the guidance of Prime Minister and Deputy Minister, CTU respectfully requests the consideration of MoET:

1. Supporting and allowing CTU to self-print undergraduate, graduate degrees based on the degree samples that have been issued by MoET.
2. Permitting CTU to approve of cooperative training projects implemented with domestic and international partners towards undergraduate and graduate degrees.
3. Consenting on the appraisal and decision on offering new undergraduate and graduate training programs that require ensuring the regulations and terms of new training programs from MoET.

CTU respectfully requests the review and approval of MoET.

Sincerely,

RECTOR

(signed)

Ha Thanh Toan

Appendix 3-15

Member List of Academic and Scientific Committee, and 9 Sub-Committees, CTU

Academic and Scientific Board (Advisory Committee), Can Tho University
(2012–2017 term)

1. Assoc. Prof. Dr. Ha Thanh Toan, Rector
2. Assoc. Prof. Dr. Tran Thi Thanh Hien, Vice Rector
3. Assoc. Prof. Dr. Le Viet Dung, Vice Rector
4. Assoc. Prof. Dr. Do Van Xe, Vice Rector
5. Prof. Dr. Nguyen Thanh Phuong, Vice Rector
6. Assoc. Prof. Dr. Vo Thanh Danh, Dean, School of Economics and Business Administration.
7. Assoc. Prof. Dr. Tran Cao De, Dean, College of Information and Communication Technology
8. Dr. Le Thi Nguyet Chau, Dean, School of Law
9. Assoc. Prof. Dr. Bui Thi Buu Hue, Dean, College of Natural Sciences
10. Assoc. Prof. Dr. Truong Quoc Phu, Dean, College of Aquaculture and Fisheries
11. Dr. Nguyen Chi Ngon, Dean, College of Technology
12. Dr. Le Duy Son, Dean, Scholl of Political Sciences
13. Dr. Trinh Quoc Lap, Dean, School of Education
14. Assoc. Prof. Dr. Tran Nhan Dung, Director, Biotechnology Research and Development Institute
15. Assoc. Prof. Dr. Le Van Hoa, Dean, College of Agriculture and Applied Biology
16. Dr. Thai Cong Dan, Dean, School of Social Science and Humanities
17. Assoc. Prof. Dr. Nguyen Hieu Trung, Dean, College of Environment and Natural Resources
18. Prof. Dr. Le Quang Tri, Director, Research Institute for Climate Change
19. Assoc. Prof. Dr. Ly Nguyen Binh, Vice- Dean, College of Agriculture and Applied Biology
20. Mr. Nguyen Thanh Son, Chairman, People's Committee of Can Tho City
21. Dr. Nguyen Duc Nghia, Vice President, National University Ho Chi Minh City.
22. Dr. Le Van Banh, Director, Cuu Long Rice Research Institute.
23. Dr. Nguyen Van Hoa, Deputy- Director, Southern Horticultural Research Institute.
24. Mr. Tran Trong Khiem, Director, Department of Education and Training of Can Tho City.
25. Assoc. Prof. Dr. Vo Van Son, Director, Center for Research and Product Development, VEMEDIM.

II. PERMANENT ACADEMIC AND SCIENTIFIC BOARD

1. Assoc. Prof. Dr. Le Viet Dung, Chairman
2. Prof. Dr. Le Quang Tri, Permanent Vice-Chairman
3. Assoc. Prof. Dr. Do Van Xe, Vice-Chairman
4. Prof. Dr. Nguyen Thanh Phuong, Vice-Chairman
5. Assoc. Prof. Dr. Ha Thanh Toan, Member
6. Assoc. Prof. Dr. Vo Thanh Danh, Member
7. Dr. Nguyen Chi Ngon, Secretary

III. SECRETARIATE

1. Mr. Nguyen Minh Tri, Head
2. Assoc. Prof. Dr. Le Van Khoa, Vice- Head
3. Assoc. Prof. Dr. Mai Văn Nam, Member
4. Dr. Trinh Quoc Lap, Member
5. Assoc. Prof. Dr. Vo Thanh Danh, Member
6. Dr. Nguyen Chi Ngon, Member
7. Assoc. Prof. Dr. Ly Nguyen Binh, Member.

IV. SPECIALIZED COMMITTEE

Natural Sciences Sub- Committee

1. Assoc. Prof. Dr. Bui Thi Buu Hue, Chairman
2. Dr. Ngo Thanh Phong, Vice- Chairman
3. Dr. Nguyen Thanh Tien, Secretary
4. Dr. Nguyen Thi Thu Thuy, Member (School of Education).
5. Dr. Ho Quoc Phong, Member (College of Engineering Technology)
6. Dr. Nguyen Huu Khanh, Member (College of Natural Sciences)
7. Dr. Vo Van Tai, Member (College of Natural Sciences)

Engineering Technology Sub- Committee

1. Dr. Nguyen Chi Ngon, Chairman
2. Assoc. Prof. Dr. Tran Cao De, Vice- Chairman
3. TS. Truong Chi Thanh, Secretary
4. Assoc. Prof. Dr. Tran Trung Tnh, Member
5. Dr. Ngo Ba Hung, Member (College of Information &Communication Technology)
6. Assoc. Prof. Dr. Huynh Xuan Hiep, Member (College of Information &Communication Technology)
7. Dr. Nguyen Van Cuong, Member (College of Engineering Technology)

Environment and Natural Resources Sub- Committee

1. Assoc. Prof. Dr. Nguyen Hieu Trung, Chairman
2. Assoc. Prof. Dr. Nguyen Van Cong, Vice- chairman
3. Dr. Nguyen Xuan Hoang, Member
4. Prof. Dr. Le Quang Tri, Member (Research Institute for Climate Change)
5. Assoc. Prof. Dr. Le Anh Tuan, Member (Research Institute for Climate Change)
6. Assoc. Prof. Dr. Nguyen Huu Chiem, Member (College of Environment and Natural Resources)
7. Dr. Van Pham Dang Tri, Member (College of Environment and Natural Resources)

Agriculture and Biotechnology Sub- Committee

1. Assoc. Prof. Dr. Le Van Hoa, Chairman
2. Assoc. Prof. Dr. Tran Nhan Dung, Vice- chairman
3. Assoc. Prof. Dr. Nguyen Minh Thuy, Secretary
4. Assoc. Prof. Dr. Ha Thanh Toan, Member
5. Assoc. Prof. Dr. Ngo Thi Phuong Dung, Member (Biotechnology Research and Development Institute)
6. Assoc. Prof. Dr. Ly Nguyen Binh, Member (College of Agriculture and Applied Biology)
7. Assoc. Prof. Dr. Do Vo Anh Khoa, Member (College of Agriculture and Applied Biology)
8. Assoc. Prof. Dr. Nguyen Duy Can, Member (College of Rural Development)
9. Dr. Dang Kieu Nhan, Member (Mekong Delta Development Research Institute)

Aquaculture and Fisheries Sub- Committee

1. Assoc. Prof. Dr. Truong Quoc Phu, Chairman
2. Assoc. Prof. Dr. Tran Ngoc Hai, Vice- Chairman
3. TS. Pham Thanh Liem, Secretary
4. Prof. Dr. Nguyen Thanh Phuong, Member
5. Assoc. Prof. Dr. Tran Thi Thanh Hien, Member
6. Assoc. Prof. Dr. Vu Ngoc Ut, Member (Aquaculture and Fisheries)
7. Assoc. Prof. Dr. Dang Thi Hoang Oanh, Member (College Aquaculture and Fisheries)
8. Assoc. Prof. Dr. Nguyen Van Thanh, Member ((Biotechnology Research and Development Institute)

9. Assoc. Prof. Dr. Nguyen Van Cong, Member (College of Environment and Natural Resources)

Education Science Sub- Committee

1. Dr. Trinh Quoc Lap, Vice- Chairman
2. Dr. Tran Van Lua, Vice- Chairman
3. Assoc. Prof. Dr. Lam Quoc Anh, Secretary
4. Assoc. Prof. Dr. Nguyen Van No, Member (School of Education)
5. Assoc. Prof. Dr. Nguyen Thi Hong Nam, Member (School of Education)
6. Assoc. Prof. Dr. Tran Thanh Ai, Member (School of Education)
7. Dr. Bui Phuong Thanh Huan, Member (School of Education)
8. Assoc. Prof. Dr. Duong Hieu Dau, Member (College of Natural Sciences)
9. Dr. Tran Van Nam, Member (School of Social Science and Humanities)

Social Science and Humanities Sub- Committee

1. Dr. Thai Cong Dan, Chairman
2. Dr. Dao Ngoc Canh, Vice- Chairman
3. Dr. Tran Thi Phung Ha, Secretary
4. Assoc. Prof. Dr. Le Viet Dung, Member
5. Dr. Nguyen Kim Chau, Member (Scholl of Social Science and Humanities)
6. Dr. Diep Kien Vu, Member (Scholl of Social Science and Humanities)
7. Dr. Phan Huy Hung, Member (Quality Assurance and Testing Center)

Economics Sub- Committee

1. Assoc. Prof. Dr.Vo Thanh Danh, Chairman
2. Assoc. Prof. Dr. Nguyen Van Sanh, Vice- Chairman
3. Assoc. Prof. Dr. Truong Dong Loc, Secretary
4. Assoc. Prof. Dr. Do Van Xe, Member
5. Assoc. Prof. Dr. Le Khuong Ninh, Member (School of Economics and Business Administration.);
6. Assoc. Prof. Dr. Luu Thanh Duc Hi, Member (School of Economics and Business Administration.);
7. Assoc. Prof. Dr.Vo Thi Thanh Loc, Member (Mekong Delta Development Research Institute)

Political Science and Law Sub- Committee

1. Dr. Le Thi Nguyet Chau, Chairman
2. Dr. Le Ngoc Triet, Vice- Chairman
3. Dr. Pham Van Beo, Secretary
4. Dr. Le Duy Son, Member (School of Political Science)
5. Dr. Tran Van Hieu, Member (School of Political Science)
6. Dr. Pham Van Bua, Member (School of Political Science)
7. Dr. Phan Trung Hien, Member (School of Law).

Appendix 3-16

Quality Assurance

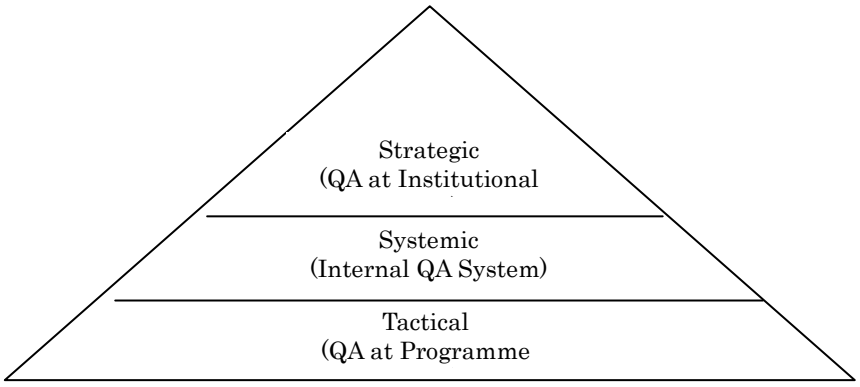
Quality Assurance

<1> MOET'10 quality standards for Accreditation at Institution level. (2nd edition, 2007-2008)

1. Mission and goals of the University: (2 criteria)
2. Organization and Management: (7 criteria)
3. Curriculum (Training programs): (6 criteria)
4. Instructional /training activities (7 criteria)
5. Teaching and managing staff (8 criteria)
6. Students (9 criteria)
7. Research and Technology Development: (7 criteria)
8. International co-operation (3 criteria)
9. Library and Facilities and infrastructure (9 criteria)
10. Finance & Financial Management (3 criteria)

<2> AUN Model

According to ASEAN University Network Quality Assurance (AUN-QA) model, it has the 3 levels of stages as shown in the chart below: 1) Tactical: programme level, 2) Systemic: internal QA system, and 3) Strategic: institutional level.



Source: Guide to AUN Actual Quality Assessment at Programme Level

Figure AUN-QA Models for Higher Education

<3> AUN Model for Programme Level

The AUN-QA Model for Programme level focuses on teaching and learning with regard to the following dimensions.

- Quality of input
- Quality of process
- Quality of output

AUN Standards

1. Expected learning outcome:

1) The curriculum is developed to promote learning, learning how to learn and to install in students a commitment of lifelong learning (e.g. commitment to critical inquiry, development of study and information-processing skills, a willingness to experiment with new ideas and practices.)

2) The curriculum offers to graduates the ability to do advanced studies, to competent in their field of study. The graduates should also have transferable skills, leadership skills, and should be oriented to the job market and be able to develop their careers.

3) The curriculum has clearly formulated learning outcomes, reflecting the relevant

demands and needs of all stakeholders.

<Check list>
1.1 The expected learning outcomes have been clearly formulated and translated into the programe
1.2 The programme promotes life-long learning
1.3 The expected learning outcomes cover both generic and specialized skills and knowledge
1.4 The expected learning outcomes clearly reflect the requirements of the stakeholders

<Source of Evidence>
- Programme and module specification
- Course brochure and prospectus or bulletin
- Skills matrix
- Stakeholders' input
- University and faculty website
- Communication media and plans to stakeholders
- Curriculum review minutes and documents
- Accreditation and benchmarking report

2. <u>Programme specification:</u>

1) Universities are recommended to publish, for each programme they offer, a programme specification which identifies potential stopping off points and gives the intended outcomes of the programme in terms of: - The knowledge and understanding that the students will have upon completion, - key skills: communication, numeracy, the use of information technology and learning how to learn, - cognitive skills, such as an understanding of methodologies or ability in critical analysis, -subject specific skills, such as laboratory skills, clinical skills, etc.

2) Programme specification is a concise description of the intended outcomes of learning from a higher education programme, and the means by which these outcomes can be achieved and demonstrated.

3) Programme specification makes explicit the intended outcomes in terms of knowledge, skills and attitudes. They should help students to understand the assessment method that enable achievement to be demonstrated; and the relationship of the programme and its study elements to the qualification frameworks in each member country and to any subsequent professional qualification or career path.

<Check list>
2.1 The university uses programme specification
2.2 The programme specification shows the expected learning outcomes and how these can be achieved
2.3 The programme specification is informative, communicated and made available to the stakeholders
<Source of Evidence>
- (same as above mentioned)

3. <u>Programme structure and content:</u>

1) The curriculum shows a balance between specialized contents, general knowledge and skills. The curriculum is designed to meet the needs of the stakeholders.

2) The curriculum takes into account and reflects the vision, mission, aims and objectives

of the institution. The vision, mission, aims and objectives are explicit and are known to staff and students.

3) The curriculum shows the expected competence of the graduate. Each course should clearly be designed to show the expected outcomes of the course competencies. To obtain this, a curriculum map should be constructed.

4) The curriculum is designed so that the subject matter is integrated and strengthens other courses in the curriculum.

5) The curriculum is structured to show range, depth, coherence and organization of the course.

6) The curriculum structure shows clearly the basic courses, the intermediate courses, the specialized courses and the final project, thesis or dissertation.

<Check list>
3.1 The programme content shows a good balance between generic and specialized skills and knowledge
3.2 the programme reflects the vision and mission of the university
3.3 the contribution made by each course to achieving the learning outcomes is clear
3.4 the programme is coherent and all subjects and courses have been integrated
3.5 The programme shows breadth and depth
3.6 The programme clearly shows the basic courses, intermediate courses, specialized courses and the final project, thesis or dissertation
3.7 the programme content is up-to-date

<Source of Evidence>
- (same as above mentioned)

4. <u>Teaching and learning strategy:</u>

1) Staff are encouraged to employ action learning. Action learning is a continuous process of learning and reflection, supported by peers, with the intention of achieving quality student learning. Through action learning, university teachers learn with and from each other by working on real problems and reflecting on their own experiences. A programme of facilitated action learning is aimed at the improvement of student learning and environment in which it occurs.

2) Quality learning is understood as involving the active construction of meaning by the students, and not just something that is imparted by the teacher. It is a deep approach of learning that seeks to make meaning and achieve understanding. Hence, the conception of teaching is the facilitation of learning.

3) It is the students who achieve the aims of higher education. Quality learning is largely dependent on the approach that the learner takes when learning. This in trun is dependent on the concepts that the learner holds of learning, what he or she knows about his or her own learning, and the strategies she or he chooses to use.

4) Quality learning embraces the principles of adult learning. Adult learning best in a relaxed, supportive, cooperative and informal learning environment. Deep learning is likely to take place in environments which foster collaborative learning. 5) In promoting responsibility in learning, teachers should:
a. create a teaching-learning environment that enables individuals to participate

responsibly in the learning process,
b. provide curricula that are flexible and enable learners to make meaningful choices in terms of subject content, programme routes, approaches to assessment and modes and duration of study.

6) In engaging with feelings and values as well as intellectual development, teachers provide learning opportunities and encounters which involve the whole person, feelings as well as intellect.

<Check list>
4.1 The faculty of department has a clear teaching and learning strategy
4.2 The teaching and learning strategy enables students to acquire and use knowledge academically
4.3 The teaching and learning strategy is student oriented and stimulates quality learning
4.4 The teaching and learning strategy stimulates action learning and facilitates learning to learn

<Source of Evidence>
- Teaching and learning strategy
- Evidence of action learning such as project, practical training, assignment, industrial attachment, etc.
- Student feedback
- Online learning portal
- Module specification

5. <u>Student assessment:</u>
1) Assessment covers:
- New student enhance by means of input competency,
- Student's study progress by means of matrix/ map/portfolio of the competency and outcome-based curriculum,
- final /exit test of the graduates by means of Graduate Competency Checklist or comprehensive and integrated assessment,

2) In line with principle of adult learning, adults prefer to be assessed by criterion-referenced methods and by a combination of peer, self- and teacher assessment.

3) In fostering open, flexible, reflective and outcome-based assessment, the teachers should provide a variety of assessment where the criteria are made explicit following negotiation with the course members. The assessment strategies adopted should be congruent with clearly defined learning outcomes.

4) Assessment methods correspond to all the aims and aspects of the curriculum as taught.

5) A range of assessment method is used in a planned manner to serve diagnostic, formative and summative purposes.

6) The scope and weighting of assessment schemes are clear and known to all concerned.

7) Standards applied in assessment schemes are explicit and consistent across the curriculum.

8) Procedures are regularly applied to ensure that, as far as possible, assessment schemes are valid, reliable and fairly administered.

9) Students have ready access to reasonable appeal procedures.

10) The reliability and validity of assessment methods should be documented and regularly evaluated and new assessment methods are developed and tested.

<Check list>
5.1 Student assessment covers student entrance, student progress and exit tests
5.2 The assessment is criterion-referenced
5.3 Student assessment uses a variety of methods
5.4 Student assessment reflects the expected learning outcomes and the content of the programme
5.5 The criteria for assessment are explicit and well-known
5.6 The assessment methods cover the objectives of the curriculum
5.7 The standards applied in the assessment are explicit and consistent
<Source of Evidence>

- Sample of in-course assessment, project work, final examination, etc.
- Marking scheme
- Moderation process
- Appeal procedure
- Programme and module specification
- Examination regulations

6. <u>Academic staff quality</u>:
1) Competent university teaching staff are able to
- design and deliver a coherent teaching and learning programme,
- apply a range of teaching and learning methods and select methods most appropriate to desired learning outcomes
- develop and use a variety of instructional media,
- employ a range of techniques to assess students' work and match these to intended learning outcomes,
- monitor and evaluate their own teaching performance and evaluate programmes they deliver,
- reflect upon their own teaching practices,
-identify needs and develop plans for continual development,

2) The teaching staff establishment or staffing is sufficient to deliver the curriculum and suitable in terms of the mix of qualifications , experience, aptitudes, age, etc.

3) Recruitment and promotion of academic staff are based on merit system, which includes teaching, research and service.

4) Roles and relationship of staff members are well defined and understood.

5) Duties allocated area appropriate to qualifications, experience, and aptitude.

6) Time management and incentive system are directed to support quality of teaching and learning.

7) All staff is accountable to the Owner of the University (e.g. the Government Board of Trustees, or the Foundation) through the Rector, President or Vice-Chancellor and to the stakeholders, taking into account their academic freedom and professional ethics.

8) There are provisions for review, consultation, and redeployment,

9) Termination, retirement and social benefits are planned and well implemented. 10) There is a well-planned staff appraisal based on fair and objective measures in the sprit of enhancement which are carried out regularly.

<Check list>
6.1 The staff are competent for their tasks
6.2 The staff are sufficient to deliver the curriculum adequately
6.3 Recruitment and promotion are based on academic merits
6.4 The roles and relationship of staff members are well defined and understood
6.5 Duties allocated are appropriate to qualifications, experience and skills
6.6 Staff workload and incentive systems are designated to support the quality of teaching and learning
6.7 Accountability of the staff members is well regulated
6.8 There are provisions for review, consultation and redeployment
6.9 Termination and retirement are planned and well implemented
6.10 There is an efficient appraisal system

<Source of Evidence>
- Recruitment criteria
- Staff qualification
- Training needs and plan
- Peer review and appraisal system
- Career plan
- Student feedback
- Award and recognition system
- Staff workload
- Allocation of roles and duties
- Termination, re-employment and retirement scheme

7. <u>Support staff quality</u>: There is adequate support in term of staffing at the libraries, laboratories, administration and student services.

<Check list>
7.1 Library staff are competent and adequate in providing a satisfactory level of service
7.2 Laboratory staff are competent and adequate in providing a satisfactory level of service
7.3 The computer facility staff are competent and adequate in providing a satisfactory level of service
7.4 The student service staff are competent and adequate in providing a satisfactory level of service

<Source of Evidence>
- Recruitment criteria
- Staff qualification
- Job description
- Training needs and plan
- Peer review and appraisal system
- Career plan
- Student/faculty feedback
- Award and recognition system
- Staff workload

- Allocation of roles and duties
- Termination, re-employment and retirement scheme

8. <u>Student quality</u>: There is a clear student intake policy and the admission criteria to the programme are formulated and reviewed periodically.

<Check list>
8.1 There is clear student intake policy
8.2 The student admission process is adequate
8.3 The actual study load is in line with the prescribed load
<Source of Evidence>

- Student selection process and criteria
- Trend of student intake
- Credit system
- Student workload
- Student performance reports
- Participation in academic and non-academic activities, extracurricular activities, competition, etc.

9. <u>Student advice and support</u>:

1) Student progress is systematically recorded and monitored feedback to students and corrective actions are made where necessary.

2) In establishing a learning environment to support the achievement of quality student learning, teachers do all in their power to provide not only a physical and material environment which is supportive of learning and which is appropriate for the activities involved, but also a social or psychological one.

<Check list>
9.1 There is an adequate student progress monitoring system
9.2 Student get adequate academic advice, support and feedback on their performance
9.3 Monitoring for student is adequate
9.4 The physical, social and psychological environment for the student is satisfactory

<Source of Evidence>

- Mechanism to report and feedback on student progress
- Provision of student support services at university and faculty level
- Coaching, mentoring and counseling schemes
- Student feedback

10. <u>Facilities and infrastructure</u>:

1) The physical resource to deliver the curriculum, including equipment, materials and information technology are sufficient.

2) Equipment is up-to-date, readily available and effectively deployed.

3) Learning resources are selected, filtered, and synchronized with the objectives of the study programme.

4) A digital library is set up in keeping with progress in information and communication technology.
5) Information technology system are set up or upgraded.

6) University compute centers provide continuously a highly accessible computer and network infrastructure that enables the campus community to fully exploit information technology for teaching, research and development, services and administration.

7) Environmental Health and Safety Standards meet the local requirements in all aspects.

<Check list>
10.1 The lecture facilities (lecture hall, small course rooms) are adequate
10.2 The library is adequate and up-to-date
10.3 The laboratories are adequate and up-to-date
10.4 The computer facilities are adequate and up-to-date
10.5 Environmental health and safety standards meet requirements in all aspects

<Source of Evidence>
- List of facilities, equipment, computer hardware and software,etc.
- Facilities booking, utilization rates, downtime/uptime, operating hours
- Maintenance plan
- New facilities and upgrading plans
- Safety , health and environmental policy
- Emergency plan
- Student and staff feedback

11. <u>Quality assurance of teaching and learning process</u>:
1) The curriculum is developed as a group to ensure the representation from the faculty Quality Committee, the faculty Teaching and Learning Committee, the programme team, students and stakeholders from industry, government and professional organizations.

2) The curriculum is periodically reviewed and evaluated as to its effectiveness. Adjustments are made after reasonable time periods.

3) A prime condition for constantly improving teaching and learning is a planned and regular process of evaluation. In this regard, teachers should foster a climate which values student involvement in the evaluation of teaching and the assessment of learning outcomes.

<Check list>
11.1 The curriculum is developed by al teaching staff members
11.2 The curriculum development involves students
11.3 The curriculum development involves the labour market
11.4 The curriculum is regularly evaluated at reasonable time period
11.5 Courses and curriculum are subject to structured student evaluation
11.6 Feedback from various stakeholders is used for improvement
11.7 The teaching and learning processes, assessment schemes, the assessment methods and the assessment itself are always subject to quality assurance and continuous improvement

<Source of Evidence>
- Curriculum design, review and approval process and minutes
- Stakeholders input
- QA of assessment and examination
- External examiners
- Local and international benchmarking
- Results of programme and module feedback

- Uses of feedback for improvement
- Percentage of students providing feedback
- Sample of feedback questionnaire

12. <u>Staff development activities</u>:
1) Training and development needs for academic and support staff are systematically identified, in relation to individual aspirations, the curriculum and institutional requirements.

2) Academic and support staff undertake appropriate staff development programmes related to the identified needs

<Check list>
12.1 There is a clear plan on the needs for training and development of both academic and support staff
12.2 The training and development activities for both academic and support staff are adequate to the identified needs

<Source of Evidence>
- Education, training and development policy and plan
- Training places and hours
- Scholarships
- Job rotation and development scheme

13. <u>Stakeholders feedback</u>: Universities are encouraged to have a built-in regular curriculum evaluation and course appraisal, involving all stakeholders (decision makers, employers, students, alumni, etc)
<Check list>
13.1 There is adequate structured feedback from the labour market
13.2 There is adequate structured feedback from the students and alumni
13.3 There is adequate structured feedback from the staff
<Source of Evidence>
- Regular and ad-hoc formal and informal survey and feedback mechanism
- Response rates
- Uses of feedback for improvement

14. <u>Output</u>: The quality of graduates should achieve the expected learning outcomes and the needs of the stakeholders. Research activities carried out by academic staff and students should meet the requirement of the stakeholders.

<Check list>
14.1 The pass rate is satisfactory and dropout rate is of acceptable level
14.2 Average time to graduate is satisfactory
14.3 Employability of graduates is satisfactory
14.4 The level of research activities by academic staff and students is satisfactory

<Source of Evidence>
- Graduates and employment surveys
- Employment statistics
- Entry level salary
- Employers feedback
- Press report

15. <u>Stakeholders satisfaction:</u> Stakeholders are satisfied with the programme and the quality of the graduates.

<Check list>
15.1 The feedback from stakeholders is satisfactory

<Source of Evidence>
- Process and indicators for measuring stakeholders satisfaction
- Stakeholders satisfaction trends
- Graduates, alumni and employers surveys
- Press reports

<4> Process

Process and schedule of AUN assessment for past 2 programmes at CTU

	Time line	**Activity**
Internal Assessment at CTU	May 2010	Part1: Workshop/Meeting of rectors of universities of Network in Uni.of Potsdam, Berlin, Germany
	Oct 2010	Part2: Workshop in Bangkok, Thailand Main contents: 1) About DIES, AUN, DAAD….and activities, 2) training QA for courses, programme, on AUN 18 Criteria (old version) and all 15 Criteria (new version), and on guide to how to write SAR.
	Dec 2011& Jan 2012	To make Decision and to set up Project Action Plan (PAP) for project; Sub self-assessment Plan for writing Self Assessment Report (1) - Workshops training on 15 criteria and on guide to write SAR and to use sub plan/survey….. - Workshops training on consultancy - Workshops training on internal auditing SAR,… - To translate SAR into English
	Feb 2012	- Submitted SAR1 via email >Feedback of experts: Good comments via e-mail - > College of Engineering Technology (CET) and School of Economics and Business Administration (SEBA) adjust (*) SAR with consultancies (twice). - > To continue to survey and to add information into SAR (or close gaps).
	March 2012	Part 3: Workshop in Potsdam, Berlin Main contents (cont): - To discuss directly on SARs > comments (peer review). - To continue to explain clearer 15 criteria and How to write a good SAR. - To analyse in order to learn some examples of SARs for different universities are externally assessed by AUN. - To visit some strong universities in adequate criteria (Criteria 1, 3, 6, 15….) - Good comments with some proposals to adjust
	July 2012	Good comments/ Submitted SAR2 Main contents (cont): - > CET and SEBA adjust (*) SAR with consultancies (> a lot of meetings of QAC and SEBA& CET). > To continue to survey and to add information into SAR (or close gaps)/ (a lot of meetings of QAC and SEBA & CET).
	Oct 2012	Part 4: Workshop at VNU/HCM City Main contents (cont): - To discuss directly on SARs > comments (peer review/pilot). - To continue to explain clearer 15 criteria and How to write a good SAR. - To analyse in order to learn some examples of SARs for different

		universities are externally assessed by AUN. - To visit some strong universities in adequate criteria - Guides to prepare site visit and practice.
	Feb 2013	Submitted SAR 3 Feedback: Good comments Adjust: (see (*)) In parallel, CTU prepares its site visit in SABA and in CET
	March & May 2013	Submitted Final SAR 4&5 and preparation for Site visit in SABA and in CET
	Dec. 2013	Part 5. Workshop in Bangkok, Thailand - Closing ASEAN-DIES Project. - Evaluation Proposals for extending project: 1) The consultancy visit of 2 programmes (2-4/6/14 at Can Tho University), 2) for proposal of DIES Partnership 2015-2018, 3) Train QA Course Background and Objectives 2015-2016 with 5 Parts/Workshops (**) and 5 Modules: **Module 1**: Effective QA and Change Management **Module 2**: Tools and Procedures of QA **Module 3**: Curriculum Design and Revision **Module 4**: Date-Based information Management **Module 5**: QA and its linkages to Higher Education Management
External Assessment at CTU	11-13 April, 2013	AUN team came to CTU for Site Visit for Electrical Engineering Programme of CoET, CTU
	13-15 June, 2013	AUN team came to CTU for Site Visit for Agricultural Economics Programme of SEBA, CTU
	March 2014	CTU Received Certificate for Agricultural Economics Programme of SEBA

(**) in 2 in Germany, 3 in southeast Asia
Source: summarized from Power point presentation from CTU TACT

<5> Reference from Self Assessment Report

SWOT Analysis for Electrical Engineering Program

	Strengths (Internal)	**Weaknesses (Internal)**
Opportunities (External)	Strengths / Opportunities: 1. Having good communication to stakeholder, especially labor markets. The program will get more useful feedback to upgrade the program, and rate of graduate employability with higher satisfaction. 2. Staff are being well-trained from many countries. So the Electrical Department will get a variety of experiences in education, and will have innovative applied products. 3. A good education system is being built by AUN criteria. The graduate will satisfy to labor markets in ASEAN area.	Weaknesses / Opportunities**:** 1. There are many staff having not been trained for the PhD. However, they will be trained for the PhD abroad according to training plan period 2008 – 2012 thanks to international relationships of CTU. 2. The system of evaluation of educational quality and outcomes has not been sufficient. Therefore, it is the opportunity to improve the curriculum, updating models in domestic as well as overseas.
Threats (External)	Strengths / Threats: 1. There are many students studying at Can Tho University. The EE is the first program with the most experience in Mekong Delta; therefore, the subjective is inevitable. In addition, the EE Department may not realize rivals in education field. 2. The EE program has initial charisma about human resources. Moreover, the Mekong Delta needs a large number of Electrical Engineers.	Weaknesses / Threats**:** 1. There are many staff who are studying postgraduate, a circumstance which burdens of training pressure may affect the education quality in a short period. 2. The EE program has not appealed to high-qualified students in the university entrance examination yet. The result of this is that there will be difficulties in training and developing job passion for

	As a result, there is going to be training pressure affecting training quality.	students, affecting training quality. 3. The scientific research activities of staff as well as students are limited. The EE Department has not had creative products in the research field, a situation that hurts the program's education and training reputation.

<6> Comment from External Assessors

External Assessors' comment for Bachelor of Agricultural Economics:

Criteria	Areas for improvement
1. Expected learning outcome	Implement the ELOs. From : Formulation > Show ELO for each module > Show ELO for entire program > Who measures the ELOs (qualitatively from staff and students; quantitatively from course assessment results) Outcome-based ELOs; input from alumni/industry
2. Programme specification	To evaluate how well the ELOs meet the program specifications Communicate program specifications and ELOs to stakeholders (students, academic staff, alumni, employers)
3. Programme structure and content	How are the ELOs achieved?
4. Teaching and learning strategy	Further broaden the above (more project work, group-based projects, external (industry) practicums, student-chosen projects. Move towards outcome-based learning. Further move towards e-learning [Difficulty with language skills]
5. Student assessment	Need to ensure equity in exam marking by different lecturers Move [more] towards group-based assessment? Moderation after all exam marks are submitted
6. Academic staff quality	The department should give more support for them to get scholarship for further study and higher degree Training on educational pedagogy is required to give young lecturers better understanding on how they can improve their teaching skills
7. Support staff quality	Increasing the number of support staff may be required in order to provide better service to the students and lecturers
8. Student quality	Better marketing should attract more qualified students to apply to the Agricultural Economic study program
9. Student advice and support	Additional support staff would be good to improve the quality of support to students
10. Facilities and infrastructure	Working space for lecturers is required to be improved in order to support their academic activities
11. Quality assurance of teaching and learning process	Continuously take ELOs into account. To be described verbally, shown in course handbook, publish, regularly communicate to lecturers, students, stakeholders. Further encourage lecturers to follow ELOs.
12. Staff development activities	To further increase participation rate in order to fully meet expectations. Support staff to be recruited from the beginning with adequate skills in order to avoid additional expensive training before they meet job requirement
13. Stakeholders feedback	The structure of getting feedback from alumni and employers to be improved (e.g., have an alumni/employer association or an alumni manager from SEBA)
14. Output	SEBA may consider how to increase the number of research proposals and publications in reviewed journals as well as how to encourage more involvement of students in research activities
15. Stakeholder satisfaction	SEBA to consider to increase student satisfaction with regards to student services, learning material, teachings aids, and library Alumni and employer feedback that English language is increasingly important

Appendix 3-17

Research Fund

Research fund at CTU

The CTU research fund is also competitive fund, and selects by proposals. The amount increased from VND 288,100,000 or US$13,719.05 in 2008 to VND 5,902,897,000 or US$281,090.33 in 2013. One research project received around US$2,500 for year 2013. The graduate students are also qualified to apply for this CTU research fund. CTU research fund for graduate students is around 1,500 USD, less than faculty members. Around one third of the CTU research activities are by CTU graduate students. CTU research fund's prioritized points are as follows:

- Rectorate board's request and ordering,
- Basic researches,
- Staff who are studying MSc or PhD programme,
- PhD holders who graduated within 2 years considered at the time of selection.
- High feasible and necessary research proposals.

The intention is to practice and train for applying external funds, especially for the young researchers. The CTU 9 sub-committees[1] involve the selection of proposals; they put the proposal in prioritized order. This internal budget allocation for research fund and providing research opportunities for young staff shows the CTU's intention to be a research university.

Competitive Research Project and Fund Information

	Research fund for one project (approximate amount)	**Project Term**	**Application deadline**	**Time to wait for notice of the result**
Central government	2 billion VND (around 100,000 USD)	3-4 years	TBA	1 month
Ministry	600-700 million VND (around 30,000 USD)	2 years	Feb	5 months
University (CTU)	50 million VND (around 2,500 USD)	1 year	Dec	3 months
DOST	600-700 thousand VND (around 30,000 USD)	2-3 years	TBA	3 months
Company	600-700 thousand VND (around 30,000 USD)	2-3 years	TBA	soon

Source: interview with Department of Research Affairs

[1] See details in Appendix 3-15

Appendix 3-18

Revenue and Expenditure
Technology Transfer and Services

REVENUE AND EXPENDITURE OF PRODUCTION ACTIVITIES AND SERVICES IN 2013

Unit:VND

No	Unit Name	Revenue	Expenditure	Income	Tax	Net Income
(1)	(2)	(3)	(4)	(5) = (3) - (4)	(6)	(7) = (5) - (6)
1	Can Tho University Software Center	20,088,961,464	13,467,064,073	6,621,897,391	336,470,791	6,285,426,600
2	Center for Services and Technology Transfer	19,280,786,070	15,837,819,821	3,442,966,249	860,891,993	2,582,074,256
3	Center for Foreign Languages	12,268,192,440	8,997,441,050	3,270,751,390	817,687,847	2,453,063,543
4	Center of Technology Research and Application	4,838,147,327	4,285,289,574	552,857,753	151,332,591	401,525,162
5	Can Tho University Publishing House	2,523,503,707	2,577,241,813	(53,738,106)		(53,738,106)
6	Center for Contruction Assessment & Consulting	4,694,533,526	4,481,775,130	212,758,396	53,189,599	159,568,797
7	Center for Electronics and Informatics	66,871,376,726	66,541,396,575	329,980,151	111,272,986	218,707,165
8	Center for Agricultural Science Services	5,729,103,643	5,666,343,764	62,759,879	15,689,969	47,069,910
9	Research and Development Biotechnology Institute	370,093,000	355,424,313	14,668,687	7,321,000	7,347,687
10	Electrical & Electronic Center	2,059,076,823	1,859,949,340	199,127,483	3,498,810	195,628,673
11	Center for Training and Consulting in Economics	1,396,134,513	1,016,571,067	379,563,446	7,387,499	372,175,947
12	Center for Professional Development in Education	3,047,271,417	1,745,137,952	1,302,133,465	325,533,366	976,600,099
13	Center for Graduate Services & Training	1,251,877,350	998,496,944	253,380,406		253,380,406
	Total	**144,419,058,006**	**127,829,951,416**	**16,589,106,590**	**2,690,276,451**	**13,898,830,139**

Appendix 3-19

Education Program at CTU

- **Information about English and Foreign Program at CTU (As of April 2014)**

	Name of Program	School/ College at CTU	Degree/ collaborating university	Starting year
1	Master of Science, Data Mining	College of Information Communication Technology	- Mantes University, France, and CTU lecturers teach in English/French at CTU. - Provides French degree	Officially approved by MOET in 2014 (2007- as internal program)
2	Bachelor of Science, Advanced Biotechnology	Institute of Biotechnology Research and Development	- Michigan State University (MSU) and Can Tho University (CTU) lectures teach in English/ Vietnamese at CTU. - Provides VN degree, and MSU certificate.	Officially approved by MOET and offered in 2006
3	Bachelor of Science, Advanced Aquaculture*	College of Aquaculture and Fisheries (CAF)	- Auburn university (AU) and CTU lectures teach in English/ Vietnamese at CTU. - Provides VN degree, and AU certificate.	Officially approved by MOET and offered in 2008

(Unofficial Translation)

MINISTRY OF EDUCATION AND TRAINING
CAN THO UNIVERSITY

SOCIALIST REPUBLIC OF VIETNAM
Independence – Freedom – Happiness
----------***----------

Can Tho, date month year 2014

PROCEDURE ON ASSESSMENT AND APPROVAL OF PROPOSAL FOR OPENING NEW COURSE

Pursuant to Article 36, Chapter VIII of "Charter of Universities" promulgated together with Decision No. 58/2010/QĐ-TTg, dated September 22, 2010 of Prime Minister on stipulating power and responsibility of rectors' universities.

Pursuant to Article 5 of Circular No. 38/2010/TT-BGDĐT, dated December 22, 2010 providing the conditions, dossiers and process for permitting training, suspending enrolment or revoking decisions permitting the training of disciplines of master or doctorate degree;

Can Tho University stipulate procedure on assessment and approval of proposal for opening undergraduate course as follows:

I. Assessment of opening course conditions

1) Undergraduate training unit (generally called to be training unit, abbreviated to be TU) based on regulations of opening course conditions (Circular No. 38/2010/TT-BGDĐT dated December 22, 2010) (see on the Website of Graduate School) makes document on proposal for opening new course together with interpretation of satisfied conditions for opening course in order to submit Graduate School (GS).

2) GS will check up conditions, if such conditions are met with requirements, GS will submit document to Standing Council of Science and Training (a copy will be sent to TU) to be approved for opening course.

3) TU will appoint representative to present/ interpret to Standing Council of Science and Training on proposal for opening new course together with representative of Graduate School (TU will archive minutes of meeting which approves conditions for opening course made by Secretariat, Standing Council of Science and Training)

II. Compilation of proposal for opening course

1) When obtaining agreed minutes for opening new course, TU will compile proposal according to stipulated form of Ministry of Education and Training (see instructions of content and format regulations of proposal on the Website of Graduate School)

2) Submit proposal to Graduate School to read and make suggestions.

III. Assessment of proposal dossier

1) When proposal has been prepared in accordance with regulations of Ministry of Education and Training, Graduate School will make and submit document on forming Assessment Council for proposal dossier to Managing board (MB).

2) After MB agrees, TU will send expected list of members in the council (chairman, 2 opponents, member, and secretary), Graduate School will make decision on forming Assessment Council for proposal dossier based on the expected list and submit MB to approve.

3) After receiving decision on forming Assessment Council, Council's secretary will contact and send document to members (including 1 proposal draft volume, a dossier approving card and decision).

4) When Council makes meeting, draft committee will present main contents of proposal; members will give their ideas and chairman will make conclusion; secretary will record minutes and member's ideas in Council, collect dossier approving cards (5 cards).

5) TU will adjust the proposal according to Council's suggestions.

6) Secretary will check up the adjusted proposal and make presentation minutes of adjusted proposal as Council' suggestions, with signature of Chairman and secretary

7) Secretary submits the adjusted proposal and minutes (suggestion minutes of Council, adjusted presentation minutes, 5 dossier approving cards) to TU.

8) TU completes the adjusted proposal and relevant minutes, binds volume and submits to Graduate School (03 volumes to Department of Education and Training and 01 volume to Graduate School).

IV. Capacity assessment of training facility

1) Graduate Scholl will compile and submit MB to sign document on proposing Department of Education and Training to form Assessment Council of capacity assessment of training facility.

2) Graduate School gathers dossier (including 03 proposal volumes and document) to Department of Education and Training.

3) TU prepares necessary dossiers so that Department of Education and Training assesses (wages sheet of lecturers in list of opening course…)

4) After receiving replying document from Department of Education and Training, TU will adjust according to suggestions of Department of Education and Training, then print out and resent 01 volume to Department of Education and Training.

V. Assessment of training programs

1) Graduate Scholl will compile and submit to MB and Ministry of Education and Training on appointing assessment unit for training programs (implementing at the same time with proposal to Department of Education and Training).

2) After getting document on appointing assessment unit for training programs from Ministry of Education and Training, TU will contact with the assessment unit to preparation the form of Council.

3) After obtaining decision on forming Council, TU will contact with Council's secretary to send documents (including 05 proposal draft volumes, dossier approving cards and decision) to members of Council.

4) When Council makes meeting, secretary will record minutes and specific ideas from members in Council, collect dossier approving cards (5 cards).

5) TU will adjust the proposal according to Council's suggestions.

6) Secretary will check up the adjusted proposal and make presentation minutes of adjusted proposal as Council' suggestions, with signature of Chairman and secretary

7) Secretary submits the adjusted proposal and minutes (suggestion minutes of Council, adjusted presentation minutes, 5 dossier approving cards) to TU.

VI. Submission of proposal to Ministry of Education and Training

1) Graduate School compile Proposal to submit Ministry based on contents supplied by TU.

2) For proposal for opening Master course: TU will submit 06 proposal volumes to Graduate School to be approved by Ministry, permitting to open training course (03 volumes to Ministry,

01 volume to Ministry's specialists, 01 volume to Department of Education and Training and 01 volume archived at Graduate School).

3) For proposal for opening Doctoral course: TU will submit 06 proposal volumes to Graduate School to be approved by Ministry, permitting to open training course (04 volumes to Ministry, 01 volume to Ministry's specialists, 01 volume to Department of Education and Training and 01 volume archived at Graduate School)

RECTOR

Appendix 3-20

Work Load Management for Teaching Staff

(Unofficial Translation)

Extracts from No.: **6288**/QĐ-ĐHCT, *Cần Thơ, date 31 month 12 year 2013*

DECISION: Promulgating Regulations of professional work management with Lecturers of Can Tho University

Article 2. Definitions

1. **Personal obligation hour** (unit: H) is the regulated professional workload which each lecturer has to complete in the year, including teaching duty and scientific research accroding to teaching title and salary rank or academic title at the time of planning.

2. **Department obligation hour** (unit: H) is the sum of all obligation hour of all lecturers in the Department or equivalent organization, determined and approved prior to implementation, to be adjected as synthetic for progress assessment.

3. **Exceeded hour** (unit: H) is the regulated professional workload which lecturers and faculty are responsible to fulfill aside from obligation hours.

Article 3. Personal obligation hour determined by title, qualification and cofficient of salary as followed:

No.	**Title, qualification of Lecturer**	**Teaching obligation hour** (H)	**Research obligation hour** (H)	**Total obligation hour** (H)
1	Professor	340	170	510
2	Associate professor	320	140	460
3	Senior lecturer with coefficient of salary ≥ 5.76	310	130	440
4	Senior lecturer with coefficient of salary from 4.40 to 5.42 and PhD degree holding lecturer	300	120	420
5	Lecturer with coefficient of salary ≥ 4.32	280	100	380
6	Lecturer with coefficient of salary from 3.33 to 3.99 and Master degree holding lecturer	250	80	330
7	Lecturer with coefficient of salary form 2.34 to 3.00	220	60	280
8	Trainee (received 85% of basic salary)	50	10	60
9.	Assistant lecturer	Based on Regulation of University (currently, Document No. 1852/ĐHCT-TCCB dated 03/12/2010)		

The personal obligation hour for lecturers of Physical Education is determined according to title, qualification and coefficient of salary as followed:

No.	**Title, qualification of Lecturer of Physical Education**	**Teaching obligation hour** (H)	**Research obligation hour** (H)	**Total obligation hour** (H)
1	Professor, superior lecturer	480	170	650
2	Associate professor	460	140	600
3	Senior lecturer with coefficient of salary ≥ 5.76	450	130	580
4	Senior lecturer with coefficient of salary from 4.40 to 5.42 and PhD degree holding lecturer	440	120	560
5	Lecturer with coefficient of salary ≥ 4.32	420	100	520
6	Lecturer with coefficient of salary from 3.33 to 3.99 and Master degree holding lecturer	390	80	470
7	Lecturer with coefficient of salary from 2.34 to 3.00	350	60	410

No.	**Title, qualification of Lecturer of Physical Education**	**Teaching obligation hour** (H)	**Research obligation hour** (H)	**Total obligation hour** (H)
8	Trainee (Received 85% of basic salary)	180	10	190
9	Assistant lecturer	Based on Regulation of University (currently, Document No. 1852/ĐHCT-TCCB dated 03/12/2010)		

Article 4. Professional work, working time and place

1. The professional work of lecturers include preparing lectures and curriculum, teaching and evaluation, scientific research, composing curriculum, participating in capacity building and performing other activities which are planned and assigned by Head of Department.

2. Weekly working hours are 40 hours. Morning teaching hour is from 7:00 to 11:30 and 13:30 to 17:00 for afternoon hour, from Monday to Saturday. Teaching hours which is not in the regulated working hour are considered as overtime and is paid based on Regulation of internal expenditure.

3. Lecturers have to work at assigned place when teaching in lecture halls, instructing exercises-practices, meetings, learning resolutions, participating in seminars-workshop-conference … and assigned tasks by Head of Department. For other works, lecturer shall choose the appropriate working place but must ensure the accomplishment of professional workload assigned by the Department.

Article 5. Workload planning

1. Planning for the next year is carried out in October annually. Based on the work plan and assignment of Head of Department, lecturers are responsible for preparing and listing his/her workload ensuring the implementation of teaching duty and research and submit to Head of Department for approval. Head of Department is responsible for adjusting, revising and summarizing the professional workload of the Department and submits to the Dean for approval before submitting to Department of Administration and Planning no later than November 30th of each year to submit for approval of Rector prior to implementation.

Head of Department is responsible for ensuring the equitable distribution of working hours so that exceeded hours (if any) must correspond with personal obligation hours and the rate of individuals' exceeded hours must correspond with Department's exceeded hours; the difference of teaching hour between person with the highest number and the one with the lowest number must not exceed 500 hours/year (not including trainees and assistant lecturers).

2. The regulated workload of lecturers is cumulative from January 1st to December 31st every year for assessment of task completion and quality of work of individuals and units.

3. The University allocates and ensures financial resource for the approved plan implementation.

Article 6. Regulation of professional work

1. All of professional works of lecturers are regulated as followed:

Category	**No**	**Specific work**	**Standard (H)**
TEACHING Applies to all education system managed by the University of educational contract	1	1 period of theoretical teaching for university and collefe **(student ratio:** ≥ 65 = 1,1; ≥ 75 = 1,2; ≥ 90 = 1,4; ≥ 115 = 1,6; ≥ 135 = 1,8; ≥ 155 = 2; ≥ 175 = 2,2; ≥ 195 = 2,4; ≥ 250 = 3; ≥ 300 = 3,5; ≥ 400 = 4,5) Multiply by 1.4 if teaching in English or French (excluding foreign language module)	1,1

Category	No	Specific work	Standard (H)
(excluding distance education)	2	1 period of practical - experiment /group (20 - 40 students): + 20 - 23 St: 0,5 H/group + 24 - 27 St: 0,6 H/group + 28 - 31 St: 0,7 H/group + 32 - 35 St: 0,8 H/group + 36 - 39 St: 0,9 H/group + ≥ 40 St: 1,0 H/group (Group with less than 20 students is considered as a 20 student group) Assistance to practical – experimental teaching (for those laboratory without staff) is calculated 0.15 of above mentioned norm	0,5 – 1,0
	3	1 day of field trip, practical training of university, college/group	2
		1 day of field trip, practical training of graduate education/group	2,8
	4	1 period of graduate teaching **(student ratio:** ≥ 65 = 1,1; ≥ 75 = 1,2; ≥ 90 = 1,4; ≥ 115 = 1,6; ≥ 135 = 1,8; ≥ 155 = 2; ≥ 175 = 2,2; ≥ 195 = 2,.4; ≥ 250 = 3; ≥ 300 = 3,5; ≥ 400 = 4,5***)*** 1 period of teaching to research student Multiply by 1.4 if teaching in English or French (excluding foreign language module)	1,4 1,8
	5	Evaluation including: preparing exam questions, answers, invigilating, examining, inputting score, notifying (university and college)	1H/5 students
		Evaluation including: preparing exam questions, answers, invigilating, examining, inputting score, notifying (graduate modules)	1,4 H/5 Students
	6	PhD thesis supervision (main/co)/PhD candidate	100 (70/30)
	7	PhD subject instruction/subject	20
		Master thesis supervision/thesis	30
	8	Master essay instruction/essay; University thesis – project supervision/thesis - project; Scientific research supervision/research	15
	9	University graduation essay supervision/essay	6
		Annual research -project-special subject instruction/ Annual research - project-special subject	3
	10	Preparing lectures and trial of trainee/credit	30
	11	Head of Department secretary (double position)/year Department < 12 lecturers: 50H, 12 to25 lecturers: 65H; ≥ 26 lecturers: 75H	
		Academic adviser/specialized class, delayed class/year (class ≤ 30 students: 30H; 31-40 students: 40H; 41-50 students: 50H; 51-60 students: 60H; 61-70 students: 70H; 71-80 students: 80*H*; 81-90 students: 90H) In charge of graduate module is calculated as academic adviser and multiply by 1,4	
	12	University graduation examination council (2 members/council/essay; 2H/member)	4
		University thesis defense council (3 members/council/thesis-project; 2H/member)	6
		Master thesis outline defense council (5 members/council/thesis; 1H/member)	5
		Master thesis defense council (5 members/council/thesis): Chairman: 4H, Secretary: 4H, 3 members (including opponent): 3H/member; writing opponent: 3H/opponent	23
		Midterm assessment council (PhD) (5 members/council/researcher; 2H/member)	10
		PhD topic examination subcommittee /topic (3 members/topic; 2H/member)	6

Category	No	Specific work	Standard (H)
		PhD article examination council /article (3 members/article; 2H/member)	6
		PhD dissertation outline defense council /outline (5 members/council/outline; 4H/member)	20
		PhD dissertation requirement assessment council (5 members/council/researcher; 2H/member)	10
		Department PhD dissertation defense council (7 members/council/dissertation); Chairman: 15H; secretary: 15H; 5 members (including opponent): 10H/member; writing opponent: 10H/opponent.	100
		University PhD dissertation defense council, quality evaluation council on PhD dissertation (7 members/council/dissertation): Chairman: 15H; secretary: 15H; 5 members (including opponent): 10H/member; writing opponent: 10H/opponent.	110
		Evaluation council on curriculum and book (7 members): Chairman: 4H, secretary: 3H, 5 members including 2 opponents): 2H/member; beside, 2 opponents will have 5H/credit/curriculum and 10H/book.	≥ 37
SCIENTIFIC RESEARCH - Applies to all types of scientific research which the University is responsible for management or implementation, including international topics and projects - Especially, female lecturers will have an addition of 10% of the time conversion for each specific work	13	Scientific research outline (after approved): + National level or valued ≥ 1 billion VND + Ministerial–provincial-city level or valued ≥ 400 million VND + Ministerial–provincial-city level or valued < 400 million VND + University or faculty level	120 80 60 40
	14	Leader (accepted): + National level or valued ≥ 1 billion VND + Ministerial–provincial-city level or valued ≥ 400 million VND + Ministerial–provincial-city level or valued < 400 million VND + University or faculty level	200 120 80 60
	15	University Science & Education council (permanent member/commissioner/secretary) Subcommittee of University Science & Education council (member – not permanent member/commissioner/secretary of University Science & Education council) Science council (Chairman/commissioner/secretary) Professor title council (H/candidate) as: commissioner: 1.0, permanent member: 1.5, opponent: 4.0	60/40/60 30 30/20/30 1
	16	Reference books, monographs, translated books (approved by University Evaluation council for publishing as reference for teaching purpose)	100
	17	Editor-in-chief/Deputy editor of University Science Journal, University Publish house	60/40
	18	Syllabus (accepted/credit); if composed in foreign language (English, French, Russian, German, Chinese) will multiply by 1.4 (except those for foreign language module).	80
	19	Scientific article: + International scientific journal (having ISSN code**);** book chapter (having ISBN code) + National scientific journal recognized by State Professor Title Council; + National scientific journal (having ISSN code); + Conference summary record /international proceedings + Conference summary record /national proceedings and university (having publish house); + Seminar from department level and above (In which author is received 50%, co-authors will share the rest 50%)	100 50 30 40 30 20
	20	Scientific products granted intellectual property right (Equally divided if there are more than 1 author)	100

2. Lecturer doubles as assistant at faculty office, institute, center and department is calculated accordingly to Regulation promulgated together with Decision No. 1052/QĐ-ĐHCT dated 25/03/2013 by Rector of Can Tho University, professional workload is regulated as:

Workload = Coefficient of personnel X total personal obligation hours

Article 7. Remission of personal obligation hour

1. Lecturers who are appointed leadership or responsible for management of Party or Unions are considered for remission as following:

No.	Subject for remission	Ratio (%/year)
1	Rector/Vice Rector	85/80
2	Head/Deputy Head of Department, Committee, Center (not educational unit)	75/70
3	Head/Deputy Head/Chief of Office – institutes – center – department (educational units): < 40 lecturers or < 250 students ≥ 40 lecturers or ≥ 250 students ≥ 80 lecturers or ≥ 1.000 students ≥ 120 lecturers or ≥ 5.000 students ≥ 150 lecturers or ≥ 10.000 students	 25/20/15 30/25/20 35/30/25 40/35/30 45/40/35
4	Head/Deputy Head of Departments: < 20 lecturers ≥ 20 lecturers ≥ 40 lecturers	 15/10 20/15 25/20
5	Specialized Head, technical Head, laboratory management	10
6	Party Secretary, Chairman of University Labour Union	50
7	Deputy Secretary and permanent members of Party Committee, Vice Chairman of Labour Union, Chairman of Veteran's organization, Chief of People Inspection Committee, Chief of Domestic economic Committee, permanent member of Labour Union at University level	40
	Party Executive Committee member, Labour Union Executive Committee member at University level	30
8	Secretary of Party Committee and Party Cell at University level, Chairman of Labour Union – Leader of Labour Union branch /Vice Secretary of Party Committee and Party Cell at University level, Vice Chairman of Labour Union – Vice Leader of Labour Union branch /commissioner of Permanent Party Committee at University / commissioner of Party Committee and Party Cell Committee at University, commissioner of Labour Union Committee at faculty – institute – center - department (educational units): < 40 lecturers or < 250 students ≥ 40 lecturers or ≥ 250 students ≥ 80 lecturers or ≥ 1.000 students ≥ 120 lecturers or ≥ 5.000 students ≥ 150 lecturers or ≥ 10.000 students	 20/15/10/05 25/20/15/10 30/25/20/15 35/30/25/20 40/35/30/25
9	Party Cell Secretary, Leader of Labour Union /Party Cell Deputy Secretary, Vice leader of Labour Union /member of Party Cell Committee: < 20 lecturers ≥ 20 lecturers ≥ 40 lecturers	 10/05/03 15/10/05 20/15/10
10	Secretary/Deputy Secretary of Youth Union, Chairman of University Student Association Vice Chairman of University Student Association; Permanent member of Youth Union at University level	70/60 50 10

No.	Subject for remission	Ratio (%/year)
	Secretary and Deputy Secretary of Youth Union of officials, permanent member of University Youth Union Executive committee, Faculty Youth Union and equivalent level.	
11	Secretary/Deputy Secretary/Permanent member of Faculty Youth Union and equivalent level: ≤ 80 lecturers or ≤ 1.000 students > 80 lecturers or > 1.000 students	 35/30/25 40/35/30

2. Lecturers who are nominated to attend advance course, professional development course, assignment or temporary off work are considered for remission as following:

a) Lecturers who are in assignment, full-time study and advance training of more than 30 days for each period have the remission of 10% of annual obligation hour for every 30 days but not exceeding 100%. If the lecturer is appointed to attend of several long training courses, then the remission is cumulative; if the last days of more than 15 are rounded to 30 days.

b) Lecturers who are appointed for part-time study and training have the total remission equivalent to remission of corresponding full-time course. Exceptionally, those who are appointed for Master or PhD study have the remission based on the Decision for appointment.

c) Lecturers who hold university degree have the remission of 100% or obligation hour in the first 3 years since the started day for profession enhancement.

d) Lecturers who are temporary off work with social insurance due to illness, maternity or by decision of University of more than 15 days per period have the remission of 5% of annual obligation hour for every 15 days but not exceeding 100%. If lecturer has more continuous off work then the remission is cumulative and the last days of more than 7 days are rounded to 15 days.

đ) If lecturers having the remission of obligation hour regulated in this Article are responsible for management, then the remission due to management responsibility is calculated on the remaining obligation hour.

3. Lecturers who do not hold leadership or management position mobilized to non-educational units or administrative units of departments of the University and engaging in professional activity at one of educational unit and ensuring the rights of lecturers with the 30% of personal obligation hour.

4. Other special cases of remission shall be considered and decided by Rector.

Article 8. Principle for calculation of obligation hour and remuneration on exceeded hour

1. Changes in scale - rank – salary coefficient, degree, title happened from June 30th and before would be used as foundation for determining the annual rights and obligations; changes happened from July 1st onward would be used for planning next year activities. Particularly, the changes on remission of obligation hour regulated in Article 7 and newly employed lecturers, scale changing or appointing for assistant task are calculated based on actual arising in the year.

2. When the department accomplishes the obligation hours, lecturers with exceeded hours and those regulated in provision 7 of Article 3 in this Decision exceeding 30% of personal obligation hour will receive the remuneration of exceeded hours. Unit price and liquidity ratio for exceeded hours is regulated in Regulation on internal expenditure of the University.

Appendix 3-21

Current Status of Existing Equipment and Summary of Activities in Each Field

1. Agricultural Field

The current situation of the faculty is described hereunder introducing a Plant genetics laboratory and a Biochemistry laboratory as typical example.

(1) Plant genetics laboratory
It has basic equipment for practical training and researching. However, the laboratory was set up in 1996 and contained equipment such as 1 PCR machine, 1 centrifuge, 1 water-bath, 1 ice-maker, -20 C freezers and so on, of which some items are still working but some items are not working. Therefore, students and researchers cannot carry out the advanced experiments and they also endure wait time to use the limited facility in the laboratory. Sometimes they are forced to wait until midnight to use the facility when they cannot use it during day time. Currently, this laboratory offers 4 PhD degrees in Agriculture and Biotechnology area. Due to the limitation of laboratory space and equipment, the researchers are facing difficulty efficiently carrying out practical training for some courses related to molecular biology and genetic engineering courses. Due to the limitation of the laboratory facility, the researchers cannot achieve the project objective scope in keeping with the trends of applied biotechnology around the world. The equipment therefore should be upgraded to meet with the expansion of the facility's capacity as well as strengthening of research functions.

(2) Biochemistry laboratory
The biochemistry laboratory has some simple equipment for practical training for undergraduate and master's degree students such as a UV-VIS spectrophotometer, a centrifuge, a Kjeldahl system, a vacuum rotary evaporator, a fat Soxhlet extractor, and a fiber extractor. Some of them have been repaired many times. However, in day time most of equipment is utilized for undergraduate and master's degree students for practice and therefore time for researchers is very limited. Researchers are therefore sometimes forced to work even at night and holidays. Besides, the equipment has also been used for research works led by other laboratories in the faculty. Other laboratories are also in the same situation, thus the situation has become an urgent issue that should be settled with highest priority.

2. Aquaculture & Fisheries Field

The current situation of the faculty is described hereunder introducing fish pathology, fish biology laboratories and the fish hatchery as typical example.

(1) Fish pathology
The existing laboratories for research and student practice on fish pathology are old and small. Bachelor, master and PhD students are also using these labs to conduct their thesis lab works. The equipment used for bacteriological analysis is overloaded and some items have been used for more than 10 years. Systems used for histological analysis have the same status and several items were out of date. Equipment for PCR analysis (such as PCR machines, centrifuges, gel documentation, spectrophotometer, etc.) have been intensively used and regularly maintained that led to a delay in teaching and research activities. Some other existing equipment has not been working properly and is not repairable such as microscopes, autoclaves, digital balances, ice machines and micro plate readers. The same laboratories which were used for teaching have also been used for doing research. Therefore, the existing equipment are mainly used to do basic analysis in the field of aquatic pathology such as surgery of diseased specimens, observation via light microscope, preparation of simple histological slides, isolation and identification of bacteria and fungus by conventional methods. In addition, many items among the existing equipment have not been updated and thus data generated from them are not so reliable. The lacking of advanced equipment has led to limited publications in international journals as well as in-depth studies which are mainly based on appropriate number of samples to be analyzed.

The laboratories often encounter the problem of being overcrowded. Currently, there are 6 PhD students, 13 master's students and more than 20 undergraduate students that undertake their thesis work in the labs. Most of the equipment is used by undergraduate and master's degree students for training/practice and therefore the research time is very limited for researchers and many are forced to work at night, weekends and even holidays.

(2) Fish biology
There are four fish biology laboratories. They are old and small, around 100m^2 in total area. These labs have been serviced for practice courses, bachelor, master and PhD students for their thesis lab work. The equipment used for proximate composition analysis of fish and feed were being overused for nearly 20 years. Systems used for monitoring the respiratory regulations of fish and shrimp in terms of physiological responses were out of date. Equipment for analysis of bio-physiology e.g. hematology analysis tools, centrifugation, incubation, UV spectrometry have been intensively used and maintained regularly, which led to delay in teaching and research. Some other existing equipment has not been working and is not repairable such as microscopes, digital balances and micro plate readers.

(3) Fish hatchery
CAF has very old fish hatchery, over 30 years old; shrimp hatchery; and some temporary wet-labs. These wet-labs are small, old, and scattered in many places. There is not enough space for students and staff to carry out research and experiments. There are about 400 undergraduate students and 50 graduate students that practice and research experiments each year. The existing equipment is simple such as a plastic tank system, an air blow supply system, and a simple biological filter. At the moment, the space is too small to meet with the increasing numbers of students and for researchers to carry out research experiments, thus the hatcheries (Wet-Labs) have to set up enough places for student practice and research work.

3. Environmental Field

The current situation of the faculty is described hereunder introducing GIS and Remote Sensing laboratory and Land Resources Laboratory.

(1) GIS and Remote Sensing laboratory
Of existing 17 items, 10 items are not working and not repairable such as A0 printer, GPS, and desktop computers. It is considered difficult for lecturers to carry out practical training efficiently for increasing numbers of the said students.

(2) Land Resources Laboratory
This laboratory provides practical training for undergraduate and master's degree students and has equipment such as stable temp furnaces, four odd electronic scales, the PH and EC meter, titration instruments, Soil Auger 2m, and Soil Munsel color chart. Of such items, titration instruments are inaccurate in data and need to be replenished in numbers. As such, all the equipment existing in the Laboratory of Land Resources are very limited and used mainly for the teaching purposes. Most of equipment is occupied by the said students for training and practice in the day time, and thus researchers cannot secure enough research time. Under the circumstances, many researchers are forced to work even in night time. In addition, they have to utilize other laboratory to continue their research works due to limited numbers of experimental instruments.

4. Supporting Departments (CoET, CoIT, and CoNS)

(1) Engineering Field

Lab1, Agricultural and Aqua-cultural Engineering Lab: this laboratory provides practical

training for undergraduate students and has equipment such as tractor, combine harvester, drying machine, and so on. All of this equipment is self-produced, Russian-made and manufactured in between the 1970s to 1980s, except for a few Japanese-made items which have recently been procured through Japanese a technical assistance scheme. It is only used for student practice and cannot be used for research purposes. The Vietnamese government launched a policy of mechanization and automation in agriculture and, up to now, the large model farms have been encouraging reform for agricultural structure in Mekong Delta.

With the existing equipment, it is very hard to tackle research works which can help farmers adapt themselves technically to the changing circumstances and environment of MD.

5. IT and Management & Governance

For IT network of CTU, The summary of current IT system is described as follows:

i) The email system is hosted on Google mail for all the professors (more than 2,000) and students (more than 50,000),

ii) Syllabuses are available on the university website, and

iii) The system has internet connection with 90 Mbps for international link and 150 Mbps for national link.

In addition, each faculty is also allocated by an INAC database to store web contents. Moreover, CTU also has an e-learning system for lecturers to develop online courses. Furthermore, the CTU library also has a system to store the digitalized materials for students and staff members.

Most of the faculties of CTU do not have a common database for other activity yet. Most of the research and study of faculty staff is done on personal computers. As estimation, the total volume of data for 3 faculties is about 3195GB. This estimation is based on the number of staff members of the faculties and the interview of some staff members of these faculties. For future IT infrastructure, it is expected that CTU IT infrastructure have a system that can allocate to the faculty and staff on demand. Therefore, this system should have high capacity storage as well as high computing power.

For personal computers, CTU currently has around 4000 computers for both students and staff. As estimated, in the future we will need around 5000-6000 desktop computers. Among of them, 3000-4000 computers are for students to practice and do research. The majority of personal computer labs were purchased about 10 years ago. Therefore, they need to be replaced in the near future.

In order to make the management tasks more efficient, an information system for CTU should be developed. This information system allows the staff and students to conduct most of the tasks online. The main problem with the information system is that it cannot respond to a large number of concurrent users because of the limitation of hardware and software.

Currently, CTU has the IT infrastructure for the whole of CTU. However, most of the equipment's (including servers, and network devices) are old and cannot meet the requirements for current and future education, management, and research. Although the data-center is centrally managed by INAC, each faculty also needs the high performance computers for specific applications.

Appendix 3-22

List of International Projects

ON-GOING PROJECTS SUMMARY

NO.	Code	Title of project	Starting time	Ending time	Total of grant	Content of project	Department	Grant organization	Grant nation
1		Climate Change affecting Land Use in the Mekong Delta: Adaptation of Rice-based Cropping Systems (CLUES)	2011/3/1	2015/2/12	1,240,521 AUD	Creating a new model for community-led science learning and environmental action for families; developing a training program to build educational leadership within the CBOs; empowering CBO-based educators to direct the focus and content of science programming; and supporting ongoing collaboration among families, community-based education leaders, and museums	Climate Change Research Institute	Australian Center for International Agricultural Research (ACIAR) and International Rice Research Institute (IRRI)	Australia
2	**EUDEN00113TSNC**	Interdisciplinary Project on Climate Change in Tropical Aquaculture (iAQUA)	2013/1/1	2017/1/12	4,151,168 DKK	To understand how global warming will affect tropical aquaculture, they will study how a temperature rise from the current value of 27-32 C to 32-37 C will affect physiological performance, food conversion efficiency and growth in air-breathing fish. Particular emphasis will be placed on the role of the cardio-respiratory and digestive systems to address the prevailing hypothesis that compromised oxygen transport capacity determines temperature tolerance of aquatic ectothermic vertebrates	College of Aquaculture & Fisheries	DANIDA	Denmark
3	**EUBELG160609NCUU**	Improving management practices and food safety related to the use of chemicals for a sustainable freshwater aquaculture in the Mekong delta	2009/1/6	2014/1/6	184,211 EUR	Reducing the impact of using chemical in aquaculture, food safety and environment by developing and applying management methods and analytic technique	College of Aquaculture & Fisheries	VLIR	Belgium
4		Education Programme about reality of environment in Asia and Africa for managers	2010/1/1	2014/1/1	1,450,000 YEN	Training and enhancing abilities in protecting environment in Asia and Africa	College of Environment and Natural Resources		Japan

NO.	Code	Title of project	Starting time	Ending time	Total of grant	Content of project	Department	Grant organization	Grant nation
5	**EUBEL 01112C TUDT**	Pre-Partner Programme (2012) - "NETWORK University Cooperation" (VLIR)	2012/5/25	2013/3/31	45,000 EUR	Construct and consolidate the university's network between Vietnam and Belgium; Construct the balanced and capable project teams including coordinator and partner leader and hub; Establishing the concept note and final proposal of the project; Establishing a strategy for curriculum development of master programmes; Establishing a strategy for the development of a joined Doctoral School; Construct the appropriate management systems to operate and manage the programme	Can Tho University	VLIR	Belgium
6	**ASMA L01512 MTNC**	Assessment state and economic - social value of fish source in lower basin of Mekong Delta	2012/1/1	2015/12/31	36,689 AUD	Quantifying the multiple values of fish resources, interpret findings, analyse implications, and convey high levels results and implications to national decision-makers, development agencies and local actors, for sustainable and improved rural livelihoods	College of Environment and Natural Resources	ACIAR	Australia
7	**EUBEL 00412T STH**	Strengthening the impact of the ASEM Aquaculture platform - the bridge between Asian and European aquaculture	2009/1/12	2013/1/11	48,054 EUR	Develop a strong "Community of Practice" to reconcile ecosystem and economic system demands to promote and consolidate sustainability in aquaculture development in both regions	College of Aquaculture & Fisheries	VLIR	Belgium
8		Mitigation of pesticide pollution in the Mekong Delta	2010/1/4	2014/3/31	99,907.50 EUR	Characterizing the present situation regarding pesticide use in the Delta and the behaviour and occurrence of pesticide	College of Agriculture and Applied Biology	VLIR	Belgium
9		The Remote sensing-based information and Insurance for Crops in Emerging (RIICE-IRRI)	2012/1/6	2015/1/1	30,000 USD	Reducing vulnerability of smallholders in rice production through better and cheaper information systems on crop growth which will in turn lead to applications such as micro-insurance schemes	College of Environment and Natural Resources	IRRI	Philippines

NO.	Code	Title of project	Starting time	Ending time	Total of grant	Content of project	Department	Grant organization	Grant nation
10		LOTUS	2010/1/1	2014/1/1	20,000 EUR	Supplying the scholarships for Vietnam (include CTU) to study in Europe	Internation Relations Department	European Commission	Ghent Universit y
11	**GLUN DP0101 2KL**	Micro-Capital Grant Agreement For Non-Credit Related Activities	2011/2/1	2013/3/31	1,813,180,175 VND	Educating law knowledge for foreign students come to CTU for law studying	School of Law	UNDP	UNDP
12	**EUVLI R00111 NNTH**	Enrichment of fermented dairy products with selected tropical fruits from the Mekong Delta region in Vietnam	2011/1/8	2014/1/8	98,710.50 EUR	Producing fruits jam products with high-quality, nutrition and safety from the tropical fruits chosen in the Mekong Delta	College of Agriculture and Applied Biology	VLIR	Belgium
13	**AUAUS 00213V KHNC**	Improving the sustainability of rice-shrimp farming systems in the Mekong Delta, Vietnam	2013/1/6	2017/5/31	130,101 AUD	The project is to understand the mechanisms, processes and functionality of rice-shrimp farming systems through rigorous scientific investigations in order to achieve sustainable production	Climate Change Research Institute	University of New South Wales (UNSW)	Australia
14	**EUBEL 01312T SNC**	Advanced studies in pond culture - keys to success for sustainable artemia farming	2012/1/7	2016/1/9	99,850 EUR	Understanding nutrient dynamics in Artemia ponds with the aim to minimize input (e.g. fertilizer, supplementary food) but maximize out-put (biomass/cyst production) and to ensure environmental protection	College of Aquaculture and Fisheries	VLIR	Belgium
15		Decision-support Research for Environ-mental Applications and Models (DREAM) JEAI-DREAM, New IRD partner teams program	2011/1/1	2013/1/1	40,000 EUR	Research and choose the suitable models for environment in the Mekong Delta	College of Information and Communicatio n Technology	IRD	France
16		Enhancement awareness of local people to protect bats and Khmer culture in the Mekong Delta of Vietnam	2013/1/7	2014/1/2	8,950 USD	The project aims at enhancement awareness of local people, students and tourists around Bat Pagoda and visitors, and study situations about bats in the local	Mekong Delta Development Reasearch Insitute	The Rufford Small Grants Foundation	Britain

NO.	Code	Title of project	Starting time	Ending time	Total of grant	Content of project	Department	Grant organization	Grant nation
17	**EUBELG19709NCUU**	Study on rice breeding for brown plant hopper resistance	2009/1/4	2013/3/31	99,975.17 EUR	Assessing hereditary resource of rice variety to choose one has brown plant hopper resistance	Biotechnology Research and Development Institute	VLIR	Belgium
18		Research plan to investigate sediment flux through the Hau River mouth and adjacent tidal channels	2012/10/4	2013/3/31	30,000 USD	Understanding tidal and sediment dynamics at the mouth of the Hau River during high flow of the river	Climate Change Research Institute	Agency of the State of Washington, Office of Naval Research Global	America
19	**EU00001NCUU**	Sustaining Ethical Aquaculture Trade (SEAT)	2009/1/8	2013/7/30	230,687 EUR	Improving sustainment and quality of aquaculture producer	College of Aquaculture and Fisheries	European Commission and The University of Stirling, Scotland	Britain
20		Development of Agricultural Technologies in the Mekong Delta to respond to climate change (JIRCAS - Phase 2)	2011/1/4	2016/1/3	91,065 USD	Building a sustainable rural society to sustain natural resources and environment through establing a sustainable agricultural production in developing places	College of Environment and Natural Resources		Japan
21	**EUNET00812VKHNC**	Developing Agriculture, Aquaculture and Environment based climate change adaptation strategies for the Mekong Delta Plan of Vietnam	2011/5/18	2013/9/30	142,400 EUR	This project is designed to ensure a tailor-made and feasible development of an integrated climate change adaptation strategy across the agriculture, aquaculture and nature sectors in which (regional and national) policy makers, researchers and practitioners will be brought together using a relevant casus or hotspot approach. The project will deliver capacity building for setting up a science based policy process, and stimulate knowledge sharing with a strong orientation towards implementation of adaptation policies.	Climate Change Research Institute	Wageningen University and Research Center (WUR)	Netherlands

NO.	Code	Title of project	Starting time	Ending time	Total of grant	Content of project	Department	Grant organization	Grant nation
						This will create necessary support to bridge the gap between national planning and actual implementation of adaptation strategies.			
22	**EUDEN 00512K TTH**	Agricultural Growth and Poverty Pockets	2011/1/11	2014/12/31	1,381,801 DKK	Providing a better understanding of the processes that create and shape geographically concentrated areas ('pockets') of poverty in regions marked by agricultural growth and diversification	School of Economics and Business Administratio n	DANIDA	Denmark
23	**EUNET 00211T SNC**	Waste Management for Pangesius culture in the Mekong Delta of Vietnam (SuPa)	2011/1/1	2013/1/12	41,149 EUR	The project aims to contribute to improving the sustainability of Pangasius production methods by Vietnamese producers in the Mekong delta, sothat farms can comply with certification standards such as those of the Aquaculture Stewardship Council	College of Aquaculture and Fisheries	Wageningen University	Netherlan ds
24	**EUDEN 00612M TNC**	Sustainable Production of Biogas from Waste Rice Straw	2012/1/4	2016/1/12	2,396,708 DKK	Demonstrate that biogas production can be significantly enhanced by the RSTM process in farm-scale digesters in Vietnam by using RS and WH as feedstocks	College of Environment and Natural Resources	DANIDA	Denmark
25	**ASJAP 01212C TUNC**	New alkaline fertilizer for soils in Vietnam (Sumitomo)	2012/1/6	2016/1/2	352,442 USD	Testing the ability of steel lag fertilizer in improving the soil pH, soil fertility, and the side effects of fertilizer on soil chemistry/physics, product quality and environment	Can Tho University	Sumitomo Company Group	Japan
26	**ASPHI L00711 ĐBNC**	Strengthening Farmer-Agricultural Reasearch and Extension System Partnership in Participatory Plant Breeding and On-farm Agrobiodiversity Conservation in Vietnam (FARES)	2011/1/1	2013/12/31	80,350 USD	Strengthening agricultural research and extension system in Vietnam though the adoption of participatory technology development processes, and inclusion of biodiversity based agriculture production system for food security and climate change adaptation.	Mekong Delta Development Reasearch Insitute	SEARICE	Philippin es

NO.	Code	Title of project	Starting time	Ending time	Total of grant	Content of project	Department	Grant organization	Grant nation
27		Training Programme for Developing Capacity of Academic Library Staff in the Mekong Delta of Vietnam	2013/1/3	2013/1/9	16,054 AUD	Developing an effective training program for improving the capacity of academic library staff in Mekong Delta region so that they can effectively enhance the libraries' performance contributing to the advancement of the education in the Mekong Delta, which is essential to the regional sustainable development	Learning Resource Center	Australia Government	Australia
28		Adaptation to Climate Change: Lan-use innovative models applied to environmental management - ACCLIMATE (PEERS)	2012/1/1	2014/1/1	32,000 EUR	Discover the technology of creative model to improve environment and to make a decision for tracing out and using land	College of Environment and Natural Resources	IRD	France
29	**AUAUS 00712V KHNC**	Climate Adaptation through Sustainable Urban Development with the sase study on Urban Water Systems in Can Tho, Vietnam (CSIRO 1)	2010/10/8	2014/10/3	150,000 AUD	Supporting decision making for water and wastewater infrastructure investment in coastal and delta cities that reflects and respond to the anticipated impacts of climate change	Climate Change Research Institute	CSIRO	Australia
30	**AUAUS 00912V KHNC**	The Future of the Mekong Delta (Vietnam/CSIRO 2-MF)	2010/1/7	2014/1/3	177,000 AUD	Joint development of fieldwork instrumentation to collect primary household data; joint design of an assistance with partner participation in the local alternative futures workshops	Climate Change Research Institute	CSIRO	Australia
31	**EUSW E00313 MTNC**	Mangrove ecosystem services valuation-A combined approach of remote sensing and household survey analyses	2013/11/1	2014/11/1	12,000 USD	This project presents the results of ecosystem service valuation for a mangrove ecosystem tested site in Ca Mau province, MD, Vietnam They use remote sensing analyses for mapping percentage of mangroves and socio-economic analyses by using semi-structural questionnaire on household basis	College of Environment and Natural Resources	IFS (International Foundation for Science)	Sweden

NO.	Code	Title of project	Starting time	Ending time	Total of grant	Content of project	Department	Grant organization	Grant nation
32		Water management through the lens of gender, class and ethnicity: a comparative case study between an upstream and downstream of Mekong Delta's Vietnam	2014/02/01	2014/07/01	12,000 CAD	The study will explore the arena of water management, focusing on roles and responsibilities of men and women in two communes, one located in an upstream area and the other located in a downstream area of Vietnam's Mekong Delta	Mekong Delta Development Reasearch Insitute	The program of ASEAN-Canada Junior Fellowship 2013/2014	Canada
33	**EUNET 00114V KHNC**	Climate change and water supply in the Mekong Delta, Vietnam	2013/01/04	2017/01/04	39,150 EUR	The objective of this project is build the plans to adapt climate change for water supply companies, through this they can ensure the sustainable water supply for Mekong Delta	Climate Change Research Institute	Vitens Evides International	Netherlands

Appendix 4-1

CTU's Operation Plan for Strengthening Human Resources in JICA ODA Loan Project

Agriculture

No.	Research Areas	Year 1 (2015)	Year 2 (2016)	Year 3 (2017)	Year 4 (2018)	Year 5 (2019)	Year 6 (2020)	Year 7 (2021)	Total	Responsible CTU Unit
1.1	**Short training course in Japan (3 months)**									
1	Genetics and Breeding		1	1	1	1			4	CAAB
2	Molecular Biology		1	1	2	1			5	BiRDI, CAAB
3	Soil science		1	1	1				3	CAAB
4	Organic farming		1	1					2	CAAB
5	Crop science		1	1	1				3	CAAB
6	Plant protection		1	1	1				3	CAAB
7	Physiology and biochemistry		1	1	1				3	CAAB
8	Animal production		1	1	1	1			4	CAAB
9	Veterinary medicine		1	1	1	1			4	CAAB
10	Food technology		1	1	1				3	CAAB
11	Food quality management				1				1	CAAB
12	Post-harvest technology		1	1					2	CAAB
13	Marketing		1	1					2	SEBA
14	Economics		1	1					2	SEBA
15	Agricultural mechanics		1	1					2	CET
16	Global effects, regional issues, local specifics		1	1					3	MDI
17	Scientific communication			1	1				2	CAAB
18	Experimental design, biometrics, data analysis			1	1				2	CAAB
	Total	**0**	**15**	**17**	**14**	**4**	**0**	**0**	**50**	
1.2	**PhD study in Japan**									
1	Genetics and biodiversity		1						1	CAAB
2	Animal breeding and genetics		1						1	CAAB
3	Plant breeding and genetics			1					1	CAAB
4	Molecular biotechnology		1	1	1				3	BiRDI
5	Crop production and energy farming		1						1	CAAB
6	Nutrient cycling			1					1	CAAB
7	Soil resources management		1						1	CAAB
8	Organic farming			1					1	CAAB
9	Biotic stress and biotic control		1						1	CAAB
10	Abiotic stress and stress physiology			1					1	CAAB
11	Agrochemicals and pollution		1						1	CAAB
12	Farming systems		1						1	MDI
13	Sustainable animal production		1						1	CAAB
14	Animal health			1					1	CAAB
15	Veterinary medicine		1	2					3	CAAB
16	Post-harvest technology		1	1					2	CAAB
17	Economics		1	1					2	SEBA
18	Food technology		1						1	CAAB
19	Agricultural mechanics		1						1	CET
	Total	**0**	**14**	**10**	**1**	**0**	**0**	**0**	**25**	

Aquaculture and Fisheries

No.	Research Areas	Year 1 (2015)	Year 2 (2016)	Year 3 (2017)	Year 4 (2018)	Year 5 (2019)	Year 6 (2020)	Year 7 (2021)	Total	Responsible CTU Unit
1.1	**Short Training Courses in Japan**									
1	Aquaculture technology (seed production, farming, nutrition, physiology)		1	1	1				3	CAF
2	Environment and Aquatic resources management /biodiversity		1	1	1				3	*CAF, CENRES*
3	Aquatic product processing technology		1	1	1				3	*CAF, CAAB*
4	Biotechnology in aquaculture and fisheries		1	1	1				3	*CAF, BIRDI, SNS*
5	Fisheries socio-economics		1	1	1				3	*CAF, SEBA, SSS*
6	Engineering (for aquaculture and fisheries)			1					1	*CAF, CET*
7	Information technology (for aquaculture and fisheries)			1					1	*CAF, CIT*
8	Laws for aquaculture, fisheries, environments and maritime			1					1	*SL*
	Total	**0**	**5**	**8**	**5**	**0**	**0**	**0**	**18**	
1.2	**PhD Training in Japan**									
1	Aquaculture (Specializations: Marine aquaculture)		1	1	1				3	*CAF*
2	Aquatic resources management (Marine aquatic resources)		1	1					2	*CAF*
3	Aquatic product processing technology		1	1					2	*CAF, CAAB*
4	Biotechnology in aquaculture and fisheries		1	1	3				5	*CAF, BIRDI, CNS*
5	Fisheries socio-economics		1	1	3				5	*CAF, SEBA, SSS*
6	Engineering (for aquaculture and fisheries)		1	1	3				5	*CAF, CET*
7	Information technology (for aquaculture and fisheries)			1					1	*CIT*
8	Laws for aquaculture, fisheries, environments and maritime			1					1	*SL*
	Total	**0**	**6**	**8**	**10**	**0**	**0**	**0**	**24**	

Environment

No.	Research Areas	Year 1 (2015)	Year 2 (2016)	Year 3 (2017)	Year 4 (2018)	Year 5 (2019)	Year 6 (2020)	Year 7 (2021)	Total	Responsible CTU Unit
1.1	**Short training course in Japan (3 months)**									
a	**Water and land resources monitoring and analysis**									
1	*Data mining and Modeling*		1	1					2	CENRes, CET
2	*GIS and Remote sensing*		1	1					2	CENRes, CET
3	*Groundwater monitoring*		1	1					2	CENRes, CET
4	*Supervisory control & data acquisition (SCADA)*		1	1					2	CENRes, CET
b	**Laboratory techniques**									
5	*Environmental analysis techniques*			1	1	2			4	CENRes
c	**Environmental impact reduction technologies**									
6	*Water and wastewater treatment and management*		1			1			2	CENRes
7	*Solid waste treatment and Management*			1	1				2	CENRes, CET
8	*Air pollution control*		1	1					2	CENRes, CET
9	*Cleaner production technology*			1	1				2	CENRes
10	*Clean Development Mechanism*				1	1			2	CENRes
11	*Green energy*		1	1					2	CENRes, SEA
12	*Environmental Risk Assessment and management*			1	1				2	SEA
d	**Environmental Management**									
13	*Environmental policy and management*			1	1				2	CENRes
14	*Water resource management*		1	1					2	CENRes
15	*Environmental economics*		1		1				2	CENRes
16	*Sustainable Natural Resource Management*			1	1				2	CENRes
17	*Coastal management*		1	1					2	CENRes, CET
18	*Biodiversity conservation*		1	1					2	CENRes
19	*Integrated farming system*			1					1	CENRes
	Total	**0**	**11**	**16**	**8**	**4**	**0**	**0**	**39**	
1.2	**PhD study in Japan**									
a	**Water and land resources monitoring and analysis**									
1	*GIS and Remote sensing*		1	1	1				3	CENRes
2	*Environmental Modeling*			1					1	CENRes
3	*River and Coastal Regulating Engineering*		1		1				2	CENRes, CET
b	**Environmental impact reduction technologies**									
4	*Wastewater treatment*		1						1	CENRes
5	*Solid waste treatment*			1					1	CENRes
6	*Environmental Microbiology*			1					1	CENRes
7	*Renewable and Green Technology*		1	1					2	CENRes, CET
c	**Environmental Management**									
8	*Biodiversity conservation*		1						1	CENRes
9	*Environmental Resources Economics*		1						1	SEBA
10	*Environmental Planning and Management*				1				1	CENRes
	Total	**0**	**6**	**5**	**3**	**0**	**0**	**0**	**14**	

University Management and Governance

No.	Research Areas	Theme of Research Plan	Graduate school	Degree	Responsible CTU Unit
1	Quality assurance management	Planning and implementing of action plans to improve quality assurance system of CTU. Performing quality system audits of CTU.	Graduate School of Management	Master of Business Administration	QATC
2	Research coordination & management	Building action plan to improve the research regulations / policies and IPR management process in CTU to meet the standards of an excellent and international recognized university.	Graduate School of Management	Master of Business Administration	DoRA
3	Academic management	Managing undergraduate, graduate, and joint training affairs. Developing policies and strategies for developing CTU's undergraduate, graduate, and joint training. Developing curriculum undergraduate, graduate, and joint training to reach international standards	Graduate School of Management	Master of Business Administration	DAA
4	Big data	Analysis of scalability of algorithms to big data. Data warehouses and online analytical processing. Efficient storage of big data including data streams. Scalable and distributed hardware and software architectures. Software as a service. Cloud Computing. Big data programming models: map-reduce, distributed databases, software for implementing streaming and sketching algorithms. Dealing with unstructured data such as images, text or biological sequences. Data mining: methods for learning descriptive and predictive models from data. Distributed algorithms over very large graphs and matrices.	Graduate School of Information Technology	Master of Science	INAC
5	Planning	Building strategic plan, year plan & monitor the implementation of the university plans. Identify the interconnections between society and the economy, and the implications for educational planning.	Graduate School of Management	Master of Business Administration	DAP
6	Governance and Administration in the university	Building administrative procedures for the university, monitor the implementation of administrative procedures of the university.	Graduate School of Management	Master of Business Administration	DAP
7	Human resources development	Developing policies to attract high quality human resources. Improving working capacities for employees. Improve working procedures for employees to make them more effective.	Graduate School of Management	Master of Business Administration	DP
8	Human resources administration	Organizing for improving the learning efficiency in learner management at units. Organizing activities & enhancing the effectiveness of learner consultancy in learning; cultivating, coaching needed skills in order to improve training efficiency, skills, attitudes for domestic students and international students.	Graduate School of Management	Master of Business Administration	DSA
9	Project Management	Building action plan to improve international and project management process in CTU. Building action plan to improve reception, project management and organize events in CTU.	Graduate School of Management	Master of Business Administration	DIR

Appendix 4-2

Campus-2 LAN Network System

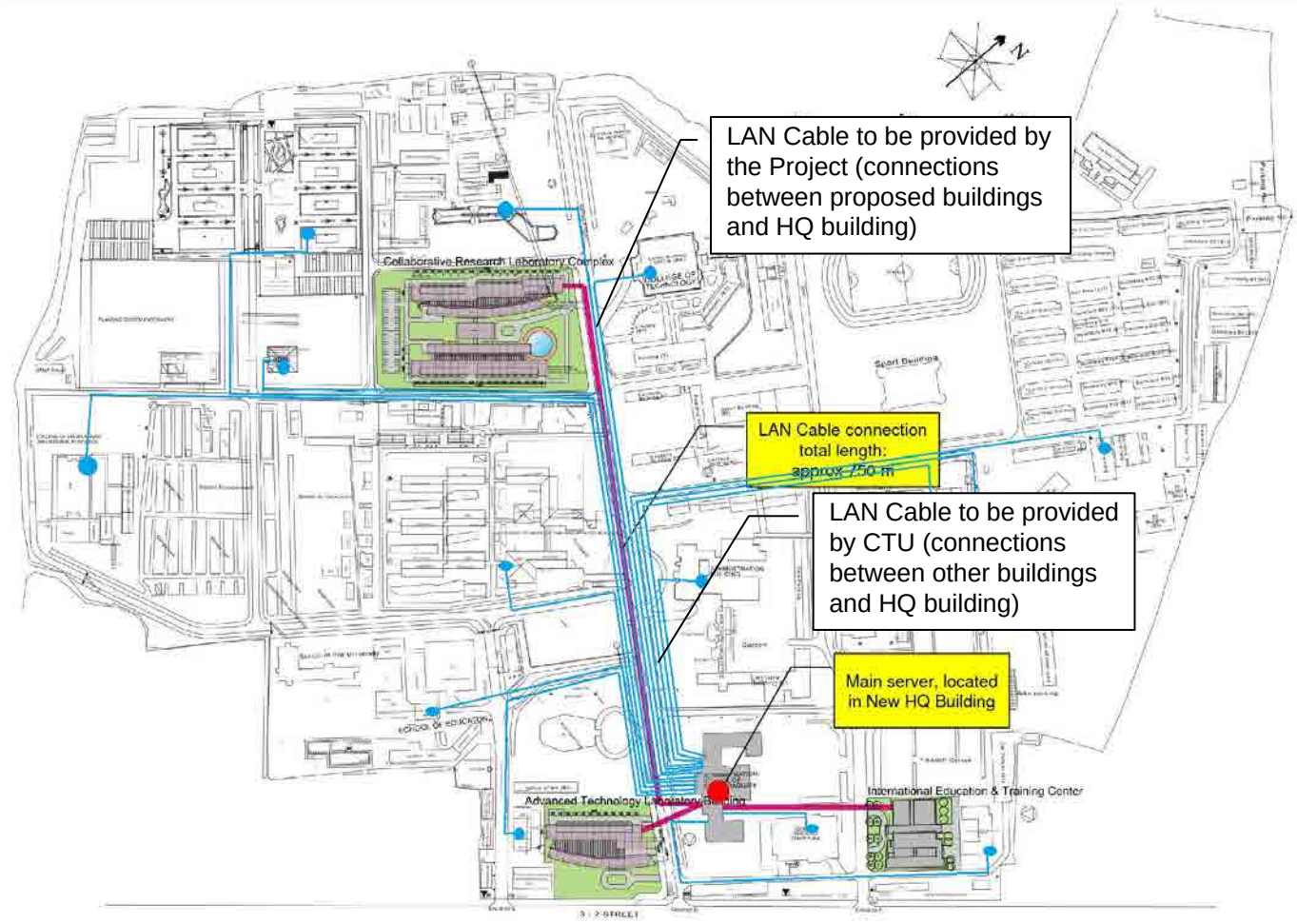


Figure Campus-2 LAN Cable System

Appendix 4-3

Relationships between Hoa An Technology Center and Priority Research Themes of CAAB, CAF and CENRes

Relationships between Hoa An Technology Center and Priority Research Themes of CAAB, CAF and CENRes

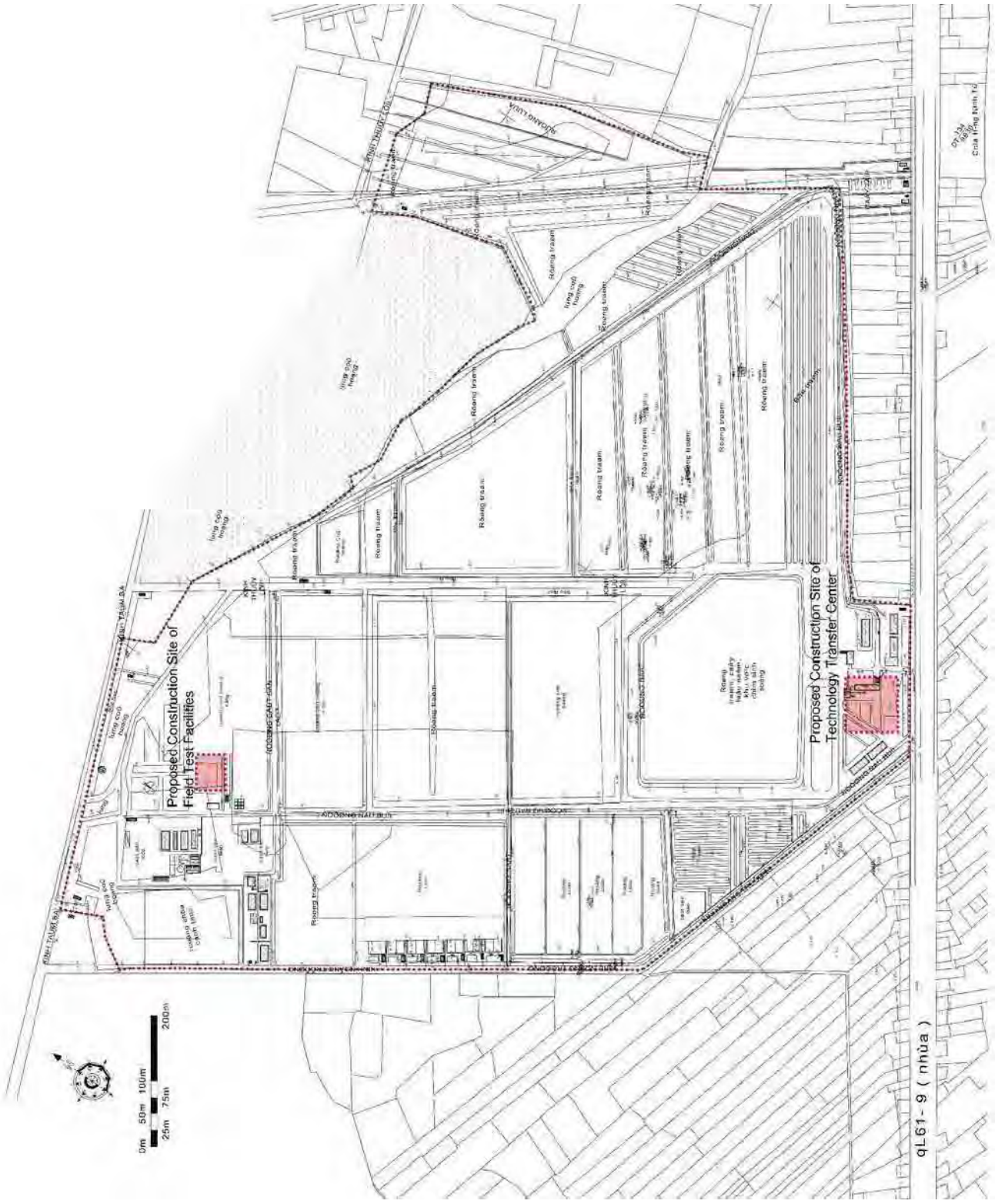
N_0	Research Themes	Tasks will be done at Hoa An Center		
		Tasks	**Existing facilities, equipment**	**Requested facilities equipment**
I	**Agriculture (CAAB)**			
1	Application of agricultural high-tech for better production of new varieties of rice and other crops in terms of quality and quantity to scope with the needs of Mekong Delta region (Program 1)	- Testing research results - Demonstration - Student practice - Transfer of technology - Seminar/conference	Paddy fields and dyke systems	- Lab - Net house - Net house & Lab, computer room - Net house & Lab, lecture, meeting & computer room - Lecture room, meeting room
2	Studies on plant responses and adaptation to environmental stresses in MD (Program 2, Research sub-theme 10)	- Testing research results - Demonstration - Student practice - Transfer of technology - Seminar/conference	Paddy fields, dyke systems and wetland area	- Lab - Net house - Net house & Lab, computer room - Net house & Lab, lecture, meeting & computer room - Lecture room, meeting room
3	Developing integrated management systems to improve the productivity and quality of rice, fruit trees, vegetables, pharmaceutical plants and industrial trees (Program 2, Research sub-theme 12, 13)	- Testing research results - Demonstration - Student practice - Transfer of technology - Seminar/conference	Paddy fields, dyke systems and wetland area	- Lab - Net house - Net house & Lab, computer room - Net house & Lab, lecture, meeting & computer room - Lecture room, meeting room
4	Studies on alternative strategies for production of rice and other crop plants under climate change impacts in the MD (Program 2, Research sub-theme 14)	- Testing research results - Demonstration - Student practice - Transfer of technology - Seminar/conference	Paddy fields	- Lab - Net house - Net house & Lab, computer room - Net house & Lab, lecture, meeting & computer room - Lecture room, meeting room
5	Developing management technologies for soil nutrition and soil remediation for crop production in the MD (Program 2, Research sub-theme 21)	- Testing research results - Demonstration - Student practice - Transfer of technology - Seminar/conference	Paddy fields and dyke systems	- Lab - Net house - Net house & Lab, computer room - Net house & Lab, lecture, meeting & computer room - Lecture room, meeting room

N_0	Research Themes	Tasks will be done at Hoa An Center		
		Tasks	**Existing facilities, equipment**	**Requested facilities equipment**
6	Development and application of high performance organic and bio-fertilizers (Program 2, Research sub-theme 26)	- Testing research results - Demonstration - Student practice - Transfer of technology - Seminar/conference	Paddy fields, dyke systems & husbandry farm	- Lab - Net house - Net house & Lab, computer room - Net house & Lab, lecture, meeting & computer room - Lecture room, meeting room
7	Application of genetic and breeding technologies for new live stock varieties with improved production, quality and adaptability to climate changes and other environmental stresses	- Testing research results - Demonstration - Student practice - Transfer of technology - Seminar/conference	Husbandry farm	- Lab - Lab, computer room - Lab, lecture, meeting & computer room - Lecture room, meeting room
II	**Aquaculture (CAF)**			
8	Green technology for seed production and farming systems for sustainable inland aquaculture	- Research - Testing research results - Demonstration - Student practice - Transfer of technology - Seminar/conference	Hatchery, Fish pond, paddy fields & wet land area	- Lab - Lab - Net house - Net house & Lab - Net house & Lab, lecture, meeting & computer room - Lecture room, meeting room
9	Monitoring and management of water and sediment quality (physical-chemical-biological factors) for inland aquaculture in Mekong Delta	- Testing research results - Demonstration - Student practice - Transfer of technology - Seminar/conference	Fish pond, tanks & paddy fields	- Lab - Net house - Net house & Lab - Net house & Lab, lecture, meeting & computer room - Lecture room, meeting room
10	Impacts of environmental changes on socioeconomics of aquaculture activities in Mekong Delta region	- Research - Testing research results - Demonstration - Student practice - Transfer of technology - Seminar/conference	Fish pond, paddy fields & surrounding areas of Hoa An campus	- Lecture, meeting & computer room - Lecture room, meeting room

N_0	Research Themes	Tasks will be done at Hoa An Center		
		Tasks	Existing facilities, equipment	Requested facilities equipment
11	Evaluation on the impacts and roles of policies on sustainable development of aquaculture	- Research - Transfer of technology - Seminar/conference	Surrounding areas of Hoa An campus	- Lecture, meeting & computer room - Lecture room, meeting room
III	**Environment (CENRes)**			
12	To study and demonstrate possible techniques to treat the soil, water and air pollutions in the specific context of the Vietnamese Mekong Delta	- Testing research results - Demonstration - Student practice - Transfer of technology - Seminar/conference	Land, paddy fields, husbandry farm, fish pond & wetland area	- Lab - Net house - Net house & Lab - Net house & Lab, lecture, meeting & computer room - Lecture room, meeting room
13	To study and demonstrate changes of the farming systems to support eliminate pollutants loaded to the environment (including GHG)	- Research - Testing research results - Demonstration - Student practice - Transfer of technology - Seminar/conference	Paddy fields, husbandry farm, fish pond &wetland area	- Lab - Lab - Net house - Net house & Lab - Net house & Lab, lecture, meeting & computer room - Lecture room, meeting room
14	To study and demonstrate possible solutions to protect the existing biodiversity and natural resources	- Research - Testing research results - Demonstration - Student practice - Transfer of technology - Seminar/conference	Wetland area	- Lab - Lab - Net house - Net house & Lab - Net house & Lab, lecture, meeting & computer room - Lecture room, meeting room
15	To study and demonstrate on the adaptation strategies on sustainable uses of natural resources in the context of climate change and environmental degradation	- Research - Testing research results - Demonstration - Student practice - Transfer of technology - Seminar/conference	Paddy fields, husbandry farm, fish pond &wetland area	- Lab - Lab - Net house - Net house & Lab - Net house & Lab, lecture, meeting & computer room - Lecture room, meeting room

Appendix 4-4

Proposed Construction Areas, Hoa An Campus



Proposed Construction Areas, Hoa An Campus

Appendix 4-5

Room Allocation List
(FSP: Functional Space Program)

Advanced Technology Lab Building-1

Advanced Technology Laboratory Building-1

Building/ Faculty/ Department	Lab Cluster	Floor	Room Allocation							Remarks
			No.	Lab's Current Condition	Types of Labs	Room Name	Room Area (sqm)	No. of Rooms	Sub-total (sqm)	
Common Equipment Operation Center		1FL			Research	Common Equipment Operation Center	389	1	389	
						Academic Staff Office	52	1	52	4 seats
						Research Office	52	1	52	12 seats
CAAB, Agriculture Genetics & Breeding			1	Existing	Research	Plant Molecular Genetics Lab	156	1	156	
			2	Existing	Research	Plant Breeding Lab	156	1	156	
			3	Existing	Research	Seed Technology Lab	156	1	156	
						Equipment/Preparation Room	39	1	39	
						Academic Staff Office	52	3	156	12 seats (4 sets/module)
						Research Office	52	2	104	24 seats (12 seats/module)
						Seminar Room	52	1	52	25 seats
		868				Administration Office	52	1	52	4 seats
CAAB, Plant Physiology & Biochemistry			4	Existing	Research	Cell Biotechnology Lab	156	1	156	
			5	New	Research	Applied Biological Science Lab	156	1	156	
						Equipment/Preparation Room	39	1	39	
						Sterilization Room	39	1	39	
						Department Head Office	26	1	26	w/secretary seat
						Academic Staff Office	52	2	104	8 seats
						Research Office	52	2	104	24 seats
						Seminar Room	52	1	52	25 seats
		726				Administration Office	52	1	52	4 seats
CAAB, Soil Science			6	Shared	Research	Soil Chemistry Lab	156	1	156	
			7	Existing	Research	Soil Physics Lab	156	1	156	
			8	Existing	Research	Soil Microbiology Lab	156	1	156	
			9	Existing	Research	Soil Classification & Micromorphology Lab	156	1	156	
						Equipment/Preparation Room	39	1	39	
						Sample Processing Room	39	1	39	
						Incubation Room/Freezing Storage Room	78	1	78	
						Academic Staff Office	52	3	156	12 seats
						Research Office	52	2	104	24 seats
						Seminar Room	52	1	52	25 seats
		1,140				Administration Office	52	1	52	4 seats
CAAB, Plant Protection			10	New	Research	Plant Protection Biological & Chemical Technology Lab	156	1	156	
						Academic Staff Office	52	1	52	4 seats
						Research Office	52	1	52	12 seats
		311				Seminar Room	52	1	52	25 seats
CAAB, Crop Science			11	New	Research	Rice Research Lab	156	1	156	
			12	New	Research	Edible & Pharmaceutical Mushroom Lab	156	1	156	
						Department Head Office	26	1	26	w/secretary seat
						Deputy Department Head Office	26	1	26	w/secretary seat
						Academic Staff Office	52	2	104	8 seats
						Research Office	52	2	104	24 seats
						Seminar Room	52	1	52	25 seats
		674				Administration Office	52	1	52	4 seats
CAAB, Animal Science			13	New	Research	Animal Biotechnology & Molecular Biology Lab	156	1	156	
						Equipment/Preparation Room	78	1	78	
						Academic Staff Office	52	1	52	4 seats
						Research Office	52	1	52	12 seats
						Seminar Room	52	1	52	25 seats
		441				Administration Office	52	1	52	4 seats
CAAB, Veterinary Medicine			14	Existing	Research	Hygiene & Safety of Animal-based Food Lab	156	1	156	
			15	Existing	Research	Histology & Molecular Pathology Lab	156	1	156	
			16	Existing	Research	Veterinary Pharmacology Lab	156	1	156	
			17	New	Research	Immunology & Epidemiology Lab	156	1	156	
			18	Existing	Research	Animal Clinic & Virology Lab	156	1	156	
						Equipment/Preparation Room	39	1	39	
						Academic Staff Office	52	3	156	12 seats
						Research Office	52	3	156	36 seats
						Seminar Room	52	1	52	25 seats
		1,231				Administration Office	52	1	52	4 seats
	Materials & Molecular Modeling		19	New	Research	Materials and Molecular Modeling Lab	156	1	156	Coputer Lab (CoNS & CoET)
						Academic Staff Office	52	1	52	4 seats
		259				Research Office	52	1	52	12 seats
BiRDI, Molecular Biotechnology	Stem Cell		20	New	Research	Stem Cell Lab	156	1	156	BSL-3 level
						Preparation/Changing Room & Anteroom	78	1	78	
						Equipment/Preparation Room	39	1	39	
						Sterilization Room	39	1	39	
						Academic Staff Office	52	1	52	4 seats
		415				Research Office	52	1	52	12 seats

Advanced Technology Lab Building-2

Advanced Technology Laboratory Building-2

Building/ Faculty/ Department	Lab Cluster	Floor	Room Allocation No.	Lab's Current Condition	Types of Labs	Room Name	Room Area (sqm)	No. of Rooms	Sub-total (sqm)	Remarks
CAF Freshwater & Coastal Aquaculture	Genetic & Selective Breeding Lab	441	21	New	Research	Fish Reproductive Biology Labs	78	1	78	
			22	New	Research	Fish Histology & Embryology Labs	78	1	78	
			23	New	Research	Fish Genetics & Selective Breeding Lab	78	1	78	
						Academic Staff Office	52	1	52	4 seats
						Lecturer Office	52	1	52	12 seats
						Research Office	52	1	52	25 seats
						Seminar Room	52	1	52	4 seats
CoNS Bio-Chemis-Pharmacy	Bio-Chemis-Pharma Technology & Aquatic Product	544	24	New	Research	Advanced Equipments Lab	78	1	78	
			25	New	Research	Bioassay Lab	156	1	156	
			26	New	Research	Natural Products Chemistry Lab	156	1	156	
						Academic Staff Office	52	1	52	4 seats
						Research Office	52	1	52	12 seats
						Seminar Room	52	1	52	25 seats
CENREs	Climate Change & Environmental	259	27			Climate Observation Lab	78	1	78	
			28			Environment Observation Lab	78	1	78	
						Academic Staff Office	52	1	52	4 seats
						Research Office	52	1	52	12 seats
	Environmental & Behavioral Economics	337	29			Behavioral Economic Research Lab	78	1	78	
			30			Quantitative Economic Research Lab	78	1	78	
			31			Economic Simulation Research Lab	78	1	78	
						Academic Staff Office	52	1	52	4 seats
						Research Office	52	1	52	12 seats
Supporting Activities for 3 Research Fields	Basic Science Lab	220	33			Advanced equipment lab	78	1	78	
						Samples Preparation Room	39	1	39	
						Academic Staff Office	52	1	52	4 seats
						Research Office	52	1	52	12 seats
	Advanced Materials Lab	220	34			Advanced Equipment Lab	78	1	78	
						Samples Preparation Room	39	1	39	
						Academic Staff Office	52	1	52	4 seats
						Research Office	52	1	52	12 seats
	Multifunctional Bio-Ecocompatible Material Lab	220	35			Advanced Equipment Lab	78	1	78	
						Samples Preparation Room	39	1	39	
						Academic Staff Office	52	1	52	4 seats
						Research Office	52	1	52	12 seats
	Multicomponent Polymer Lab	220	36			Advanced Equipment Lab	78	1	78	
						Samples Preparation Room	39	1	39	
						Academic Staff Office	52	1	52	4 seats
						Research Office	52	1	52	12 seats
	Medical Biology Lab	181	37			Medical Biology Lab	78	1	78	
						Academic Staff Office	52	1	52	4 seats
						Research Office	52	1	52	12 seats
	Electronic Circuit Lab	181	38			Electronic Circuit Lab	78	1	78	
						Academic Staff Office	52	1	52	4 seats
						Research Office	52	1	52	12 seats
Administration Office (Advanced Common Felicity						Professor/Associate Professor Room	26	10	259	
						Research Office	52	5	259	
						Seminar Room	52	4	207	
						Lecture Room (30 seats)	52	4	207	
						PBL (Problem-Based Learning) Room	26	8	207	
						Library	156	1	156	
						Dining Room/Kitchen	156	1	156	
						Auditorium (200 seat)	156	1	156	
						Exhibition Space	156	1	156	Introducing Japanese culture
						Administration Office	52	1	52	4 seats
						Meeting Room	52	2	104	
						BMS Control Room	52	1	52	
						Electric Room	52	1	52	
						Generator Room	104	1	104	
						Machine Room	52	1	52	
						Wastewater Treatment Room	52	1	52	
						NET Total			11,120	
						Toilets, Pantry, Storage, Corridor and Stairs, etc.				
						Total Floor Area	16,348	(Actual Total Floor Area)		

Bio-tech Building (CAAB)

Research Laboratory Complex, Bio-Tech Wing (College of Agriculture & Applied Biology, CAAB)

Building/ Faculty/ Department	Lab Cluster	Floor	Room Allocation							Remarks
			No.	Lab's Current Condition	Types of Labs	Room Name	Room Area (sqm)	No. of Rooms	Sub-total (sqm)	
CAAB, Food Technology			1	Shared	Research Basic	Food Technology Lab	156	1	156	
						Food Technology Basic Lab	117	1	117	
						Preparation Room	39	1	39	
			2	Shared	Research Basic	Postharvest Technology Lab	156	1	156	
						Postharvest Technology Basic Lab	117	1	117	
						Preparation Room	39	1	39	
			3	Shared	Research	Food Nutrition Lab	156	1	156	
			4		Research	Food Process Engineering Lab	156	1	156	
						Food Process Engineering Basic Lab	117	1	117	
						Preparation Room	39	1	39	
			5	New	Research	Food Chemistry Lab	156	1	156	
			6	New	Research	Food Microbiology Lab	156	1	156	
						Food Microbiology Basic Lab	117	1	117	
						Preparation Room	39	1	39	
			7	Existing	Research	Food Biotechnology Lab	156	1	156	
						Sensory Evaluation Room	39	1	39	
						Cooling/Frozen Storage Rooms	78	1	78	
		1F	8	Shared	Research	Fish & Meat Processing Pilot Plant Lab	117	1	117	
		1F	9		Research	Cereal Processing Pilot Plant Lab	117	1	117	
		1F	10	Shared	Research	Post Harvest Technology Pilot Plant Lab	117	1	117	
		1F	11		Research	Beverage Processing Pilot Plant Lab	117	1	117	
						Computer Room	104	1	104	25 seats
						Department Head Office	26	1	26	w/secretary seat
						Academic Staff Office	52	6	311	24 seats
						Research Office	52	2	104	24 seats
						Seminar Room	52	2	104	25 seats x 2
		2,994				Administration Office	52	1	52	4 seats

Field Test Facility (College of Agriculture & Applied Biology, CAAB)

Building/ Faculty/ Department	Lab Cluster	Floor	Room Allocation							Remarks
			No.	Lab's Current Condition	Types of Labs	Room Name	Room Area (sqm)	No. of Rooms	Sub-total (sqm)	
CAAB	Crop Science					Horticulture Science Net House	500	3	1,500	Net House
						Phytotron	100	2	200	Glass house with climate control
						Rice Research Net House	500	1	500	Net House
						Mushroom Greenhouse	100	5	500	
	Agriculture Genetics & Breeding					Greenhouse	500	2	1,000	
	Plant Protection					Greenhouse	500	3	1,500	
						Net House	500	3	1,500	Net House
	Soil Science					Greenhouse	300	1	300	
						Greenhouse	300	1	300	
						Phytotron	100	1	100	Glass house with climate control
BiRDI						Greenhouse	500	2	1,000	
							Total Floor Area	8,400		

Biotechnology Research & Development Institute (BiRDI)

Research Laboratory Complex, Bio-Tech Wing (Biotechnology Research & Development Institute, BiRDI)

Building/ Faculty/ Department	Lab Cluster	Floor	Room Allocation: No.	Lab's Current Condition	Types of Labs	Room Name	Room Area (sqm)	No. of Rooms	Sub-total (sqm)	Remarks
BiRDI, Microbial Biotechnology	Food Biochemistry		1	Shared	Research	Food Biochemistry Lab	156	1	156	BSL-2 level
			2		Basic	Food Biochemistry Basic Lab	117	1	117	BSL-2 level
						Preparation Room	39	1	39	
			3	Existing	Research	Protein Technology & Natural Product Lab (research lab)	117	1	117	BSL-2 level
						Cold Room	39	1	39	
						Department Head Office	26	1	26	w/secretary seat
						Academic Staff Office	52	1	52	4 seats
						Research Office	52	1	52	12 seats
		9048				Seminar Room	52	1	52	25 seats
	Food Biotechnology		4	Shared	Research	Food Biotechnology Lab	117	1	117	BSL-2 level
			5		Basic	Food Biotechnology Basic Lab	117	1	117	BSL-2 level
						Preparation Room	39	1	39	
			6	Existing	Research	Food Microbiology Lab	156	1	156	BSL-2 level
			7	Existing	Research	Industrial Microbiology Lab	156	1	156	BSL-2 level
			8	Existing	Research	Mycology Lab	78	1	78	BSL-2 level
						Department Head Office	26	1	26	w/secretary seat
						Academic Staff Office	52	1	52	4 seats
						Research Office	52	1	52	12 seats
		842				Seminar Room	52	1	52	25 seats
	Microbiology & Environmental Microbiology		8	Shared	Research	Microbiology Lab	156	1	156	BSL-2 level
			10		Basic	Microbiology Basic Lab	117	1	117	BSL-2 level
						Preparation Room	39	1	39	
			11	Existing	Research	Environmental Microbiology Lab	156	1	156	BSL-2 level
						Fermentation Room	78	1	78	
						Department Head Office	26	1	26	w/secretary seat
						Academic Staff Office	52	1	52	4 seats
						Research Office	52	1	52	12 seats
		674								
BiRDI, Molecular Biotechnology	Plant Gene Technology & Bioinformatics		12	Shared	Research	Plant Tissue Culture Lab	156	1	156	BSL-2 level
			13		Basic	Plant Tissue Culture Basic Lab	117	1	117	BSL-2 level
						Preparation Room	39	1	39	
			14	Shared	Research	Plant Breeding Lab	117	1	117	BSL-2 level
			15		Basic	Plant Breeding Basic Lab	117	1	117	BSL-2 level
						Preparation Room	39	1	39	
			16	Existing	Research	Gene Technology Lab	117	1	117	BSL-3 level
						Preparation/Changing Room & Anteroom	78	1	78	
			17	Existing	Research	Bioinformatics Lab	117	1	117	
						Department Head Office	26	1	26	w/secretary seat
						Academic Staff Office	52	1	52	4 seats
						Research Office	52	1	52	12 seats
	Molecular Biotechnology		18	Shared	Research	Molecular Biology Lab	156	1	156	BSL-3 level
			19		Basic	Molecular Biology Basic Lab	117	1	117	BSL-3 level
						Preparation Room	39	1	39	
			20	Existing	Research	Virology Lab	117	1	117	BSL-3 level
						Preparation/Changing Room & Anteroom	78	1	78	
						Sterilization Room	78	1	78	
						Electrophoresis/2D Electrophoresis Room	78	1	78	
						Department Head Office	26	1	26	w/secretary seat
						Academic Staff Office	52	1	52	4 seats
		791				Research Office	52	1	52	12 seats
BiRDI						PBL (Problem-Based Learning) Room	26	6	156	Shared by all departments
						Computer Room	104	2	207	25 seats/each
	Directorate & Administration Office					Director Office/Secretary Room	52	1	52	w/secretary seat
						Deputy Director Room	26	2	52	w/secretary seat
						Administration Office	52	1	52	4 seats
						Institutional Unions Office	26	1	26	
						Meeting Room	52	2	104	25 seats x 2
						Library	156	1	156	
						Dining Room/Kitchen	78	1	78	
						Auditorium (200 seat)	311	1	311	
Common Facility						BMS Control Room	52	1	52	
						Electric Room	52	1	52	
						Generator Room	52	1	52	
						Machine Room	52	1	52	
						Wastewater Treatment Room	52	1	52	
						NET Total			16,824	
						Toilets, Pantry, Storage, Corridor and Stairs, etc.				
						Total Floor Area	12,706	(Actual Total Floor Area)		

College of Aquaculture & Fisheries, CAF

Building/ Faculty/ Department	Lab Cluster	Floor	Room Allocation: No.	Lab's Current Condition	Types of Labs	Room Name	Room Area (sqm)	No. of Rooms	Sub-total (sqm)	Remarks
Aquatic Nutrition & Products	Fish Biology		1	Shared	Research	Fish Nutrition Lab	78	1	78	
			2		Basic	Fish Nutrition Basic Lab	78	1	78	
			3	Shared	Research	Fish Physiology Lab	78	1	78	
			4		Basic	Fish Physiology Basic Lab	78	1	78	
	Product Processing		5	Shared	Research	Microbiology Lab	78	1	78	
			6		Basic	Microbiology Basic Lab	78	1	78	
			7	Shared	Research	Food Safety Lab	78	1	78	
			8		Basic	Food Safety Basic Lab	78	1	78	
					Research	Aquatic Product Processing Techniques (CAF Area)				
					Basic	Aquatic Product Processing Basic Techniques (CAF Area)				
						Lecturer Office	52	1	52	4 seats
						Research Office	52	1	52	12 seats
		467				Seminar Room	52	1	52	25 seats
Aquatic Biology & Pathology	Fish Pathology		9	Existing	Research	Parasitology Lab / Mycology labs	39	2	78	
			10	Existing	Research	Bacteriology Lab	78	1	78	
			12	Existing	Research	PCR - Virology Lab	39	2	78	BSL-3?
			13	Existing	Research	Histology Lab	78	1	78	
			14	Existing	Research	Fish Immunology Lab - tissue culture	39	2	78	
			18	Existing	Basic	Fish Pathology Basic Lab	117	1	117	
						Preparation Room	39	1	39	
						Lecturer Office	52	1	52	4 seats
						Research Office	52	1	52	12 seats
		700				Seminar Room	52	1	52	25 seats
Applied Hydrobiology	Aquatic Environment		19	New	Research	Aquaculture Ponds Water/Sediment Lab	78	1	78	
			20	Existing	Research	Algae Toxins & Plankton/Periphyton Biodiversity Lab	78	1	78	
			21	Existing	Research	Live Food Study Lab	39	2	78	
			22	Existing	Research	Probiotics Study Lab	78	1	78	
			23	Existing	Research	Marine Biodiversity & Bioactive Products Lab	78	1	78	
			26	Existing	Basic	Water Quality/Aquatic Invertebrate/Fish Taxonomy Basic Lal	78	2	156	
						Lecturer Office	52	1	52	4 seats
						Research Office	52	1	52	12 seats
		700				Seminar Room	52	1	52	25 seats
Fisheries Management & Economics	Fisheries Resources		25		Basic lab	Fish Biology Lab	78	1	78	
			26			Fish Distribution & Migration Lab	78	1	78	
			27			Fish Stock Assessment & Management Lab	78	1	78	
			28			Fish Population Dynamics Lab	78	1	78	
			29			Fish Collection Room	156	1	156	
						Lecturer Office	52	1	52	4 seats
						Research Office	52	1	52	12 seats
		544				Seminar Room	52	1	52	25 seats
Common Facility						Machine Room	52	1	52	
						NET Total			2,851	
						Toilets, Pantry, Storage, Corridor and Stairs, etc.				
						Total Floor Area	13,007		(Total Floor Area of CAF, CENRes CoET Lab Complex	

Hatcheries (College of Aquaculture & Marine Living Aquatic Resources, CAF)

Building/ Faculty/ Department	Lab Cluster	Floor	Room Allocation: No.	Lab's Current Condition	Types of Labs	Room Name	Room Area (sqm)	No. of Rooms	Sub-total (sqm)	Remarks
CAF Hatchery-1 Coastal Aquaculture	Braskishwater Seed Production					Student Practice Hatchery	200	1	200	
						Crustacean Hatchery	200	1	200	
						Blackish & Marine Fish Hatchery	200	1	200	
						Mollusca Hatchery	100	1	100	
						Algae Hatchery	50	1	50	
						Seaweed Hatchery	50	1	50	
						Staff/Student Room	50	1	50	
						Store Room	50	1	50	
Hatchery-2 Freshwater Aquaculture	Freshwater Seed Production					Student Practice Hatchery	200	1	200	
						General Seed Production Hatchery	300	1	300	
						Seed Selective Breeding Hatchery	200	1	200	
						Ornamental Fish Hatchery	100	1	100	
						Staff/Student Room	50	1	50	
						Store Room	50	1	50	
Hatchery-3 Aquatic Nutrition & Products Processing						Physiology Hatchery	200	1	200	
						Nutrition & Biology Research Hatchery	200	1	200	
						Staff/Student Room	50	1	50	
						Store Room	50	1	50	
Applied Hydrobiology						Environmental & Fisheries Resource Hatchery	200	1	200	
Aquatic Biology & Pathology						Fish Pathology Hatchery	200	1	200	
						Total Floor Area	2,700			

College of Environment & Natural Resources Management, CENRes

Research Laboratory Complex, CENRes Wing (College of Environment & Natural Resources Management, CENRes)

Building/ Faculty/ Department	Lab Cluster	Floor	Room Allocation: No.	Lab's Current Condition	Types of Labs	Room Name	Room Area (sqm)	No. of Rooms	Sub-total (sqm)	Remarks
Environmental Science Dept.	Environmental Biology		1	Existing	Research	Environmental Macrobiology Lab	78	1	78	BSL-2
			2	New	Research	Environmental Microbiology Lab	78	1	78	BSL-2
						Biology Specimens Room	78	1	78	Specimen Museum
			3	New	Basic	Environmental Biology Basic Lab	117	1	117	
						Preparation Room/Lecturer Office	39	1	39	
		441				Research Office	52	1	52	12 seats
	Water & Soil Environment		4	Shared	Research	Soil & Water Environmental Quality Lab	78	1	78	
			5		Basic	Soil & Water Environmental Quality Basic Lab	117	1	117	
						Sample Preparation Room/Lecturer Office	39	1	39	
		285				Research Office	52	1	52	12 seats
	Environmental Toxicology	1F?	6	Shared	Research	Environmental Toxicology Lab	78	1	78	Open space (150 m2)
			7		Basic	Environmental Toxicology Basic Lab	117	1	117	
						Preparation Room/Lecturer Office	39	1	39	
		285				Research Office	52	1	52	12 seats
Environmental Engineering Dept.	Wastewater Treatment	1F?	8	Shared	Research	Water & Wastewater Treatment Technology Lab	78	1	78	Open space (75 m2)
			9		Basic	Water & Wastew ater Treatment Technology Basic Lab	117	1	117	
						Preparation Room/Lecturer Office	39	1	39	
		285				Research Office	52	1	52	12 seats
	Solid Waste Treatment	1F?	10	Shared	Research	Solid Waste Treatment Technology Lab	78	1	78	Open space (75 m2)
			11		Basic	Solid Waste Treatment Technology Basic Lab	117	1	117	
						Preparation Room/Lecturer Office	39	1	39	
		285				Research Office	52	1	52	12 seats
	Chemical Environmental Engineering		12	Shared	Research	Environmental Chemical Engineering Lab	78	1	78	
			13		Basic	Environmental Chemical Engineering Basic Lab	117	1	117	
						Preparation Room/Lecturer Office	39	1	39	
		285				Research Office	52	1	52	12 seats
Land Resources Dept.	GIS & Remote Sensing		14	New	Basic	GIS & Remote Sensing Basic Lab	78	1	78	
						Academic Staff Office	52	1	52	4 seats
		181				Research Office	52	1	52	12 seats
	Land Resources		15	New	Basic	Land Resources Basic Lab	78	1	78	
						Academic Staff Office	52	1	52	4 seats
		181				Research Office	52	1	52	12 seats
Environmental & Natural Resources Management	Air Pollution Control		16	New	Research	Air Pollution Control Technology Lab	78	1	78	
			17	New	Research	Air Pollution Control Technology Basic Lab	117	1	117	
						Preparation Room	39	1	39	
						Research Office	52	1	52	
		285				Academic Staff Office				
	Environmental Modeling					Ground Water Modeling Lab	78	1	78	
						Surface Water Modeling Lab	78	1	78	
						Research Office	52	1	52	
		207				Academic Staff Office				
						Lecture Room (80 seats)	52	2	104	
						Administration Office				
						NET Total			2,825	
						Toilets, Pantry, Storage, Corridor and Stairs, etc.				
						Total Floor Area	13,007	(Total Floor Area of CAF, CENRes CoET Lab Complex		

College of Engineering Technology, CoET

Research Laboratory Complex, CoET Wing (College of Engineering Technology, CoET)

Building/ Faculty/ Department	Lab Cluster	Floor	Room Allocation							Remarks
			No.	Lab's Current Condition	Types of Labs	Room Name	Room Area (sqm)	No. of Rooms	Sub-total (sqm)	
CoET, Mechanical Engineering/ Automation Technology/ Industrial Management	Agricultural & Aquacultural Engineering Lab			Existing	Research	Agricultural & Aquacultural Engineering Lab	156	2	311	
						Academic Staff Office	52	1	52	4 seats
						Research Office	52	2	104	12 seats
						Seminar Room	52	1	52	25 seats
CoET, Mechanical Engineering/ Civil Engineering/ Chemical Engineering	Material Engineering Lab			Existing	Research	Material Engineering Lab	156	3	467	
						Academic Staff Office	52	1	52	4 seats
						Research Office	52	2	104	12 seats
						Seminar Room	52	1	52	25 seats
CoET, Electrical Engineering/ Chemical Engineering	Clean & Renewable Energy Lab			New	Research	Clean & Renewable Energy Lab	156	2	311	
						Academic Staff Office	52	1	52	4 seats
						Research Office	52	2	104	12 seats
						Seminar Room	52	1	52	25 seats
CoET, Automation Technology/ Electronics & Telecommunic	Aquaculture & Environment Automation Lab			New	Research	Aquaculture & Environment Automation Lab	156	2	311	
						Academic Staff Office	52	1	52	4 seats
						Research Office	52	2	104	12 seats
						Seminar Room	52	1	52	25 seats
CoET, Chemical Engineering	Chemical Engineering Lab			Existing	Research	Chemical Engineering Lab	156	2	311	
						Academic Staff Office	52	1	52	4 seats
						Research Office	52	2	104	12 seats
						Seminar Room	52	1	52	25 seats
						Preparation Room/Chemical Storage	52	1	52	
						NET Total			2,800	
						Toilets, Pantry, Storage, Corridor and Stairs, etc.				
						Total Floor Area	13,007	(Total Floor Area of CAF, CENRes CoET Lab Complex		

International Education Training Center (IETC)

International Education Training Center (IETC)

Building/ Faculty/ Department	Lab Cluster	Floor	Room Allocation: No.	Lab's Current Condition	Types of Labs	Room Name	Room Area (sqm)	No. of Rooms	Sub-total (sqm)	Remarks
Common Lecture Rooms						500 Seat Auditorium	534	1	534	(including MR for Auditorium)
						300 Seat Auditorium	426	1	426	(including MR for Auditorium)
						Lecture Room 40 seat	64	4	256	
						Lecture Room 60 seat	96	16	1,536	
						Lecture Room 80 seat	128	18	2,304	
						Lecture Room 120 seat	192	10	1,920	
						Administration Office	64	3	192	
						NET Total			7,168	
						Toilets, Pantry, Storage, Corridor and Stairs, etc.				
						Total Floor Area	10,270	(Actual Total Floor Area)		

Hoa An Technology Transfer Center

Hoa An, Center for Technology Transfer

Building/ Faculty/ Department	Lab Cluster	Floor	Room Allocation: No.	Lab's Current Condition	Types of Labs	Room Name	Room Area (sqm)	No. of Rooms	Sub-total (sqm)	Remarks
College of Rural Development					Basic	Student Practice Lab	117	2	233	
						Preparation Room/Lecturer Office	78	1	78	
	CAF					Research Office (CAAB)	52	1	52	
	CENRes					Research Office (CAF)	52	1	52	For visiting researchers and
	CAAB					Research Office (CENRes)	52	1	52	experts
						Expert Room	52	1	52	
						Seminar Room	52	4	207	
						PBL (Problem-Based Learning) Room	26	5	130	For group discussion during training
						Computer Room	104	1	104	
						Lecture room 40 seats	52	5	259	
						Lecture room 80 seats	104	15	1,555	
						Library	104	1	104	(including reading spaces)
						Meeting Room	207	1	207	400 seats
						Manager Room	26	1	26	
	CTU					Hoa An Campus Management Office	104	1	104	To be used for CTU's Officers
						Lounge	104	1	104	
						Cafeteria/Kitchen	104	1	104	
						NET Total			3,421	
						Toilets, Pantry, Storage, Corridor and Stairs, etc.				
						Total Floor Area	4,888	(Assuming NET Area/Total Floor Area rate 70%)		

Field Test Facility (Hoa An Campus)

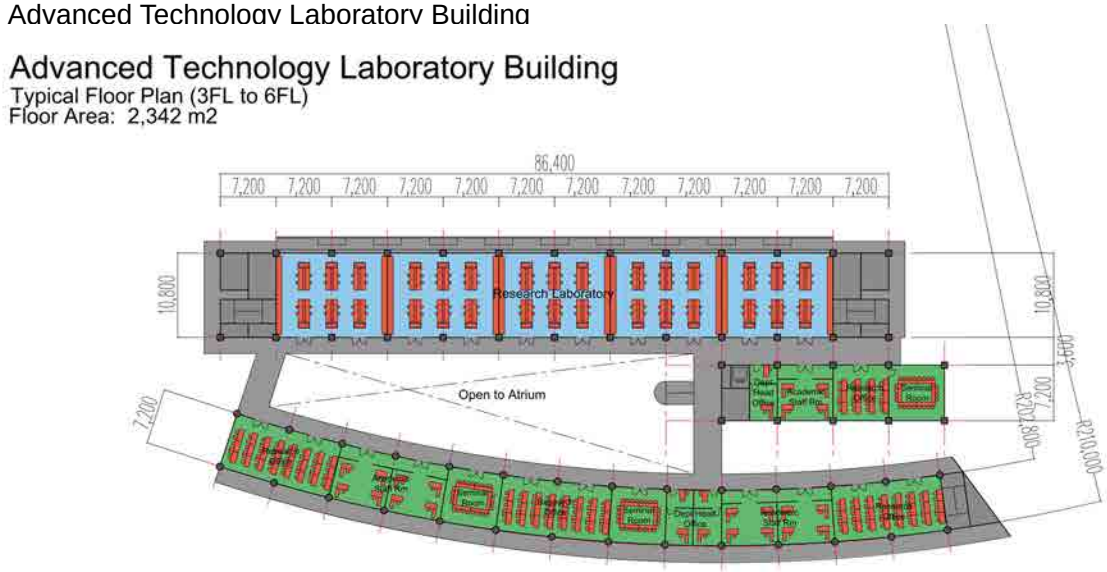
Building/ Faculty/ Department	Lab Cluster	Floor	Room Allocation: No.	Lab's Current Condition	Types of Labs	Room Name	Room Area (sqm)	No. of Rooms	Sub-total (sqm)	Remarks
College of Rural Development						Greenhouse	500	4	2,000	
						Total Floor Area	2,000			

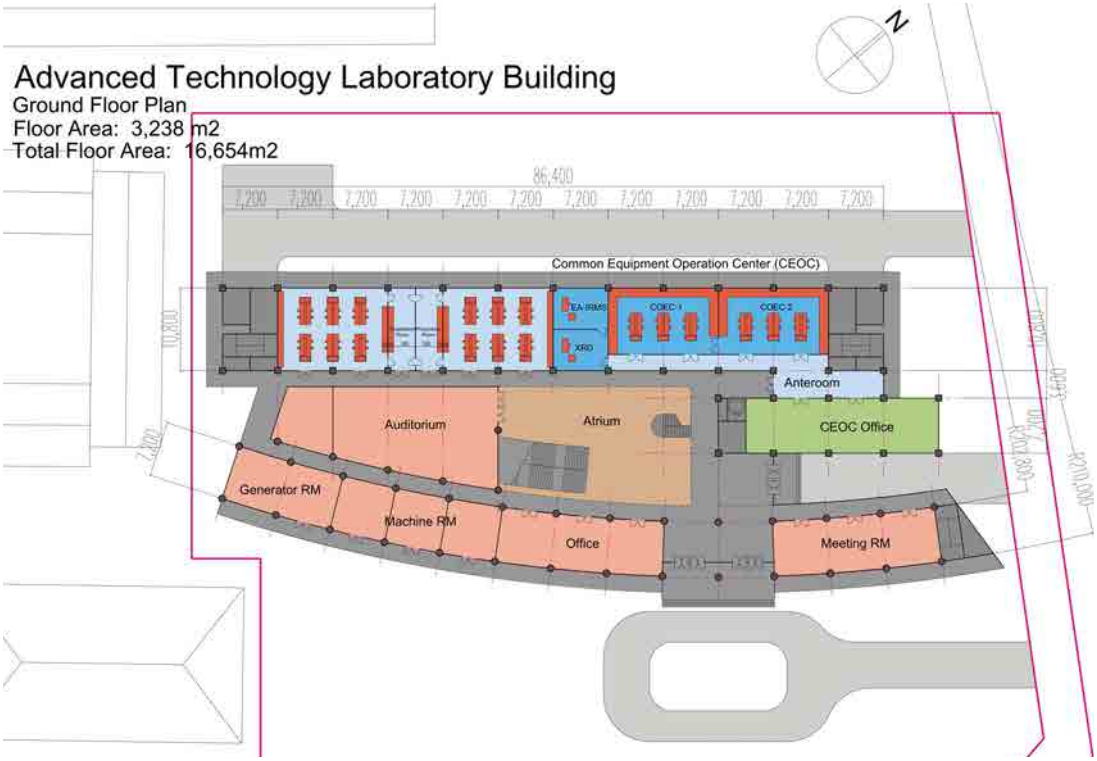
Appendix 4-6

Preliminary Building Plans

Campus-2 Block Layout Plan

Preliminary Building Plans
Advanced Technology Laboratory Building

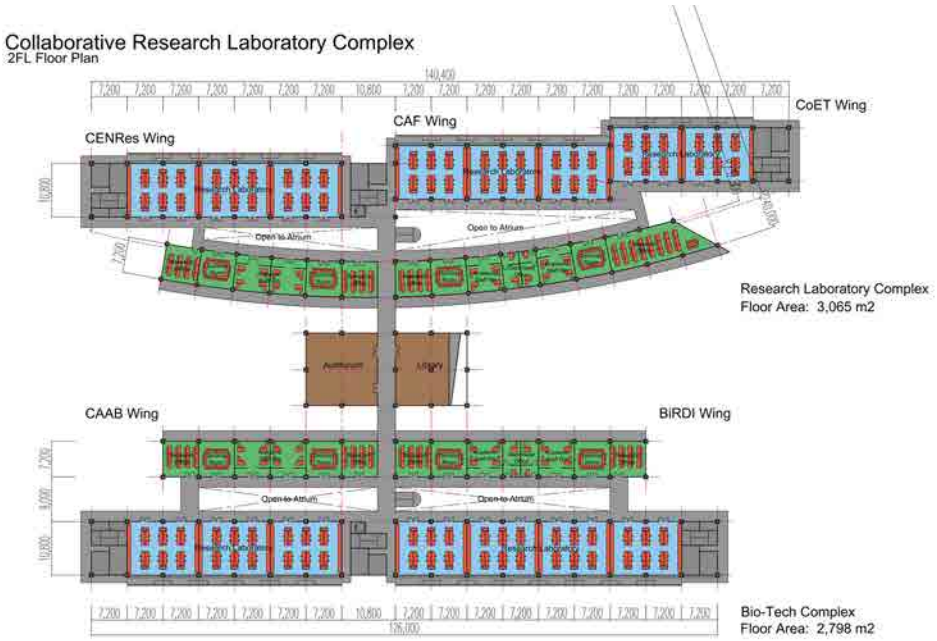


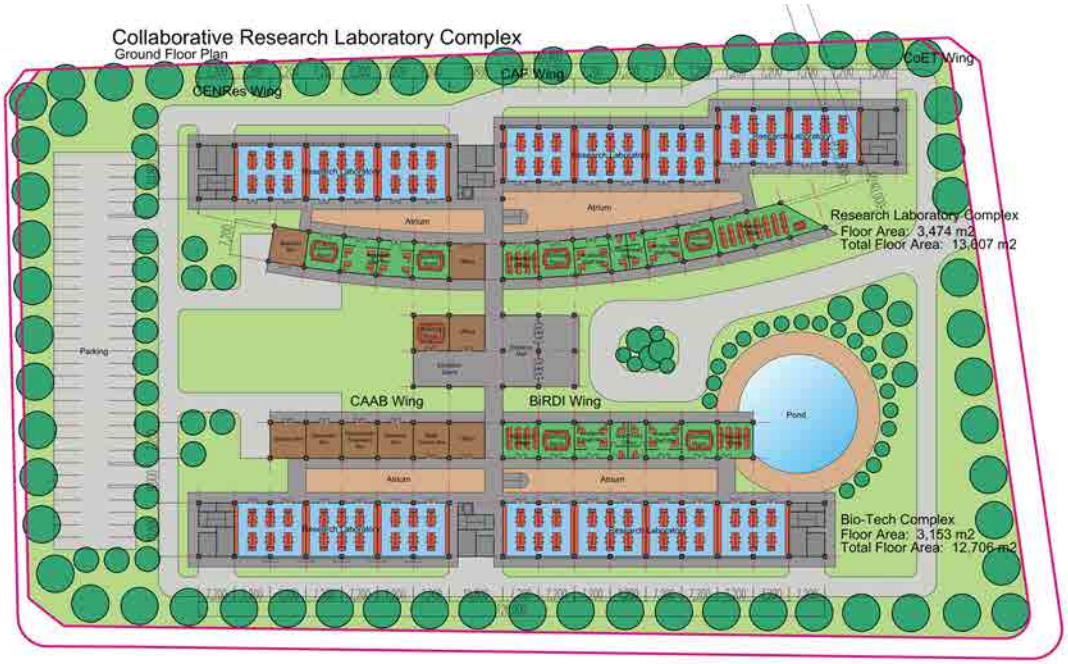


Area Table, Advanced Technology Building

Floor	Area (m^2)
7F	1,400
6F	2,342
5F	2,342
4F	2,342
3F	2,342
2F	2,342
GF	3,238
Total	16,348

Collaborative Research Laboratory Complex





Area Table

Bio-tech Building

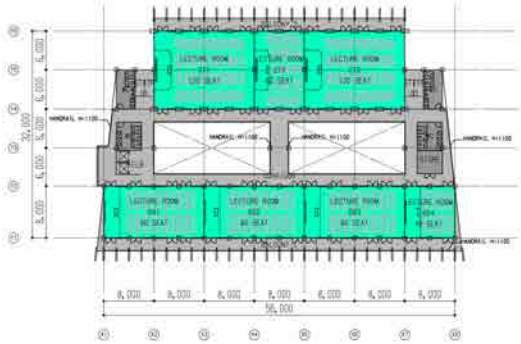
Floor	Area (m^2)
5F	1,625
4F	2,565
3F	2,565
2F	2,565
GF	3,474
Total	13,007

CAF/CENTRes/CoET Lab Complex

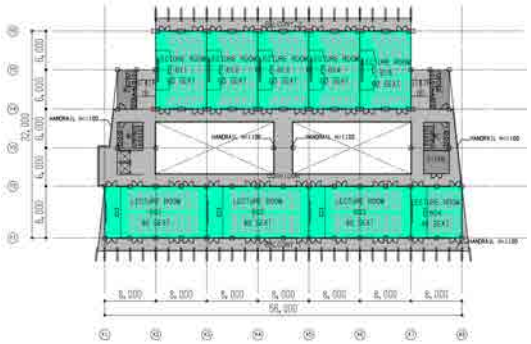
Floor	Area (m^2)
5F	1,818
4F	1,818
3F	2,832
2F	3,065
GF	3,474
Total	13,007

International Education and Training Center (IETC)

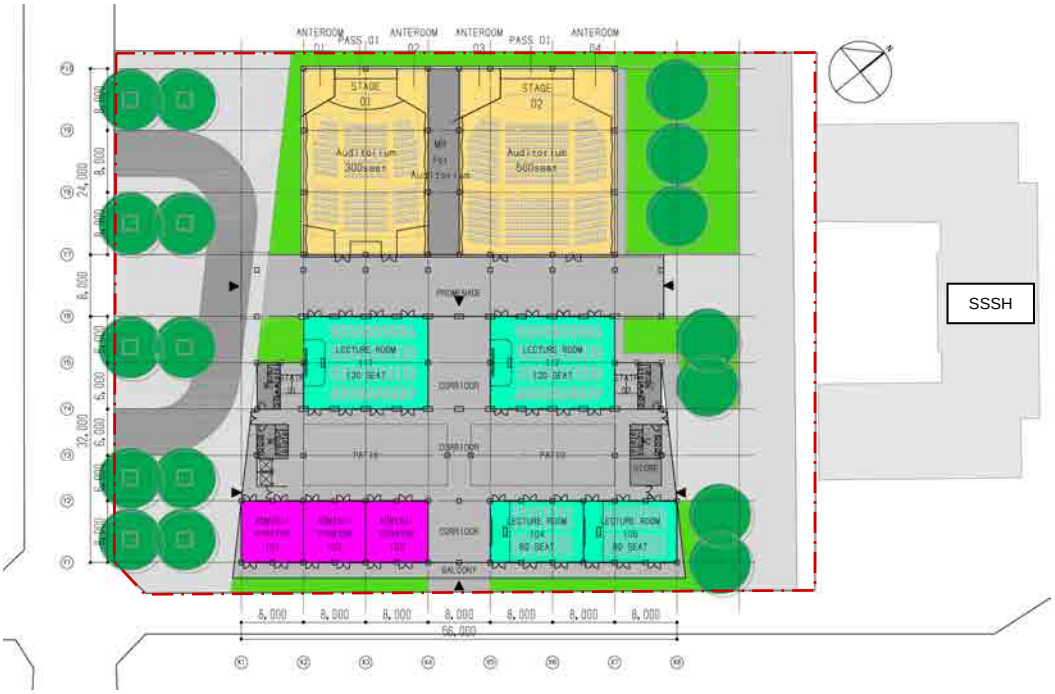
2nd-5th Floor Plan



6th-7th Floor Plan



Ground Floor Plan



Area Table, IETC

Floor	Area (m^2)
7F	1,330
6F	1,330
5F	1,330
4F	1,330
3F	1,330
2F	1,330
GF	2,290
Total	10,270

Appendix 4-7

Summary of Soil Investigation Report

SUMMARY ON SOIL INVESTIGATION

PROJECT FOR STRENGTHENING CAN THO UNIVERSITY IN VIET NAM

Stage: Preliminary survey

Contractor: Vietnam Investment and Construction Design JSC. (CDC)

1. LEGAL BASIS

- Contract between NIHON SEKKEI INC. and Vietnam Investment Consulting and Construction Designing JSC (CDC) signed on 08 May 2014 on soil investigation for the initial investigation stage of the project for strengthening Can Tho university in Viet Nam
- Specifications and conditions for soil investigation prepared by NIHON SEKKEI INC. for the project for strengthening Can Tho university in Viet Nam
- The Vietnam Investment Consulting and Construction Designing JSC (CDC) carried out drilling and soil investigation at the site in May 2014. The soil investigation was subjected to supervision and inspection of the Japanese consultant NIHON SEKKEI INC and representative of the Employer. In charge of the supervision of drilling work and field investigation were Eng. Dang Quang Nhu, MSc. Pham Thi Nghia, MSc Vu Thiet Hung and Eng. Do Van Han was in charge of data processing and report preparation. This report presents the results of soil investigation and consists of two parts: The Main report and the Appendices.

2. OBJECTIVES AND SCOPE OF THE SURVEY

2.1. The OBJECTIVES

This geological Survey works for the initial investigation phase of the project "Strengthening Can Tho University in Vietnam". The objectives of this survey is to provide structural designers with geological data of the site including soil structure, mechanical properties of soil so that they can determine the foundation solution for buildings and for infrastructures in the project.

2.2. Scope of the work

- To clarify geological conditions, divisions of soil and to predict geological phenomena detrimental to construction, to conduct field testsincluding taking soil samples to determine the mechanical properties physical and of the ground;
- To clarify the distribution and thickness of the soil layers within the influence of the construction pit, the target of physical and mechanical ground should meet design computational models;
- To provides parameters of groundwater levels.
- To conduct the static load test by plate to determine the load-bearing capacity of the ground soil in the near-surface layer for the construction of infrastructure projects;

3. OVERVIEW OF THE SURVEY AREA

3.1. Overview about the survey area *(Source http://cantho.gov.vn)*

Can Tho city is located in the central-lower basin and at the centre of Mekong River Delta Region, lengthened in 55km along Western Bank of Hau River with total natural area of 1,401.60 km^2, accounting for 3.49% of total area of the region. The North of the province adjoins to An Giang province; the East adjoins to Dong Thap and Vinh Long provinces; the West adjoins to Kien Giang province, the

South adjoins to Hau Giang province.

Can Tho city is at geographical coordinate of $105^{O}13'38"$- $105^{O}50'35"$ of East longitude and $9^{O}55'08"$ - $10^{O}19'38"$ Northern latitude. Administration units of Can Tho city include 5 districts (Ninh Kieu, Cai Rang, Binh Thuy, O Mon, Thot Not) and 4 districts (Phong Dien, Co Do, Vinh Thanh, Thoi Lai) with 85 administrative units at commune, ward and town level (including 5 towns, 36 communes and 44 wards). On April 19th, 2009, Prime Minister signed the Decision No. 492/QD-TTg on establishing the Mekong River Delta Key economic zone including 4 provinces/central city of: Can Tho city, An Giang province, Kien Giang province and Ca Mau province to promote potentials, geographical location and comparative advantages of the region and step by step develop Mekong River.

Characteristics topology

The terrain is relatively flat overall, suitable for agriculture, fisheries nghiep. The elevation average of about 1.00 to 2.00m from the ground sloping dunes along Hau River and Can Tho River lower toward the infield (from northeast to southwest). Located next to a large river so Can Tho city have canal network is quite thick. Besides, the Can Tho city also has dunes and ponds on river islet almost Con Au, Con Khuong, Con Son and Tan Lap isle.

Geomorphology includes of 3 main types:

- The Hau inshore river forming high land strip (natural dike) and the Hau river inshore islet.
- Long Xuyen quadrilateral, low-lying, flood directly affected each year.
- Hau River Delta affected tide and flood late in the season.

Geology:

The strata are formed mainly through the process of sedimentation and marine sediment of the Mekong River, there are two types of deposits: the Holocene (new alluvial) and Pleistocene (old alluvial).

Climate:

Can Tho is located in tropical climates - monsoon. Comfortable climate regulation, fewer storms, hot and humid all year, no have winter. The rainy season lasts from May to November, dry season from December to April next year.

- Yearly average temperature is about 28ºC, the average number of hours of sunshine: 2249.2 h.
- Yearly average rainfall is 1600mm (about 1,911 in 2000, 2004 is about1.416mm).
- Yearly average humidity: 82% - 87% (change according the years).

Wind has two main directions: Northeast: from December to April (dry season). Southwest: from May to October (the rainy season), average wind speed of 1.8 m/s. The few storms but usually thunderstorms, hurricanes during the rainy season.

Advantages: Area Influenced tropical monsoon climate, with advantages in ground temperature, thermal radiation mode, advanced mode and stable over two seasons. The advantage of this very favorable for the growth and development of organisms, one can create a tropical agricultural systems with high productivity, with many kinds of saplings, creating diversity in production and in restructuring production.

Limitations: The rainy season usually comes with flooding affecting about 50% of the whole city; dry season is usually accompanied by a lack of water, making it difficult for production and living, especially areas affected by salinity, acidity increases as seasonal demand for water is also unevenly between seasons agricultural production. *Hydrology:*

Hau River is the biggest one with the total length of crossing the city: 65 km; the one crossing Can Tho having 1.6km in width. The total amount of water going to the sea is about 200 billions m3/year (making up 41% the total amount of Me Kong River's water), the average water flow in Can Tho is 14.800 m3/sec.

The total amount of alluvium in Hau river is 35 millions m3/year (making up nearly ½ the total amount of alluvium in Me Kong river).

Can Tho river originates from the interior field in the west of Hau river, 16 km in length, from 280-350 km in width, passing O Mon, Phong Dien, Cai Rang, Ninh Kieu districts and go to Hau river at Ninh Kieu quay. Can Tho river has freshwater all the time, helps both irrigating in dry season and drainage in flooding season and having significance in traffic.

The Big River, which is 20km in length, having width of estuary from 600 to 700m, 10-12m in depth, has the ability of effective drainage.

Beside that, Can Tho city also has dense canal system, with more than 158 rivers, big or small canals being tributaries of two big rivers: Hau river and Can Tho river crossing the city combining waterway network. Other waterways are Binh Thuy, Tra Noc, O Mon, Thot Not, Tham Ron canals and many other big canals in outskirt districts: Thot Not, Vinh Thanh, Co Do and Phong Dien, supplying freshwater during rainy and dry seasons, giving conditions for farmers to do irrigation and soil improving works.

3.2 Survey work at Can Tho University

The survey works for the project" Strengthening Can Tho University in Vietnam" including 02 campus:

A. Campus 1: Can Tho University, 3/2 Road Can Tho city.

Site A: Cai Khe area consists of three site: Site A01 with un area of 28000m^2; Site A02 with an area of 20000m^2, and Site A03 with an area of 14000m^2 located in the campus of the University Can Tho has a total area of 80.95 ha.

B. Campus 2 At Hoa An Commune, Phung Hiep District, Hau Giang Province

Site B: The site Hoa An with an area of 30.000m^2 located in campus 2 of Can Tho University in Vietnam with a total area of 112ha. The far from center of Can Tho city about 40 kilometers toward southwest of the Highway 61 of Can Tho city to Vi Thanh city.

Site Map and location of boreholes see attached drawing

(Survey location map and Figures 1 and 2)

4. INVESTIGATION METHOD AND EQUIPMENT

4.1. Geodetic survey for determining the locations of boreholes

The TOPCON total GTS 105 N station made in Japan was used for survey by polar coordinate method. The place the geodetic at the point of topographical grid to locate the drill hole. Original coordinates are points GPS-1 and GPS-2.

Table 4.1: Coordinates and Elevation of boreholes

No	Points name	Coordinates		Elevation(m)	Remarks
		X	Y		
1	GPS -1	1109358.9823	474414.3690	+2.087	Original point
2	GPS -2	1109492.8344	474506.2949	+1.955	Original point
3	HK1	1109361.200	474348.479	+2.150	Site A01
4	HK2	1109361.739	474988.175	+1.724	Site A03
5	HK3	1109097.829	474746.212	+1.820	Site A02
6	HK4	5226.3651	4873.7959	+0.970	Site B01

Table 4.2: Coordinates and Elevation of static load test

No	Points name	Location	Coordinates		Elevation / Depth of pit (m)
			X	Y	
1	LT No1	Site A01	1109359.0854	474335.8930	+2.10 / 0.65
2	LT No2	Site A03	1109365.3816	475051.6222	+2.15 / 0.50
3	LT No3	Site A02	1109157.1550	474805.4721	+1.85 / 0.50
4	LT No4	Site B01	5226.6359	4881.6950	+1.00 / 0.45

Photo 1: Positioning boreholes in the field

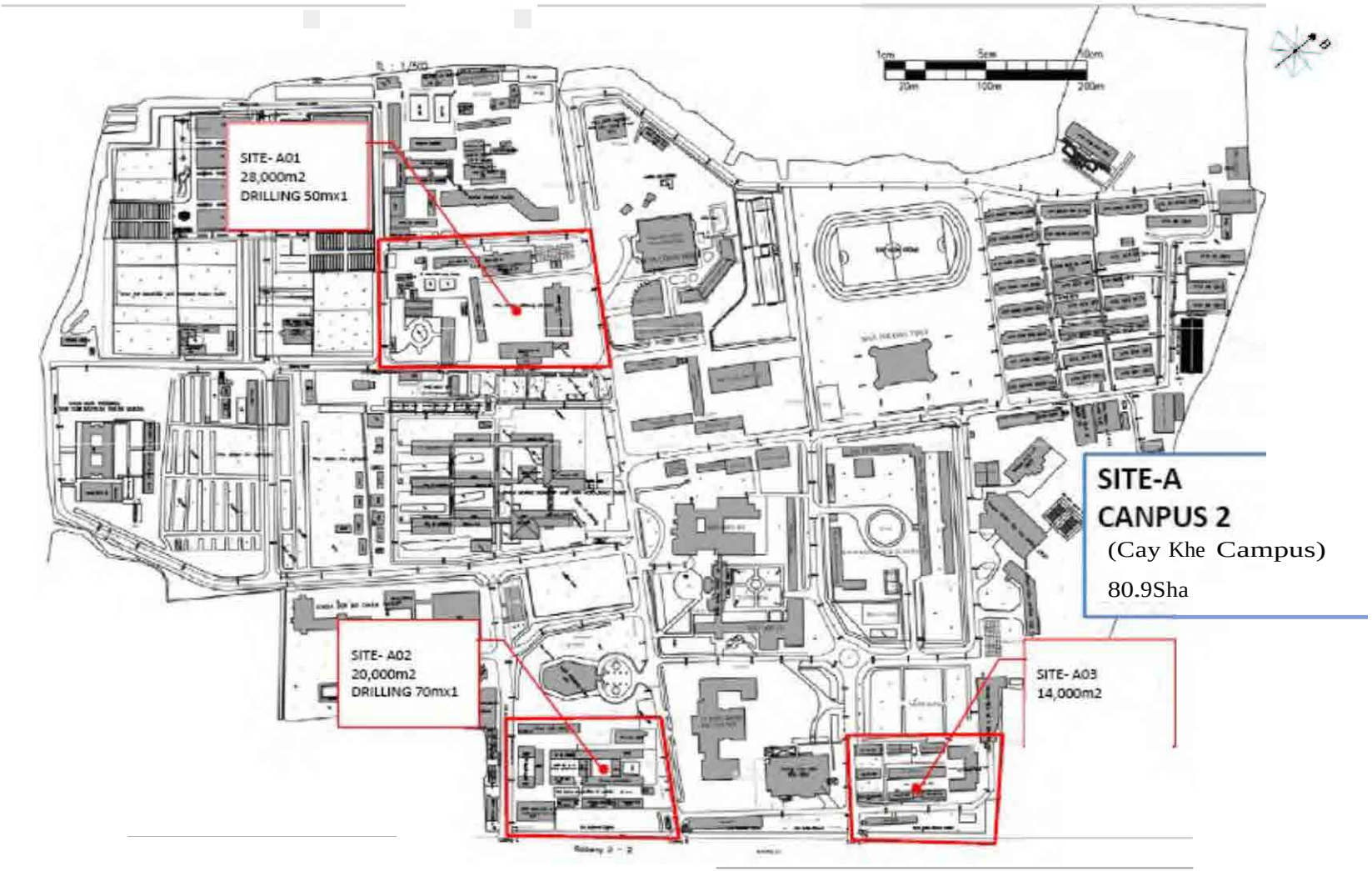


Figure 4.1: Site Map of campus A - University Can Tho, 3/2 road, Can Tho city

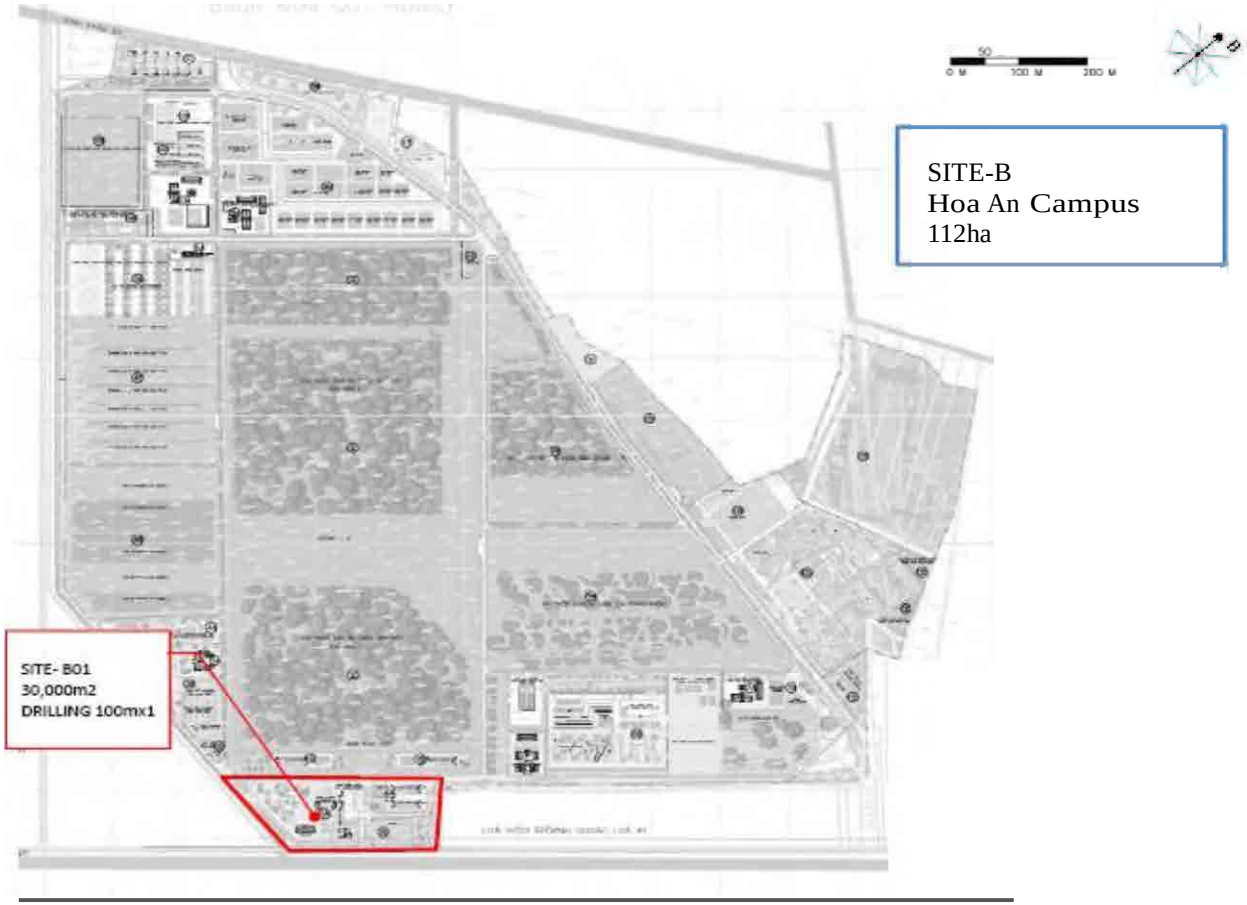


Figure 4.2: Site Map of campus B - University Can Tho, Hoa An Commune, Phung Hiep District, Hau Giang Province

5. GEOTECHNICAL CHARACTERISTICS

This report presents the results of the survey drilling of 04 boreholes in 04 site as follows:

SITE A - CAN THO UNIVERSITY, 3/2 ROAD, CAN THO CITY

SITE A01 – BOREHOLE HK1

The borehole HK1 of 56m depth the stratum is divided as follows:

No	Soil name	Soil description	Thickness (m)	SPT (Times)
1	Fill - up	Made ground: Greynish brown Sandy	0.80	
2	CH	Very soft blackish grey, Fat Clay with organic	32.7	2-5
4	sCL	Very stiff, blackish grey, grey, Sandy lean Clay	6.3	16-22
5	CH	Very stiff, yellowish brown pinkish brown, greenish grey Fat Sandy lean Clay with some thin layers silty sandy	8.9	19-23
6	SC-SM	Dense, yellowish brown, pinkish brown silty clayey sand	>7.3	40-67
		Total	**56.0m**	
		Groundwater levels stable	*1.50m*	

SITE A02 – BOREHOLE HK3

The borehole HK3 of 73.0m depth the stratum is divided as follows:

No	Soil name	Soil description	Thickness (m)	SPT (Times)
1	Fill - up	Concrete, stone, sand with various inhomogeneous composition	0.80	
2	CH	Very soft, blackish grey, Fat Clay	26.20	2-4
3a	sCL	Stiff, yellow, yellowish brown, dark brown, Sandy lean Clay	3.50	9-10
3	CH	Hard, brown, yellowish brown, reddish brown, Fat Clay	4.50	14
4	CLs	Very stiff, blackish grey, grey Sandy lean Clay	14.50	13-24
6	SM-SC	Medium dense to dense, yellow, yellowish brown, yellowish grey, Silty Sand with some thin layers silty clay	8.00	14-53
7	CH	Very stiff, pinkish brown, dark brown mixed greenish grey, Lean Clay with Sand	10.0	16-21
8	SM	Very dense, yellow, yellowish brown, Silty Sand	>5.5	52-56
		Total	**73.0m**	
		Groundwater levels stable	*0.80m*	

SITE A03 – BOREHOLE HK2

The borehole HK2 of 66.0m depth the stratum is divided as follows:

No	Soil name	Soil description	Thickness (m)	SPT (Times)
1	Fill - up	Blackish grey, brownish grey Sandy Clay	1.50	
2	CH	Very soft, blackish grey, Fat Clay with Organic	32.50	1-2
3	CL	Very Stiff, reddish brown, pinkish brown, Fat Clay	3.30	10-40
4	(CL)s	Very stiff, blackish grey, grey, Sandy lean Clay with some thin layers silty sand	5.70	21-25
5	CH	Very stiff, pinkish brown reddish brown, yellowish brown, Fat Sandy lean Clay with some thin layers silty sand	6.50	29-31
6	SM-SC	Very dense, Yellowish brown, yellowish grey, Silty clayey Sand with some thin layers silty clay	5.60	43-52
7	(CH)s	Very stiff, yellowish brown, redish brown greenish grey, Fat Clay with Sand	5.40	22-28
8	SM	Very dense, yellow, yellowish brown, Silty sand	>5.5	51-61
		Total	**66.0m**	
		Groundwater levels stable	*0.50m*	

DETAILED DESCRIPTION OF LAYERS - SITE A

Based on the results of drilling SPT and laboratory test of soil samples from 3 boreholes (HK1, HK2 and HK3), the soil layers in site A have been identified, plotted on the cross section and named uniformly for the whole site. Below are detailed descriptions of soil layers in site A

Layer 1: Top soil and made ground

Occurring on top of the section, the top soil and made ground layer has a thickness varying from 0.8m to 1.5m. Its has mixed and inhomogeneous composition, composed mainly of clay, fill sand mixed with wasted construction material. At Site A02 the upper part is a cement floor with broken brick. At Site A03, near the building of the Faculty of Social and Humanitarian Sciences and along the internal road there is a well compacted fill sand layer which has rather high bearing capacity. However, in most of the area covered by tree gardens this layer is composed mainly of clay mixed with sand formed in the process of site filling and construction lasting for many years.

Layer 2: (CH) Very soft, blackish grey, greenish grey, greyish brown, Fat Clay with Organic

Underlying the above top soil and made ground layer, Layer 2 is spread all over the site, is met in all 03 boreholes. Its thickness varies from 26.2m (HK3-A02) to 32.7m (HK1-A01). Layer 2 is composed of black gray, blue gray, brown gray, very soft clay of high plasticity, mixed with organic matter (CH). Its SPT N value varies within N = 1-5, in average 3.

Layer 2 is a soft soil layer with large thickness, over 30m, has low bearing capacity, is easy to settle and cause instability for the engineering structures.

Photo2 : The weak clay mud layer in drainage ditches near the Site A02

Lens 3a: (sCL) Stiff, reddish brown, pinkish brown, yellow, yellowish brown, dark brown, Sandy lean Clay

Underlying Layer 2 mentioned above, Lens 3a (TK3a) was met only in Borehole HK3-A02. Its thickness is 3.5m. it is composed of red brown, pink brown, dark brown stiff clay of low plasticity (CL). The SPT N value varies within N = 9-10. The physico- mechanical parameters of Lens 3a are summarized in the following Table.

Layer 3: (CH) Hard, brown, yellowish brown, reddish brown, Fat Clay

Underlying the above soil layers, Layer 3 was encountered in 02 boreholes HK3- A02 and HK2-A03. Its thickness varies from 3.3m (HK2-A03) to 4.5m (HK3-A02). It is composed of brown, yellow brown, red brown, hard clay of high plasticity (CH). The SPT value varies within N = 14-40.

Layer 3 and lens TK3a are of not wide distribution area, with small thickness medium bearing capacity.

Layer 4: (sCL), (CLs) Very stiff, blackish grey, grey, yellow, yellowish brown, Sandy lean Clay with some thin layers silty Sand

Underlying the above layers, Layer 4 is spread all over the site. Its thickness varies in a rather wide range from 5.7m (HK2-A03) to 14.5m (HK3-A02). It is composed of Black gray, yellow brown, yellow, very stiff clay of low plasticity, in some places intercalated with thin layers of clayey sand (CL). The SPT value varies N = 13 - 25, in average 20.

Layer 4 is of wide distribution area, highly variable thickness, the soil here is firm, with rather high bearing capacity.

Layer 5: (sCH), (CH) Very stiff, pinkish brown, reddish brown, yellowish brown, Sandy fat Clay with some thin layers silty sand

Underlying the above layers, Layer 5 is spread rather widely in the area met in 02 boreholes at locations A01 and A03. Its thickness varies from 6.5m (HK2-A03) to 8.9m (HK1-A01). It is composed of pink brown, red brown, yellow brown, hard clay of high plasticity, intercalated with thin layers of clayey sand (CH). The SPT value varies N = 19- 31, in average 22.

Layer 5 is unevenly distributed, however the soil here is firm, of rather high bearing capacity.

Layer 6: (SC-SM) Very dense, yellowish brown, yellowish grey, pinkish brown, Silty Clay Sand with some thin layers silty Clay

Underlying the above layers, Layer 6 is spread widely in the area, met in all 03 locations. Its thickness varies from 5.6m (HK2-A03) to 8.0m (HK3-A02), at borehole HK1-A01 in particular Layer 6 is over 7.3m thick. As the SPT N was >50 within 5m continuously, the drilling was stopped before reaching the bottom of this layer. It is composed of yellow brown, yellow gray, pink brown silty-clayey sand intercalated with thin layers of silty clay (SC-SM). The SPT value is rather high, reaching N >50.

Layer 6 occurs at the depth below 50m,. here the soil is firm, with rather high SPT N value. However its thickness varies greatly, therefore depending on the place the foundation depth should be selected appropriately in accordance with the load of the building.

Layer 7: (CHs) Very stiff, pinkish brown, darkish brown, yellowish brown, greenish grey, resddish brown, Fat Clay with Sand

Underlying the above layers, Layer 7 is spread widely in the area. However, at it occurs at great depth it was encountered only in 02 boreholes HK2-A03 and HK2-A03 (Borehole HK1-A01 has not reached the depth of occurrence of Layer 7). The thickness Layer 7 varies from 5.4m (HK2-A03) to 10.0m (HK3-A02). It is composed of yellow brown, red brown, blue gray, pink brown, very stiff to hard silty clay of high plasticity (CH). The SPT value varies within N = 16-28.

Layer 8: SM-Very dense, yellow, yellowish brown, Silty Sand.

Layer 8 occurs at great depth and is the lowermost layer within the investigation depth. Its top is at the depth from 60.5m (El -58.77m / HK2-A03) to 67.5m (El -65.68m / HK3-A02). Its thickness has not been determined. Both boreholes (HK2-A03 and HK3- A02) were drilled 5.5m into this layer and were stopped when the SPT N value exceeded.

50 (N > 50) within 5m continuously. This layer is composed of yellow brown very dense fine to medium grained sand. This layer is of very high bearing capacity, is suitable to be selected for laying the foundation of high load buildings.

SITE B – HOA AN CAMPUS OF CAN THO UNIVERSITY, PHUNG HIEP DISTRICT, HAU GIANG

SITE 01 – BOREHOLE HK4

The borehole HK4 of 84.0m deep, stratum is divided as follows:

No	Soil name	Soil description	Thickness (m)	SPT (Times)
1	Fill - up	Greynish black Silty sand and Sand	0.80	
2	CH	Very soft, greenish grey, Fat Clay mixed Organic	31.70	1-3
3	(CL)s	Very Stiff, greenish grey, reddish brown mixed yellow, Lean Clay with Sand	4.50	23-24
4	s(CL)	Stiff, whitish grey, yellowish brown, greenish grey, Sandy Lean Clay	20.60	11-15
5	CL	Very stiff, brownish grey, pale grey, Flat Clay	5.60	15-18
6	CH	Very dense, Yellowish brown, yellowish grey, Silty clayey Sand with some thin layers silty clay	11.40	10-29
7	SM	Very dense, ash grey, greenish grey, Small to medium Grained Sand	>9.4	32->50
		Total	**84.0m**	
		Groundwater levels stable	*1.10m*	

From the depth of 74.6m downward occurs Layer 7 composed of yellow brown, fine to medium grained sand (SM). The upper part of this layer at the depth 74.6-77.5m the sand is dense with SPT value N = 32. From the depth of 77.5m downward to the final depth of investigation of 84.0m the sand is very dense with SPT value N >50. This layer is of very high bearing capacity, with thickness over 6.5m within the depth of investigation. This layer can be the foundation bearing layer for the buildings at Site B01.

6. OUTLINE OF THE GROUND WATER FEATURES

In Site A, Cai Khe Campus of Can Tho University, 3/2 Road, Can Tho city: The boreholes show that, in the upper part within the investigation depth are clay layers which contain water absorbed in the soil and can be considered as aquicludes. However, the groundwater level is near the ground surface at the depth of 0.5-1.5m. At the depth of over 50 m downward occur fine sand and silty sand layers which can be permeable and contain groundwater. However, so far there are still no data for evaluating the water bearing capacity as well as chemical composition of the groundwater .

Table 6.1: Groundwater levels in the borehole Site A (May, 2014)

No	Borehole Name	Elevation of boring (m)	GWL(m)	Date of measure
1	HK1 – A01	+2.150	1.50	11-14 May, 2014
2	HK2 – A03	+1.724	0.50	14-18 May, 2014
3	HK3 – A02	+1.820	0.80	19-22 May, 2014

In site B, Hoa An Campus of Can Tho University, the possibly permeable and water-bearing sediments occurs at the depth of 74.6m downward, in the fine to medium sand layer of ash gray color. However, so far there are still no data for evaluating the water bearing capacity as well as chemical composition of the groundwater in this area.

Table 6.2: Groundwater levels in boreholes HK4 – Site B01 (May, 2014)

No	Borehole Name	Elevation of boring (m)	GWL(m)	Date of measure
1	HK4 – B01	+0.970	1.10	25-28 May, 2014

7. CONCLUSIONS AND RECOMMENDATIONS

From the data of soil investigation boreholes we have the following conclusion :

SITE A – CAI KHE CAMPUS OF CAN THO UNIVERSITY, 3/2 ROAD, CAN THO CITY

In general the soil layers in the site were formed mainly by the process of depositing marine and alluvial sediments of the Mekong river. In the upper part occur mainly soft clay soil layers with large thickness, about 30m. In the lower part occur layers of better consolidated clay layers which have medium bearing capacity and deformation. The layers with high bearing capacity occur at the depth 50m downwards. The details for each Site are as follows:

SITE A01:

- From the depth of 33.5m downward occur Layers 4 and 5 composed of very stiff clay (CL and CH). If pre-cast concrete piles are applied they can be pushed by static load to these layers.

- From the depth of 48.7m downward occurs Layer 6 composed of yellow brown, very dense, fine to medium grained silty sand (SC-SM), with SPT value, N = 40-67, thickness over 7.3m within the depth of investigation. This layer is suitable to be used as load bearing layer for the building if bored piles are applied.

SITE A02:

- From the depth of 30.5m downward occurs Layer 3,4 composed of very stiff silty clay (CL). If pre-cast concrete piles are applied they can be pushed by static load to this layer.

- If bored piles are applied, depending on the designed load bearing capacity of the piles they can be placed in Layer 6 occurring from the depth of 49.5m, composed of yellow brown, dense silty sand intercalated with clay (SC-SM), with thickness of about

8m, or in layer 8 occurring at the depth of 67.5m downward, composed of yellow brown, very dense, fine to medium sand (SM), with SPT N value >50, as the load bearing layer of the building.

SITE A03:

- From the depth of 34.0m downward occurs Layers 3, 4 and 5 composed of very stiff silty clay (CL) and (CH). If pre-cast concrete piles are used they can be pushed by static load to this layer.

- If bored piles are applied, depending on the designed load-bearing capacity of the piles they can be placed in Layer 6 composed of yellow brown, very dense silty sand intercalated with clay (SC-SM), with thickness about 5.6m, or in layer 8 occurring at the depth of 60.5m, composed of yellow brown very dens, fine to medium grained sand (SM), with SPT value N >50 as the load bearing layer for the building.

SITE B – HOA AN CAMPUS OF CAN THO UNIVERSITY, PHUNG HIEP DISTRICT, HAU GIANG

SITE B01:

The soil layers in the site were formed mainly by the process of depositing marine and alluvial sediments of the Mekong river. In the upper part occur mainly soft clay soil layers with large thickness, over 32m. In the lower part occur layers of better consolidated clay layers which have medium bearing capacity and deformation. The layers with high bearing capacity occur at the depth 75m downwards.

- From the depth of 32.5m downward occur Layers 3, 4 and 5 composed of stiff to very stiff clay (CL) and Layer 6 composed of very stiff clay (CH). If pre-cast concrete piles are applied they can be pushed by static load to these layers.

- From the depth of 74.6m downward occurs Layer 7 composed of yellow brown, fine to medium grained sand (SM). In the upper part of this layer at the depth 74.6-77.5m the soil is dense, with SPT value N = 32. From the depth of 77.5m downward to the bottom of the borehole at the depth of 84.0m the soil is very dense with SPT value N

>50. This layer has very high bearing capacity, with thickness 6.5m within the depth of investigation. It can be a good load bearing layer for the site B01 and suitable for bored piles.

APPENDICES

CHỈ DẪN CÁC LỚP ĐẤT
LEGEND OF SOIL LAYER

Đất sét pha xám đen, xám nâu dày 0,2m, phía dưới là cát san lấp.
Made ground: Blackish grey, brownish grey Layey sand, Sandy.

Layer 2: CH - Soft to very Soft, backish grey,greenish grey, greyish brown Fat Clay with organic.
CH: Sét dẻo cao màu xám đen, xám xanh, xám nâu trạng thái chảy có hữu cơ.

Lens(TK 3a): s(CL) - Stiff, reddish brown, pinkish brown, yellow, yellowish brown, darkish brown Sandy lean Clay.
s(CL): Sét dẻo thấp màu nâu đỏ, nâu hồng, nâu gụ, trạng thái dẻo cứng.

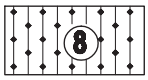
Layer 3: CH - Hard, brown, yellowish brown, reddish brown Fat Clay.
CH: Sét dẻo cao màu nâu, nâu vàng, nâu đỏ, trạng thái cứng.

Layer 4: s(CL), (CL)s - Very stiff, blackish grey, grey, yellow, yellowish brown Sandy lean Clay with some thin layers silty Sand.
s(CL), (CL)s: Sét dẻo thấp pha cát màu xám đen,nâu vàng, vàng, lẫn lớp mỏng cát pha.

Layer 5: s(CH), CH- Very stiff, Pinkish brown,reddish brown, yellowish brown Sandy fat Clay, Fat Clay with some thin layers silty sand.
s(CH),CH: Sét dẻo cao pha cát màu nâu hồng, nâu đỏ, nâu vàng, xen kẹp lớp mỏng cát pha, trạng thái nửa cứng.

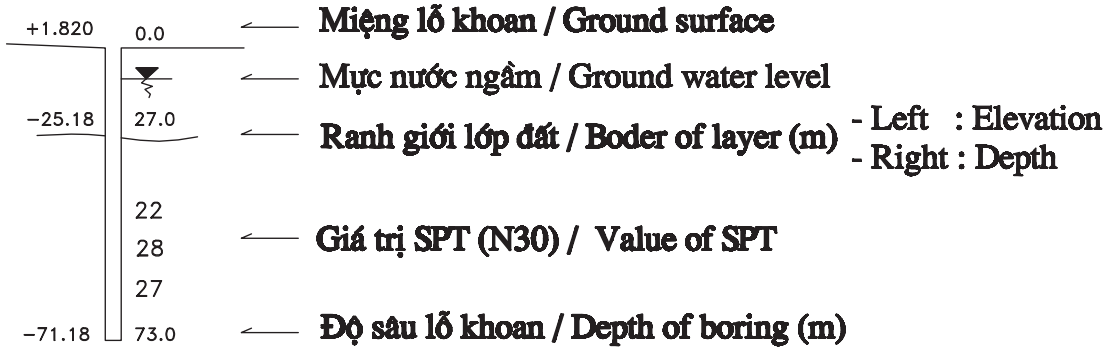
Layer 6: SC-SM- Very dense, Yellowish brown, Yellowish grey, pinkish brown Silty Clay Sand with some thin layers silty Clay.
(SC-SM): Cát pha bụi sét màu nâu vàng, xám vàng, nâu hồng lẫn lớp mỏng sét pha.

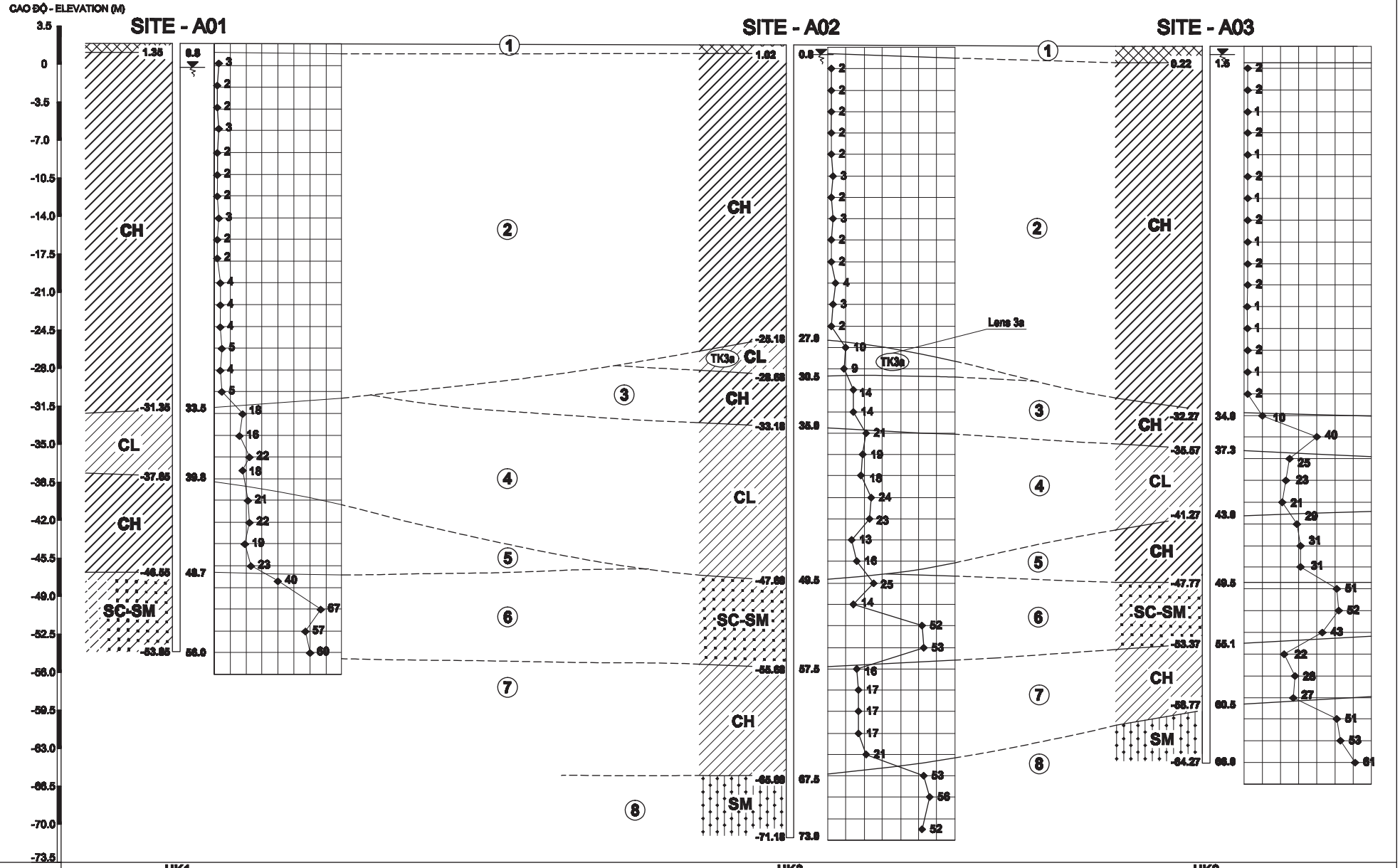
Layer 7:(CH)s- Very stiff, Pinkish brown, darkish brown,yellowish brown, greenish grey, resddish brown Fat Clay with Sand.
(CH): Sét dẻo cao pha cát màu nâu vàng, nâu đỏ, xám xanh, nâu hồng, trạng thái cứng.



Cát hạt nhỏ đến vừa (SM) màu vàng, nâu vàng kết cấu rất chặt.
SM-Very dense, yellow, yellowish brown, Silty Sand.

LỖ KHOAN TRÊN MẶT CẮT / BORING IN SECTION





HỐ KHOAN - BOREHOLE	HK1	HK3	HK2
CAO ĐỘ - ELEVATION (m)	+2.150	+1.820	+1.724
K. CÁCH - DISTANCE (m)	484.23	328.45	
M.N.N - G.W.L (m)	1.80	0.80	0.80

CÔNG TY CP TƯ VẤN ĐẦU TƯ VÀ THIẾT KẾ XÂY DỰNG VIỆT NAM - CDC
VIETNAM INVESTMENT CONSULTING AND CONSTRUCTION DESIGNING JOINT STOCK COMPANY

CÔNG TRÌNH - PROJECT :
DỰ ÁN TĂNG CƯỜNG NĂNG LỰC ĐẠI HỌC TỔNG HỢP CẦN THƠ TẠI VIỆT NAM
PROJECT FOR STRENGTHENING CAN THO UNIVERSITY IN VIET NAM

BẢN VẼ - DRAWING :
MẶT CẮT ĐỊA CHẤT CÔNG TRÌNH I- I
GEOTECHNICAL PROFILE I - I

TỶ LỆ - SCALE:
ĐỨNG - VERTICAL : 1 / 350
NGANG - HORIZONTAL: 1 / 3000

BV: DC 02
6/ 2014

Appendix 4-8

Draft Equipment List

1 CAAB

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	1. Plant Molecular Genetics	1-1 Plant Molecular Genetics - Adv Tech Lab Bldg	1	2D-electroporesis, IEF for IPG strip	New	1	12,000	12,000
Agriculture	1. Plant Molecular Genetics	1-1 Plant Molecular Genetics - Adv Tech Lab Bldg	2	Autoclave (110 L)	New	1	14,500	14,500
Agriculture	1. Plant Molecular Genetics	1-1 Plant Molecular Genetics - Adv Tech Lab Bldg	3	Biophotometer Plus	New	1	25,000	25,000
Agriculture	1. Plant Molecular Genetics	1-1 Plant Molecular Genetics - Adv Tech Lab Bldg	4	Block cooler	New	1	4,000	4,000
Agriculture	1. Plant Molecular Genetics	1-1 Plant Molecular Genetics - Adv Tech Lab Bldg	5	Block heater	New	1	3,500	3,500
Agriculture	1. Plant Molecular Genetics	1-1 Plant Molecular Genetics - Adv Tech Lab Bldg	6	Cabinet (Chemical Storage cabinet)	New	1	500	500
Agriculture	1. Plant Molecular Genetics	1-1 Plant Molecular Genetics - Adv Tech Lab Bldg	7	Cabinet (Horizontal Laminar Flow Cabinet)	New	1	7,000	7,000
Agriculture	1. Plant Molecular Genetics	1-1 Plant Molecular Genetics - Adv Tech Lab Bldg	9	Centrifuge (Refrigerated Centrifuge)	New	1	9,500	9,500
Agriculture	1. Plant Molecular Genetics	1-1 Plant Molecular Genetics - Adv Tech Lab Bldg	10	Digital scale (sartorius TE612)	New	1	2,500	2,500
Agriculture	1. Plant Molecular Genetics	1-1 Plant Molecular Genetics - Adv Tech Lab Bldg	11	Digital scale (sartorius CPA324S)	New	1	4,000	4,000
Agriculture	1. Plant Molecular Genetics	1-1 Plant Molecular Genetics - Adv Tech Lab Bldg	12	DNA vacuum concentrator	New	1	12,000	12,000
Agriculture	1. Plant Molecular Genetics	1-1 Plant Molecular Genetics - Adv Tech Lab Bldg	13	Double Water distiller	New	1	6,000	6,000
Agriculture	1. Plant Molecular Genetics	1-1 Plant Molecular Genetics - Adv Tech Lab Bldg	14	Ductless Fume Hood	New	1	12,000	12,000
Agriculture	1. Plant Molecular Genetics	1-1 Plant Molecular Genetics - Adv Tech Lab Bldg	16	Ethidium bromide Removal System	New	10	200	2,000
Agriculture	1. Plant Molecular Genetics	1-1 Plant Molecular Genetics - Adv Tech Lab Bldg	18	Freezer (Biomedical Upright Freezer -30ºC)	New	1	5,500	5,500
Agriculture	1. Plant Molecular Genetics	1-1 Plant Molecular Genetics - Adv Tech Lab Bldg	19	Freezer (Ultra-low temperature freezer -86ºC)	New	1	12,000	12,000
Agriculture	1. Plant Molecular Genetics	1-1 Plant Molecular Genetics - Adv Tech Lab Bldg	20	Gel documentation system	New	1	17,000	17,000
Agriculture	1. Plant Molecular Genetics	1-1 Plant Molecular Genetics - Adv Tech Lab Bldg	21	Gene Delivery system	New	1	6,000	6,000
Agriculture	1. Plant Molecular Genetics	1-1 Plant Molecular Genetics - Adv Tech Lab Bldg	22	Glass bead sterilizer	New	2	1,000	2,000
Agriculture	1. Plant Molecular Genetics	1-1 Plant Molecular Genetics - Adv Tech Lab Bldg	23	High Specification Growth Chambers	New	1	10,000	10,000
Agriculture	1. Plant Molecular Genetics	1-1 Plant Molecular Genetics - Adv Tech Lab Bldg	24	Incubator (Low Temp. incubated Shaker)	New	1	9,000	9,000
Agriculture	1. Plant Molecular Genetics	1-1 Plant Molecular Genetics - Adv Tech Lab Bldg	25	Incubator shaker	New	1	7,900	7,900
Agriculture	1. Plant Molecular Genetics	1-1 Plant Molecular Genetics - Adv Tech Lab Bldg	26	Liquid Nitrogen Container	New	1	5,000	5,000
Agriculture	1. Plant Molecular Genetics	1-1 Plant Molecular Genetics - Adv Tech Lab Bldg	27	Microscope (Inverted Microscope)	New	1	7,000	7,000
Agriculture	1. Plant Molecular Genetics	1-1 Plant Molecular Genetics - Adv Tech Lab Bldg	28	Microscope (Stereo microscope)	New	1	2,500	2,500
Agriculture	1. Plant Molecular Genetics	1-1 Plant Molecular Genetics - Adv Tech Lab Bldg	29	Microscope (Upright microscope)	New	1	3,000	3,000
Agriculture	1. Plant Molecular Genetics	1-1 Plant Molecular Genetics - Adv Tech Lab Bldg	30	Oven	New	1	4,500	4,500
Agriculture	1. Plant Molecular Genetics	1-1 Plant Molecular Genetics - Adv Tech Lab Bldg	31	Oven (Hybridization oven)	New	1	4,000	4,000
Agriculture	1. Plant Molecular Genetics	1-1 Plant Molecular Genetics - Adv Tech Lab Bldg	32	Pipettes (Micropipette sets)	New	2	2,000	4,000
Agriculture	1. Plant Molecular Genetics	1-1 Plant Molecular Genetics - Adv Tech Lab Bldg	33	Refrigerator	New	4	500	2,000
Agriculture	1. Plant Molecular Genetics	1-1 Plant Molecular Genetics - Adv Tech Lab Bldg	34	Refrigerator (Portable refrigerators)	New	4	700	2,800
Agriculture	1. Plant Molecular Genetics	1-1 Plant Molecular Genetics - Adv Tech Lab Bldg	35	Shaker (Microplate Shaker)	New	2	2,500	5,000

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	1. Plant Molecular Genetics	1-1 Plant Molecular Genetics - Adv Tech Lab Bldg	37	Thermocycler, PCR (Realtime PCR system)	New	1	81,000	81,000
Agriculture	1. Plant Molecular Genetics	1-1 Plant Molecular Genetics - Adv Tech Lab Bldg	38	Ultrasonic cleaner system	New	1	3,000	3,000
Agriculture	1. Plant Molecular Genetics	1-1 Plant Molecular Genetics - Adv Tech Lab Bldg	39	UV/Vis/NIR Spectrophotometer	New	1	10,000	10,000
Agriculture	1. Plant Molecular Genetics	1-1 Plant Molecular Genetics - Adv Tech Lab Bldg	40	Water bath	New	2	2,000	4,000
Agriculture	1. Plant Molecular Genetics	1-1 Plant Molecular Genetics - Adv Tech Lab Bldg	41	Water distiller	New	1	4,000	4,000
Agriculture	1. Plant Molecular Genetics	1-1 Plant Molecular Genetics - Adv Tech Lab Bldg	42	Water Purification System	New	1	10,000	10,000
Agriculture	1. Plant Molecular Genetics	1-1 Plant Molecular Genetics - Adv Tech Lab Bldg	43	Vortex mixer	New	2	300	600
Agriculture	1. Plant Molecular Genetics	1-1 Plant Molecular Genetics - Adv Tech Lab Bldg	44	Descicator	New	4	500	2,000
Agriculture	1. Plant Molecular Genetics	1-1 Plant Molecular Genetics - Adv Tech Lab Bldg	45	Incubator	New	2	4,000	8,000
Agriculture	1. Plant Molecular Genetics	1-1 Plant Molecular Genetics - Adv Tech Lab Bldg	46	Hotplate stirrer	New	2	1,500	3,000
Agriculture	1. Plant Molecular Genetics	1-1 Plant Molecular Genetics - Adv Tech Lab Bldg	47	Vacuum filtration system	New	1	4,000	4,000
Agriculture	1. Plant Molecular Genetics	1-1 Plant Molecular Genetics - Adv Tech Lab Bldg	48	Salinity meter	New	4	300	1,200
Agriculture	1. Plant Molecular Genetics	1-1 Plant Molecular Genetics - Adv Tech Lab Bldg	49	pH meter	New	4	500	2,000
Agriculture	1. Plant Molecular Genetics	1-1 Plant Molecular Genetics - Adv Tech Lab Bldg	50	Ultraviolet lamp	New	10	200	2,000
Agriculture	1. Plant Molecular Genetics	1-1 Plant Molecular Genetics - Adv Tech Lab Bldg	51	Microwave	New	1	300	300
Agriculture	1. Plant Molecular Genetics	1-1 Plant Molecular Genetics - Adv Tech Lab Bldg	Fu-1	Laboratory bench, large	Fu (New)	2	1,200	2,400
Agriculture	1. Plant Molecular Genetics	1-1 Plant Molecular Genetics - Adv Tech Lab Bldg	Fu-2	Laboratory bench, medium	Fu (New)	8	800	6,400
Agriculture	1. Plant Molecular Genetics	1-1 Plant Molecular Genetics - Adv Tech Lab Bldg	Fu-3	Shelf, large	Fu (New)	4	400	1,600
Agriculture	1. Plant Molecular Genetics	1-2 Academic Staff room - Adv Tech Lab Bldg	Fu-4	Desk with chair	Fu (New)	4	500	2,000
Agriculture	1. Plant Molecular Genetics	1-2 Academic Staff room - Adv Tech Lab Bldg	Fu-5	Shelf, large	Fu (New)	4	400	1,600
Agriculture	1. Plant Molecular Genetics	1-2 Academic Staff room - Adv Tech Lab Bldg	Fu-6	File cabinet	Fu (New)	4	500	2,000
Agriculture	1. Plant Molecular Genetics	1-2 Academic Staff room - Adv Tech Lab Bldg	Fu-7	Bulletin board	Fu (New)	1	300	300
Agriculture	1. Plant Molecular Genetics	1-3 Research Office - Adv Tech Lab Bldg	Fu-8	Desk with chair	Fu (New)	12	500	6,000
Agriculture	1. Plant Molecular Genetics	1-3 Research Office - Adv Tech Lab Bldg	Fu-9	Shelf, large	Fu (New)	4	400	1,600
Agriculture	1. Plant Molecular Genetics	1-3 Research Office - Adv Tech Lab Bldg	Fu-10	Bulletin board	Fu (New)	1	300	300
Agriculture	1. Plant Molecular Genetics	1-4 Seminar room - Adv Tech Lab Bldg	Fu-11	Chair	Fu (New)	24	100	2,400
Agriculture	1. Plant Molecular Genetics	1-4 Seminar room - Adv Tech Lab Bldg	Fu-12	Table (for 4 chairs)	Fu (New)	6	500	3,000
Agriculture	1. Plant Molecular Genetics	1-4 Seminar room - Adv Tech Lab Bldg	Fu-13	Bulletin board	Fu (New)	1	300	300
Agriculture	1. Plant Molecular Genetics	1-5 Administration Office - Adv Tech Lab Bldg	Fu-14	Desk with chair	Fu (New)	4	500	2,000
Agriculture	1. Plant Molecular Genetics	1-5 Administration Office - Adv Tech Lab Bldg	Fu-15	File cabinet	Fu (New)	4	500	2,000
Agriculture	1. Plant Molecular Genetics	1-5 Administration Office - Adv Tech Lab Bldg	Fu-16	Bulletin board	Fu (New)	2	300	600
Agriculture	1. Plant Molecular Genetics	1-5 Administration Office - Adv Tech Lab Bldg	Fu-17	Shelf, large	Fu (New)	4	400	1,600
Agriculture								
Agriculture	2. Plant Breeding	2-1 Plant Breeding - Adv Tech Lab Bldg	3	Supply power	New	2	800	1,600
Agriculture	2. Plant Breeding	2-1 Plant Breeding - Adv Tech Lab Bldg	4	Salinity meter (set)	New	1	2,000	2,000
Agriculture	2. Plant Breeding	2-1 Plant Breeding - Adv Tech Lab Bldg	5	Digital force gauge	New	1	1,000	1,000
Agriculture	2. Plant Breeding	2-1 Plant Breeding - Adv Tech Lab Bldg	6	Balance (Electronic balance)	New	2	500	1,000
Agriculture	2. Plant Breeding	2-1 Plant Breeding - Adv Tech Lab Bldg	7	Oven	New	1	4,500	4,500
Agriculture	2. Plant Breeding	2-1 Plant Breeding - Adv Tech Lab Bldg	8	Centrifuge	New	1	7,500	7,500

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	2. Plant Breeding	2-1 Plant Breeding - Adv Tech Lab Bldg	10	pH meter	New	2	500	1,000
Agriculture	2. Plant Breeding	2-1 Plant Breeding - Adv Tech Lab Bldg	11	Microscope (Flourorescence microscope)	New	1	13,500	13,500
Agriculture	2. Plant Breeding	2-1 Plant Breeding - Adv Tech Lab Bldg	12	Densitometer	New	1	1,950	1,950
Agriculture	2. Plant Breeding	2-1 Plant Breeding - Adv Tech Lab Bldg	13	Spectrophometer	New	1	5,000	5,000
Agriculture	2. Plant Breeding	2-1 Plant Breeding - Adv Tech Lab Bldg	14	Water bath	New	1	2000	2000
Agriculture	2. Plant Breeding	2-1 Plant Breeding - Adv Tech Lab Bldg	Fu-1	Laboratory Bench, large	Fu (New)	2	1,200	2,400
Agriculture	2. Plant Breeding	2-1 Plant Breeding - Adv Tech Lab Bldg	Fu-2	Laboratory Bench, medium	Fu (New)	8	800	6,400
Agriculture	2. Plant Breeding	2-1 Plant Breeding - Adv Tech Lab Bldg	Fu-3	Shelf, large	Fu (New)	4	400	1,600
Agriculture	2. Plant Breeding	2-2 Academic Staff room - Adv Tech Lab Bldg	Fu-4	Desk with chair	Fu (New)	4	500	2,000
Agriculture	2. Plant Breeding	2-2 Academic Staff room - Adv Tech Lab Bldg	Fu-5	Shelf, large	Fu (New)	4	400	1,600
Agriculture	2. Plant Breeding	2-2 Academic Staff room - Adv Tech Lab Bldg	Fu-6	File cabinet	Fu (New)	4	500	2,000
Agriculture	2. Plant Breeding	2-2 Academic Staff room - Adv Tech Lab Bldg	Fu-7	Bulletin board	Fu (New)	1	300	300
Agriculture	2. Plant Breeding	2-3 Research Office - Adv Tech Lab Bldg	Fu-8	Desk with chair	Fu (New)	12	500	6,000
Agriculture	2. Plant Breeding	2-3 Research Office - Adv Tech Lab Bldg	Fu-9	Shelf, large	Fu (New)	4	400	1,600
Agriculture	2. Plant Breeding	2-3 Research Office - Adv Tech Lab Bldg	Fu-10	Bulletin board	Fu (New)	1	300	300
Agriculture								
Agriculture	3. Seed Technology	3-1 Seed Technology - Adv Tech Lab Bldg	1	Seed aspirator	New	1	4,000	4,000
Agriculture	3. Seed Technology	3-1 Seed Technology - Adv Tech Lab Bldg	2	Electric centrifugal seed divider	New	1	500	500
Agriculture	3. Seed Technology	3-1 Seed Technology - Adv Tech Lab Bldg	3	Seed germination chamber	New	1	15,400	15,400
Agriculture	3. Seed Technology	3-1 Seed Technology - Adv Tech Lab Bldg	4	Seed cleaner	New	1	2,500	2,500
Agriculture	3. Seed Technology	3-1 Seed Technology - Adv Tech Lab Bldg	5	Balance	New	2	1,000	2,000
Agriculture	3. Seed Technology	3-1 Seed Technology - Adv Tech Lab Bldg	6	Counting and placement tray	New	5	200	1,000
Agriculture	3. Seed Technology	3-1 Seed Technology - Adv Tech Lab Bldg	7	Clipper Office Tester and Cleaner	New	1	2,800	2,800
Agriculture	3. Seed Technology	3-1 Seed Technology - Adv Tech Lab Bldg	8	Air Blast seed cleaner	New	2	2,300	4,600
Agriculture	3. Seed Technology	3-1 Seed Technology - Adv Tech Lab Bldg	9	Seed divider Boener coplete with 2 pans	New	2	1,750	3,500
Agriculture	3. Seed Technology	3-1 Seed Technology - Adv Tech Lab Bldg	10	Digital hand tally	New	10	20	200
Agriculture	3. Seed Technology	3-1 Seed Technology - Adv Tech Lab Bldg	11	Power Grist Mill	New	1	2,500	2,500
Agriculture	3. Seed Technology	3-1 Seed Technology - Adv Tech Lab Bldg	12	Handheld portable Moisture tester-Rice Kett	New	2	550	1,100
Agriculture	3. Seed Technology	3-1 Seed Technology - Adv Tech Lab Bldg	13	Grain moisture meter Kett	New	2	1,300	2,600
Agriculture	3. Seed Technology	3-1 Seed Technology - Adv Tech Lab Bldg	14	Purity work board and diaphanoscope	New	5	300	1,500
Agriculture	3. Seed Technology	3-1 Seed Technology - Adv Tech Lab Bldg	15	Dazor circline magnifier lamp	New	5	400	2,000
Agriculture	3. Seed Technology	3-1 Seed Technology - Adv Tech Lab Bldg	16	Spiral separator	New	1	3,050	3,050
Agriculture	3. Seed Technology	3-1 Seed Technology - Adv Tech Lab Bldg	17	Seed counter	New	1	8,000	8,000
Agriculture	3. Seed Technology	3-1 Seed Technology - Adv Tech Lab Bldg	18	Cool storage room (2.7x1.8 x 2.6m)	New	2	10,000	20,000
Agriculture	3. Seed Technology	3-1 Seed Technology - Adv Tech Lab Bldg	19	Oven (Heating oven Binder)	New	2	2,000	4,000

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	3. Seed Technology	3-1 Seed Technology - Adv Tech Lab Bldg	20	Refrigerator	New	2	1,000	2,000
Agriculture	3. Seed Technology	3-1 Seed Technology - Adv Tech Lab Bldg	21	Gravity separotor	New	1	8,000	8,000
Agriculture	3. Seed Technology	3-1 Seed Technology - Adv Tech Lab Bldg	22	Length separator	New	1	7,000	7,000
Agriculture	3. Seed Technology	3-1 Seed Technology - Adv Tech Lab Bldg	23	Seed health testing	New	1	6,000	6,000
Agriculture	3. Seed Technology	3-1 Seed Technology - Adv Tech Lab Bldg	24	Viability testing equipment	New	1	5,000	5,000
Agriculture	3. Seed Technology	3-1 Seed Technology - Adv Tech Lab Bldg	25	Grinding mill	New	1	5,000	5,000
Agriculture	3. Seed Technology	3-1 Seed Technology - Adv Tech Lab Bldg	26	Seed strorage room dehumidifier	New	1	12,000	12,000
Agriculture	3. Seed Technology	3-1 Seed Technology - Adv Tech Lab Bldg	27	Seed germinator	New	1	20,000	20,000
Agriculture	3. Seed Technology	3-1 Seed Technology - Adv Tech Lab Bldg	Fu-1	Laboratory Bench, large	Fu (New)	2	1,200	2,400
Agriculture	3. Seed Technology	3-1 Seed Technology - Adv Tech Lab Bldg	Fu-2	Laboratory Bench, medium	Fu (New)	8	800	6,400
Agriculture	3. Seed Technology	3-1 Seed Technology - Adv Tech Lab Bldg	Fu-3	Shelf, large	Fu (New)	4	400	1,600
Agriculture	3. Seed Technology	3-2 Academic Staff room - Adv Tech Lab Bldg	Fu-4	Desk with chair	Fu (New)	4	500	2,000
Agriculture	3. Seed Technology	3-2 Academic Staff room - Adv Tech Lab Bldg	Fu-5	Shelf, large	Fu (New)	4	400	1,600
Agriculture	3. Seed Technology	3-2 Academic Staff room - Adv Tech Lab Bldg	Fu-6	File cabinet	Fu (New)	4	500	2,000
Agriculture	3. Seed Technology	3-2 Academic Staff room - Adv Tech Lab Bldg	Fu-7	Bulletin board	Fu (New)	1	300	300
Agriculture								
Agriculture	4. Cell Biotechnology	4-1 Cell Biotechnology - Adv Tech Lab Bldg	1	Cell homogenizer system	New	1	4,000	4,000
Agriculture	4. Cell Biotechnology	4-1 Cell Biotechnology - Adv Tech Lab Bldg	2	RVDV-IP brookfield digital viscometer	New	1	2,500	2,500
Agriculture	4. Cell Biotechnology	4-1 Cell Biotechnology - Adv Tech Lab Bldg	3	ELISA system	New	1	10,000	10,000
Agriculture	4. Cell Biotechnology	4-1 Cell Biotechnology - Adv Tech Lab Bldg	4	Centrifuge Eppendorf with variable speeds	New	1	7,500	7,500
Agriculture	4. Cell Biotechnology	4-1 Cell Biotechnology - Adv Tech Lab Bldg	6	Waterbath combined between shaker and thermal controller	New	1	4,000	4,000
Agriculture	4. Cell Biotechnology	4-1 Cell Biotechnology - Adv Tech Lab Bldg	7	Large scale shaker	New	1	2,500	2,500
Agriculture	4. Cell Biotechnology	4-1 Cell Biotechnology - Adv Tech Lab Bldg	8	Small and medium shaker	New	1	2,500	2,500
Agriculture	4. Cell Biotechnology	4-1 Cell Biotechnology - Adv Tech Lab Bldg	9	Three dimensional shaker	New	1	6,000	6,000
Agriculture	4. Cell Biotechnology	4-1 Cell Biotechnology - Adv Tech Lab Bldg	10	Laminar flow cabinets	New	1	6,000	6,000
Agriculture	4. Cell Biotechnology	4-1 Cell Biotechnology - Adv Tech Lab Bldg	11	Bioreactor air lift bubble 3 liters	New	10	1,000	10,000
Agriculture	4. Cell Biotechnology	4-1 Cell Biotechnology - Adv Tech Lab Bldg	12	Bioreactor airlift bubble 5 liters	New	10	1,000	10,000
Agriculture	4. Cell Biotechnology	4-1 Cell Biotechnology - Adv Tech Lab Bldg	13	Bioreactor airlift bubble 10 liters	New	5	1,500	7,500
Agriculture	4. Cell Biotechnology	4-1 Cell Biotechnology - Adv Tech Lab Bldg	15	Bioreactor Vessel kits - Advanced cell culture	New	1	4,000	4,000
Agriculture	4. Cell Biotechnology	4-1 Cell Biotechnology - Adv Tech Lab Bldg	17	Autoclave 120 L	New	1	15,000	15,000
Agriculture	4. Cell Biotechnology	4-1 Cell Biotechnology - Adv Tech Lab Bldg	20	Liquid nitrogen container (20 L)	New	1	4,000	4,000
Agriculture	4. Cell Biotechnology	4-1 Cell Biotechnology - Adv Tech Lab Bldg	21	Plant growth chamber (various capacity)	New	1	10,000	10,000
Agriculture	4. Cell Biotechnology	4-1 Cell Biotechnology - Adv Tech Lab Bldg	22	Three dimensional microscope	New	1	2,000	2,000
Agriculture	4. Cell Biotechnology	4-1 Cell Biotechnology - Adv Tech Lab Bldg	23	Three dimensional fluorescence microscopy	New	1	14,000	14,000

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	4. Cell Biotechnology	4-1 Cell Biotechnology - Adv Tech Lab Bldg	24	Digital micropipet sets	New	1	2,000	2,000
Agriculture	4. Cell Biotechnology	4-1 Cell Biotechnology - Adv Tech Lab Bldg	27	Thermal mixer comport	New	1	2,500	2,500
Agriculture	4. Cell Biotechnology	4-1 Cell Biotechnology - Adv Tech Lab Bldg	28	Portable pH, EC meters	New	1	2,000	2,000
Agriculture	4. Cell Biotechnology	4-1 Cell Biotechnology - Adv Tech Lab Bldg	29	Incubators	New	2	2,000	4,000
Agriculture	4. Cell Biotechnology	4-1 Cell Biotechnology - Adv Tech Lab Bldg	30	Glassware	New	1	5,000	5,000
Agriculture	4. Cell Biotechnology	4-1 Cell Biotechnology - Adv Tech Lab Bldg	Fu-1	Working table, chairs	Fu (New)	18	200	3,600
Agriculture	4. Cell Biotechnology	4-1 Cell Biotechnology - Adv Tech Lab Bldg	Fu-2	Self for documents	Fu (New)	9	300	2,700
Agriculture	4. Cell Biotechnology	4-2 Academic Staff room - Adv Tech Lab Bldg	Fu-4	Desk with chair	Fu (New)	4	500	2,000
Agriculture	4. Cell Biotechnology	4-2 Academic Staff room - Adv Tech Lab Bldg	Fu-5	Shelf, large	Fu (New)	4	400	1,600
Agriculture	4. Cell Biotechnology	4-2 Academic Staff room - Adv Tech Lab Bldg	Fu-6	File cabinet	Fu (New)	4	500	2,000
Agriculture	4. Cell Biotechnology	4-2 Academic Staff room - Adv Tech Lab Bldg	Fu-7	Bulletin board	Fu (New)	1	300	300
Agriculture	4. Cell Biotechnology	4-3 Research Office - Adv Tech Lab Bldg	Fu-8	Desk with chair	Fu (New)	12	500	6,000
Agriculture	4. Cell Biotechnology	4-3 Research Office - Adv Tech Lab Bldg	Fu-9	Shelf, large	Fu (New)	4	400	1,600
Agriculture	4. Cell Biotechnology	4-3 Research Office - Adv Tech Lab Bldg	Fu-10	Bulletin board	Fu (New)	1	300	300
Agriculture								
Agriculture	5. Applied Biological Science	5-1 Applied Biological Sci. - Adv Tech Lab Bldg	1	Supercritical CO_2 extraction system	New	1	25,000	25,000
Agriculture	5. Applied Biological Science	5-1 Applied Biological Sci. - Adv Tech Lab Bldg	3	High Performance liquid chromatography	New	1	45,000	45,000
Agriculture	5. Applied Biological Science	5-1 Applied Biological Sci. - Adv Tech Lab Bldg	4	Electrophoresis system (horizon)	New	1	3,500	3,500
Agriculture	5. Applied Biological Science	5-1 Applied Biological Sci. - Adv Tech Lab Bldg	5	Electrophoresis system (vertical)	New	1	3,500	3,500
Agriculture	5. Applied Biological Science	5-1 Applied Biological Sci. - Adv Tech Lab Bldg	6	Spectrophotometer (multiple wells)	New	1	8,000	8,000
Agriculture	5. Applied Biological Science	5-1 Applied Biological Sci. - Adv Tech Lab Bldg	7	Centrifuges (multiple rotors)	New	1	7,500	7,500
Agriculture	5. Applied Biological Science	5-1 Applied Biological Sci. - Adv Tech Lab Bldg	8	Laminar air flow cabinet	New	1	5,000	5,000
Agriculture	5. Applied Biological Science	5-1 Applied Biological Sci. - Adv Tech Lab Bldg	9	Homogenizer	New	1	3,500	3,500
Agriculture	5. Applied Biological Science	5-1 Applied Biological Sci. - Adv Tech Lab Bldg	10	Autoclave	New	1	15,000	15,000
Agriculture	5. Applied Biological Science	5-1 Applied Biological Sci. - Adv Tech Lab Bldg	11	Incubator	New	2	5,000	10,000
Agriculture	5. Applied Biological Science	5-1 Applied Biological Sci. - Adv Tech Lab Bldg	12	Freezers (-80^{o}C)	New	1	10,000	10,000
Agriculture	5. Applied Biological Science	5-1 Applied Biological Sci. - Adv Tech Lab Bldg	13	PCR system	New	1	7,500	7,500

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	5. Applied Biological Science	5-1 Applied Biological Sci. - Adv Tech Lab Bldg	14	Gel scanning system	New	1	7,000	7,000
Agriculture	5. Applied Biological Science	5-1 Applied Biological Sci. - Adv Tech Lab Bldg	15	Liquid nitrogen container (10L)	New	1	1,100	1,100
Agriculture	5. Applied Biological Science	5-1 Applied Biological Sci. - Adv Tech Lab Bldg	17	Shaker	New	2	3,000	6,000
Agriculture	5. Applied Biological Science	5-1 Applied Biological Sci. - Adv Tech Lab Bldg	18	Thermal mixer	New	1	700	700
Agriculture	5. Applied Biological Science	5-1 Applied Biological Sci. - Adv Tech Lab Bldg	19	pH meter	New	1	750	750
Agriculture	5. Applied Biological Science	5-1 Applied Biological Sci. - Adv Tech Lab Bldg	20	EC meter	New	1	1,200	1,200
Agriculture	5. Applied Biological Science	5-1 Applied Biological Sci. - Adv Tech Lab Bldg	21	Microscopes	New	5	1,500	7,500
Agriculture	5. Applied Biological Science	5-1 Applied Biological Sci. - Adv Tech Lab Bldg	22	Microtome	New	1	3,500	3,500
Agriculture	5. Applied Biological Science	5-1 Applied Biological Sci. - Adv Tech Lab Bldg	23	Rotary evaporator	New	1	12,000	12,000
Agriculture	5. Applied Biological Science	5-1 Applied Biological Sci. - Adv Tech Lab Bldg	24	Freeze dryer	New	1	25,000	25,000
Agriculture	5. Applied Biological Science	5-1 Applied Biological Sci. - Adv Tech Lab Bldg	25	Micropette sets	New	1	2,000	2,000
Agriculture	5. Applied Biological Science	5-1 Applied Biological Sci. - Adv Tech Lab Bldg	26	Glasswares	New	1	5,000	5,000
Agriculture	5. Applied Biological Science	5-2 Preparation Room - Adv Tech Lab Bldg	27	Technical balance	New	2	1,000	2,000
Agriculture	5. Applied Biological Science	5-2 Preparation Room - Adv Tech Lab Bldg	Fu-1	Stainless Steel Table (1.2x2.4m)	Fu (New)	2	1,000	2,000
Agriculture	5. Applied Biological Science	5-2 Preparation Room - Adv Tech Lab Bldg	Fu-2	Lab chair	Fu (New)	10	100	1,000
Agriculture	5. Applied Biological Science	5-3 Sterilization room - Adv Tech Lab Bldg	28	Autoclave	New	2	8,000	16,000
Agriculture	5. Applied Biological Science	5-3 Sterilization room - Adv Tech Lab Bldg	29	Stainless Steel Table (1.2x2.4m)	Fu (New)	2	1,000	2,000
Agriculture	5. Applied Biological Science	5-4 Seminar room - Adv Tech Lab Bldg	Fu-3	Chair	Fu (New)	24	100	2,400
Agriculture	5. Applied Biological Science	5-4 Seminar room - Adv Tech Lab Bldg	Fu-4	Table (for 4 chairs)	Fu (New)	6	500	3,000
Agriculture	5. Applied Biological Science	5-4 Seminar room - Adv Tech Lab Bldg	Fu-5	Bulletin board	Fu (New)	1	300	300

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	5. Applied Biological Science	5-5 Administration Office - Adv Tech Lab Bldg	Fu-6	Desk with chair	Fu (New)	4	500	2,000
Agriculture	5. Applied Biological Science	5-5 Administration Office - Adv Tech Lab Bldg	Fu-7	File cabinet	Fu (New)	4	500	2,000
Agriculture	5. Applied Biological Science	5-5 Administration Office - Adv Tech Lab Bldg	Fu-8	Bulletin board	Fu (New)	2	300	600
Agriculture	5. Applied Biological Science	5-5 Administration Office - Adv Tech Lab Bldg	Fu-9	Shelf, large	Fu (New)	4	400	1,600
Agriculture	5. Applied Biological Science	5-6 Academic Staff room - Adv Tech Lab Bldg	Fu-10	Desk with chair	Fu (New)	4	500	2,000
Agriculture	5. Applied Biological Science	5-6 Academic Staff room - Adv Tech Lab Bldg	Fu-11	Shelf, large	Fu (New)	4	400	1,600
Agriculture	5. Applied Biological Science	5-6 Academic Staff room - Adv Tech Lab Bldg	Fu-12	File cabinet	Fu (New)	4	500	2,000
Agriculture	5. Applied Biological Science	5-6 Academic Staff room - Adv Tech Lab Bldg	Fu-13	Bulletin board	Fu (New)	1	300	300
Agriculture	5. Applied Biological Science	5-7 Research Office - Adv Tech Lab Bldg	Fu-14	Desk with chair	Fu (New)	12	500	6,000
Agriculture	5. Applied Biological Science	5-7 Research Office - Adv Tech Lab Bldg	Fu-15	Shelf, large	Fu (New)	4	400	1,600
Agriculture	5. Applied Biological Science	5-7 Research Office - Adv Tech Lab Bldg	Fu-16	Bulletin board	Fu (New)	1	300	300
Agriculture	5. Applied Biological Science	5-8 Department head office - Adv Tech Lab Bldg	Fu-17	Desk with chair	Fu (New)	1	400	400
Agriculture	5. Applied Biological Science	5-8 Department head office - Adv Tech Lab Bldg	Fu-18	Shelf, large	Fu (New)	2	400	800
Agriculture	5. Applied Biological Science	5-8 Department head office - Adv Tech Lab Bldg	Fu-19	File cabinet	Fu (New)	2	400	800
Agriculture								
Agriculture	6. Plant and Animal Biochemistry	6-1 Biochemistry Lab. (D214)	1	UV/Vis Spectrophotometer	New	1	8,000	8,000
Agriculture	6. Plant and Animal Biochemistry	6-1 Biochemistry Lab. (D214)	2	Eppendorf Thermomixer	New	1	4,000	4,000
Agriculture	6. Plant and Animal Biochemistry	6-1 Biochemistry Lab. (D214)	3	Biologic™ Low-pressure chromatography systems (Bio Frac-fraction collector+ Econo Gradient pump + Accessories)	New	1	25,000	25,000
Agriculture	6. Plant and Animal Biochemistry	6-1 Biochemistry Lab. (D214)	4	Mini-PROTEAN Tetra cell 1-D Electrophoresis Systems	New	1	15,000	15,000

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	6. Plant and Animal Biochemistry	6-1 Biochemistry Lab. (D214)	5	PROTEAN ® i12™ IEF system and 2-D Electrophoresis Workflow	New	1	20,000	20,000
Agriculture	6. Plant and Animal Biochemistry	6-1 Biochemistry Lab. (D214)	6	Nucleic Acid Electrophoresis and Blotting	New	1	20,000	20,000
Agriculture	6. Plant and Animal Biochemistry	6-1 Biochemistry Lab. (D214)	7	Fluorescence spectrophotometer	New	1	20,000	20,000
Agriculture	6. Plant and Animal Biochemistry	6-1 Biochemistry Lab. (D214)	8	Sample Homogenizer	New	1	5,000	5,000
Agriculture	6. Plant and Animal Biochemistry	6-1 Biochemistry Lab. (D214)	9	Refrigerated eppendorf Centrifuge	New	1	5,000	5,000
Agriculture	6. Plant and Animal Biochemistry	6-1 Biochemistry Lab. (D214)	10	Water Purification System	New	1	2,000	2,000
Agriculture	6. Plant and Animal Biochemistry	6-1 Biochemistry Lab. (D214)	11	Shaker Incubator	New	1	2,000	2,000
Agriculture	6. Plant and Animal Biochemistry	6-1 Biochemistry Lab. (D214)	12	Heating magnetic stir	New	2	2,000	4,000
Agriculture	6. Plant and Animal Biochemistry	6-1 Biochemistry Lab. (D214)	13	Laminar air flow cabinet	New	1	5,000	5,000
Agriculture	6. Plant and Animal Biochemistry	6-1 Biochemistry Lab. (D214)	14	Water bath with shaker	New	2	1,800	3,600
Agriculture	6. Plant and Animal Biochemistry	6-1 Biochemistry Lab. (D214)	15	Freezer (-20oC)	New	1	8,000	8,000
Agriculture	6. Plant and Animal Biochemistry	6-1 Biochemistry Lab. (D214)	16	Ultrasonic cleaner system	New	1	3,000	3,000
Agriculture	6. Plant and Animal Biochemistry	6-1 Biochemistry Lab. (D214)	17	Vacuum drier	New	1	2,000	2,000
Agriculture	6. Plant and Animal Biochemistry	6-1 Biochemistry Lab. (D214)	18	pH meter	New	2	1,000	2,000
Agriculture	6. Plant and Animal Biochemistry	6-1 Biochemistry Lab. (D214)	19	Small equipments (Vortex mixer, Chromatography colums, vacuum filtration system, spin centrifuge, Microwave...)	New	1	5,000	5,000
Agriculture	6. Plant and Animal Biochemistry	6-2 Academic Staff room (D212, D213)	Fu-1	Desk with chair	Fu (New)	4	500	2,000
Agriculture	6. Plant and Animal Biochemistry	6-2 Academic Staff room (D212, D213)	Fu-2	Shelf, large	Fu (New)	4	400	1,600
Agriculture	6. Plant and Animal Biochemistry	6-2 Academic Staff room (D212, D213)	Fu-3	File cabinet	Fu (New)	4	500	2,000
Agriculture	6. Plant and Animal Biochemistry	6-2 Academic Staff room (D212, D213)	Fu-4	Bulletin board	Fu (New)	1	300	300

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	6. Plant and Animal Biochemistry	6-3 Research Office (D211)	Fu-5	Desk with chair	Fu (New)	12	500	6,000
Agriculture	6. Plant and Animal Biochemistry	6-3 Research Office (D211)	Fu-6	Shelf, large	Fu (New)	4	400	1,600
Agriculture	6. Plant and Animal Biochemistry	6-3 Research Office (D211)	Fu-7	Bulletin board	Fu (New)	1	300	300
Agriculture								
Agriculture	7. Plant physiology	7-1 Plant physiolgy	1	FLIPR membrane potential system	New	1	4,000	4,000
Agriculture	7. Plant physiology	7-1 Plant physiolgy	2	Making Soil CO_2 Flux Measurements of LI	New	1	7,000	7,000
Agriculture	7. Plant physiology	7-1 Plant physiolgy	3	CO_2 source Assembly of LI 6400	New	1	1,000	1,000
Agriculture	7. Plant physiology	7-1 Plant physiolgy	4	Intergrated fluorescence measurement of LI 6400 (photosynthesis measurement)	New	1	10,000	10,000
Agriculture	7. Plant physiology	7-1 Plant physiolgy	5	Area leaf measurement system portable	New	1	6,000	6,000
Agriculture	7. Plant physiology	7-1 Plant physiolgy	6	Area leaf measurement system handle	New	1	8,000	8,000
Agriculture	7. Plant physiology	7-1 Plant physiolgy	7	Leaf water potential system	New	1	7,000	7,000
Agriculture	7. Plant physiology	7-1 Plant physiolgy	8	Light measurement apparatus recorder	New	1	1,500	1,500
Agriculture	7. Plant physiology	7-1 Plant physiolgy	9	Waterbath combined between shaker and thermal controller	New	1	4,000	4,000
Agriculture	7. Plant physiology	7-1 Plant physiolgy	10	Colorimeter	New	1	10,000	10,000
Agriculture	7. Plant physiology	7-1 Plant physiolgy	11	Chlorophyll measurement apparatus	New	1	5,000	5,000
Agriculture	7. Plant physiology	7-1 Plant physiolgy	12	Analyzed balance	New	2	1,000	2,000
Agriculture	7. Plant physiology	7-1 Plant physiolgy	13	Freezer (-20oC)	New	1	5,000	5,000
Agriculture	7. Plant physiology	7-1 Plant physiolgy	14	Cold chambers	New	1	4,000	4,000
Agriculture	7. Plant physiology	7-1 Plant physiolgy	15	Leaf porometer	New	1	3,500	3,500
Agriculture	7. Plant physiology	7-1 Plant physiolgy	16	Hand-held photosynthesis system	New	1	25,000	25,000
Agriculture	7. Plant physiology	7-1 Plant physiolgy	17	Glassware	New			5,000
Agriculture	7. Plant physiology	7-1 Plant physiolgy	19	Light Microscopes	New	5	1,000	5,000
Agriculture	7. Plant physiology	7-2 Academic Staff room	Fu-1	Desk with chair	Fu (New)	4	500	2,000
Agriculture	7. Plant physiology	7-2 Academic Staff room	Fu-2	Shelf, large	Fu (New)	4	400	1,600
Agriculture	7. Plant physiology	7-2 Academic Staff room	Fu-3	File cabinet	Fu (New)	4	500	2,000
Agriculture	7. Plant physiology	7-2 Academic Staff room	Fu-4	Bulletin board	Fu (New)	1	300	300
Agriculture	7. Plant physiology	7-3 Research Office	Fu-5	Desk with chair	Fu (New)	12	500	6,000
Agriculture	7. Plant physiology	7-3 Research Office	Fu-6	Shelf, large	Fu (New)	4	400	1,600
Agriculture	7. Plant physiology	7-3 Research Office	Fu-7	Bulletin board	Fu (New)	1	300	300
Agriculture								

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	8. Soil Chemistry	8-1 Soil Chemistry - Adv Tech Lab Bldg	1	IC (Ion chrotomography)	New	1	60,000	60,000
Agriculture	8. Soil Chemistry	8-1 Soil Chemistry - Adv Tech Lab Bldg	2	Spectrophotomter with FIA system	New	1	30,000	30,000
Agriculture	8. Soil Chemistry	8-1 Soil Chemistry - Adv Tech Lab Bldg	4	TOC analyzer	New	1	45,000	45,000
Agriculture	8. Soil Chemistry	8-1 Soil Chemistry - Adv Tech Lab Bldg	5	Glass wares: flask, tube, erlenmyer, cylinder, beaker…	New	1	5,000	5,000
Agriculture	8. Soil Chemistry	8-1 Soil Chemistry - Adv Tech Lab Bldg	6	Microwave sample digester	New	1	25,000	25,000
Agriculture	8. Soil Chemistry	8-1 Soil Chemistry - Adv Tech Lab Bldg	7	Dumas analyzer	New	1	25,000	25,000
Agriculture	8. Soil Chemistry	8-1 Soil Chemistry - Adv Tech Lab Bldg	8	Fume hood	New	2	5,000	10,000
Agriculture	8. Soil Chemistry	8-1 Soil Chemistry - Adv Tech Lab Bldg	9	CO_2 analyser system	New	1	15,000	15,000
Agriculture	8. Soil Chemistry	8-1 Soil Chemistry - Adv Tech Lab Bldg	10	High speed freezing centrifuge	New	1	8,000	8,000
Agriculture	8. Soil Chemistry	8-1 Soil Chemistry - Adv Tech Lab Bldg	11	Kjedahl system	New	1	4,500	4,500
Agriculture	8. Soil Chemistry	8-1 Soil Chemistry - Adv Tech Lab Bldg	12	Water deionizer	New	1	4,500	4,500
Agriculture	8. Soil Chemistry	8-1 Soil Chemistry - Adv Tech Lab Bldg	13	Furnace oven	New	1	4,000	4,000
Agriculture	8. Soil Chemistry	8-1 Soil Chemistry - Adv Tech Lab Bldg	14	Drying oven	New	2	2,000	4,000
Agriculture	8. Soil Chemistry	8-1 Soil Chemistry - Adv Tech Lab Bldg	15	Shaker	New	2	1,500	3,000
Agriculture	8. Soil Chemistry	8-1 Soil Chemistry - Adv Tech Lab Bldg	16	Electronic balance	New	2	1,500	3,000
Agriculture	8. Soil Chemistry	8-1 Soil Chemistry - Adv Tech Lab Bldg	17	Computer, printer for the staff office and the office of graduate students	New	12	500	6,000
Agriculture	8. Soil Chemistry	8-1 Soil Chemistry - Adv Tech Lab Bldg	18	Water bath	New	2	2,000	4,000
Agriculture	8. Soil Chemistry	8-1 Soil Chemistry - Adv Tech Lab Bldg	19	Stirrer	New	2	400	800
Agriculture	8. Soil Chemistry	8-1 Soil Chemistry - Adv Tech Lab Bldg	20	pH and Eh meters	New	2	1,300	2,600
Agriculture	8. Soil Chemistry	8-1 Soil Chemistry - Adv Tech Lab Bldg	21	Heating plate	New	3	1,000	3,000
Agriculture	8. Soil Chemistry	8-1 Soil Chemistry - Adv Tech Lab Bldg	22	Pipettes	New	15	200	3,000
Agriculture	8. Soil Chemistry	8-1 Soil Chemistry - Adv Tech Lab Bldg	23	-20^{o}C freezer	New	2	700	1,400
Agriculture	8. Soil Chemistry	8-1 Soil Chemistry - Adv Tech Lab Bldg	24	Freezer	New	2	600	1,200
Agriculture	8. Soil Chemistry	8-1 Soil Chemistry - Adv Tech Lab Bldg	25	Dispensers	New	3	400	1,200
Agriculture	8. Soil Chemistry	8-1 Soil Chemistry - Adv Tech Lab Bldg	26	Ultrasonic cleaning bath	New	1	2,000	2,000
Agriculture	8. Soil Chemistry	8-1 Soil Chemistry - Adv Tech Lab Bldg	27	EC meters	New	2	800	1,600
Agriculture	8. Soil Chemistry	8-1 Soil Chemistry - Adv Tech Lab Bldg	28	Ultrasonic probe	New	1	1,500	1,500
Agriculture	8. Soil Chemistry	8-1 Soil Chemistry - Adv Tech Lab Bldg	29	Centrifuge	New	1	8,000	8,000
Agriculture	8. Soil Chemistry	8-1 Soil Chemistry - Adv Tech Lab Bldg	30	Oxygen disolved meter	New	1	1,200	1,200
Agriculture	8. Soil Chemistry	8-1 Soil Chemistry - Adv Tech Lab Bldg	31	Minicentrifuge	New	2	400	800
Agriculture	8. Soil Chemistry	8-2 Academic Staff office - Adv Tech Lab Bldg	Fu-1	Desk with chair	Fu (New)	8	500	4,000
Agriculture	8. Soil Chemistry	8-2 Academic Staff office - Adv Tech Lab Bldg	Fu-2	Shelf, large	Fu (New)	8	400	3,200
Agriculture	8. Soil Chemistry	8-2 Academic Staff office - Adv Tech Lab Bldg	Fu-3	File cabinet	Fu (New)	8	500	4,000
Agriculture	8. Soil Chemistry	8-2 Academic Staff office - Adv Tech Lab Bldg	Fu-4	Bulletin board	Fu (New)	2	300	600
Agriculture	8. Soil Chemistry	8-2 Academic Staff office - Adv Tech Lab Bldg	Fu-5	Book case	Fu	4	500	2,000
Agriculture	8. Soil Chemistry	8-2 Academic Staff office - Adv Tech Lab Bldg	32	Computers	Fu	4	500	2,000
Agriculture	8. Soil Chemistry	8-2 Academic Staff office - Adv Tech Lab Bldg	33	Printer	Fu	1	200	200
Agriculture	8. Soil Chemistry	8-3 Research office - Adv Tech Lab Bldg	Fu-6	Desk with chair	Fu (New)	12	500	6,000

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	8. Soil Chemistry	8-3 Research office - Adv Tech Lab Bldg	Fu-7	Shelf, large	Fu (New)	4	400	1,600
Agriculture	8. Soil Chemistry	8-3 Research office - Adv Tech Lab Bldg	Fu-8	Bulletin board	Fu (New)	1	300	300
Agriculture	8. Soil Chemistry	8-3 Research office - Adv Tech Lab Bldg	34	Computer	Fu	12	500	6,000
Agriculture	8. Soil Chemistry	8-3 Research office - Adv Tech Lab Bldg	35	Printer	Fu	1	200	200
Agriculture	8. Soil Chemistry	8-3 Research office - Adv Tech Lab Bldg	36	Scanner	Fu	1	200	200
Agriculture	8. Soil Chemistry	8-4 Equipment/preparartion room	Fu-9	Long shelves for boxes	Fu	6	500	3,000
Agriculture	8. Soil Chemistry	8-5 Sample processing room	Fu-10	Long shelves for boxes	Fu	6	500	3,000
Agriculture	8. Soil Chemistry	8-5 Sample processing room	Fu-11	Table	Fu	2	400	800
Agriculture	8. Soil Chemistry	8-5 Sample processing room	Fu-12	Cooling 4^{o}C cabinet 8m^{2}	new	1	5,000	5,000
Agriculture	8. Soil Chemistry	8-5 Sample processing room	37	Fume hoods	New	2	5,000	10,000
Agriculture	8. Soil Chemistry	8-6 Seminar room - Adv Tech Lab Bldg	Fu-13	Chair	Fu (New)	24	100	2,400
Agriculture	8. Soil Chemistry	8-6 Seminar room - Adv Tech Lab Bldg	Fu-14	Table (for 4 chairs)	Fu (New)	6	500	3,000
Agriculture	8. Soil Chemistry	8-6 Seminar room - Adv Tech Lab Bldg	Fu-15	Bulletin board	Fu (New)	1	300	300
Agriculture	8. Soil Chemistry	8-6 Seminar room - Adv Tech Lab Bldg	Fu-16	Tools	Fu	30	50	1,500
Agriculture	8. Soil Chemistry	8-6 Seminar room - Adv Tech Lab Bldg	Fu-17	Screen	Fu	1	300	300
Agriculture	8. Soil Chemistry	8-6 Seminar room - Adv Tech Lab Bldg	38	Computer	Fu	1	500	500
Agriculture	8. Soil Chemistry	8-6 Seminar room - Adv Tech Lab Bldg	Fu-18	Book shelve	Fu	2	500	1,000
Agriculture	8. Soil Chemistry	8-6 Seminar room - Adv Tech Lab Bldg	39	LCD projector	Fu	1	700	700
Agriculture	8. Soil Chemistry	8-6 Seminar room - Adv Tech Lab Bldg	40	Printer	Fu	1	200	200
Agriculture	8. Soil Chemistry	8-6 Seminar room - Adv Tech Lab Bldg	41	Scanner	Fu	1	200	200
Agriculture	8. Soil Chemistry	8-7 Administration Office - Adv Tech Lab Bldg	Fu-19	Desk with chair	Fu (New)	4	500	2,000
Agriculture	8. Soil Chemistry	8-7 Administration Office - Adv Tech Lab Bldg	Fu-20	File cabinet	Fu (New)	4	500	2,000
Agriculture	8. Soil Chemistry	8-7 Administration Office - Adv Tech Lab Bldg	Fu-21	Bulletin board	Fu (New)	2	300	600
Agriculture	8. Soil Chemistry	8-7 Administration Office - Adv Tech Lab Bldg	Fu-22	Shelf, large	Fu (New)	4	400	1,600
Agriculture								
Agriculture	9. Soil Physics	9-1 Soil Physics - Adv Tech Lab Bldg	1	Laboratory Kunsat measurement	new	1	8,000	8,000
Agriculture	9. Soil Physics	9-1 Soil Physics - Adv Tech Lab Bldg	2	Laboratory Ksat measurement	new	1	7,000	7,000
Agriculture	9. Soil Physics	9-1 Soil Physics - Adv Tech Lab Bldg	3	Laboratory equipment for soil limit measurment	new	2	1,200	2,400
Agriculture	9. Soil Physics	9-1 Soil Physics - Adv Tech Lab Bldg	4	Electric transducer tensiometer for soil matric potential measurement	new	1	10,000	10,000

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	9. Soil Physics	9-1 Soil Physics - Adv Tech Lab Bldg	5	Mercury manometer tensiometer with the different soil depths to 100 cm (10 cm interval) for soil matric potential measurement: 50 sets	new	10	1,000	10,000
Agriculture	9. Soil Physics	9-1 Soil Physics - Adv Tech Lab Bldg	6	Complete pressure pan equipment for pF measurement with pF values >2	new	1	3,000	3,000
Agriculture	9. Soil Physics	9-1 Soil Physics - Adv Tech Lab Bldg	7	Electronic balance	new	2	1,500	3,000
Agriculture	9. Soil Physics	9-1 Soil Physics - Adv Tech Lab Bldg	8	Sand box apparatus for pF measurement with pF values <=2	new	1	3,000	3,000
Agriculture	9. Soil Physics	9-1 Soil Physics - Adv Tech Lab Bldg	9	Soil penetrometers (mechanic transducer)	new	1	2,000	2,000
Agriculture	9. Soil Physics	9-1 Soil Physics - Adv Tech Lab Bldg	10	Soil penetrometers (electronic transducer)	new	1	5,200	5,200
Agriculture	9. Soil Physics	9-1 Soil Physics - Adv Tech Lab Bldg	11	Soil oxygen and air diffusion meter	new	1	2,000	2,000
Agriculture	9. Soil Physics	9-1 Soil Physics - Adv Tech Lab Bldg	12	Sieve set with the different diameters: 5 sets	new	5	1,000	5,000
Agriculture	9. Soil Physics	9-1 Soil Physics - Adv Tech Lab Bldg	13	Ring box for undisturbed soil sampling: 30 boxes	new	10	1,000	10,000
Agriculture	9. Soil Physics	9-1 Soil Physics - Adv Tech Lab Bldg	14	Soil sampling set	new	1	5,000	5,000
Agriculture	9. Soil Physics	9-1 Soil Physics - Adv Tech Lab Bldg	15	Drying oven	new	1	2,000	2,000
Agriculture	9. Soil Physics	9-1 Soil Physics - Adv Tech Lab Bldg	16	System of soil aggregate stability measurement	new	1	5,000	5,000
Agriculture	9. Soil Physics	9-1 Soil Physics - Adv Tech Lab Bldg	17	System for soil texture measurement (pipet method) and shaker	new	1	5,000	5,000
Agriculture	9. Soil Physics	9-1 Soil Physics - Adv Tech Lab Bldg	18	Evaporation pan	new	2	1,000	2,000
Agriculture	9. Soil Physics	9-1 Soil Physics - Adv Tech Lab Bldg	19	Portable soil moisture meters	new	2	2,000	4,000
Agriculture	9. Soil Physics	9-1 Soil Physics - Adv Tech Lab Bldg	20	Tension Infiltrometer	new	1	3,000	3,000
Agriculture	9. Soil Physics	9-1 Soil Physics - Adv Tech Lab Bldg	21	Water bath	new	1	2,000	2,000
Agriculture	9. Soil Physics	9-1 Soil Physics - Adv Tech Lab Bldg	22	Heating plates	new	2	1,000	2,000
Agriculture	9. Soil Physics	9-1 Soil Physics - Adv Tech Lab Bldg	23	Pipette	new	10	200	2,000
Agriculture	9. Soil Physics	9-1 Soil Physics - Adv Tech Lab Bldg	24	Fume hood	new	2	5,000	10,000
Agriculture	9. Soil Physics	9-1 Soil Physics - Adv Tech Lab Bldg	25	Glass wares	new	1	5,000	5,000
Agriculture	9. Soil Physics	9-2 Research office - Adv Tech Lab Bldg	Fu-1	Desk with chair	Fu (New)	12	500	6,000
Agriculture	9. Soil Physics	9-2 Research office - Adv Tech Lab Bldg	Fu-2	Shelf, large	Fu (New)	4	400	1,600
Agriculture	9. Soil Physics	9-2 Research office - Adv Tech Lab Bldg	Fu-3	Bulletin board	Fu (New)	1	300	300
Agriculture								
Agriculture	10. Soil Microbiology	10-1 Soil Microbiology	1	LC/MS	new	1	75,000	75,000
Agriculture	10. Soil Microbiology	10-1 Soil Microbiology	3	ASE (accelerated solvent extractor)	new	1	30,000	30,000

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	10. Soil Microbiology	10-1 Soil Microbiology	4	Rotary evaporator	new	1	4,000	4,000
Agriculture	10. Soil Microbiology	10-1 Soil Microbiology	6	Biological microscope	new	1	10,000	10,000
Agriculture	10. Soil Microbiology	10-1 Soil Microbiology	7	Glass wares	new		5,000	10,000
Agriculture	10. Soil Microbiology	10-1 Soil Microbiology	9	DGGE system	new	1	8,000	8,000
Agriculture	10. Soil Microbiology	10-1 Soil Microbiology	10	Spectrophotomer for DNA (DNA nanodrop)	new	1	12,000	12,000
Agriculture	10. Soil Microbiology	10-1 Soil Microbiology	12	Laminar hood	new	2	6,000	12,000
Agriculture	10. Soil Microbiology	10-1 Soil Microbiology	13	Fume hood	new	2	5,000	10,000
Agriculture	10. Soil Microbiology	10-1 Soil Microbiology	15	Autoclave	new	1	4,500	4,500
Agriculture	10. Soil Microbiology	10-1 Soil Microbiology	16	Gel image station	new	1	8,000	8,000
Agriculture	10. Soil Microbiology	10-1 Soil Microbiology	17	Anaerobic glove box	new	1	8,000	8,000
Agriculture	10. Soil Microbiology	10-1 Soil Microbiology	18	Incubator	new	1	3,500	3,500
Agriculture	10. Soil Microbiology	10-1 Soil Microbiology	19	Stereo microscope	new	1	3,000	3,000
Agriculture	10. Soil Microbiology	10-1 Soil Microbiology	20	Shaker	new	2	1,500	3,000
Agriculture	10. Soil Microbiology	10-1 Soil Microbiology	21	Drying oven	new	1	2,000	2,000
Agriculture	10. Soil Microbiology	10-1 Soil Microbiology	22	High speed freezer centrifuge	new	1	8,000	8,000
Agriculture	10. Soil Microbiology	10-1 Soil Microbiology	23	Furnace oven	new	1	4,000	4,000
Agriculture	10. Soil Microbiology	10-1 Soil Microbiology	25	Pipette	new	10	200	2,000
Agriculture	10. Soil Microbiology	10-1 Soil Microbiology	26	Shaker-incubator	new	1	3,000	3,000
Agriculture	10. Soil Microbiology	10-1 Soil Microbiology	27	Dispenser	new	6	400	2,400
Agriculture	10. Soil Microbiology	10-1 Soil Microbiology	28	Gel electrophoresis with voltage source	new	2	1,000	2,000
Agriculture	10. Soil Microbiology	10-1 Soil Microbiology	29	Fluorometer for quantifying RNA and DNA	new	1	2,000	2,000
Agriculture	10. Soil Microbiology	10-1 Soil Microbiology	30	pH and Eh meter	new	1	2,000	2,000
Agriculture	10. Soil Microbiology	10-1 Soil Microbiology	31	Ultrasonic cleaning bath	new	1	2,000	2,000
Agriculture	10. Soil Microbiology	10-1 Soil Microbiology	32	Vortex	new	3	400	1,200
Agriculture	10. Soil Microbiology	10-1 Soil Microbiology	33	Ultrasonic probe	new	1	1,500	1,500
Agriculture	10. Soil Microbiology	10-1 Soil Microbiology	34	Setting up N2-Argon-CO2 system for anaerobic system	new	1	1,500	1,500
Agriculture	10. Soil Microbiology	10-1 Soil Microbiology	35	Stirrer	new	3	400	1,200
Agriculture	10. Soil Microbiology	10-1 Soil Microbiology	36	EC meter	new	1	800	800
Agriculture	10. Soil Microbiology	10-1 Soil Microbiology	37	Minicentrifuge	new	2	400	800
Agriculture	10. Soil Microbiology	10-2 Academic staff office	Fu-1	Desk with chair	Fu (New)	4	500	2,000
Agriculture	10. Soil Microbiology	10-2 Academic staff office	Fu-2	Shelf, large	Fu (New)	4	400	1,600
Agriculture	10. Soil Microbiology	10-2 Academic staff office	Fu-3	File cabinet	Fu (New)	4	500	2,000
Agriculture	10. Soil Microbiology	10-2 Academic staff office	Fu-4	Bulletin board	Fu (New)	1	300	300
Agriculture	10. Soil Microbiology	10-2 Academic staff office	Fu-5	Book case	Fu	4	500	2,000
Agriculture	10. Soil Microbiology	10-3 Incubation room	Fu-7	Air conditioner	Fu	1	1,000	1,000
Agriculture	10. Soil Microbiology	10-3 Incubation room	Fu-8	Shelves	Fu	2	500	1,000

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	10. Soil Microbiology	10-3 Incubation room	Fu-9	Round shaker	Fu	2	2,000	4,000
Agriculture	10. Soil Microbiology	10-3 Incubation room	Fu-10	Reciprocal shaker	Fu	2	2,000	4,000
Agriculture								
Agriculture	11. Soil Classification & Micromorphology	11. Soil Classification & Micromorphology	1	X-ray diffractor	new	1	50,000	50,000
Agriculture	11. Soil Classification & Micromorphology	11. Soil Classification & Micromorphology	2	Polarized microscope	new	1	20,000	20,000
Agriculture	11. Soil Classification & Micromorphology	11. Soil Classification & Micromorphology	3	Digitizer	new	1	25,000	25,000
Agriculture	11. Soil Classification & Micromorphology	11. Soil Classification & Micromorphology	4	Soil auger	new	10	500	5,000
Agriculture	11. Soil Classification & Micromorphology	11. Soil Classification & Micromorphology	5	Peat auger	new	1	700	700
Agriculture	11. Soil Classification & Micromorphology	11. Soil Classification & Micromorphology	6	Upgrading the soil microslide maker	new	1	5,000	5,000
Agriculture	11. Soil Classification & Micromorphology	11. Soil Classification & Micromorphology	7	GPS	new	10	400	4,000
Agriculture	11. Soil Classification & Micromorphology	11. Soil Classification & Micromorphology	8	Munsell colr chart	new	5	300	1,500
Agriculture	11. Soil Classification & Micromorphology	11. Soil Classification & Micromorphology	9	Printing plotter	new	1	5,000	5,000
Agriculture	11. Soil Classification & Micromorphology	11. Soil Classification & Micromorphology	10	Computer	new	10	500	5,000
Agriculture	11. Soil Classification & Micromorphology	11. Soil Classification & Micromorphology	Fu-1	Furniture: desks, table, book shelves and cupboards	new	1	7,000	7,000
Agriculture								
Agriculture	12. Biological and Chemical Technology in Plant Protection	12.1 Biological and Chemical Technology in Plant Protection - Adv Tech Lab Bldg	2	Ultracentrifuge	New	1	10,000	10,000
Agriculture	12. Biological and Chemical Technology in Plant Protection	12.1 Biological and Chemical Technology in Plant Protection - Adv Tech Lab Bldg	3	Temperature-controlled centrifuge	New	1	10,000	10,000
Agriculture	12. Biological and Chemical Technology in Plant Protection	12.1 Biological and Chemical Technology in Plant Protection - Adv Tech Lab Bldg	4	High Performance Liquid Chromatography (HPLC) and accessories	New	1	50,000	50,000
Agriculture	12. Biological and Chemical Technology in Plant Protection	12.1 Biological and Chemical Technology in Plant Protection - Adv Tech Lab Bldg	6	FTIR spectrometer and accessories	New	1	20,000	20,000

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	12. Biological and Chemical Technology in Plant Protection	12.1 Biological and Chemical Technology in Plant Protection - Adv Tech Lab Bldg	11	Nanodrop machine	New	1	24,000	24,000
Agriculture	12. Biological and Chemical Technology in Plant Protection	12.1 Biological and Chemical Technology in Plant Protection - Adv Tech Lab Bldg	12	Effendorf microcentrifuge	New	1	1,000	1,000
Agriculture	12. Biological and Chemical Technology in Plant Protection	12.1 Biological and Chemical Technology in Plant Protection - Adv Tech Lab Bldg	13	Mini- microcentrifuges	New	3	300	900
Agriculture	12. Biological and Chemical Technology in Plant Protection	12.1 Biological and Chemical Technology in Plant Protection - Adv Tech Lab Bldg	14	Ice maker machine	New	1	8,000	8,000
Agriculture	12. Biological and Chemical Technology in Plant Protection	12.1 Biological and Chemical Technology in Plant Protection - Adv Tech Lab Bldg	15	Milipore machine	New	1	12,000	12,000
Agriculture	12. Biological and Chemical Technology in Plant Protection	12.1 Biological and Chemical Technology in Plant Protection - Adv Tech Lab Bldg	16	Fumehood	New	2	5,000	10,000
Agriculture	12. Biological and Chemical Technology in Plant Protection	12.1 Biological and Chemical Technology in Plant Protection - Adv Tech Lab Bldg	17	Freeze dryer and accessories	New	1	20,000	20,000
Agriculture	12. Biological and Chemical Technology in Plant Protection	12.1 Biological and Chemical Technology in Plant Protection - Adv Tech Lab Bldg	18	Temperature-controlled shaker	New	1	8,000	8,000
Agriculture	12. Biological and Chemical Technology in Plant Protection	12.1 Biological and Chemical Technology in Plant Protection - Adv Tech Lab Bldg	20	Conductivity metter	New	1	500	500
Agriculture	12. Biological and Chemical Technology in Plant Protection	12.1 Biological and Chemical Technology in Plant Protection - Adv Tech Lab Bldg	21	ELISA reader and accessories	New	1	15,000	15,000
Agriculture	12. Biological and Chemical Technology in Plant Protection	12.1 Biological and Chemical Technology in Plant Protection - Adv Tech Lab Bldg	22	Spectrophotometer and accessories	New	1	10,000	10,000
Agriculture	12. Biological and Chemical Technology in Plant Protection	12.1 Biological and Chemical Technology in Plant Protection - Adv Tech Lab Bldg	23	Ultrasonic washing machine	New	1	4,000	4,000
Agriculture	12. Biological and Chemical Technology in Plant Protection	12.1 Biological and Chemical Technology in Plant Protection - Adv Tech Lab Bldg	25	Freezer (-20^{o}C)	New	1	6,200	6,200

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	12. Biological and Chemical Technology in Plant Protection	12.1 Biological and Chemical Technology in Plant Protection - Adv Tech Lab Bldg	26	Laminar/Clean bench	New	1	2,500	2,500
Agriculture	12. Biological and Chemical Technology in Plant Protection	12.1 Biological and Chemical Technology in Plant Protection - Adv Tech Lab Bldg	27	Oven	New	2	4,500	9,000
Agriculture	12. Biological and Chemical Technology in Plant Protection	12.1 Biological and Chemical Technology in Plant Protection - Adv Tech Lab Bldg	28	Autoclave	New	1	10,000	10,000
Agriculture	12. Biological and Chemical Technology in Plant Protection	12.1 Biological and Chemical Technology in Plant Protection - Adv Tech Lab Bldg	29	Olfactometer and accessories	New	1	10,000	10,000
Agriculture	12. Biological and Chemical Technology in Plant Protection	12.1 Biological and Chemical Technology in Plant Protection - Adv Tech Lab Bldg	30	Microscopes	New	2	1,300	2,600
Agriculture	12. Biological and Chemical Technology in Plant Protection	12.1 Biological and Chemical Technology in Plant Protection - Adv Tech Lab Bldg	31	Stereo microscopes	New	2	1,300	2,600
Agriculture	12. Biological and Chemical Technology in Plant Protection	12.1 Biological and Chemical Technology in Plant Protection - Adv Tech Lab Bldg	33	Vortex	New	3	300	900
Agriculture	12. Biological and Chemical Technology in Plant Protection	12.1 Biological and Chemical Technology in Plant Protection - Adv Tech Lab Bldg	34	Analytical balance (Sarotius CPA124S , 120 g x 0.1 mg	New	2	2,000	4,000
Agriculture	12. Biological and Chemical Technology in Plant Protection	12.1 Biological and Chemical Technology in Plant Protection - Adv Tech Lab Bldg	35	Micropipipete sets (0.1-2, 0.5-10; 2-20, 20-200, 100-1000 Microlitre)	New	2	1,000	2,000
Agriculture	12. Biological and Chemical Technology in Plant Protection	12.1 Biological and Chemical Technology in Plant Protection - Adv Tech Lab Bldg	36	Multiplechanel pipette sets	New	2	1,500	3,000
Agriculture	12. Biological and Chemical Technology in Plant Protection	12.1 Biological and Chemical Technology in Plant Protection - Adv Tech Lab Bldg	37	Other devices and laboratory glasswares	New	1	5,000	5,000
Agriculture	12. Biological and Chemical Technology in Plant Protection	12-2 Academic staff office - Adv Tech Lab Bldg	Fu-1	Desk with chair	Fu (New)	4	500	2,000
Agriculture	12. Biological and Chemical Technology in Plant Protection	12-2 Academic staff office - Adv Tech Lab Bldg	Fu-2	Shelf, large	Fu (New)	4	400	1,600

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	12. Biological and Chemical Technology in Plant Protection	12-2 Academic staff office - Adv Tech Lab Bldg	Fu-3	File cabinet	Fu (New)	4	500	2,000
Agriculture	12. Biological and Chemical Technology in Plant Protection	12-2 Academic staff office - Adv Tech Lab Bldg	Fu-4	Bulletin board	Fu (New)	1	300	300
Agriculture	12. Biological and Chemical Technology in Plant Protection	12-3 Research Office - Adv Tech Lab Bldg	Fu-5	Desk with chair	Fu (New)	12	500	6,000
Agriculture	12. Biological and Chemical Technology in Plant Protection	12-3 Research Office - Adv Tech Lab Bldg	Fu-6	Shelf, large	Fu (New)	4	400	1,600
Agriculture	12. Biological and Chemical Technology in Plant Protection	12-3 Research Office - Adv Tech Lab Bldg	Fu-7	Bulletin board	Fu (New)	1	300	300
Agriculture	12. Biological and Chemical Technology in Plant Protection	12-4 Seminar room - Adv Tech Lab Bldg	Fu-8	Chair	Fu (New)	24	100	2,400
Agriculture	12. Biological and Chemical Technology in Plant Protection	12-4 Seminar room - Adv Tech Lab Bldg	Fu-9	Table (for 4 chairs)	Fu (New)	6	500	3,000
Agriculture	12. Biological and Chemical Technology in Plant Protection	12-4 Seminar room - Adv Tech Lab Bldg	Fu-10	Bulletin board	Fu (New)	1	300	300
Agriculture								
Agriculture	13. Plant Pathology	13.1 Plant Pathology	1	Temperature-controlled centrifuge	New	1	10,000	10,000
Agriculture	13. Plant Pathology	13.1 Plant Pathology	2	Milipore machine	New	1	12,000	12,000
Agriculture	13. Plant Pathology	13.1 Plant Pathology	3	Fume hood	New	1	5,000	5,000
Agriculture	13. Plant Pathology	13.1 Plant Pathology	4	Temperature-controlled shaker	New	1	8,000	8,000
Agriculture	13. Plant Pathology	13.1 Plant Pathology (C101-107)	5	Conductivity metter	New	1	500	500
Agriculture	13. Plant Pathology	13.1 Plant Pathology (C101-107)	6	Pulse power or electroporation (for plasmid transformation)	New	1	20,000	20,000
Agriculture	13. Plant Pathology	13.1 Plant Pathology (C101-107)	7	Ultrasonic washing machine	New	1	5,000	5,000
Agriculture	13. Plant Pathology	13.1 Plant Pathology (C101-107)	8	Freezer (-80°C)	New	1	10,000	10,000
Agriculture	13. Plant Pathology	13.1 Plant Pathology (C101-107)	9	Freezer (-20°C)	New	1	6,200	6,200
Agriculture	13. Plant Pathology	13.1 Plant Pathology (C101-107)	10	Laminar/Clean bench	New	2	2,500	5,000
Agriculture	13. Plant Pathology	13.1 Plant Pathology (C101-107)	11	Oven	New	1	4,500	4,500
Agriculture	13. Plant Pathology	13.1 Plant Pathology (C101-107)	12	Autoclave	New	1	10,000	10,000
Agriculture	13. Plant Pathology	13.1 Plant Pathology (C101-107)	13	Microscopes	New	10	1,300	13,000
Agriculture	13. Plant Pathology	13.1 Plant Pathology (C101-107)	14	Stereo microscopes	New	2	1,300	2,600

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	13. Plant Pathology	13.1 Plant Pathology (C101-107)	15	Fluorescent microscope	New	1	10,000	10,000
Agriculture	13. Plant Pathology	13.1 Plant Pathology (C101-107)	16	Vortex	New	3	300	900
Agriculture	13. Plant Pathology	13.1 Plant Pathology (C101-107)	17	Analytical balance (Sarotius CPA124S , 120 g x 0.1 mg	New	2	3,000	6,000
Agriculture	13. Plant Pathology	13.1 Plant Pathology (C101-107)	18	Micropipipete sets (0.1-2, 0.5-10; 2-20, 20-200, 100-1000 Microlitre)	New	2	1,000	2,000
Agriculture	13. Plant Pathology	13.1 Plant Pathology (C101-107)	19	Multiplechanel pipette sets	New	2	1,500	3,000
Agriculture	13. Plant Pathology	13.1 Plant Pathology (C101-107)	20	Other devices and laboratory glasswares	New	1	5,000	5,000
Agriculture	13. Plant Pathology	13.2 Natural disease control	21	Four demical number analytical balance	New	1	3,000	3,000
Agriculture	13. Plant Pathology	13.2 Natural disease control	22	Ion exchange chromatography	New	1	35,000	35,000
Agriculture	13. Plant Pathology	13.2 Natural disease control	24	Nano Spray Dryer B-90	New	1	30,000	30,000
Agriculture	13. Plant Pathology	13.2 Natural disease control	27	Vacuum rotary evaporator	New	1	20,000	20,000
Agriculture								
Agriculture	14. Entomology	14.1 Entomology (C108-114)	1	Milipore machine	New	1	12,000	12,000
Agriculture	14. Entomology	14.1 Entomology (C108-114)	2	Fume hood	New	1	5,000	5,000
Agriculture	14. Entomology	14.1 Entomology (C108-114)	3	Incubator	New	1	6,000	6,000
Agriculture	14. Entomology	14.1 Entomology (C108-114)	4	Conductivity metter	New	1	500	500
Agriculture	14. Entomology	14.1 Entomology (C108-114)	5	Freezer -20°C	New	1	6,200	6,200
Agriculture	14. Entomology	14.1 Entomology (C108-114)	6	Microscopes	New	1	1,300	1,300
Agriculture	14. Entomology	14.1 Entomology (C108-114)	7	Stereo microscopes	New	4	1,300	5,200
Agriculture	14. Entomology	14.1 Entomology (C108-114)	8	Oven	New	1	4,500	4,500
Agriculture	14. Entomology	14.1 Entomology (C108-114)	9	Autoclave	New	1	10,000	10,000
Agriculture	14. Entomology	14.1 Entomology (C108-114)	10	Analytical balance (Sarotius CPA124S , 120 g x 0.1 mg	New	2	3,000	6,000
Agriculture	14. Entomology	14.1 Entomology (C108-114)	11	Micropipipete sets (0.1-2, 0.5-10; 2-20, 20-200, 100-1000 Microlitre)	New	2	1,000	2,000
Agriculture	14. Entomology	14.1 Entomology (C108-114)	12	Other devices and laboratory glasswares	New	1	5,000	5,000
Agriculture								
Agriculture	15. Biological Control	15.1 Biological Control (NEDO Building)	1	Incubator	New	2	6,000	12,000
Agriculture	15. Biological Control	15.1 Biological Control (NEDO Building)	2	Temperature-controlled centrifuge	New	1	8,000	8,000
Agriculture	15. Biological Control	15.1 Biological Control (NEDO Building)	3	Sample grinder	New	1	6,000	6,000
Agriculture	15. Biological Control	15.1 Biological Control (NEDO Building)	4	Fume hood	New	1	5,000	5,000
Agriculture	15. Biological Control	15.1 Biological Control (NEDO Building)	5	Temperature-controlled shaker	New	1	8,000	8,000
Agriculture	15. Biological Control	15.1 Biological Control (NEDO Building)	6	Vortex	New	2	300	600
Agriculture	15. Biological Control	15.1 Biological Control (NEDO Building)	7	Conductivity metter	New	1	500	500
Agriculture	15. Biological Control	15.1 Biological Control (NEDO Building)	8	Freezer -20°C	New	1	6,200	6,200
Agriculture	15. Biological Control	15.1 Biological Control (NEDO Building)	9	Laminar/Clean bench	New	2	2,400	4,800

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	15. Biological Control	15.1 Biological Control (NEDO Building)	10	Autoclave	New	1	10,000	10,000
Agriculture	15. Biological Control	15.1 Biological Control (NEDO Building)	11	Oven	New	1	4,500	4,500
Agriculture	15. Biological Control	15.1 Biological Control (NEDO Building)	14	Analytical balance (Sarotius CPA124S , 120 g x 0.1 mg	New	1	3,000	3,000
Agriculture	15. Biological Control	15.1 Biological Control (NEDO Building)	15	Micropipipete sets (0.1-2, 0.5-10; 2-20, 20-200, 100-1000 Microlitre)	New	2	1,000	2,000
Agriculture	15. Biological Control	15.1 Biological Control (NEDO Building)	16	Multiplechanel pipette sets	New	2	1,500	3,000
Agriculture	15. Biological Control	15.1 Biological Control (NEDO Building)	17	Computer-connected stereo microscope	New	1	3,000	3,000
Agriculture	15. Biological Control	15.1 Biological Control (NEDO Building)	18	Other devices and laboratory glasswares	New	1	5,000	5,000
Agriculture								
Agriculture	16. Rice research	16-1 Rice Research - Adv Tech Lab Bldg	1	Cold Plate for Modular Tissue Embedding Syste	New	1	4,600	4,600
Agriculture	16. Rice research	16-1 Rice Research - Adv Tech Lab Bldg	2	Flattening table for clinical histopathology	New	1	4,500	4,500
Agriculture	16. Rice research	16-1 Rice Research - Adv Tech Lab Bldg	3	Heated Paraffin Embedding	New	1	15,500	15,500
Agriculture	16. Rice research	16-1 Rice Research - Adv Tech Lab Bldg	4	Fully Motorized Rotary Microtome	New	1	32,500	32,500
Agriculture	16. Rice research	16-1 Rice Research - Adv Tech Lab Bldg	5	Tissue processor	New	1	36,000	36,000
Agriculture	16. Rice research	16-1 Rice Research - Adv Tech Lab Bldg	6	Autostainer	New	1	48,000	48,000
Agriculture	16. Rice research	16-1 Rice Research - Adv Tech Lab Bldg	7	Water bath for paraffin sections	New	1	4,300	4,300
Agriculture	16. Rice research	16-1 Rice Research - Adv Tech Lab Bldg	8	Dry oven	New	1	1,000	1,000
Agriculture	16. Rice research	16-1 Rice Research - Adv Tech Lab Bldg	9	Rice seed moisture metter	New	1	700	700
Agriculture	16. Rice research	16-1 Rice Research - Adv Tech Lab Bldg	10	Hard extension metter	New	1	800	800
Agriculture	16. Rice research	16-1 Rice Research - Adv Tech Lab Bldg	11	Seed counting machine	New	1	1,000	1,000
Agriculture	16. Rice research	16-1 Rice Research - Adv Tech Lab Bldg	12	Chlorophyll meter	New	1	2,500	2,500
Agriculture	16. Rice research	16-1 Rice Research - Adv Tech Lab Bldg	13	Microscopy	New	2	2,000	4,000
Agriculture	16. Rice research	16-1 Rice Research - Adv Tech Lab Bldg	14	EC metter	New	2	1,500	3,000
Agriculture	16. Rice research	16-1 Rice Research - Adv Tech Lab Bldg	15	Rice mill machine	New	1	2,000	2,000
Agriculture	16. Rice research	16-1 Rice Research - Adv Tech Lab Bldg	16	N,P, K analysis set	New	1	2,500	2,500
Agriculture	16. Rice research	16-1 Rice Research - Adv Tech Lab Bldg	17	Eh metter	New	2	1,500	3000
Agriculture	16. Rice research	16-1 Rice Research - Adv Tech Lab Bldg	18	Ring set	New	2	1,000	2,000
Agriculture	16. Rice research	16-1 Rice Research - Adv Tech Lab Bldg	19	Pynometer	New	1	1,500	1,500
Agriculture	16. Rice research	16-1 Rice Research - Adv Tech Lab Bldg	20	Others	New	1	3,000	3,000
Agriculture	16. Rice research	16-2 Academic Staff room - Adv Tech Lab Bldg	Fu-1	Desk with chair	Fu (New)	4	500	2,000
Agriculture	16. Rice research	16-2 Academic Staff room - Adv Tech Lab Bldg	Fu-2	Shelf, large	Fu (New)	4	400	1,600
Agriculture	16. Rice research	16-2 Academic Staff room - Adv Tech Lab Bldg	Fu-3	File cabinet	Fu (New)	4	500	2,000
Agriculture	16. Rice research	16-2 Academic Staff room - Adv Tech Lab Bldg	Fu-4	Bulletin board	Fu (New)	1	300	300
Agriculture	16. Rice research	16-3 Research Office - Adv Tech Lab Bldg	Fu-5	Desk with chair	Fu (New)	12	500	6,000
Agriculture	16. Rice research	16-3 Research Office - Adv Tech Lab Bldg	Fu-6	Shelf, large	Fu (New)	4	400	1,600

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Agriculture	16. Rice research	16-3 Research Office - Adv Tech Lab Bldg	Fu-7	Bulletin board	Fu (New)	1	300	300
Agriculture	16. Rice research	16-4 Seminar room - Adv Tech Lab Bldg	Fu-8	Chair	Fu (New)	24	100	2,400
Agriculture	16. Rice research	16-4 Seminar room - Adv Tech Lab Bldg	Fu-9	Table (for 4 chairs)	Fu (New)	6	500	3,000
Agriculture	16. Rice research	16-4 Seminar room - Adv Tech Lab Bldg	Fu-10	Bulletin board	Fu (New)	1	300	300
Agriculture	16. Rice research	16-5 Administration Office - Adv Tech Lab Bldg	Fu-11	Desk with chair	Fu (New)	4	500	2,000
Agriculture	16. Rice research	16-5 Administration Office - Adv Tech Lab Bldg	Fu-12	File cabinet	Fu (New)	4	500	2,000
Agriculture	16. Rice research	16-5 Administration Office - Adv Tech Lab Bldg	Fu-13	Bulletin board	Fu (New)	2	300	600
Agriculture	16. Rice research	16-5 Administration Office - Adv Tech Lab Bldg	Fu-14	Shelf, large	Fu (New)	4	400	1,600
Agriculture								
Agriculture	17. Edible and Pharmaceutical Mushroom	17-1 Edible and Pharmaceutical Mushroom - Adv Tech Lab Bldg	1	Microwave extractor		1	40,000	40,000
Agriculture	17. Edible and Pharmaceutical Mushroom	17-1 Edible and Pharmaceutical Mushroom - Adv Tech Lab Bldg	2	Elementar vario Macro C-N Analyzer		1	10,000	10,000
Agriculture	17. Edible and Pharmaceutical Mushroom	17-1 Edible and Pharmaceutical Mushroom - Adv Tech Lab Bldg	3	Autoclave		1	10,000	10,000
Agriculture	17. Edible and Pharmaceutical Mushroom	17-1 Edible and Pharmaceutical Mushroom - Adv Tech Lab Bldg	4	Digital Microscope Camera		1	7,000	7,000
Agriculture	17. Edible and Pharmaceutical Mushroom	17-1 Edible and Pharmaceutical Mushroom - Adv Tech Lab Bldg	5	Flaminar flow		2	3,000	6,000
Agriculture	17. Edible and Pharmaceutical Mushroom	17-1 Edible and Pharmaceutical Mushroom - Adv Tech Lab Bldg	6	Glassware		1	5,000	5,000
Agriculture	17. Edible and Pharmaceutical Mushroom	17-1 Edible and Pharmaceutical Mushroom - Adv Tech Lab Bldg	7	Incubators		2	2,000	4,000
Agriculture	17. Edible and Pharmaceutical Mushroom	17-1 Edible and Pharmaceutical Mushroom - Adv Tech Lab Bldg	8	Rice straw cutter		1	3,000	3,000
Agriculture	17. Edible and Pharmaceutical Mushroom	17-1 Edible and Pharmaceutical Mushroom - Adv Tech Lab Bldg	9	Light meter		1	2,000	2,000
Agriculture	17. Edible and Pharmaceutical Mushroom	17-1 Edible and Pharmaceutical Mushroom - Adv Tech Lab Bldg	10	Distill water machine		1	2,000	2,000
Agriculture	17. Edible and Pharmaceutical Mushroom	17-1 Edible and Pharmaceutical Mushroom - Adv Tech Lab Bldg	11	Dissection knives (set)		5	300	1,500
Agriculture	17. Edible and Pharmaceutical Mushroom	17-1 Edible and Pharmaceutical Mushroom - Adv Tech Lab Bldg	12	Fridge		2	700	1,400
Agriculture	17. Edible and Pharmaceutical Mushroom	17-1 Edible and Pharmaceutical Mushroom - Adv Tech Lab Bldg	13	Sheves (0,4 x 3 x 2 m)		5	200	1,000

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	17. Edible and Pharmaceutical Mushroom	17-1 Edible and Pharmaceutical Mushroom - Adv Tech Lab Bldg	14	Dry oven		1	1,000	1,000
Agriculture	17. Edible and Pharmaceutical Mushroom	17-1 Edible and Pharmaceutical Mushroom - Adv Tech Lab Bldg	15	pH meter (Lab.)		1	1,000	1,000
Agriculture	17. Edible and Pharmaceutical Mushroom	17-1 Edible and Pharmaceutical Mushroom - Adv Tech Lab Bldg	16	Orbital shaker		1	1,000	1,000
Agriculture	17. Edible and Pharmaceutical Mushroom	17-1 Edible and Pharmaceutical Mushroom - Adv Tech Lab Bldg	17	Temperature and moisture metter		2	500	1,000
Agriculture	17. Edible and Pharmaceutical Mushroom	17-1 Edible and Pharmaceutical Mushroom - Adv Tech Lab Bldg	18	Hot sterilization box		2	400	800
Agriculture	17. Edible and Pharmaceutical Mushroom	17-1 Edible and Pharmaceutical Mushroom - Adv Tech Lab Bldg	19	Soil moisture metter		3	250	750
Agriculture	17. Edible and Pharmaceutical Mushroom	17-1 Edible and Pharmaceutical Mushroom - Adv Tech Lab Bldg	20	Digital cammera		1	700	700
Agriculture	17. Edible and Pharmaceutical Mushroom	17-1 Edible and Pharmaceutical Mushroom - Adv Tech Lab Bldg	21	Microwave		2	250	500
Agriculture	17. Edible and Pharmaceutical Mushroom	17-1 Edible and Pharmaceutical Mushroom - Adv Tech Lab Bldg	22	Soil pH meter		1	200	200
Agriculture	17. Edible and Pharmaceutical Mushroom	17-2 Academic Staff room - Adv Tech Lab Bldg	Fu-1	Desk with chair	Fu (New)	4	500	2,000
Agriculture	17. Edible and Pharmaceutical Mushroom	17-2 Academic Staff room - Adv Tech Lab Bldg	Fu-2	Shelf, large	Fu (New)	4	400	1,600
Agriculture	17. Edible and Pharmaceutical Mushroom	17-2 Academic Staff room - Adv Tech Lab Bldg	Fu-3	File cabinet	Fu (New)	4	500	2,000
Agriculture	17. Edible and Pharmaceutical Mushroom	17-2 Academic Staff room - Adv Tech Lab Bldg	Fu-4	Bulletin board	Fu (New)	1	300	300
Agriculture	17. Edible and Pharmaceutical Mushroom	17-3 Research Office - Adv Tech Lab Bldg	Fu-5	Desk with chair	Fu (New)	12	500	6,000
Agriculture	17. Edible and Pharmaceutical Mushroom	17-3 Research Office - Adv Tech Lab Bldg	Fu-6	Shelf, large	Fu (New)	4	400	1,600
Agriculture	17. Edible and Pharmaceutical Mushroom	17-3 Research Office - Adv Tech Lab Bldg	Fu-7	Bulletin board	Fu (New)	1	300	300
Agriculture	17. Edible and Pharmaceutical Mushroom	17-4 Department head office - Adv Tech Lab Bldg	Fu-8	Desk with chair	Fu (New)	1	400	400
Agriculture	17. Edible and Pharmaceutical Mushroom	17-4 Department head office - Adv Tech Lab Bldg	Fu-9	Shelf, large	Fu (New)	2	400	800
Agriculture	17. Edible and Pharmaceutical Mushroom	17-4 Department head office - Adv Tech Lab Bldg	Fu-10	File cabinet	Fu (New)	2	400	800
Agriculture	17. Edible and Pharmaceutical Mushroom	17-5 Deputy Department head office - Adv Tech Lab Bldg	Fu-11	Desk with chair	Fu (New)	1	400	400

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	17. Edible and Pharmaceutical Mushroom	17-5 Deputy Department head office - Adv Tech Lab Bldg	Fu-12	Shelf, large	Fu (New)	2	400	800
Agriculture	17. Edible and Pharmaceutical Mushroom	17-5 Deputy Department head office - Adv Tech Lab Bldg	Fu-13	File cabinet	Fu (New)	2	400	800
Agriculture								
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	1	Plant growth chamber	New	3	10,000	30,000
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	4	LiCor LI-6400XT Portable Photosynthesis System (Measure small photosynthesis rates and CO_2 exchange)	New	1	30,000	30,000
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	5	Model 260D Pump with controller and temperature control jacket installed	New	1	27,450	27,450
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	6	HPLC	New	1	50,000	50,000
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	7	Meteorological data logger (multi channel)	New	1	10,000	10,000
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	8	Colorimeter MiniScan XE Plus/ HunterLab	New	1	10,000	10,000
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	9	PUMP ASSY, 50GM/MIN 220V - P50A	New	1	16,710	16,710
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	10	PCR Biorad DNA Engine	New	1	15,000	15,000
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	11	Gel doc Machine	New	1	13,000	13,000
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	12	LCD 64 inch	New	1	12,000	12,000
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	13	Automatic Kjeldahl analyzer	New	1	10,000	10,000
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	14	Distilled water machine + Deionized water system	New	1	10,000	10,000
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	15	Micropipette set (P2/P20/P200/P1000)	New	2	1,000	2,000
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	17	Spectrophotometer UV/Vis+cuvettes/cells	New	1	10,000	10,000
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	18	Refrigerated centrifuge	New	1	7,000	7,000
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	19	Digital refractometer	New	2	500	1,000
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	20	Analytical balances	New	1	3,000	3,000
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	21	Freezer (-40 degree C)	New	1	10,000	10,000
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	22	Konica Minolta color meter	New	1	10,000	10,000
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	23	Digital leaf area meter	New	1	3,000	3,000
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	24	Light meter	New	1	2,000	2,000
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	25	SPAD Meter, Konica Minolta SPAD502Plus Chlorophyll measurement, non-destructive)	New	1	3,000	3,000

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Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	26	Water potential chamber + Gas cyclinder	New	1	3,000	3,000
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	27	Fume hood	New	1	5,000	5,000
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	28	Glassware	New	1	5,000	5,000
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	29	Glassware washer/disinfector	New	1	5,000	5,000
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	30	Oil extract machine	New	1	5,000	5,000
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	31	Water potential in leaf machine	New	2	2,500	5,000
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	35	Microhardness testers	New	1	2,000	2,000
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	36	Micropipette set (P2/P20/P200/P1000)	New	2	1,000	2,000
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	37	Incubators	New	1	1,900	1,900
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	38	Fruit classify system	New	1	3,000	3,000
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	40	Quantum sensor (Measurement of photosynthetically active radiation-PAR)	New	1	3,000	3,000
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	42	Sample homogenizer/Ball mill grinder	New	1	3,000	3,000
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	43	Dry oven	New	2	1,000	2,000
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	44	Electric conductivity (EC) meter (Lab. and field)	New	2	1,000	2,000
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	45	Neutron moisture probe (measure soil moisture at 2m depth)	New	1	2,000	2,000
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	46	Orbital shaker	New	2	1,000	2,000
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	47	pH meter (Lab. and field)	New	2	1,000	2,000
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	48	Porometers (Measuring transpiration, stomatal conductance)	New	1	2,000	2,000
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	49	Pressure Plate Membrane Apparatus (Soil moisture measurement, soil water retention)	New	1	2,000	2,000
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	50	Water bath	New	2	1,000	2,000
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	51	Horticultural tools: grafting knives, hand saws, pruning tools, digging tools, water pump, pesticide spraying machine	New	1	2,000	2,000
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	52	Tools for soil sample collection: drills, rings	New	1	2,000	2,000
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	53	Portable centrifuge	New	2	500	1,000
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	54	Seed moisture meter	New	1	1,500	1,500
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	55	Balance (100g, 1kg, 20 kg)	New	3	500	1,500

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	56	Digital camera	New	1	700	700
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	57	Liquid nitrogen dry shipper (10L and 20L)	New	2	500	1,000
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	58	Nitrate in leaf meter	New	1	1,000	1,000
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	59	Chemical storing cabinets	New	2	200	400
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	60	Toxic chemical storing cabinets	New	2	300	600
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	61	SpeedVac (Drying samples via evaporation under vacuum)	New	1	1,000	1,000
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	62	Vortex mixer	New	2	500	1,000
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	63	Soil moisture meter	New	2	250	500
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	Fu-1	Shelves-small (New)	Fu	12	50	600
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	Fu-2	Shelves-large (New)	Fu	8	200	1,600
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	Fu-3	Working rotary chairs (New)	Fu	15	100	1,500
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	Fu-4	Working tables (New)	Fu	15	200	3,000
Agriculture	18. Horticulture Science	18-1 Horticulture Science (D204, D206, D207)	Fu-5	Lab chairs (New)	Fu	30	50	1,500
Agriculture								
Agriculture	19. Animal Biotechnology and Molecular Biology	19-1 Antiseptic Lab and Safety Lab for Culture - Adv Tech Lab Bldg	1	Temperature-controlled shaker	New	1	8,000	8,000
Agriculture	19. Animal Biotechnology and Molecular Biology	19-1 Antiseptic Lab and Safety Lab for Culture - Adv Tech Lab Bldg	3	Humidity and temperature control cabinet	New	1	5,000	5,000
Agriculture	19. Animal Biotechnology and Molecular Biology	19-1 Antiseptic Lab and Safety Lab for Culture - Adv Tech Lab Bldg	4	General purpose incubators	New	1	2,500	2,500
Agriculture	19. Animal Biotechnology and Molecular Biology	19-1 Antiseptic Lab and Safety Lab for Culture - Adv Tech Lab Bldg	5	Embryo collector	New	2	1,000	2,000
Agriculture	19. Animal Biotechnology and Molecular Biology	19-1 Antiseptic Lab and Safety Lab for Culture - Adv Tech Lab Bldg	6	Cell transporter type II	New	1	10,000	10,000
Agriculture	19. Animal Biotechnology and Molecular Biology	19-1 Antiseptic Lab and Safety Lab for Culture - Adv Tech Lab Bldg	7	Biological safety cabinet	New	1	3,000	3,000
Agriculture	19. Animal Biotechnology and Molecular Biology	19-1 Antiseptic Lab and Safety Lab for Culture - Adv Tech Lab Bldg	8	Automatic irrigator for collecting embryo	New	1	10,000	10,000
Agriculture	19. Animal Biotechnology and Molecular Biology	19-1 Antiseptic Lab and Safety Lab for Culture - Adv Tech Lab Bldg	9	Autoclave (70 L)	New	1	7,000	7,000
Agriculture	19. Animal Biotechnology and Molecular Biology	19-2 Molecular Amplification Work Lab - Adv Tech Lab Bldg	10	UV Cabinets	New	1	3,000	3,000
Agriculture	19. Animal Biotechnology and Molecular Biology	19-2 Molecular Amplification Work Lab - Adv Tech Lab Bldg	11	Thermal cycler (PCR)	New	1	20,000	20,000
Agriculture	19. Animal Biotechnology and Molecular Biology	19-2 Molecular Amplification Work Lab - Adv Tech Lab Bldg	12	Shaking water bath	New	1	3,000	3,000
Agriculture	19. Animal Biotechnology and Molecular Biology	19-2 Molecular Amplification Work Lab - Adv Tech Lab Bldg	13	Sequencing machine ABI 3130 DNA Analyzer	New	1	5,000	5,000

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	19. Animal Biotechnology and Molecular Biology	19-2 Molecular Amplification Work Lab - Adv Tech Lab Bldg	14	PCR workstation	New	1	15,000	15,000
Agriculture	19. Animal Biotechnology and Molecular Biology	19-2 Molecular Amplification Work Lab - Adv Tech Lab Bldg	15	Magnetic hot plate mixture	New	1	2,000	2,000
Agriculture	19. Animal Biotechnology and Molecular Biology	19-2 Molecular Amplification Work Lab - Adv Tech Lab Bldg	16	Gel documentation system	New	1	9,600	9,600
Agriculture	19. Animal Biotechnology and Molecular Biology	19-2 Molecular Amplification Work Lab - Adv Tech Lab Bldg	17	DNA horizontal/vertical electrophoresis system	New	1	2,000	2,000
Agriculture	19. Animal Biotechnology and Molecular Biology	19-2 Molecular Amplification Work Lab - Adv Tech Lab Bldg	18	DGGE electrophoresis system	New	1	2,500	2,500
Agriculture	19. Animal Biotechnology and Molecular Biology	19-2 Molecular Amplification Work Lab - Adv Tech Lab Bldg	19	Capillary Electrophoresis System (Dionex CES-1)	New	1	1,000	1,000
Agriculture	19. Animal Biotechnology and Molecular Biology	19-2 Molecular Amplification Work Lab - Adv Tech Lab Bldg	20	Capillary electrophoresis and accessories	New	1	30,000	30,000
Agriculture	19. Animal Biotechnology and Molecular Biology	19-3 Sequencing Lab - Adv Tech Lab Bldg	21	Vacuum concentrator (Genevac - Duo concentrator DUC-23050-A00)	New	1	3,000	3,000
Agriculture	19. Animal Biotechnology and Molecular Biology	19-3 Sequencing Lab - Adv Tech Lab Bldg	22	PSQ96MA Pyrosequencing instrument	New	1	4,000	4,000
Agriculture	19. Animal Biotechnology and Molecular Biology	19-3 Sequencing Lab - Adv Tech Lab Bldg	23	Minipore water system and accessories	New	1	8,000	8,000
Agriculture	19. Animal Biotechnology and Molecular Biology	19-3 Sequencing Lab - Adv Tech Lab Bldg	24	Micropipette sets	New	2	1,000	2,000
Agriculture	19. Animal Biotechnology and Molecular Biology	19-3 Sequencing Lab - Adv Tech Lab Bldg	25	Mass spectrometer	New	1	25,000	25,000
Agriculture	19. Animal Biotechnology and Molecular Biology	19-3 Sequencing Lab - Adv Tech Lab Bldg	26	Horizontal Laminar flow cabinet	New	2	2,000	4,000
Agriculture	19. Animal Biotechnology and Molecular Biology	19-3 Sequencing Lab - Adv Tech Lab Bldg	27	Vaccum dryer	New	1	12,000	12,000
Agriculture	19. Animal Biotechnology and Molecular Biology	19-3 Sequencing Lab - Adv Tech Lab Bldg	28	Diluter/dispenser (Hamilton Microlab 1000)	New	1	1,200	1,200
Agriculture	19. Animal Biotechnology and Molecular Biology	19-3 Sequencing Lab - Adv Tech Lab Bldg	29	Affymetrix GeneChip 3000 7G, complete system	New	1	35,000	35,000
Agriculture	19. Animal Biotechnology and Molecular Biology	19-4 Specimen Labelling and Analysing Room - Adv Tech Lab Bldg	30	UV-VIS thermo electron	New	1	8,000	8,000
Agriculture	19. Animal Biotechnology and Molecular Biology	19-4 Specimen Labelling and Analysing Room - Adv Tech Lab Bldg	31	Sperm meter	New	1	5,000	5,000
Agriculture	19. Animal Biotechnology and Molecular Biology	19-4 Specimen Labelling and Analysing Room - Adv Tech Lab Bldg	32	Software (BLUP, SAS, Feed formulation)	New	1	10,000	10,000
Agriculture	19. Animal Biotechnology and Molecular Biology	19-4 Specimen Labelling and Analysing Room - Adv Tech Lab Bldg	33	Semen quality analyse system	New	1	10,000	10,000

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	19. Animal Biotechnology and Molecular Biology	19-4 Specimen Labelling and Analysing Room - Adv Tech Lab Bldg	34	NanoDrop spectrophotometer	New	1	10,000	10,000
Agriculture	19. Animal Biotechnology and Molecular Biology	19-4 Specimen Labelling and Analysing Room - Adv Tech Lab Bldg	35	Inverted Microscope	New	1	24,000	24,000
Agriculture	19. Animal Biotechnology and Molecular Biology	19-4 Specimen Labelling and Analysing Room - Adv Tech Lab Bldg	36	Homogenizers (Misonix Sonicator 4000)	New	1	5,000	5,000
Agriculture	19. Animal Biotechnology and Molecular Biology	19-4 Specimen Labelling and Analysing Room - Adv Tech Lab Bldg	37	Homogenizer apparatus	New	1	5,000	5,000
Agriculture	19. Animal Biotechnology and Molecular Biology	19-4 Specimen Labelling and Analysing Room - Adv Tech Lab Bldg	38	Fume hood	New	1	5,000	5,000
Agriculture	19. Animal Biotechnology and Molecular Biology	19-4 Specimen Labelling and Analysing Room - Adv Tech Lab Bldg	40	Digital balance	New	2	1,500	3,000
Agriculture	19. Animal Biotechnology and Molecular Biology	19-4 Specimen Labelling and Analysing Room - Adv Tech Lab Bldg	41	Conductivity and pH meter	New	1	2,500	2,500
Agriculture	19. Animal Biotechnology and Molecular Biology	19-4 Specimen Labelling and Analysing Room - Adv Tech Lab Bldg	42	CO_2 incubator	New	1	14,500	14,500
Agriculture	19. Animal Biotechnology and Molecular Biology	19-4 Specimen Labelling and Analysing Room - Adv Tech Lab Bldg	43	Chicken sperm quality analyzers (SQA Swine, Turkey)	New	1	45,000	45,000
Agriculture	19. Animal Biotechnology and Molecular Biology	19-4 Specimen Labelling and Analysing Room - Adv Tech Lab Bldg	44	Centrifuge	New	1	10,000	10,000
Agriculture	19. Animal Biotechnology and Molecular Biology	19-5 Storage room - Adv Tech Lab Bldg	46	Refrigerator	New	1	5,000	5,000
Agriculture	19. Animal Biotechnology and Molecular Biology	19-5 Storage room - Adv Tech Lab Bldg	47	Liquid nitrogen container	New	1	5,500	5,500
Agriculture	19. Animal Biotechnology and Molecular Biology	19-5 Storage room - Adv Tech Lab Bldg	48	Ice maker machine	New	1	8,000	8,000
Agriculture	19. Animal Biotechnology and Molecular Biology	19-5 Storage room - Adv Tech Lab Bldg	49	Deep freezer	New	1	10,000	10,000
Agriculture	19. Animal Biotechnology and Molecular Biology	19-5 Storage room - Adv Tech Lab Bldg	51	Biological transport container	New	3	1,000	3,000
Agriculture	19. Animal Biotechnology and Molecular Biology	19-5 Storage room - Adv Tech Lab Bldg	Fu-1	Sample cabinet	Fu	2	300	600
Agriculture	19. Animal Biotechnology and Molecular Biology	19-5 Storage room - Adv Tech Lab Bldg	Fu-2	Tool Shelf	Fu	2	200	400
Agriculture	19. Animal Biotechnology and Molecular Biology	19-5 Storage room - Adv Tech Lab Bldg	Fu-3	Document cabinet	Fu	8	250	2,000
Agriculture	19. Animal Biotechnology and Molecular Biology	19-5 Storage room - Adv Tech Lab Bldg	Fu-4	Chemical shelf	Fu	2	200	400
Agriculture	19. Animal Biotechnology and Molecular Biology	19-5 Storage room - Adv Tech Lab Bldg	Fu-5	Chemical cabinet	Fu	2	250	500

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	19. Animal Biotechnology and Molecular Biology	19-6 Academic Staff room - Adv Tech Lab Bldg	Fu-6	Desk with chair	Fu (New)	4	500	2,000
Agriculture	19. Animal Biotechnology and Molecular Biology	19-6 Academic Staff room - Adv Tech Lab Bldg	Fu-7	Shelf, large	Fu (New)	4	400	1,600
Agriculture	19. Animal Biotechnology and Molecular Biology	19-6 Academic Staff room - Adv Tech Lab Bldg	Fu-8	File cabinet	Fu (New)	4	500	2,000
Agriculture	19. Animal Biotechnology and Molecular Biology	19-6 Academic Staff room - Adv Tech Lab Bldg	Fu-9	Bulletin board	Fu (New)	1	300	300
Agriculture	19. Animal Biotechnology and Molecular Biology	19-7 Research Office - Adv Tech Lab Bldg	Fu-10	Desk with chair	Fu (New)	12	500	6,000
Agriculture	19. Animal Biotechnology and Molecular Biology	19-7 Research Office - Adv Tech Lab Bldg	Fu-11	Shelf, large	Fu (New)	4	400	1,600
Agriculture	19. Animal Biotechnology and Molecular Biology	19-7 Research Office - Adv Tech Lab Bldg	Fu-12	Bulletin board	Fu (New)	1	300	300
Agriculture	19. Animal Biotechnology and Molecular Biology	19-8 Seminar room - Adv Tech Lab Bldg	Fu-13	Chair	Fu (New)	24	100	2,400
Agriculture	19. Animal Biotechnology and Molecular Biology	19-8 Seminar room - Adv Tech Lab Bldg	Fu-14	Table (for 4 chairs)	Fu (New)	6	500	3,000
Agriculture	19. Animal Biotechnology and Molecular Biology	19-8 Seminar room - Adv Tech Lab Bldg	Fu-15	Bulletin board	Fu (New)	1	300	300
Agriculture	19. Animal Biotechnology and Molecular Biology	19-8 Seminar room - Adv Tech Lab Bldg	Fu-16	Book shelves	Fu	2	500	1,000
Agriculture	19. Animal Biotechnology and Molecular Biology	19-9 Administration Office - Adv Tech Lab Bldg	Fu-17	Desk with chair	Fu (New)	4	500	2,000
Agriculture	19. Animal Biotechnology and Molecular Biology	19-9 Administration Office - Adv Tech Lab Bldg	Fu-18	File cabinet	Fu (New)	4	500	2,000
Agriculture	19. Animal Biotechnology and Molecular Biology	19-9 Administration Office - Adv Tech Lab Bldg	Fu-19	Bulletin board	Fu (New)	2	300	600
Agriculture	19. Animal Biotechnology and Molecular Biology	19-9 Administration Office - Adv Tech Lab Bldg	Fu-20	Shelf, large	Fu (New)	4	400	1,600
Agriculture	19. Animal Biotechnology and Molecular Biology	19-10 Preparation Room - Adv Tech Lab Bldg	56	Technical balance	New	2	1,000	2,000
Agriculture	19. Animal Biotechnology and Molecular Biology	19-10 Preparation Room - Adv Tech Lab Bldg	Fu-21	Stainless Steel Table (1.2x2.4m)	Fu (New)	2	1,000	2,000
Agriculture	19. Animal Biotechnology and Molecular Biology	19-10 Preparation Room - Adv Tech Lab Bldg	Fu-2	Lab chair	Fu (New)	10	100	1,000
Agriculture								
Agriculture	20. Animal Anatomy and Physiology	20-1 Animal Anatomy	1	Classic small animal anesthesia system	New	1	7,000	7,000

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	20. Animal Anatomy and Physiology	20-1 Animal Anatomy	2	Analox P-GM7	New	1	5,000	5,000
Agriculture	20. Animal Anatomy and Physiology	20-1 Animal Anatomy	3	Cattle anatomy model	New	1	6,500	6,500
Agriculture	20. Animal Anatomy and Physiology	20-1 Animal Anatomy	4	Pig skeleton model	New	1	6,000	6,000
Agriculture	20. Animal Anatomy and Physiology	20-1 Animal Anatomy	5	Dog, chicken and fetal pig anatomy models	New	1	1,000	1,000
Agriculture	20. Animal Anatomy and Physiology	20-1 Animal Anatomy	6	3D ruminant, canine and bird anatomy soft	New	1	1,000	1,000
Agriculture	20. Animal Anatomy and Physiology	20-1 Animal Anatomy	7	Animal surgical table	New	1	1,500	1,500
Agriculture	20. Animal Anatomy and Physiology	20-1 Animal Anatomy	8	Animal anatomy dissecting set	New	1	500	500
Agriculture	20. Animal Anatomy and Physiology	20-1 Animal Anatomy	9	Electronic meat saw and bone drill	New	1	500	500
Agriculture	20. Animal Anatomy and Physiology	20-1 Animal Anatomy	10	Bone storage cabinet	New	1	800	800
Agriculture	20. Animal Anatomy and Physiology	20-1 Animal Anatomy	11	Microscope storage cabinet	New	1	800	800
Agriculture	20. Animal Anatomy and Physiology	20-1 Animal Anatomy	13	Round table	New	2	3,000	6,000
Agriculture	20. Animal Anatomy and Physiology	20-2 Animal Physiology	14	Blood pressure transducer and cable	New	1	20,000	20,000
Agriculture	20. Animal Anatomy and Physiology	20-2 Animal Physiology	15	Hematology analyser	New	1	15,000	15,000
Agriculture	20. Animal Anatomy and Physiology	20-2 Animal Physiology	16	24-place hematocrit	New	1	4,000	4,000
Agriculture	20. Animal Anatomy and Physiology	20-2 Animal Physiology	17	Electrocardiogram machine	New	1	3,500	3,500
Agriculture	20. Animal Anatomy and Physiology	20-2 Animal Physiology	18	Spirometer	New	1	2,400	2,400
Agriculture	20. Animal Anatomy and Physiology	20-2 Animal Physiology	19	Electric kymograph	New	5	475	2,375
Agriculture	20. Animal Anatomy and Physiology	20-2 Animal Physiology	20	Recoder of heart and respiratory rates in a	New	1	2,500	2,500
Agriculture	20. Animal Anatomy and Physiology	20-2 Animal Physiology	21	Oven	New	1	2,800	2,800
Agriculture	20. Animal Anatomy and Physiology	20-2 Animal Physiology	22	Fume hood	New	1	5,000	5,000

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	20. Animal Anatomy and Physiology	20-2 Animal Physiology	23	Digital pH meter	New	1	2,500	2,500
Agriculture	20. Animal Anatomy and Physiology	20-2 Animal Physiology	24	Digital scale, 120 g capacity, readability 0.1	New	1	1,500	1,500
Agriculture	20. Animal Anatomy and Physiology	20-2 Animal Physiology	25	Electronic pipettor	New	5	200	1,000
Agriculture	20. Animal Anatomy and Physiology	20-2 Animal Physiology	26	Micropipette 10-200 □L, 100-1000□L	New	10	200	2,000
Agriculture	20. Animal Anatomy and Physiology	20-2 Animal Physiology	27	Vortex mixer	New	1	800	800
Agriculture	20. Animal Anatomy and Physiology	20-2 Animal Physiology	28	Hot plate and stirrer	New	2	340	680
Agriculture	20. Animal Anatomy and Physiology	20-2 Animal Physiology	29	Reusable respirator	New	5	150	750
Agriculture	20. Animal Anatomy and Physiology	20-2 Animal Physiology	30	Specimen storage tank	New	5	100	500
Agriculture	20. Animal Anatomy and Physiology	20-2 Animal Physiology	31	Round table	New	2	3,000	6,000
Agriculture	20. Animal Anatomy and Physiology	20-3 Implementation model and media	Fu-1	Desk - chair set	Fu	30	250	7,500
Agriculture	20. Animal Anatomy and Physiology	20-3 Implementation model and media	Fu-6	Bookshelf	Fu	6	200	1,200
Agriculture	20. Animal Anatomy and Physiology	20-3 Implementation model and media	Fu-7	Document cabinet	Fu	6	250	1,500
Agriculture	20. Animal Anatomy and Physiology	20-4 Storage room	Fu-9	Sample cabinet	Fu	2	300	600
Agriculture	20. Animal Anatomy and Physiology	20-4 Storage room	Fu-10	Tool Shelf	Fu	2	200	400
Agriculture	20. Animal Anatomy and Physiology	20-4 Storage room	Fu-11	Document cabinet	Fu	8	250	2,000
Agriculture	20. Animal Anatomy and Physiology	20-4 Storage room	Fu-12	Chemical shelf	Fu	2	200	400
Agriculture	20. Animal Anatomy and Physiology	20-4 Storage room	Fu-13	Chemical cabinet	Fu	2	250	500
Agriculture	20. Animal Anatomy and Physiology	20-4 Storage room	35	Freezer -20°C (668 litre)	New	1	1,000	1,000
Agriculture	20. Animal Anatomy and Physiology	20-4 Storage room	36	Refrigerator 320 litre	New	2	800	1,600
Agriculture								

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	21. Animal Nutrition and Feed Technology	21-1 Animal Nutrition and Feed Technology	4	Kjeldahl Digestion apparatus	New	1	10,000	10,000
Agriculture	21. Animal Nutrition and Feed Technology	21-1 Animal Nutrition and Feed Technology	5	Kjeltec™ distillators	New	1	20,000	20,000
Agriculture	21. Animal Nutrition and Feed Technology	21-1 Animal Nutrition and Feed Technology	7	Fibre analysis system, Fibertec™ M6	New	1	28,000	28,000
Agriculture	21. Animal Nutrition and Feed Technology	21-1 Animal Nutrition and Feed Technology	10	Magnetic stirrer	New	2	2,000	4,000
Agriculture	21. Animal Nutrition and Feed Technology	21-1 Animal Nutrition and Feed Technology	11	Centrifuge 16000	New	1	10,000	10,000
Agriculture	21. Animal Nutrition and Feed Technology	21-1 Animal Nutrition and Feed Technology	12	Cleaning and dissinfecting machine	New	1	2,500	2,500
Agriculture	21. Animal Nutrition and Feed Technology	21-1 Animal Nutrition and Feed Technology	15	Dietary Fiber Extractor CSF6 115V/60Hz	New	1	7,200	7,200
Agriculture	21. Animal Nutrition and Feed Technology	21-1 Animal Nutrition and Feed Technology	16	Digital electronic balance	New	2	1,500	3,000
Agriculture	21. Animal Nutrition and Feed Technology	21-1 Animal Nutrition and Feed Technology	17	Freezer	New	1	7,500	7,500
Agriculture	21. Animal Nutrition and Feed Technology	21-1 Animal Nutrition and Feed Technology	18	Fume hood (Dalton, Japan)	New	1	3,000	3,000
Agriculture	21. Animal Nutrition and Feed Technology	21-1 Animal Nutrition and Feed Technology	20	Incubator (BD240, Binder, Germany)	New	1	2,500	2,500
Agriculture	21. Animal Nutrition and Feed Technology	21-1 Animal Nutrition and Feed Technology	21	Micropipette 0.1-2.5 ul; 0.5-10 ul; 2-20 ul; 5-50 ul; 10-100 ul; 20-200 ul; 100-1000 ul; 1000-5000 ul	New	2	1,000	2,000
Agriculture	21. Animal Nutrition and Feed Technology	21-1 Animal Nutrition and Feed Technology	22	Mixed feed machine	New	1	1,500	1,500
Agriculture	21. Animal Nutrition and Feed Technology	21-1 Animal Nutrition and Feed Technology	23	Moiture Determination Balance (MB45, Ohaus-USA. Made in Switzerland)	New	1	2,000	2,000
Agriculture	21. Animal Nutrition and Feed Technology	21-1 Animal Nutrition and Feed Technology	24	pH/Ion meter with pH electrode and ATC probe	New	2	1,500	3,000
Agriculture	21. Animal Nutrition and Feed Technology	21-1 Animal Nutrition and Feed Technology	26	Refrigerator	New	1	5,000	5,000
Agriculture	21. Animal Nutrition and Feed Technology	21-1 Animal Nutrition and Feed Technology	27	Shaking	New	1	3,500	3,500
Agriculture	21. Animal Nutrition and Feed Technology	21-1 Animal Nutrition and Feed Technology	28	Shaking Incubator	New	1	4,000	4,000
Agriculture	21. Animal Nutrition and Feed Technology	21-1 Animal Nutrition and Feed Technology	29	Shaking water bath	New	1	3,000	3,000

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	21. Animal Nutrition and Feed Technology	21-1 Animal Nutrition and Feed Technology	30	Soxhlet fat analysis	New	1	6,000	6,000
Agriculture	21. Animal Nutrition and Feed Technology	21-1 Animal Nutrition and Feed Technology	31	Stirring hot plate (RCT basic safery control, IKA, Germany)	New	4	1,000	4,000
Agriculture	21. Animal Nutrition and Feed Technology	21-1 Animal Nutrition and Feed Technology	32	Temperature and moisture metter	New	1	1,000	1,000
Agriculture	21. Animal Nutrition and Feed Technology	21-1 Animal Nutrition and Feed Technology	33	Ultra centrifugal Mill ZM	New	1	10,000	10,000
Agriculture	21. Animal Nutrition and Feed Technology	21-1 Animal Nutrition and Feed Technology	34	UV - visible spectrophotometer	New	1	7,000	7,000
Agriculture	21. Animal Nutrition and Feed Technology	21-1 Animal Nutrition and Feed Technology	36	Water bath	New	1	1,000	1,000
Agriculture	21. Animal Nutrition and Feed Technology	21-1 Animal Nutrition and Feed Technology	37	Water deionizer	New	1	4,000	4,000
Agriculture	21. Animal Nutrition and Feed Technology	21-1 Animal Nutrition and Feed Technology	38	Round table	New	2	3,000	6,000
Agriculture	21. Animal Nutrition and Feed Technology	21-2 Electron Microscope Room	39	White blood cell counter	New	1	1,200	1,200
Agriculture	21. Animal Nutrition and Feed Technology	21-2 Electron Microscope Room	41	somacount 150	New	1	10,000	10,000
Agriculture	21. Animal Nutrition and Feed Technology	21-2 Electron Microscope Room	42	Refractometer for protein in serum	New	1	2,000	2,000
Agriculture	21. Animal Nutrition and Feed Technology	21-2 Electron Microscope Room	43	Porcine sperm photometer	New	1	600	600
Agriculture	21. Animal Nutrition and Feed Technology	21-2 Electron Microscope Room	44	Pipette for hemocytometer	New	10	200	2,000
Agriculture	21. Animal Nutrition and Feed Technology	21-2 Electron Microscope Room	45	Milk meter with snap on bracket	New	2	500	1,000
Agriculture	21. Animal Nutrition and Feed Technology	21-2 Electron Microscope Room	46	Laser printer	New	1	300	300
Agriculture	21. Animal Nutrition and Feed Technology	21-2 Electron Microscope Room	47	Hemocytometer	New	10	100	1,000
Agriculture	21. Animal Nutrition and Feed Technology	21-2 Electron Microscope Room	48	Haematocrit tubes	New	50	50	2,500
Agriculture	21. Animal Nutrition and Feed Technology	21-2 Electron Microscope Room	49	Haematocrit centrifuge	New	1	1,100	1,100
Agriculture	21. Animal Nutrition and Feed Technology	21-2 Electron Microscope Room	51	Cover glass for hemocytometer sets	New	50	75	3,750
Agriculture	21. Animal Nutrition and Feed Technology	21-2 Electron Microscope Room	52	Counting chamber (Neubauer)	New	10	92	920

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	21. Animal Nutrition and Feed Technology	21-3 Endotoxin toxing Room	53	portal pH meters	New	2	1,000	2,000
Agriculture	21. Animal Nutrition and Feed Technology	21-3 Endotoxin toxing Room	54	Micropipette sets	New	2	1,000	2,000
Agriculture	21. Animal Nutrition and Feed Technology	21-3 Endotoxin toxing Room	55	Fume hood	New	1	2,700	2,700
Agriculture	21. Animal Nutrition and Feed Technology	21-3 Endotoxin toxing Room	56	Digital balance	New	3	1,500	4,500
Agriculture	21. Animal Nutrition and Feed Technology	21-3 Endotoxin toxing Room	57	Centrifuge	New	1	10,000	10,000
Agriculture	21. Animal Nutrition and Feed Technology	21-4 In-situ hybridization staining	58	Shaking water bath	New	1	3,000	3,000
Agriculture	21. Animal Nutrition and Feed Technology	21-4 In-situ hybridization staining	60	Incubator bacteriological	New	1	900	900
Agriculture	21. Animal Nutrition and Feed Technology	21-4 In-situ hybridization staining	61	Double distillation	New	1	7,000	7,000
Agriculture	21. Animal Nutrition and Feed Technology	21-4 In-situ hybridization staining	62	Color gram automated staining system (bioMérieux™ PREVI™)	New	1	18,000	18,000
Agriculture	21. Animal Nutrition and Feed Technology	21-4 In-situ hybridization staining	63	Colony counter (Haloes Caliper)	New	1	3,800	3,800
Agriculture	21. Animal Nutrition and Feed Technology	21-4 In-situ hybridization staining	64	Anaerobic Culture system	New	1	20,000	20,000
Agriculture	21. Animal Nutrition and Feed Technology	21-5 Realtime imaging Lab	65	Warner-Bratzler meat shear device	New	1	6,000	6,000
Agriculture	21. Animal Nutrition and Feed Technology	21-5 Realtime imaging Lab	66	Geotechnical instruments GA94, Germany	New	1	16,000	16,000
Agriculture	21. Animal Nutrition and Feed Technology	21-5 Realtime imaging Lab	67	Air sampler (Spin Air Basic)	New	1	3,000	3,000
Agriculture	21. Animal Nutrition and Feed Technology	21-6 Storage room	68	Refrigerator	New	1	5,000	5,000
Agriculture	21. Animal Nutrition and Feed Technology	21-6 Storage room	Fu-1	Storage cabinet	New	1	5,000	5,000
Agriculture	21. Animal Nutrition and Feed Technology	21-6 Storage room	Fu-4	Sample cabinet	Fu	2	300	600
Agriculture	21. Animal Nutrition and Feed Technology	21-6 Storage room	Fu-5	Tool Shelf	Fu	2	200	400
Agriculture	21. Animal Nutrition and Feed Technology	21-6 Storage room	Fu-6	Document cabinet	Fu	8	250	2,000
Agriculture	21. Animal Nutrition and Feed Technology	21-6 Storage room	Fu-7	Chemical shelf	Fu	2	200	400

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	21. Animal Nutrition and Feed Technology	21-6 Storage room	Fu-8	Chemical cabinet	Fu	2	250	500
Agriculture	21. Animal Nutrition and Feed Technology	21-7 Academic Staff room (CAAB)	Fu-9	Desk with chair	Fu (New)	4	500	2,000
Agriculture	21. Animal Nutrition and Feed Technology	21-7 Academic Staff room (CAAB)	Fu-10	Shelf, large	Fu (New)	4	400	1,600
Agriculture	21. Animal Nutrition and Feed Technology	21-7 Academic Staff room (CAAB)	Fu-11	File cabinet	Fu (New)	4	500	2,000
Agriculture	21. Animal Nutrition and Feed Technology	21-7 Academic Staff room (CAAB)	Fu-12	Bulletin board	Fu (New)	1	300	300
Agriculture	21. Animal Nutrition and Feed Technology	21-8 Research Office (CAAB)	Fu-13	Desk with chair	Fu (New)	12	500	6,000
Agriculture	21. Animal Nutrition and Feed Technology	21-8 Research Office (CAAB)	Fu-14	Shelf, large	Fu (New)	4	400	1,600
Agriculture	21. Animal Nutrition and Feed Technology	21-8 Research Office (CAAB)	Fu-15	Bulletin board	Fu (New)	1	300	300
Agriculture								
Agriculture	22. Non-ruminant Animal Production Techniques	22-1 Non-ruminant Animal Production Techniques	2	Testing machine (Clenbuterol,Salbutamon, Ractopamine..) and kits	New	1	19,000	19,000
Agriculture	22. Non-ruminant Animal Production Techniques	22-1 Non-ruminant Animal Production Techniques	5	Automatic Isoperibol Calorimeter; Parr 6400	New	1	12,000	12,000
Agriculture	22. Non-ruminant Animal Production Techniques	22-1 Non-ruminant Animal Production Techniques	7	Ultra centrifugal Mill ZM 200	New	1	10,500	10,500
Agriculture	22. Non-ruminant Animal Production Techniques	22-1 Non-ruminant Animal Production Techniques	8	Automatic poultry egg incubator	New	1	10,000	10,000
Agriculture	22. Non-ruminant Animal Production Techniques	22-1 Non-ruminant Animal Production Techniques	9	Benchtop homogenizer	New	1	7,000	7,000
Agriculture	22. Non-ruminant Animal Production Techniques	22-1 Non-ruminant Animal Production Techniques	10	Cleaning and dissinfecting machine	New	1	6,200	6,200
Agriculture	22. Non-ruminant Animal Production Techniques	22-1 Non-ruminant Animal Production Techniques	12	Egg shell streng measurement	New	1	5,000	5,000
Agriculture	22. Non-ruminant Animal Production Techniques	22-1 Non-ruminant Animal Production Techniques	13	Renco sonograder, USA	New	1	5,000	5,000
Agriculture	22. Non-ruminant Animal Production Techniques	22-1 Non-ruminant Animal Production Techniques	14	Chromameter Minolta	New	1	3,800	3,800
Agriculture	22. Non-ruminant Animal Production Techniques	22-1 Non-ruminant Animal Production Techniques	15	Biological safety cabinet	New	1	3,000	3,000
Agriculture	22. Non-ruminant Animal Production Techniques	22-1 Non-ruminant Animal Production Techniques	16	Fume hood	New	1	2,700	2,700

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	22. Non-ruminant Animal Production Techniques	22-1 Non-ruminant Animal Production Techniques	17	Digital thermo hygrometer	New	1	1,500	1,500
Agriculture	22. Non-ruminant Animal Production Techniques	22-1 Non-ruminant Animal Production Techniques	18	Desktop computer	New	3	700	2,100
Agriculture	22. Non-ruminant Animal Production Techniques	22-1 Non-ruminant Animal Production Techniques	19	Multifunction printer	New	1	2,000	2,000
Agriculture	22. Non-ruminant Animal Production Techniques	22-1 Non-ruminant Animal Production Techniques	20	Environment Anemometer, Lutron LM 8000	New	1	1,000	1,000
Agriculture	22. Non-ruminant Animal Production Techniques	22-1 Non-ruminant Animal Production Techniques	21	Kestrel weather and environmental meters	New	1	1,000	1,000
Agriculture	22. Non-ruminant Animal Production Techniques	22-1 Non-ruminant Animal Production Techniques	22	Microtector II G450	New	1	1,000	1,000
Agriculture	22. Non-ruminant Animal Production Techniques	22-1 Non-ruminant Animal Production Techniques	24	Anemometer Lutron LM-81AM	New	1	1,000	1,000
Agriculture	22. Non-ruminant Animal Production Techniques	22-1 Non-ruminant Animal Production Techniques	25	Kestrelmeters	New	1	1,000	1,000
Agriculture	22. Non-ruminant Animal Production Techniques	22-1 Non-ruminant Animal Production Techniques	26	Microtector II G450	New	1	1,000	1,000
Agriculture	22. Non-ruminant Animal Production Techniques	22-1 Non-ruminant Animal Production Techniques	27	The series GSTA carbon monoxide/Nitrogen dioxide transmitters	New	1	700	700
Agriculture	22. Non-ruminant Animal Production Techniques	22-1 Non-ruminant Animal Production Techniques	28	The series CDW2 wall mount carbon dioxide transmitters	New	1	500	500
Agriculture	22. Non-ruminant Animal Production Techniques	22-1 Non-ruminant Animal Production Techniques	29	Hot-wire air velocity/Temperature transmitter	New	1	400	400
Agriculture	22. Non-ruminant Animal Production Techniques	22-1 Non-ruminant Animal Production Techniques	30	Laser printer	New	1	300	300
Agriculture	22. Non-ruminant Animal Production Techniques	22-1 Non-ruminant Animal Production Techniques	31	Temperature/Humidity switch	New	1	300	300
Agriculture	22. Non-ruminant Animal Production Techniques	22-1 Non-ruminant Animal Production Techniques	32	Model 472A-1 Dual Input thermocouple thermometer	New	1	200	200
Agriculture	22. Non-ruminant Animal Production Techniques	22-1 Non-ruminant Animal Production Techniques	33	Ultrasonic system diagnostic scanner for pigs	New	1	20,000	20,000
Agriculture	22. Non-ruminant Animal Production Techniques	22-1 Non-ruminant Animal Production Techniques	34	Veterinary thermometer	New	1	200	200
Agriculture	22. Non-ruminant Animal Production Techniques	22-1 Non-ruminant Animal Production Techniques	35	Egg shell thickness gause	New	3	50	150
Agriculture	22. Non-ruminant Animal Production Techniques	22-1 Non-ruminant Animal Production Techniques	36	Egg shell strength meter Type II	New	1	1,500	1,500

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	22. Non-ruminant Animal Production Techniques	22-1 Non-ruminant Animal Production Techniques	37	Egg form coeficient measuring instrument	New	3	200	600
Agriculture	22. Non-ruminant Animal Production Techniques	22-1 Non-ruminant Animal Production Techniques	38	Drawing knife, dressing knife, skinning knife, inspection hoof	New	3	500	1,500
Agriculture	22. Non-ruminant Animal Production Techniques	22-1 Non-ruminant Animal Production Techniques	39	Debeaker Super	New	1	5,000	5,000
Agriculture	22. Non-ruminant Animal Production Techniques	22-1 Non-ruminant Animal Production Techniques	40	Vacuum packaging machine	New	1	750	750
Agriculture	22. Non-ruminant Animal Production Techniques	22-1 Non-ruminant Animal Production Techniques	41	Micropipette sets	New	2	1,000	2,000
Agriculture	22. Non-ruminant Animal Production Techniques	22-1 Non-ruminant Animal Production Techniques	42	Round table	New	2	3,000	6,000
Agriculture	22. Non-ruminant Animal Production Techniques	22-2 Storage room	Fu-1	Sample cabinet	Fu	2	300	600
Agriculture	22. Non-ruminant Animal Production Techniques	22-2 Storage room	Fu-2	Tool Shelf	Fu	2	200	400
Agriculture	22. Non-ruminant Animal Production Techniques	22-2 Storage room	Fu-3	Document cabinet	Fu	8	250	2,000
Agriculture	22. Non-ruminant Animal Production Techniques	22-2 Storage room	Fu-4	Chemical shelf	Fu	2	200	400
Agriculture	22. Non-ruminant Animal Production Techniques	22-2 Storage room	Fu-5	Chemical cabinet	Fu	2	250	500
Agriculture	22. Non-ruminant Animal Production Techniques	22-3 Academic Staff room (CAAB)	Fu-6	Desk with chair	Fu (New)	4	500	2,000
Agriculture	22. Non-ruminant Animal Production Techniques	22-3 Academic Staff room (CAAB)	Fu-7	Shelf, large	Fu (New)	4	400	1,600
Agriculture	22. Non-ruminant Animal Production Techniques	22-3 Academic Staff room (CAAB)	Fu-8	File cabinet	Fu (New)	4	500	2,000
Agriculture	22. Non-ruminant Animal Production Techniques	22-3 Academic Staff room (CAAB)	Fu-9	Bulletin board	Fu (New)	1	300	300
Agriculture	22. Non-ruminant Animal Production Techniques	22-4 Research Office (CAAB)	Fu-10	Desk with chair	Fu (New)	12	500	6,000
Agriculture	22. Non-ruminant Animal Production Techniques	22-4 Research Office (CAAB)	Fu-11	Shelf, large	Fu (New)	4	400	1,600
Agriculture	22. Non-ruminant Animal Production Techniques	22-4 Research Office (CAAB)	Fu-12	Bulletin board	Fu (New)	1	300	300
Agriculture								
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	1	MilkoScanTM FT2-infrared milk analyzer (FOSS)	New	1	50,000	50,000

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	6	Biogas analyer	New	1	20,000	20,000
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	7	CH_4/N_2O analyser for environment	New	1	15,000	15,000
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	9	Heating and cooling units	New	1	20,000	20,000
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	10	Gas mixer and controller (oxygen, carbonic, nitrogen, ethylen, vapour)	New	1	10,000	10,000
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	12	Heat detector (in cattle)	New	1	15,000	15,000
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	14	Water bath with shaker	New	1	5,000	5,000
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	15	Centrifuge machine (16,000 g)	New	1	10,000	10,000
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	16	Pipettes (Micropipette sets)	New	2	1,000	2,000
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	17	Animal waste chambers	New	2	2,000	4,000
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	18	Water bath (Ultrasonic water bath)	New	1	3,000	3,000
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	19	Microbial culture system for anarobic, Gas Jet Md	New	1	7,500	7,500
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	20	Anaerobic chamber	New	1	6,000	6,000
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	21	Water bath	New	2	2,000	4,000
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	22	Elementar Analysensysteme GmbH - vario Max CN Element Analyzer	New	1	6,000	6,000
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	23	Automatic beef slicer	New	1	5,000	5,000
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	24	Balance (Analytical balance (0.0001 - 10 g))	New	2	2,500	5,000
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	25	Water bath WNB 22+L1 for *in vitro*	New	2	2,500	5,000
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	26	Incubator (Micro incubator system)	New	2	2,500	5,000
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	27	pH meter (Beef pH meter (meat quality measurement))	New	2	2,000	4,000
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	28	Vortexer	New	4	500	2,000

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	29	Retsch grinder SR300	New	1	5,000	5,000
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	30	Electronic large animal scale	New	1	4,500	4,500
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	31	Incubator (Shaking incubator)	New	1	4,500	4,500
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	32	Bacteria counter	New	1	4,000	4,000
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	33	Cabinet (Huminity and temperature control cabinet)	New	1	4,000	4,000
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	34	CP-Sil88 column for FAME	New	2	2,000	4,000
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	35	Portable ultrasound scanner machine	New	2	2,000	4,000
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	36	Rumen volatile fatty acid analyzer	New	1	3,500	3,500
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	37	Oven UFE 550	New	1	3,000	3,000
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	38	Muffle funace	New	1	3,000	3,000
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	39	Protozoa counter	New	1	3,000	3,000
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	40	A 30 m fused silica capillary column	New	2	1,500	3,000
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	41	Separate funnel	New	30	100	3,000
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	42	California Mastitis Test (CMT)	New	100	30	3,000
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	43	Fume hood	New	1	2,700	2,700
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	44	pH, MV meter	New	1	2,500	2,500
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	45	Desktop computer	New	3	700	2,100
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	46	Fume chamber	New	1	2,000	2,000
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	47	Homogenizer	New	1	2,000	2,000
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	48	Mastitis test	New	1	2,000	2,000

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	49	Incubator	New	1	2,000	2,000
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	50	pH meter for feeds, silage, etc	New	2	1,000	2,000
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	51	pH meter (Portable pH meter)	New	2	1,000	2,000
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	52	Shaker (Rotary flash shaker)	New	2	1,000	2,000
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	53	Stirrer (Magnetic stirrer)	New	2	1,000	2,000
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	54	Vial crimpers 20 mm (close vial)	New	2	1,000	2,000
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	55	Vial crimpers 20 mm (open vial)	New	2	1,000	2,000
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	56	Vial crimpers 11 mm (close vial)	New	2	800	1,600
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	57	Vial crimpers 11 mm (open vial)	New	2	800	1,600
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	58	Gas bags for storage	New	300	5	1,500
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	59	Balance (Digital balance (0.1 - 200 g))	New	2	500	1,000
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	62	GC-MS (VFAs analysis)	New	1	50,000	50,000
Agriculture	23. Ruminant Animal Production Techniques	23-1 Ruminant Animal Production Techniques	66	Round table	New	4	3,000	12,000
Agriculture	23. Ruminant Animal Production Techniques	23-2 Storage room	67	Deep freezer (-80^{o}C)	New	1	9,000	9,000
Agriculture	23. Ruminant Animal Production Techniques	23-2 Storage room	68	Freezer	New	2	900	1,800
Agriculture	23. Ruminant Animal Production Techniques	23-2 Storage room	69	Refrigerator	New	2	800	1,600
Agriculture	23. Ruminant Animal Production Techniques	23-2 Storage room	Fu-1	Sample cabinet	Fu	2	300	600
Agriculture	23. Ruminant Animal Production Techniques	23-2 Storage room	Fu-2	Tool Shelf	Fu	2	200	400
Agriculture	23. Ruminant Animal Production Techniques	23-2 Storage room	Fu-3	Document cabinet	Fu	4	250	1,000
Agriculture	23. Ruminant Animal Production Techniques	23-2 Storage room	Fu-4	Chemical shelf	Fu	2	200	400

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	23. Ruminant Animal Production Techniques	23-2 Storage room	Fu-5	Chemical cabinet	Fu	2	250	500
Agriculture	23. Ruminant Animal Production Techniques	23-3 Academic Staff room (CAAB)	Fu-1	Desk (1500 x 1800) with chair	Fu (New)	4	500	2,000
Agriculture	23. Ruminant Animal Production Techniques	23-3 Academic Staff room (CAAB)	Fu-2	Shelf, large	Fu (New)	4	400	1,600
Agriculture	23. Ruminant Animal Production Techniques	23-3 Academic Staff room (CAAB)	Fu-3	File cabinet	Fu (New)	4	500	2,000
Agriculture	23. Ruminant Animal Production Techniques	23-3 Academic Staff room (CAAB)	Fu-4	Bulletin board	Fu (New)	1	300	300
Agriculture	23. Ruminant Animal Production Techniques	23-4 Research Office (CAAB)	Fu-5	Desk with chair	Fu (New)	12	500	6,000
Agriculture	23. Ruminant Animal Production Techniques	23-4 Research Office (CAAB)	Fu-6	Shelf, large	Fu (New)	4	400	1,600
Agriculture	23. Ruminant Animal Production Techniques	23-4 Research Office (CAAB)	Fu-7	Bulletin board	Fu (New)	1	300	300
Agriculture								
Agriculture	24. Experimental Animal Unit	24-2 Artificial insemination room	8	Artificial insemination instrument	New	1	40,000	40,000
Agriculture	24. Experimental Animal Unit	24-2 Artificial insemination room	9	Printing machine for semen tube	New	1	20,000	20,000
Agriculture	24. Experimental Animal Unit	24-2 Artificial insemination room	10	Straw semen tube	New	1	5,000	5,000
Agriculture	24. Experimental Animal Unit	24-2 Artificial insemination room	11	Constant temperature artificial vagina preserving device	New	1	1,000	1,000
Agriculture	24. Experimental Animal Unit	24-2 Artificial insemination room	12	Sterilizing cabinet for rubber liner	New	1	1,000	1,000
Agriculture	24. Experimental Animal Unit	24-2 Artificial insemination room	13	Automatic sperm counter	New	1	10,000	10,000
Agriculture	24. Experimental Animal Unit	24-2 Artificial insemination room	14	Artificial vagina for boar	New	5	2,000	10,000
Agriculture	24. Experimental Animal Unit	24-2 Artificial insemination room	15	Porcine sperm photometer	New	1	2,000	2,000
Agriculture	24. Experimental Animal Unit	24-2 Artificial insemination room	16	Thermo regulator cabinet for storaging semen	New	1	1,500	1,500
Agriculture	24. Experimental Animal Unit	24-3 Basic treating room	17	Air conditioner		2	700	1,400
Agriculture	24. Experimental Animal Unit	24-3 Basic treating room	20	Digital balance, 150g	New	1	1,500	1,500

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	24. Experimental Animal Unit	24-3 Basic treating room	21	Oven	New	1	3,000	3,000
Agriculture	24. Experimental Animal Unit	24-3 Basic treating room	22	Fume hood	New	1	2,700	2,700
Agriculture	24. Experimental Animal Unit	24-3 Basic treating room	23	Centrifuge (tube 2ml)	New	1	320	320
Agriculture	24. Experimental Animal Unit	24-3 Basic treating room	24	Centrifuge (tube 10 ml)	New	1	400	400
Agriculture	24. Experimental Animal Unit	24-3 Basic treating room	25	Centrifuge (tube 200 ml)	New	1	550	550
Agriculture	24. Experimental Animal Unit	24-3 Basic treating room	26	Electronic pipettor	New	5	190	950
Agriculture	24. Experimental Animal Unit	24-3 Basic treating room	27	Digital animal scale, 13.5 kg capacity	New	2	175	350
Agriculture	24. Experimental Animal Unit	24-3 Basic treating room	28	Digital animal scale, 500 kg capacity	New	1	550	550
Agriculture	24. Experimental Animal Unit	24-3 Basic treating room	29	Non-contact infrared thermometer	New	2	170	340
Agriculture	24. Experimental Animal Unit	24-3 Basic treating room	30	Electronic balance	New	2	1,000	2,000
Agriculture	24. Experimental Animal Unit	24-3 Basic treating room	31	Freezer -80°C	g	1	8,500	8,500
Agriculture	24. Experimental Animal Unit	24-3 Basic treating room	32	Refrigerator (320 litre)	g	3	800	2,400
Agriculture	24. Experimental Animal Unit	24-3 Basic treating room	33	Built-in bottom freezer -20°C	g	1	8,000	8,000
Agriculture	24. Experimental Animal Unit	24-3 Basic treating room	34	Cool centrifuge (tube 200 ml)	g	1	7,000	7,000
Agriculture	24. Experimental Animal Unit	24-3 Basic treating room	35	Refrigerator 4oC	g	3	600	1,800
Agriculture	24. Experimental Animal Unit	24-3 Basic treating room	36	pH/Ion meter with pH electrode and ATC	New	1	1,520	1,520
Agriculture	24. Experimental Animal Unit	24-3 Basic treating room	37	Micropipette sets	New	2	1,000	2,000
Agriculture	24. Experimental Animal Unit	24-5 Cattle farm	43	Load bar scale system, 4000 kg capacity	New	1	2,000	2,000
Agriculture	24. Experimental Animal Unit	24-5 Cattle farm	44	Mobile dummy cow	New	1	4,000	4,000
Agriculture	24. Experimental Animal Unit	24-5 Cattle farm	45	Training cow model	New	1	10,000	10,000

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	24. Experimental Animal Unit	24-5 Cattle farm	46	Restraining stall	New	1	3,000	3,000
Agriculture	24. Experimental Animal Unit	24-6 Egg incubation room	48	Egg incubator	g	4	3,000	12,000
Agriculture	24. Experimental Animal Unit	24-7 Feed production manufacture	52	Grass cutting machine for forage	New	1	2,000	2,000
Agriculture	24. Experimental Animal Unit	24-7 Feed production manufacture	53	Feed grinding machine	New	1	7,000	7,000
Agriculture	24. Experimental Animal Unit	24-7 Feed production manufacture	54	Feed drying machine	New	1	5,000	5,000
Agriculture	24. Experimental Animal Unit	24-7 Feed production manufacture	55	Chaff cutter/Hay processing machine	New	2	1,000	2,000
Agriculture	24. Experimental Animal Unit	24-7 Feed production manufacture	56	pH/Ion meter with pH electrode and ATC	New	1	1,520	1,520
Agriculture	24. Experimental Animal Unit	24-10 Kitchen room	66	Air conditioner	New	1	700	700
Agriculture	24. Experimental Animal Unit	24-10 Kitchen room	67	Industrial fan	New	2	150	300
Agriculture	24. Experimental Animal Unit	24-10 Kitchen room	68	Table	New	4	300	1,200
Agriculture	24. Experimental Animal Unit	24-10 Kitchen room	69	Chair	New	30	50	1,500
Agriculture	24. Experimental Animal Unit	24-10 Kitchen room	70	Refrigerator 4oC	g	2	600	1,200
Agriculture	24. Experimental Animal Unit	24-11 Milking room	72	Milking machine	g	2	3,000	6,000
Agriculture	24. Experimental Animal Unit	24-11 Milking room	73	Stainless steel milker bucket	New	5	100	500
Agriculture	24. Experimental Animal Unit	24-11 Milking room	74	pH/Ion meter with pH electrode and ATC	New	1	1,520	1,520
Agriculture	24. Experimental Animal Unit	24-12 Pig farm	75	Industrial fan	New	6	150	900
Agriculture	24. Experimental Animal Unit	24-12 Pig farm	77	Mobile dummy pig	New	1	4,000	4,000
Agriculture	24. Experimental Animal Unit	24-13 Poultry farm	82	Industrial fan	New	4	150	600
Agriculture	24. Experimental Animal Unit	24-13 Poultry farm	84	Automatic electric chicken beak cutter	New	1	150	150
Agriculture	24. Experimental Animal Unit	24-14 Slaughtering house	87	pH/Ion meter with pH electrode and ATC	New	1	1,520	1,520
Agriculture	24. Experimental Animal Unit	24-14 Slaughtering house	88	Industrial fan	New	4	150	600

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	24. Experimental Animal Unit	24-14 Slaughtering house	90	Animal dissecting set	New	6	2,000	12,000
Agriculture	24. Experimental Animal Unit	24-14 Slaughtering house	91	Animal surgical table	New	1	3,000	3,000
Agriculture	24. Experimental Animal Unit	24-14 Slaughtering house	92	Animal incinerator	New	1	10,000	10,000
Agriculture	24. Experimental Animal Unit	24-14 Slaughtering house	93	Carcass splitting bandsaw	New	1	1,500	1,500
Agriculture	24. Experimental Animal Unit	24-14 Slaughtering house	94	Vacuum packaging machine	New	1	750	750
Agriculture	24. Experimental Animal Unit	24-15 Storage room	95	Air conditioner	New	1	700	700
Agriculture	24. Experimental Animal Unit	24-15 Storage room	96	Medicine cabinet	New	2	300	600
Agriculture	24. Experimental Animal Unit	24-15 Storage room	97	Electric generator	New	1	7,000	7,000
Agriculture	24. Experimental Animal Unit	24-15 Storage room	98	High pressure spraying machine	New	1	500	500
Agriculture	24. Experimental Animal Unit	24-15 Storage room	99	Automatic vaccine syringe	New	3	180	540
Agriculture	24. Experimental Animal Unit	24-15 Storage room	100	50ml veterinary syringe	New	5	20	100
Agriculture	24. Experimental Animal Unit	24-15 Storage room	101	Pregnancy detector for animals	New	1	625	625
Agriculture	24. Experimental Animal Unit	24-15 Storage room	102	Laparotomy set for large animal	New	4	1,500	6,000
Agriculture	24. Experimental Animal Unit	24-15 Storage room	103	Laparotomy set for small animal	New	4	1,500	6,000
Agriculture	24. Experimental Animal Unit	24-15 Storage room	104	Rumenotomy set	New	2	1,000	2,000
Agriculture	24. Experimental Animal Unit	24-15 Storage room	105	Surgical instrument set	New	4	500	2,000
Agriculture	24. Experimental Animal Unit	24-15 Storage room	106	Untrasonic system diagnostic scanner for pig	New	1	40,000	40,000
Agriculture	24. Experimental Animal Unit	24-15 Storage room	107	Untrasonic system diagnostic scanner for cow	New	1	40,000	40,000
Agriculture	24. Experimental Animal Unit	24-15 Storage room	108	Sample cabinet	Fu	10	300	3,000
Agriculture	24. Experimental Animal Unit	24-15 Storage room	109	Tool Shelf	Fu	10	200	2,000

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	24. Experimental Animal Unit	24-15 Storage room	110	Document cabinet	Fu	2	250	500
Agriculture	24. Experimental Animal Unit	24-15 Storage room	111	Irrigation system for pasture	New	1	15,000	15,000
Agriculture	24. Experimental Animal Unit	24-16 Study room	112	Air conditioner	New	2	700	1,400
Agriculture	24. Experimental Animal Unit	24-16 Study room	114	Table and chair for student	New	30	50	1,500
Agriculture	24. Experimental Animal Unit	24-16 Study room	115	Table and chair for lecturer	New	2	100	200
Agriculture	24. Experimental Animal Unit	24-19 Administration Office	119	Air conditioner	New	4	700	2,800
Agriculture	24. Experimental Animal Unit	24-19 Administration Office	123	Industrial fan	New	4	150	600
Agriculture	24. Experimental Animal Unit	24-19 Administration Office	124	Computer desk and chair	New	4	300	1,200
Agriculture	24. Experimental Animal Unit	24-19 Administration Office	125	Desk and chair for staff	New	10	300	3,000
Agriculture	24. Experimental Animal Unit	24-19 Administration Office	126	Document cabinet	New	5	300	1,500
Agriculture	24. Experimental Animal Unit	24-19 Administration Office	129	Stereo microscope	New	1	1,000	1,000
Agriculture	24. Experimental Animal Unit	24-19 Administration Office	130	Hole punch plier for animals	New	2	25	50
Agriculture	24. Experimental Animal Unit	24-19 Administration Office	132	Refrigerator 4oC	g	1	600	600
Agriculture								
Agriculture	25. Hygiene and Safety of Animal-based Food	25-1 Serology and Molecular lab (New Buiding)	1	Automatic ELISA system (computer, printer, electrically charged 1KVA)	New	1	5,000	5,000
Agriculture	25. Hygiene and Safety of Animal-based Food	25-1-1 Serology - Adv Tech Lab Bldg	2	ELISA washing machine	New	1	2,000	2,000
Agriculture	25. Hygiene and Safety of Animal-based Food	25-1-1 Serology - Adv Tech Lab Bldg	3	Heamatocrite 210	New	1	200	200
Agriculture	25. Hygiene and Safety of Animal-based Food	25-1-1 Serology - Adv Tech Lab Bldg	4	Incubater shaker machine Thermostor	New	1	6,300	6,300
Agriculture	25. Hygiene and Safety of Animal-based Food	25-1-1 Serology - Adv Tech Lab Bldg	5	Water bath	New	1	2,500	2,500
Agriculture	25. Hygiene and Safety of Animal-based Food	25-1-1 Serology - Adv Tech Lab Bldg	6	Incubator	New	1	2,000	2,000

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	25. Hygiene and Safety of Animal-based Food	25-1-1 Serology - Adv Tech Lab Bldg	7	Cool Centrifuge 1.5 ml	New	1	4,500	4,500
Agriculture	25. Hygiene and Safety of Animal-based Food	25-1-1 Serology - Adv Tech Lab Bldg	8	Refrigerator (- 20°C)	New	1	2,000	2,000
Agriculture	25. Hygiene and Safety of Animal-based Food	25-1-1 Serology - Adv Tech Lab Bldg	9	Refrigerator (4 - 8°C)	New	1	500	500
Agriculture	25. Hygiene and Safety of Animal-based Food	25-1-1 Serology - Adv Tech Lab Bldg	10	Biosecurity clean bench Class II	New	1	15,000	15,000
Agriculture	25. Hygiene and Safety of Animal-based Food	25-1-1 Serology - Adv Tech Lab Bldg	11	Voltage stabilizer 15 kva	New	1	300	300
Agriculture	25. Hygiene and Safety of Animal-based Food	25-1-2 Recieving and Proccessing samples - Adv Tech Lab Bldg	12	Biosecurity clean bench class II	New	1	15,000	15,000
Agriculture	25. Hygiene and Safety of Animal-based Food	25-1-2 Recieving and Proccessing samples - Adv Tech Lab Bldg	15	Refrigerator 4-8oC	New	1	500	500
Agriculture	25. Hygiene and Safety of Animal-based Food	25-1-2 Recieving and Proccessing samples - Adv Tech Lab Bldg	16	Refrigerator -80oC	New	1	10,000	10,000
Agriculture	25. Hygiene and Safety of Animal-based Food	25-1-2 Recieving and Proccessing samples - Adv Tech Lab Bldg	17	Vortex mixer	New	1	550	550
Agriculture	25. Hygiene and Safety of Animal-based Food	25-1-2 Recieving and Proccessing samples - Adv Tech Lab Bldg	18	Voltage stabilizer 15 kva	New	1	300	300
Agriculture	25. Hygiene and Safety of Animal-based Food	25-1-2 Recieving and Proccessing samples - Adv Tech Lab Bldg	19	Pipettes (10-100µl, 100-1,000 µ, 1-5mL) and suppored racks	New	10	200	2,000
Agriculture	25. Hygiene and Safety of Animal-based Food	25-1-3 RNA/DNA Extraction - Adv Tech Lab Bldg	20	NanoDrop Spectrophotometer	New	1	10,000	10,000
Agriculture	25. Hygiene and Safety of Animal-based Food	25-1-3 RNA/DNA Extraction - Adv Tech Lab Bldg	21	Clean bench class I	New	1	7,000	7,000
Agriculture	25. Hygiene and Safety of Animal-based Food	25-1-3 RNA/DNA Extraction - Adv Tech Lab Bldg	24	Refrigerator 4-8oC	New	1	500	500
Agriculture	25. Hygiene and Safety of Animal-based Food	25-1-3 RNA/DNA Extraction - Adv Tech Lab Bldg	25	Refrigerator -20oC	New	1	2,000	2,000
Agriculture	25. Hygiene and Safety of Animal-based Food	25-1-3 RNA/DNA Extraction - Adv Tech Lab Bldg	26	Vortex mixer	New	1	550	550
Agriculture	25. Hygiene and Safety of Animal-based Food	25-1-3 RNA/DNA Extraction - Adv Tech Lab Bldg	27	Mini centrifuge (Spindown)	New	1	2,000	2,000
Agriculture	25. Hygiene and Safety of Animal-based Food	25-1-3 RNA/DNA Extraction - Adv Tech Lab Bldg	28	Block heater	New	1	500	500
Agriculture	25. Hygiene and Safety of Animal-based Food	25-1-3 RNA/DNA Extraction - Adv Tech Lab Bldg	29	Voltage stabilizer 15 kva	New	1	300	300

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	25. Hygiene and Safety of Animal-based Food	25-1-3 RNA/DNA Extraction - Adv Tech Lab Bldg	30	Pipettes (0.5-10µl, 2-20µl, 20-200µl, 100-1,000 µ) and supported racks	New	4	200	800
Agriculture	25. Hygiene and Safety of Animal-based Food	25-1-4 Master Mix - Adv Tech Lab Bldg	31	Biosecurity clean bench class II	New	1	15,000	15,000
Agriculture	25. Hygiene and Safety of Animal-based Food	25-1-4 Master Mix - Adv Tech Lab Bldg	32	Mini centrifuge (Spindown)	New	1	2,000	2,000
Agriculture	25. Hygiene and Safety of Animal-based Food	25-1-4 Master Mix - Adv Tech Lab Bldg	33	Refrigerator -20oC	New	1	2,000	2,000
Agriculture	25. Hygiene and Safety of Animal-based Food	25-1-4 Master Mix - Adv Tech Lab Bldg	34	Refrigerator 4-8oC	New	1	500	500
Agriculture	25. Hygiene and Safety of Animal-based Food	25-1-4 Master Mix - Adv Tech Lab Bldg	35	Tube shaker machine	New	1	3,000	3,000
Agriculture	25. Hygiene and Safety of Animal-based Food	25-1-4 Master Mix - Adv Tech Lab Bldg	36	Voltage stabilizer 15 kva	New	1	300	300
Agriculture	25. Hygiene and Safety of Animal-based Food	25-1-4 Master Mix - Adv Tech Lab Bldg	37	Pipettes (0.5-10µl, 2-20µl, 20-200µl, 100-1,000 µ) and suppored racks	New	10	200	2,000
Agriculture	25. Hygiene and Safety of Animal-based Food	25-1-5 PCR machine room - Adv Tech Lab Bldg	39	Mini centrifuge (Spindown)	New	1	2,000	2,000
Agriculture	25. Hygiene and Safety of Animal-based Food	25-1-6 Electrophoresis Room - Adv Tech Lab Bldg	44	Horizontal electrophoresis system	New	1	2,000	2,000
Agriculture	25. Hygiene and Safety of Animal-based Food	25-1-6 Electrophoresis Room - Adv Tech Lab Bldg	45	Pulse Field Gel Electrophoresis system (PFGE) (1 x 3000)	New	1	3,000	3,000
Agriculture	25. Hygiene and Safety of Animal-based Food	25-1-6 Electrophoresis Room - Adv Tech Lab Bldg	47	Pipettes (2-20µl, 100-1,000 µ) and suppored racks	New	10	200	2,000
Agriculture	25. Hygiene and Safety of Animal-based Food	25-2-1 Recieving and Proccessing samples - Adv Tech Lab Bldg	50	Precision analytical balance	New	1	2,000	2,000
Agriculture	25. Hygiene and Safety of Animal-based Food	25-2-1 Recieving and Proccessing samples - Adv Tech Lab Bldg	51	Stomacher	New	1	1,100	1,100
Agriculture	25. Hygiene and Safety of Animal-based Food	25-2-1 Recieving and Proccessing samples - Adv Tech Lab Bldg	52	Refrigerator 4 oC	New	1	500	500
Agriculture	25. Hygiene and Safety of Animal-based Food	25-2-2 Medium preparation - Adv Tech Lab Bldg	56	Refrigerator 4 oC	New	1	500	500
Agriculture	25. Hygiene and Safety of Animal-based Food	25-2-2 Medium preparation - Adv Tech Lab Bldg	57	Double water distilator	New	1	6,000	6,000
Agriculture	25. Hygiene and Safety of Animal-based Food	25-2-2 Medium preparation - Adv Tech Lab Bldg	58	Vertical Autoclave 110 L	New	1	9,200	9,200
Agriculture	25. Hygiene and Safety of Animal-based Food	25-2-2 Medium preparation - Adv Tech Lab Bldg	61	Precision analytical balance	New	1	1,500	1,500
Agriculture	25. Hygiene and Safety of Animal-based Food	25-2-2 Medium preparation - Adv Tech Lab Bldg	62	pH meter	New	1	800	800

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	25. Hygiene and Safety of Animal-based Food	25-2-2 Medium preparation - Adv Tech Lab Bldg	63	Glassware Drying Cabinet 60°C	New	1	1,000	1,000
Agriculture	25. Hygiene and Safety of Animal-based Food	25-2-2 Medium preparation - Adv Tech Lab Bldg	64	Dry heat sterilizer at 180°C	New	1	2,000	2,000
Agriculture	25. Hygiene and Safety of Animal-based Food	25-2-2 Medium preparation - Adv Tech Lab Bldg	67	Magnetic stirrer Hotplate	New	1	1,000	1,000
Agriculture	25. Hygiene and Safety of Animal-based Food	25-2-3 Isolation and Identification room - Adv Tech Lab Bldg	70	Clean bench class I	New	1	7,000	7,000
Agriculture	25. Hygiene and Safety of Animal-based Food	25-2-3 Isolation and Identification room - Adv Tech Lab Bldg	71	Pipettes (20-200µl, 100-1,000 µl)and suppored racks	New	10	200	2,000
Agriculture	25. Hygiene and Safety of Animal-based Food	25-2-3 Isolation and Identification room - Adv Tech Lab Bldg	72	Incubator 20-42°C	New	2	2,000	4,000
Agriculture	25. Hygiene and Safety of Animal-based Food	25-2-4 Result reading room - Adv Tech Lab Bldg	76	Colony count machine	New	1	2,000	2,000
Agriculture	25. Hygiene and Safety of Animal-based Food	25-2-4 Result reading room - Adv Tech Lab Bldg	77	Microscope	New	1	3,300	3,300
Agriculture	25. Hygiene and Safety of Animal-based Food	25-2-4 Result reading room - Adv Tech Lab Bldg	79	Microplanter for MIC	New	1	1,000	1,000
Agriculture	25. Hygiene and Safety of Animal-based Food	25-2-4 Result reading room - Adv Tech Lab Bldg	80	Vertical Autoclave 110L	New	1	10,000	10,000
Agriculture	25. Hygiene and Safety of Animal-based Food		81	Other tools: chair, bottle, petri dish, alcohol lamp, rack several size, Glass test tube several size with cap, beaker, basket for tools sterilize, inox pot and spoon, surgical tools, magnifier, labware test tubes, other common tools	New	all	5,000	5,000
Agriculture	25. Hygiene and Safety of Animal-based Food	25-2-5 Academic Staff room - Adv Tech Lab Bldg	Fu-1	Desk (1500 x 1800) with chair	Fu (New)	4	500	2,000
Agriculture	25. Hygiene and Safety of Animal-based Food	25-2-5 Academic Staff room - Adv Tech Lab Bldg	Fu-2	Shelf, large	Fu (New)	4	400	1,600
Agriculture	25. Hygiene and Safety of Animal-based Food	25-2-5 Academic Staff room - Adv Tech Lab Bldg	Fu-3	File cabinet	Fu (New)	4	500	2,000
Agriculture	25. Hygiene and Safety of Animal-based Food	25-2-5 Academic Staff room - Adv Tech Lab Bldg	Fu-4	Bulletin board	Fu (New)	1	300	300
Agriculture	25. Hygiene and Safety of Animal-based Food	25-2-6 Research Office - Adv Tech Lab Bldg	Fu-5	Desk with chair	Fu (New)	12	500	6,000
Agriculture	25. Hygiene and Safety of Animal-based Food	25-2-6 Research Office - Adv Tech Lab Bldg	Fu-6	Shelf, large	Fu (New)	4	400	1,600

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	25. Hygiene and Safety of Animal-based Food	25-2-6 Research Office - Adv Tech Lab Bldg	Fu-7	Bulletin board	Fu (New)	1	300	300
Agriculture								
Agriculture	26. Histology and Molecular Pathology	26-1 Histology - Adv Tech Lab Bldg	1	Pathology workstations	New	1	12,000	12,000
Agriculture	26. Histology and Molecular Pathology	26-1 Histology - Adv Tech Lab Bldg	2	Tissue embedding system	New	1	40,000	40,000
Agriculture	26. Histology and Molecular Pathology	26-1 Histology - Adv Tech Lab Bldg	3	Automatic rotary microtome	New	1	30,000	30,000
Agriculture	26. Histology and Molecular Pathology	26-1 Histology - Adv Tech Lab Bldg	4	Cryostat	New	1	20,000	20,000
Agriculture	26. Histology and Molecular Pathology	26-1 Histology - Adv Tech Lab Bldg	5	Flotation bath	New	1	7,000	7,000
Agriculture	26. Histology and Molecular Pathology	26-1 Histology - Adv Tech Lab Bldg	6	Slide hotplate	New	1	7,000	7,000
Agriculture	26. Histology and Molecular Pathology	26-1 Histology - Adv Tech Lab Bldg	7	Automatic tissue staining system	New	1	40,000	40,000
Agriculture	26. Histology and Molecular Pathology	26-1 Histology - Adv Tech Lab Bldg	8	Slide storage system	New	1	6,000	6,000
Agriculture	26. Histology and Molecular Pathology	26-1 Histology - Adv Tech Lab Bldg	9	Labstack storage system	New	3	600	1,800
Agriculture	26. Histology and Molecular Pathology	26-1 Histology - Adv Tech Lab Bldg	10	Cytospin	New	1	32,000	32,000
Agriculture	26. Histology and Molecular Pathology	26-1 Histology - Adv Tech Lab Bldg	11	Microscope (Versatile compound microscope)	New	1	12,000	12,000
Agriculture	26. Histology and Molecular Pathology	26-2 Molecular Pathology - Adv Tech Lab Bldg	12	Balance (Analytical balance)	New	1	2,200	2,200
Agriculture	26. Histology and Molecular Pathology	26-2 Molecular Pathology - Adv Tech Lab Bldg	13	Balance (Top loading balance)	New	1	1,400	1,400
Agriculture	26. Histology and Molecular Pathology	26-2 Molecular Pathology - Adv Tech Lab Bldg	14	pH metter	New	2	1,000	2,000
Agriculture	26. Histology and Molecular Pathology	26-2 Molecular Pathology - Adv Tech Lab Bldg	15	Freezer and Refrigerator	New	2	500	1,000
Agriculture	26. Histology and Molecular Pathology	26-2 Molecular Pathology - Adv Tech Lab Bldg	16	Freezer (-20oC)	New	2	2,000	4,000
Agriculture	26. Histology and Molecular Pathology	26-2 Molecular Pathology - Adv Tech Lab Bldg	17	Physiological and biochemical testing machine	New	1	7,500	7,500
Agriculture	26. Histology and Molecular Pathology	26-2 Molecular Pathology - Adv Tech Lab Bldg	18	Urine testing machine	New	1	2,500	2,500

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	26. Histology and Molecular Pathology	26-2 Molecular Pathology - Adv Tech Lab Bldg	19	Centrifuge (Refrigerated centrifuge)	New	1	8,000	8,000
Agriculture	26. Histology and Molecular Pathology	26-2 Molecular Pathology - Adv Tech Lab Bldg	21	Tissue homonizer	New	1	2,000	2,000
Agriculture	26. Histology and Molecular Pathology	26-2 Molecular Pathology - Adv Tech Lab Bldg	22	Microarray hybridization chamber	New	5	100	500
Agriculture	26. Histology and Molecular Pathology	26-2 Molecular Pathology - Adv Tech Lab Bldg	23	Hybridization systems	New	1	6,000	6,000
Agriculture	26. Histology and Molecular Pathology	26-2 Molecular Pathology - Adv Tech Lab Bldg	24	Water purification system - Millipore	New	1	12,000	12,000
Agriculture	26. Histology and Molecular Pathology	26-2 Molecular Pathology - Adv Tech Lab Bldg	25	Cabinet (Biological safety cabinet)	New	1	10,000	10,000
Agriculture	26. Histology and Molecular Pathology	26-2 Molecular Pathology - Adv Tech Lab Bldg	30	Electrophoresis system (DNA electrophoresis system)	New	1	1,800	1,800
Agriculture	26. Histology and Molecular Pathology	26-2 Molecular Pathology - Adv Tech Lab Bldg	31	Electrophoresis system (Vertical DNA electrophoresis system)	New	1	2,000	2,000
Agriculture	26. Histology and Molecular Pathology	26-2 Molecular Pathology - Adv Tech Lab Bldg	32	Vertical PAGE/Blotting System	New	1	4,000	4,000
Agriculture	26. Histology and Molecular Pathology	26-2 Molecular Pathology - Adv Tech Lab Bldg	33	Gel documentation system	New	1	18,000	18,000
Agriculture	26. Histology and Molecular Pathology	26-2 Molecular Pathology - Adv Tech Lab Bldg	34	Autoclave	New	1	6,000	6,000
Agriculture	26. Histology and Molecular Pathology	26-2 Molecular Pathology - Adv Tech Lab Bldg	35	Incubator (shaking)	New	1	8,000	8,000
Agriculture	26. Histology and Molecular Pathology	26-2 Molecular Pathology - Adv Tech Lab Bldg	36	Oven	New	2	500	1,000
Agriculture	26. Histology and Molecular Pathology	26-2 Molecular Pathology - Adv Tech Lab Bldg	37	Lab waste disposer	New	1	3,000	3,000
Agriculture	26. Histology and Molecular Pathology	26-2 Molecular Pathology - Adv Tech Lab Bldg	38	Ductless fume hood	New	1	8,000	8,000
Agriculture	26. Histology and Molecular Pathology	26-2 Molecular Pathology - Adv Tech Lab Bldg	39	Liquid nitrogen container	New	3	500	1,500
Agriculture	26. Histology and Molecular Pathology	26-2 Molecular Pathology - Adv Tech Lab Bldg	40	Air conditioner	New	2	550	1,100
Agriculture	26. Histology and Molecular Pathology	26-2 Molecular Pathology - Adv Tech Lab Bldg	41	Vortex mixer	New	3	400	1,200
Agriculture	26. Histology and Molecular Pathology	26-2 Molecular Pathology - Adv Tech Lab Bldg	42	Stirrer (Magnetic stirrer)	New	2	1,200	2,400
Agriculture	26. Histology and Molecular Pathology	26-2 Molecular Pathology - Adv Tech Lab Bldg	45	Flake ice maker	New	1	7,000	7,000

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	26. Histology and Molecular Pathology	26-2 Molecular Pathology - Adv Tech Lab Bldg	46	Pipettes (Micropipette sets)	New	2	1,000	2,000
Agriculture	26. Histology and Molecular Pathology	26-2 Molecular Pathology - Adv Tech Lab Bldg	47	Pipettes (Multichanel pipette)	New	2	1,000	2,000
Agriculture	26. Histology and Molecular Pathology	26-3 Academic Staff room - Adv Tech Lab Bldg	Fu-1	Desk (1500 x 1800) with chair	Fu (New)	4	500	2,000
Agriculture	26. Histology and Molecular Pathology	26-3 Academic Staff room - Adv Tech Lab Bldg	Fu-2	Shelf, large	Fu (New)	4	400	1,600
Agriculture	26. Histology and Molecular Pathology	26-3 Academic Staff room - Adv Tech Lab Bldg	Fu-3	File cabinet	Fu (New)	4	500	2,000
Agriculture	26. Histology and Molecular Pathology	26-3 Academic Staff room - Adv Tech Lab Bldg	Fu-4	Bulletin board	Fu (New)	1	300	300
Agriculture								
Agriculture	27. Veterinary Pharmacology	27-1 Veterinary Pharmacology - Adv Tech Lab Bldg	1	HPLC (High-performance liquid chromatography) and accessories	New	1	60,000	60,000
Agriculture	27. Veterinary Pharmacology	27-1 Veterinary Pharmacology - Adv Tech Lab Bldg	2	UV-Vis spectrophotometer	New	1	7,000	7,000
Agriculture	27. Veterinary Pharmacology	27-1 Veterinary Pharmacology - Adv Tech Lab Bldg	3	Biological safety cabinet	New	1	10,000	10,000
Agriculture	27. Veterinary Pharmacology	27-1 Veterinary Pharmacology - Adv Tech Lab Bldg	4	Refrigerated & Heating Bath Circulators	New	1	3,500	3,500
Agriculture	27. Veterinary Pharmacology	27-1 Veterinary Pharmacology - Adv Tech Lab Bldg	5	Universal Piston Burret	New	1	2,000	2,000
Agriculture	27. Veterinary Pharmacology	27-1 Veterinary Pharmacology - Adv Tech Lab Bldg	6	Dual-Action Shakers	New	1	5,500	5,500
Agriculture	27. Veterinary Pharmacology	27-1 Veterinary Pharmacology - Adv Tech Lab Bldg	8	Soxhlet extractor with three positions	New	1	3,000	3,000
Agriculture	27. Veterinary Pharmacology	27-1 Veterinary Pharmacology - Adv Tech Lab Bldg	10	McFarland density check	New	1	5,000	5,000
Agriculture	27. Veterinary Pharmacology	27-1 Veterinary Pharmacology - Adv Tech Lab Bldg	11	Forced Convection Ovens	New	1	2,500	2,500
Agriculture	27. Veterinary Pharmacology	27-1 Veterinary Pharmacology - Adv Tech Lab Bldg	12	Refrigerator	New	1	500	500
Agriculture	27. Veterinary Pharmacology	27-1 Veterinary Pharmacology - Adv Tech Lab Bldg	13	Vortex mixer	New	2	400	800
Agriculture	27. Veterinary Pharmacology	27-1 Veterinary Pharmacology - Adv Tech Lab Bldg	14	Vacuum filter	New	1	1,200	1,200
Agriculture	27. Veterinary Pharmacology	27-1 Veterinary Pharmacology - Adv Tech Lab Bldg	15	Rotary evaporator	New	1	3,500	3,500

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	27. Veterinary Pharmacology	27-1 Veterinary Pharmacology - Adv Tech Lab Bldg	16	Atomizing dryer	New	1	15,000	15,000
Agriculture	27. Veterinary Pharmacology	27-1 Veterinary Pharmacology - Adv Tech Lab Bldg	17	Dissolution tester	New	1	3,500	3,500
Agriculture	27. Veterinary Pharmacology	27-1 Veterinary Pharmacology - Adv Tech Lab Bldg	18	Melting point meter	New	1	1,300	1,300
Agriculture	27. Veterinary Pharmacology	27-1 Veterinary Pharmacology - Adv Tech Lab Bldg	19	Karl Fisher titrator	New	1	8,000	8,000
Agriculture	27. Veterinary Pharmacology	27-1 Veterinary Pharmacology - Adv Tech Lab Bldg	20	Disintegration tester	New	1	1,500	1,500
Agriculture	27. Veterinary Pharmacology	27-2 Research Office - Adv Tech Lab Bldg	Fu-1	Desk with chair	Fu (New)	12	500	6,000
Agriculture	27. Veterinary Pharmacology	27-2 Research Office - Adv Tech Lab Bldg	Fu-2	Shelf, large	Fu (New)	4	400	1,600
Agriculture	27. Veterinary Pharmacology	27-2 Research Office - Adv Tech Lab Bldg	Fu-3	Bulletin board	Fu (New)	1	300	300
Agriculture	27. Veterinary Pharmacology	27-3 Seminar room - Adv Tech Lab Bldg	Fu-4	Chair	Fu (New)	24	100	2,400
Agriculture	27. Veterinary Pharmacology	27-3 Seminar room - Adv Tech Lab Bldg	Fu-5	Table (for 4 chairs)	Fu (New)	6	500	3,000
Agriculture	27. Veterinary Pharmacology	27-3 Seminar room - Adv Tech Lab Bldg	Fu-6	Bulletin board	Fu (New)	1	300	300
Agriculture	27. Veterinary Pharmacology	27-3 Seminar room - Adv Tech Lab Bldg	Fu-7	Book shelves	Fu	2	500	1,000
Agriculture								
Agriculture	28. Immunology and Epidemiology	28-1 Immunology and Epidemiology - Adv Tech Lab Bldg	1	Automated ELISA system	New	1	24,000	24,000
Agriculture	28. Immunology and Epidemiology	28-1 Immunology and Epidemiology - Adv Tech Lab Bldg	2	Automated cell counter	New	1	8,000	8,000
Agriculture	28. Immunology and Epidemiology	28-1 Immunology and Epidemiology - Adv Tech Lab Bldg	3	Incubator	New	1	2,000	2,000
Agriculture	28. Immunology and Epidemiology	28-1 Immunology and Epidemiology - Adv Tech Lab Bldg	4	Autoclave	New	1	10,000	10,000
Agriculture	28. Immunology and Epidemiology	28-1 Immunology and Epidemiology - Adv Tech Lab Bldg	5	Analytical balance	New	1	1,500	1,500
Agriculture	28. Immunology and Epidemiology	28-1 Immunology and Epidemiology - Adv Tech Lab Bldg	8	DNA electrophoresis	New	1	2,000	2,000
Agriculture	28. Immunology and Epidemiology	28-1 Immunology and Epidemiology - Adv Tech Lab Bldg	10	Biosafety cabinet (class III)	New	1	20,000	20,000

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	28. Immunology and Epidemiology	28-1 Immunology and Epidemiology - Adv Tech Lab Bldg	11	Vortex	New	1	900	900
Agriculture	28. Immunology and Epidemiology	28-1 Immunology and Epidemiology - Adv Tech Lab Bldg	13	Refrigerated centrifuge	New	1	8,000	8,000
Agriculture	28. Immunology and Epidemiology	28-1 Immunology and Epidemiology - Adv Tech Lab Bldg	15	pH meter	New	1	1,000	1,000
Agriculture	28. Immunology and Epidemiology	28-1 Immunology and Epidemiology - Adv Tech Lab Bldg	16	Laboratory drying oven	New	1	2,800	2,800
Agriculture	28. Immunology and Epidemiology	28-1 Immunology and Epidemiology - Adv Tech Lab Bldg	17	Protein electrophoresis	New	1	2,000	2,000
Agriculture	28. Immunology and Epidemiology	28-1 Immunology and Epidemiology - Adv Tech Lab Bldg	18	Protein transfer apparatus	New	1	2,000	2,000
Agriculture	28. Immunology and Epidemiology	28-1 Immunology and Epidemiology - Adv Tech Lab Bldg	19	Chemical storage cabinet	New	1	6,000	6,000
Agriculture	28. Immunology and Epidemiology	28-1 Immunology and Epidemiology - Adv Tech Lab Bldg	20	Exhaust system components	New	1	5,000	5,000
Agriculture	28. Immunology and Epidemiology	28-1 Immunology and Epidemiology - Adv Tech Lab Bldg	22	Magnetic stirrer	New	1	200	200
Agriculture	28. Immunology and Epidemiology	28-1 Immunology and Epidemiology - Adv Tech Lab Bldg	23	CO_2 incubator	New	1	12,000	12,000
Agriculture	28. Immunology and Epidemiology	28-1 Immunology and Epidemiology - Adv Tech Lab Bldg	24	Flow cytometer	New	1	9,000	9,000
Agriculture	28. Immunology and Epidemiology	28-1 Immunology and Epidemiology - Adv Tech Lab Bldg	26	Sonicator	New	1	2,000	2,000
Agriculture	28. Immunology and Epidemiology	28-1 Immunology and Epidemiology - Adv Tech Lab Bldg	27	Versatile compound microscope	New	1	1,200	1,200
Agriculture	28. Immunology and Epidemiology	28-1 Immunology and Epidemiology - Adv Tech Lab Bldg	28	Egg hatcher	New	1	200	200
Agriculture	28. Immunology and Epidemiology	28-1 Immunology and Epidemiology - Adv Tech Lab Bldg	29	Automatic biochemistry analyzer	New	1	3,000	3,000
Agriculture	28. Immunology and Epidemiology	28-1 Immunology and Epidemiology - Adv Tech Lab Bldg	30	Haematokrit centrifuge	New	1	500	500
Agriculture	28. Immunology and Epidemiology	28-1 Immunology and Epidemiology - Adv Tech Lab Bldg	31	Haemacytometer	New	1	150	150
Agriculture	28. Immunology and Epidemiology	28-1 Immunology and Epidemiology - Adv Tech Lab Bldg	32	Platelet rotator	New	1	1,000	1,000
Agriculture	28. Immunology and Epidemiology	28-1 Immunology and Epidemiology - Adv Tech Lab Bldg	33	Electro ejuculator	New	1	1,000	1,000
Agriculture	28. Immunology and Epidemiology	28-1 Immunology and Epidemiology - Adv Tech Lab Bldg	34	Water bath	New	1	500	500

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	28. Immunology and Epidemiology	28-1 Immunology and Epidemiology - Adv Tech Lab Bldg	35	Automated microbiology system	New	1	14,000	14,000
Agriculture	28. Immunology and Epidemiology	28-1 Immunology and Epidemiology - Adv Tech Lab Bldg	36	Bacterial identification system	New	1	4,000	4,000
Agriculture	28. Immunology and Epidemiology	28-1 Immunology and Epidemiology - Adv Tech Lab Bldg	37	Semen quality analysis system	New	1	10,000	10,000
Agriculture	28. Immunology and Epidemiology	28-1 Immunology and Epidemiology - Adv Tech Lab Bldg	38	Metrosperm	New	2	1,000	2,000
Agriculture	28. Immunology and Epidemiology	28-1 Immunology and Epidemiology - Adv Tech Lab Bldg	39	SPC - 2000 A Ultrasound	New	2	2,000	4,000
Agriculture	28. Immunology and Epidemiology	28-1 Immunology and Epidemiology - Adv Tech Lab Bldg	40	Spem storage cabinet	New	1	800	800
Agriculture	28. Immunology and Epidemiology	28-1 Immunology and Epidemiology - Adv Tech Lab Bldg	42	Perkin Elmer Wizard 1470 gamma counter-1470-020 - and Assessory - Perkin Elmer	New	1	20,000	20,000
Agriculture	28. Immunology and Epidemiology	28-1 Immunology and Epidemiology - Adv Tech Lab Bldg	43	Stainless steel hot plate	New	1	1,500	1,500
Agriculture	28. Immunology and Epidemiology	28-1 Immunology and Epidemiology - Adv Tech Lab Bldg	44	Pipettes and suppored racks, set	New	1	2,000	2,000
Agriculture	28. Immunology and Epidemiology	28-2 Academic Staff room - Adv Tech Lab Bldg	Fu-1	Desk (1500 x 1800) with chair	Fu (New)	4	500	2,000
Agriculture	28. Immunology and Epidemiology	28-2 Academic Staff room - Adv Tech Lab Bldg	Fu-2	Shelf, large	Fu (New)	4	400	1,600
Agriculture	28. Immunology and Epidemiology	28-2 Academic Staff room - Adv Tech Lab Bldg	Fu-3	File cabinet	Fu (New)	4	500	2,000
Agriculture	28. Immunology and Epidemiology	28-2 Academic Staff room - Adv Tech Lab Bldg	Fu-4	Bulletin board	Fu (New)	1	300	300
Agriculture	28. Immunology and Epidemiology	28-3 Administration Office - Adv Tech Lab Bldg	Fu-5	Desk with chair	Fu (New)	4	500	2,000
Agriculture	28. Immunology and Epidemiology	28-3 Administration Office - Adv Tech Lab Bldg	Fu-6	File cabinet	Fu (New)	4	500	2,000
Agriculture	28. Immunology and Epidemiology	28-3 Administration Office - Adv Tech Lab Bldg	Fu-7	Bulletin board	Fu (New)	2	300	600
Agriculture	28. Immunology and Epidemiology	28-3 Administration Office - Adv Tech Lab Bldg	Fu-8	Shelf, large	Fu (New)	4	400	1,600
Agriculture								
Agriculture	29. Animal Clinic and Virology	29-1 Animal Clinic	1	3D ultrasound scanner	New	1	15,000	15,000
Agriculture	29. Animal Clinic and Virology	29-1 Animal Clinic	2	Ultrasound printer	New	1	750	750

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	29. Animal Clinic and Virology	29-1 Animal Clinic	3	Veterinary ultrasound scanner for small animal	New	1	10,000	10,000
Agriculture	29. Animal Clinic and Virology	29-1 Animal Clinic	4	Veterinary ultrasound scanner for large animal	New	1	2,000	2,000
Agriculture	29. Animal Clinic and Virology	29-1 Animal Clinic	5	Endoscope system	New	1	10,000	10,000
Agriculture	29. Animal Clinic and Virology	29-1 Animal Clinic	6	Physiological and biochemical testing machine	New	1	7,500	7,500
Agriculture	29. Animal Clinic and Virology	29-1 Animal Clinic	7	Urine testing machine	New	1	2,500	2,500
Agriculture	29. Animal Clinic and Virology	29-1 Animal Clinic	8	Surgical scrub sink	New	1	900	900
Agriculture	29. Animal Clinic and Virology	29-1 Animal Clinic	9	Electrocardiography Meter	New	1	2,000	2,000
Agriculture	29. Animal Clinic and Virology	29-1 Animal Clinic	10	Blood oxygen meter	New	1	1,900	1,900
Agriculture	29. Animal Clinic and Virology	29-1 Animal Clinic	11	Medical wastes treatment machine	New	1	35,000	35,000
Agriculture	29. Animal Clinic and Virology	29-1 Animal Clinic	12	Sphygmomanometer	New	2	200	400
Agriculture	29. Animal Clinic and Virology	29-1 Animal Clinic	13	Respiratory aids machine	New	1	400	400
Agriculture	29. Animal Clinic and Virology	29-1 Animal Clinic	14	Refrigerator	New	1	750	750
Agriculture	29. Animal Clinic and Virology	29-1 Animal Clinic	17	Spindown	New	2	350	700
Agriculture	29. Animal Clinic and Virology	29-1 Animal Clinic	18	Stethoscope	New	2	135	270
Agriculture	29. Animal Clinic and Virology	29-1 Animal Clinic	19	Pulse Oximeter	New	1	300	300
Agriculture	29. Animal Clinic and Virology	29-1 Animal Clinic	20	Blood glucose meter	New	2	115	230
Agriculture	29. Animal Clinic and Virology	29-1 Animal Clinic	21	Diagnostic tables	New	2	300	600
Agriculture	29. Animal Clinic and Virology	29-1 Animal Clinic	22	Thermometer	New	5	30	150
Agriculture	29. Animal Clinic and Virology	29-1 Animal Clinic	23	Ultrasoud putting table	Fu	3	150	450
Agriculture	29. Animal Clinic and Virology	29-2 Virology lab - Adv Tech Lab Bldg	43	Fluorescent microscope	New	1	12,000	12,000

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	29. Animal Clinic and Virology	29-2 Virology lab - Adv Tech Lab Bldg	44	Automated Cell Counter	New	1	3,500	3,500
Agriculture	29. Animal Clinic and Virology	29-2 Virology lab - Adv Tech Lab Bldg	45	Class III Biosafety Cabinet	New	1	15,000	15,000
Agriculture	29. Animal Clinic and Virology	29-2 Virology lab - Adv Tech Lab Bldg	47	DNA electrophoresis	New	1	1,800	1,800
Agriculture	29. Animal Clinic and Virology	29-2 Virology lab - Adv Tech Lab Bldg	49	Versatile compound microscope	New	1	1,600	1,600
Agriculture	29. Animal Clinic and Virology	29-2 Virology lab - Adv Tech Lab Bldg	50	Pipettes and supported racks (05 pipettes + 1 rack)	New	2	1,000	2,000
Agriculture	29. Animal Clinic and Virology	29-3 Preparation Room - Adv Tech Lab Bldg	54	Technical balance	New	2	1,000	2,000
Agriculture	29. Animal Clinic and Virology	29-3 Preparation Room - Adv Tech Lab Bldg	Fu-1	Stainless Steel Table (1.2x2.4m)	Fu (New)	2	1,000	2,000
Agriculture	29. Animal Clinic and Virology	29-3 Preparation Room - Adv Tech Lab Bldg	Fu-2	Lab chair	Fu (New)	10	100	1,000
Agriculture	29. Animal Clinic and Virology	29-4 Research Office - Adv Tech Lab Bldg	Fu-3	Desk with chair	Fu (New)	12	500	6,000
Agriculture	29. Animal Clinic and Virology	29-4 Research Office - Adv Tech Lab Bldg	Fu-4	Shelf, large	Fu (New)	4	400	1,600
Agriculture	29. Animal Clinic and Virology	29-4 Research Office - Adv Tech Lab Bldg	Fu-5	Bulletin board	Fu (New)	1	300	300
Agriculture								
Agriculture	30. Parasitology	30-1 Parasitology	1	Microscope	New	10	1,000	10,000
Agriculture	30. Parasitology	30-1 Parasitology	2	Microscope connect to computer	New	1	7,500	7,500
Agriculture	30. Parasitology	30-1 Parasitology	3	MicroCL 21 Microcentrifuge-Thermo scientific-21R	New	1	1,400	1,400
Agriculture	30. Parasitology	30-1 Parasitology	4	Mc Master counting egg	New	20	75	1,500
Agriculture	30. Parasitology	30-1 Parasitology	5	Refrigerator	New	1	2,000	2,000
Agriculture	30. Parasitology	30-1 Parasitology	6	Deep freezer (-80^{o}C)	New	1	18,000	18,000
Agriculture	30. Parasitology	30-1 Parasitology	7	Magnifer	New	8	500	4,000
Agriculture	30. Parasitology	30-1 Parasitology	8	Analytical Balance	New	1	2,600	2,600
Agriculture	30. Parasitology	30-1 Parasitology	9	Biological safty cabinet	New	1	13,000	13,000
Agriculture	30. Parasitology	30-1 Parasitology	10	Automatic ELISA	New	1	24,000	24,000
Agriculture	30. Parasitology	30-1 Parasitology	11	Fume hood	New	1	2,700	2,700
Agriculture	30. Parasitology	30-1 Parasitology	12	PCR High sample throughput cycler 96 well plate	New	1	10,000	10,000
Agriculture	30. Parasitology	30-1 Parasitology	13	PCR workstation	New	1	3,600	3,600
Agriculture	30. Parasitology	30-1 Parasitology	14	DNA horizontal electrophoresis system, including power supply	New	1	3,000	3,000

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	30. Parasitology	30-1 Parasitology	15	Gel doc	New	1	20,000	20,000
Agriculture	30. Parasitology	30-1 Parasitology	17	Electrophoresis system	New	1	2,000	2,000
Agriculture	30. Parasitology	30-1 Parasitology	19	Stereoscopic microscope (body)	New	1	2,500	2,500
Agriculture	30. Parasitology	30-1 Parasitology	20	Stereoscopic microscope (lens)	New	2	500	1,000
Agriculture	30. Parasitology	30-1 Parasitology	22	Inverted biological microscope	New	1	7,000	7,000
Agriculture	30. Parasitology	30-1 Parasitology	23	PCR strip rotor	New	1	1,000	1,000
Agriculture	30. Parasitology	30-1 Parasitology	24	Spectrophotometer	New	1	10,000	10,000
Agriculture	30. Parasitology	30-1 Parasitology	25	Fake ice maker	New	1	7,000	7,000
Agriculture	30. Parasitology	30-1 Parasitology	26	Water purification system - Millipore	New	1	12,000	12,000
Agriculture	30. Parasitology	30-1 Parasitology	27	Magnetic stirrer	New	1	1,200	1,200
Agriculture	30. Parasitology	30-1 Parasitology	28	Temperature-control shaker	New	1	7,937	7,937
Agriculture	30. Parasitology	30-1 Parasitology	29	Centrifuge and rotor	New	1	4,000	4,000
Agriculture	30. Parasitology	30-1 Parasitology	30	Protein bloting (Bio-rad) Trans-Blot®	New	1	5,000	5,000
Agriculture	30. Parasitology	30-1 Parasitology	31	Freezer -20°C (668 litre)	New	1	6,200	6,200
Agriculture	30. Parasitology	30-1 Parasitology	32	Vortex mixer	New	1	550	550
Agriculture	30. Parasitology	30-1 Parasitology	33	Pipette 2-20 µl	New	5	200	1,000
Agriculture	30. Parasitology	30-1 Parasitology	34	Pipette 100-1000 µl	New	5	200	1,000
Agriculture	30. Parasitology	30-1 Parasitology	35	Multichannel Pipettor 5-50 µl (2 x 840)	New	1	1,000	1,000
Agriculture	30. Parasitology	30-1 Parasitology	36	Multichannel Pipettor 50-200 µl (2 x 840)	New	1	1,000	1,000
Agriculture	30. Parasitology	30-1 Parasitology	37	Pipet rack	New	2	100	200
Agriculture	30. Parasitology	30-1 Parasitology	45	Ultrasoud putting table	New	3	150	450
Agriculture	30. Parasitology	30-1 Parasitology	Fu	Chair for student	Fu	40	50	2,000
Agriculture	30. Parasitology	30-2 Academic Staff room (CAAB)	Fu-1	Desk (1500 x 1800) with chair	Fu (New)	4	500	2,000
Agriculture	30. Parasitology	30-2 Academic Staff room (CAAB)	Fu-2	Shelf, large	Fu (New)	4	400	1,600
Agriculture	30. Parasitology	30-2 Academic Staff room (CAAB)	Fu-3	File cabinet	Fu (New)	4	500	2,000
Agriculture	30. Parasitology	30-2 Academic Staff room (CAAB)	Fu-4	Bulletin board	Fu (New)	1	300	300
Agriculture	30. Parasitology	23-3 Research Office (CAAB)	Fu-5	Desk with chair	Fu (New)	2	500	1,000
Agriculture	30. Parasitology	23-3 Research Office (CAAB)	Fu-6	Shelf, large	Fu (New)	1	400	400
Agriculture	30. Parasitology	23-3 Research Office (CAAB)	Fu-7	Bulletin board	Fu (New)	1	300	300
Agriculture								
Agriculture	31. Veterinary Bacteriology and Mycology	31-1 Microbial Culture Room	1	Autoclave	New	1	6,000	6,000
Agriculture	31. Veterinary Bacteriology and Mycology	31-1 Microbial Culture Room	2	Biological safety cabinet	New	1	10,000	10,000
Agriculture	31. Veterinary Bacteriology and Mycology	31-1 Microbial Culture Room	3	Deep freezer	New	1	10,000	10,000

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	31. Veterinary Bacteriology and Mycology	31-1 Microbial Culture Room	4	CO_2 incubator	New	1	12,000	12,000
Agriculture	31. Veterinary Bacteriology and Mycology	31-1 Microbial Culture Room	5	Refrigerated centrifuge	New	1	8,000	8,000
Agriculture	31. Veterinary Bacteriology and Mycology	31-1 Microbial Culture Room	6	Thermal cycler, PCR	New	1	20,000	20,000
Agriculture	31. Veterinary Bacteriology and Mycology	31-1 Microbial Culture Room	7	DNA electrophoresis	New	2	2,000	4,000
Agriculture	31. Veterinary Bacteriology and Mycology	31-1 Microbial Culture Room	8	Gel documentation system	New	1	18,000	18,000
Agriculture	31. Veterinary Bacteriology and Mycology	31-1 Microbial Culture Room	9	Spectrometer	New	1	11,000	11,000
Agriculture	31. Veterinary Bacteriology and Mycology	31-1 Microbial Culture Room	10	Water bath	New	1	3,000	3,000
Agriculture	31. Veterinary Bacteriology and Mycology	31-2 Microbial Molecular Room	11	Analytical balance	new	1	2,200	2,200
Agriculture	31. Veterinary Bacteriology and Mycology	31-2 Microbial Molecular Room	12	Paddle plender	New	1	1,300	1,300
Agriculture	31. Veterinary Bacteriology and Mycology	31-2 Microbial Molecular Room	13	API panel reading	New	1	5,000	5,000
Agriculture	31. Veterinary Bacteriology and Mycology	31-2 Microbial Molecular Room	14	Bacterial identification system	New	1	4,000	4,000
Agriculture	31. Veterinary Bacteriology and Mycology	31-2 Microbial Molecular Room	15	Automated microbiology system	New	1	14,000	14,000
Agriculture	31. Veterinary Bacteriology and Mycology	31-2 Microbial Molecular Room	16	Fungal identification system	New	1	7,000	7,000
Agriculture	31. Veterinary Bacteriology and Mycology	31-2 Microbial Molecular Room	17	Endotoxin measurement device	New	1	5,000	5,000
Agriculture	31. Veterinary Bacteriology and Mycology	31-2 Microbial Molecular Room	18	Microscope	New	3	1,000	3,000
Agriculture	31. Veterinary Bacteriology and Mycology	31-2 Microbial Molecular Room	20	Magnetic stirrer	New	1	500	500
Agriculture	31. Veterinary Bacteriology and Mycology	31-2 Microbial Molecular Room	21	Protein electrophoresis	New	2	1,000	2,000
Agriculture	31. Veterinary Bacteriology and Mycology	31-2 Microbial Molecular Room	22	Sonicator	New	1	2,000	2,000
Agriculture	31. Veterinary Bacteriology and Mycology	31-2 Microbial Molecular Room	23	Chemical storage cabinet	New	1	500	500
Agriculture	31. Veterinary Bacteriology and Mycology	31-2 Microbial Molecular Room	24	Anaerobic chamber	New	1	6,000	6,000

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	31. Veterinary Bacteriology and Mycology	31-2 Microbial Molecular Room	25	Microscope store capinet	New	1	700	700
Agriculture	31. Veterinary Bacteriology and Mycology	31-2 Microbial Molecular Room	26	Refrigerator	New	1	1,000	1,000
Agriculture	31. Veterinary Bacteriology and Mycology	31-2 Microbial Molecular Room	27	Pipettes and suppored racks, set	New	1	2,000	2,000
Agriculture	31. Veterinary Bacteriology and Mycology	31-2 Microbial Molecular Room	28	Chemicals, standard kits, microtubes, microplates, glasswares, multi-dispenser,etc.	New			5,000
Agriculture	31. Veterinary Bacteriology and Mycology	31-3 Academic Staff room (CAAB)	Fu-1	Desk (1500 x 1800) with chair	Fu (New)	4	500	2,000
Agriculture	31. Veterinary Bacteriology and Mycology	31-3 Academic Staff room (CAAB)	Fu-2	Shelf, large	Fu (New)	4	400	1,600
Agriculture	31. Veterinary Bacteriology and Mycology	31-3 Academic Staff room (CAAB)	Fu-3	File cabinet	Fu (New)	4	500	2,000
Agriculture	31. Veterinary Bacteriology and Mycology	31-3 Academic Staff room (CAAB)	Fu-4	Bulletin board	Fu (New)	1	300	300
Agriculture	31. Veterinary Bacteriology and Mycology	31-4 Research Office (CAAB)	Fu-5	Desk with chair	Fu (New)	2	500	1,000
Agriculture	31. Veterinary Bacteriology and Mycology	31-4 Research Office (CAAB)	Fu-6	Shelf, large	Fu (New)	1	400	400
Agriculture	31. Veterinary Bacteriology and Mycology	31-4 Research Office (CAAB)	Fu-7	Bulletin board	Fu (New)	1	300	300
Agriculture								
Agriculture	32. Food Nutrition	32-1 Food Nutrition lab - BioTech wing	1	Bod Pod Body Composition Testing (%fat)	New	1	40,000	40,000
Agriculture	32. Food Nutrition	32-1 Food Nutrition lab - BioTech wing	2	Brookfield LVDV-III ULTRA programmable rheometer	New	1	3,000	3,000
Agriculture	32. Food Nutrition	32-1 Food Nutrition lab - BioTech wing	5	Thomas Model 4 Wiley® Mill	New	1	24480	24,480
Agriculture	32. Food Nutrition	32-1 Food Nutrition lab - BioTech wing	6	HPLC system autosampler	New	1	15,000	15,000
Agriculture	32. Food Nutrition	32-1 Food Nutrition lab - BioTech wing	9	Oil bath	New	1	4500	4,500
Agriculture	32. Food Nutrition	32-1 Food Nutrition lab - BioTech wing	10	Alcohol analyzer	New	1	1000	1,000
Agriculture	32. Food Nutrition	32-1 Food Nutrition lab - BioTech wing	11	Titrator	New	1	6000	6,000
Agriculture	32. Food Nutrition	32-1 Food Nutrition lab - BioTech wing	13	Thermal analyzer	New	1	6,000	6,000
Agriculture	32. Food Nutrition	32-1 Food Nutrition lab - BioTech wing	14	Ultrafreezer	New	1	2,500	2,500
Agriculture	32. Food Nutrition	32-1 Food Nutrition lab - BioTech wing	15	Laboratory water bath	New	2	2500	5,000
Agriculture	32. Food Nutrition	32-1 Food Nutrition lab - BioTech wing	16	Free-Standing Vertical Laminar Flow Hood	New	1	1100	1,100
Agriculture	32. Food Nutrition	32-1 Food Nutrition lab - BioTech wing	17	Tanita bioelectrical impedance analyzer	New	1	4,000	4,000

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	32. Food Nutrition	32-1 Food Nutrition lab - BioTech wing	18	Micro Kjeldahl Digestor Unit, 6-Place	New	1	3,000	3,000
Agriculture	32. Food Nutrition	32-1 Food Nutrition lab - BioTech wing	19	Pipette (0,1 to 1000 µl)	New	10	200	2,000
Agriculture	32. Food Nutrition	32-1 Food Nutrition lab - BioTech wing	20	Rotary evaporator	New	1	4,000	4,000
Agriculture	32. Food Nutrition	32-1 Food Nutrition lab - BioTech wing	21	Mineral testing equipment	New	1	2,500	2,500
Agriculture	32. Food Nutrition	32-1 Food Nutrition lab - BioTech wing	22	Eppendorf Refrigerated Centrifuge	New	1	7,500	7,500
Agriculture	32. Food Nutrition	32-1 Food Nutrition lab - BioTech wing	23	Fisher Scientific Accumet pH Meter	New	1	500	500
Agriculture	32. Food Nutrition	32-1 Food Nutrition lab - BioTech wing	24	Laboratory High Temperature Muffle Furnane	New	1	23,000	23,000
Agriculture	32. Food Nutrition	32-1 Food Nutrition lab - BioTech wing	25	Tube Mill control	New	1	2261	2,261
Agriculture	32. Food Nutrition	32-1 Food Nutrition lab - BioTech wing	26	Bomb calorimeter	New	1	35000	35,000
Agriculture	32. Food Nutrition	32-1 Food Nutrition lab - BioTech wing	27	Ohaus Pioneer Analytical Balance	New	2	1000	2,000
Agriculture	32. Food Nutrition	32-1 Food Nutrition lab - BioTech wing	29	Quincy Lab Oven Model 30GC	New	1	1800	1,800
Agriculture	32. Food Nutrition	32-1 Food Nutrition lab - BioTech wing	30	Moisture analyzers	New	1	1,500	1,500
Agriculture	32. Food Nutrition	32-1 Food Nutrition lab - BioTech wing	31	Spectrophotometer (UV/VIS)	New	1	8000	8,000
Agriculture	32. Food Nutrition	32-1 Food Nutrition lab - BioTech wing	32	Hematocrit Centrifuge with reader	New	1	1,200	1,200
Agriculture	32. Food Nutrition	32-1 Food Nutrition lab - BioTech wing	33	Delta Trac Metabolic Cart	New	1	1,000	1,000
Agriculture	32. Food Nutrition	32-1 Food Nutrition lab - BioTech wing	34	Tallow Analysis and Edible OIl Analysis	New	1	1,000	1,000
Agriculture	32. Food Nutrition	32-1 Food Nutrition lab - BioTech wing	35	Pipette Washer/Dryer	New	1	1,000	1,000
Agriculture	32. Food Nutrition	32-1 Food Nutrition lab - BioTech wing	36	Barnstead laboratory sterilizer autoclave	New	1	5,000	5,000
Agriculture	32. Food Nutrition	32-1 Food Nutrition lab - BioTech wing	39	Electronic balance	New	2	300	600
Agriculture	32. Food Nutrition	32-1 Food Nutrition lab - BioTech wing	40	Lange skinfold calipers	New	3	200	600
Agriculture	32. Food Nutrition	32-1 Food Nutrition lab - BioTech wing	41	RT3 Triaxial activity monitors	New	1	500	500
Agriculture	32. Food Nutrition	32-1 Food Nutrition lab - BioTech wing	43	WNT-500 Series Laboratory Balance	New	2	400	800
Agriculture	32. Food Nutrition	32-1 Food Nutrition lab - BioTech wing	44	Small size full automatic incubator	New	1	2000	2,000
Agriculture	32. Food Nutrition	32-1 Food Nutrition lab - BioTech wing	46	Refractometer	New	2	500	1,000
Agriculture	32. Food Nutrition	32-1 Food Nutrition lab - BioTech wing	48	Mini Mitter activity monitors	New	1	300	300
Agriculture	32. Food Nutrition	32-1 Food Nutrition lab - BioTech wing	49	Soxhlet extractor	New	1	300	300
Agriculture	32. Food Nutrition	32-1 Food Nutrition lab - BioTech wing	50	Guard column	New	1	280	280
Agriculture	32. Food Nutrition	32-1 Food Nutrition lab - BioTech wing	55	Laboratory water purification systems	New	1	4,000	4,000
Agriculture	32. Food Nutrition	32-1 Food Nutrition lab - BioTech wing	58	Refrigerator	New	2	500	1,000
Agriculture	32. Food Nutrition	32-1 Food Nutrition lab - BioTech wing	Fu-1	Office table	Fu	2	250	500
Agriculture	32. Food Nutrition	32-1 Food Nutrition lab - BioTech wing	Fu-2	Chair	Fu	2	120	240
Agriculture	32. Food Nutrition	32-1 Food Nutrition lab - BioTech wing	Fu-3	Black board	Fu	1	100	100
Agriculture	32. Food Nutrition	32-1 Food Nutrition lab - BioTech wing	Fu-4	Lab cabinet	Fu	2	289.5	579
Agriculture	32. Food Nutrition	32-1 Food Nutrition lab - BioTech wing	Fu-5	Chair	Fu	24	100	2,400

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	32. Food Nutrition	32-1 Food Nutrition lab - BioTech wing	Fu-6	Desk (3600 x 1500)	Fu	6	1,000	6,000
Agriculture	32. Food Nutrition	32-1 Food Nutrition lab - BioTech wing	Fu-7	Lab reagent cabinet	Fu	2	250	500
Agriculture	32. Food Nutrition	32-2 Academic Staff room - BioTech wing	Fu-8	Desk (1500 x 1800) with chair	Fu (New)	4	500	2,000
Agriculture	32. Food Nutrition	32-2 Academic Staff room - BioTech wing	Fu-9	Shelf, large	Fu (New)	4	400	1,600
Agriculture	32. Food Nutrition	32-2 Academic Staff room - BioTech wing	Fu-10	File cabinet	Fu (New)	4	500	2,000
Agriculture	32. Food Nutrition	32-2 Academic Staff room - BioTech wing	Fu-11	Bulletin board	Fu (New)	1	300	300
Agriculture								
Agriculture	33. Food Chemistry	33-1 Food Chemistry Lab - BioTech wing	2	UV/Vis/NIR Spectrophotometer	New	1	8,000	8,000
Agriculture	33. Food Chemistry	33-1 Food Chemistry Lab - BioTech wing	3	Freezer (-20, -30, -80^{o}C)	New	3	10,000	30,000
Agriculture	33. Food Chemistry	33-1 Food Chemistry Lab - BioTech wing	4	High performance anion exchange chromatography (HPAEC) with amperometric detector (PAD) and CarboPac PA1 column (Dionex)	New	1	50,000	50,000
Agriculture	33. Food Chemistry	33-1 Food Chemistry Lab - BioTech wing	5	LECO C-H-N analyzer	New	1	30,000	30,000
Agriculture	33. Food Chemistry	33-1 Food Chemistry Lab - BioTech wing	6	Centrifuge with temperature controller	New	1	8,000	8,000
Agriculture	33. Food Chemistry	33-1 Food Chemistry Lab - BioTech wing	7	Oil bath	New	2	5,000	10,000
Agriculture	33. Food Chemistry	33-1 Food Chemistry Lab - BioTech wing	8	Low temperature bath	New	3	5,000	15,000
Agriculture	33. Food Chemistry	33-1 Food Chemistry Lab - BioTech wing	10	Electrophoresis protein 2D (2D-PAGE)	New	1	10,000	10,000
Agriculture	33. Food Chemistry	33-1 Food Chemistry Lab - BioTech wing	11	Artificial digestive system	New	1	20,000	20,000
Agriculture	33. Food Chemistry	33-1 Food Chemistry Lab - BioTech wing	12	Amino acid analyzer	New	1	20,000	20,000
Agriculture	33. Food Chemistry	33-1 Food Chemistry Lab - BioTech wing	13	Ultrasonic cleaning machine	New	1	20,000	20,000
Agriculture	33. Food Chemistry	33-1 Food Chemistry Lab - BioTech wing	14	Small instrument: magnetic mixer, vortex stirrer, pH meter, balance, refractometer…)	New	1	5,000	5,000
Agriculture	33. Food Chemistry	33-1 Food Chemistry Lab - BioTech wing	16	Colorimetter	New	1	10,000	10,000
Agriculture	33. Food Chemistry	33-1 Food Chemistry Lab - BioTech wing	17	Differential scanning calorimeter (DSC)	New	1	12,000	12,000
Agriculture	33. Food Chemistry	33-1 Food Chemistry Lab - BioTech wing	18	Mastersizer laser diffraction instrument	New	1	12,000	12,000
Agriculture	33. Food Chemistry	33-1 Food Chemistry Lab - BioTech wing	19	Fume hood	New	1	5,000	5,000
Agriculture	33. Food Chemistry	33-1 Food Chemistry Lab - BioTech wing	20	Water bath	New	3	2,000	6,000
Agriculture	33. Food Chemistry	33-1 Food Chemistry Lab - BioTech wing	21	Centrifuge (for large tubes)	New	1	10,000	10,000
Agriculture	33. Food Chemistry	33-1 Food Chemistry Lab - BioTech wing	22	Glasswares (bottles, flasks, beaker, funnels ...)	New	1	5,000	5,000

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	33. Food Chemistry	33-1 Food Chemistry Lab - BioTech wing	23	Micropipette 0.1-2.5 ul; 0.5-10 ul; 2-20 ul; 5-50 ul; 10-100 ul; 20-200 ul; 100-1000 ul; 1000-5000 ul	New	20	200	4,000
Agriculture	33. Food Chemistry	33-1 Food Chemistry Lab - BioTech wing	24	Water bath with shaker	New	2	3,000	6,000
Agriculture	33. Food Chemistry	33-1 Food Chemistry Lab - BioTech wing	25	Microcentrifuge (Eppendorf)	New	1	6,000	6,000
Agriculture	33. Food Chemistry	33-1 Food Chemistry Lab - BioTech wing	26	Technical balance	New	3	1,000	3,000
Agriculture	33. Food Chemistry	33-1 Food Chemistry Lab - BioTech wing	27	Water Purification System	New	1	12,000	12,000
Agriculture	33. Food Chemistry	33-1 Food Chemistry Lab - BioTech wing	Fu-1	Laboratory benches (cabinets, shelf)	New	6	2,000	12,000
Agriculture	33. Food Chemistry	33-1 Food Chemistry Lab - BioTech wing	Fu-2	Chair	Fu	24	100	2,400
Agriculture	33. Food Chemistry	33-1 Food Chemistry Lab - BioTech wing	Fu-3	Desk (3600 x 1500)	Fu	6	1,000	6,000
Agriculture	33. Food Chemistry	33-1 Food Chemistry Lab - BioTech wing	Fu-4	Arm chairs	New	2	200	400
Agriculture	33. Food Chemistry	33-1 Food Chemistry Lab - BioTech wing	Fu-5	Laboratory shelves (for glasswares and chemicals)	New	2	1,000	2,000
Agriculture	33. Food Chemistry	33-1 Food Chemistry Lab - BioTech wing	Fu-6	Laboratory glass and plastic storage cabinets	New	2	1,000	2,000
Agriculture	33. Food Chemistry	33-2 Cereal Processing Pilot Plant - BioTech wing	Fu-7	Desk (3600 x 1500)	Fu	3	1,000	3,000
Agriculture	33. Food Chemistry	33-2 Cereal Processing Pilot Plant - BioTech wing	Fu-8	Chair	Fu	24	300	7,200
Agriculture	33. Food Chemistry	33-3 Seminar room 1 - BioTech wing	Fu-7	Chair	Fu (New)	24	100	2,400
Agriculture	33. Food Chemistry	33-3 Seminar room 1 - BioTech wing	Fu-8	Table (for 4 chairs)	Fu (New)	6	500	3,000
Agriculture	33. Food Chemistry	33-3 Seminar room 1 - BioTech wing	Fu-9	Bulletin board	Fu (New)	1	300	300
Agriculture	33. Food Chemistry	33-3 Seminar room 1 - BioTech wing	29	Computer	New	1	500	500
Agriculture	33. Food Chemistry	33-3 Seminar room 1 - BioTech wing	Fu-10	Book shelves	Fu	2	500	1,000
Agriculture	33. Food Chemistry	33-3 Seminar room 1 - BioTech wing	30	LCD projector	New	1	700	700
Agriculture	33. Food Chemistry	33-3 Seminar room 1 - BioTech wing	31	Printer	New	1	200	200
Agriculture	33. Food Chemistry	33-3 Seminar room 1 - BioTech wing	32	Scanner	New	1	200	200
Agriculture								
Agriculture	34. Food Microbiology	34-1 Food Microbiology - BioTech wing	1	Nucleic acid extractor by magnet technology	New	1	40,000	40,000
Agriculture	34. Food Microbiology	34-1 Food Microbiology - BioTech wing	2	Ultra centrifuge (155,000 rpm)	New	1	20,000	20,000
Agriculture	34. Food Microbiology	34-1 Food Microbiology - BioTech wing	6	Phase constrast microscope	New	1	10,000	10,000
Agriculture	34. Food Microbiology	34-1 Food Microbiology - BioTech wing	7	CO_2, NO_2 incubator	New	1	14,000	14,000
Agriculture	34. Food Microbiology	34-1 Food Microbiology - BioTech wing	8	Microplate reader	New	1	35,000	35,000
Agriculture	34. Food Microbiology	34-1 Food Microbiology - BioTech wing	9	Set of micropippete 1000 - 5000 µL	New	10	200	2,000
Agriculture	34. Food Microbiology	34-1 Food Microbiology - BioTech wing	11	Set of micropippete 10 - 1000 µL	New	10	200	2,000
Agriculture	34. Food Microbiology	34-1 Food Microbiology - BioTech wing	12	Autoclave	New	1	10,000	10,000
Agriculture	34. Food Microbiology	34-1 Food Microbiology - BioTech wing	13	Biosafety cabinet	New	1	12,000	12,000
Agriculture	34. Food Microbiology	34-1 Food Microbiology - BioTech wing	14	Refrigerated Incubator (-50°C to 65°C; forced air incubator)	New	1	12,000	12,000

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	34. Food Microbiology	34-1 Food Microbiology - BioTech wing	16	Fume hood	New	1	5,000	5,000
Agriculture	34. Food Microbiology	34-1 Food Microbiology - BioTech wing	17	Incubator (+5 to 80°C; 250 L, forced air incubator)	New	1	10,000	10,000
Agriculture	34. Food Microbiology	34-1 Food Microbiology - BioTech wing	18	Shaking incubator	New	1	10,000	10,000
Agriculture	34. Food Microbiology	34-1 Food Microbiology - BioTech wing	20	Biospectrometer	New	1	8,000	8,000
Agriculture	34. Food Microbiology	34-1 Food Microbiology - BioTech wing	21	Water bath	New	2	4,000	8,000
Agriculture	34. Food Microbiology	34-1 Food Microbiology - BioTech wing	22	UV-Vis Spectrophotometer	New	1	8,000	8,000
Agriculture	34. Food Microbiology	34-1 Food Microbiology - BioTech wing	23	Ultra low temperature freezer	New	1	10,000	10,000
Agriculture	34. Food Microbiology	34-1 Food Microbiology - BioTech wing	24	Automated Cell Counter	New	1	6,500	6,500
Agriculture	34. Food Microbiology	34-1 Food Microbiology - BioTech wing	25	Light microscope	New	4	3,000	12,000
Agriculture	34. Food Microbiology	34-1 Food Microbiology - BioTech wing	26	Denaturing gradient gel electrophoresis system	New	1	6,000	6,000
Agriculture	34. Food Microbiology	34-1 Food Microbiology - BioTech wing	28	Micro refrigerated centrifuge	New	1	8,000	8,000
Agriculture	34. Food Microbiology	34-1 Food Microbiology - BioTech wing	29	Stomacher	New	1	6,000	6,000
Agriculture	34. Food Microbiology	34-1 Food Microbiology - BioTech wing	30	Elisa reader	New	1	11,000	11,000
Agriculture	34. Food Microbiology	34-1 Food Microbiology - BioTech wing	31	UV chamber	New	1	10,000	10,000
Agriculture	34. Food Microbiology	34-1 Food Microbiology - BioTech wing	32	Set of micropippete 0.1- 10 µL	New	10	200	2,000
Agriculture	34. Food Microbiology	34-1 Food Microbiology - BioTech wing	33	Simple laboratory apparatus, glassware	New	1	5,000	5,000
Agriculture	34. Food Microbiology	34-1 Food Microbiology - BioTech wing	34	Benchtop open air shaker	New	2	4,300	8,600
Agriculture	34. Food Microbiology	34-1 Food Microbiology - BioTech wing	35	Laminar flow clean benches	New	1	8,000	8,000
Agriculture	34. Food Microbiology	34-1 Food Microbiology - BioTech wing	36	Oven	New	2	4,000	8,000
Agriculture	34. Food Microbiology	34-1 Food Microbiology - BioTech wing	37	Multi vortex	New	2	4,000	8,000
Agriculture	34. Food Microbiology	34-1 Food Microbiology - BioTech wing	38	Flake ice maker	New	1	7,000	7,000
Agriculture	34. Food Microbiology	34-1 Food Microbiology - BioTech wing	40	High speed magnetic stirrer	New	2	1,500	3,000
Agriculture	34. Food Microbiology	34-1 Food Microbiology - BioTech wing	41	Automatic water distillation apparatus	New	1	6,000	6,000
Agriculture	34. Food Microbiology	34-1 Food Microbiology - BioTech wing	43	Suspension turbidity detector	New	1	4,200	4,200
Agriculture	34. Food Microbiology	34-1 Food Microbiology - BioTech wing	44	Transilluminator	New	1	4,000	4,000
Agriculture	34. Food Microbiology	34-1 Food Microbiology - BioTech wing	45	Magnetic stirrers	New	2	1,000	2,000
Agriculture	34. Food Microbiology	34-1 Food Microbiology - BioTech wing	46	Media Sterilizer	New	1	3,000	3,000
Agriculture	34. Food Microbiology	34-1 Food Microbiology - BioTech wing	47	Ultra sonic bath	New	1	3,000	3,000
Agriculture	34. Food Microbiology	34-1 Food Microbiology - BioTech wing	48	Personal Vortex	New	4	500	2,000
Agriculture	34. Food Microbiology	34-1 Food Microbiology - BioTech wing	49	Refrigerator	New	1	1,500	1,500
Agriculture	34. Food Microbiology	34-1 Food Microbiology - BioTech wing	50	Electronic dispensing system	New	1	1,000	1,000
Agriculture	34. Food Microbiology	34-1 Food Microbiology - BioTech wing	Fu-1	Working table	Fu	1	200	200
Agriculture	34. Food Microbiology	34-1 Food Microbiology - BioTech wing	Fu-2	Shelve	Fu	2	500	1,000
Agriculture	34. Food Microbiology	34-1 Food Microbiology - BioTech wing	Fu-3	Chair	Fu	24	100	2,400
Agriculture	34. Food Microbiology	34-1 Food Microbiology - BioTech wing	Fu-4	Desk (3600 x 1500)	Fu	6	1,000	6,000
Agriculture	34. Food Microbiology	34-2 Food Microbiology Basic Lab - BioTech wing	Fu-5	Chair	Fu	24	100	2,400

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	34. Food Microbiology	34-2 Food Microbiology Basic Lab - BioTech wing	Fu-6	Desk (3600 x 1500)	Fu	3	1,000	3,000
Agriculture	34. Food Microbiology	34-3 FM Preparation Lab - BioTech wing	51	Biomedical Refrigerator (730L)	New	1	5,000	5,000
Agriculture	34. Food Microbiology	34-3 FM Preparation Lab - BioTech wing	Fu-7	Tools (blender, oven, hot and cool water)	New	1	10,000	10,000
Agriculture	34. Food Microbiology	34-3 FM Preparation Lab - BioTech wing	52	Scale	New	1	500	500
Agriculture	34. Food Microbiology	34-4 Academic Staff room - BioTech wing	Fu-8	Desk (1500 x 1800) with chair	Fu (New)	4	500	2,000
Agriculture	34. Food Microbiology	34-4 Academic Staff room - BioTech wing	Fu-9	Shelf, large	Fu (New)	4	400	1,600
Agriculture	34. Food Microbiology	34-4 Academic Staff room - BioTech wing	Fu-10	File cabinet	Fu (New)	4	500	2,000
Agriculture	34. Food Microbiology	34-4 Academic Staff room - BioTech wing	Fu-11	Bulletin board	Fu (New)	1	300	300
Agriculture	34. Food Microbiology	34-5 Research Office - BioTech wing	Fu-12	Desk with chair	Fu (New)	12	500	6,000
Agriculture	34. Food Microbiology	34-5 Research Office - BioTech wing	Fu-13	Shelf, large	Fu (New)	4	400	1,600
Agriculture	34. Food Microbiology	34-5 Research Office - BioTech wing	Fu-14	Bulletin board	Fu (New)	1	300	300
Agriculture	34. Food Microbiology	34-6 Department head office - BioTech wing	Fu-15	Desk (1500 x 1800) with chair	Fu (New)	1	400	400
Agriculture	34. Food Microbiology	34-6 Department head office - BioTech wing	Fu-16	Shelf, large	Fu (New)	2	400	800
Agriculture	34. Food Microbiology	34-6 Department head office - BioTech wing	Fu-17	File cabinet	Fu (New)	2	400	800
Agriculture								
Agriculture	35. Food Technology	35-1 Food Technology Lab - BioTech wing	2	Freeze dryer	New	1	20,000	20,000
Agriculture	35. Food Technology	35-1 Food Technology Lab - BioTech wing	4	Low temperature bath	New	1	10,000	10,000
Agriculture	35. Food Technology	35-1 Food Technology Lab - BioTech wing	6	Electronic balance	New	2	2,000	4,000
Agriculture	35. Food Technology	35-1 Food Technology Lab - BioTech wing	7	Vacuum mincer	New	1	20,000	20,000
Agriculture	35. Food Technology	35-1 Food Technology Lab - BioTech wing	8	Vacuum mixer	New	1	20,000	20,000
Agriculture	35. Food Technology	35-1 Food Technology Lab - BioTech wing	9	Combined microwave-air dryer	New	1	15,000	15,000
Agriculture	35. Food Technology	35-1 Food Technology Lab - BioTech wing	10	Oil bath	New	2	5,000	10,000
Agriculture	35. Food Technology	35-1 Food Technology Lab - BioTech wing	11	Tray dryer	New	1	10,000	10,000
Agriculture	35. Food Technology	35-1 Food Technology Lab - BioTech wing	12	Vaccum tumbler	New	1	10,000	10,000
Agriculture	35. Food Technology	35-1 Food Technology Lab - BioTech wing	13	Vacuum fryer	New	1	10,000	10,000
Agriculture	35. Food Technology	35-1 Food Technology Lab - BioTech wing	14	Wet grinder	New	1	10,000	10,000
Agriculture	35. Food Technology	35-1 Food Technology Lab - BioTech wing	15	Water bath	New	2	2,000	4,000
Agriculture	35. Food Technology	35-1 Food Technology Lab - BioTech wing	16	Forced Air Vacuum Ovens	New	1	6,000	6,000
Agriculture	35. Food Technology	35-1 Food Technology Lab - BioTech wing	17	pH meter	New	2	1,000	2,000
Agriculture	35. Food Technology	35-1 Food Technology Lab - BioTech wing	Fu-1	Chair	Fu	24	100	2,400
Agriculture	35. Food Technology	35-1 Food Technology Lab - BioTech wing	Fu-2	Desk (3600 x 1500)	Fu	6	1,000	6,000

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	35. Food Technology	35-2 Food Technology Basic Lab - BioTech wing	Fu-3	Chair	Fu	24	100	2,400
Agriculture	35. Food Technology	35-2 Food Technology Basic Lab - BioTech wing	Fu-4	Desk (3600 x 1500)	Fu	3	1,000	3,000
Agriculture	35. Food Technology	35-2 Food Technology Basic Lab - BioTech wing	18	Glasswares (bottles, flasks, beaker, petri disk....)	New	1	5,000	5,000
Agriculture	35. Food Technology	35-2 Food Technology Basic Lab - BioTech wing	20	Whiteness meter	New	1	10,000	10,000
Agriculture	35. Food Technology	35-2 Food Technology Basic Lab - BioTech wing	21	Colorimeter	New	1	10,000	10,000
Agriculture	35. Food Technology	35-2 Food Technology Basic Lab - BioTech wing	22	Spectrophotometer (110-10.000 nm)	New	1	7,000	7,000
Agriculture	35. Food Technology	35-2 Food Technology Basic Lab - BioTech wing	23	Moisture Analyzers	New	2	2,000	4,000
Agriculture	35. Food Technology	35-2 Food Technology Basic Lab - BioTech wing	24	Spectrophotometer VIS	New	1	8,000	8,000
Agriculture	35. Food Technology	35-2 Food Technology Basic Lab - BioTech wing	25	Refractometer	New	2	500	1,000
Agriculture	35. Food Technology	35-2 Food Technology Basic Lab - BioTech wing	26	Scale	New	1	500	500
Agriculture	35. Food Technology	35-2 Food Technology Basic Lab - BioTech wing	27	Soxhlet Extraction Apparatus 250mL/500 mL	New	2	550	1,100
Agriculture	35. Food Technology	35-3 FT Preparation Lab - BioTech wing	28	Biomedical Refrigerator (730L)	New	1	5,000	5,000
Agriculture	35. Food Technology	35-3 FT Preparation Lab - BioTech wing	Fu-5	Tools (blender, oven, hot and cool water)	New	1	10,000	10,000
Agriculture	35. Food Technology	35-3 FT Preparation Lab - BioTech wing	Fu-6	Scale	New	1	500	500
Agriculture	35. Food Technology	35-3 FT Preparation Lab - BioTech wing	Fu-7	Cabinet	New	2	100	200
Agriculture	35. Food Technology	35-4 Sensory Evaluation room - BioTech wing	Fu-8	Sensory evaluation cabin and chair	New	10	500	5,000
Agriculture	35. Food Technology	35-4 Sensory Evaluation room - BioTech wing	Fu-9	Desk (3600 x 1500)	Fu	2	1,000	2,000
Agriculture	35. Food Technology	35-4 Sensory Evaluation room - BioTech wing	Fu-10	Chair	Fu	20	100	2,000
Agriculture	35. Food Technology	35-4 Sensory Evaluation room - BioTech wing	29	Biomedical Refrigerator (340L, 2°C to 14°C)	New	1	3,000	3,000
Agriculture	35. Food Technology	35-5 Cooling/Frozen Storage Room	30	Biomedical Refrigerator (728L, 2°C to 14°C)	New	2	5,000	10,000
Agriculture	35. Food Technology	35-5 Cooling/Frozen Storage Room	31	Freezer -25°C, -40 °C, -80 °C (728 L, each)	New	3	10,000	30,000
Agriculture	35. Food Technology	35-6 Fish & Meat Processing Pilot Plant - BioTech wing	Fu-11	Desk (3600 x 1500)	Fu	3	1,000	3,000
Agriculture	35. Food Technology	35-6 Fish & Meat Processing Pilot Plant - BioTech wing	Fu-12	Chair	Fu	24	300	7,200
Agriculture	35. Food Technology	35-7 Beverage Processing Pilot Plant - BioTech wing	Fu-13	Desk (3600 x 1500)	Fu	3	1,000	3,000
Agriculture	35. Food Technology	35-7 Beverage Processing Pilot Plant - BioTech wing	Fu-14	Chair	Fu	24	300	7,200
Agriculture	35. Food Technology	35-8 Academic Staff room - BioTech wing	Fu-15	Desk (1500 x 1800) with chair	Fu (New)	4	500	2,000

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	35. Food Technology	35-8 Academic Staff room - BioTech wing	Fu-16	Shelf, large	Fu (New)	4	400	1,600
Agriculture	35. Food Technology	35-8 Academic Staff room - BioTech wing	Fu-17	File cabinet	Fu (New)	4	500	2,000
Agriculture	35. Food Technology	35-8 Academic Staff room - BioTech wing	Fu-18	Bulletin board	Fu (New)	1	300	300
Agriculture								
Agriculture	36. Postharvest Technology	36-1 Postharvest Technology Lab - BioTech wing	2	GC-ECD	New	1	50,000	50,000
Agriculture	36. Postharvest Technology	36-1 Postharvest Technology Lab - BioTech wing	4	Freezer -25°C, -40 °C	New	2	10,000	20,000
Agriculture	36. Postharvest Technology	36-1 Postharvest Technology Lab - BioTech wing	6	Spectrofluorometer	New	1	20,000	20,000
Agriculture	36. Postharvest Technology	36-1 Postharvest Technology Lab - BioTech wing	7	Spectrophotometer, UV-VIS	New	1	8,000	8,000
Agriculture	36. Postharvest Technology	36-1 Postharvest Technology Lab - BioTech wing	8	Colorimeter	New	1	10,000	10,000
Agriculture	36. Postharvest Technology	36-1 Postharvest Technology Lab - BioTech wing	9	Tenderometer for measuring texture of foods	New	1	15,000	15,000
Agriculture	36. Postharvest Technology	36-1 Postharvest Technology Lab - BioTech wing	11	Automatic titrator	New	1	10,000	10,000
Agriculture	36. Postharvest Technology	36-1 Postharvest Technology Lab - BioTech wing	13	Vacuum food packaging unit	New	1	10,000	10,000
Agriculture	36. Postharvest Technology	36-1 Postharvest Technology Lab - BioTech wing	14	Microcentrifuge	New	1	8,000	8,000
Agriculture	36. Postharvest Technology	36-1 Postharvest Technology Lab - BioTech wing	15	Centrifuge	New	1	8,000	8,000
Agriculture	36. Postharvest Technology	36-1 Postharvest Technology Lab - BioTech wing	16	Gas mixer and controller (oxygen, carbonic, nitrogen, ethylen, vapour)	New	1	10,000	10,000
Agriculture	36. Postharvest Technology	36-1 Postharvest Technology Lab - BioTech wing	17	Glasswares (bottles, flasks, beaker, petri disk....)	New	1	5,000	5,000
Agriculture	36. Postharvest Technology	36-1 Postharvest Technology Lab - BioTech wing	18	Water bath	New	2	2,000	4,000
Agriculture	36. Postharvest Technology	36-1 Postharvest Technology Lab - BioTech wing	19	Respirator (oxygen and carbon dioxide measurement)	New	1	5,000	5,000
Agriculture	36. Postharvest Technology	36-1 Postharvest Technology Lab - BioTech wing	20	Wireless datalogger (oxygen, carbonic, nitrogen, temperature)	New	1	5,000	5,000
Agriculture	36. Postharvest Technology	36-1 Postharvest Technology Lab - BioTech wing	21	Small instrument: magnetic mixer, vortex stirrer, pH meter)	New	1	5,000	5,000
Agriculture	36. Postharvest Technology	36-1 Postharvest Technology Lab - BioTech wing	22	Analytical balance	New	2	2,000	4,000
Agriculture	36. Postharvest Technology	36-1 Postharvest Technology Lab - BioTech wing	23	Laboratory balance	New	2	1,000	2,000
Agriculture	36. Postharvest Technology	36-1 Postharvest Technology Lab - BioTech wing	24	Micropipette 0.1-2.5 ul; 0.5-10 ul; 2-20 ul; 5-50 ul; 10-100 ul; 20-200 ul; 100-1000 ul; 1000-5000 ul	New	20	200	4,000
Agriculture	36. Postharvest Technology	36-1 Postharvest Technology Lab - BioTech wing	26	Clarck cell electrode for measurement of dissolved oxygen in solutions	New	1	1,000	1,000
Agriculture	36. Postharvest Technology	36-1 Postharvest Technology Lab - BioTech wing	27	Oxygen/carbon dioxide monitoring in air	New	1	1,000	1,000
Agriculture	36. Postharvest Technology	36-1 Postharvest Technology Lab - BioTech wing	28	Refractometer	New	2	500	1,000

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	36. Postharvest Technology	36-1 Postharvest Technology Lab - BioTech wing	30	Dryer (for drying lab-ware)	New	2	2,000	4,000
Agriculture	36. Postharvest Technology	36-1 Postharvest Technology Lab - BioTech wing	31	Washing machine (for washing glassware)	New	1	1,000	1,000
Agriculture	36. Postharvest Technology	36-1 Postharvest Technology Lab - BioTech wing	Fu-1	Cabinet (for chemicals storage)	New	2	500	1,000
Agriculture	36. Postharvest Technology	36-1 Postharvest Technology Lab - BioTech wing	Fu-2	Desk (3600 x 1500)	Fu	6	1,000	6,000
Agriculture	36. Postharvest Technology	36-1 Postharvest Technology Lab - BioTech wing	Fu-3	Shelve	Fu	6	500	3,000
Agriculture	36. Postharvest Technology	36-1 Postharvest Technology Lab - BioTech wing	Fu-4	Chair	Fu	24	300	7,200
Agriculture	36. Postharvest Technology	36-2 Postharvest Technology Basic Lab - BioTech wing	Fu-5	Desk (3600 x 1500)	Fu	3	1,000	3,000
Agriculture	36. Postharvest Technology	36-2 Postharvest Technology Basic Lab - BioTech wing	Fu-6	Shelve	Fu	6	500	3,000
Agriculture	36. Postharvest Technology	36-2 Postharvest Technology Basic Lab - BioTech wing	Fu-7	Chair	Fu	24	300	7,200
Agriculture	36. Postharvest Technology	36-3 Postharvest Preparation Lab - BioTech wing	32	Biomedical Refrigerator (730L)	New	1	5,000	5,000
Agriculture	36. Postharvest Technology	36-3 Postharvest Preparation Lab - BioTech wing	33	Tools (blender, oven, hot and cool water)	New	1	10,000	10,000
Agriculture	36. Postharvest Technology	36-3 Postharvest Preparation Lab - BioTech wing	34	Desk (3600 x 1500)	New	2	1,000	2,000
Agriculture	36. Postharvest Technology	36-3 Postharvest Preparation Lab - BioTech wing	35	Scale	New	1	500	500
Agriculture	36. Postharvest Technology	36-4 Post Harvest Technology Pilot Plant	Fu-10	Desk (3600 x 1500)	Fu	3	1,000	3,000
Agriculture	36. Postharvest Technology	36-4 Post Harvest Technology Pilot Plant	Fu-11	Chair	Fu	24	300	7,200
Agriculture	36. Postharvest Technology	36-4 Post Harvest Technology Pilot Plant	33	Cool store system 0-20^{o}C, 30 m^{3} each	New	4	15,000	60,000
Agriculture	36. Postharvest Technology	36-4 Post Harvest Technology Pilot Plant	34	Refractance Window drying system	New	1	75,000	75,000
Agriculture	36. Postharvest Technology	36-4 Post Harvest Technology Pilot Plant	35	Biomedical Refrigerator (730L)	New	1	5,000	5,000
Agriculture	36. Postharvest Technology	36-5 Academic Staff room - BioTech wing	Fu-12	Desk (1500 x 1800) with chair	Fu (New)	4	500	2,000
Agriculture	36. Postharvest Technology	36-5 Academic Staff room - BioTech wing	Fu-13	Shelf, large	Fu (New)	4	400	1,600
Agriculture	36. Postharvest Technology	36-5 Academic Staff room - BioTech wing	Fu-14	File cabinet	Fu (New)	4	500	2,000
Agriculture	36. Postharvest Technology	36-5 Academic Staff room - BioTech wing	Fu-15	Bulletin board	Fu (New)	1	300	300
Agriculture	36. Postharvest Technology	36-6 Research Office - BioTech wing	Fu-16	Desk with chair	Fu (New)	12	500	6,000
Agriculture	36. Postharvest Technology	36-6 Research Office - BioTech wing	Fu-17	Shelf, large	Fu (New)	4	400	1,600
Agriculture	36. Postharvest Technology	36-6 Research Office - BioTech wing	Fu-18	Bulletin board	Fu (New)	1	300	300

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	36. Postharvest Technology	36-7 Administration Office - BioTech wing	Fu-19	Desk (1500 x 1800) with chair	Fu (New)	4	500	2,000
Agriculture	36. Postharvest Technology	36-7 Administration Office - BioTech wing	Fu-20	File cabinet	Fu (New)	4	500	2,000
Agriculture	36. Postharvest Technology	36-7 Administration Office - BioTech wing	Fu-21	Bulletin board	Fu (New)	2	300	600
Agriculture	36. Postharvest Technology	36-7 Administration Office - BioTech wing	Fu-22	Shelf, large	Fu (New)	4	400	1,600
Agriculture								
Agriculture	37. Food Process Engineering	37-1 Food Engineering Lab - BioTech wing	2	Heat pump dryer	New	1	35,000	35,000
Agriculture	37. Food Process Engineering	37-1 Food Engineering Lab - BioTech wing	4	Membrane Separation Unit	New	1	30,000	30,000
Agriculture	37. Food Process Engineering	37-1 Food Engineering Lab - BioTech wing	5	Modular evaporator series (laboratory)	New	1	10,000	10,000
Agriculture	37. Food Process Engineering	37-1 Food Engineering Lab - BioTech wing	7	Filter press (laboratory)	New	1	20,000	20,000
Agriculture	37. Food Process Engineering	37-1 Food Engineering Lab - BioTech wing	8	Reverse osmosis/Ultrafiltration unit	New	1	20,000	20,000
Agriculture	37. Food Process Engineering	37-1 Food Engineering Lab - BioTech wing	9	Vapour compression refrigeration unit	New	1	20,000	20,000
Agriculture	37. Food Process Engineering	37-1 Food Engineering Lab - BioTech wing	10	Distillation Engineering Teaching equipment	New	1	10,000	10,000
Agriculture	37. Food Process Engineering	37-1 Food Engineering Lab - BioTech wing	11	Dryer connected with computer (laboratory)	New	1	10,000	10,000
Agriculture	37. Food Process Engineering	37-1 Food Engineering Lab - BioTech wing	12	Oil extraction unit	New	1	10,000	10,000
Agriculture	37. Food Process Engineering	37-1 Food Engineering Lab - BioTech wing	13	Plate centrifuge	New	1	10,000	10,000
Agriculture	37. Food Process Engineering	37-1 Food Engineering Lab - BioTech wing	14	Multiple processing machine	New	1	5,000	5,000
Agriculture	37. Food Process Engineering	37-1 Food Engineering Lab - BioTech wing	15	Stainless Steel Table (1.2x2.4m)	Fu	4	1,000	4,000
Agriculture	37. Food Process Engineering	37-1 Food Engineering Lab - BioTech wing	16	Desk (1500 x 1800) with chair	Fu	2	500	1,000
Agriculture	37. Food Process Engineering	37-1 Food Engineering Lab - BioTech wing	18	Lab chair	Fu	20	100	2,000
Agriculture	37. Food Process Engineering	37-1 Food Engineering Lab - BioTech wing	19	Material Cabinet	Fu	2	500	1,000

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	37. Food Process Engineering	37-1 Food Engineering Lab - BioTech wing	20	Office cabinet	Fu	2	500	1,000
Agriculture	37. Food Process Engineering	37-2 Food Engineering Basic Lab - BioTech wing	21	Electronic nose	New	1	30,000	30,000
Agriculture	37. Food Process Engineering	37-2 Food Engineering Basic Lab - BioTech wing	22	Sensors (CO_2, O_2, force, humidity, DO, conductivity, pH, pressure, temperature...)	New	1	15,000	15,000
Agriculture	37. Food Process Engineering	37-2 Food Engineering Basic Lab - BioTech wing	23	Data logger (multiple chanels)	New	2	5,000	10,000
Agriculture	37. Food Process Engineering	37-2 Food Engineering Basic Lab - BioTech wing	24	Desktop Microwave Meter	New	1	25,000	25,000
Agriculture	37. Food Process Engineering	37-2 Food Engineering Basic Lab - BioTech wing	25	Brabender Amylograph	New	1	25,000	25,000
Agriculture	37. Food Process Engineering	37-2 Food Engineering Basic Lab - BioTech wing	26	Diffusion coeffiecient measurement unit	New	1	20,000	20,000
Agriculture	37. Food Process Engineering	37-2 Food Engineering Basic Lab - BioTech wing	27	Small instrument: magnetic mixer, vortex stirrer, pH meter, balance, refractometer…)	New	1	5,000	5,000
Agriculture	37. Food Process Engineering	37-2 Food Engineering Basic Lab - BioTech wing	28	Water activity checker	New	1	5,000	5,000
Agriculture	37. Food Process Engineering	37-2 Food Engineering Basic Lab - BioTech wing	29	Low temperature bath	New	3	5,000	15,000
Agriculture	37. Food Process Engineering	37-2 Food Engineering Basic Lab - BioTech wing	30	Thermo imaging camera	New	1	12,000	12,000
Agriculture	37. Food Process Engineering	37-2 Food Engineering Basic Lab - BioTech wing	31	Differential scanning calorimeter (DSC)	New	1	12,000	12,000
Agriculture	37. Food Process Engineering	37-2 Food Engineering Basic Lab - BioTech wing	32	Fiber optical temperature sensor and dataloger	New	1	10,000	10,000
Agriculture	37. Food Process Engineering	37-2 Food Engineering Basic Lab - BioTech wing	33	Freezer	New	1	10,000	10,000
Agriculture	37. Food Process Engineering	37-2 Food Engineering Basic Lab - BioTech wing	34	Oil bath	New	1	5,000	5,000
Agriculture	37. Food Process Engineering	37-2 Food Engineering Basic Lab - BioTech wing	36	Water bath	New	3	2,000	6,000
Agriculture	37. Food Process Engineering	37-2 Food Engineering Basic Lab - BioTech wing	37	Wireless high temperature and pressure recorder	New	5	2,000	10,000
Agriculture	37. Food Process Engineering	37-2 Food Engineering Basic Lab - BioTech wing	38	Constant Temperature Liquid Circulating Baths	New	3	2,000	6,000
Agriculture	37. Food Process Engineering	37-2 Food Engineering Basic Lab - BioTech wing	39	Chemical Metering Systems	New	3	1,000	3,000

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	37. Food Process Engineering	37-2 Food Engineering Basic Lab - BioTech wing	40	Dielectric property determinator	New	1	5,000	5,000
Agriculture	37. Food Process Engineering	37-2 Food Engineering Basic Lab - BioTech wing	41	High temperature pressure sensor	New	5	1,000	5,000
Agriculture	37. Food Process Engineering	37-2 Food Engineering Basic Lab - BioTech wing	42	Peristaltic Pumps & motor	New	5	1,000	5,000
Agriculture	37. Food Process Engineering	37-2 Food Engineering Basic Lab - BioTech wing	43	Technical balance	New	3	1,000	3,000
Agriculture	37. Food Process Engineering	37-2 Food Engineering Basic Lab - BioTech wing	44	Temperature sensor (thermocouple, RTD, ..)	New	1	5,000	5,000
Agriculture	37. Food Process Engineering	37-2 Food Engineering Basic Lab - BioTech wing	45	Viscometer (Vibration method)	New	1	10,000	10,000
Agriculture	37. Food Process Engineering	37-2 Food Engineering Basic Lab - BioTech wing	Fu-1	Desk with chair	Fu	2	500	1,000
Agriculture	37. Food Process Engineering	37-2 Food Engineering Basic Lab - BioTech wing	Fu-2	Stainless Steel Table (1.2x2.4m)	Fu	5	1,000	5,000
Agriculture	37. Food Process Engineering	37-2 Food Engineering Basic Lab - BioTech wing	Fu-3	Lab chair	Fu	30	100	3,000
Agriculture	37. Food Process Engineering	37-2 Food Engineering Basic Lab - BioTech wing	Fu-4	Material Cabinet	Fu	2	500	1,000
Agriculture	37. Food Process Engineering	37-2 Food Engineering Basic Lab - BioTech wing	Fu-5	Cabinet	Fu	4	500	2,000
Agriculture	37. Food Process Engineering	37-3 Computer room - BioTech wing	50	Computer	New	24	500	12,000
Agriculture	37. Food Process Engineering	37-3 Computer room - BioTech wing	Fu-6	Desk with chair	Fu	25	500	12,500
Agriculture	37. Food Process Engineering	37-3 Computer room - BioTech wing	Fu-7	White board	Fu	1	300	300
Agriculture	37. Food Process Engineering	37-4 Preparation Room - BioTech wing	56	Technical balance	New	2	1,000	2,000
Agriculture	37. Food Process Engineering	37-4 Preparation Room - BioTech wing	57	Glasswares (bottles, flasks, beaker..)	New	1	5,000	5,000
Agriculture	37. Food Process Engineering	37-4 Preparation Room - BioTech wing	58	Sensor, controller and calibrator (Temperature and Humidity)	New	1	5,000	5,000
Agriculture	37. Food Process Engineering	37-4 Preparation Room - BioTech wing	Fu-1	Office table	Fu	2	1,000	2,000
Agriculture	37. Food Process Engineering	37-4 Preparation Room - BioTech wing	Fu-2	Office chair	Fu	2	500	1,000
Agriculture	37. Food Process Engineering	37-4 Preparation Room - BioTech wing	Fu-3	Stainless Steel Table (1.2x2.4m)	Fu	1	1,000	1,000

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	37. Food Process Engineering	37-4 Preparation Room - BioTech wing	Fu-4	Lab chair	Fu	4	100	400
Agriculture	37. Food Process Engineering	37-4 Preparation Room - BioTech wing	Fu-5	Material Cabinet	Fu	2	500	1,000
Agriculture	37. Food Process Engineering	37-4 Preparation Room - BioTech wing	Fu-6	Office Cabinet	Fu	2	500	1,000
Agriculture	37. Food Process Engineering	37-5 Academic Staff room - BioTech wing	Fu-7	Desk (1500 x 1800) with chair	Fu (New)	4	500	2,000
Agriculture	37. Food Process Engineering	37-5 Academic Staff room - BioTech wing	Fu-8	Shelf, large	Fu (New)	4	400	1,600
Agriculture	37. Food Process Engineering	37-5 Academic Staff room - BioTech wing	Fu-9	File cabinet	Fu (New)	4	500	2,000
Agriculture	37. Food Process Engineering	37-5 Academic Staff room - BioTech wing	Fu-10	Bulletin board	Fu (New)	1	300	300
Agriculture								
Agriculture	38. Food Biotechnology	38-1 Food Biotechnology - BioTech wing	1	LC/MS (AB SCIEX TOF/TOF5800)	New	1	75,000	75,000
Agriculture	38. Food Biotechnology	38-1 Food Biotechnology - BioTech wing	4	Autoclave	New	1	10,000	10,000
Agriculture	38. Food Biotechnology	38-1 Food Biotechnology - BioTech wing	5	Portable Autoclave (for "sterilize in place (SIP) processes")	New	1	10,000	10,000
Agriculture	38. Food Biotechnology	38-1 Food Biotechnology - BioTech wing	6	Shaking Water Bath	New	1	8,000	8,000
Agriculture	38. Food Biotechnology	38-1 Food Biotechnology - BioTech wing	7	Water Bath	New	3	2,500	7,500
Agriculture	38. Food Biotechnology	38-1 Food Biotechnology - BioTech wing	8	Hot Plate/Magnetic Stirrer	New	2	1,000	2,000
Agriculture	38. Food Biotechnology	38-1 Food Biotechnology - BioTech wing	9	Protein Vertical Electrophoresis System - Mini	New	1	15,000	15,000
Agriculture	38. Food Biotechnology	38-1 Food Biotechnology - BioTech wing	10	Process Controlled Bioreactor 5-10 liter	New	1	15,000	15,000
Agriculture	38. Food Biotechnology	38-1 Food Biotechnology - BioTech wing	12	Carbon Dioxide Incubator	Ex	1		
Agriculture	38. Food Biotechnology	38-1 Food Biotechnology - BioTech wing	13	Incubator	New	1	10,000	10,000
Agriculture	38. Food Biotechnology	38-1 Food Biotechnology - BioTech wing	14	Centrifuge, Digital-13000 RPM	New	1	10,000	10,000
Agriculture	38. Food Biotechnology	38-1 Food Biotechnology - BioTech wing	20	UV Transilluminator	New	1	10,000	10,000
Agriculture	38. Food Biotechnology	38-1 Food Biotechnology - BioTech wing	21	Protein Blotter	New	1	10,000	10,000
Agriculture	38. Food Biotechnology	38-1 Food Biotechnology - BioTech wing	22	Microarray	New	1	10,000	10,000
Agriculture	38. Food Biotechnology	38-1 Food Biotechnology - BioTech wing	24	Microscope	New	1	10,000	10,000
Agriculture	38. Food Biotechnology	38-1 Food Biotechnology - BioTech wing	25	UV Visible Spectrophotometer	New	1	10,000	10,000
Agriculture	38. Food Biotechnology	38-1 Food Biotechnology - BioTech wing	26	Magnetic Stirrer	New	2	1,000	2,000
Agriculture	38. Food Biotechnology	38-1 Food Biotechnology - BioTech wing	27	pH Meter, Digital, Delux	New	2	3,000	6,000
Agriculture	38. Food Biotechnology	38-1 Food Biotechnology - BioTech wing	29	Biosafety Cabinet	New	1	2,000	2,000
Agriculture	38. Food Biotechnology	38-1 Food Biotechnology - BioTech wing	30	Analytical Balance	New	2	3,000	6,000
Agriculture	38. Food Biotechnology	38-1 Food Biotechnology - BioTech wing	31	Protein Gel Box	New	2	2,000	4,000
Agriculture	38. Food Biotechnology	38-1 Food Biotechnology - BioTech wing	32	Shaking Incubator	New	1	5,000	5,000

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	38. Food Biotechnology	38-1 Food Biotechnology - BioTech wing	35	Microtiter Plate Reader	New	1	5,000	5,000
Agriculture	38. Food Biotechnology	38-1 Food Biotechnology - BioTech wing	36	Pipette (0ul to 10ul or 20ul; 20ul to 100ul; and 100ul to 1000ul)	New	10	200	2,000
Agriculture	38. Food Biotechnology	38-1 Food Biotechnology - BioTech wing	37	DNA Gel Box	New	2	2,000	4,000
Agriculture	38. Food Biotechnology	38-1 Food Biotechnology - BioTech wing	39	Ultrasonic machine	New	1	2,000	2,000
Agriculture	38. Food Biotechnology	38-1 Food Biotechnology - BioTech wing	40	Refrigerator	New	3	1,000	3,000
Agriculture	38. Food Biotechnology	38-1 Food Biotechnology - BioTech wing	41	Triple Beam Balance	New	1	3,000	3,000
Agriculture	38. Food Biotechnology	38-2 Academic Staff room - BioTech wing	Fu-1	Desk with chair	Fu (New)	4	500	2,000
Agriculture	38. Food Biotechnology	38-2 Academic Staff room - BioTech wing	Fu-2	Shelf, large	Fu (New)	4	400	1,600
Agriculture	38. Food Biotechnology	38-2 Academic Staff room - BioTech wing	Fu-3	File cabinet	Fu (New)	4	500	2,000
Agriculture	38. Food Biotechnology	38-2 Academic Staff room - BioTech wing	Fu-4	Bulletin board	Fu (New)	1	300	300
Agriculture	38. Food Biotechnology	38-3 Seminar room 2 - BioTech wing	Fu-5	Chair	Fu (New)	24	100	2,400
Agriculture	38. Food Biotechnology	38-3 Seminar room 2 - BioTech wing	Fu-6	Table (for 4 chairs)	Fu (New)	6	500	3,000
Agriculture	38. Food Biotechnology	38-3 Seminar room 2 - BioTech wing	Fu-7	Bulletin board	Fu (New)	1	300	300
Agriculture	38. Food Biotechnology	38-3 Seminar room 2 - BioTech wing	51	Computer	New	1	500	500
Agriculture	38. Food Biotechnology	38-3 Seminar room 2 - BioTech wing	Fu-8	Book shelves	Fu	2	500	1,000
Agriculture	38. Food Biotechnology	38-3 Seminar room 2 - BioTech wing	52	LCD projector	New	1	700	700
Agriculture	38. Food Biotechnology	38-3 Seminar room 2 - BioTech wing	53	Printer	New	1	200	200
Agriculture	38. Food Biotechnology	38-3 Seminar room 2 - BioTech wing	54	Scanner	New	1	200	200
Agriculture	39. Molecular Biology	39-1 Molecular Biology Lab	1	Next Seq 500 (Illumina)	New	1	450,640	450,640
Agriculture	39. Molecular Biology	39-1 Molecular Biology Lab	3	7500 Fast Dx Real-Time PCR	New	1	96,000	96,000
Agriculture	39. Molecular Biology	39-1 Molecular Biology Lab	4	Gradient PCR machine	New	1	5,700	5,700
Agriculture	39. Molecular Biology	39-1 Molecular Biology Lab	5	PCR machine	New	1	3,300	3,300
Agriculture	39. Molecular Biology	39-1 Molecular Biology Lab	6	Biosafety carbinet class II	New	1	6,700	6,700
Agriculture	39. Molecular Biology	39-1 Molecular Biology Lab	7	Micropipette set	New	1	1,000	1,000
Agriculture	39. Molecular Biology	39-1 Molecular Biology Lab	8	Incubator	New	1	1,200	1,200
Agriculture	39. Molecular Biology	39-1 Molecular Biology Lab	9	Freezer (-20^{o}C)	New	1	1,000	1,000
Agriculture	39. Molecular Biology	39-1 Molecular Biology Lab	Fu-1	Lab bench	Fu	3	1,000	3,000
Agriculture	39. Molecular Biology	39-1 Molecular Biology Lab	Fu-3	Desk	Fu	6	100	600
Agriculture	39. Molecular Biology	39-1 Molecular Biology Lab	Fu-4	Chair	Fu	24	50	1,200
Agriculture	39. Molecular Biology	39-1 Molecular Biology Lab	Fu-5	Book Shelf	Fu	2	150	300
Agriculture	39. Molecular Biology	39-1 Molecular Biology Lab	Fu-6	Chemical shelf	Fu	2	400	800
Agriculture	39. Molecular Biology	39-2 Molecular Biology Basic Lab	11	Growth Chamber 1500C (1512L)	New	1	10,000	10,000
Agriculture	39. Molecular Biology	39-2 Molecular Biology Basic Lab	12	Centrifuge 5430R (Eppendorf)	New	1	7,200	7,200
Agriculture	39. Molecular Biology	39-2 Molecular Biology Basic Lab	13	Biosafety carbinet class II	New	1	6,700	6,700
Agriculture	39. Molecular Biology	39-2 Molecular Biology Basic Lab	14	Fluorescent Microscope (IX-51-2)	New	1	10,000	10,000
Agriculture	39. Molecular Biology	39-2 Molecular Biology Basic Lab	17	Micropipette set	New	2	1,000	2,000
Agriculture	39. Molecular Biology	39-2 Molecular Biology Basic Lab	18	Incubator	New	1	1,200	1,200
Agriculture	39. Molecular Biology	39-2 Molecular Biology Basic Lab	20	Nanodrop System (ND-8000)	New	1	12,000	12,000

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	39. Molecular Biology	39-2 Molecular Biology Basic Lab	Fu-1	Lab bench	Fu	3	1,000	3,000
Agriculture	39. Molecular Biology	39-2 Molecular Biology Basic Lab	Fu-2	Air-conditioner	Fu	4	500	2,000
Agriculture	39. Molecular Biology	39-2 Molecular Biology Basic Lab	Fu-3	Desk	Fu	6	100	600
Agriculture	39. Molecular Biology	39-2 Molecular Biology Basic Lab	Fu-4	Chair	Fu	24	50	1,200
Agriculture	39. Molecular Biology	39-2 Molecular Biology Basic Lab	Fu-5	Book Shelf	Fu	2	150	300
Agriculture	39. Molecular Biology	39-2 Molecular Biology Basic Lab	Fu-6	Chemical shelf	Fu	2	400	800
Agriculture	39. Molecular Biology	39-3 Virology Lab	21	Growth Chambers 1500C (1512L)	New	1	10,000	10,000
Agriculture	39. Molecular Biology	39-3 Virology Lab	22	Biosafety carbinet class II	New	1	6,700	6,700
Agriculture	39. Molecular Biology	39-3 Virology Lab	23	Micropipette set	New	1	1,000	1,000
Agriculture	39. Molecular Biology	39-3 Virology Lab	24	Incubator	New	1	1,200	1,200
Agriculture	39. Molecular Biology	39-3 Virology Lab	25	Freezer (-20^{o}C)	New	1	1,000	1,000
Agriculture	39. Molecular Biology	39-3 Virology Lab	Ex-3	Freezer (-40^{o}C)	Ex	1		
Agriculture	39. Molecular Biology	39-3 Virology Lab	Fu-1	Lab bench	Fu	2	1,000	2,000
Agriculture	39. Molecular Biology	39-3 Virology Lab	Fu-2	Air-conditioner	Fu	2	500	1,000
Agriculture	39. Molecular Biology	39-3 Virology Lab	Fu-3	Desk	Fu	4	100	400
Agriculture	39. Molecular Biology	39-3 Virology Lab	Fu-4	Chair	Fu	16	50	800
Agriculture	39. Molecular Biology	39-3 Virology Lab	Fu-5	Book Shelf	Fu	1	150	150
Agriculture	39. Molecular Biology	39-3 Virology Lab	Fu-6	Chemical shelf	Fu	1	400	400
Agriculture	39. Molecular Biology	39-4 Electrophoresis Room	26	Electrophoresis Set (260x160x160mm)	New	1	3,500	3,500
Agriculture	39. Molecular Biology	39-4 Electrophoresis Room	27	Ethidium bromide removal system	New	5	2,400	12,000
Agriculture	39. Molecular Biology	39-4 Electrophoresis Room	28	Micropipette set	New	1	1,000	1,000
Agriculture	39. Molecular Biology	39-4 Electrophoresis Room	Fu-1	Lab bench	Fu	1	1,000	1,000
Agriculture	39. Molecular Biology	39-4 Electrophoresis Room	Fu-2	Air-conditioner	Fu	1	500	500
Agriculture	39. Molecular Biology	39-4 Electrophoresis Room	Fu-3	Desk	Fu	1	100	100
Agriculture	39. Molecular Biology	39-4 Electrophoresis Room	Fu-4	Chair	Fu	4	50	200
Agriculture	39. Molecular Biology	39-4 Electrophoresis Room	Fu-5	Chemical shelf	Fu	1	400	400
Agriculture	39. Molecular Biology	39-5 Preparation Room	29	PBI autoclave 21 L automatic	New	2	7,200	14,400
Agriculture	39. Molecular Biology	39-5 Preparation Room	30	Ionized water filtration system	New	1	10,500	10,500
Agriculture	39. Molecular Biology	39-5 Preparation Room	31	CO_2 Incubator	New	1	10,000	10,000
Agriculture	39. Molecular Biology	39-5 Preparation Room	Fu-1	Lab bench	Fu	1	1,000	1,000
Agriculture	39. Molecular Biology	39-6 Sterilization Room	33	Dryer 108L	New	2	4,800	9,600
Agriculture	39. Molecular Biology	39-6 Sterilization Room	34	JSR Autoclave 80L	New	1	9,500	9,500
Agriculture	39. Molecular Biology	39-6 Sterilization Room	Fu-1	Lab bench	Fu	1	1,000	1,000
Agriculture	39. Molecular Biology	39-7 Preparation/Changing Room & Anteroom	Fu-1	Clothes shelf	Fu	2	200	400
Agriculture	39. Molecular Biology	39-7 Preparation/Changing Room & Anteroom	Fu-2	Desk	Fu	1	100	100
Agriculture	39. Molecular Biology	39-7 Preparation/Changing Room & Anteroom	Fu-3	Chair	Fu	4	50	200
Agriculture	39. Molecular Biology	39-8 Department Head Office	Fu-1	Computer	Fu	2	650	1,300
Agriculture	39. Molecular Biology	39-8 Department Head Office	Fu-3	Printer	Fu	1	250	250
Agriculture	39. Molecular Biology	39-8 Department Head Office	Fu-4	Photocopy	Fu	1	400	400

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	39. Molecular Biology	39-8 Department Head Office	Fu-2	Air-conditioner	Fu	1	500	500
Agriculture	39. Molecular Biology	39-8 Department Head Office	Fu-3	Desk	Fu	2	100	200
Agriculture	39. Molecular Biology	39-8 Department Head Office	Fu-4	Chair	Fu	4	50	200
Agriculture	39. Molecular Biology	39-8 Department Head Office	Fu-5	Book Shelf	Fu	4	150	600
Agriculture	39. Molecular Biology	39-9 Acedemic Staff Office	Fu-1	Computer	Fu	6	650	3,900
Agriculture	39. Molecular Biology	39-9 Acedemic Staff Office	Fu-3	Printer	Fu	1	250	250
Agriculture	39. Molecular Biology	39-9 Acedemic Staff Office	Fu-2	Air-conditioner	Fu	1	500	500
Agriculture	39. Molecular Biology	39-9 Acedemic Staff Office	Fu-3	Desk	Fu	6	100	600
Agriculture	39. Molecular Biology	39-9 Acedemic Staff Office	Fu-4	Chair	Fu	12	50	600
Agriculture	39. Molecular Biology	39-9 Acedemic Staff Office	Fu-5	Book Shelf	Fu	4	150	600
Agriculture	39. Molecular Biology	39-10 Research Office	Fu-1	Computer	Fu	6	650	3,900
Agriculture	39. Molecular Biology	39-10 Research Office	Fu-2	Air-conditioner	Fu	1	500	500
Agriculture	39. Molecular Biology	39-10 Research Office	Fu-3	Desk	Fu	6	100	600
Agriculture	39. Molecular Biology	39-10 Research Office	Fu-4	Chair	Fu	24	50	1,200
Agriculture	39. Molecular Biology	39-10 Research Office	Fu-5	Book Shelf	Fu	4	150	600
Agriculture								
Agriculture	40. Stem Cell	40-1 Cell separation and culture Laboratory	2	Cell Separators from tissue	New	1	128,600	128,600
Agriculture	40. Stem Cell	40-1 Cell separation and culture Laboratory	3	Small volume cell separator system and testing kits	New	1	60,000	60,000
Agriculture	40. Stem Cell	40-1 Cell separation and culture Laboratory	4	Fluorescent Microscope + specialized software	New	1	150,000	150,000
Agriculture	40. Stem Cell	40-1 Cell separation and culture Laboratory	5	Centrifuge specialized for separation of cells	New	1	22,000	22,000
Agriculture	40. Stem Cell	40-1 Cell separation and culture Laboratory	6	Cells mixer	New	1	8,000	8,000
Agriculture	40. Stem Cell	40-1 Cell separation and culture Laboratory	7	Biosafety Cabinets Class II + sterile gas and UV lights	New	1	40,000	40,000
Agriculture	40. Stem Cell	40-1 Cell separation and culture Laboratory	9	CO_2 incubator with variable oxygen control, multi-position shelf rack	New	1	32,000	32,000
Agriculture	40. Stem Cell	40-1 Cell separation and culture Laboratory	10	Media distributor	New	1	7,000	7,000
Agriculture	40. Stem Cell	40-1 Cell separation and culture Laboratory	11	Vortex, Pipette, small instruments …	New	1	20,000	20,000
Agriculture	40. Stem Cell	40-1 Cell separation and culture Laboratory	Fu-1	Lab bench	Fu	3	1,000	3,000
Agriculture	40. Stem Cell	40-1 Cell separation and culture Laboratory	Fu-2	Air-conditioner	Fu	4	500	2,000
Agriculture	40. Stem Cell	40-1 Cell separation and culture Laboratory	Fu-3	Desk	Fu	6	100	600
Agriculture	40. Stem Cell	40-1 Cell separation and culture Laboratory	Fu-4	Chair	Fu	24	50	1,200
Agriculture	40. Stem Cell	40-1 Cell separation and culture Laboratory	Fu-5	Book Shelf	Fu	2	150	300
Agriculture	40. Stem Cell	40-1 Cell separation and culture Laboratory	Fu-6	Chemical shelf	Fu	2	400	800
Agriculture	40. Stem Cell	40-2 Cell storage system	12	Temperature control system for cell storage	New	1	65,000	65,000
Agriculture	40. Stem Cell	40-2 Cell storage system	13	Cell storage cabinet	New	1	20,000	20,000
Agriculture	40. Stem Cell	40-2 Cell storage system	14	Liquid nitrogen container	New	1	28,000	28,000

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	40. Stem Cell	40-2 Cell storage system	15	Machine monitoring oxygen levels in sample storage room	New	1	9,000	9,000
Agriculture	40. Stem Cell	40-2 Cell storage system	16	Deep Freezer -80°C	New	1	22,000	22,000
Agriculture	40. Stem Cell	40-2 Cell storage system	Fu-7	Lab bench	Fu	1	1,000	1,000
Agriculture	40. Stem Cell	40-2 Cell storage system	Fu-8	Air-conditioner	Fu	1	500	500
Agriculture	40. Stem Cell	40-3 Kitchen (Medium preparation room)	17	pH meter	New	1	2,000	2,000
Agriculture	40. Stem Cell	40-3 Kitchen (Medium preparation room)	18	Analytical and technical balance	New	1	3,500	3,500
Agriculture	40. Stem Cell	40-3 Kitchen (Medium preparation room)	19	Magnetic stirrer with heating hot plate	New	1	1,000	1,000
Agriculture	40. Stem Cell	40-3 Kitchen (Medium preparation room)	20	Vortex	New	1	3,000	3,000
Agriculture	40. Stem Cell	40-3 Kitchen (Medium preparation room)	21	Microwave	New	1	150	150
Agriculture	40. Stem Cell	40-3 Kitchen (Medium preparation room)	22	Refrigerator 2 - 8°C	New	1	2,000	2,000
Agriculture	40. Stem Cell	40-3 Kitchen (Medium preparation room)	23	Water Bidistilled water machine	New	1	8,000	8,000
Agriculture	40. Stem Cell	40-3 Kitchen (Medium preparation room)	24	Ultrapure water filtration system	New	1	11,000	11,000
Agriculture	40. Stem Cell	40-3 Kitchen (Medium preparation room)	25	Ice maker machine	New	1	9,000	9,000
Agriculture	40. Stem Cell	40-3 Kitchen (Medium preparation room)	Fu-9	Lab bench	Fu	1	1,000	1,000
Agriculture	40. Stem Cell	40-4 Washing, sterilizing and drying room	26	Ultrasonic washing machine, 3L	New	1	7,500	7,500
Agriculture	40. Stem Cell	40-4 Washing, sterilizing and drying room	27	Autoclave - 50L	New	1	15,000	15,000
Agriculture	40. Stem Cell	40-4 Washing, sterilizing and drying room	28	Drying Oven 108L	New	1	10,000	10,000
Agriculture	40. Stem Cell	40-4 Washing, sterilizing and drying room	29	Reagents, consumables, lab coats, etc.	New	1	50,000	50,000
Agriculture	40. Stem Cell	40-4 Washing, sterilizing and drying room	30	Lab benches, store cabinets, etc.	New	1	50,000	50,000
Agriculture	40. Stem Cell	40-4 Washing, sterilizing and drying room	Fu-10	Lab bench	Fu	1	1,000	1,000
Agriculture								
Agriculture	41. Protein Technology and Natural Product	41-1 Protein Technology and Natural Product Lab	1	Peptide Synthesizer (Model: Libety 1)	New	1	80,000	80,000
Agriculture	41. Protein Technology and Natural Product	41-1 Protein Technology and Natural Product Lab	3	Protein Extraction System (Model: Discover)	New	1	45,000	45,000
Agriculture	41. Protein Technology and Natural Product	41-1 Protein Technology and Natural Product Lab	4	Protein Analyser (Model: CEM Sprint)	New	1	44,000	44,000
Agriculture	41. Protein Technology and Natural Product	41-1 Protein Technology and Natural Product Lab	6	Rotary evaporator with vacuum, waterbath	New	1	12,000	12,000
Agriculture	41. Protein Technology and Natural Product	41-1 Protein Technology and Natural Product Lab	8	Cooled centrifuge with exchangeable rotor	New	1	10,000	10,000
Agriculture	41. Protein Technology and Natural Product	41-1 Protein Technology and Natural Product Lab	10	Spectrophotomoter (IR)	New	1	10,000	10,000
Agriculture	41. Protein Technology and Natural Product	41-1 Protein Technology and Natural Product Lab	11	Ultra low temperature freezer -80°C	New	1	9,000	9,000

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	41. Protein Technology and Natural Product	41-1 Protein Technology and Natural Product Lab	12	Spectrophotomoter (UV/VIS)	New	1	8,000	8,000
Agriculture	41. Protein Technology and Natural Product	41-1 Protein Technology and Natural Product Lab	13	Laboratory fume Hood with blower	New	2	3,500	7,000
Agriculture	41. Protein Technology and Natural Product	41-1 Protein Technology and Natural Product Lab	15	Autoclave	New	1	5,500	5,500
Agriculture	41. Protein Technology and Natural Product	41-1 Protein Technology and Natural Product Lab	16	Laminar	New	2	2,500	5,000
Agriculture	41. Protein Technology and Natural Product	41-1 Protein Technology and Natural Product Lab	18	Analytical balance (digital, 2-4 decimals)	New	2	2,000	4,000
Agriculture	41. Protein Technology and Natural Product	41-1 Protein Technology and Natural Product Lab	19	Ultra sonic cleaner	New	1	1,500	1,500
Agriculture	41. Protein Technology and Natural Product	41-1 Protein Technology and Natural Product Lab	20	pH meter	New	2	1,500	3,000
Agriculture	41. Protein Technology and Natural Product	41-1 Protein Technology and Natural Product Lab	21	Glassware (Unit)	New	1	3,000	3,000
Agriculture	41. Protein Technology and Natural Product	41-1 Protein Technology and Natural Product Lab	22	Orbital shaker	New	1	2,900	2,900
Agriculture	41. Protein Technology and Natural Product	41-1 Protein Technology and Natural Product Lab	23	Heated circulating bath	New	1	2,550	2,550
Agriculture	41. Protein Technology and Natural Product	41-1 Protein Technology and Natural Product Lab	25	Horizontal shaker bath	New	1	2,500	2,500
Agriculture	41. Protein Technology and Natural Product	41-1 Protein Technology and Natural Product Lab	26	Vacuum dryer (128 L, 200^{o}C)	New	1	2,500	2,500
Agriculture	41. Protein Technology and Natural Product	41-1 Protein Technology and Natural Product Lab	27	Stereo microscope with camera	New	1	2,500	2,500
Agriculture	41. Protein Technology and Natural Product	41-1 Protein Technology and Natural Product Lab	28	Micropipette (2µl...-5ml)	New	10	200	2,000
Agriculture	41. Protein Technology and Natural Product	41-1 Protein Technology and Natural Product Lab	29	Low speed shaker	New	1	1,900	1,900
Agriculture	41. Protein Technology and Natural Product	41-1 Protein Technology and Natural Product Lab	30	Digital laboratory hot plate magnetic stirrer	New	2	900	1,800
Agriculture	41. Protein Technology and Natural Product	41-1 Protein Technology and Natural Product Lab	31	Incubator	New	1	1,700	1,700
Agriculture	41. Protein Technology and Natural Product	41-1 Protein Technology and Natural Product Lab	32	Low temperature refrigerator -30^{o}C	New	1	1,500	1,500
Agriculture	41. Protein Technology and Natural Product	41-1 Protein Technology and Natural Product Lab	33	Brix meter	New	2	600	1,200
Agriculture	41. Protein Technology and Natural Product	41-1 Protein Technology and Natural Product Lab	34	Vortex mixture	New	2	500	1,000

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	41. Protein Technology and Natural Product	41-1 Protein Technology and Natural Product Lab	35	Lab distillation equiment	New	1	1,000	1,000
Agriculture	41. Protein Technology and Natural Product	41-1 Protein Technology and Natural Product Lab	36	Teflon Labware (Unit)	New	1	1,000	1,000
Agriculture	41. Protein Technology and Natural Product	41-1 Protein Technology and Natural Product Lab	37	Microscope with camera	New	1	600	600
Agriculture	41. Protein Technology and Natural Product	41-1 Protein Technology and Natural Product Lab	38	Heating mantle	New	2	280	560
Agriculture	41. Protein Technology and Natural Product	41-1 Protein Technology and Natural Product Lab	Fu-1	Lab benches	Fu	8	1000	8,000
Agriculture	41. Protein Technology and Natural Product	41-1 Protein Technology and Natural Product Lab	Fu-3	Desks (big size)	Fu	2	200	400
Agriculture	41. Protein Technology and Natural Product	41-1 Protein Technology and Natural Product Lab	Fu-4	Desks (medium size)	Fu	4	150	600
Agriculture	41. Protein Technology and Natural Product	41-1 Protein Technology and Natural Product Lab	Fu-5	Chairs	Fu	6	100	600
Agriculture	41. Protein Technology and Natural Product	41-1 Protein Technology and Natural Product Lab	Fu-6	Lab stools	Fu	36	50	1,800
Agriculture	41. Protein Technology and Natural Product	41-1 Protein Technology and Natural Product Lab	Fu-7	Chemical safety storage cabinets	Fu	2	1,000	2,000
Agriculture	41. Protein Technology and Natural Product	41-1 Protein Technology and Natural Product Lab	Fu-8	File shelf (FS410)	Fu	1	150	150
Agriculture	41. Protein Technology and Natural Product	41-1 Protein Technology and Natural Product Lab	Fu-9	Book shelfs	Fu	2	400	800
Agriculture	41. Protein Technology and Natural Product	41-1 Protein Technology and Natural Product Lab	Fu-10	Cupbroads	Fu	2	200	400
Agriculture	41. Protein Technology and Natural Product	41-1 Protein Technology and Natural Product Lab	Fu-11	Lockers (CAT983/3K)	Fu	2	200	400
Agriculture	41. Protein Technology and Natural Product	41-1 Protein Technology and Natural Product Lab	Fu-12	Lockers CAT986/3K)	Fu	1	200	200
Agriculture								
Agriculture	42. Gene bank	42-1 Gene bank	1	Quality Grain inspector	New	1	100,000	100,000
Agriculture	42. Gene bank	42-1 Gene bank	2	Freezer (-25^{o}C)	New	1	7,000	7,000
Agriculture	42. Gene bank	42-1 Gene bank	3	Conex (4,1x3,2x2,6m = 34m^{3})	New	1	15,000	15,000
Agriculture	42. Gene bank	42-1 Gene bank	4	Growth champer	New	2	13,500	27,000
Agriculture	42. Gene bank	42-1 Gene bank	5	Seed storage room with low temperature control	New	1	30,000	30,000
Agriculture	42. Gene bank	42-1 Gene bank	6	Electrophoresis (Sub-Cell GT)	New	1	10,000	10,000
Agriculture	42. Gene bank	42-1 Gene bank	7	Electricity generator	New	1	15,000	15,000
Agriculture	42. Gene bank	42-1 Gene bank	8	Microfuge (13000 rmp, Eppendorf)	New	1	8,000	8,000

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	42. Gene bank	42-1 Gene bank	9	Thermocycler, PCR (PCR, GenAmp 9700, PE Applied Biosystem, USA)	New	1	10,000	10,000
Agriculture	42. Gene bank	42-1 Gene bank	10	Drier (53 L model ED53, Binder, Germany)	New	1	10,000	10,000
Agriculture	42. Gene bank	42-1 Gene bank	11	Freezer (-80^{o}C) NU-6501 Nuaire, USA	New	1	6,000	6,000
Agriculture	42. Gene bank	42-1 Gene bank	12	Autoclave (32 L Model: KT-30S-ALP)	New	1	5,000	5,000
Agriculture	42. Gene bank	42-1 Gene bank	13	Vacuum machine	New	1	4,000	4,000
Agriculture	42. Gene bank	42-1 Gene bank	14	Vacuum drier	New	1	4,000	4,000
Agriculture	42. Gene bank	42-1 Gene bank	15	Seed grinder	New	1	3,000	3,000
Agriculture	42. Gene bank	42-1 Gene bank	16	Seed divider	New	1	3,000	3,000
Agriculture	42. Gene bank	42-1 Gene bank	17	Refrigerator	New	2	1,500	3,000
Agriculture	42. Gene bank	42-1 Gene bank	18	Shaker (GFL - Germany)	New	1	2,000	2,000
Agriculture	42. Gene bank	42-1 Gene bank	19	Seed cleaner by fan Seedburo, Mỹ	New	1	2,000	2,000
Agriculture	42. Gene bank	42-3 Academic Staff Room/New Buiding	Fu-1	L-table	Fu	2	615	1,230
Agriculture	42. Gene bank	42-3 Academic Staff Room/New Buiding	Fu-2	Chair	Fu	4	95	380
Agriculture	42. Gene bank	42-3 Academic Staff Room/New Buiding	Fu-3	Cabinet	Fu	2	150	300
Agriculture	42. Gene bank	42-3 Academic Staff Room/New Buiding	Fu-4	Book shelf	Fu	2	100	200
Agriculture	42. Gene bank	42-3 Academic Staff Room/New Buiding	Fu-5	Computer	Fu	2	800	1,600
Agriculture	42. Gene bank	42-3 Academic Staff Room/New Buiding	Fu-6	Refrigerator	Fu	1	500	500
Agriculture	42. Gene bank	42-3 Academic Staff Room/New Buiding	Fu-7	Printer	Fu	2	150	300
Agriculture	42. Gene bank	42-3 Academic Staff Room/New Buiding	Fu-8	Scanner	Fu	1	150	150
Agriculture	42. Gene bank	42-4 Research Officce/New Buiding	Fu-9	Single table	Fu	6	375	2,250
Agriculture	42. Gene bank	42-4 Research Officce/New Buiding	Fu-10	Chair	Fu	12	95	1,140
Agriculture	42. Gene bank	42-4 Research Officce/New Buiding	Fu-11	Book shelf	Fu	6	100	600
Agriculture								
Agriculture	43. Materials and Molecular Modeling	43-1 Materials and Molecular Modeling	1	First computer system (normal system): 12 nodes	New	1	32,000	32,000
Agriculture	43. Materials and Molecular Modeling	43-1 Materials and Molecular Modeling	2	Second computer system (fat system): 6 nodes	New	1	64,000	64,000
Agriculture	43. Materials and Molecular Modeling	43-1 Materials and Molecular Modeling	3	Third computer system (parallel system): 40 nodes	New	1	80,000	80,000
Agriculture	43. Materials and Molecular Modeling	43-1 Materials and Molecular Modeling	4	Host machine	New	1	40,000	40,000
Agriculture	43. Materials and Molecular	43-1 Materials and Molecular Modeling	5	Software, Gaussian, Molpro, VASP, other	New	1	40,000	40,000
Agriculture	43. Materials and Molecular Modeling	43-2 Academic staff room	Fu-1	L-table	Fu	4	615	2,460

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	43. Materials and Molecular Modeling	43-2 Academic staff room	Fu-2	Chair	Fu	4	95	380
Agriculture	43. Materials and Molecular Modeling	43-2 Academic staff room	Fu-3	Cabinet	Fu	4	150	600
Agriculture	43. Materials and Molecular Modeling	43-2 Academic staff room	Fu-4	Book shelf	Fu	4	100	400
Agriculture	43. Materials and Molecular Modeling	43-2 Academic staff room	Fu-5	Whiteboard	Fu	1	50	50
Agriculture	43. Materials and Molecular Modeling	43-3 Research office	Fu-1	Single table	Fu	12	375	4,500
Agriculture	43. Materials and Molecular Modeling	43-3 Research office	Fu-2	Chair	Fu	12	95	1,140
Agriculture	43. Materials and Molecular Modeling	43-3 Research office	Fu-3	Book shelf	Fu	12	100	1,200
Agriculture	43. Materials and Molecular Modeling	43-3 Research office	Fu-4	Whiteboard	Fu	2	50	100
Agriculture								
Agriculture	44. Agricultural and Aquacultural Engineering Lab	44.1 Agricultural and Aquacultural Engineering Lab - Room 1	1	Universal testing machine 250 KN	New	1	97,000	97,000
Agriculture	44. Agricultural and Aquacultural Engineering Lab	44.1 Agricultural and Aquacultural Engineering Lab - Room 1	2	Hydraulics training equipment set	New	1	45,000	45,000
Agriculture	44. Agricultural and Aquacultural Engineering Lab	44.1 Agricultural and Aquacultural Engineering Lab - Room 1	4	DIC system	New	1	90,000	90,000
Agriculture	44. Agricultural and Aquacultural Engineering Lab	44.1 Agricultural and Aquacultural Engineering Lab - Room 1	5	Heavy shaker	New	1	32,000	32,000
Agriculture	44. Agricultural and Aquacultural Engineering Lab	44.1 Agricultural and Aquacultural Engineering Lab - Room 1	6	Data acquisition system (for studying argicultural machinery on farm)	New	1	70,000	70,000
Agriculture	44. Agricultural and Aquacultural Engineering Lab	44.1 Agricultural and Aquacultural Engineering Lab - Room 1	7	Computer room for logistics simulation (40 PC)	New	40	700	28,000
Agriculture	44. Agricultural and Aquacultural Engineering Lab	44.1 Agricultural and Aquacultural Engineering Lab - Room 1	8	Software: Arena, Preactor, supply chain Guru, Simio Academic edition, Flow Planner, Pro Balance, Pro Time Estimation, SPSS	New	1	62,750	62,750

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	44. Agricultural and Aquacultural Engineering Lab	44.1 Agricultural and Aquacultural Engineering Lab - Room 1	Fu-1	Table for computers (Single table)	Fu	40	375	15,000
Agriculture	44. Agricultural and Aquacultural Engineering Lab	44.1 Agricultural and Aquacultural Engineering Lab - Room 1	Fu-2	Two-wall table	Fu	2	1,800	3,600
Agriculture	44. Agricultural and Aquacultural Engineering Lab	44.1 Agricultural and Aquacultural Engineering Lab - Room 1	Fu-3	Chair	Fu	44	95	4,180
Agriculture	44. Agricultural and Aquacultural Engineering Lab	44.1 Agricultural and Aquacultural Engineering Lab - Room 1	Fu-4	Cabinet	Fu	4	150	600
Agriculture	44. Agricultural and Aquacultural Engineering Lab	44-2. Academic staff room	Fu-1	L-table	Fu	4	615	2,460
Agriculture	44. Agricultural and Aquacultural Engineering Lab	44-2. Academic staff room	Fu-2	Chair	Fu	4	95	380
Agriculture	44. Agricultural and Aquacultural Engineering Lab	44-2. Academic staff room	Fu-3	Cabinet	Fu	4	150	600
Agriculture	44. Agricultural and Aquacultural Engineering Lab	44-2. Academic staff room	Fu-4	Book shelf	Fu	4	100	400
Agriculture	44. Agricultural and Aquacultural Engineering Lab	44-3. Research office 1	Fu-1	Single table	Fu	12	375	4,500
Agriculture	44. Agricultural and Aquacultural Engineering Lab	44-3. Research office 1	Fu-2	Chair	Fu	12	95	1,140
Agriculture	44. Agricultural and Aquacultural Engineering Lab	44-3. Research office 1	Fu-3	Book shelf	Fu	12	100	1,200
Agriculture	44. Agricultural and Aquacultural Engineering Lab	44-3. Research office 1	Fu-4	Cabinet	Fu	2	150	300
Agriculture	44. Agricultural and Aquacultural Engineering Lab	44-4. Seminar room	Fu-1	Four-seat table	Fu	7	600	4,200

Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Agriculture	44. Agricultural and Aquacultural Engineering Lab	44-4. Seminar room	Fu-2	Chair	Fu	24	95	2,280
Agriculture	44. Agricultural and Aquacultural Engineering Lab	44-4. Seminar room	Fu-3	Whiteboard	Fu	1	50	50
Agriculture	45. Material Engineering Lab	45.1 Material Engineering Lab - Room 1	2	CNC Turning (150MS)	New	1	99,000	99,000
Agriculture	45. Material Engineering Lab	45.1 Material Engineering Lab - Room 1	3	CNC Milling (430FZS)	New	1	98,000	98,000
Agriculture	45. Material Engineering Lab	45.1 Material Engineering Lab - Room 1	5	Universal lathe machine	New	1	50,500	50,500
Agriculture	45. Material Engineering Lab	45.1 Material Engineering Lab - Room 1	6	Universal milling machine	New	1	47,000	47,000
Agriculture	45. Material Engineering Lab	45.1 Material Engineering Lab - Room 1	7	Radial arm drilling machine	New	1	11,500	11,500
Agriculture	45. Material Engineering Lab	45.1 Material Engineering Lab - Room 1	8	Hydraulics shearing machine	New	1	67,000	67,000
Agriculture	45. Material Engineering Lab	45.1 Material Engineering Lab - Room 1	10	Automated welding (welding robot)	New	1	43,500	43,500
Agriculture	45. Material Engineering Lab	45.1 Material Engineering Lab - Room 1	20	High frequency induction melting furnace	New	1	44,000	44,000
Agriculture	45. Material Engineering Lab	45.1 Material Engineering Lab - Room 1	Fu-1	Two-wall table	Fu	8	1,800	14,400
Agriculture	45. Material Engineering Lab	45.1 Material Engineering Lab - Room 1	Fu-2	Chair	Fu	16	95	1,520
Agriculture	45. Material Engineering Lab	45.1 Material Engineering Lab - Room 1	Fu-3	Mobile whiteboard	Fu	1	50	50
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Faculty	Nw Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Classification new/modify Lab	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/ Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Aquaculture	1 Genetics and selective breeding	1-1 Fish reproductive biology Lab	new	1	Microscope connect with digital camera and software (Image Analysis System)	New	1	30,000	30,000
Aquaculture	1 Genetics and selective breeding	1-1 Fish reproductive biology Lab	new	2	Inverted microscope with camera and computer control	New	1	14,500	14,500
Aquaculture	1 Genetics and selective breeding	1-1 Fish reproductive biology Lab	new	3	Profile Projector	New	1	15,000	15,000
Aquaculture	1 Genetics and selective breeding	1-1 Fish reproductive biology Lab	new	4	Cooling water system	New	2	15,000	30,000
Aquaculture	1 Genetics and selective breeding	1-1 Fish reproductive biology Lab	new	5	Untrasound system for checking fish maturation	New	1	5,000	5,000
Aquaculture	1 Genetics and selective breeding	1-1 Fish reproductive biology Lab	new	6	Microinjection complete system	New	1	15,000	15,000
Aquaculture	1 Genetics and selective breeding	1-1 Fish reproductive biology Lab	new	7	Hydrostatic pressure equipment	New	2	5,000	10,000
Aquaculture	1 Genetics and selective breeding	1-1 Fish reproductive biology Lab	new	8	Automatic heater system	New	3	6,500	19,500
Aquaculture	1 Genetics and selective breeding	1-1 Fish reproductive biology Lab	new	9	UV light system	New	2	5,000	10,000
Aquaculture	1 Genetics and selective breeding	1-1 Fish reproductive biology Lab	new	10	Fluorescence microscope with trinocular observation	New	1	28,000	28,000
Aquaculture	1 Genetics and selective breeding	1-1 Fish reproductive biology Lab	new	11	Research Stereo microscope	New	1	15,000	15,000
Aquaculture	1 Genetics and selective breeding	1-1 Fish reproductive biology Lab	new	20	Specialization table for microscope, and other equipments	Fu	10	500	5,000
Aquaculture	1 Genetics and selective breeding	1-1 Fish reproductive biology Lab	new	22	Embedding machine	New	1	12,000	12,000
Aquaculture	1 Genetics and selective breeding	1-1 Fish reproductive biology Lab	new	12	Phase contrast microscope	New	1	25,000	25,000
Aquaculture	1 Genetics and selective breeding	1-1 Fish reproductive biology Lab	new	21	Voltage stabilizer	Fu	1	5,000	5,000
Aquaculture	1 Genetics and selective breeding	1-1 Fish reproductive biology Lab	new	13	Cryopreservation system	New	1	60,000	60,000
Aquaculture	1 Genetics and selective breeding	1-1 Fish reproductive biology Lab	new	14	Nitrogen bottle	New	5	800	4,000
Aquaculture	1 Genetics and selective breeding	1-2 Fish Histology & Emryology Lab	new	23	Microtome	New	2	9,000	18,000
Aquaculture	1 Genetics and selective breeding	1-2 Fish Histology & Emryology Lab	new	24	Analyzed balance	New	3	5,000	15,000
Aquaculture	1 Genetics and selective breeding	1-2 Fish Histology & Emryology Lab	new	25	IsoMet Low speed Saw (Precision sectioning saw)	New	1	6,500	6,500
Aquaculture	1 Genetics and selective breeding	1-2 Fish Histology & Emryology Lab	new	26	Lapping and polishing machine (Model 910)	New	1	8,500	8,500
Aquaculture	1 Genetics and selective breeding	1-2 Fish Histology & Emryology Lab	new	27	Fume exhauster cabinet	New	2	5,000	10,000
Aquaculture	1 Genetics and selective breeding	1-2 Fish Histology & Emryology Lab	new	28	Tissue processing machine	New	1	30,000	30,000
Aquaculture	1 Genetics and selective breeding	1-2 Fish Histology & Emryology Lab	new	29	Paraffin section mounting Bath (2L)	New	2	1,250	2,500
Aquaculture	1 Genetics and selective breeding	1-2 Fish Histology & Emryology Lab	new	30	Oven	New	2	1,000	2,000
Aquaculture	1 Genetics and selective breeding	1-2 Fish Histology & Emryology Lab	new	40	Specialization table for microscope, profile projector, and other equipments	Fu	10	500	5,000
Aquaculture	1 Genetics and selective breeding	1-2 Fish Histology & Emryology Lab	new	31	Cooling paraffin block machine	New	2	1,000	2,000
Aquaculture	1 Genetics and selective breeding	1-2 Fish Histology & Emryology Lab	new	33	Refrigerator	New	2	500	1,000
Aquaculture	1 Genetics and selective breeding	1-2 Fish Histology & Emryology Lab	new	34	Slide warmer	New	4	300	1,200
Aquaculture	1 Genetics and selective breeding	1-2 Fish Histology & Emryology Lab	new	35	Slide storage cabinet	New	10	150	1,500
Aquaculture	1 Genetics and selective breeding	1-2 Fish Histology & Emryology Lab	new	36	paraffin block storage cabinet	New	10	150	1,500
Aquaculture	1 Genetics and selective breeding	1-2 Fish Histology & Emryology Lab	new	37	Slide dryer cabinet	New	2	2,000	4,000
Aquaculture	1 Genetics and selective breeding	1-2 Fish Histology & Emryology Lab	new	38	Slide marker	New	4	200	800
Aquaculture	1 Genetics and selective breeding	1-2 Fish Histology & Emryology Lab	new	41	Chemical strore cupboard	Fu	2	2,500	5,000
Aquaculture	1 Genetics and selective breeding	1-3 Fish genetics & selective breeding Lab	new	42	NanoDrop 2000 Spectrophotometer	New	1	15,500	15,500
Aquaculture	1 Genetics and selective breeding	1-3 Fish genetics & selective breeding Lab	new	43	Bioanalyser 2200	New	1	75,000	75,000
Aquaculture	1 Genetics and selective breeding	1-3 Fish genetics & selective breeding Lab	new	44	Image Documentation and Analysis System	New	1	15,000	15,000
Aquaculture	1 Genetics and selective breeding	1-3 Fish genetics & selective breeding Lab	new	45	DNA Thermal Cycler (PCR machine)	New	2	8,500	17,000
Aquaculture	1 Genetics and selective breeding	1-3 Fish genetics & selective breeding Lab	new	46	Refrigerated centrifuge	New	1	25,000	25,000

Faculty	Nw Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Classification new/modify Lab	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/ Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Aquaculture	1 Genetics and selective breeding	1-3 Fish genetics & selective breeding Lab	new	47	High Speed Microcentrifuge	New	4	2,500	10,000
Aquaculture	1 Genetics and selective breeding	1-3 Fish genetics & selective breeding Lab	new	48	Ultrasonic cleaner system	New	2	3,000	6,000
Aquaculture	1 Genetics and selective breeding	1-3 Fish genetics & selective breeding Lab	new	49	Biomedical Upright Freezer -30ºC	New	2	5,000	10,000
Aquaculture	1 Genetics and selective breeding	1-3 Fish genetics & selective breeding Lab	new	50	Incubator and hybridization oven (L018)	New	1	8,000	8,000
Aquaculture	1 Genetics and selective breeding	1-3 Fish genetics & selective breeding Lab	new	51	2D-electroporesis	New	1	15,000	15,000
Aquaculture	1 Genetics and selective breeding	1-3 Fish genetics & selective breeding Lab	new	52	Incubator shaker	New	2	5,800	11,600
Aquaculture	1 Genetics and selective breeding	1-3 Fish genetics & selective breeding Lab	new	53	Water bath (thermal control)	New	2	2,500	5,000
Aquaculture	1 Genetics and selective breeding	1-3 Fish genetics & selective breeding Lab	new	54	Autoclave (50 liters)	New	2	10,000	20,000
Aquaculture	1 Genetics and selective breeding	1-3 Fish genetics & selective breeding Lab	new	55	Autoclave (100 liters)	New	1	14,667	14,667
Aquaculture	1 Genetics and selective breeding	1-3 Fish genetics & selective breeding Lab	new	56	UV Microwave	New	1	20,000	20,000
Aquaculture	1 Genetics and selective breeding	1-3 Fish genetics & selective breeding Lab	new	57	Vertical Electrophoresis	New	4	2,100	8,400
Aquaculture	1 Genetics and selective breeding	1-3 Fish genetics & selective breeding Lab	new	58	Spin-down (mini centrifuge)	New	5	1,000	5,000
Aquaculture	1 Genetics and selective breeding	1-3 Fish genetics & selective breeding Lab	new	59	Untrasonic Tissue grinder	New	1	6,500	6,500
Aquaculture	1 Genetics and selective breeding	1-3 Fish genetics & selective breeding Lab	new	60	Horizontal Laminar Flow Cabinet	New	2	8,500	17,000
Aquaculture	1 Genetics and selective breeding	1-3 Fish genetics & selective breeding Lab	new	61	Horizontal Electrophoresis	New	4	3,000	12,000
Aquaculture	1 Genetics and selective breeding	1-3 Fish genetics & selective breeding Lab	new	62	Vortex	New	4	850	3,400
Aquaculture	1 Genetics and selective breeding	1-3 Fish genetics & selective breeding Lab	new	71	Specialization table for microscope, profile projector, and other equipments	Fu	10	500	5,000
Aquaculture	1 Genetics and selective breeding	1-3 Fish genetics & selective breeding Lab	new	63	Real time PCR	New	1	65,000	65,000
Aquaculture	1 Genetics and selective breeding	1-3 Fish genetics & selective breeding Lab	new	64	Deionized Water purification system	New	2	10,500	21,000
Aquaculture	2 Bio-Chemis- Pharma Technology	2-1 Advanced Equipment	new	1	UV-VIS Spectrophotometer	New	1	20,000	20,000
Aquaculture	2 Bio-Chemis- Pharma Technology	2-1 Advanced Equipment	new	2	Tecan Genios Microplate reader with 96-well	New	1	60,000	60,000
Aquaculture	2 Bio-Chemis- Pharma Technology	2-1 Advanced Equipment	new	4	Flourescene Microscope	new	1	20,000	20,000
Aquaculture	2 Bio-Chemis- Pharma Technology	2-1 Advanced Equipment	new	5	Polarimeter	New	1	20,000	20,000
Aquaculture	2 Bio-Chemis- Pharma Technology	2-1 Advanced Equipment	new	6	Vacuum refrigerated centrifuge	New	1	20,000	20,000
Aquaculture	2 Bio-Chemis- Pharma Technology	2-1 Advanced Equipment	new	7	Melting point meter	New	1	10,000	10,000
Aquaculture	2 Bio-Chemis- Pharma Technology	2-1 Advanced Equipment	new	8	Four demical number analytical balance	New	1	3,000	3,000
Aquaculture	2 Bio-Chemis- Pharma Technology	2-1 Advanced Equipment	new	9	Refrigerator	New	1	500	500
Aquaculture	2 Bio-Chemis- Pharma Technology	2-1 Advanced Equipment	new	10	Dehumidifier machine	New	1	1,000	1,000
Aquaculture	2 Bio-Chemis- Pharma Technology	2-1 Advanced Equipment	new	11	others(chromatography colum: cuvet)	New	1	10,000	10,000
Aquaculture	2 Bio-Chemis- Pharma Technology	2-1 Advanced Equipment	new	14	Drying Oven	New	1	6,319	6,319
Aquaculture	2 Bio-Chemis- Pharma Technology	2-1 Advanced Equipment	new	15	Humidity chamber	New	1	8,617	8,617
Aquaculture	2 Bio-Chemis- Pharma Technology	2-1 Advanced Equipment	new	16	Resistance meter	New	1	8,617	8,617
Aquaculture	2 Bio-Chemis- Pharma Technology	2-1 Advanced Equipment	new	17	air conditioner	New	2	500	1,000
Aquaculture	2 Bio-Chemis- Pharma Technology	2-1 Advanced Equipment	new	13	Dielectric constant tester	New	1	43,083	43,083
Aquaculture	2 Bio-Chemis- Pharma Technology	2-1 Advanced Equipment	new	3	High performance liquid chromatography with DAD	New	1	70,000	70,000
Aquaculture	2 Bio-Chemis- Pharma Technology	2-2 Bioassay-1	new	25	Microscopy with camera and monitor	New	1	15,000	15,000
Aquaculture	2 Bio-Chemis- Pharma Technology	2-2 Bioassay	new	26	Clean Bench	New	2	4,500	9,000
Aquaculture	2 Bio-Chemis- Pharma Technology	2-2 Bioassay	new	27	CO_2 Incubator	New	2	10,000	20,000
Aquaculture	2 Bio-Chemis- Pharma Technology	2-2 Bioassay	new	29	air conditioner	New	2	500	1,000
Aquaculture	2 Bio-Chemis- Pharma Technology	2-2 Bioassay	new	30	ultraviolet lamp	New	4	100	400
Aquaculture	2 Bio-Chemis- Pharma Technology	2-2 Bioassay	new	31	clean air system	New	2	2,000	4,000
Aquaculture	2 Bio-Chemis- Pharma Technology	2-2 Bioassay	new	32	Chair	New	10	20	200
Aquaculture	2 Bio-Chemis- Pharma Technology	2-2 Bioassay	new	33	Exper imental table	New	4	200	800
Aquaculture	2 Bio-Chemis- Pharma Technology	2-2 Bioassay	new	34	Shelf, large	New	2	150	300
Aquaculture	2 Bio-Chemis- Pharma Technology	2-2 Bioassay	new	35	Table for install equipment	New	10	200	2,000

Faculty	Nw Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Classification new/modify Lab	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/ Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Aquaculture	2 Bio-Chemis- Pharma Technology	2-2 Bioassay	new	36	Working table	New	1	50	50
Aquaculture	2 Bio-Chemis- Pharma Technology	2-2 Bioassay	new	28	Dehumidifier machine	New	1	1,000	1,000
Aquaculture	2 Bio-Chemis- Pharma Technology	2-3 Bioassay-2	new	37	Deep freezer (-80^{0}C)	New	1	20,000	20,000
Aquaculture	2 Bio-Chemis- Pharma Technology	2-3 Bioassay	new	38	autoclave	New	1	6,000	6,000
Aquaculture	2 Bio-Chemis- Pharma Technology	2-3 Bioassay	new	39	Shaking and incubator	New	1	5,000	5,000
Aquaculture	2 Bio-Chemis- Pharma Technology	2-3 Bioassay	new	40	Thermostat magnetic stirrer	New	4	2,000	8,000
Aquaculture	2 Bio-Chemis- Pharma Technology	2-3 Bioassay	new	44	PH-meter	New	1	1,000	1,000
Aquaculture	2 Bio-Chemis- Pharma Technology	2-3 Bioassay	new	45	Ultrasonic cleaner	New	1	2,000	2,000
Aquaculture	2 Bio-Chemis- Pharma Technology	2-3 Bioassay	new	47	Vortex mixer	New	1	1,000	1,000
Aquaculture	2 Bio-Chemis- Pharma Technology	2-3 Bioassay	new	48	Deep Freezer (-20oC)	New	1	3,000	3,000
Aquaculture	2 Bio-Chemis- Pharma Technology	2-3 Bioassay	new	49	Fume Hood	New	2	5,000	10,000
	2 Bio-Chemis- Pharma Technology	2-3 Bioassay	new	50	Four demical number analytical balance	New	1	3,000	3,000
Aquaculture	2 Bio-Chemis- Pharma Technology	2-3 Bioassay	new	51	Laboratory oven	New	1	3,000	3,000
Aquaculture	2 Bio-Chemis- Pharma Technology	2-3 Bioassay	new	52	MicroPipett 0,5-10uL	New	2	300	600
Aquaculture	2 Bio-Chemis- Pharma Technology	2-3 Bioassay	new	53	MicroPipett 2-20uL	New	2	300	600
Aquaculture	2 Bio-Chemis- Pharma Technology	2-3 Bioassay	new	54	MicroPipett 5-50uL	New	2	300	600
Aquaculture	2 Bio-Chemis- Pharma Technology	2-3 Bioassay	new	55	MicroPipett 10-100uL	New	2	300	600
Aquaculture	2 Bio-Chemis- Pharma Technology	2-3 Bioassay	new	56	MicroPipett 50-200uL	New	2	300	600
Aquaculture	2 Bio-Chemis- Pharma Technology	2-3 Bioassay	new	57	MicroPipett 100-1000uL	New	2	300	600
Aquaculture	2 Bio-Chemis- Pharma Technology	2-3 Bioassay	new	58	Glassware equipments + others	New	1	10,000	10,000
Aquaculture	2 Bio-Chemis- Pharma Technology	2-3 Bioassay	new	41	Microtome	New	1	9,000	9,000
Aquaculture	2 Bio-Chemis- Pharma Technology	2-3 Bioassay	new	42	Colony counter	New	1	1,000	1,000
Aquaculture	2 Bio-Chemis- Pharma Technology	2-3 Bioassay	new	43	Staining device	New	1	1,000	1,000
Aquaculture	2 Bio-Chemis- Pharma Technology	2-3 Bioassay	new	46	Nitrogen bottle	New	2	4,000	8,000
Aquaculture	2 Bio-Chemis- Pharma Technology	2-3 Bioassay	new	59	chemical cabinet	New	1	5,000	5,000
Aquaculture	2 Bio-Chemis- Pharma Technology	2-3 Bioassay	new	60	Refrigerator	New	1	500	500
Aquaculture	2 Bio-Chemis- Pharma Technology	2-4 Natural Product Chemistry	new	68	Preparative Liquid chromatography (UV-Vis and ELSD detector)	New	1	60,000	60,000
Aquaculture	2 Bio-Chemis- Pharma Technology	2-4 Natural Product Chemistry	new	69	Vacuum rotary evaporator + freezer system + vacumn pump	New	2	30,000	60,000
Aquaculture	2 Bio-Chemis- Pharma Technology	2-4 Natural Product Chemistry	new	70	Size large Soxhlet apparatus	New	1	3,000	3,000
	2 Bio-Chemis- Pharma Technology	2-4 Natural Product Chemistry	new	71	Microwave extraction	new	1	35,000	35,000
Aquaculture	2 Bio-Chemis- Pharma Technology	2-4 Natural Product Chemistry	new	72	Thermostat magnetic stirrer	New	4	2,000	8,000
Aquaculture	2 Bio-Chemis- Pharma Technology	2-4 Natural Product Chemistry	new	73	Thermostat tank	New	2	6,000	12,000
Aquaculture	2 Bio-Chemis- Pharma Technology	2-4 Natural Product Chemistry	new	74	Vacuum Filtration system(Vacuum pump, Filtering funnel, proctecting, flasks)	New	2	3,000	6,000
Aquaculture	2 Bio-Chemis- Pharma Technology	2-4 Natural Product Chemistry	new	75	UV lamp and UV cabinet	New	1	2,000	2,000
Aquaculture	2 Bio-Chemis- Pharma Technology	2-4 Natural Product Chemistry	new	76	Vacuum pump	New	2	4,000	8,000
Aquaculture	2 Bio-Chemis- Pharma Technology	2-4 Natural Product Chemistry	new	78	laboratory oven	New	1	3,000	3,000
Aquaculture	2 Bio-Chemis- Pharma Technology	2-4 Natural Product Chemistry	new	80	Electronic pH meter	New	1	2,000	2,000
Aquaculture	2 Bio-Chemis- Pharma Technology	2-4 Natural Product Chemistry	new	81	Deep Freezer (-20oC)	New	1	3,000	3,000
Aquaculture	2 Bio-Chemis- Pharma Technology	2-4 Natural Product Chemistry	new	82	Fume Hood	New	4	5,000	20,000
Aquaculture	2 Bio-Chemis- Pharma Technology	2-4 Natural Product Chemistry	new	84	Glassware equipments + others	New	1	20,000	20,000
Aquaculture	2 Bio-Chemis- Pharma Technology	2-4 Natural Product Chemistry	new	77	chemical cabinet	New	1	5,000	5,000
Aquaculture	2 Bio-Chemis- Pharma Technology	2-4 Natural Product Chemistry	new	69	Vacuum rotary evaporator + freezer system + vacumn pump	New	1	30,000	30,000
Aquaculture	2 Bio-Chemis- Pharma Technology	2-4 Natural Product Chemistry	new	79	Four decimal number analytical balance	New	1	3,000	3,000
Aquaculture	2 Bio-Chemis- Pharma Technology	2-4 Natural Product Chemistry	new	83	Refrigerator	New	1	500	500

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Aquaculture	3 Fish Biology	3-1 Fish nutrition Lab	new	1	IKA Tube mill control	New	1	1,817	1,817
Aquaculture	3 Fish Biology	3-1 Fish nutrition Lab	new	2	IKA Universal mill	New	1	6,592	6,592
Aquaculture	3 Fish Biology	3-1 Fish nutrition Lab	new	3	pH metter, F-51BW-Horiba-Japan	New	1	1,294	1,294
Aquaculture	3 Fish Biology	3-1 Fish nutrition Lab	new	4	YSI professional plus-Handheld Multiparameter Instrument	New	1	2,500	2,500
Aquaculture	3 Fish Biology	3-1 Fish nutrition Lab	new	6	Oven 115L	New	2	1,358	2,717
Aquaculture	3 Fish Biology	3-1 Fish nutrition Lab	new	10	Freeze dryer-big tubes	New	1	25,000	25,000
Aquaculture	3 Fish Biology	3-1 Fish nutrition Lab	new	15	Fiber analysis system	New	1	11,979	11,979
Aquaculture	3 Fish Biology	3-1 Fish nutrition Lab	new	22	Bomb callorimetter	New	1	28,749	28,749
Aquaculture	3 Fish Biology	3-1 Fish nutrition Lab	new	23	amino acid analyzer	New	1	25,000	25,000
Aquaculture	3 Fish Biology	3-1 Fish nutrition Lab	new	25	Refrigerated Centrifuge	New	1	18,000	18,000
Aquaculture	3 Fish Biology	3-1 Fish nutrition Lab	new	5	YSI professional plus NH3/NH4, NO2	New	1	1,200	1,200
Aquaculture	3 Fish Biology	3-1 Fish nutrition Lab	new	7	Fume Cabinet	New	2	6,708	13,416
Aquaculture	3 Fish Biology	3-1 Fish nutrition Lab	new	13	kjeldahl analysis system	New	1	58,160	58,160
Aquaculture	3 Fish Biology	3-1 Fish nutrition Lab	new	8	Balance 2 digits	New	2	623	1,246
Aquaculture	3 Fish Biology	3-1 Fish nutrition Lab	new	9	Balance 4 digits	New	2	2,656	5,312
Aquaculture	3 Fish Biology	3-1 Fish nutrition Lab	new	11	Ultra-Turrax t25 homogenizer	New	1	1,420	1,420
Aquaculture	3 Fish Biology	3-1 Fish nutrition Lab	new	12	UV-VIS spectrometer (1 well)	New	1	8,000	8,000
Aquaculture	3 Fish Biology	3-1 Fish nutrition Lab	new	14	Soxtec + Hydrotherm	New	1	32,199	32,199
Aquaculture	3 Fish Biology	3-1 Fish nutrition Lab	new	16	Conductivity metter	New	1	1,917	1,917
Aquaculture	3 Fish Biology	3-1 Fish nutrition Lab	new	18	Vacuum filtration system	New	2	2,163	4,327
Aquaculture	3 Fish Biology	3-1 Fish nutrition Lab	new	19	shaker SK300	New	1	2,754	2,754
Aquaculture	3 Fish Biology	3-1 Fish nutrition Lab	new	20	Rotary evaporator RV 8 V-C IKA	New	2	3,199	6,398
Aquaculture	3 Fish Biology	3-1 Fish nutrition Lab	new	21	Particle analysing machine	New	1	2,000	2,000
Aquaculture	3 Fish Biology	3-1 Fish nutrition Lab	new	24	Brookfield LVDV-II Viscometer	New	1	3,000	3,000
Aquaculture	3 Fish Biology	3-1 Fish nutrition Lab	new	27	Bench with granite surface (W.0.7xL.2xH.1m)	Furniture	3	500	1,500
Aquaculture	3 Fish Biology	3-2 Fish nutrition basic Lab	new	28	Water Purification System	New	1	14,771	14,771
Aquaculture	3 Fish Biology	3-2 Fish nutrition basic Lab	new	37	UV-VIS spectrometer (1 well)	New	1	8,000	8,000
Aquaculture	3 Fish Biology	3-2 Fish nutrition basic Lab	new	29	Fish grinder machine	New	1	150	150
Aquaculture	3 Fish Biology	3-2 Fish nutrition basic Lab	new	30	Dry powder mixer 5 kg	New	2	2,012	4,025
Aquaculture	3 Fish Biology	3-2 Fish nutrition basic Lab	new	34	Oven 115L	New	1	1,358	1,358
Aquaculture	3 Fish Biology	3-2 Fish nutrition basic Lab	new	35	Fume Cabinet	New	1	6,708	6,708
Aquaculture	3 Fish Biology	3-2 Fish nutrition basic Lab	new	36	Furnace 600oC	New	1	956	956
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new	41	UV/Vis/NIR Spectrophotometer (8 wells)	New	1	16,000	16,000
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new	42	Respiratory meter	New	1	10,000	10,000
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new	43	Flake ice machine	New	1	7,500	7,500
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new	44	Eppendorf 5810R Centrifuge with Rotors	New	1	18,000	18,000
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new	48	Fume hood (secial for toxic chemical)	New	1	9,000	9,000
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new	49	Hematocric centrifuge	New	1	10,000	10,000
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new	50	Ultra-Turrax t25 homogenizer	New	1	1,420	1,420
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new	51	Ultra-low temperature freezer -86ºC	New	1	19,166	19,166
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new	52	Multiskan Spectrum*Microplate Photometers	New	1	18,481	18,481
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new	53	Osmotic pressure meter	New	1	15,000	15,000
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new	54	Na,K Ionic meter	New	1	15,000	15,000
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new	55	Chlorine Ionic meter	New	1	10,000	10,000
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new	56	Optical microscope	New	1	2,276	2,276
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new	57	Microscope with camera	New	1	5,386	5,386

Faculty	Nw Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Classification new/modify Lab	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/ Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new	58	Electro microscope connect to computer	New	1	2,500	2,500
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new	59	Biological microscope	New	1	1,270	1,270
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new	60	Microtome KD3368AM	New	1	13,000	13,000
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new	61	Automatic Tissue processer - KD- TS6A	New	1	13,000	13,000
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new	62	KD-RS1 tissue slide stainer	New	1	10,000	10,000
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new	65	Warm up slide board	New	1	3,400	3,400
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new	66	freezer -20ºC	New	1	958	958
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new	67	YSI professional plus-Handheld Multiparameter Instrument	New	1	2,500	2,500
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new	69	cobas b 121	New	1	17,000	17,000
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new	70	sysmex XS-1000i	New	1	35,000	35,000
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new	71	surgical instruments	New	1	1,000	1,000
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new	73	Liquid nitrogen tank	New	2	1,000	2,000
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new	74	pH, temperature, CO2, O2 measuring, monitoring and control system designed for use in fish tanks	New	1	20,000	20,000
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new	75	fish locating system in pond	New	1	15,000	15,000
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new	79	Water bath	New	1	2,113	2,113
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new	83	Ultrasonic cleaner system	New	1	6,708	6,708
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new	87	Bench with granite surface (W.0.7xL0.8xH.1m)	Furniture	2	300	600
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new	90	Shelf for materials keeping (D.0.5xW.2xH.2.5m)	Furniture	1	2,000	2,000
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new	93	Refrigerated Centrifuge (15 and 50 ml)	New	1	16,000	16,000
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new		UV/Vis/NIR Spectrophotometer (8 wells)	New	1	16,000	16,000
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new		Respiratory meter	New	1	10,000	10,000
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new		Eppendorf 5810R Centrifuge with Rotors	New	1	18,000	18,000
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new	46	Balance 4 digits	New	1	2,656	2,656
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new	47	Balance 2 digits	New	1	623	623
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new		Ultra-Turrax t25 homogenizer	New	1	1,420	1,420
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new		Ultra-low temperature freezer -86ºC	New	1	19,166	19,166
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new		Microscope with camera	New	1	5,386	5,386
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new		Electro microscope connect to computer	New	1	2,500	2,500
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new	63	Magnetic stirrer/Hot-plates	New	3	500	1,500
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new		freezer -20ºC	New	1	958	958
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new	68	YSI professional plus NH3/NH4, NO2	New	1	1,200	1,200
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new	72	Storage canbinets microscope	Furniture	1	2,500	2,500
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new		Liquid nitrogen tank	New	1	1,000	1,000
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new		pH, temperature, CO2, O2 measuring, monitoring and control system designed for use in fish tanks	New	1	20,000	20,000
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new	76	Hotplate Stirrer	New	2	1,006	2,012
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new	77	Vortex mixer VM-96B	New	1	862	862
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new	78	Micropipette sets	New	2	1,410	2,820
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new	80	Timers:	New	12	30	360
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new	82	Chemical storage cabinets	Furniture	1	2,400	2,400
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new	84	temperature control centrifuge (ependorf)	New	2	10,000	20,000
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new	85	continues mutiples micropepete	New	1	1,000	1,000
Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new	88	Stainless steel laboratory chair with high adjustable	Furniture	20	100	2,000

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Aquaculture	3 Fish Biology	3-3 Fish physiology Lab	new	89	Stainless steel laboratory table with high adjustable	Furniture	2	500	1,000
Aquaculture	3 Fish Biology	3-4 Fish physiology basic Lab	new	98	Optical microscope	New	2	2,276	4,552
Aquaculture	3 Fish Biology	3-4 Fish physiology basic Lab	new	99	Microscope with camera	New	1	5,386	5,386
Aquaculture	3 Fish Biology	3-4 Fish physiology basic Lab	new	100	Biological microscope	New	6	1,270	7,621
Aquaculture	3 Fish Biology	3-4 Fish physiology basic Lab	new	101	Micropipette (1-10 uL, 5-25 uL, 10-100 uL, 0,1-1 mL, 1-5 mL, 2-10mL)	New	3	200	600
Aquaculture	3 Fish Biology	3-4 Fish physiology basic Lab	new	102	Water bath	New	1	2,113	2,113
Aquaculture	3 Fish Biology	3-4 Fish physiology basic Lab	new	103	pH metter, F-51BW-Horiba-Japan	New	1	1,294	1,294
Aquaculture	3 Fish Biology	3-4 Fish physiology basic Lab	new	104	Storage canbinets microscope	Furniture	1	2,500	2,500
Aquaculture	3 Fish Biology	3-4 Fish physiology basic Lab	new	105	Stainless steel laboratory chair with high adjustable	Furniture	15.00	100	1,500
Aquaculture	3 Fish Biology	3-4 Fish physiology basic Lab	new	106	Shelf for chemicals and materials keeping (D.0.5xW.2xH.2.5m)	Furniture	2.00	2,000	4,000
Aquaculture	3 Fish Biology	3-4 Fish physiology basic Lab	new	107	Fume hood (secial for toxic chemical)	New	1	9,000	9,000
Aquaculture	3 Fish Biology	3-4 Fish physiology basic Lab	new	109	Stainless steel laboratory table with high adjustable	Furniture	2	500	1,000
Aquaculture	3 Fish Biology	3-4 Fish physiology basic Lab	new		Optical microscope	New	3	2,276	6,828
Aquaculture	3 Fish Biology	3-4 Fish physiology basic Lab	new		Microscope with camera	New	1	5,386	5,386
Aquaculture	3 Fish Biology	3-4 Fish physiology basic Lab	new		Biological microscope	New	1	1,270	1,270
Aquaculture	3 Fish Biology	3-4 Fish physiology basic Lab	new		Water bath	New	1	2,113	2,113
Aquaculture	3 Fish Biology	3-4 Fish physiology basic Lab	new		pH metter, F-51BW-Horiba-Japan	New	1	1,294	1,294
Aquaculture	3 Fish Biology	3-4 Fish physiology basic Lab	new		Stainless steel laboratory chair with high adjustable	Furniture	2.00	100	200
Aquaculture	4 Product Processing	4-1 Microbiology Lab	new	110	pH/EC/TDS/ºC/NaCl metter	new	1	1,025	1,025
Aquaculture	4 Product Processing	4-1 Microbiology Lab	new	111	MicroscopeCx 21 - Olympus	new	2	1,198	2,396
Aquaculture	4 Product Processing	4-1 Microbiology Lab	new	112	Microscope with camera	new	1	5,386	5,386
Aquaculture	4 Product Processing	4-1 Microbiology Lab	new	113	Real time qPCR system	new	1	38,000	38,000
Aquaculture	4 Product Processing	4-1 Microbiology Lab	new	114	Refrigerated Microcentrifuge tabletop for 1.5 and 2ml microtubes	new	1	3,588	3,588
Aquaculture	4 Product Processing	4-1 Microbiology Lab	new	115	cool incubator	new	1	4,894	4,894
Aquaculture	4 Product Processing	4-1 Microbiology Lab	new	116	incubator	new	1	4,922	4,922
Aquaculture	4 Product Processing	4-1 Microbiology Lab	new	118	oven (drying equipments) Model : XAS 320- Etuves – France	new	1	1,650	1,650
Aquaculture	4 Product Processing	4-1 Microbiology Lab	new	119	fume hood	new	1	6,708	6,708
Aquaculture	4 Product Processing	4-1 Microbiology Lab	new	121	Horizontal Laminar Flow Cabinet (Biological safety cabinet)	new	1	6,708	6,708
Aquaculture	4 Product Processing	4-1 Microbiology Lab	new	122	shaking incubator machine	new	1	2,754	2,754
Aquaculture	4 Product Processing	4-1 Microbiology Lab	new	123	Refrigerated Centrifuge	new	1	5,831	5,831
Aquaculture	4 Product Processing	4-1 Microbiology Lab	new	124	shaking machine Model: Vortex Classic- Velp – Italia	new	2	208	416
Aquaculture	4 Product Processing	4-1 Microbiology Lab	new	125	Multiskan Spectrum* Microplate Photometers	new	1	15,000	15,000
Aquaculture	4 Product Processing	4-1 Microbiology Lab	new	126	stomacher	new	1	4,900	4,900
Aquaculture	4 Product Processing	4-1 Microbiology Lab	new	127	colony counter machin	new	2	1,400	2,800
Aquaculture	4 Product Processing	4-1 Microbiology Lab	new	128	Freezer (-80), Nuaire- USA	new	1	15,000	15,000
Aquaculture	4 Product Processing	4-1 Microbiology Lab	new	129	Liquid nitrogen tank	new	2	1,000	2,000
Aquaculture	4 Product Processing	4-1 Microbiology Lab	new	130	Spectrophotometer (to measure bactiria density)	new	1	7,700	7,700
Aquaculture	4 Product Processing	4-1 Microbiology Lab	new	132	Balance with 4 digits,CPA324S-Sartorius-German	new	2	643	1,286

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Aquaculture	4 Product Processing	4-1 Microbiology Lab	new	133	electronic balance 2 digits	new	2	679	1,359
Aquaculture	4 Product Processing	4-1 Microbiology Lab	new	134	Moisture Balance-Infrared Heat - FD610	new	1	2,195	2,195
Aquaculture	4 Product Processing	4-1 Microbiology Lab	new	135	Cold room	new	1	6,000	6,000
Aquaculture	4 Product Processing	4-1 Microbiology Lab	new	136	Temperature Humidity Meter EXTECH	new	1	502	502
Aquaculture	4 Product Processing	4-1 Microbiology Lab	new	137	Digital Buret™ III with drying tube 25ml	new	2	825	1,650
Aquaculture	4 Product Processing	4-1 Microbiology Lab	new	138	Digital Buret™ III with drying tube 50ml	new	2	825	1,650
Aquaculture	4 Product Processing	4-1 Microbiology Lab	new	117	oven Memmert - Germany UFE500	new	2	2,276	4,552
Aquaculture	4 Product Processing	4-1 Microbiology Lab	new	120	autoclave	new	2	8,000	16,000
Aquaculture	4 Product Processing	4-1 Microbiology Lab	new	131	Chemical storage cabinets	Furniture	2	2,400	4,800
Aquaculture	4 Product Processing	4-1 Microbiology Lab	new	139	Glass erlenmeyer sets (50ml, 100ml, 250ml, 500ml, 1000ml, 2000ml)	new	10	50	500
Aquaculture	4 Product Processing	4-1 Microbiology Lab	new	140	Sterilized glass bottle sets (100ml, 250ml, 500ml, 1000ml)	new	20	50	1,000
Aquaculture	4 Product Processing	4-1 Microbiology Lab	new	141	Cyclinders sets (5ml, 10ml, 25ml, 50ml, 100ml, 250ml, 500ml, 1000ml)	new	10	50	500
Aquaculture	4 Product Processing	4-1 Microbiology Lab	new	142	PCR tube rack	new	20	10	200
Aquaculture	4 Product Processing	4-1 Microbiology Lab	new	143	Eppendorf racks	new	30	15	450
Aquaculture	4 Product Processing	4-1 Microbiology Lab	new	144	Autoclaves/Sterilizers 50 L	new	2	2,100	4,200
Aquaculture	4 Product Processing	4-1 Microbiology Lab	new	145	Autoclaves/Sterilizers Mini	new	2	750	1,500
Aquaculture	4 Product Processing	4-1 Microbiology Lab	new	146	Microplate Reader	new	1	2,850	2,850
Aquaculture	4 Product Processing	4-1 Microbiology Lab	new	147	Incubator (with CO2 supplier)	new	1	7,500	7,500
Aquaculture	4 Product Processing	4-1 Microbiology Lab	new	148	Incubators (bacterial plate incubator and for yeast also)	new	2	1,500	3,000
Aquaculture	4 Product Processing	4-1 Microbiology Lab	new	150	Fluorescent Microscopes BX51-F	new	1	7,000	7,000
Aquaculture	4 Product Processing	4-1 Microbiology Lab	new	151	Ultraviolet (UV) Crosslinkers	new	1	1,200	1,200
Aquaculture	4 Product Processing	4-1 Microbiology Lab	new	152	Mini centrifuge machine (for eppendorf)	new	2	100	200
Aquaculture	4 Product Processing	4-1 Microbiology Lab	new	153	Mini Centrifuge for PCR tubes	new	2	100	200
Aquaculture	4 Product Processing	4-1 Microbiology Lab	new	154	Refrigerated Centrifuge Tabletop for 15 and 50 ml Conicals	new	1	15,000	15,000
Aquaculture	4 Product Processing	4-1 Microbiology Lab	new	160	Gel doc system	new	1	6,000	6,000
Aquaculture	4 Product Processing	4-1 Microbiology Lab	new	161	UV Transilluminators	new	2	1,500	3,000
Aquaculture	4 Product Processing	4-1 Microbiology Lab	new	172	Vortexers/Mixers (Multi-Tube)	new	2	250	500
Aquaculture	4 Product Processing	4-2 Microbiology basic Lab	new	180	MicroscopeCx 21 - Olympus	New	2	1,198	2,396
Aquaculture	4 Product Processing	4-2 Microbiology basic Lab	new	181	electronic balance	New	2	679	1,359
Aquaculture	4 Product Processing	4-2 Microbiology basic Lab	new	182	Multi-channel Micropipette EMC 10-100 µl	New	1	359	359
Aquaculture	4 Product Processing	4-2 Microbiology basic Lab	new	183	cool incubator	New	1	4,894	4,894
Aquaculture	4 Product Processing	4-2 Microbiology basic Lab	new	184	incubator	New	1	4,922	4,922
Aquaculture	4 Product Processing	4-2 Microbiology basic Lab	new	185	oven Memmert - Germany UFE500	New	1	2,276	2,276
Aquaculture	4 Product Processing	4-2 Microbiology basic Lab	new	187	Hotplate Stirrer	New	1	643	643
Aquaculture	4 Product Processing	4-2 Microbiology basic Lab	new	188	Chemical storage cabinets	Furniture	1	2,400	2,400
Aquaculture	4 Product Processing	4-2 Microbiology basic Lab	new	189	stomacher	New	1	4,900	4,900
Aquaculture	4 Product Processing	4-2 Microbiology basic Lab	new	190	MicroscopeCx 21 - Olympus	New	1	1,198	1,198
Aquaculture	4 Product Processing	4-2 Microbiology basic Lab	new	191	Water bath	New	1	843	843
Aquaculture	4 Product Processing	4-2 Microbiology basic Lab	new	192	Refrigerator Sanyo SR-U21MN	New	2	323	646
Aquaculture	4 Product Processing	4-2 Microbiology basic Lab	new	193	Horizontal Laminar Flow Cabinet (Biological safety cabinet)	New	1	6,708	6,708
Aquaculture	4 Product Processing	4-2 Microbiology basic Lab	new	194	Digital Buret™ III with drying tube 25ml	New	2	825	1,650
Aquaculture	4 Product Processing	4-2 Microbiology basic Lab	new	195	Digital Buret™ III with drying tube 50ml	New	2	825	1,650

Faculty	Nw Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Classification new/modify Lab	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/ Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Aquaculture	4 Product Processing	4-2 Microbiology basic Lab	new	196	Counter	New	2	25	50
Aquaculture	4 Product Processing	4-2 Microbiology basic Lab	new	197	Glass erlenmeyer sets (50ml, 100ml, 250ml, 500ml, 1000ml, 2000ml)	New	10	50	500
Aquaculture	4 Product Processing	4-2 Microbiology basic Lab	new	198	Sterilized glass bottle sets (100ml, 250ml, 500ml, 1000ml)	New	20	50	1,000
Aquaculture	4 Product Processing	4-2 Microbiology basic Lab	new	186	fume hood	New	1	6,708	6,708
Aquaculture	4 Product Processing	4-2 Microbiology basic Lab	new	199	Cyclinders sets (5ml, 10ml, 25ml, 50ml, 100ml, 250ml, 500ml, 1000ml)	New	10	50	500
Aquaculture	4 Product Processing	4-2 Microbiology basic Lab	new	200	Beakers sets (50ml, 100ml, 250ml, 500ml, 1000ml)	New	10	50	500
Aquaculture	4 Product Processing	4-2 Microbiology basic Lab	new	201	Spectrophotometer (to measure bactiria density)	New	1	7,700	7,700
Aquaculture	4 Product Processing	4-2 Microbiology basic Lab	new	202	Bench with granite surface (W.0.7xL.2xH.1m)	Furniture	4	500	2,000
Aquaculture	4 Product Processing	4-2 Microbiology basic Lab	new	203	Bench with granite surface (W.0.7xL.2xH.1.4m)	Furniture	2	800	1,600
Aquaculture	4 Product Processing	4-3 Food safety Lab	new	216	Bench with granite surface (W.0.7xL.2xH.1m)	New	6	500	3,000
Aquaculture	4 Product Processing	4-3 Food safety Lab	new	217	Bench with granite surface (W.0.7xL0.8xH.1m)	New	1	300	300
		4-3 Food safety Lab	new	221	Shelf for chemicals and materials keeping (D.0.5xW.2xH.2.5m)	New	1	1,000	1,000
Aquaculture	4 Product Processing	4-3 Food safety Lab	new	226	Thermostat magnetic stirrer	New	2	958	1,916
Aquaculture	4 Product Processing	4-3 Food safety Lab	new	245	AA-7000 Atomic Absorption Spectrophotometer Shimadzu	New	1	90,300	90,300
Aquaculture	4 Product Processing	4-3 Food safety Lab	new	227	Multiskan Spectrum* Microplate Photometers	New	1	18,481	18,481
Aquaculture	4 Product Processing	4-3 Food safety Lab	new	228	Vacuum Freeze Dryer	New	1	20,000	20,000
		4-3 Food safety Lab	new	231	stomacher BAGMIXER 400W, Interscience-	New	1	4,900	4,900
Aquaculture	4 Product Processing	4-3 Food safety Lab	new	239	Fume Hood	New	1	6,708	6,708
Aquaculture	4 Product Processing	4-3 Food safety Lab	new	243	Rotavapor Buchi	New	1	8,000	8,000
Aquaculture	4 Product Processing				Bench with granite surface (W.0.7xL0.8xH.1m)	New	1	300	300
Aquaculture	4 Product Processing	4-3 Food safety Lab	new	218	Stainless steel laboratory chair with high adjustable	New	20	100	2,000
Aquaculture	4 Product Processing	4-3 Food safety Lab	new	219	Wood Office desk (0.8x1.2x1m)	New	2	300	600
		4-3 Food safety Lab	new	220	Wood Office chair	New	2	100	200
Aquaculture	4 Product Processing	4-3 Food safety Lab	new	229	High performance liquid chromatography with UV detector/DAD detector and fluorescein detector	New	1	90,000	90,000
Aquaculture	4 Product Processing	4-3 Food safety Lab	new	222	Cool chamber (3x3x3m)	New	1	6,600	6,600
Aquaculture	4 Product Processing	4-3 Food safety Lab	new	223	Pressurized fluid extractor, PFE (ASE-200)	New	1	25,000	25,000
		4-3 Food safety Lab	new	224	Flake ice machine	New	1	7,500	7,500
Aquaculture	4 Product Processing	4-3 Food safety Lab	new	225	Pressure homoginizer	New	1	2,000	2,000
Aquaculture	4 Product Processing				Vacuum Freeze Dryer	New	1	20,000	20,000
Aquaculture	4 Product Processing				stomacher BAGMIXER 400W, Interscience-	New	1	4,900	4,900
Aquaculture	4 Product Processing	4-3 Food safety Lab	new	233	Ultra-Turrax t25 homogenizer	New	1	1,420	1,420
Aquaculture	4 Product Processing	4-3 Food safety Lab	new	235	balance with 6 digits	New	1	5,750	5,750
Aquaculture	4 Product Processing	4-3 Food safety Lab	new	238	Ultrasonic cleaner system	New	1	6,780	6,780
Aquaculture	4 Product Processing				Fume Hood	New	1	6,708	6,708
Aquaculture	4 Product Processing				Rotavapor Buchi	New	1	8,000	8,000
		4-3 Food safety Lab	new	244	Nitrogen generator	New	1	14,375	14,375
Aquaculture	4 Product Processing	4-3 Food safety Lab	new	246	High-Speed Programmable Refrigerated Universal Centrifuge; 220V (YO-17303-15) and rotors	New	1	15,000	15,000
Aquaculture	4 Product Processing	4-3 Food safety Lab	new	230	Automated liquid-liquid extractor	New	1	15,000	15,000
Aquaculture	4 Product Processing	4-3 Food safety Lab	new	241	freezer -86	New	1	15,000	15,000

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Aquaculture	4 Product Processing	4-4 Food safety basic Lab	new	251	Bench with granite surface (W.0.7xL.2xH.1m)	New	3	500	1,500
		4-4 Food safety basic Lab	new	252	Bench with granite surface (W.0.7xL.2xH.1.4m)	New	2	800	1,600
Aquaculture	4 Product Processing	4-4 Food safety basic Lab	new	253	Bench with granite surface (W.0.7xL0.8xH.1m)	New	1	300	300
Aquaculture	4 Product Processing	4-4 Food safety basic Lab	new	257	Shelf for chemicals and materials keeping (D.0.5xW.2xH.2.5m)	New	1	1,000	1,000
Aquaculture	4 Product Processing	4-4 Food safety basic Lab	new	261	homogenizer (polytron) T25 digital ULTRA-TURRAX® IKA	New	2	1,420	2,840
Aquaculture	4 Product Processing	4-4 Food safety basic Lab	new	262	Multiskan Spectrum* Microplate Photometers	New	1	15,000	15,000
Aquaculture	4 Product Processing	4-4 Food safety basic Lab	new	266	Rotavapo Buchi	New	1	9,583	9,583
Aquaculture	4 Product Processing	4-4 Food safety basic Lab	new	267	Fume Hood	New	2	6,708	13,416
		4-4 Food safety basic Lab	new	268	spectrophotomter 1 well	New	2	8,000	16,000
Aquaculture	4 Product Processing	4-4 Food safety basic Lab	new	269	Water bath	New	2	2,013	4,026
Aquaculture	4 Product Processing	4-4 Food safety basic Lab	new	277	High-Speed Programmable Refrigerated Universal Centrifuge; 220V (YO-17303-15) and rotors	New	1	15,000	15,000
Aquaculture	4 Product Processing				Bench with granite surface (W.0.7xL.2xH.1m)	New	3	500	1,500
Aquaculture	4 Product Processing	4-4 Food safety basic Lab	new	254	Stainless steel laboratory chair with high adjustable	New	20	100	2,000
Aquaculture	4 Product Processing	4-4 Food safety basic Lab	new	255	Wood Office desk (0.8x1.2x1m)	New	1	300	300
Aquaculture	4 Product Processing	4-4 Food safety basic Lab	new	256	Wood Office chair	New	1	100	100
Aquaculture	4 Product Processing				Shelf for chemicals and materials keeping (D.0.5xW.2xH.2.5m)	New	1	1,000	1,000
Aquaculture	4 Product Processing	4-4 Food safety basic Lab	new	260	Cool incubator	New	1	4,894	4,894
Aquaculture	4 Product Processing	4-4 Food safety basic Lab	new	263	balance with 4 digits	New	2	2,656	5,313
		4-4 Food safety basic Lab	new	264	balance with 2 digits	New	1	623	623
Aquaculture	4 Product Processing	4-4 Food safety basic Lab	new	265	Oven 100 Lit	New	1	1,533	1,533
Aquaculture	4 Product Processing				Rotavapo Buchi	New	1	9,583	9,583
Aquaculture	4 Product Processing	4-4 Food safety basic Lab	new	272	Vortex VM-963	New	2	862	1,724
Aquaculture	4 Product Processing	4-4 Food safety basic Lab	new	275	freezer (-20)	New	2	985	1,970
Aquaculture	4 Product Processing	4-4 Food safety basic Lab	new	276	Refrigerator centrifuge Hettich MIKRO 220R	New	2	5,989	11,978
Aquaculture	4 Product Processing	4-5 Aquatic Product Processing Techniques Lab (CAF Area)	exiting	288	Fume Hood, DLH-11G-Jeiotech- Korea	New	1	6,708	6,708
Aquaculture	4 Product Processing	4-5 Aquatic Product Processing Techniques Lab (CAF Area)	exiting	289	Brookfield LVDV-II Viscometer	New	1	3,000	3,000
Aquaculture	4 Product Processing	4-5 Aquatic Product Processing Techniques Lab (CAF Area)	exiting	290	Laboratory Infrared rapid moisture analyzer	New	1	3,980	3,980
Aquaculture	4 Product Processing	4-5 Aquatic Product Processing Techniques Lab (CAF Area)	exiting	295	HP-200 Electronic Photo Colorimeter	New	1	3,560	3,560
Aquaculture	4 Product Processing	4-5 Aquatic Product Processing Techniques Lab (CAF Area)	exiting	298	Bioreactor	New	1	40,000	40,000
Aquaculture	4 Product Processing	4-5 Aquatic Product Processing Techniques Lab (CAF Area)	exiting	300	Autoclave HV110 for Bioreactor	New	1	10,000	10,000
Aquaculture	4 Product Processing	4-5 Aquatic Product Processing Techniques Lab (CAF Area)	exiting	301	Incubated shaker	New	1	8,000	8,000
Aquaculture	4 Product Processing	4-5 Aquatic Product Processing Techniques Lab (CAF Area)	exiting	305	Multiskan Spectrum* Microplate Photometers	New	1	15,000	15,000
Aquaculture	4 Product Processing	4-5 Aquatic Product Processing Techniques Lab (CAF Area)	exiting	307	Oxidation Test Reactor 230V for Shelf Life Studies ASTM D942	New	1	15,000	15,000
Aquaculture	4 Product Processing	4-5 Aquatic Product Processing Techniques Lab (CAF Area)	exiting	308	amino acid analyzer	New	1	20,000	20,000
Aquaculture	4 Product Processing	4-5 Aquatic Product Processing Techniques Lab (CAF Area)	exiting	309	TA-XT2 Plus Texture Analyzer	New	1	55,000	55,000

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Aquaculture	4 Product Processing	4-5 Aquatic Product Processing Techniques Lab (CAF Area)	exiting	312	Bench with granite surface (W.0.7xL0.8xH.1m)	Furniture	1	300	300
Aquaculture	4 Product Processing	4-5 Aquatic Product Processing Techniques Lab (CAF Area)	exiting	314	Wood Office desk (0.8x1.2x1m)	Furniture	1	180	180
Aquaculture	4 Product Processing	4-5 Aquatic Product Processing Techniques Lab (CAF Area)	exiting	315	Wood Office chair	Furniture	1	100	100
Aquaculture	4 Product Processing	4-5 Aquatic Product Processing Techniques Lab (CAF Area)	exiting	278	Balance with 4 digits,CPA324S-Sartorius-German	New	2	2,656	5,313
Aquaculture	4 Product Processing	4-5 Aquatic Product Processing Techniques Lab (CAF Area)	exiting	280	Ultra-Turrax t25 homogenizer	New	1	1,420	1,420
Aquaculture	4 Product Processing	4-5 Aquatic Product Processing Techniques Lab (CAF Area)	exiting	281	Rotavapo Buchi	New	1	9,583	9,583
Aquaculture	4 Product Processing	4-5 Aquatic Product Processing Techniques Lab (CAF Area)	exiting	292	Digital Buret™ III with drying tube 50ml	New	2	825	1,650
Aquaculture	4 Product Processing	4-5 Aquatic Product Processing Techniques Lab (CAF Area)	exiting	293	Shelf for chemicals and materials keeping (D.0.5xW.2xH.2.5m)	New	1	1,000	1,000
Aquaculture	4 Product Processing	4-5 Aquatic Product Processing Techniques Lab (CAF Area)	exiting	294	K-Type Thermocouple Thermometer with Penetration Probe	New	2	118	236
Aquaculture	4 Product Processing	4-5 Aquatic Product Processing Techniques Lab (CAF Area)	exiting	296	Digital Refractometers DR 6000 Kruss, Đức	New	1	6,655	6,655
Aquaculture	4 Product Processing	4-5 Aquatic Product Processing Techniques Lab (CAF Area)	exiting	297	Refrigerator centrifuge, Hettich MIKRO 220 R	New	1	5,989	5,989
Aquaculture	4 Product Processing	4-5 Aquatic Product Processing Techniques Lab (CAF Area)	exiting	299	Laptop for Bioreactor operation	New	1	1,000	1,000
Aquaculture	4 Product Processing	4-5 Aquatic Product Processing Techniques Lab (CAF Area)	exiting	302	Freeze dryer-big tubes	New	1	20,000	20,000
Aquaculture	4 Product Processing	4-5 Aquatic Product Processing Techniques Lab (CAF Area)	exiting	303	Cool incubator	New	1	4,894	4,894
Aquaculture	4 Product Processing	4-5 Aquatic Product Processing Techniques Lab (CAF Area)	exiting	304	UV/Vis/NIR Spectrophotometer (8 wells)	New	1	12,000	12,000
Aquaculture	4 Product Processing	4-5 Aquatic Product Processing Techniques Lab (CAF Area)	exiting	306	Thermo Lumina Fluorescence Spectrometer	New	1	15,000	15,000
Aquaculture	4 Product Processing	4-5 Aquatic Product Processing Techniques Lab (CAF Area)	exiting	310	Bench with granite surface (W.0.7xL.2xH.1m)	Furniture	2	500	1,000
Aquaculture	4 Product Processing	4-5 Aquatic Product Processing Techniques Lab (CAF Area)	exiting	311	Bench with granite surface (W.0.7xL.2xH.1.4m)	Furniture	2	800	1,600
Aquaculture	4 Product Processing	4-5 Aquatic Product Processing Techniques Lab (CAF Area)	exiting	313	Stainless steel laboratory chair with high adjustable	Furniture	5	100	500
Aquaculture	4 Product Processing	4-5 Aquatic Product Processing Techniques Lab (CAF Area)	exiting	289	Brookfield LVDV-II Viscometer	New	1	3,000	3,000
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	317	Pressure homoginizer	New	1	958	958
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	318	Ultra-Turrax t25 homogenizer	New	1	1,420	1,420
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	319	Stomacher	New	1	4,900	4,900
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	320	Micropipette (1-10 uL, 5-25 uL, 10-100 uL, 0,1-1 mL, 1-5 mL	New	1 2	359	4,312
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	321	pH meter, F-51BW-Horiba- Japan	New	2	1,294	2,587
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	322	Fume Hood, DLH-11G-Jeiotech- Korea	New	1	6,708	6,708
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	327	Water bath BW-10G	New	1	2,156	2,156

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Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	328	vortex VM-96B	New	1	862	862
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	329	Hydraulic oil press machine	New	1	5,000	5,000
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	330	Hotplate Stirrer	New	1	1,006	1,006
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	331	Conductivity metter	New	2	1,917	3,833
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	334	K-Type Thermocouple Thermometer with Penetration Probe	New	2	118	236
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	336	Furnace 600°C	New	1	956	956
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	337	protein analysis system	New	1	50,160	50,160
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	339	Lipid analyser	New	1	30,000	30,000
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	342	Evaporator	New	1	2,396	2,396
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	343	Dryer	New	1	5,000	5,000
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	344	Oven 100L, ON-11E-Jeiotech- Korea	New	1	1,533	1,533
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	346	Vacuum fryer	New	1	383	383
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	347	Spray Dryer B-290	New	1	6,107	6,107
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	348	Hot Fish Smoking Machine	New	1	20,000	20,000
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	350	E-VAC Cryovac Vacuum Packaging Machine	New	2	3,152	6,304
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	351	Fish skining machine	New	1	7,667	7,667
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	352	Air blast freezer	New	1	12,000	12,000
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	353	High quanlity vertical heat sealer	New	1	500	500
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	354	Guangzhou Semi auto caps sealing machine	New	1	2,595	2,595
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	355	Autoclave, HV-50, Hirayama- Japan	New	1	8,200	8,200
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	357	Sausage Stuffer	New	1	309	309
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	359	Fish meat accurately strainer	New	1	4,000	4,000
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	360	Roaster NFC-5D,KingSun,Taiwan	New	1	1,916	1,916
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	361	screw press	New	1	5,000	5,000
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	362	Meat grinder	New	1	1,249	1,249
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	363	Thunderbird Mixer Model ARM-01	New	1	1,500	1,500
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	365	Fish Ball Making Machine	New	2	700	1,400

Faculty	Nw Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Classification new/modify Lab	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/ Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	366	Vacuum filtration system	New	1	2,163	2,163
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	368	Particle analysing machine	New	1	2,000	2,000
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	369	Hydraulic sausage meat extruder	New	2	350	700
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	370	TSM 20 lb. Electric Meat Smoker	New	2	350	700
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	373	Koch type steamer with two removable shelves 220-240V.A.C	New	1	1,960	1,960
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	374	Home use solar drying machine for fish	New	1	1,850	1,850
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	413	Bench with granite surface (W.0.7xL0.8xH.1m)	Furniture	1	300	300
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	415	Wood Office desk (0.8x1.2x1m)	Furniture	1	300	300
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	416	Wood Office chair	Furniture	1	100	100
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	325	Freezer (-20oC),Lgex 3410- Liebherr-	New	1	958	958
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	326	Test tube shaker, SK-300-Jeiotech- Korea	New	1	4,792	4,792
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	332	Temperature Testers	New	1	61	61
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	338	Bomb callorimetter	New	1	20,000	20,000
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	340	Fibre analysis CF, NDF, ADF, Lignin	New	1	11,979	11,979
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	345	Fish meat bone separator machine	New	1	5,000	5,000
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	355	Autoclave, HV-50, Hirayama- Japan	New	1	8,200	8,200
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	356	Seafood Fish Packaging Machine/Wrapping Machine	New	1	25,000	25,000
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	358	Meat Bowl Cutter / Meat Bowl Cutting Machine	New	1	4,000	4,000
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	376	Inox table and water supply system	New	2	958	1,916
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	411	Bench with granite surface (W.0.7xL.2xH.1m)	Furniture	4	500	2,000
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	412	Bench with granite surface (W.0.7xL.2xH.1.4m)	Furniture	2	800	1,600
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	414	Stainless steel laboratory chair with high adjustable	Furniture	15	100	1,500
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	341	Flake ice machine	New	1	7,500	7,500
Aquaculture	4 Product Processing	4-6 Aquatic Product Processing Basic Techniques Lab (CAF Area)	exiting	349	Cold Fish Smoking Machine	New	1	20,000	20,000
Aquaculture	5 Fish Pathology	5-1 Parasitology Lab / Aquatic Mycology Lab	new	424	Non-refrigerated Microcentrifuge Tabletop for 1.5 and 2.0 ml Microtubes	New	1	7200	7,200
Aquaculture	5 Fish Pathology	5-1 Parasitology Lab / Aquatic Mycology Lab	new	430	Fume Hood	New	1	7000	7,000
Aquaculture	5 Fish Pathology	5-1 Parasitology Lab / Aquatic Mycology Lab	new	431	Laminar Flow Cabinet	New	2	9000	18,000
Aquaculture	5 Fish Pathology	5-1 Parasitology Lab / Aquatic Mycology Lab	new	432	Microscopes (optical)	New	5	2400	12,000

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Aquaculture	5 Fish Pathology	5-1 Parasitology Lab / Aquatic Mycology Lab	new	433	Incubators (bacterial plate incubator and for yeast also)	New	1	2400	2,400
Aquaculture	5 Fish Pathology	5-1 Parasitology Lab / Aquatic Mycology Lab	new	434	Incubator shakers (orbital)	New	1	3300	3,300
Aquaculture	5 Fish Pathology	5-1 Parasitology Lab / Aquatic Mycology Lab	new	435	Incubator	New	1	6400	6,400
Aquaculture	5 Fish Pathology	5-1 Parasitology Lab / Aquatic Mycology Lab	new	437	Micro balance	New	1	6000	6,000
Aquaculture	5 Fish Pathology	5-1 Parasitology Lab / Aquatic Mycology Lab	new	439	Shakers (orbital)	New	1	1600	1,600
Aquaculture	5 Fish Pathology	5-1 Parasitology Lab / Aquatic Mycology Lab	new	442	Autoclaves/Sterilizers Mini	New	2	800	1,600
Aquaculture	5 Fish Pathology	5-1 Parasitology Lab / Aquatic Mycology Lab	new	443	Dry heat sterilizers 80L	New	1	2000	2,000
Aquaculture	5 Fish Pathology	5-1 Parasitology Lab / Aquatic Mycology Lab	new	445	Microscope connected to the hand-painted	New	1	8500	8,500
Aquaculture	5 Fish Pathology	5-1 Parasitology Lab / Aquatic Mycology Lab	new	446	Stereomicroscope Digital Camera (SZ 61, Olympus, Japan)	New	1	5800	5,800
Aquaculture	5 Fish Pathology	5-1 Parasitology Lab / Aquatic Mycology Lab	new	447	Research stereo microscope	New	2	2500	5,000
Aquaculture	5 Fish Pathology	5-1 Parasitology Lab / Aquatic Mycology Lab	new	449	Homogenizers	New	1	2500	2,500
Aquaculture	5 Fish Pathology	5-1 Parasitology Lab / Aquatic Mycology Lab	new	456	Bench with granite surface (W.0.7xL.2xH.1m)	Furniture	4	500	2,000
Aquaculture	5 Fish Pathology	5-1 Parasitology Lab / Aquatic Mycology Lab	new	457	Bench with granite surface (W.0.7xL.2xH.1.4m)	Furniture	2	800	1,600
Aquaculture	5 Fish Pathology	5-1 Parasitology Lab / Aquatic Mycology Lab	new	458	Bench with granite surface (W.0.7xL0.8xH.1m)	Furniture	1	300	300
Aquaculture	5 Fish Pathology	5-1 Parasitology Lab / Aquatic Mycology Lab	new	459	Stainless steel laboratory chair with high adjustable	Furniture	15	100	1,500
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	462	Standard thermal cycler, 96x0.2 ul format block	New	1	6000	6,000
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	463	Standard thermal cycler, 96x0.5 ul format block	New	1	6000	6,000
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	464	DNA electrophoresis system	New	1	2,500	2,500
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	465	Gel beds and combs	New	4	750	3,000
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	466	Dry block Heater	New	1	700	700
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	467	Non-refrigerated Microcentrifuge Tabletop for 1.5 and 2.0 ml Microtubes	New	1	7200	7,200
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	468	Mini Centrifuge for PCR tubes	New	1	2000	2,000
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	469	Non-refrigerated Centrifuge Tabletop for 15 and 50 ml Conicals	New	1	11000	11,000
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	470	Refrigerate centrifuge (big capacity)	New	1	10000	10,000
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	471	Refrigerated Centrifuge Tabletop for 15 and 50 ml Conicals	New	1	10000	10,000
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	472	Refrigerated Microcentrifuge Tabletop for 1.5 and 2.0 ml Microtubes	New	1	9000	9,000
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	473	Mini centrifuge machine (for eppendorf)	New	1	2000	2,000
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	475	Fume Hood	New	1	7000	7,000
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	476	Laminar Flow Cabinet	New	1	9000	9,000
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	477	Biosafe flow cabinet	New	1	12000	12,000
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	478	Incubators (bacterial plate incubator and for yeast also)	New	1	2400	2,400
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	479	Incubator (with CO2 supplier)	New	1	7500	7,500
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	480	Incubator shakers	New	1	3300	3,300
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	481	Incubator shakers (orbital)	New	1	3300	3,300
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	482	Incubator	New	2	6400	12,800
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	484	Spectrophotometer	New	1	7700	7,700
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	485	Micro balance	New	1	6000	6,000
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	486	Microplate Reader	New	1	16700	16,700
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	487	Shakers (rotating)	New	1	1600	1,600
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	488	Shaker (linear)	New	1	1600	1,600
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	489	Shakers (orbital)	New	1	1600	1,600
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	490	Autoclaves/Sterilizers 80 L	New	1	2100	2,100
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	491	Autoclaves/Sterilizers 50 L	New	1	2100	2,100

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Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	492	Autoclaves/Sterilizers Mini	New	4	1800	7,200
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	493	Dry heat sterilizers 80L	New	1	2000	2,000
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	494	Stomacher	New	1	5000	5,000
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	495	Sonicator	New	1	2800	2,800
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	496	Water bath	New	1	2113	2,113
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	497	Stirrer waterbath	New	1	750	750
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	498	Vacuum chamber	New	1	2000	2,000
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	499	Homogenizers	New	1	2500	2,500
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	500	Ultrasonicator	New	1	2800	2,800
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	503	pH-meter	New	1	500	500
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	504	Hot air oven	New	1	2000	2,000
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	505	Spectrophotometer (to measure bacteria density)	New	1	7700	7,700
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	506	pH meter (with temperature)	New	1	2000	2,000
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	507	pH meter electrode (môi trường nuôi cấy vi khuẩn) (pH meter electrode)	New	1	2000	2,000
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	508	Vortexers/Mixers (Multi-Tube)	New	1	250	250
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	509	Thermomixer	New	1	750	750
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	510	Magnetic stirrer/Hot-plates	New	1	500	500
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	512	Stirrer	New	1	250	250
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	513	Analytical balance	New	1	3000	3,000
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	517	Multichannel pipettes (p20, p200)	New	5	1000	5,000
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	520	Freezer -80 C	New	1	9600	9,600
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	521	Freezer -20 C	New	1	1200	1,200
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	522	Refrigerator	New	2	1000	2,000
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	523	Two door coolers	New	1	2400	2,400
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	524	Gene pulser electroporation system	New	1	7000	7,000
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	525	Spectrophotometry Cuvettes	New	1	200	200
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	526	disk-dispenser	New	1	1000	1,000
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	527	MIC Multiple inoculating apparatus set	New	1	3000	3,000
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	532	Elisa analyzer	New	1	5000	5,000
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	533	Immunoassay Analyzer	New	1	5000	5,000
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	534	Chemistry analyzer	New	1	6500	6,500
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	535	Immunoassay System	New	1	5000	5,000
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	536	Sterilizer UV	New	1	2000	2,000
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	546	Bench with granite surface (W.0.7xL.2xH.1m)	Furniture	4	500	2,000
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	547	Bench with granite surface (W.0.7xL.2xH.1.4m)	Furniture	2	800	1,600
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	548	Bench with granite surface (W.0.7xL0.8xH.1m)	Furniture	1	300	300
Aquaculture	5 Fish Pathology	5-2 Bacteriology Lab	new	549	Stainless steel laboratory chair with high adjustable	Furniture	15	100	1,500
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	552	Gradient thermal cycler, 96x0.2 ul format block	New	1	13000	13,000
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	555	Standard thermal cycler, 96x0.5 ul format block	New	2	6000	12,000
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	557	DNA electrophoresis system	New	5	2,500	12,500
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	558	Gel beds and combs	New	5	750	3,750
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	559	Gel documentation system	New	1	13,000	13,000
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	560	UV Transilluminators	New	1	1500	1,500
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	561	Dry block heater with shake	New	1	1000	1,000
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	562	Dry block Heater	New	1	700	700

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Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	564	Non-refrigerated Microcentrifuge Tabletop for 1.5 and 2.0 ml Microtubes	New	1	7200	7,200
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	565	Mini Centrifuge for PCR tubes	New	1	2000	2,000
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	566	Plate Centrifuge	New	1	9800	9,800
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	574	Biological safety cabinet	New	1	11600	11,600
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	575	Fume Hood	New	1	7000	7,000
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	576	Laminar Flow Cabinet	New	1	9000	9,000
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	578	Incubator with shaker	New	1	8400	8,400
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	579	Incubator shakers (orbital)	New	1	3300	3,300
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	580	Incubator (370C)	New	1	6400	6,400
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	583	Micro balance	New	1	3000	3,000
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	584	Microplate Reader	New	1	16700	16,700
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	585	Shakers (rotating)	New	1	1600	1,600
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	586	Shakers (orbital)	New	1	1600	1,600
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	587	Autoclaves/Sterilizers 80 L	New	1	2100	2,100
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	588	Autoclaves/Sterilizers 50 L	New	1	2100	2,100
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	589	Autoclaves/Sterilizers Mini	New	2	800	1,600
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	590	Dry heat sterilizers 80L	New	1	2000	2,000
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	591	Microscopes (inverted)	New	1	7000	7,000
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	592	Vacuum chamber	New	1	2000	2,000
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	593	Homogenizers	New	1	2500	2,500
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	594	Ultrasonicator	New	1	2800	2,800
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	595	Protein electrophoresis system	New	1	2500	2,500
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	596	Western mini blotters	New	1	750	750
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	597	Transblot transfer system	New	1	1000	1,000
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	598	Immuno blot nitrocelluse membrane (rolls)	New	10	50	500
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	599	Blot absorbent filter paper	New	5	20	100
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	600	Power suppliers	New	1	2000	2,000
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	603	pH-meter	New	1	500	500
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	605	Hot air oven	New	1	2000	2,000
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	606	pH meter (with temperature)	New	1	2000	2,000
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	607	pH meter electrode (môi trường nuôi cấy vi khuẩn) (pH meter electrode)	New	1	2000	2,000
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	608	Vortexers/Mixers (Multi-Tube)	New	1	250	250
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	609	Thermomixer	New	1	750	750
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	610	Magnetic stirrer/Hot-plates	New	1	500	500
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	612	Analytical balance	New	1	6000	6,000
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	619	Freezer -80 C	New	1	9600	9,600
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	620	Freezer -20 C	New	1	1200	1,200
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	621	Refrigerator	New	1	1000	1,000
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	622	Two door coolers	New	1	1200	1,200
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	623	Flake ice machine	New	1	7500	7,500
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	556	Realtime PCR and accessories	New	1	85000	85,000
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	624	Gene pulser electroporation system	New	1	7000	7,000
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	625	Hybridization Oven	New	1	3500	3,500
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	626	Microplate Washers	New	1	2000	2,000
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	627	Spectrophotometry Cuvettes	New	1	200	200

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Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	628	Glassware washers	New	1	750	750
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	629	Bench with granite surface (W.0.7xL.2xH.1m)	Furniture	4	500	2,000
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	630	Bench with granite surface (W.0.7xL.2xH.1.4m)	Furniture	2	800	1,600
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	631	Bench with granite surface (W.0.7xL0.8xH.1m)	Furniture	1	300	300
Aquaculture	5 Fish Pathology	5-3 PCR - Virology Lab	new	632	Stainless steel laboratory chair with high adjustable	Furniture	15	100	1,500
Aquaculture	5 Fish Pathology	5-4 Histology Lab	new	635	Fume Hood	New	1	7,000	7,000
Aquaculture	5 Fish Pathology	5-4 Histology Lab	new	636	Laminar Flow Cabinet	New	1	9,000	9,000
Aquaculture	5 Fish Pathology	5-4 Histology Lab	new	637	Fume hood (secial for toxic chemical)	New	2	9,000	18,000
Aquaculture	5 Fish Pathology	5-4 Histology Lab	new	638	Microscope Supplies (Cover Glasses/Slips)	New	1	200	200
Aquaculture	5 Fish Pathology	5-4 Histology Lab	new	639	Microscope	New	1	2,500	2,500
Aquaculture	5 Fish Pathology	5-4 Histology Lab	new	640	Microtome	New	1	10,000	10,000
Aquaculture	5 Fish Pathology	5-4 Histology Lab	new	641	Microscope connect computers & shooting target template	New	1	8,500	8,500
Aquaculture	5 Fish Pathology	5-4 Histology Lab	new	643	Stirrer waterbath	New	1	750	750
Aquaculture	5 Fish Pathology	5-4 Histology Lab	new	644	Chemical storage	New	2	2,400	4,800
Aquaculture	5 Fish Pathology	5-4 Histology Lab	new	646	pH-meter	New	1	2,000	2,000
Aquaculture	5 Fish Pathology	5-4 Histology Lab	new	647	Hot air oven Memmert UNB500	New	1	2,000	2,000
Aquaculture	5 Fish Pathology	5-4 Histology Lab	new	648	Vortexers/Mixers (Multi-Tube)	New	1	250	250
Aquaculture	5 Fish Pathology	5-4 Histology Lab	new	649	Magnetic stirrer/Hot-plates	New	1	750	750
Aquaculture	5 Fish Pathology	5-4 Histology Lab	new	651	Analytical balance	New	1	3,000	3,000
Aquaculture	5 Fish Pathology	5-4 Histology Lab	new	657	Freezer -80 C	New	1	9,600	9,600
Aquaculture	5 Fish Pathology	5-4 Histology Lab	new	658	Freezer -20 C	New	1	1,200	1,200
Aquaculture	5 Fish Pathology	5-4 Histology Lab	new	659	Refrigerator	New	1	1,000	1,000
Aquaculture	5 Fish Pathology	5-4 Histology Lab	new	660	Two door coolers	New	1	1,200	1,200
Aquaculture	5 Fish Pathology	5-4 Histology Lab	new	663	Automated cell counter	New	1	8,000	8,000
Aquaculture	5 Fish Pathology	5-4 Histology Lab	new	665	Parifin emmbeding machine	New	1	25,000	25,000
Aquaculture	5 Fish Pathology	5-4 Histology Lab	new	666	Warm up slide board	New	1	3,400	3,400
Aquaculture	5 Fish Pathology	5-4 Histology Lab	new	676	Bench with granite surface (W.0.7xL.2xH.1.4m)	Furniture	2	800	1,600
Aquaculture	5 Fish Pathology	5-4 Histology Lab	new	677	Bench with granite surface (W.0.7xL0.8xH.1m)	Furniture	1	300	300
Aquaculture	5 Fish Pathology	5-4 Histology Lab	new	678	Stainless steel laboratory chair with high adjustable	Furniture	15	100	1,500
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	681	Gradient thermal cycler, 96x0.5 ul format block	New	1	13000	13,000
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	682	Standard thermal cycler, 96x0.2 ul format block	New	1	6000	6,000
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	683	Standard thermal cycler, 96x0.5 ul format block	New	1	6000	6,000
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	685	DNA electrophoresis system	New	1	2,500	2,500
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	686	Gel beds and combs	New	10	750	7,500
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	687	UV Transilluminators	New	1	1,500	1,500
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	688	Dry block heater with shake	New	1	700	700
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	689	Dry block Heater	New	1	700	700
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	691	High speed cold centrifuge rotors (various capacity)	New	1	5000	5,000
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	692	Non-refrigerated Microcentrifuge Tabletop for 1.5 and 2.0 ml Microtubes	New	1	7200	7,200
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	693	Mini Centrifuge for PCR tubes	New	1	2000	2,000
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	694	Non-refrigerated Centrifuge Tabletop for 15 and 50 ml Conicals	New	1	11000	11,000
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	695	Plate Centrifuge	New	1	9800	9,800

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Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	696	High speed cold centrifuge machine	New	1	20000	20,000
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	703	Biosafe flow cabinet	New	2	10000	20,000
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	704	Fume Hood	New	1	11600	11,600
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	705	Laminar Flow Cabinet	New	1	9000	9,000
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	706	Incubator (for cell culture)	New	3	2500	7,500
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	707	Laminar flow hood	New	1	9000	9,000
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	708	Incubators (bacterial plate incubator and for yeast also)(2)	New	1	2400	2,400
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	709	Incubator shakers	New	1	3300	3,300
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	710	Incubator shakers (orbital)	New	1	3300	3,300
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	711	Incubator	New	1	6400	6,400
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	714	Micro balance	New	1	6000	6,000
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	715	Microplate Reader	New	1	16700	16,700
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	716	Shakers (rotating)	New	1	1600	1,600
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	717	Shaker (linear)	New	1	1600	1,600
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	718	Shakers (orbital)	New	1	1600	1,600
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	719	Autoclaves/Sterilizers 80 L	New	1	2100	2,100
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	720	Autoclaves/Sterilizers 50 L	New	1	2100	2,100
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	721	Autoclaves/Sterilizers Mini	New	2	800	1,600
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	722	Dry heat sterilizers 80L	New	1	2000	2,000
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	728	Electro microscope connect to computer	New	1	2500	2,500
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	731	Stirrer waterbath	New	1	750	750
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	733	Homogenizers	New	1	2500	2,500
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	734	Cold room	New	1	6600	6,600
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	735	Ultrasonicator	New	1	2800	2,800
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	742	Multifunction electroporation	New	1	2800	2,800
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	744	Liquid nitrogen tank	New	1	1000	1,000
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	745	Tank for liquid nitrogen (big capacity, for cell culture)	New	2	2000	4,000
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	746	pH-meter	New	1	2000	2,000
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	747	Water Purifier	New	1	7800	7,800
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	748	Hot air oven	New	1	2000	2,000
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	750	pH meter electrode (môi trường nuôi cấy vi khuẩn) (pH meter electrode)	New	1	2000	2,000
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	751	Vortexers/Mixers (Multi-Tube)	New	5	250	1,250
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	752	Thermomixer	New	1	750	750
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	753	Magnetic stirrer/Hot-plates	New	1	500	500
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	755	Stirrer	New	1	250	250
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	756	Analytical balance	New	1	3000	3,000
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	764	Freezer -80 C	New	1	9600	9,600
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	765	Freezer -20 C	New	1	1200	1,200
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	766	Freezer -20 C (Small)	New	1	500	500
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	768	Ettan DALT*six* Large Vertical System	New	1	7000	7,000
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	769	Gel Caster	New	1	240	240
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	770	Electrophoresis Power Supply EPS 601	New	1	1150	1,150
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	771	MultiTempIII Thermostatic Circulator	New	1	1250	1,250
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	774	Refrigerator	New	2	500	1,000
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	775	Refrigerator (for centrifuge rotors)	New	1	500	500

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Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	776	Two door coolers	New	2	1200	2,400
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	777	Ice maker	New	1	7500	7,500
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	778	Gene pulser electroporation system	New	1	7000	7,000
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	779	Hybridization Oven	New	1	3500	3,500
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	780	Microplate Washers	New	1	2000	2,000
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	781	Spectrophotometry Cuvettes	New	1	200	200
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	783	Glassware washers	New	1	750	750
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	786	Elisa analyzer	New	1	5000	5,000
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	787	Immunoassay Analyzer	New	1	5000	5,000
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	788	Chemistry analyzer	New	1	6500	6,500
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	789	Immunoassay System	New	1	5000	5,000
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	790	Automated fluorescence in situ hybridization (FISH) enumeration systems	New	1	3500	3,500
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	791	Digital Filter Fluorometers	New	1	1000	1,000
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	792	Fluorescent Light Boxes	New	1	1000	1,000
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	802	Bench with granite surface (W.0.7xL.2xH.1m)	Furniture	4	500	2,000
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	803	Bench with granite surface (W.0.7xL.2xH.1.4m)	Furniture	2	800	1,600
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	804	Bench with granite surface (W.0.7xL0.8xH.1m)	Furniture	1	300	300
Aquaculture	5 Fish Pathology	5-5 Fish Immunology - tissue culture Lab	new	805	Stainless steel laboratory chair with high adjustable	Furniture	15	100	1,500
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	808	Refrigerate centrifuge tabletop	New	1	10800	10,800
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	809	Spindown centriuge machine	New	1	100	100
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	810	Non-refrigerated Centrifuge Tabletop for 15 and 50 ml Conicals	New	1	11000	11,000
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	811	Refrigerated Centrifuge Tabletop for 15 and 50 ml Conicals	New	1	16000	16,000
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	816	Gradient thermal cycler, 96x0.2 ul format block	New	1	13000	13,000
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	817	Standard thermal cycler, 96x0.5 ul format block	New	3	6000	18,000
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	819	Homogenizers	New	1	2500	2,500
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	821	Biological safety cabinet	New	2	11600	23,200
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	824	Microwave	New	2	250	500
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	825	Gel beds and combs	New	5	750	3,750
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	826	Gel doc system	New	1	13000	13,000
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	827	UV Transilluminators	New	1	1500	1,500
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	828	Dry block heater with shake	New	1	1000	1,000
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	829	Dry block Heater	New	1	700	700
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	831	Stirrer waterbath	New	1	750	750
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	832	Fume Hood	New	1	11600	11,600
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	833	Incubators (bacterial plate incubator and for yeast also)	New	1	2400	2,400
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	834	Incubator shakers (orbital)	New	1	3300	3,300
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	835	Laminar flow hood	New	2	9000	18,000
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	836	Incubator with shaker	New	1	8400	8,400
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	837	Fume hood (secial for toxic chemical)	New	1	9000	9,000
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	841	Hot air oven	New	1	2000	2,000
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	843	Thermomixer	New	1	750	750
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	844	Vortexers/Mixers (Multi-Tube)	New	1	250	250
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	845	Shakers (orbital)	New	1	1600	1,600
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	846	Shakers (rotating)	New	1	1600	1,600

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Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	847	Shaker (linear)	New	1	1600	1,600
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	848	pH-meter	New	1	2000	2,000
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	849	pH meter (with temperature)	New	1	2000	2,000
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	851	Spectrophotometer (to measure bactiria density)	New	1	7700	7,700
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	852	Stirrer	New	3	250	750
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	853	Magnetic stirrer/Hot-plates	New	1	500	500
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	855	Analytical balance	New	2	3000	6,000
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	856	Micro balance	New	2	6000	12,000
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	863	Refrigerator	New	4	500	2,000
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	864	Microplate Reader	New	1	10000	10,000
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	866	Microscopes (optical)	New	1	2400	2,400
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	867	Microscopes (inverted)	New	1	7000	7,000
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	868	Microscope Supplies (Cover Glasses/Slips)	New	10	200	2,000
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	871	Microscope	New	5	2500	12,500
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	872	Microscope connect to camera MBL2000-T	New	1	2500	2,500
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	874	Electro microscope connect to computer	New	1	2500	2,500
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	877	MIC Multiple inoculating apparatus set	New	1	3000	3,000
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	879	Automatic multi-dispenser	New	1	6000	6,000
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	880	Elisa analyzer	New	1	5000	5,000
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	882	Parafin emmbeding machine	New	1	30000	30,000
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	883	Warm up slide board	New	2	3400	6,800
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	885	LCD	New	2	2,500	5,000
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	886	Shelf for chemicals and materials keeping (D.0.5xW.2xH.2.5m)	Furniture	4	750	3,000
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	887	Bench with granite surface (W.0.7xL.2xH.1m)	Furniture	6	500	3,000
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	888	Bench with granite surface (W.0.7xL.2xH.1.4m)	Furniture	4	800	3,200
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	889	Bench with granite surface (W.0.7xL0.8xH.1m)	Furniture	2	300	600
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	890	Stainless steel laboratory chair with high adjustable	Furniture	30	100	3,000
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	891	Wood Office desk (0.8x1.2x1m)	Furniture	2	300	600
Aquaculture	5 Fish Pathology	5-6 Fish Pathology Basic Lab	new	892	Wood Office chair	Furniture	2	100	200
Aquaculture	5 Fish Pathology	5-7 Preparation Room	new	893	Spindown centrifuge machine	New	1	100	100
Aquaculture	5 Fish Pathology	5-7 Preparation Room	new	894	Non-refrigerated Microcentrifuge Tabletop for 1.5 and 2.0 ml Microtubes	New	1	7200	7,200
Aquaculture	5 Fish Pathology	5-7 Preparation Room	new	895	Refrigerated Microcentrifuge Tabletop for 1.5 and 2.0 ml Microtubes	New	1	7000	7,000
Aquaculture	5 Fish Pathology	5-7 Preparation Room	new	896	Mini Centrifuge for PCR tubes	New	1	2000	2,000
Aquaculture	5 Fish Pathology	5-7 Preparation Room	new	898	Homogenizers	New	1	2500	2,500
Aquaculture	5 Fish Pathology	5-7 Preparation Room	new	900	Incubators (bacterial plate incubator and for yeast also)	New	1	2400	2,400
Aquaculture	5 Fish Pathology	5-7 Preparation Room	new	901	Laminar flow hood	New	2	7000	14,000
Aquaculture	5 Fish Pathology	5-7 Preparation Room	new	902	Incubator with shaker	New	2	8400	16,800
Aquaculture	5 Fish Pathology	5-7 Preparation Room	new	903	Vortexers/Mixers (Multi-Tube)	New	2	250	500
Aquaculture	5 Fish Pathology	5-7 Preparation Room	new	909	Refrigerator	New	4	500	2,000
Aquaculture	5 Fish Pathology	5-7 Preparation Room	new	911	Spectrophotometer	New	1	7700	7,700
Aquaculture	5 Fish Pathology	5-7 Preparation Room	new	919	Shelf for chemicals and materials keeping (D.0.5xW.2xH.2.5m)	Furniture	4	750	3,000
Aquaculture	5 Fish Pathology	5-7 Preparation Room	new	920	Bench with granite surface (W.0.7xL.2xH.1m)	Furniture	4	500	2,000

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Aquaculture	5 Fish Pathology	5-7 Preparation Room	new	921	Bench with granite surface (W.0.7xL.2xH.1.4m)	Furniture	2	800	1,600
Aquaculture	5 Fish Pathology	5-7 Preparation Room	new	922	Bench with granite surface (W.0.7xL0.8xH.1m)	Furniture	1	300	300
Aquaculture	5 Fish Pathology	5-7 Preparation Room	new	923	Stainless steel laboratory chair with high adjustable	Furniture	15	100	1,500
Aquaculture	5 Fish Pathology	5-7 Preparation Room	new	905	Pipette (p5000)	New	5	300	1,500
Aquaculture	5 Fish Pathology	5-7 Preparation Room	new	906	Multichannel pipettes (p20, p200)	New	5	1000	5,000
Aquaculture	5 Fish Pathology	5-7 Preparation Room	new	907	Accu jet pipette controllers	New	1	450	450
Aquaculture	5 Fish Pathology	5-7 Preparation Room	new	908	Pipette stands	New	3	25	75
Aquaculture	5 Fish Pathology	5-7 Preparation Room	new	910	Microplate Reader	New	1	15000	15,000
Aquaculture	5 Fish Pathology	5-7 Preparation Room	new	912	PCR tube rack	New	10	20	200
Aquaculture	5 Fish Pathology	5-7 Preparation Room	new	913	Eppendorf racks	New	10	15	150
Aquaculture	5 Fish Pathology	5-7 Preparation Room	new	914	Glass erlenmeyer sets (50ml, 100ml, 250ml, 500ml, 1000ml, 2000ml)	New	10	50	500
Aquaculture	5 Fish Pathology	5-7 Preparation Room	new	915	Sterilized glass bottle sets (100ml, 250ml, 500ml, 1000ml)	New	10	50	500
Aquaculture	5 Fish Pathology	5-7 Preparation Room	new	916	Cyclinders sets (5ml, 10ml, 25ml, 50ml, 100ml, 250ml, 500ml, 1000ml)	New	10	50	500
Aquaculture	5 Fish Pathology	5-7 Preparation Room	new	917	Beakers sets (50ml, 100ml, 250ml, 500ml, 1000ml)	New	10	50	500
Aquaculture	5 Fish Pathology	5-7 Preparation Room	new	918	Timers:	New	10	30	300
Aquaculture	5 Fish Pathology	5-7 Preparation Room	new	924	Wood Office desk (0.8x1.2x1m)	Furniture	1	300	300
Aquaculture	5 Fish Pathology	5-7 Preparation Room	new	925	Wood Office chair	Furniture	1	100	100
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	926	Analytical balance (2 digits)	New	1	3,000	3,000
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	927	Analytical balance (5 digits)	New	1	6,000	6,000
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	929	Automatic Total Nitrogen Analyzer	New	1	28,600	28,600
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	930	BOD Oxidirect (Lovibond) (6 sensors)	New	4	3,600	14,400
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	931	BOD Oxidirect cabinet (20 oC)	New	1	4,000	4,000
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	933	Cabinets for equipment and materials	New	6	500	3,000
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	934	Centrifuge (50 mL)	New	1	1,500	1,500
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	935	COD Digester	New	4	800	3,200
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	936	Cuvette (quart and glass)	New	20	300	6,000
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	938	Digital micropippet	New	10	800	8,000
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	939	Digital Stirring	New	2	1,000	2,000
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	940	Digital Water bath	New	3	800	2,400
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	941	Dispenser (10 mL, 25 mL, 50 mL)	New	20	750	15,000
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	942	Water double distiller	New	3	3,400	10,200
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	943	Dry oven	New	2	4,300	8,600
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	944	Esco Fume Hood	New	4	2,900	11,600
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	946	Flow Injection Analysis (FIA) (6 channels)	New	1	20,000	20,000
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	948	Freeze dryer	New	2	5,800	11,600
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	949	Handheld Multiparameter water quality Horiba U-51	New	2	5,800	11,600
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	950	Handheld Turbidity meter	New	1	2,900	2,900
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	952	High-Temperature Chamber Furnaces	New	1	3,100	3,100
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	953	Ion Chromatography System (ICS 5000)	New	1	20,000	20,000
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	954	Kjeldahl Digestion Units - DK Series	New	2	3,600	7,200
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	955	Microplate reader	New	1	16,700	16,700
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	956	Microwave Digestion system	New	3	5,800	17,400

Faculty	Nw Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Classification new/modify Lab	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/ Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	959	Multisediment Trap	New	6	3,100	18,600
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	961	Pipette	New	12	400	4,800
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	962	Refrigerator 2-14 oC (Sanyo-MPR 514)	New	3	2,400	7,200
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	963	Spectrophotometer	New	2	12,000	24,000
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	964	Table pH meter	New	2	1,000	2,000
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	965	Table turbidity meter	New	2	4,000	8,000
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	966	Total Organic Carbon Analyzer	New	1	14,300	14,300
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	967	Toxic filter (for Kejdalh Digestion System)	New	2	900	1,800
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	968	Vacuum pumb + Filter	New	2	2,000	4,000
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	969	Handheld YSI 556	New	4	2,400	9,600
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	970	Microscope (Nikon, Japan)	New	4	2,400	9,600
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	971	Refractometer	New	5	300	1,500
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	972	Velocity Flow meter	New	1	6,200	6,200
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	973	Vertical Laminar Flow Hood	New	2	4,800	9,600
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	983	Shallow Water Multibeam system	New	1	38,100	38,100
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	974	High purity water	New	2	3,900	7,800
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	978	Shelf, large	Furniture	6	400	2,400
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	979	Working tables	Furniture	6	400	2,400
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	932	Cabinets for chemical storeage with toxic filter	New	2	2,000	4,000
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	928	Atomic Absorption Spectropotometer system (AAS)	New	1	60,000	60,000
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	945	Evermed Lab Freezer -86 oC	New	1	9,600	9,600
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	951	Handheld YSI 6600	New	2	3,400	6,800
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	957	Moiture Determination Balance	New	2	2,000	4,000
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	960	Oil Content Analyzer	New	1	6,200	6,200
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	975	Stirring ZX3	New	6	800	4,800
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	976	Handheld pH, EC meter (Sension3)	New	4	1,200	4,800
Aquaculture	6 Aquatic Environment	6-1 Aquaculture Ponds Water/Sediment Lab	new	980	Gas Chromatography (Shimazhu GC-2010)	New	1	150,000	150,000
Aquaculture	6 Aquatic Environment	6-2 Algae Toxins & Plankton/Periphyton Biodiversity Lab	new	997	Esco Fume Hood	New	1	2,900	2,900
Aquaculture	6 Aquatic Environment	6-2 Algae Toxins & Plankton/Periphyton Biodiversity Lab	new	999	Fluorescence Spectrophotometer (F7000) (Also share with Probiotic Study Lab)	New	1	50,000	50,000
Aquaculture	6 Aquatic Environment	6-2 Algae Toxins & Plankton/Periphyton Biodiversity Lab	new	1000	Inverted Microscope	New	2	8,100	16,200
Aquaculture	6 Aquatic Environment	6-2 Algae Toxins & Plankton/Periphyton Biodiversity Lab	new	1002	Microscope cabinet (to store microscopes)	New	1	5,000	5,000
Aquaculture	6 Aquatic Environment	6-2 Algae Toxins & Plankton/Periphyton Biodiversity Lab	new	1003	Microscope Digital Camera	New	1	12,000	12,000
Aquaculture	6 Aquatic Environment	6-2 Algae Toxins & Plankton/Periphyton Biodiversity Lab	new	1004	Pipette	New	10	300	3,000
Aquaculture	6 Aquatic Environment	6-2 Algae Toxins & Plankton/Periphyton Biodiversity Lab	new	1006	Refrigerated Centrifuge	New	1	5,800	5,800
Aquaculture	6 Aquatic Environment	6-2 Algae Toxins & Plankton/Periphyton Biodiversity Lab	new	1007	Refrigerator (2-14 oC) Sanyo-MPR 514	New	2	4,100	8,200
Aquaculture	6 Aquatic Environment	6-2 Algae Toxins & Plankton/Periphyton Biodiversity Lab	new	1008	Spectrophotometer	New	1	12,000	12,000
Aquaculture	6 Aquatic Environment	6-2 Algae Toxins & Plankton/Periphyton Biodiversity Lab	new	1011	Shelf, large	Furniture	3	400	1,200
Aquaculture	6 Aquatic Environment	6-2 Algae Toxins & Plankton/Periphyton Biodiversity Lab	new	1012	Working tables	Furniture	2	400	800

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Aquaculture	6 Aquatic Environment	6-2 Algae Toxins & Plankton/Periphyton Biodiversity Lab	new	995	Cabinets for equipment and materials	New	4	500	2,000
Aquaculture	6 Aquatic Environment	6-2 Algae Toxins & Plankton/Periphyton Biodiversity Lab	new	998	Fluorescence Microscopy Digital Upright Camera	New	1	24,000	24,000
Aquaculture	6 Aquatic Environment	6-2 Algae Toxins & Plankton/Periphyton Biodiversity Lab	new	996	Digital Stirring	New	1	1,000	1,000
Aquaculture	6 Aquatic Environment	6-2 Algae Toxins & Plankton/Periphyton Biodiversity Lab	new	1001	Microscope (Nikon, Japan)	New	1	2,400	2,400
Aquaculture	6 Aquatic Environment	6-2 Algae Toxins & Plankton/Periphyton Biodiversity Lab	new	1005	Plate Centrifuge	New	2	9,800	19,600
Aquaculture	6 Aquatic Environment	6-3 Live Food Study Lab	new	1024	Algae Batch culture system	New	1	2,000	2,000
Aquaculture	6 Aquatic Environment	6-3 Live Food Study Lab	new	1025	Algae Centrifuge	New	4	3,600	14,400
Aquaculture	6 Aquatic Environment	6-3 Live Food Study Lab	new	1026	Algae culture system	New	2	10,000	20,000
Aquaculture	6 Aquatic Environment	6-3 Live Food Study Lab	new	1027	Algae incubator	New	4	5,000	20,000
Aquaculture	6 Aquatic Environment	6-3 Live Food Study Lab	new	1028	Analytical balance (2 digits)	New	1	3,000	6,000
Aquaculture	6 Aquatic Environment	6-3 Live Food Study Lab	new	1029	Autoclaves /Sterilizers 80 L	New	1	2,100	2,100
Aquaculture	6 Aquatic Environment	6-3 Live Food Study Lab	new	1030	Automatic feeder	New	5	3,900	19,500
Aquaculture	6 Aquatic Environment	6-3 Live Food Study Lab	new	1031	Cabinets for equiment and materials	New	4	500	2,000
Aquaculture	6 Aquatic Environment	6-3 Live Food Study Lab	new	1032	CO2 maker/generator	New	1	1,500	1,500
Aquaculture	6 Aquatic Environment	6-3 Live Food Study Lab	new	1034	Dry oven	New	1	1,500	1,500
Aquaculture	6 Aquatic Environment	6-3 Live Food Study Lab	new	1035	Esco Fume Hood	New	1	2,900	2,900
Aquaculture	6 Aquatic Environment	6-3 Live Food Study Lab	new	1037	Freeze dryer	New	1	5,800	5,800
Aquaculture	6 Aquatic Environment	6-3 Live Food Study Lab	new	1039	Incubator shakers	New	1	3,300	3,300
Aquaculture	6 Aquatic Environment	6-3 Live Food Study Lab	new	1040	Light intensity meter	New	2	1,500	3,000
Aquaculture	6 Aquatic Environment	6-3 Live Food Study Lab	new	1041	Microscope (Nikon, Japan)	New	1	2,400	2,400
Aquaculture	6 Aquatic Environment	6-3 Live Food Study Lab	new	1042	Microscope cabinet (to store microscopes)	New	1	5,000	5,000
Aquaculture	6 Aquatic Environment	6-3 Live Food Study Lab	new	1044	Ozone generator (4 g/h, 10 g/h)	New	4	1,000	4,000
Aquaculture	6 Aquatic Environment	6-3 Live Food Study Lab	new	1045	Pipette	New	10	300	3,000
Aquaculture	6 Aquatic Environment	6-3 Live Food Study Lab	new	1046	Refractometer	New	5	300	1,500
Aquaculture	6 Aquatic Environment	6-3 Live Food Study Lab	new	1047	Refrigerated Microcentrifuge Tabletop for 1.5 and 2.0 ml Microtubes	New	1	7,000	7,000
Aquaculture	6 Aquatic Environment	6-3 Live Food Study Lab	new	1048	Refrigerator (-86C)	New	2	10,500	21,000
Aquaculture	6 Aquatic Environment	6-3 Live Food Study Lab	new	1049	Stainless Steel Vacuum Packaging Machine	New	1	1,000	1,000
Aquaculture	6 Aquatic Environment	6-3 Live Food Study Lab	new	1050	Stereomicroscope Digital Camera	New	1	5,900	5,900
Aquaculture	6 Aquatic Environment	6-3 Live Food Study Lab	new	1051	Table pH meter	New	2	1,000	2,000
Aquaculture	6 Aquatic Environment	6-3 Live Food Study Lab	new	1052	UV generator	New	4	1,500	6,000
Aquaculture	6 Aquatic Environment	6-3 Live Food Study Lab	new	1053	Benchtop Centrifuge	New	1	7,200	7,200
Aquaculture	6 Aquatic Environment	6-3 Live Food Study Lab	new	1054	Shelf, large	Furniture	3	400	1,200
Aquaculture	6 Aquatic Environment	6-3 Live Food Study Lab	new	1055	Working tables	Furniture	2	400	800
Aquaculture	6 Aquatic Environment	6-3 Live Food Study Lab	new	1033	Composite tanks for algae culture (m3) (also for wetlab)	New	50	200	10,000
Aquaculture	6 Aquatic Environment	6-3 Live Food Study Lab	new	1038	Handheld Turbidity meter	New	4	1,500	6,000
Aquaculture	6 Aquatic Environment	6-3 Live Food Study Lab	new	1043	Osmotic pressure meter	New	1	15,000	15,000
Aquaculture	6 Aquatic Environment	6-3 Live Food Study Lab	new	1036	Fluorescence Microscope	New	1	2,400	2,400
Aquaculture	6 Aquatic Environment	6-4 Probiotics Study Lab	new	1067	Analytical balance (2 digits)	New	1	3,000	3,000
Aquaculture	6 Aquatic Environment	6-4 Probiotics Study Lab	new	1069	Autoclaves /Sterilizers 80 L	New	1	2,100	2,100
Aquaculture	6 Aquatic Environment	6-4 Probiotics Study Lab	new	1070	Centrifuge (50 mL tube)	New	2	1,500	3,000
Aquaculture	6 Aquatic Environment	6-4 Probiotics Study Lab	new	1072	Dry oven	New	1	1,500	1,500
Aquaculture	6 Aquatic Environment	6-4 Probiotics Study Lab	new	1073	Esco Fume Hood	New	1	2,900	2,900

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Aquaculture	6 Aquatic Environment	6-4 Probiotics Study Lab	new	1074	Cabinets for equiment and materials	New	4	500	2,000
Aquaculture	6 Aquatic Environment	6-4 Probiotics Study Lab	new	1075	Microscope (Nikon, Japan)	New	1	2,400	2,400
Aquaculture	6 Aquatic Environment	6-4 Probiotics Study Lab	new	1076	Incubator (37 oC)	New	1	6,400	6,400
Aquaculture	6 Aquatic Environment	6-4 Probiotics Study Lab	new	1077	Incubator shakers	New	1	3,300	3,300
Aquaculture	6 Aquatic Environment	6-4 Probiotics Study Lab	new	1079	Pipette	New	10	300	3,000
Aquaculture	6 Aquatic Environment	6-4 Probiotics Study Lab	new	1081	Vertical Laminar flow hood	New	2	9,000	18,000
Aquaculture	6 Aquatic Environment	6-4 Probiotics Study Lab	new	1082	Vortex mixer multi-tube	New	4	800	3,200
Aquaculture	6 Aquatic Environment	6-4 Probiotics Study Lab	new	1083	Fermenter	New	1	29,200	29,200
Aquaculture	6 Aquatic Environment	6-4 Probiotics Study Lab	new	1085	Digital water bath	New	2	1,200	2,400
Aquaculture	6 Aquatic Environment	6-4 Probiotics Study Lab	new	1087	Stirring ZX3	New	3	600	1,800
Aquaculture	6 Aquatic Environment	6-4 Probiotics Study Lab	new	1088	Shelf, large	Furniture	3	400	1,200
Aquaculture	6 Aquatic Environment	6-4 Probiotics Study Lab	new	1089	Working tables	Furniture	2	400	800
Aquaculture	6 Aquatic Environment	6-4 Probiotics Study Lab	new	1068	Analytical balance (5 digits)	New	1	6,000	6,000
Aquaculture	6 Aquatic Environment	6-4 Probiotics Study Lab	new	1071	Digital Stirring	New	1	1,000	1,000
Aquaculture	6 Aquatic Environment	6-4 Probiotics Study Lab	new	1078	Power suppliers	New	1	3,000	3,000
Aquaculture	6 Aquatic Environment	6-4 Probiotics Study Lab	new	1080	Stirring hot plate	New	2	800	1,600
Aquaculture	6 Aquatic Environment	6-4 Probiotics Study Lab	new	1084	Multichannel pipettes (100 microliter)	New	3	1,000	3,000
Aquaculture	6 Aquatic Environment	6-4 Probiotics Study Lab	new	1086	Air conditioner	New	4	700	2,800
Aquaculture	6 Aquatic Environment	6-5 Marine Biodiversity & Bioactive Products Lab	new	1094	Esco Fume Hood	New	1	2,900	2,900
Aquaculture	6 Aquatic Environment	6-5 Marine Biodiversity & Bioactive Products Lab	new	1096	Freeze dryer	New	1	5,800	5,800
Aquaculture	6 Aquatic Environment	6-5 Marine Biodiversity & Bioactive Products Lab	new	1098	Inverted Microscope	New	1	8,100	8,100
Aquaculture	6 Aquatic Environment	6-5 Marine Biodiversity & Bioactive Products Lab	new	1099	Marine plankton net	New	6	1,000	6,000
Aquaculture	6 Aquatic Environment	6-5 Marine Biodiversity & Bioactive Products Lab	new	1100	Microplate reader ELISA	New	1	16,700	16,700
Aquaculture	6 Aquatic Environment	6-5 Marine Biodiversity & Bioactive Products Lab	new	1101	Microscope (Nikon, Japan)	New	1	2,400	2,400
Aquaculture	6 Aquatic Environment	6-5 Marine Biodiversity & Bioactive Products Lab	new	1102	Multisediment Trap (for zoobenthods sampling)	New	4	3,100	12,400
Aquaculture	6 Aquatic Environment	6-5 Marine Biodiversity & Bioactive Products Lab	new	1103	Pipette	New	10	300	3,000
Aquaculture	6 Aquatic Environment	6-5 Marine Biodiversity & Bioactive Products Lab	new	1105	Scuba Diving equipment (SCUBA)	New	6	5,800	34,800
Aquaculture	6 Aquatic Environment	6-5 Marine Biodiversity & Bioactive Products Lab	new	1106	Spectrophotometer	New	1	12,000	12,000
Aquaculture	6 Aquatic Environment	6-5 Marine Biodiversity & Bioactive Products Lab	new	1107	Stereomicroscope Digital Camera	New	1	5,900	5,900
Aquaculture	6 Aquatic Environment	6-5 Marine Biodiversity & Bioactive Products Lab	new	1108	Underwater camera	New	1	4,000	4,000
Aquaculture	6 Aquatic Environment	6-5 Marine Biodiversity & Bioactive Products Lab	new	1110	Shelf, large	Furniture	3	400	1,200
Aquaculture	6 Aquatic Environment	6-5 Marine Biodiversity & Bioactive Products Lab	new	1111	Working tables	Furniture	4	400	1,600
Aquaculture	6 Aquatic Environment	6-5 Marine Biodiversity & Bioactive Products Lab	new	1092	Air conditioner	New	4	700	2,800
Aquaculture	6 Aquatic Environment	6-5 Marine Biodiversity & Bioactive Products Lab	new	1093	Cabinets for equiment and materials	New	4	500	2,000
Aquaculture	6 Aquatic Environment	6-5 Marine Biodiversity & Bioactive Products Lab	new	1095	Fluorescence Microscopy Digital Upright Camera	New	1	24,000	24,000

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Aquaculture	6 Aquatic Environment	6-5 Marine Biodiversity & Bioactive Products Lab	new	1097	Handheld Multiparameter water quality Horiba U-50	New	1	5,800	11,600
Aquaculture	6 Aquatic Environment	6-5 Marine Biodiversity & Bioactive Products Lab	new	1104	Quart cuvette	New	10	300	3,000
Aquaculture	6 Aquatic Environment	6-5 Marine Biodiversity & Bioactive Products Lab	new	1109	Hight Wave measurement system	New	1	4,800	4,800
Aquaculture	6 Aquatic Environment	6-6 Water Quality/Aquatic Invertebrate/Fish Taxonomy Basic Lab	new	1123	Analytical balance (5 digits)	New	1	6,000	6,000
Aquaculture	6 Aquatic Environment	6-6 Water Quality/Aquatic Invertebrate/Fish Taxonomy Basic Lab	new	1124	BOD Oxidirect cabinet (20 oC)	New	1	4,000	4,000
Aquaculture	6 Aquatic Environment	6-6 Water Quality/Aquatic Invertebrate/Fish Taxonomy Basic Lab	new	1125	BOD Oxidirect Sensors (Lovibond) (6 sensors)	New	4	3,600	14,400
Aquaculture	6 Aquatic Environment	6-6 Water Quality/Aquatic Invertebrate/Fish Taxonomy Basic Lab	new	1126	Table pH meter	New	2	1,000	2,000
Aquaculture	6 Aquatic Environment	6-6 Water Quality/Aquatic Invertebrate/Fish Taxonomy Basic Lab	new	1127	Dispenser (25 mL, 50 mL)	New	15	750	11,250
Aquaculture	6 Aquatic Environment	6-6 Water Quality/Aquatic Invertebrate/Fish Taxonomy Basic Lab	new	1128	Dry oven	New	2	4,500	9,000
Aquaculture	6 Aquatic Environment	6-6 Water Quality/Aquatic Invertebrate/Fish Taxonomy Basic Lab	new	1129	Esco Fume Hood (toxic removal)	New	4	2,000	8,000
Aquaculture	6 Aquatic Environment	6-6 Water Quality/Aquatic Invertebrate/Fish Taxonomy Basic Lab	new	1130	Freeze dryer	New	1	5,800	5,800
Aquaculture	6 Aquatic Environment	6-6 Water Quality/Aquatic Invertebrate/Fish Taxonomy Basic Lab	new	1132	Handheld multiparameter YSI 556	New	2	2,500	5,000
Aquaculture	6 Aquatic Environment	6-6 Water Quality/Aquatic Invertebrate/Fish Taxonomy Basic Lab	new	1133	Handheld Turbidity meter	New	1	1,500	1,500
Aquaculture	6 Aquatic Environment	6-6 Water Quality/Aquatic Invertebrate/Fish Taxonomy Basic Lab	new	1134	High-Temperature Chamber Furnaces	New	1	3,100	3,100
Aquaculture	6 Aquatic Environment	6-6 Water Quality/Aquatic Invertebrate/Fish Taxonomy Basic Lab	new	1135	Inverted Microscope	New	1	8,100	8,100
Aquaculture	6 Aquatic Environment	6-6 Water Quality/Aquatic Invertebrate/Fish Taxonomy Basic Lab	new	1136	Kjeldahl Digestion Units (20 tubes) +Filter	New	1	3,600	3,600
Aquaculture	6 Aquatic Environment	6-6 Water Quality/Aquatic Invertebrate/Fish Taxonomy Basic Lab	new	1137	Micropipette	New	20	300	6,000
Aquaculture	6 Aquatic Environment	6-6 Water Quality/Aquatic Invertebrate/Fish Taxonomy Basic Lab	new	1138	Microscope (Nikon, Japan) (10 existing)	New	10	2,400	24,000
Aquaculture	6 Aquatic Environment	6-6 Water Quality/Aquatic Invertebrate/Fish Taxonomy Basic Lab	new	1139	Microscope cabinet (to store microscopes)	New	1	5,000	5,000
Aquaculture	6 Aquatic Environment	6-6 Water Quality/Aquatic Invertebrate/Fish Taxonomy Basic Lab	new	1140	Microscope Digital Camera	New	1	12,000	12,000
Aquaculture	6 Aquatic Environment	6-6 Water Quality/Aquatic Invertebrate/Fish Taxonomy Basic Lab	new	1141	Refractometer (0-100‰)	New	5	300	1,500
Aquaculture	6 Aquatic Environment	6-6 Water Quality/Aquatic Invertebrate/Fish Taxonomy Basic Lab	new	1142	Refrigerator (2-14 oC)	New	2	1,100	2,200
Aquaculture	6 Aquatic Environment	6-6 Water Quality/Aquatic Invertebrate/Fish Taxonomy Basic Lab	new	1143	Stereomicroscope Digital Camera	New	1	5,900	5,900
Aquaculture	6 Aquatic Environment	6-6 Water Quality/Aquatic Invertebrate/Fish Taxonomy Basic Lab	new	1148	Digital microburette (for titration)	New	10	800	8,000
Aquaculture	6 Aquatic Environment	6-6 Water Quality/Aquatic Invertebrate/Fish Taxonomy Basic Lab	new	1149	Spectrophotometer	New	1	12,000	12,000
Aquaculture	6 Aquatic Environment	6-6 Water Quality/Aquatic Invertebrate/Fish Taxonomy Basic Lab	new	1150	Working tables	Furniture	4	400	1600
Aquaculture	6 Aquatic Environment	6-6 Water Quality/Aquatic Invertebrate/Fish Taxonomy Basic Lab	new	1122	Analytical balance (2 digits)	New	2	3,000	6,000

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Aquaculture	6 Aquatic Environment	6-6 Water Quality/Aquatic Invertebrate/Fish Taxonomy Basic Lab	new	1131	Handheld EC, TDS, salinity meter (Sension)	New	1	1,300	1,300
Aquaculture	6 Aquatic Environment	6-6 Water Quality/Aquatic Invertebrate/Fish Taxonomy Basic Lab	new	1144	Stirring hot plate	New	2	800	1,600
Aquaculture	6 Aquatic Environment	6-6 Water Quality/Aquatic Invertebrate/Fish Taxonomy Basic Lab	new	1145	Total Organic Carbon Analyzer (also share with graduate teaching)	New	1	14,300	14,300
Aquaculture	6 Aquatic Environment	6-6 Water Quality/Aquatic Invertebrate/Fish Taxonomy Basic Lab	new	1146	Toxic filter (for Kejdalh Digestion System)	New	2	900	1,800
Aquaculture	6 Aquatic Environment	6-6 Water Quality/Aquatic Invertebrate/Fish Taxonomy Basic Lab	new	1147	Vacuum pumb + Filter	New	2	2,000	4,000
Aquaculture	7 Fisheries Resources	7-1 Fish biology Lab	new	1107	Biological microscope	New	15	1,500	22,500
Aquaculture	7 Fisheries Resources	7-1 Fish biology Lab	new	1108	Inverted microscope	New	2	6,500	13,000
Aquaculture	7 Fisheries Resources	7-1 Fish biology Lab	new	1109	Stereo Binocular magnifier	New	10	2,000	20,000
Aquaculture	7 Fisheries Resources	7-1 Fish biology Lab	new	1110	Microscope with camera and computer control	New	2	5,000	10,000
Aquaculture	7 Fisheries Resources	7-1 Fish biology Lab	new	1111	Microscope with hand drawing part	New	2	2,500	5,000
Aquaculture	7 Fisheries Resources	7-1 Fish biology Lab	new	1112	Microscope stored cupboard	New	3	2,500	7,500
Aquaculture	7 Fisheries Resources	7-1 Fish biology Lab	new	1113	Freezer (-20)	New	5	1,200	6,000
Aquaculture	7 Fisheries Resources	7-1 Fish biology Lab	new	1106	Multi Observation Microscope	New	1	30,000	30,000
Aquaculture	7 Fisheries Resources	7-1 Fish biology Lab	new	1119	Digital calipers	New	5	1,000	5,000
Aquaculture	7 Fisheries Resources	7-1 Fish biology Lab	new	1120	Cool sampling box	New	2	1,500	3,000
Aquaculture	7 Fisheries Resources	7-1 Fish biology Lab	new	1121	Vortex	New	4	850	3,400
Aquaculture	7 Fisheries Resources	7-1 Fish biology Lab	new	1122	Oven	New	2	1,000	2,000
Aquaculture	7 Fisheries Resources	7-1 Fish biology Lab	new	1124	Specialization table for microscope, profile projector, and other equipments	Fu	10	500	5,000
Aquaculture	7 Fisheries Resources	7-2 Fish distribution and migration	new	1125	Electronic tags	New	500	35	17,500
Aquaculture	7 Fisheries Resources	7-2 Fish distribution and migration	new	1126	Electronic tag receiver	New	3	15,000	45,000
Aquaculture	7 Fisheries Resources	7-2 Fish distribution and migration	new	1127	Waterproof sampling suit	new	10	1,000	10,000
Aquaculture	7 Fisheries Resources	7-2 Fish distribution and migration	new	1130	V-Detector	New	3	7,000	21,000
Aquaculture	7 Fisheries Resources	7-2 Fish distribution and migration	new	1131	Micro Grinding machine	New	1	60,000	60,000
Aquaculture	7 Fisheries Resources	7-2 Fish distribution and migration	new	1132	Fish Otolith Polishing Tool + Accessories	New	1	50,000	50,000
Aquaculture	7 Fisheries Resources	7-2 Fish distribution and migration	new	1133	Chemicals and instruments for otolith analysis	New	1	35,000	35,000
Aquaculture	7 Fisheries Resources	7-2 Fish distribution and migration	new	1132	Fish Otolith Polishing Tool + Accessories	New	1	35,000	35,000
Aquaculture	7 Fisheries Resources	7-2 Fish distribution and migration	new	1140	Handylab Multi	New	3	4,000	12,000
Aquaculture	7 Fisheries Resources	7-2 Fish distribution and migration	new	1148	Digital Balance	New	5	2,000	10,000
Aquaculture	7 Fisheries Resources	7-2 Fish distribution and migration	new	1150	Refrigerator	New	4	1,000	4,000
Aquaculture	7 Fisheries Resources	7-3 Fishing Stcok Assessment and management	new	1155	Fishers Towed Video	New	3	7,000	21,000
Aquaculture	7 Fisheries Resources	7-3 Fishing Stcok Assessment and management	new	1157	Flowmeter	New	4	1,500	6,000
Aquaculture	7 Fisheries Resources	7-3 Fishing Stcok Assessment and management	new	1158	Digital Flowmeter	New	10	500	5,000
Aquaculture	7 Fisheries Resources	7-3 Fishing Stcok Assessment and management	new	1160	Handylab Multi	New	2	4,000	8,000
Aquaculture	7 Fisheries Resources	7-3 Fishing Stcok Assessment and management	new	1161	Magnifiers	New	10	1,000	10,000
Aquaculture	7 Fisheries Resources	7-3 Fishing Stcok Assessment and management	new	1162	Fishing gears models	new	20	600	12,000
Aquaculture	7 Fisheries Resources	7-3 Fishing Stcok Assessment and management	new	1166	Nautical Equipment	New	1	16,900	16,900
Aquaculture	7 Fisheries Resources	7-3 Fishing Stcok Assessment and management	new	1163	Microscope stored cupboard	New	2	2,500	5,000

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Aquaculture	7 Fisheries Resources	7-3 Fishing Stcok Assessment and management	new	1164	Hydroacoustic gear and software	New	2	20,000	40,000
Aquaculture	7 Fisheries Resources	7-3 Fishing Stcok Assessment and management	new	1159	GPS	New	5	500	2,500
Aquaculture	7 Fisheries Resources	7-4 Fish Population Dynamics Lab	new	1175	Fishers Towed Video	New	3	7,000	21,000
Aquaculture	7 Fisheries Resources	7-4 Fish Population Dynamics Lab	new	1176	Fishing geas	New	4	1,000	4,000
Aquaculture	7 Fisheries Resources	7-4 Fish Population Dynamics Lab	new	1178	CWT tag formats	New	400	120	48,000
Aquaculture	7 Fisheries Resources	7-4 Fish Population Dynamics Lab	new	1180	Manual histological proccessing set	New	1	45,000	45,000
Aquaculture	7 Fisheries Resources	7-4 Fish Population Dynamics Lab	new	1181	Chemical strore cupboard	New	2	3,000	6,000
Aquaculture	7 Fisheries Resources	7-4 Fish Population Dynamics Lab	new	1182	Pipette	New	10	250	2,500
Aquaculture	7 Fisheries Resources	7-4 Fish Population Dynamics Lab	new	1183	Laminar flow cabinat	new	1	4,000	4,000
Aquaculture	7 Fisheries Resources	7-4 Fish Population Dynamics Lab	new	1184	Aquatic habitat echosounder	New	1	25,000	25,000
Aquaculture	7 Fisheries Resources	7-4 Fish Population Dynamics Lab	new	1185	FishCall	New	1	20,000	20,000
Aquaculture	7 Fisheries Resources	7-4 Fish Population Dynamics Lab	new	1186	Data Buoys	New	1	30,000	30,000
Aquaculture	7 Fisheries Resources	7-4 Fish Population Dynamics Lab	new	1187	Chemical	New	1	10,000	10,000
Aquaculture	7 Fisheries Resources	7-4 Fish Population Dynamics Lab	new	1188	Fish Sounder (FURUNO)	New	2	5,000	10,000
Aquaculture	7 Fisheries Resources	7-4 Fish Population Dynamics Lab	new	1189	Flowmeter	New	6	1,500	9,000
Aquaculture	7 Fisheries Resources	7-4 Fish Population Dynamics Lab	new	1177	Handheld Multishot Tag Injector	New	3	15,000	45,000
Aquaculture	7 Fisheries Resources	7-4 Fish Population Dynamics Lab	new	1179	V-Detector	New	3	7,000	21,000
Aquaculture	7 Fisheries Resources	7-5 Fish Collection Room	new	1201	Mobile Shelves	New	30	2,500	75,000
Aquaculture	7 Fisheries Resources	7-5 Fish Collection Room	new	1202	Specimen bottles	New	1,000	40	40,000
Aquaculture	7 Fisheries Resources	7-5 Fish Collection Room	new	1203	Preserved specimens	New	1,000	75	75,000
Aquaculture	7 Fisheries Resources	7-5 Fish Collection Room	new	1205	Digital camera and accessories	New	2	4,000	8,000
Aquaculture	7 Fisheries Resources	7-5 Fish Collection Room	new	1206	Magnifiers	New	5	1,000	5,000
Aquaculture	7 Fisheries Resources	7-5 Fish Collection Room	new	1209	Microscopes	New	2	6,000	12,000
Aquaculture	7 Fisheries Resources	7-5 Fish Collection Room	new	1210	Waterproof video	New	2	5,000	10,000
Aquaculture	7 Fisheries Resources	7-5 Fish Collection Room	new	1211	Waterproof camera	New	2	2,000	4,000
Aquaculture	7 Fisheries Resources	7-5 Fish Collection Room	new	1212	Microscope stored cupboard	New	1	2,500	2,500
Aquaculture	7 Fisheries Resources	7-5 Fish Collection Room	new	1213	Ruler board	New	10	200	2,000
Aquaculture	7 Fisheries Resources	7-5 Fish Collection Room	new	1216	Glass tanks	New	30	450	13,500
Aquaculture	7 Fisheries Resources	7-5 Fish Collection Room	new	1223	Fisheries Books/Atlas	New	80	250	20,000
Aquaculture	7 Fisheries Resources	7-5 Fish Collection Room	new	1225	Diving equipments	New	10	2,500	25,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	6	Oxygen supply system	new	2	5,000	10,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	7	Air-Blower - Electric Generator system	new	2	12,000	24,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	8	Automatic water quality Testing systems	new	3	15,000	45,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	11	Camera and software for observation fish behavior	new	2	20,000	40,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	12	Microchip reader	new	1	30,000	30,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	13	Tag and tagger	new	2	10,000	20,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	15	Recirculation aquaculture production tanks for broodstock	new	4	25,000	100,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	16	Water quality handy machines	new	2	15,000	30,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	17	Salinometer	new	5	250	1,250
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	19	Biological microscope with micrometer	new	4	2,500	10,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	20	Stereo microscope with camera and computer control	new	4	5,000	20,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	21	Microscope with camera and computer control	new	4	5,000	20,000

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Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	22	Completed recirculating tank systems for nursing	new	6	20,000	120,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	23	Completed recirculating tank systems for grow-out	new	6	20,000	120,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	24	Air supply systems	new	2	5,000	10,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	25	Water treatment systems	new	2	10,000	20,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	26	Standby generator systems	new	2	4,500	9,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	27	Lighting systems	new	2	5,000	10,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	28	Coolers	new	4	750	3,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	29	Water quality measurement machine with 6 indicators	new	4	4,500	18,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	30	Oxygen measurement machine	new	4	1,500	6,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	31	Handing pH measurement machine	new	4	750	3,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	32	Sanility measurement machine	new	4	500	2,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	34	Microsope and micro eyepiece	new	6	4,500	27,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	35	Magnifying glasses	new	4	2,500	10,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	36	Cabinet	new	6	1,500	9,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	37	Table	new	6	1,500	9,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	38	Cages for boodstock culture	new	3	15,000	45,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	40	Autofeeding machines	new	10	1,200	12,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	41	Automatic counting and size grading system	new	2	15,000	30,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	44	Outdoor concrete/composite tanks (50m3/tank)	new	20	5,000	100,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	45	Water supply systems for outdoor tanks	new	2	10,000	20,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	49	Reservoir tanks	new	5	1,000	5,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	64	Computer	new	4	1,500	6,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	54	Electronic balance with 2 odd numbers	new	2	1,500	3,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	52	Biological microscope with micrometer	new	4	2,500	10,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	55	Electronic balance with 4 odd numbers	new	2	3,000	6,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	48	Live feed cultured tanks (m3)	new	50	100	5,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	50	Water pumps	new	6	1,000	6,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	56	Refrigerators	new	4	1,000	4,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	62	Freezer with -20oC	new	1	20,000	20,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	63	Automatic heater	new	10	1,000	10,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	4	Waste treatment tank	new	5	1,000	5,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	5	Water supply and treatment system for wetlabs	new	2	10,000	20,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	68	Completed and modern systems of marine cages	new	3	20,000	60,000
		Brackish water / Freshwater hatcheries	new	68	Carbon filters	new	4	15,000	60,000
		Brackish water / Freshwater hatcheries	new		Cartrige filters	new	4	10,000	40,000
		Brackish water / Freshwater hatcheries	new		Bead biofilters	new	4	10,000	40,000
		Brackish water / Freshwater hatcheries	new		UV systems	new	4	10,000	40,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	42	Small boats	new	2	2,500	5,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	46	Tanks for broodstock and spwaning (m3)	new	50	100	5,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	47	Larval nursing tanks (m3)	new	50	100	5,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	51	Salinometer	new	5	250	1,250
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	53	Refrigerators	new	4	500	2,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	57	Sample storage cabinet	new	8	800	6,400

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Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	59	Automatic feeders	new	6	1,200	7,200
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	66	Automatic camera (under water)	new	1	9,000	9,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	67	Protein skimmer	new	4	5,000	20,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	1	Plastic substrates for embed biofilters (m3)	new	24	500	12,000
		Brackish water / Freshwater hatcheries	new		Plastric substrate for trickling biofilters (m3)	new	24	500	12,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	9	Water pumps	new	3	1,000	3,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	10	Voltage stabilizer	new	2	12,000	24,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	14	Sand filter	new	4	15,000	60,000
Aquaculture	8 Wet Lab (Hatchery)	Brackish water / Freshwater hatcheries	new	18	Flow velocity measurement machine	new	4	2,000	8,000
					Books on Aquaculture		100	300	30,000
Aquaculture	10 Material Engineering Lab	Material Engineering Lab - Room 2	new	2	Mixer	New	1	33,645	33,645
Aquaculture	10 Material Engineering Lab	Material Engineering Lab - Room 2	new	7	Tensile testing machine	New	1	30,000	30,000
Aquaculture	10 Material Engineering Lab	Material Engineering Lab - Room 2	new	3	Vacuum pump uses for composite application	New	1	26,932	26,932
Aquaculture	10 Material Engineering Lab	Material Engineering Lab - Room 2	new	4	Fiber cutter	New	1	10,096	10,096
Aquaculture	10 Material Engineering Lab	Material Engineering Lab - Room 2	new	5	Large centrifuger	New	1	10,096	10,096
Aquaculture	10 Material Engineering Lab	Material Engineering Lab - Room 2	new	6	Falling dart impact tester for rigid plastic	New	1	104,327	104,327
Aquaculture	10 Material Engineering Lab	Material Engineering Lab - Room 2	new	Fu-1	Table for install equipment	Fu	15	375	5,625
Aquaculture	10 Material Engineering Lab	Material Engineering Lab - Room 2	new	Fu-2	Table for computer of equipment	Fu	10	375	3,750
Aquaculture	11 Agricultural and Aquacultural Engineering Lab	Agricultural and Aquacultural Engineering Lab - Room 2	new	1	Gear hobbing machine	New	1	60,000	60,000
Aquaculture	11 Agricultural and Aquacultural Engineering Lab	Agricultural and Aquacultural Engineering Lab - Room 2	new	2	Dynamic balancing machine	New	1	74,300	74,300
Aquaculture	11 Agricultural and Aquacultural Engineering Lab	Agricultural and Aquacultural Engineering Lab - Room 2	new	3	Slotting machine	New	1	22,600	22,600
Aquaculture	11 Agricultural and Aquacultural Engineering Lab	Agricultural and Aquacultural Engineering Lab - Room 2	new	4	MIG welding machine	New	1	4,875	4,875
Aquaculture	11 Agricultural and Aquacultural Engineering Lab	Agricultural and Aquacultural Engineering Lab - Room 2	new	5	Magnetic drilling machine	New	1	2,400	2,400
Aquaculture	11 Agricultural and Aquacultural Engineering Lab	Agricultural and Aquacultural Engineering Lab - Room 2	new	6	Instrument system for data acquisiton	New	1	52,000	52,000
Aquaculture	11 Agricultural and Aquacultural Engineering Lab	Agricultural and Aquacultural Engineering Lab - Room 2	new	Fu-1	Two-wall table	Fu	4	1,800	7,200
Aquaculture	12 Aquaculture & Environment Automation Lab	Aquaculture & Environment Automation Lab - Room 1	New	1	Equipment for monitoring control the enviroment of a industrial aquaculture ponds	New	1	50,000	50,000
	12 Aquaculture & Environment Automation Lab	Aquaculture & Environment Automation Lab - Room 1	New	1	Equipment for monitoring control the enviroment of a industrial aquaculture ponds	New	1	40,000	40,000
Aquaculture	12 Aquaculture & Environment Automation Lab	Aquaculture & Environment Automation Lab - Room 1	New	Fu-1	Tables (for research room)	Fu	6	1800	10800
Aquaculture	12 Aquaculture & Environment Automation Lab	Aquaculture & Environment Automation Lab - Room 1	New	Fu-2	Chairs	Fu	24	95	2280
Aquaculture	13 Basic Lab - IT for Aquaculture and Fisheries		Existing	202	Desktop PC	New	200	900	180,000
Aquaculture	14 Research Lab - IT for Aquaculture and Fisheries		Existing	204	High performance Server for processing data in Aquaculture	New	3	30,000	90,000
Aquaculture	13 Basic Lab - IT for Aquaculture and Fisheries		Existing	203	Projector	New	5	1,500	7,500

Faculty	Nw Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Classification new/modify Lab	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/ Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Aquaculture	14 Research Lab - IT for Aquaculture and Fisheries		Existing	204	High performance Server for processing data in Aquaculture	New	2	30,000	60,000
Aquaculture	13 Basic Lab - IT for Aquaculture and Fisheries		Existing	205	Video Conferencing / Tele-training device	New	1	30,000	30,000
Aquaculture	13 Basic Lab - IT for Aquaculture and Fisheries		Existing	206	Cooling systems (air-conditioner) for protecting devices	New	10	1,500	15,000
Aquaculture	13 Basic Lab - IT for Aquaculture and Fisheries		Existing	207	Table-chair suite	New	200	100	20,000
Aquaculture	14 Research Lab - IT for Aquaculture and Fisheries		Existing	208	High speed Switch 10Gi	New	1	10,000	10,000
Aquaculture	14 Research Lab - IT for Aquaculture and Fisheries		Existing	209	Other devices (cables, jack,..)	New			16,500
	TOTAL Budget - Aquaculture and Fisheries								**10,427,321**

3 CENREs

Faculty	Nw Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Environment	GIS and Remote sensing	GIS & Remote Sensing Basic Lab	1	DELL desktop computers sync	New	30	1,000	30,000
Environment	GIS and Remote sensing	GIS & Remote Sensing Basic Lab	2	Panasonic projector	New	2	2,500	5,000
Environment	GIS and Remote sensing	GIS & Remote Sensing Basic Lab	3	Computer tables and chairs	Fu	31	100	3,100
Environment	GIS and Remote sensing	Research Office	4	Copyright eCognition software (Desktop license for research)	New	4	5,000	20,000
Environment	GIS and Remote sensing	Research Office	5	Copyright ERDAS Software (Desktop license for research)	New	4	5,000	20,000
Environment	GIS and Remote sensing	Research Office	6	Remote sensing data for entire Mekong River Delta (1 set for research)	New	1	80,000	80,000
Environment	GIS and Remote sensing	Research Office	7	Electronic total station	New	3	15,000	45,000
Environment	GIS and Remote sensing	Research Office	8	The GPS two frequencies high accuracy (set)	New	1	30,000	30,000
Environment	GIS and Remote sensing	Research Office	9	A0 Color printer	New	1	7,500	7,500
Environment	GIS and Remote sensing	GIS & Remote Sensing Basic Lab	10	Copyright ArcGIS Software (full server license with 50 uers for teaching)	New	1	70,000	70,000
Environment	GIS and Remote sensing	Research Office	13	Copyright ENVI Software (Full desktop license for research)	New	1	5,000	5,000
Environment	GIS and Remote sensing	Research Office	14	Spectrometer (PSR/PSM-3500)	New	1	10,000	10,000
Environment	GIS and Remote sensing	Research Office	15	Handheld GPS high accuracy	New	10	500	5,000
Environment	GIS and Remote sensing	GIS & Remote Sensing Basic Lab	16	Dell server computers	New	2	4,000	8,000
Environment	GIS and Remote sensing	Research Office	19	A0 scanners	New	1	4,000	4,000
Environment	GIS and Remote sensing	GIS & Remote Sensing Basic Lab		UPS 1000KVA	New	1	1,200	1,200
Environment	GIS and Remote sensing	GIS & Remote Sensing Basic Lab	18	Copyright MapInfo Software (Full server license for teaching)	New	1	50,000	50,000
Environment	GIS and Remote sensing	Research Office	14	Spectrometer (PSR/PSM-3500)	New	1	10,000	10,000
Environment	GIS and Remote sensing	Research Office	4	Copyright eCognition software (Desktop license for research)	New	1	5,000	5,000
Environment	GIS and Remote sensing	Research Office	5	Copyright ERDAS Software (Desktop license for research)	New	1	5,000	5,000
Environment	GIS and Remote sensing	Research Office	13	Copyright ENVI Software (Full desktop license for research)	New	1	5,000	5,000
Environment	GIS and Remote sensing	Research Office	5	Copyright ERDAS Software (Desktop license for research)	New	1	5,000	5,000
Environment	GIS and Remote sensing	Research Office	17	Copyright IDRISI Software (Desktop license for research)	New	6	5,000	30,000
Environment	GIS and Remote sensing	Research Office	20	A3 scanners	New	1	3,500	3,500
Environment	GIS and Remote sensing	GIS & Remote Sensing Basic Lab	21	Audio equipment (Multimedia)	New	1	10,000	10,000
Environment	GIS and Remote sensing	GIS & Remote Sensing Basic Lab	22	Large screen LCD	New	2	3,500	7,000
Environment	GIS and Remote sensing	Research Office	23	The stereographic glasses	New	4	500	2,000
Environment	GIS and Remote sensing	Academic Staff Office	24	Laptop computers	New	5	3,000	15,000
Environment	GIS and Remote sensing	Academic Staff Office	25	Portable Projector	New	2	2,500	5,000
Environment	Land Resources	Land Resources LAB	1	Chromatometer	New	1	23,000	23,000
Environment	Land Resources	Land Resources LAB	2	Spectrometer	New	1	33,000	33,000
Environment	Land Resources	Land Resources LAB	3	The Kjeldahl distillation	New	2	30,000	60,000
Environment	Land Resources	Land Resources LAB	4	The sample digesion equipments	New	3	10,000	30,000

Faculty	Nw Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Environment	Land Resources	Land Resources LAB	5	The titration devices	New	3	2,500	7,500
Environment	Land Resources	Land Resources LAB	5	The titration devices	New	2	2,500	5,000
Environment	Land Resources	Land Resources LAB	6	The compressor, vacuum extraction of the saturated water soil machine	New	1	20,000	20,000
Environment	Land Resources	Land Resources LAB	7	The oven	New	2	13,000	26,000
Environment	Land Resources	Land Resources LAB	8	The heating cabinet	New	2	5,000	10,000
Environment	Land Resources	Land Resources LAB	11	Two odd, three odd and four odd electronic scales	New	3	3,500	10,500
Environment	Land Resources	Land Resources LAB	12	Centrifural machine for separating solids that having diferent blocks from the solution	New	1	18,000	18,000
Environment	Land Resources	Land Resources LAB	15	The sample mill machine	New	1	21,000	21,000
Environment	Land Resources	Land Resources LAB	16	Distiller distill water, demineralize machines	New	2	10,000	20,000
Environment	Land Resources	Land Resources LAB	17	Exhaust cabinet	New	2	5,000	10,000
Environment	Land Resources	Land Resources LAB	20	Filed soil Moisture, temperature meters	New	5	250	1,250
Environment	Land Resources	Land Resources LAB	21	Soil Auger 2m	New	5	1,500	7,500
Environment	Land Resources	Land Resources LAB	23	The suck sample systerm Robinson for soil particle size density determination	New	5	2,000	10,000
Environment	Land Resources	Land Resources LAB	26	Hydrometer Pynometer	New	2	20,000	40,000
Environment	Land Resources	Land Resources LAB	33	Other auxiliary components (pipet press, cylinder, cone, nozzele, flasks, etc.)	New	1	15,000	15,000
Environment	Land Resources	Land Resources LAB		UPS 1000KVA	New	1	1,200	1,200
Environment	Land Resources	Land Resources LAB	3	The Kjeldahl distillation	New	1	30,000	30,000
Environment	Land Resources	Land Resources LAB	4	The sample digesion equipments	New	3	10,000	30,000
Environment	Land Resources	Land Resources LAB	9	The freezer storage sample and chemical	New	2	1,000	2,000
Environment	Land Resources	Land Resources LAB	10	The cool store storage sample and chemical	New	2	1,000	2,000
Environment	Land Resources	Land Resources LAB	13	The horizontal shaker sample machine	New	4	1,000	4,000
Environment	Land Resources	Land Resources LAB	14	The circle shaker sample machine	New	4	1,000	4,000
Environment	Land Resources	Land Resources LAB	18	The Laboratory PH meter, conductivity EC, the redox potential Eh, meters	New	5	4,000	20,000
Environment	Land Resources	Land Resources LAB	19	Fields PH, Electrical Conductivity-EC meters	New	4	1,000	4,000
Environment	Land Resources	Land Resources LAB	22	Soil Munsel colour chart	New	5	1,000	5,000
Environment	Land Resources	Land Resources LAB	24	The original sample ring	New	20	1,000	20,000
Environment	Land Resources	Land Resources LAB	25	Penetrologger: measure the density of the soil	New	2	10,000	20,000
Environment	Land Resources	Land Resources LAB	27	Kits for the determination mass and volume of water in the soil	New	20	1,000	20,000
Environment	Land Resources	Land Resources LAB	28	The systerm of sanbox, tensiometer and compression pressure cooker	New	2	20,000	40,000
Environment	Land Resources	Land Resources LAB	29	Soil saturated permeability measurement systerm (Ksat)	New	2	20,000	40,000
Environment	Land Resources	Land Resources LAB	30	Field permeability measurement system (single ring and double ring)	New	20	1,000	20,000
Environment	Land Resources	Land Resources LAB	31	Measuring soil plastic stick device set	New	5	1,000	5,000

Faculty	Nw Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Environment	Land Resources	Land Resources LAB	32	Dry and wet sieve systerm	New	5	1,000	5,000
Environment	Land Resources	Research Office	Fu-1	Shelf	Fur	4	600	2,400
Environment	Land Resources	Land Resources LAB	Fu-13	Chairs	Fur	4	200	800
Environment	Land Resources	Land Resources LAB	Fu-14	Soil sample dried shelves	Fur	5	200	1,000
Environment	Land Resources	Research Office	Fu-2	Desks and Chairs	Fur	12	200	2,400
Environment	Land Resources	Academic Staff Office	Fu-5	Large shelf	Fur	4	1000	4,000
Environment	Land Resources	Academic Staff Office	Fu-6	Working table and chair	Fur	4	500	2,000
Environment	Land Resources	Land Resources LAB	Fu-8	Experimental Tables	Fur	4	500	2,000
Environment	Soil and Water Environment	Research Office	Ne-1	TOC Analyzers	New	2	48,000	96,000
Environment	Soil and Water Environment	Soil & Water Environmental Quality Basic Lab	Ne-3	UV-VIS Spectrophotometer U2900, Hitachi, Japan	New	2	20,000	40,000
Environment	Soil and Water Environment	Research Office	Ne-4	IC – Ion Chromatography, IC 850	New	1	25,000	25,000
Environment	Soil and Water Environment	Soil & Water Environmental Quality Basic Lab	Ne-5	Dissolved Oxygen Meter, YSI ECOSENSE DO200, YSI USA	New	6	2,000	12,000
Environment	Soil and Water Environment	Soil & Water Environmental Quality Basic Lab	Ne-6	Portable pH Meter, SENSION1, Hach-USA	New	6	3,500	21,000
Environment	Soil and Water Environment	Soil & Water Environmental Quality Basic Lab	Ne-7	Electrical conductivity meter	New	6	3,000	18,000
Environment	Soil and Water Environment	Soil & Water Environmental Quality Basic Lab	Ne-8	Laboratory Turbidity meter 2100N, Hach-USA	New	3	7,000	21,000
Environment	Soil and Water Environment	Soil & Water Environmental Quality Basic Lab	Ne-9	Kjeldahl System for determining Nitrogen	New	1	10,000	10,000
Environment	Soil and Water Environment	Soil & Water Environmental Quality Basic Lab	Ne-11	40 Vessels Microwave Digestion/Extraction System	New	1	20,000	20,000
Environment	Soil and Water Environment	Soil & Water Environmental Quality Basic Lab	Ne-19	Refrigerated Centrifuge, Sigma 4-16K	New	1	18,000	18,000
Environment	Soil and Water Environment	Soil & Water Environmental Quality Basic Lab	Ne-20	Autoclave (110L)	New	1	18,000	18,000
Environment	Soil and Water Environment	Soil & Water Environmental Quality Basic Lab	Ne-21	Universal oven, UNB 200, Germany	New	1	13,000	13,000
Environment	Soil and Water Environment	Soil & Water Environmental Quality Basic Lab	Ne-22	Micropipette	New	10	250	2,500
Environment	Soil and Water Environment	Soil & Water Environmental Quality Basic Lab	Ne-23	Incubator	New	3	2,000	6,000
Environment	Soil and Water Environment	Soil & Water Environmental Quality Lab	Ne-26	Balances (4 digits), Satorius ME 414S, Germany	New	2	4,000	8,000
Environment	Soil and Water Environment	Soil & Water Environmental Quality Lab	Ne-27	Balances (5 digits)	New	2	6,000	12,000
Environment	Soil and Water Environment	Soil & Water Environmental Quality Basic Lab	Ne-29	Vortex mixer	New	4	500	2,000
Environment	Soil and Water Environment	Soil & Water Environmental Quality Basic Lab	Ne-30	Water stills, WSC/8, Hamilton, England	New	2	5,000	10,000
Environment	Soil and Water Environment	Soil & Water Environmental Quality Basic Lab	Ne-34	Vacuum	New	2	3,500	7,000
Environment	Soil and Water Environment	Soil & Water Environmental Quality Basic Lab	Ne-35	Automatic titrator	New	5	3,000	15,000
Environment	Soil and Water Environment	Soil & Water Environmental Quality Basic Lab	Ne-37	Shaking machine	New	4	2,500	10,000
Environment	Soil and Water Environment	Soil & Water Environmental Quality Basic Lab	Ne-40	Water path	New	2	1,000	2,000
Environment	Soil and Water Environment	Soil & Water Environmental Quality Lab	Ne-50	Fementation Microoganism system	New	2	5,000	10,000
Environment	Soil and Water Environment	Soil & Water Environmental Quality Basic Lab	Ne-61	Ultrasonic cleaner	New	1	2,578	2,578
Environment	Soil and Water Environment	Soil & Water Environmental Quality Lab	Fu-1	wall bench	Fu	1	4,500	4,500
Environment	Soil and Water Environment	Soil & Water Environmental Quality Lab	Fu-2	Island bench	Fu	1	5,500	5,500
Environment	Soil and Water Environment	Soil & Water Environmental Quality Lab	Fu-3	Working table with shelf	Fu	4	1,000	4,000
Environment	Soil and Water Environment	Soil & Water Environmental Quality Lab	Fu-4	Large shelf	Fu	4	100	400

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Environment	Soil and Water Environment	Soil & Water Environmental Quality Lab	Fu-5	Cabinet	Fu	4	120	480
Environment	Soil and Water Environment	Soil & Water Environmental Quality Lab	Fu-6	Office table	Fu	1	250	250
Environment	Soil and Water Environment	Soil & Water Environmental Quality Lab	Fu-7	Lab stool	Fu	20	50	1,000
Environment	Soil and Water Environment	Soil & Water Environmental Quality Basic Lab	Fu-8	wall bench	Fu	1	4,500	4,500
Environment	Soil and Water Environment	Soil & Water Environmental Quality Basic Lab	Fu-9	Island bench	Fu	1	5,500	5,500
Environment	Soil and Water Environment	Soil & Water Environmental Quality Basic Lab	Fu-10	Working table with shelf	Fu	4	1,000	4,000
Environment	Soil and Water Environment	Soil & Water Environmental Quality Basic Lab	Fu-11	Large shelf	Fu	4	100	400
Environment	Soil and Water Environment	Soil & Water Environmental Quality Basic Lab	Fu-12	Cabinet	Fu	10	120	1,200
Environment	Soil and Water Environment	Soil & Water Environmental Quality Basic Lab	Fu-13	Office table	Fu	1	250	250
Environment	Soil and Water Environment	Soil & Water Environmental Quality Basic Lab	Fu-14	Lab stool	Fu	40	50	2,000
Environment	Soil and Water Environment	Sample Preparation Room/Lecturer Office	Fu-15	wall bench	Fu	1	4,500	4,500
Environment	Soil and Water Environment	Sample Preparation Room/Lecturer Office	Fu-16	Working table with shelf	Fu	4	1,000	4,000
Environment	Soil and Water Environment	Sample Preparation Room/Lecturer Office	Fu-17	Large shelf	Fu	2	100	200
Environment	Soil and Water Environment	Sample Preparation Room/Lecturer Office	Fu-18	Cabinet	Fu	6	120	720
Environment	Soil and Water Environment	Sample Preparation Room/Lecturer Office	Fu-19	Office table	Fu	2	250	500
Environment	Soil and Water Environment	Sample Preparation Room/Lecturer Office	Fu-20	Lab stool	Fu	8	50	400
Environment	Soil and Water Environment	Research Office	Fu-21	wall bench	Fu	1	4,500	4,500
Environment	Soil and Water Environment	Research Office	Fu-22	Working table with shelf	Fu	4	1,000	4,000
Environment	Soil and Water Environment	Research Office	Fu-23	Large shelf	Fu	2	100	200
Environment	Soil and Water Environment	Research Office	Fu-24	Cabinet	Fu	6	120	720
Environment	Soil and Water Environment	Research Office	Fu-25	Office table	Fu	4	250	1,000
Environment	Soil and Water Environment	Research Office	Fu-26	Lab stool	Fu	12	50	600
Environment	Soil and Water Environment	Soil & Water Environmental Quality Basic Lab		UPS 1000KVA	New	1	1,200	1,200
Environment	Soil and Water Environment	Soil & Water Environmental Quality Lab		UPS 1000KVA	New	1	1,200	1,200
Environment	Soil and Water Environment	Soil & Water Environmental Quality Basic Lab	Ne-12	Portable Ammonia Photometer, HI 96733, Hanna Italia	New	4	6,000	24,000
Environment	Soil and Water Environment	Research Office	Ne-16	Emission Measurement and Analysis System	New	2	3,500	7,000
Environment	Soil and Water Environment	Soil & Water Environmental Quality Lab	Ne-17	Gas flow measuring equipment	New	2	2,000	4,000
Environment	Soil and Water Environment	Soil & Water Environmental Quality Basic Lab	Ne-18	Eh meter	New	2	3,500	7,000
Environment	Soil and Water Environment	Research Office	Ne-24	Refrigerated thermostat BOD	New	4	4,000	16,000
Environment	Soil and Water Environment	Soil & Water Environmental Quality Basic Lab	Ne-36	Hot plate	New	4	2,000	8,000
Environment	Soil and Water Environment	Soil & Water Environmental Quality Lab	Ne-48	Soil texture (Robinson method)	New	5	1,500	7,500
Environment	Soil and Water Environment	Soil & Water Environmental Quality Lab	Ne-25	Anaerobic incubator	New	2	3,000	6,000
Environment	Soil and Water Environment	Research Office	Ne-28	Balances (3 digits), Satorius CP323S, Germany	New	2	3,500	7,000
Environment	Soil and Water Environment	Sample Preparation Room/Lecturer Office	Ne-33	Freezer <40oC	New	2	10,000	20,000
Environment	Soil and Water Environment	Soil & Water Environmental Quality Basic Lab	Ne-38	Round shaking machine	New	4	5,000	20,000
Environment	Soil and Water Environment	Soil & Water Environmental Quality Lab (1) and Sam	Ne-32	Deep freezer (-80c)	New	1	14,000	14,000
Environment	Soil and Water Environment	Soil & Water Environmental Quality Lab	Ne-43	Set of soil sampling (auger + ring + mundsel)	New	8	1,200	9,600

Faculty	Nw Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Environment	Soil and Water Environment	Soil & Water Environmental Quality Lab	Ne-45	Surface water sampling equipment	New	6	2,500	15,000
Environment	Soil and Water Environment	Soil & Water Environmental Quality Lab	Ne-46	Sample crusher	New	3	8,000	24,000
Environment	Soil and Water Environment	Research Office	Ne-55	Microsensors (for N2O, O2, ORP, and pH)	New	4	8,000	32,000
Environment	Soil and Water Environment	Soil & Water Environmental Quality Basic Lab	Ne-62	Checkit direct COD Vario	New	3	12,000	36,000
Environment	Soil and Water Environment	Soil & Water Environmental Quality Basic Lab	Ne-31	Muffle furnaces, LT40/12, Nabertherm – Germany	New	2	5,000	10,000
Environment	Soil and Water Environment	Soil & Water Environmental Quality Lab	Ne-44	Oil-in-Water Instrument	New	1	17,000	17,000
Environment	Soil and Water Environment	Research Office	Ne-49	Clean bench	New	1	3,000	3,000
Environment	Soil and Water Environment	Research Office	Ne-54	UV photo camera (with gel)	New	1	8,000	8,000
Environment	Environmental Biology	Environmental Microbiology Lab	6	Freezer	New	2	5,800	11,600
Environment	Environmental Biology	Environmental Biology Basic Lab	8	Laminar flow cabinet + spare parts	New	1	15,000	15,000
Environment	Environmental Biology	Environmental Microbiology Lab	9	Autoclave Sterilizer	New	2	12,000	24,000
Environment	Environmental Biology	Environmental Microbiology Lab	11	Environmental chamber	New	2	24,000	48,000
Environment	Environmental Biology	Environmental Microbiology Lab	17	Oven	New	2	2,500	5,000
Environment	Environmental Biology	Environmental Biology Basic Lab	18	CO2 incubation chamber	New	2	12,000	24,000
Environment	Environmental Biology	Environmental Macrobiology Lab	19	Floating animals Counting Chamber Code: 430 010/Canada	New	10	600	6,000
Environment	Environmental Biology	Environmental Macrobiology Lab	20	Floating plants Counting Chamber Code: 435 016/Canada	New	6	600	3,600
Environment	Environmental Biology	Environmental Microbiology Lab	22	UV Spectrometer	New	1	20,000	20,000
Environment	Environmental Biology	Environmental Microbiology Lab	23	Centrifuge - model Universal 320	New	1	18,000	18,000
	Environmental Biology	Environmental Microbiology Lab	25	Incubator Shaker	New	2	8,000	16,000
Environment	Environmental Biology	Sample preparation room	29	Zooplankton collection net	New	5	700	3,500
Environment	Environmental Biology	Sample preparation room	30	Phytoplankton collection net	New	5	700	3,500
Environment	Environmental Biology	Sample preparation room	31	Erkman for zoobenthos sampling	New	5	1,000	5,000
Environment	Environmental Biology	Environmental Microbiology Lab	1	Vacuum Rotary evaporator	New	2	11,000	22,000
Environment	Environmental Biology	Environmental Biology Basic Lab	2	Ultrasound assisted washing machine	New	2	2,700	5,400
Environment	Environmental Biology	Environmental Biology Basic Lab	3	BOD box + spare parts	New	4	5,000	20,000
Environment	Environmental Biology	Environmental Biology Basic Lab	4	Photosynthesis Measurement System	New	2	2,700	5,400
Environment	Environmental Biology	Environmental Microbiology Lab	26	Shaker Votex	New	2	800	1,600
Environment	Environmental Biology	Environmental Microbiology Lab	32	Microscope Olympus (Fluorescent microscope phase contrast-three optical transmission) - Japan Model: BX – 51	New	1	24,000	24,000
Environment	Environmental Biology	Environmental Biology Basic Lab	40	Mold-resistant cabinet, model KA-06 VietNam	New	2	1,500	3,000
Environment	Environmental Biology	Environmental Biology Basic Lab	41	Vacuum Pump - model PK 2DC	New	4	4,000	16,000
Environment	Environmental Biology	Sample preparation room	42	Screen sieve (different mesh size)	New	10	350	3,500
Environment	Environmental Biology	Environmental Biology Basic Lab	44	Element analyzer and Isotope ratio mass spectrometer (EA-IRMS)	New	1	125,000	125,000
Environment	Environmental Biology	Environmental Macrobiology Lab	45	Olympus microscope	New	15	2,500	37,500

Faculty	Nw Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Environment	Environmental Biology	Environmental Macrobiology Lab	50	Zooplanktons Counting Chamber	New	10	300	3,000
Environment	Environmental Biology	Environmental Macrobiology Lab	51	Phytoplanktons Counting Chamber	New	10	300	3,000
Environment	Environmental Biology	Sample preparation room	52	Balances (5 digits), Satorius CP323S, Germany	New	2	6,000	12,000
Environment	Environmental Biology	Sample preparation room	53	Balances (4 digits), Satorius CP323S, Germany	New	3	4,000	12,000
Environment	Environmental Biology	Sample preparation room	54	Balances (3 digits), Satorius ME 414S, Germany	New	2	3,300	6,600
Environment	Environmental Biology	Environmental Biology Basic Lab	56	Dryer	New	2	2000	4,000
Environment	Environmental Biology	Environmental Biology Basic Lab	58	MICROPIPET	New	8	800	6,400
Environment	Environmental Biology	Environmental Biology Basic Lab	59	Multiple Position Magnetic Stirrer	New	1	2200	2,200
Environment	Environmental Biology	Environmental Biology Basic Lab	61	Refrigerated Centrifuge, Sigma 4-16K	New	1	18,000	18,000
Environment	Environmental Biology	Environmental Biology Basic Lab	63	Shaking thermostatic bath	New	1	11000	11,000
Environment	Environmental Biology	Environmental Biology Basic Lab	66	Water ultrapurification system	New	1	15800	15,800
Environment	Environmental Biology	Environmental Biology Basic Lab	68	Themostat tank	New	2	700	1,400
Environment	Environmental Biology	Sample preparation room	43	Shelf (large)	Fu	2	1,000	2,000
Environment	Environmental Biology	Biology Specimens room	90	Large shelf	Fu	2	5,000	10,000
Environment	Environmental Biology	Environmental Microbiology Lab	91	Working table with shelf	Fu	8	120	960
Environment	Environmental Biology	Environmental Microbiology Lab	92	Lab chair	Fu	8	1,000	8,000
Environment	Environmental Biology	Environmental Microbiology Lab	93	Chemcical store cabinet	Fu	1	150	150
Environment	Environmental Biology	Environmental Microbiology Lab	94	Large shelf	Fu	2	5,000	10,000
Environment	Environmental Biology	Environmental Macrobiology Lab	95	Working table with shelf	Fu	8	120	960
Environment	Environmental Biology	Environmental Macrobiology Lab	96	Lab chair	Fu	8	1,000	8,000
Environment	Environmental Biology	Environmental Macrobiology Lab	97	Chemcical store cabinet	Fu	1	150	150
Environment	Environmental Biology	Environmental Macrobiology Lab	98	Large shelf	Fu	2	5,000	10,000
Environment	Environmental Biology	Environmental Biology Basic Lab	99	Working table with shelf	Fu	8	120	960
Environment	Environmental Biology	Environmental Biology Basic Lab	100	Lab chair	Fu	8	1,000	8,000
Environment	Environmental Biology	Environmental Biology Basic Lab	101	Chemcical store cabinet	Fu	1	150	150
Environment	Environmental Biology	Environmental Biology Basic Lab	102	Large shelf	Fu	2	5,000	10,000
Environment	Environmental Biology	Sample preparation room	103	Working table with shelf	Fu	8	120	960
Environment	Environmental Biology	Sample preparation room	104	Lab chair	Fu	8	1,000	8,000
Environment	Environmental Biology	Sample preparation room	105	Large shelf	Fu	2	100	200
Environment	Environmental Biology	Research Office	106	Cabinet	Fu	12	120	1,440
Environment	Environmental Biology	Research Office	107	Office table	Fu	12	250	3,000
Environment	Environmental Biology	Research Office	108	Chair	Fu	12	50	600
Environment	Environmental Biology	Research Office	109	UPS 1000KVA	New	1	1,200	1,200
Environment	Environmental Biology	Environmental Biology Basic Lab	114	UPS 1000KVA	New	1	1,200	1,200
Environment	Environmental Biology	Environmental Macrobiology Lab	115	Photosynthesis Measurement System	New	2	2,700	5,400
Environment	Environmental Biology	Environmental Biology Basic Lab	4	Objective Micrometer	New	6	150	900

Faculty	Nw Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Environment	Environmental Biology	Environmental Macrobiology Lab	21	Soil Urger	New	5	2,500	12,500
Environment	Environmental Biology	Sample preparation room	46	Ultra Centrifugal Mill ZM 200 (Restch)	New	1	11500	11,500
Environment	Environmental Biology	Environmental Biology Basic Lab	55	Rotary Evaporator Vacuum System, Büchi G-3820-2	New	1	11000	11,000
Environment	Environmental Biology	Environmental Biology Basic Lab	62	Professional camera	New	1	1,500	1,500
Environment	Environmental Biology	Environmental Biology Basic Lab	2	Ultrasound assisted washing machine	New	1	2,700	2,700
Environment	Environmental Biology	Environmental Biology Basic Lab	3	BOD box + spare parts	New	2	5,000	10,000
Environment	Environmental Biology	Sample preparation room	5	Ice making machine	New	1	7,800	7,800
Environment	Environmental Biology	Environmental Microbiology Lab	26	Shaker Votex	New	1	800	800
Environment	Environmental Biology	Sample preparation room	43	Professional camera	New	1	1,500	1,500
Environment	Environmental Biology	Sample preparation room	47	Distance meter	New	5	500	2,500
Environment	Environmental Biology	Sample preparation room	48	Light meter	New	5	450	2,250
Environment	Environmental Biology	Environmental Biology Basic Lab	57	High-speed Refrigerated Centrifuge	New	1	10,000	10,000
Environment	Environmental Biology	Environmental Biology Basic Lab	60	Portable pH Meter, SENSION1, Hach-USA	New	1	3,500	3,500
Environment	Environmental Biology	Environmental Biology Basic Lab	65	Temperature and moisture sensors	New	1	1500	1,500
Environment	Environmental toxicology	Preparation Room	1	Solid phase extraction system	New	1	15,000	15,000
Environment	Environmental toxicology	Preparation Room	2	Gas/solvent separator	New	1	7,000	7,000
Environment	Environmental toxicology	Preparation Room	3	Rotary Vacuum Evaporator System	New	1	8,000	8,000
Environment	Environmental toxicology	Environmental Toxicology Lab	4	UV-Visible Spectrophotometers	New	1	15,000	15,000
Environment	Environmental toxicology	Environmental Toxicology Basic Lab	5	UV-Visible Spectrophotometers	New	1	15,000	15,000
Environment	Environmental toxicology	Environmental Toxicology Lab	6	Microwave Digestion System	New	1	25,000	25,000
Environment	Environmental toxicology	Preparation Room	7	Sample extraction equipment with themal control	New	2	15,000	30,000
Environment	Environmental toxicology	Preparation Room	8	Centrifuge (with temperature control)	New	1	18,000	18,000
Environment	Environmental toxicology	Environmental Toxicology Lab	10	Vortex-mixer	New	5	500	2,500
Environment	Environmental toxicology	Environmental Toxicology Basic Lab	11	Vortex-mixer	New	5	500	2,500
Environment	Environmental toxicology	Preparation Room	12	Ultrasonic cleaner	New	4	5,000	20,000
Environment	Environmental toxicology	Environmental Toxicology Lab	14	Continuous flow analyzer	New	1	45,000	45,000
Environment	Environmental toxicology	Environmental Toxicology Basic Lab	15	Microplate Reader	New	1	16,000	16,000
Environment	Environmental toxicology	Preparation Room	16	Ultra low temperature Freezer	New	1	14,000	14,000
Environment	Environmental toxicology	Preparation Room	17	Liquid nitogen bottle	New	3	500	1,500
Environment	Environmental toxicology	Environmental Toxicology Lab	18	Liquid nitogen bottle	New	3	500	1,500
Environment	Environmental toxicology	Environmental Toxicology Basic Lab	19	Micropipete	New	10	200	2,000
	Environmental toxicology	Preparation Room	20	Micropipete	New	10	200	2,000
Environment	Environmental toxicology	Environmental Toxicology Lab	21	Micropipete	New	10	200	2,000
Environment	Environmental toxicology	Environmental Toxicology Basic Lab	22	Oxygen meter	New	5	900	4,500
Environment	Environmental toxicology	Environmental Toxicology Basic Lab	24	pH meters	New	5	400	2,000
Environment	Environmental toxicology	Environmental Toxicology Basic Lab	31	Analytical table with fume hood	New	2	5,000	10,000

Faculty	Nw Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Environment	Environmental toxicology	Environmental Toxicology Basic Lab	35	pH automatic titrator	New	3	5,000	15,000
Environment	Environmental toxicology	Environmental Toxicology Lab	36	pH automatic titrator	New	3	5,000	15,000
Environment	Environmental toxicology	Preparation Room	37	Water still, double distilled	New	1	15,000	15,000
Environment	Environmental toxicology	Environmental Toxicology Lab	38	Water still, double distilled	New	1	15,000	15,000
Environment	Environmental toxicology	Environmental Toxicology Basic Lab	40	3 digits Balance	New	2	4,000	8,000
Environment	Environmental toxicology	Preparation Room	41	3 digits Balance	New	2	7,000	14,000
Environment	Environmental toxicology	Environmental Toxicology Lab	42	4 digits Balance	New	2	7,000	14,000
Environment	Environmental toxicology	Preparation Room	43	4 digits Balance	New	2	10,000	20,000
Environment	Environmental toxicology	Environmental Toxicology Lab	44	5 digits Balance	New	1	10,000	10,000
Environment	Environmental toxicology	Environmental Toxicology Basis Lab	79	Fridge freezer for laboratory	Fu	6	100	600
Environment	Environmental toxicology	Environmental Toxicology Basis Lab	80	Cabinet	Fu	8	120	960
Environment	Environmental toxicology	Environmental Toxicology Basis Lab	81	Working table with shelf	Fu	8	1,000	8,000
Environment	Environmental toxicology	Environmental Toxicology Basis Lab	82	Lab chair	Fu	40	25	1,000
Environment	Environmental toxicology	Environmental Toxicology Lab	83	Large shelf	Fu	4	100	400
Environment	Environmental toxicology	Environmental Toxicology Lab	84	Cabinet	Fu	6	120	720
Environment	Environmental toxicology	Environmental Toxicology Lab	85	Working table with shelf	Fu	8	1,000	8,000
Environment	Environmental toxicology	Environmental Toxicology Lab	86	Lab chair	Fu	20	25	500
Environment	Environmental toxicology	Research Office	87	Large shelf	Fu	2	100	200
Environment	Environmental toxicology	Research Office	88	Cabinet	Fu	12	120	1,440
Environment	Environmental toxicology	Research Office	89	Office table	Fu	12	250	3,000
Environment	Environmental toxicology	Research Office	90	Chair	Fu	12	50	600
Environment	Environmental toxicology	Environmental Toxicology Basis Lab	95	UPS 1000KVA	New	1	1,200	1,200
Environment	Environmental toxicology	Environmental Toxicology Lab	96	UPS 1000KVA	New	1	1,200	1,200
Environment	Environmental toxicology	Environmental Toxicology Lab	23	Oxygen meter	New	5	900	4,500
Environment	Environmental toxicology	Environmental Toxicology Lab	13	C/N Analyser	New	1	30,000	30,000
Environment	Environmental toxicology	Environmental Toxicology Lab	25	pH meters	New	5	400	2,000
Environment	Environmental toxicology	Preparation Room	27	Sample Horizontal shaker	New	2	5,000	10,000
Environment	Environmental toxicology	Environmental Toxicology Lab	34	Aquarium system for toxicology experiment	New	1	20,000	20,000
Environment	Environmental toxicology	Environmental Toxicology Lab	9	Ultra centrifuge	New	1	50,000	50,000
Environment	Environmental toxicology	Preparation Room	26	Milling machine	New	2	5,000	10,000
Environment	Environmental toxicology	Environmental Toxicology Lab	28	Sample Horizontal shaker	New	4	5,000	20,000
Environment	Environmental toxicology	Environmental Toxicology Lab	30	Sample circular Shaker	New	4	5,000	20,000
Environment	Environmental toxicology	Environmental Toxicology Lab	32	Analytical table with fume hood	New	1	5,000	5,000
Environment	Environmental toxicology	Environmental Toxicology Lab	34	Aquarium system for toxicology experiment	New	1	25,000	25,000
Environment	Environmental toxicology	Preparation Room	39	Water bath	New	2	5,000	10,000
Environment	Environmental toxicology	Environmental Toxicology Basic Lab	45	Air Sampling Equipment	New	1	10,000	10,000

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Environment	Wastewater treatment	Water & Wastewater Treatment Technology Lab	1	Kjeldahl System for determining Nitrogen, UDK 142, Italy	new	1	10,000	10,000
Environment	Wastewater treatment	Research Office	2	IC – Ion Chromatography, IC 850	new	1	25,000	25,000
Environment	Wastewater treatment	Research Office	4	UV-VIS-NIR Spectroscopy	new	1	33,000	33,000
Environment	Wastewater treatment	Water & Wastewater Treatment Technology Lab	5	UV-VIS Spectrophotometer U2900, Hitachi, Japan	new	1	13,000	13,000
Environment	Wastewater treatment	Water & Wastewater Treatment Technology Lab	6	Refrigerated thermostat BOD, FOC-225E	new	2	7,000	14,000
Environment	Wastewater treatment	Water & Wastewater Treatment Technology Lab	7	Refrigerated Centrifuge, Sigma 4-16K	new	1	18,000	18,000
Environment	Wastewater treatment	Research Office, Water & Wastewater Treatment T	8	Oil-in-Water Instrument	new	1	18,900	18,900
Environment	Wastewater treatment	Water & Wastewater Treatment Technology Lab	9	Universal oven, UNB 200, Germany	new	1	13,000	13,000
Environment	Wastewater treatment	Research Office	10	Oxygen meter	new	2	2,000	4,000
Environment	Wastewater treatment	Water & Wastewater Treatment Technology Basic L	11	Laboratory Turbidimeter	new	2	4,900	9,800
Environment	Wastewater treatment	Research Office	12	Laboratory Turbidimeter 2100N, Hach-USA	new	2	7,000	14,000
Environment	Wastewater treatment	Research Office	13	Portable pH Meter, SENSION1, Hach-USA	new	2	3,500	7,000
Environment	Wastewater treatment	Research Office	14	Conductivity Meter, YSI ECOSENSE EC300, YSI USA	new	2	3,500	7,000
Environment	Wastewater treatment	Water & Wastewater Treatment Technology Lab	15	Dissolved Oxygen Meter, YSI ECOSENSE DO200, YSI USA	new	2	2,000	4,000
Environment	Wastewater treatment	Water & Wastewater Treatment Technology Lab	16	Water stills, WSC/8, Hamilton, England	new	2	5,000	10,000
Environment	Wastewater treatment	Water & Wastewater Treatment Technology Basic L	17	Refrigerated thermostat BOD	new	2	3,500	7,000
Environment	Wastewater treatment	Research Office	18	Portable Ammonia Photometer, HI 96733, Hanna Italia	new	2	6,000	12,000
Environment	Wastewater treatment	Research Office	19	Balances (4 digits), Satorius ME 414S, Germany	new	2	4,000	8,000
Environment	Wastewater treatment	Water & Wastewater Treatment Technology Lab	20	Laboratory Fume Hoods, EFH-4A1, Esco-Singapore	new	2	5,000	10,000
Environment	Wastewater treatment	Research Office	21	CHECKIT DIRECT COD VARIO	new	2	12,000	24,000
Environment	Wastewater treatment	Water & Wastewater Treatment Technology Lab	22	High-speed Refrigerated Centrifuge	new	1	10,000	10,000
Environment	Wastewater treatment	Water & Wastewater Treatment Technology Lab	23	Vacuum pump	new	2	2,800	5,600
Environment	Wastewater treatment	Water & Wastewater Treatment Technology Lab	24	Micro-environmental chamber	new	1	24,000	24,000
Environment	Wastewater treatment	Water & Wastewater Treatment Technology Lab	25	Sterilizer cabinet	new	1	12,000	12,000
Environment	Wastewater treatment	Water & Wastewater Treatment Technology Lab	26	Microbiological cabinets	new	2	7,000	14,000
Environment	Wastewater treatment	Water & Wastewater Treatment Technology Lab	27	Muffle furnaces, LT40/12, Nabertherm – Germany	new	1	5,000	5,000
Environment	Wastewater treatment	Water & Wastewater Treatment Technology Lab	28	Circular shaker + accessories	new	1	4,000	4,000
Environment	Wastewater treatment	Water & Wastewater Treatment Technology Lab	29	Shaker Votex	new	2	800	1,600
Environment	Wastewater treatment	Water & Wastewater Treatment Technology Lab	30	Shaking thermostatic bath	new	1	11,000	11,000
Environment	Wastewater treatment	Research Office	31	Analytical balance, 5 digits	new	1	4,500	4,500
Environment	Wastewater treatment	Water & Wastewater Treatment Technology Lab	32	Electrodeionization filter	new	1	2,500	2,500
Environment	Wastewater treatment	Water & Wastewater Treatment Technology Lab	33	Multiple Position Magnetic Stirrer	new	1	2,200	2,200
Environment	Wastewater treatment	Water & Wastewater Treatment Technology Basic L	35	Mud sediment sampling instruments	new	2	1,500	3,000
Environment	Wastewater treatment	Water & Wastewater Treatment Technology Basic L	36	Deep mud sediment sampling instruments	new	1	2,800	2,800
Environment	Wastewater treatment	Research Office, Preparation Room/Lecturer Office	62	Working table, Workbench	Fu	3	350	1,050
Environment	Wastewater treatment	Research Office, Preparation Room/Lecturer Office	63	Working chair	Fu	4	200	800
Environment	Wastewater treatment	Water & Wastewater Treatment Technology Lab	64	Equipment, chemical storing cabinet	Fu	2	1,200	2,400

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Environment	Water & Wastewater Treatment Technology Lab - Water & Wastewater Treatment Technology Basic Lab - Research Office	Water & Wastewater Treatment Technology Lab and	65	Table for experiment	Fu	3	1,500	4,500
Environment	Water & Wastewater Treatment Technology Lab - Water & Wastewater Treatment Technology Basic Lab - Research Office	Water & Wastewater Treatment Technology Lab and	66	Lab chair	Fu	40	100	4,000
Environment	Water & Wastewater Treatment Technology Lab - Water & Wastewater Treatment Technology Basic Lab - Research Office	Water & Wastewater Treatment Technology Lab and	67	Cabinet	Fu	3	300	900
	Wastewater treatment	Research Office	70	Photocopy	Fu	1	450	450
Environment	Wastewater treatment	Research Office	71	Scanner - Fax	Fu	1	350	350
Environment	Wastewater treatment	Water & Wastewater Treatment Technology Basic Lab		UPS 1000KVA	New	1	1,200	1,200
Environment	Wastewater treatment	Water & Wastewater Treatment Technology Lab		UPS 1000KVA	New	1	1,200	1,200
Environment	Wastewater treatment	Preparation Room/Lecturer Office	40	Pipet	new	5	250	1,250
Environment	Wastewater treatment	Preparation Room/Lecturer Office	41	MICROPIPET	new	2	800	1,600
Environment	Wastewater treatment	Water & Wastewater Treatment Technology Basic L	52	pH/ORP/Temperature Datalogger, EXTECH, SDL100	new	2	4,000	8,000
Environment	Wastewater treatment	Water & Wastewater Treatment Technology Lab	53	Nanofiltration (aqueous media)	new	1	26,000	26,000
Environment	Wastewater treatment	Water & Wastewater Treatment Technology Lab	54	Nanofiltration (non-aqueous media)	new	1	22,000	22,000
Environment	Wastewater treatment	Preparation Room/Lecturer Office	40	Pipet	new	3	250	750
Environment	Wastewater treatment	Preparation Room/Lecturer Office	41	MICROPIPET	new	2	800	1,600
Environment	Wastewater treatment	Water & Wastewater Treatment Technology Lab	42	Raw fibre extractor 6 channels	new	1	11,000	11,000
Environment	Wastewater treatment	Research Office	49	Amino acid analysis system	new	1	82,000	82,000
Environment	Wastewater treatment	Water & Wastewater Treatment Technology Lab	37	Glass equipment, tools fragile	new	1	15,000	15,000
Environment	Wastewater treatment	Research Office	39	Automated Isoperibol Bomb Calorimeter	new	1	4,000	4,000
Environment	Wastewater treatment	Water & Wastewater Treatment Technology Lab	43	Water ultrapurification system	new	1	16,000	16,000
Environment	Wastewater treatment	Water & Wastewater Treatment Technology Lab	46	Ultrasonic flow probe	new	2	1,100	2,200
Environment	Wastewater treatment	Water & Wastewater Treatment Technology Lab	47	Titration Kit	new	1	2,500	2,500
Environment	Wastewater treatment	Water & Wastewater Treatment Technology Lab	50	40 Vessels Microwave Digestion/Extraction System	new	1	20,000	20,000
Environment	Wastewater treatment	Water & Wastewater Treatment Technology Lab	51	Balances (3 digits), Satorius CP323S, Germany	new	2	3,500	7,000
Environment	Wastewater treatment	Water & Wastewater Treatment Technology Lab	55	Ultrasonic flow probe	new	1	2,800	2,800
Environment	Wastewater treatment	Water & Wastewater Treatment Technology Lab	56	Reverse Osmosis Pressure Gauge Kit	new	1	18,000	18,000
Environment	Wastewater treatment	Water & Wastewater Treatment Technology Basic L	57	Measuring the depth of the water table	new	1	1,800	1,800
Environment	Wastewater treatment	Water & Wastewater Treatment Technology Basic L	58	Surface water sampling equipment type stand	new	2	2,500	5,000
Environment	Wastewater treatment	Water & Wastewater Treatment Technology Lab	59	ABEM Terrameter SAS 4000 Resistivity meter	new	1	13,400	13,400

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Environment	Solids waste treatment	Solid Waste Treatment Technology Lab	18	Elemental Analysers: EuroEA3000 CHNS-O	New	1	70,000	70,000
Environment	Solids waste treatment	Solid Waste Treatment Technology Lab	19	Furnace 1700 °C	New	1	16,000	16,000
Environment	Solids waste treatment	Solid Waste Treatment Technology Lab	20	Landfill Simulation Reactors (LSRs) (with optional: aeration system) - accesorry	New	4	3,500	14,000
Environment	Solids waste treatment	Solid Waste Treatment Technology Lab	21	Temperature and moisture sensors	New	4	1,500	6,000
Environment	Solids waste treatment	Solid Waste Treatment Technology Lab	22	Furnance with vacuum chamber	New	1	32,000	32,000
Environment	Solids waste treatment	Solid Waste Treatment Technology Lab	23	Automatic distilation unit for nitrogen determination	New	1	36,000	36,000
Environment	Solids waste treatment	Solid Waste Treatment Technology Lab	24	Dryer	New	2	2,000	4,000
Environment	Solids waste treatment	Solid Waste Treatment Technology Lab	26	Oven + accessory	New	2	1,900	3,800
Environment	Solids waste treatment	Solid Waste Treatment Technology Lab	27	Ultra Centrifugal Mill ZM 200 (Restch)	New	2	11,500	23,000
Environment	Solids waste treatment	Solid Waste Treatment Technology Lab	30	Milling machine to destroy the sample and accessory	New	2	12,000	24,000
Environment	Solids waste treatment	Solid Waste Treatment Technology Lab	31	Vacuum system and accesssory	New	2	3,000	6,000
Environment	Solids waste treatment	Solid Waste Treatment Technology Lab	32	Permentation system for biogas, auotmatic controler	New	3	6,000	18,000
Environment	Solids waste treatment	Solid Waste Treatment Technology Lab	33	Stirer and pressure gage	New	5	1,200	6,000
Environment	Solids waste treatment	Solid Waste Treatment Technology Lab	34	Plastic sheet press	New	2	6,500	13,000
Environment	Solids waste treatment	Solid Waste Treatment Technology Lab	38	Biogas Analysser	New	2	12,000	24,000
Environment	Solids waste treatment	Solid Waste Treatment Technology Lab	39	Biogas Volumn	New	2	7,000	14,000
Environment	Solids waste treatment	Solid Waste Treatment Technology Basic Lab	40	Lab bench	Fu	2	1200	2,400
Environment	Solids waste treatment	Solid Waste Treatment Technology Basic Lab	41	Lab chair	Fu	25	50	1,250
Environment	Solids waste treatment	Solid Waste Treatment Technology Basic Lab	42	Chemical shelf	Fu	2	400	800
Environment	Solids waste treatment	Solid Waste Treatment Technology Basic Lab	43	Chemical storing Cabinet	Fu	1	120	120
Environment	Solids waste treatment	Solid Waste Treatment Technology Lab	44	Lab bench	Fu	1	1200	1,200
Environment	Solids waste treatment	Solid Waste Treatment Technology Lab	45	Lab chair	Fu	25	50	1,250
Environment	Solids waste treatment	Solid Waste Treatment Technology Lab	46	Chemical shelf	Fu	1	400	400
Environment	Solids waste treatment	Solid Waste Treatment Technology Lab	47	Chemical storing Cabinet	Fu	1	120	120
Environment	Solids waste treatment	Preparation room	48	Lab bench	Fu	1	1200	1,200
Environment	Solids waste treatment	Preparation room	49	Lab chair	Fu	20	50	1,000
Environment	Solids waste treatment	Preparation room	50	Chemical shelf	Fu	1	400	400
Environment	Solids waste treatment	Preparation room	51	Fume hoods	Fu	1	1500	1,500
Environment	Solids waste treatment	Research office	52	Working table	Fu	2	600	1,200
Environment	Solids waste treatment	Multifunctional Bio-Ecocompatible Material Lab	40	Twin-screw extruder - the system is for producing pellets which are combination of different types of plastics, additives, reinforcements like rice husk, rice straw, coconut fibres,… - accessories: + Twin-screw extruder: Comac	New	1	270,000	270,000
Environment	Solids waste treatment	Material Engineering Lab - Room 2	53	Grinding machine for agricultural by products or waste	New	1	15,865	15,865

Faculty	Nw Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Environment	Solids waste treatment	Material Engineering Lab - Room 2		Small & big recycled resin grinding machine	New	1	25,960	25,960
Environment	Solids waste treatment	Material Engineering Lab - Room 2		Heat distortion tester/ Vicat	New	1	20,195	20,195
Environment	Solids waste treatment	Material Engineering Lab - Room 2		Oxygen index flammability tester	New	1	21,635	21,635
Environment	Solids waste treatment	Material Engineering Lab - Room 2		Plastic flammability tester	New	1	24,520	24,520
Environment	Solids waste treatment	Material Engineering Lab - Room 2		Aging tester by temperature	New	1	60,000	60,000
Environment	Solids waste treatment	Material Engineering Lab - Room 2		Aging tester by humidity and light	New	1	47,143	47,143
Environment	Solids waste treatment	Material Engineering Lab - Room 2		Aging tester by ozon	New	1	113,294	113,294
Environment	Solids waste treatment	Material Engineering Lab - Room 3	1	Concrete mixer 200 L	New	1	20,900	20,900
Environment	Solids waste treatment	Material Engineering Lab - Room 3	2	Slump cone test sets	New	2	594	1,188
Environment	Solids waste treatment	Material Engineering Lab - Room 3	3	Automatic mortar mixer	New	1	8,800	8,800
Environment	Solids waste treatment	Material Engineering Lab - Room 3	6	Electronic Balances 32kg/1g	New	2	825	1,650
Environment	Solids waste treatment	Material Engineering Lab - Room 3	7	Electronic Balances 6200g/0.01g	New	1	1,265	1,265
Environment	Solids waste treatment	Material Engineering Lab - Room 3	8	Automatic Vicat Apparatus	New	1	5,918	5,918
Environment	Solids waste treatment	Material Engineering Lab - Room 3	9	Electromagnetic Sieve Shakers	New	1	3,124	3,124
Environment	Solids waste treatment	Material Engineering Lab - Room 3	10	Sieves, ASTM, fine and coarse woven cloth	New	1	3,168	3,168
Environment	Solids waste treatment	Material Engineering Lab - Room 3	11	Large Capacity Drying Oven	New	1	5,500	5,500
Environment	Solids waste treatment	Material Engineering Lab - Room 3	12	Curing Cabinet	New	1	15,730	15,730
Environment	Solids waste treatment	Material Engineering Lab - Room 3	13	Large Curing Tank	New	1	2,575	2,575
Environment	Solids waste treatment	Material Engineering Lab - Room 3	14	Electrical Resistivity Meter	New	1	7,337	7,337
Environment	Solids waste treatment	Material Engineering Lab - Room 3	15	Concrete penetrometer	New	1	1,122	1,122
Environment	Solids waste treatment	Material Engineering Lab - Room 3	16	Chloride ion penetration meter	New	1	7,634	7,634
Environment	Solids waste treatment	Material Engineering Lab - Room 3	17	Drying, Shrinkage and Moisture Movement apparatus	New	1	1,859	1,859
Environment	Solids waste treatment	Material Engineering Lab - Room 3	18	Moulds for Drying, Shrinkage and Moisture Movement test	New	2	352	704
Environment	Solids waste treatment	Material Engineering Lab - Room 3	19	Heat of hydrations of Cement Apparatus	New	1	16,907	16,907
Environment	Solids waste treatment	Material Engineering Lab - Room 3	20	Le Chatelier Flask	New	4	187	748
Environment	Solids waste treatment	Material Engineering Lab - Room 3	21	Determination of Fineness Blaine Apparatus	New	1	1,309	1,309
Environment	Solids waste treatment	Material Engineering Lab - Room 3	22	Standard cement for Fineness Blaine Test	New	1	231	231
Environment	Solids waste treatment	Material Engineering Lab - Room 3	23	Aggregate Crushing Value Apparatus	New	1	374	374
Environment	Solids waste treatment	Material Engineering Lab - Room 3	24	Crack Detection Microscope	New	1	1,606	1,606
Environment	Solids waste treatment	Material Engineering Lab - Room 3	25	Compression machine	New	1	27,940	27,940
Environment	Solids waste treatment	Material Engineering Lab - Room 3	26	Lab storage cabinet	New	3	1,000	3,000
Environment	Solids waste treatment	Material Engineering Lab - Room 3	27	Marshall compression machine	New	1	17,864	17,864
Environment	Solids waste treatment	Material Engineering Lab - Room 3	28	Automatic Marshall compactor	New	3	2,995	8,985
Environment	Solids waste treatment	Material Engineering Lab - Room 3	29	Drying Oven	New	1	13,200	13,200
Environment	Solids waste treatment	Material Engineering Lab - Room 3	30	Skid resistance and friction tester	New	1	12,320	12,320
Environment	Solids waste treatment	Material Engineering Lab - Room 3	31	Accelerated polish machine	New	1	27,269	27,269
Environment	Solids waste treatment	Material Engineering Lab - Room 3	35	Digital water bath	New	1	2,948	2,948

Faculty	Nw Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Environment	Solids waste treatment	Material Engineering Lab - Room 3	36	Benkelman beam apparatus	New	1	2,695	2,695
Environment	Solids waste treatment	Material Engineering Lab - Room 3	37	Digital thermometers	New	3	198	594
Environment	Solids waste treatment	Material Engineering Lab - Room 3	38	Specific gravity frame	New	1	1,463	1,463
Environment	Solids waste treatment	Material Engineering Lab - Room 3	39	Core drilling machine	New	1	10,120	10,120
Environment	Solids waste treatment	Material Engineering Lab - Room 3	34	Mortar Mixer 20 litres capacity	New	1	18,000	18,000
Environment	Solids waste treatment	Solid Waste Treatment Technology Lab	28	Cutting Mill SM 200 +accessory + balls	New	1	21,000	21,000
Environment	Solids waste treatment	Solid Waste Treatment Technology Lab	29	Milling machine for wet samples	New	1	6,500	6,500
Environment	Solids waste treatment	Solid Waste Treatment Technology Lab	37	Freezer (-18°C) - 16m3	New	1	20,000	20,000
Environment	Solids waste treatment	Solid Waste Treatment Technology Lab	25	Four shaft shredder, (FS8060)	New	1	23,000	23,000
Environment	Solids waste treatment	Solid Waste Treatment Technology Lab	28	Cutting Mill SM 200 +accessory + balls	New	1	21,000	21,000
Environment	Solids waste treatment	Solid Waste Treatment Technology Lab	29	Milling machine for wet samples	New	1	6,500	6,500
Environment	Solids waste treatment	Solid Waste Treatment Technology Lab	35	Hot press	New	1	6,000	6,000
Environment	Solids waste treatment	Solid Waste Treatment Technology Lab	36	Leaching tester (titration)	New	1	10,000	10,000
Environment	Solids waste treatment	Research office	53	Chair	Fu	4	90	360
Environment	Solids waste treatment	Material Engineering Lab - Room 3	32	Gyratory compactor	New	1	64,185	64,185
Environment	Solids waste treatment	Material Engineering Lab - Room 3	4	Apparatus for Determining Flow in Concrete	New	1	1,155	1,155
Environment	Solids waste treatment	Material Engineering Lab - Room 3	5	Apparatus for Determining Flow in Mortar	New	1	2,508	2,508
Environment	Solids waste treatment	Material Engineering Lab - Room 3	33	Abrasion machine	New	1	24,200	24,200
Environment	Chemical Environmental Engineering	Environmental Chemical Engineering Basic Lab	2	Solid phase extraction system	New	1	15,000	15,000
Environment	Chemical Environmental Engineering	Environmental Chemical Engineering Lab	4	Temperature control system with shaking	New	2	11,000	22,000
Environment	Chemical Environmental Engineering	Environmental Chemical Engineering Basic Lab	5	Ion in water meter	New	2	10,000	20,000
Environment	Chemical Environmental Engineering	Environmental Chemical Engineering Basic Lab	6	Oil in water Instrument	New	1	18,900	18,900
Environment	Chemical Environmental Engineering	Environmental Chemical Engineering Lab	7	Glass equipment, fragile instruments, bottle, flask, volumetric flask, …	New	1	20,000	20,000
Environment	Chemical Environmental Engineering	Environmental Chemical Engineering Basic Lab	8	MICROPIPET	New	10	800	8,000
Environment	Chemical Environmental Engineering	Environmental Chemical Engineering Lab	9	Vacuum tube Furnace	New	1	32,000	32,000
Environment	Chemical Environmental Engineering	Environmental Chemical Engineering Lab	10	Drying chamber	New	2	2,000	4,000
Environment	Chemical Environmental Engineering	Environmental Chemical Engineering Basic Lab	20	Working table, Workbench, working chair, chemical storing cabinet	New	1	15,000	15,000
Environment	Chemical Environmental Engineering	Environmental Chemical Engineering Lab	39	Large shelf	Furniture	4	1000	4,000
Environment	Chemical Environmental Engineering	Research Office	40	Working table	Furniture	4	450	1,800

Faculty	Nw Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Environment	Chemical Environmental Engineering	Research Office	41	Chair	Furniture	4	50	200
Environment	Chemical Environmental Engineering	Environmental Chemical Engineering Lab	42	Experimental Tables	Furniture	4	200	800
Environment	Chemical Environmental Engineering	Environmental Chemical Engineering Lab	43	Lab chairs	Furniture	30	40	1,200
Environment	Chemical Environmental Engineering	Environmental Chemical Engineering Lab	44	Waste containers	Furniture	4	100	400
Environment	Chemical Environmental Engineering	Environmental Chemical Engineering Lab	45	Sink	Furniture	4	100	400
Environment	Chemical Environmental Engineering	Environmental Chemical Engineering Lab	46	Emergengy shower	Furniture	1	200	200
Environment	Chemical Environmental Engineering	Environmental Chemical Engineering Lab	47	Fume Hood	Furniture	1	2,000	2,000
Environment	Chemical Environmental Engineering	Environmental Chemical Engineering Basic Lab	1	Ion filter	New	3	2,500	7,500
Environment	Chemical Environmental Engineering	Environmental Chemical Engineering Basic Lab	3	Gas/solvent separator	New	3	7,000	21,000
Environment	Chemical Environmental Engineering	Environmental Chemical Engineering Basic Lab	18	UPS 1000KVA	New	1	1,200	1,200
Environment	Chemical Environmental Engineering	Environmental Chemical Engineering Lab	19	UPS 1000KVA	New	1	1,200	1,200
Environment	Chemical Environmental Engineering	Environmental Chemical Engineering Basic Lab	13	Titration set	New	4	2,500	10,000
Environment	Chemical Environmental Engineering	Environmental Chemical Engineering Basic Lab	12	Circular shaker + Spare parts	New	2	4,000	8,000
Environment	Chemical Environmental Engineering	Environmental Chemical Engineering Lab	15	Magnetic stirrer	New	10	2,200	22,000
Environment	Chemical Environmental Engineering	Research Office	16	5 digits Analytical balance	New	2	4,500	9,000
Environment	Chemical Environmental Engineering	Environmental Chemical Engineering Basic Lab	17	Fermentor	New	1	52,000	52,000
Environment	Hydraulics	Existing water reources lab	N_1	Sentinel V ADCP	N	1	40,000	40,000
Environment	Hydraulics	Existing water reources lab	N_5	vhf portable transceiver	N	6	300	1,800
Environment	Hydraulics	Existing water reources lab	N_6	Handheld gps device	N	10	1,000	10,000
Environment	Hydraulics	Existing water reources lab	N_7	RTK_GPS	N	2	12,500	25,000
Environment	Hydraulics	Existing water reources lab	N_10	Water flow probe	N	5	1,300	6,500
Environment	Hydraulics	Existing water reources lab	N_11	Water Velocity Meter (USGS Type AA Current Meters Model 6200)	N	10	800	8,000
Environment	Hydraulics	Existing water reources lab	N_13	The Global Water FM500 ultrasonic flow meters	N	5	3,500	17,500
Environment	Hydraulics	Existing water reources lab	N_14	Flow sampling system	N	6	3,000	18,000
Environment	Hydraulics	Existing water reources lab	N_15	Pump water sampler	N	5	500	2,500

Faculty	Nw Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Environment	Hydraulics	Existing water reources lab	N_16	Current meter by spillway experiment kits (Notch Apparatus)	N	2	3,000	6,000
Environment	Hydraulics	Existing water reources lab	N_17	Series ULF Ultrasonic Flow Transmitter ULF-01-KFN	N	4	900	3,600
Environment	Hydraulics	Existing water reources lab	N_18	Static flow meter flume	N	2	1,100	2,200
Environment	Hydraulics	Existing water reources lab	N_20	Sediment sampler equipment (Ekman Berge)	N	5	1,000	5,000
Environment	Hydraulics	Existing water reources lab	N_22	Rain sensor	N	5	1,000	5,000
Environment	Hydraulics	Existing water reources lab	N_23	Anemometer	N	5	1,000	5,000
Environment	Hydraulics	Existing water reources lab	N_24	Experimental Flume HM162-Modular Flow Channel/ 300x450mm	N	1	6,000	6,000
Environment	Hydraulics	Existing water reources lab	N_25	General hydraulic experiment	N	3	2,500	7,500
Environment	Hydraulics	Existing water reources lab	N_26	Model dam, irrigation drain (Models of dam and sluice gates)	N	1	1,000	1,000
Environment	Hydraulics	Existing water reources lab	N_28	Motorized foot valve pump	N	2	2,000	4,000
Environment	Hydraulics	Existing water reources lab	N_29	Diver water level logger for Groundwater Monitoring	N	5	4,000	20,000
Environment	Hydraulics	Existing water reources lab	N_30	Floating layer thickness meter with acoustic and light signal	N	5	3,000	15,000
Environment	Hydraulics	Existing water reources lab	N_31	Sounding devices with acoustic and light signal	N	3	3,000	9,000
Environment	Hydraulics	Existing water reources lab	N_33	CTD and Multiparameter Instruments	N	2	15,000	30,000
Environment	Hydraulics	Existing water reources lab	F_1	Furniture (lump sum)	F	1	15,000	15,000
Environment	Hydraulics	Existing water reources lab	N_12	Electromagnetic Current Meter	N	2	15,000	30,000
Environment	Hydraulics	Existing water reources lab	N_32	Water Quality Monitor (WQM)	N	3	8,000	24,000
Environment	Hydraulics	Existing water reources lab	N_2	3D wave current meter	N	1	40,000	40,000
Environment	Hydraulics	Existing water reources lab	N_3	Total station - Topcon GPT-7501	N	1	8,500	8,500
Environment	Hydraulics	Existing water reources lab	N_4	Maptek I-Site 8810 Laser Scanner	N	1	40,000	40,000
Environment	Hydraulics	Existing water reources lab	N_8	Aqua TROLL 400 Multiparameter Instrument	N	5	4,950	24,750
Environment	Hydraulics	Existing water reources lab	N_19	High Sediment Concentration Sensor	N	2	15,000	30,000
Environment	Hydraulics	Existing water reources lab	N_21	Turbidity sensor	N	3	6,000	18,000
Environment	Hydraulics	Existing water reources lab	N_2	3D wave current meter	N	1	40,000	40,000
Environment	Hydraulics	Existing water reources lab	N_3	Total station - Topcon GPT-7501	N	2	8,500	17,000
Environment	Hydraulics	Existing water reources lab	N_4	Maptek I-Site 8810 Laser Scanner	N	1	40,000	40,000
Environment	Hydraulics	Existing water reources lab	N_8	Aqua TROLL 400 Multiparameter Instrument	N	5	4,950	24,750
Environment	Hydraulics	Existing water reources lab	N_9	TROLL 9500 Water Quality Instrument	N	10	4,200	42,000
Environment	Hydraulics	Existing water reources lab	N_19	High Sediment Concentration Sensor	N	3	15,000	45,000
Environment	Hydraulics	Existing water reources lab	N_21	Turbidity sensor	N	3	6,000	18,000
Environment	Hydraulics	Existing water reources lab	N_12	Electromagnetic Current Meter	N	2	15,000	30,000

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Environment	Environmental Modeling	Groundwater modelling lab, Surface water modelling	N_1	Powerful Desktop (to serve as a server)	N	2	3,500	7,000
Environment	Environmental Modeling	Groundwater modelling lab, Surface water modelling	N_2	Desktop	N	30	1,000	30,000
Environment	Environmental Modeling	Groundwater modelling lab, Surface water modelling	N_5	Uninterruptible power supply (UPS) SUA2200I	N	5	800	4,000
Environment	Environmental Modeling	Groundwater modelling lab, Surface water modelling	N_12	Weather stations	N	4	1,200	4,800
Environment	Environmental Modeling	Groundwater modelling lab, Surface water modelling	N_13	Water Velocity Meter (USGS Type AA Current Meters Model 6200)	N	4	800	3,200
Environment	Environmental Modeling	Groundwater modelling lab, Surface water modelling	N_14	Laser Rangefinder / Integrated Compass / Inclinometer	N	4	1,800	7,200
Environment	Environmental Modeling	Groundwater modelling lab, Surface water modelling	N_15	Gasoline Powered Portable Generator with Honda Engine Electric Star	N	2	4,000	8,000
Environment	Environmental Modeling	Groundwater modelling lab, Surface water modelling	N_17	Color printer (A4 size)	N	3	1,500	4,500
Environment	Environmental Modeling	Groundwater modelling lab, Surface water modelling	N_18	Black / White printer	N	3	1,000	3,000
Environment	Environmental Modeling	Groundwater modelling lab, Surface water modelling	N_20	ADTPro software	N	3	200	600
Environment	Environmental Modeling	Groundwater modelling lab, research office and Acad	N_21	Visual MODFLOW® Flex	N	3	4,000	12,000
Environment	Environmental Modeling	Surface water modelling lab, research office and Aca	N_22	Mike Software (full set)	N	1	23,000	23,000
Environment	Environmental Modeling	Groundwater modelling lab, research office and Acad	N_27	3DFATMIC	N	3	600	1,800
Environment	Environmental Modeling	Groundwater modelling lab, research office and Acad	N_28	EdGCM	N	3	200	600
Environment	Environmental Modeling	Groundwater modelling lab, research office and Acad	N_29	AqQA	N	3	300	900
Environment	Environmental Modeling	Groundwater modelling lab, Surface water modelling	N_31	Projectors	N	3	2,500	7,500
Environment	Environmental Modeling	Groundwater modelling lab, Surface water modelling	N_11	Aqua TROLL 400 Multiparameter Instrument	N	5	4,950	24,750
Environment	Environmental Modeling	Groundwater modelling lab, Surface water modelling	N_3	Laptop	N	3	1,800	5,400
Environment	Environmental Modeling	Groundwater modelling lab, Surface water modelling	N_4	Waterproof laptop	N	2	4,000	8,000
Environment	Environmental Modeling	Groundwater modelling lab, Surface water modelling	N_6	Camera IP Vivotek IP8352 (GPS	N	2	1,500	3,000
Environment	Environmental Modeling	Groundwater modelling lab, Surface water modelling	N_9	Large (size) screen SHARP LC-90LE740X 90 INCH	N	1	14,000	14,000
Environment	Environmental Modeling	Groundwater modelling lab, Surface water modelling	N_10	Handheld gps device	N	3	1,000	3,000
Environment	Environmental Modeling	Groundwater modelling lab, Surface water modelling	N_16	Color printer (A0 size)	N	1	14,500	14,500
Environment	Environmental Modeling	Groundwater modelling lab, Surface water modelling	N_3	Laptop	N	2	1,800	3,600
Environment	Environmental Modeling	Groundwater modelling lab, Surface water modelling	N_4	Waterproof laptop	N	2	4,000	8,000
Environment	Environmental Modeling	Groundwater modelling lab, Surface water modelling	N_6	Camera IP Vivotek IP8352 (GPS	N	2	1,500	3,000
Environment	Environmental Modeling	Groundwater modelling lab, Surface water modelling	N_9	Large (size) screen SHARP LC-90LE740X 90 INCH	N	1	14,000	14,000
Environment	Environmental Modeling	Groundwater modelling lab, Surface water modelling	N_10	Handheld gps device	N	3	1,000	3,000
Environment	Environmental Modeling	Groundwater modelling lab, Surface water modelling	N_16	Color printer (A0 size)	N	1	14,500	14,500
Environment	Environmental Modeling	Surface water modelling lab, research office and Aca	N_23	ISIS Software (full set)	N	2	11,000	22,000
Environment	Environmental Modeling	Groundwater modelling lab, Surface water modelling	N_25	Arc GIS (full set)	N	4	4,000	16,000
Environment	Environmental Modeling	Groundwater modelling lab, Surface water modelling	N_26	ENVI (full set)	N	4	4,000	16,000
Environment	Environmental Modeling	Groundwater modelling lab, Surface water modelling	N_3	Laptop	N	5	1,800	9,000
Environment	Environmental Modeling	Groundwater modelling lab, Surface water modelling	N_4	Waterproof laptop	N	4	4,000	16,000
Environment	Environmental Modeling	Groundwater modelling lab, Surface water modelling	N_6	Camera IP Vivotek IP8352 (GPS	N	1	1,500	1,500
Environment	Environmental Modeling	Groundwater modelling lab, Surface water modelling	N_9	Large (size) screen SHARP LC-90LE740X 90 INCH	N	1	14,000	14,000

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Environment	Environmental Modeling	Groundwater modelling lab, Surface water modelling	N_10	Handheld gps device	N	2	1,000	2,000
Environment	Environmental Modeling	Groundwater modelling lab, Surface water modelling	N_3	Laptop	N	7	1,800	12,600
Environment	Environmental Modeling	Groundwater modelling lab, Surface water modelling	N_4	Waterproof laptop	N	3	4,000	12,000
Environment	Environmental Modeling	Groundwater modelling lab, Surface water modelling	N_6	Camera IP Vivotek IP8352 (GPS	N	1	1,500	1,500
Environment	Environmental Modeling	Groundwater modelling lab, Surface water modelling	N_7	TIVI LCD SONY KDL-60R550A AF1	N	3	1,800	5,400
Environment	Environmental Modeling	Groundwater modelling lab, Surface water modelling	N_9	Large (size) screen SHARP LC-90LE740X 90 INCH	N	1	14,000	14,000
Environment	Environmental Modeling	Groundwater modelling lab, Surface water modelling	N_10	Handheld gps device	N	2	1,000	2,000
Environment	Environmental Modeling	Groundwater modelling lab, Surface water modelling	N_16	Color printer (A0 size)	N	1	14,500	14,500
Environment	Environmental Modeling	Groundwater modelling lab, Surface water modelling	N_19	Matlab software	N	4	2,000	8,000
Environment	Environmental Modeling	Surface water modelling lab, research office and Aca	N_23	ISIS Software (full set)	N	2	11,000	22,000
Environment	Environmental Modeling	Surface water modelling lab, research office and Aca	N_24	DSSAT software	N	3	200	600
Environment	Environmental Modeling	Groundwater modelling lab, Surface water modelling	F_1	Computer room and furniture	F	1	40,000	40,000
Environment	Advanced Techniques lab	Advanced Equipment Lab	1	ICP-MS	N	1	330,000	330,000
Environment	Advanced Techniques lab	Samples Preparation Room	2	Rotary evaporator with vacuum	N	1	15,000	15,000
Environment	Advanced Techniques lab	Samples Preparation Room	6	Sample preparation	N	1	30,000	30,000
Environment	Advanced Techniques lab	Research Office	7	Chromatography ion machine	N	1	70,000	70,000
Environment	Advanced Techniques lab	Samples Preparation Room	10	Solid phase extraction system	N	1	15,000	15,000
Environment	Advanced Techniques lab	Samples Preparation Room	11	Gas/solvent separator	N	1	7,000	7,000
Environment	Advanced Techniques lab	Samples Preparation Room	12	Rotary Vacuum Evaporator System	N	1	8,000	8,000
Environment	Advanced Techniques lab	Samples Preparation Room	13	Microwave Digestion System	N	1	25,000	25,000
Environment	Advanced Techniques lab	Samples Preparation Room	15	Balances (5 digits), Satorius CP323S, Germany	New	1	6,000	6,000
Environment	Advanced Techniques lab	Samples Preparation Room	16	Balances (4 digits), Satorius CP323S, Germany	New	1	4,000	4,000
Environment	Advanced Techniques lab	Samples Preparation Room	21	MICROPIPET	New	5	800	4,000
Environment	Advanced Techniques lab	Samples Preparation Room	23	Oxygen meter	New	4	900	3,600
Environment	Advanced Techniques lab	Samples Preparation Room	24	pH meters	New	4	400	1,600
Environment	Advanced Techniques lab	Samples Preparation Room	25	Centrifuge (with temperature control)	New	1	18,000	18,000
Environment	Advanced Techniques lab	Advanced Equipment Lab	23	UPS 1000KVA	New	1	1,200	1,200
Environment	Advanced Techniques lab	Samples Preparation Room	3	Distiller and deionized water	N	1	20,000	20,000
Environment	Advanced Techniques lab	Samples Preparation Room	14	Sample extraction equipment with themal control	N	1	15,000	15,000
Environment	Advanced Techniques lab	Samples Preparation Room	26	Ultra low temperature Freezer	New	1	14,000	14,000
Environment	Advanced Techniques lab	Samples Preparation Room	18	Cabinet	Fu	4	120	480
Environment	Advanced Techniques lab	Samples Preparation Room	3	Distiller and deionized water	N	1	20,000	20,000
Environment	Advanced Techniques lab	Samples Preparation Room	14	Sample extraction equipment with themal control	N	1	15,000	15,000
Environment	Advanced Techniques lab	Samples Preparation Room	22	Milling machine to destroy the sample and accessory	New	1	12,000	12,000
Environment	Advanced Techniques lab	Samples Preparation Room	26	Ultra low temperature Freezer	New	1	14,000	14,000

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Environment	Advanced Techniques lab	Samples Preparation Room	17	Large shelf	Fu	8	100	800
Environment	Advanced Techniques lab	Samples Preparation Room	18	Cabinet	Fu	4	120	480
Environment	Advanced Techniques lab	Samples Preparation Room	20	Lab chair	Fu	40	25	1,000
Environment	Climate Change and Environmental Observation	Climate Observation Lab (satelite labs)	4	Solar energy station (provide energy for real-time equipment)	N	3	5,000	15,000
Environment	Climate Change and Environmental Observation	Academic Staff Office	8	AMI (Airborne Multispectral Imager)	N	1	50,000	50,000
Environment	Climate Change and Environmental Observation	Academic Staff Office	9	LCTF (liquid crystal tunable filter-system)	N	2	10,000	20,000
Environment	Climate Change and Environmental Observation	Environment Observation Lab	10	GHG monitoring	N	3	3,000	9,000
Environment	Climate Change and Environmental Observation	Climate Observation Lab, Environment Observation I	13	Network Analyzer	N	1	80,000	80,000
Environment	Climate Change and Environmental Observation	Climate Observation Lab, Environment Observation I	15	Agilent N9010A-513 EXA - Signal Analyzer	N	1	35,000	35,000
Environment	Climate Change and Environmental Observation	Climate Observation Lab, Environment Observation I	17	USBee-AX-DE (Bus Data Extractors for the USBee AX Test Pod)	N	1	500	500
Environment	Climate Change and Environmental Observation	Climate Observation Lab, Environment Observation I	18	Logic16 16-channel USB Logic Analyzer - 12,5MHz	N	1	500	500
Environment	Climate Change and Environmental Observation	Climate Observation Lab, Environment Observation I	20	V3500A Handheld RF Power Meter	N	1	5,000	5,000
Environment	Climate Change and Environmental Observation	Climate Observation Lab, Environment Observation I	21	Altera DE4 Development and Education Board	N	2	3,000	6,000
Environment	Climate Change and Environmental Observation	Climate Observation Lab, Environment Observation I	22	Video and Embedded Evaluation Kit - Multi-touch	N	1	1,000	1,000
Environment	Climate Change and Environmental Observation	Climate Observation Lab, Environment Observation I	23	Desktop PC 4 Ch Digitizer - NI - 4 channels 200MS/s 12bits	N	1	30,000	30,000
Environment	Climate Change and Environmental Observation	Climate Observation Lab, Environment Observation I	24	Quartus II Subscription Edition (Fixed subscription, ModelSim - Altera Edition software + Renew 3 years)	N	1	50,000	50,000
Environment	Climate Change and Environmental Observation	Climate Observation Lab, Environment Observation I	25	UPS 1000KVA	New	1	1,200	1,200
Environment	Climate Change and Environmental Observation	Climate Observation Lab, Environment Observation I	2	Desktop	N	25	1,500	37,500
Environment	Climate Change and Environmental Observation	Climate Observation Lab, Environment Observation I	3	TIVI LCD SONY KDL-60R550A AF1	N	2	1,800	3,600
Environment	Climate Change and Environmental Observation	Environment Observation Lab (satelite labs)	6	Real-Time Water Quality Station (Aqua TROLL 400 Multiparameter Instrument)	N	3	4,950	14,850
Environment	Climate Change and Environmental Observation	Environment Observation Lab (satelite labs)	7	Realtime Streamflow Stations (Electromagnetic Current Meter)	N	3	15,000	45,000
Environment	Climate Change and Environmental Observation	Climate Observation Lab, Environment Observation I	12	Agilent E4405B ESA-E - Spectrum Analyzer	N	1	40,000	40,000
Environment	Climate Change and Environmental Observation	Environment Observation Lab (satelite labs)	7	Realtime Streamflow Stations (Electromagnetic Current Meter)	N	3	15,000	45,000

Faculty	Nw Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Environment	Climate Change and Environmental Observation	Climate Observation Lab, Environment Observation I	14	Agilent E4438C-506 Vector Signal Generator	N	1	45,000	45,000
Environment	Climate Change and Environmental Observation	Climate Observation Lab, Environment Observation I	16	Agilent - 16822A 68 Channel Portable Logic Analyzer	N	1	40,000	40,000
Environment	Climate Change and Environmental Observation	Climate Observation Lab, Environment Observation I	19	Agilent: N1912A P-Series Dual Channel Power Meter	N	1	40,000	40,000
Environment	Climate Change and Environmental Observation	Climate Observation Lab, Environment Observation I	3	TIVI LCD SONY KDL-60R550A AF1	N	1	1,800	1,800
Environment	Climate Change and Environmental Observation	Climate Observation Lab (satelite labs)	5	Weather station	N	3	4,000	12,000
Environment	Climate Change and Environmental Observation	Climate Observation Lab, Environment Observation I	26	Lab chair and tables	Fu	25	200	5,000
Environment	13. Aquaculture & Environment Automation Lab	13-2 Aquaculture & Environment Automation Lab - R	1	SCADA System for supervisory control of water treatment process	New	1	59,500	59,500
Environment	13. Aquaculture & Environment Automation Lab	13-2 Aquaculture & Environment Automation Lab - Room 2	3	Automated Micromanipulation System of Micro-Objects	New	1	96,000	96,000
Environment	13. Aquaculture & Environment Automation Lab	13-2 Aquaculture & Environment Automation Lab - Room 2	4	Mobile monitoring platforms and accurate GPS positioning system for on-demand monitoring and analysis	New	1	40,000	40,000
Environment	13. Aquaculture & Environment Automation Lab	13-2 Aquaculture & Environment Automation Lab - Room 2	5	Other accessories (Sensors for remote sensing purposes (visible, multispectral and hyperspectral (VNIR), thermal, and LiDAR))	New	1	35,000	35,000
Environment	13. Aquaculture & Environment Automation Lab	13-2 Aquaculture & Environment Automation Lab - Room 2	2	SCADA system network in combination with GIS used for forecasting and controling the flood in large area	New	1	133,000	133,000
Environment	13. Aquaculture & Environment Automation Lab	13-2 Aquaculture & Environment Automation Lab - Room 2	Fu-1	Tables (for research room)	Fu	6	1,800	10,800
Environment	13. Aquaculture & Environment Automation Lab	13-2 Aquaculture & Environment Automation Lab - Room 2	Fu-2	Chairs	Fu	24	95	2,280
Environment	13. Aquaculture & Environment Automation Lab	13-2 Aquaculture & Environment Automation Lab - Room 2	Fu-4	Lab cabinet	Fu	2	1,000	2,000
Environment	13. Aquaculture & Environment Automation Lab	13-3 Academic Staff Office	Fu-5	L-table (for academic staff office)	Fu	4	615	2,460
Environment	13. Aquaculture & Environment Automation Lab	13-3 Academic Staff Office	Fu-6	Chair	Fu	4	95	380
Environment	13. Aquaculture & Environment Automation Lab	13-3 Academic Staff Office	Fu-8	Lab cabinet	Fu	2	1,000	2,000
Environment	13. Aquaculture & Environment Automation Lab	13-5 Research office 2	Fu-10	Tables (for research offfice)	Fu	12	375	4,500
Environment	13. Aquaculture & Environment Automation Lab	13-5 Research office 2	Fu-11	Chairs	Fu	12	95	1,140
Environment	13. Aquaculture & Environment Automation Lab	13-5 Research office 2	Fu-13	Lab cabinet	Fu	2	1,000	2,000
Environment	13. Aquaculture & Environment Automation Lab	13-6 Seminar Room	Fu-15	Chair	Fu	24	95	2,280

Faculty	Nw Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Environment	Environmental and Behavioral Economics Lab	Behavior Lab (121 computers); Quantitative Lab (121 computers); Simulation lab (121 computers); Academic office (3 computers); Research office (34 computers)	1	Desktops	New	40	600	24,000
Environment	Environmental and Behavioral Economics Lab	Behavior Lab (1 hub computer); Quantitative Lab (1 hub computer); Simulation lab (1 hub computer)	2	Hub computers	New	3	4,000	12,000
Environment	Environmental and Behavioral Economics Lab	Behavior Lab (1 screen); Quantitative Lab (1 hub screen); Simulation lab (1 hub screen)	3	Large OLED screen	New	3	4,000	12,000
Environment	Environmental and Behavioral Economics Lab	Behavior Lab (60 terminals&chairs); Quantitative Lab (150 terminals&chairs); Simulation lab (150 terminals&chairs); Academic office (5 terminals&chairs); Research office (35 terminals&chairs)	4	Computer terminals + chairs	New	40	100	4,000
Environment	Environmental and Behavioral Economics Lab	Behavior Lab (1 desk); Quantitative Lab (1 desk); Simulation lab (1 desk)	5	Lecturer desk	New	3	60	180
Environment	Environmental and Behavioral Economics Lab	Behavior Lab (1 system); Quantitative Lab (1 system); Simulation lab (1 system)	6	Audio + video system	New	3	4,000	12,000
Environment	Environmental and Behavioral Economics Lab	Behavior Lab; Quantitative Lab; Simulation lab; Academic office; Research office	7	Software packages	New	1	60,000	60,000
Environment	Environmental and Behavioral Economics Lab	Academic Staff Office	11	Network printer, photocopier and scanner	New	1	20,000	20,000
Environment	Environmental and Behavioral Economics Lab	Behavior Lab; Quantitative Lab; Simulation lab; Academic office; Research office	7	Software packages	New	1	40,000	40,000
Environment	Environmental and Behavioral Economics Lab	Behavior Lab (1); Quantitative Lab (1); Simulation lab (2); Academic office (1); Research office (1)	9	White board	New	6	100	600
Environment	Environmental and Behavioral Economics Lab	Behavior Lab; Quantitative Lab; Simulation lab; Academic office; Research office	10	Electricity and Network System	New	3	8,000	24,000
Environment	Environmental and Behavioral Economics Lab	Behavior Lab; Quantitative Lab; Simulation lab; Academic office; Research office	12	Switch 24 ports	New	20	300	6,000
Environment	Air Pollution Control	Air Pollution Control Technology Lab	1	Exhaust gas analyzer	New	1	25,000	25,000
Environment	Air Pollution Control	Air Pollution Control Technology Basic Lab	2	High volume dust sampling equipment	New	2	5,000	10,000
Environment	Air Pollution Control	Air Pollution Control Technology Lab	3	Dust digital meter	New	3	3,100	9,300
Environment	Air Pollution Control	Air Pollution Control Technology Basic Lab	4	Dust sampling device	New	3	3,000	9,000
Environment	Air Pollution Control	Air Pollution Control Technology Lab	5	Poison gas meter	New	3	2,000	6,000
Environment	Air Pollution Control	Air Pollution Control Technology Lab	6	Gas sampling device	New	1	15,000	15,000
Environment	Air Pollution Control	Air Pollution Control Technology Basic Lab	9	Electrostatic Dust filter equipment	New	1	15,000	15,000
Environment	Air Pollution Control	Air Pollution Control Technology Basic Lab	10	Illumination power meter	New	3	700	2,100
Environment	Air Pollution Control	Air Pollution Control Technology Lab	11	Micro climate meter	New	3	1,500	4,500
Environment	Air Pollution Control	Air Pollution Control Technology Basic Lab	13	Wireless Weather Station: Temperature, Humidity, Wind Speed/Wind Direction, Atmospheric Pressure, Rainfall	New	2	13,000	26,000
Environment	Air Pollution Control	Four rooms of the Lab	14	Air-condition for storing equipments, and options	New	3	800	2,400

Faculty	Nw Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Environment	Air Pollution Control	Air Pollution Control Technology Lab	15	Greenhouse gas analyzer	New	3	10,000	30,000
Environment	Air Pollution Control	Preparation Room	16	Rotary vacuum evaporator system	New	2	9,000	18,000
Environment	Air Pollution Control	Preparation Room	17	Ultrasonic cleaner	New	2	5,000	10,000
Environment	Air Pollution Control	Air Pollution Control Technology Lab	19	UV - Visible NIR spectrophotometer	New	1	26,000	26,000
Environment	Air Pollution Control	Air Pollution Control Technology Lab	21	Portable natural gas chromatograph	New	1	20,000	20,000
Environment	Air Pollution Control	Air Pollution Control Technology Lab	23	Continous emission monitoring system	New	1	25,000	25,000
Environment	Air Pollution Control	Air Pollution Control Technology Basic Lab	25	Glassware	New	1	15,000	15,000
Environment	Air Pollution Control	Air Pollution Control Technology Basic Lab	26	3 digits balance	New	2	3,500	7,000
Environment	Air Pollution Control	Air Pollution Control Technology Basic Lab	27	4 digits balance	New	1	4,000	4,000
Environment	Air Pollution Control	Air Pollution Control Technology Lab	28	Velocity of wind handle meter	New	3	1,200	3,600
Environment	Air Pollution Control	Air Pollution Control Technology Lab	29	Noise meter	New	3	600	1,800
Environment	Air Pollution Control	Air Pollution Control Technology Lab	30	Gas flow meter	New	3	300	900
Environment	Air Pollution Control	Air Pollution Control Technology Lab	31	Heat radiation meter	New	3	700	2,100
Environment	Air Pollution Control	Air Pollution Control Technology Basic Lab	33	Chemical storing Cabinet	Fu	2	120	240
Environment	Air Pollution Control	Air Pollution Control Technology Basic Lab	34	Lab bench	Fu	2	1,200	2,400
Environment	Air Pollution Control	Air Pollution Control Technology Basic Lab	35	Lab chair	Fu	25	50	1,250
Environment	Air Pollution Control	Air Pollution Control Technology Basic Lab	36	Chemical shelf	Fu	2	400	800
Environment	Air Pollution Control	Air Pollution Control Technology Lab	37	Chemical storing Cabinet	Fu	1	120	120
Environment	Air Pollution Control	Air Pollution Control Technology Lab	38	Lab bench	Fu	1	1,200	1,200
Environment	Air Pollution Control	Air Pollution Control Technology Lab	39	Lab chair	Fu	25	50	1,250
Environment	Air Pollution Control	Air Pollution Control Technology Lab	40	Chemical shelf	Fu	1	400	400
Environment	Air Pollution Control	Preparation Room	41	Chemical storing Cabinet	Fu	1	120	120
Environment	Air Pollution Control	Preparation Room	42	Lab bench	Fu	1	1,200	1,200
Environment	Air Pollution Control	Preparation Room	43	Lab chair	Fu	20	50	1,000
Environment	Air Pollution Control	Preparation Room	44	Chemical shelf	Fu	1	400	400
Environment	Air Pollution Control	Preparation Room	45	Fume hoods	Fu	1	1,500	1,500
Environment	Air Pollution Control	Research office	46	L-table	Fu	2	615	1,230
Environment	Air Pollution Control	Research office	47	Chair	Fu	4	90	360
Environment	Air Pollution Control	Research office	48	Book shelf	Fu	2	100	200
Environment	Air Pollution Control	Air Pollution Control Technology Lab	24	Nitrogen oxides, sulfur dioxide and H2S analyser	New	1	22,000	22,000
Environment	Air Pollution Control	Air Pollution Control Technology Lab		UPS 1000KVA	New	1	1,200	1,200
Environment	Air Pollution Control	Air Pollution Control Technology Basic Lab	8	Model of dust filter equipments	New	4	25,000	100,000
Environment	Air Pollution Control	Air Pollution Control Technology Lab	22	Portable gas gravitometers	New	1	18,000	18,000
Environment	Air Pollution Control	Air Pollution Control Technology Lab	18	Ultraviolet spectrometer	New	1	15,050	15,050
Environment	Air Pollution Control	Air Pollution Control Technology Lab	32	Geographic positioning system navigation device	New	3	500	1,500

Faculty	Nw Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Environment	16. Clean and Renewable Energy	16-1. Clean and Renewable Energy - Room 1	1	Solar Panel	New	1	5,000	5,000
Environment	16. Clean and Renewable Energy	16-1. Clean and Renewable Energy - Room 1	4	Sun radiation meter	New	1	600	600
Environment	16. Clean and Renewable Energy	16-1. Clean and Renewable Energy - Room 1	18	Modules of power retifier and converter, Module of IGBT 7 chanel, and options	New	1	20,746	20,746
Environment	16. Clean and Renewable Energy	16-1. Clean and Renewable Energy - Room 1	19	Card dsPACE, Card DSP is used to Matlab and software	New	1	39,970	39,970
Environment	16. Clean and Renewable Energy	16-1. Clean and Renewable Energy - Room 1	22	Wind generator	New	1	158,654	158,654
Environment	16. Clean and Renewable Energy	16-1. Clean and Renewable Energy - Room 1	23	Solar cell module	New	1	105,769	105,769
Environment	16. Clean and Renewable Energy	16-1. Clean and Renewable Energy - Room 1	24	Energy restoring equipments and loads: fuel cell, DC/DC Converter, hydro generator, Hydrogen storage cainster, electrical load	New	1	50,481	50,481
Environment	16. Clean and Renewable Energy	16-1. Clean and Renewable Energy - Room 1	25	Model for supervising power energy of aquatic production factory	New	1	72,115	72,115
Environment	16. Clean and Renewable Energy	16-4. Research Office 1	1	Datalogger and sensor	New	1	12,000	12,000
Environment	16. Clean and Renewable Energy	16-4. Research Office 1	3	Perfomance osciloscope, handle osciloscope, and options	New	1	20,000	20,000
Environment	16. Clean and Renewable Energy	16-4. Research Office 1	4	Digital clamp multimeter and clamp handle multimeter	New	1	15,000	15,000
Environment	16. Clean and Renewable Energy	16-4. Research Office 1	5	Quality of electricity analyzer and software	New	1	35,000	35,000
Environment	16. Clean and Renewable Energy	16-4. Research Office 1	6	Vibration of machine handle meter, and analyzer software	New	1	21,635	21,635
Environment	16. Clean and Renewable Energy	16-2. Clean and Renewable Energy - Room 2	1	Electrochemistry multimeter	new	1	50,000	50,000
Environment	16. Clean and Renewable Energy	16-2. Clean and Renewable Energy - Room 2	4	photocatalytic reactor	new	1	14,000	14,000
Environment	16. Clean and Renewable Energy	16-2. Clean and Renewable Energy - Room 2	5	Syringe pump	new	1	4,200	4,200
Environment	16. Clean and Renewable Energy	16-2. Clean and Renewable Energy - Room 2	6	Heat circulation bath	new	1	6,000	6,000
Environment	16. Clean and Renewable Energy	16-2. Clean and Renewable Energy - Room 2	7	Ultrasonic bath	new	1	1,000	1,000
Environment	16. Clean and Renewable Energy	16-2. Clean and Renewable Energy - Room 2	8	shaking machine	new	1	500	500
Environment	16. Clean and Renewable Energy	16-2. Clean and Renewable Energy - Room 2	10	Refrigerator	new	1	500	500
Environment	16. Clean and Renewable Energy	16-2. Clean and Renewable Energy - Room 2	11	Centrifugate	new	1	2,000	2,000
Environment	16. Clean and Renewable Energy	16-2. Clean and Renewable Energy - Room 2	12	Balance (4 digits)	new	1	2,000	2,000

Faculty	Nw Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Environment	16. Clean and Renewable Energy	16-2. Clean and Renewable Energy - Room 2	14	Laboratory oven	new	1	1,500	1,500
Environment	16. Clean and Renewable Energy	16-2. Clean and Renewable Energy - Room 2	15	PH-meter	new	1	1,000	1,000
Environment	16. Clean and Renewable Energy	16-2. Clean and Renewable Energy - Room 2	16	MicroPipett (0,5-10uL, 2-20uL, 5-50uL, 10-100uL, 50-200uL, 100-1000uL)	new	1	1,500	1,500
Environment	16. Clean and Renewable Energy	16-2. Clean and Renewable Energy - Room 2	17	Vortex mixer	new	1	500	500
Environment	16. Clean and Renewable Energy	16-2. Clean and Renewable Energy - Room 2	18	Vacuum filter	new	1	1,500	1,500
Environment	16. Clean and Renewable Energy	16-2. Clean and Renewable Energy - Room 2	19	Thermostat magnetic stirrer	new	1	500	500
Environment	16. Clean and Renewable Energy	16-2. Clean and Renewable Energy - Room 2	20	Heating magnetic stirrer	new	1	300	300
Environment	16. Clean and Renewable Energy	16-1. Clean and Renewable Energy - Room 1	8	Oxidation stability device 873 Biodiesel - Rancimat	New	1	48,000	48,000
Environment	16. Clean and Renewable Energy	16-1. Clean and Renewable Energy - Room 1	9	The titration 848 TitrinoPlus	New	1	18,000	18,000
Environment	16. Clean and Renewable Energy	16-1. Clean and Renewable Energy - Room 1	11	Density meter DMA 4100M	New	1	13,000	13,000
Environment	16. Clean and Renewable Energy	16-1. Clean and Renewable Energy - Room 1	10	Water contents measuring device Karl Fischer Coulometer 851 Titrando	New	1	24,200	24,200
Environment	16. Clean and Renewable Energy	16-1. Clean and Renewable Energy - Room 1	5	Velocity of wind meter, and towernull	New	1	30,000	30,000
Environment	16. Clean and Renewable Energy	16-1. Clean and Renewable Energy - Room 1	12	IWAKI incubator	New	2	6,000	12,000
Environment	16. Clean and Renewable Energy	16-1. Clean and Renewable Energy - Room 1	13	Distilation machine GFL - German	New	1	8,000	8,000
Environment	16. Clean and Renewable Energy	16-1. Clean and Renewable Energy - Room 1	14	Piosion air exhaust cabinet - USA	New	2	5,400	10,800
Environment	16. Clean and Renewable Energy	16-1. Clean and Renewable Energy - Room 1	21	DC machine, three phases machines and options	New	1	35,577	35,577
Environment	16. Clean and Renewable Energy	16-4. Research Office 1	7	Device meters: leakage gas, pressure, flow by ultrasound wave,…	New	1	21,154	21,154
Environment	16. Clean and Renewable Energy	16-4. Research Office 1	8	Device meters: Lux, harmonics, velocity, resistor, temperature,…	New	1	35,000	35,000
Environment	16. Clean and Renewable Energy	16-2. Clean and Renewable Energy - Room 2	2	Centrifugal cold high speed machine	new	1	21,000	21,000
Environment	16. Clean and Renewable Energy	16-2. Clean and Renewable Energy - Room 2	9	water double filter	new	1	1,000	1,000
Environment	16. Clean and Renewable Energy	16-2. Clean and Renewable Energy - Room 2	13	Balance (2 digits)	new	1	500	500
Environment	16. Clean and Renewable Energy	16-1. Clean and Renewable Energy - Room 1	2	Battery	New	20	40	800
Environment	16. Clean and Renewable Energy	16-1. Clean and Renewable Energy - Room 1	3	Heat radiation sensor, time relay	New	1	3,000	3,000

Faculty	Nw Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Environment	16. Clean and Renewable Energy	16-1. Clean and Renewable Energy - Room 1	6	Temperature IR meter	New	2	500	1,000
Environment	16. Clean and Renewable Energy	16-1. Clean and Renewable Energy - Room 1	7	Water boiler by sun energy	New	1	1,000	1,000
Environment	16. Clean and Renewable Energy	16-1. Clean and Renewable Energy - Room 1	15	Synthetize biodiesel device	New	1	20,000	20,000
Environment	16. Clean and Renewable Energy	16-1. Clean and Renewable Energy - Room 1	16	Chemical storing cabinet	New	2	2,000	4,000
Environment	16. Clean and Renewable Energy	16-1. Clean and Renewable Energy - Room 1	17	Oil press used to obtain cold pressed oil from bulk seeds	New	1	3,000	3,000
Environment	16. Clean and Renewable Energy	16-1. Clean and Renewable Energy - Room 1	20	Moment meter, brake control, and options	New	1	41,346	41,346
Environment	16. Clean and Renewable Energy	16-1. Clean and Renewable Energy - Room 1	Fu-3	Student practice table	Fu	24	375	9,000
Environment	16. Clean and Renewable Energy	16-1. Clean and Renewable Energy - Room 1	Fu-4	Student practice table	Fu	6	343	2,058
Environment	16. Clean and Renewable Energy	16-1. Clean and Renewable Energy - Room 1	Fu-5	Long table	Fu	1	675	675
Environment	16. Clean and Renewable Energy	16-1. Clean and Renewable Energy - Room 1	Fu-7	Two-wall table	Fu	6	1,800	10,800
Environment	16. Clean and Renewable Energy	16-1. Clean and Renewable Energy - Room 1	Fu-8	Chair	Fu	24	95	2,280
Environment	16. Clean and Renewable Energy	16-4. Research Office 1	Fu-3	Table	Fu	12	375	4,500
Environment	16. Clean and Renewable Energy	16-2. Clean and Renewable Energy - Room 2	21	Vacuum freeze dryer	new	1	5,000	5,000
Environment	16. Clean and Renewable Energy	16-2. Clean and Renewable Energy - Room 2	Fu-2	Chairs	Fu	24	95	2,280
Environment	16. Clean and Renewable Energy	16-2. Clean and Renewable Energy - Room 2	Fu-3	Fume hood	Fu	1	1,500	1,500
Environment	16. Clean and Renewable Energy	16-2. Clean and Renewable Energy - Room 2	Fu-8	Chemical storing cabinet	Fu	1	300	300
Environment	16. Clean and Renewable Energy	16-4. Research Office 1	Fu-4	Chair	Fu	12	95	1,140
Environment	16. Clean and Renewable Energy	16-5. Research Office 2	Fu-1	Table	Fu	12	375	4,500
Environment	16. Clean and Renewable Energy	16-5. Research Office 2	Fu-2	Chair	Fu	12	95	1,140
Environment	16. Clean and Renewable Energy	16-6. Seminar room	Fu-1	Four-seat table	Fu	6	600	3,600
Environment	16. Clean and Renewable Energy	16-6. Seminar room	Fu-2	Chair	Fu	24	95	2,280
Environment	Center for Pilot Demonstration	Center for Model Demonstration	1	Recycling model, automatic classification	new	1	20,000	20,000
Environment	Center for Pilot Demonstration	Model Demonstration workshop	2	Hazardous waste processing and chemical model	new	2	14,000	28,000

Faculty	Nw Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Environment	Center for Pilot Demonstration	Preparation Room/Lecturer Office	3	Dust and air pollution processing model (cloth bags, sleeves, static electricity, etc.)	new	1	25,000	25,000
Environment	Center for Pilot Demonstration	Research Office	4	Aquatic wastewater processing models	new	2	15,000	30,000
Environment	Center for Pilot Demonstration		5	Rural clean water supply model	new	1	5,000	5,000
Environment	Center for Pilot Demonstration		6	Solar water heaters, solar radiation measurement model	new	2	2,000	4,000
Environment	Center for Pilot Demonstration		7	Solar panel model, the controller (solar house)	new	2	4,000	8,000
Environment	Center for Pilot Demonstration		8	Motors running on biodiesel, and accessories measurement - analysis	new	2	5,000	10,000
Environment	Center for Pilot Demonstration		9	Detoxicating equipment model (filter)	new	2	5,000	10,000
Environment	Center for Pilot Demonstration		10	Anaerobic processing model	new	2	10,000	20,000
Environment	Center for Pilot Demonstration		11	Aerobic processing model	new	2	10,000	20,000
Environment	Center for Pilot Demonstration		12	Brackets and electric system for model control	new	2	2,500	5,000
Environment	Center for Pilot Demonstration		14	UPS 1000KVA	New	1	1,200	1,200
Environment	Center for Pilot Demonstration		13	computer, projector and model simulation using computer	new	1	70,000	70,000
							sum	10,445,505

4 CoET

	Building	Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting /Furniture)	Quantity	Price/unit (USD)	Cost (USD)
CoET	CoET wing		CoET 5. Chemical Engineering Lab	CoET 5.1 Chemical Engineering Lab - Room 1	1	Autoclave	New	1	11,000	11,000
	CoET wing		CoET 5. Chemical Engineering Lab	CoET 5.1 Chemical Engineering Lab - Room 1	2	Laminar Flow Cabinet	New	1	8,000	8,000
	CoET wing		CoET 5. Chemical Engineering Lab	CoET 5.1 Chemical Engineering Lab - Room 1	3	Themostat tank	New	1	12,000	12,000
	CoET wing		CoET 5. Chemical Engineering Lab	CoET 5.1 Chemical Engineering Lab - Room 1	4	High-speed centrifuge	New	1	21,000	21,000
	CoET wing		CoET 5. Chemical Engineering Lab	CoET 5.1 Chemical Engineering Lab - Room 1	7	High performance liquid chromatography (HPLC)	New	1	65,000	65,000
	CoET wing		CoET 5. Chemical Engineering Lab	CoET 5.1 Chemical Engineering Lab - Room 1	8	UV-Vis Spectrophotometer	New	1	15,000	15,000
	CoET wing		CoET 5. Chemical Engineering Lab	CoET 5.1 Chemical Engineering Lab - Room 1	9	Gas chromatography (GC)	New	1	25,000	25,000
	CoET wing		CoET 5. Chemical Engineering Lab	CoET 5.1 Chemical Engineering Lab - Room 1	10	Glove box	New	1	2,000	2,000
	CoET wing		CoET 5. Chemical Engineering Lab	CoET 5.1 Chemical Engineering Lab - Room 1	11	Schlenkline	New	1	3,000	3,000
	CoET wing		CoET 5. Chemical Engineering Lab	CoET 5.1 Chemical Engineering Lab - Room 1	12	Vacuum freeze dryer	New	1	500	500
	CoET wing		CoET 5. Chemical Engineering Lab	CoET 5.1 Chemical Engineering Lab - Room 1	13	Ultrasonic bath	New	1	500	500
	CoET wing		CoET 5. Chemical Engineering Lab	CoET 5.1 Chemical Engineering Lab - Room 1	14	Shaking machine	New	1	1,500	1,500
	CoET wing		CoET 5. Chemical Engineering Lab	CoET 5.1 Chemical Engineering Lab - Room 1	15	Water double filter	New	1	500	500
	CoET wing		CoET 5. Chemical Engineering Lab	CoET 5.1 Chemical Engineering Lab - Room 1	16	Refrigerator	New	1	1,000	1,000
	CoET wing		CoET 5. Chemical Engineering Lab	CoET 5.1 Chemical Engineering Lab - Room 1	17	Centrifugate	New	1	2,000	2,000
	CoET wing		CoET 5. Chemical Engineering Lab	CoET 5.1 Chemical Engineering Lab - Room 1	18	Balance (4 digits)	New	1	1,500	1,500
	CoET wing		CoET 5. Chemical Engineering Lab	CoET 5.1 Chemical Engineering Lab - Room 1	19	Balance (2 digits)	New	1	1,000	1,000
	CoET wing		CoET 5. Chemical Engineering Lab	CoET 5.1 Chemical Engineering Lab - Room 1	20	Laboratory oven	New	1	1,500	1,500
	CoET wing		CoET 5. Chemical Engineering Lab	CoET 5.1 Chemical Engineering Lab - Room 1	21	pH-meter	New	1	1,000	1,000
	CoET wing		CoET 5. Chemical Engineering Lab	CoET 5.1 Chemical Engineering Lab - Room 1	22	MicroPipett (0,5-10uL, 2-20uL, 5-50uL, 10-100uL, 50-200uL, 100-1000uL)	New	1	1,500	1,500
	CoET wing		CoET 5. Chemical Engineering Lab	CoET 5.1 Chemical Engineering Lab - Room 1	23	Vortex mixer	New	1	500	500
	CoET wing		CoET 5. Chemical Engineering Lab	CoET 5.1 Chemical Engineering Lab - Room 1	24	Vacuum filter	New	1	1,500	1,500
	CoET wing		CoET 5. Chemical Engineering Lab	CoET 5.1 Chemical Engineering Lab - Room 1	25	Thermostat magnetic stirrer	New	3	500	1,500
	CoET wing		CoET 5. Chemical Engineering Lab	CoET 5.1 Chemical Engineering Lab - Room 1	26	Heating magnetic stirrer	New	3	300	900
	CoET wing		CoET 5. Chemical Engineering Lab	CoET 5.1 Chemical Engineering Lab - Room 1	27	Vacuum Freeze Dryer	New	1	5,000	5,000
	CoET wing		CoET 5. Chemical Engineering Lab	CoET 5.2 Chemical Engineering Lab - Room 2	1	Fiber-coupled Spectrophotometer (400-1000 nm)	New	1	20,000	20,000
	CoET wing		CoET 5. Chemical Engineering Lab	CoET 5.2 Chemical Engineering Lab - Room 2	3	UV-Vis-NIR Light Sources	New	1	20,000	20,000
	CoET wing		CoET 5. Chemical Engineering Lab	CoET 5.2 Chemical Engineering Lab - Room 2	4	Calibration Light Sources	New	1	20,000	20,000
	CoET wing		CoET 5. Chemical Engineering Lab	CoET 5.2 Chemical Engineering Lab - Room 2	5	Standard Reflectances	New	1	10,000	10,000
	CoET wing		CoET 5. Chemical Engineering Lab	CoET 5.2 Chemical Engineering Lab - Room 2	6	Optical fibers	New	1	5,000	5,000
	CoET wing		CoET 5. Chemical Engineering Lab	CoET 5.2 Chemical Engineering Lab - Room 2	10	Digital Refractometer	New	1	40,000	40,000
	CoET wing		CoET 5. Chemical Engineering Lab	CoET 5.2 Chemical Engineering Lab - Room 2	11	Glove box	New	1	2,000	2,000
	CoET wing		CoET 5. Chemical Engineering Lab	CoET 5.2 Chemical Engineering Lab - Room 2	12	Schlenkline	New	1	3,000	3,000
	CoET wing		CoET 5. Chemical Engineering Lab	CoET 5.2 Chemical Engineering Lab - Room 2	13	Vacuum Freeze Dryer	New	1	500	500
	CoET wing		CoET 5. Chemical Engineering Lab	CoET 5.2 Chemical Engineering Lab - Room 2	14	Ultrasonic bath	New	1	500	500
	CoET wing		CoET 5. Chemical Engineering Lab	CoET 5.2 Chemical Engineering Lab - Room 2	15	Shaking machine	New	1	1,500	1,500
	CoET wing		CoET 5. Chemical Engineering Lab	CoET 5.2 Chemical Engineering Lab - Room 2	16	Water double filter	New	1	500	500
	CoET wing		CoET 5. Chemical Engineering Lab	CoET 5.2 Chemical Engineering Lab - Room 2	17	Refrigerator	New	1	1,000	1,000
	CoET wing		CoET 5. Chemical Engineering Lab	CoET 5.2 Chemical Engineering Lab - Room 2	18	Centrifugate	New	1	2,000	2,000
	CoET wing		CoET 5. Chemical Engineering Lab	CoET 5.2 Chemical Engineering Lab - Room 2	19	Balance (4 digits)	New	1	1,500	1,500

	Building	Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting /Furniture)	Quantity	Price/unit (USD)	Cost (USD)
	CoET wing		CoET 5. Chemical Engineering Lab	CoET 5.2 Chemical Engineering Lab - Room 2	20	Balance (2 digits)	New	1	1,000	1,000
	CoET wing		CoET 5. Chemical Engineering Lab	CoET 5.2 Chemical Engineering Lab - Room 2	21	Laboratory oven	New	1	1,500	1,500
	CoET wing		CoET 5. Chemical Engineering Lab	CoET 5.2 Chemical Engineering Lab - Room 2	22	pH-meter	New	1	1,000	1,000
	CoET wing		CoET 5. Chemical Engineering Lab	CoET 5.2 Chemical Engineering Lab - Room 2	23	MicroPipett (0,5-10uL, 2-20uL, 5-50uL, 10-100uL, 50-200uL, 100-1000uL)	New	1	1,500	1,500
	CoET wing		CoET 5. Chemical Engineering Lab	CoET 5.2 Chemical Engineering Lab - Room 2	24	Vortex mixer	New	1	500	500
	CoET wing		CoET 5. Chemical Engineering Lab	CoET 5.2 Chemical Engineering Lab - Room 2	25	Vacuum filter	New	1	1,500	1,500
	CoET wing		CoET 5. Chemical Engineering Lab	CoET 5.2 Chemical Engineering Lab - Room 2	26	Thermostat magnetic stirrer	New	1	500	500
	CoET wing		CoET 5. Chemical Engineering Lab	CoET 5.2 Chemical Engineering Lab - Room 2	27	Heating magnetic stirrer	New	1	300	300
CoET	Advanced Lab		34. Advanced material Lab	34.1 Advanced material Lab	1	Photocatalyst reactor	New	1	14,000	14,000
	Advanced Lab		34. Advanced material Lab	34.1 Advanced material Lab	2	Potentiostat	New	1	15,000	15,000
	Advanced Lab		34. Advanced material Lab	34.1 Advanced material Lab	3	UV-Vis Spectrophotometer	New	1	15,000	15,000
	Advanced Lab		34. Advanced material Lab	34.1 Advanced material Lab	4	Electrospinning	New	1	15,000	15,000
	Advanced Lab		34. Advanced material Lab	34.1 Advanced material Lab	5	Centrifugate	New	1	2,000	2,000
	Advanced Lab		34. Advanced material Lab	34.1 Advanced material Lab	6	Ultrasonic bath	New	1	1,000	1,000
	Advanced Lab		34. Advanced material Lab	34.1 Advanced material Lab	7	shaking machine	New	1	500	500
	Advanced Lab		34. Advanced material Lab	34.1 Advanced material Lab	8	water double filter	New	1	1,000	1,000
	Advanced Lab		34. Advanced material Lab	34.1 Advanced material Lab	9	Refrigerator	New	1	500	500
	Advanced Lab		34. Advanced material Lab	34.1 Advanced material Lab	10	Laboratory oven	New	1	1,500	1,500
	Advanced Lab		34. Advanced material Lab	34.1 Advanced material Lab	11	Vortex mixer	New	1	500	500
	Advanced Lab		34. Advanced material Lab	34.1 Advanced material Lab	12	Vacuum filter	New	1	1,500	1,500
	Advanced Lab		34. Advanced material Lab	34.1 Advanced material Lab	13	Thermostat magnetic stirrer	New	3	500	1,500
	Advanced Lab		34. Advanced material Lab	34.1 Advanced material Lab	14	Heating magnetic stirrer	New	3	300	900
	Advanced Lab		34. Advanced material Lab	34.2 Samples Preparation Room	1	Balance (4 digits)	New	1	2,000	2,000
	Advanced Lab		34. Advanced material Lab	34.2 Samples Preparation Room	2	Balance (2 digits)	New	1	500	500
	Advanced Lab		34. Advanced material Lab	34.2 Samples Preparation Room	3	MicroPipett (0,5-10uL, 2-20uL, 5-50uL, 10-100uL, 50-200uL, 100-1000uL)	New	1	1,500	1,500
	Advanced Lab		34. Advanced material Lab	34.2 Samples Preparation Room	4	PH-meter	New	1	1,000	1,000
CoET	Advanced Lab		35. Multifuctional, Bio-Ecocompatible m	35.1 Multifuctional, Bio-Ecocompatible materials Lab	1	Microbial Oxidative Degradation Analyzer	New	1	90,000	90,000
CoET	Advanced Lab		36. Multicomponent Polymer Lab	36.1 Multicomponent Polymer Lab	1	Fluorescence Microscope	New	1	30,000	30,000
	Advanced Lab		36. Multicomponent Polymer Lab	36.1 Multicomponent Polymer Lab	2	Electrical Conductivity Analyzer	New	1	10,000	10,000
	Advanced Lab		36. Multicomponent Polymer Lab	36.1 Multicomponent Polymer Lab	3	UV light source	New	1	10,000	10,000
	Advanced Lab		36. Multicomponent Polymer Lab	36.1 Multicomponent Polymer Lab	4	Optical fiber	New	1	20,000	20,000
	Advanced Lab		36. Multicomponent Polymer Lab	36.1 Multicomponent Polymer Lab	5	UV Intensity Meter	New	1	4,000	4,000
CoET	Advanced Lab		37. Biomedical Engineering Lab	37.1 Biomedical Engineering Lab	1	ELISA Microplate Reader	New	1	20,000	20,000
	Advanced Lab		37. Biomedical Engineering Lab	37.1 Biomedical Engineering Lab	2	Critical Point Dryer (CPD)	New	1	20,140	20,140
	Advanced Lab		37. Biomedical Engineering Lab	37.1 Biomedical Engineering Lab	3	Microscope	New	1	20,000	20,000
	Advanced Lab		37. Biomedical Engineering Lab	37.1 Biomedical Engineering Lab	4	Shaking incubator	New	1	10,000	10,000
	Advanced Lab		37. Biomedical Engineering Lab	37.1 Biomedical Engineering Lab	5	Cell culture room	New	1	45,000	45,000
	Advanced Lab		37. Biomedical Engineering Lab	37.1 Biomedical Engineering Lab	6	Centrifugate	New	1	2,000	2,000
	Advanced Lab		37. Biomedical Engineering Lab	37.1 Biomedical Engineering Lab	7	Ultrasonic bath	New	1	1,000	1,000
	Advanced Lab		37. Biomedical Engineering Lab	37.1 Biomedical Engineering Lab	8	shaking machine	New	1	500	500

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	Advanced Lab		37. Biomedical Engineering Lab	37.1 Biomedical Engineering Lab	10	Refrigerator	New	1	500	500
	Advanced Lab		37. Biomedical Engineering Lab	37.1 Biomedical Engineering Lab	11	autoclave	New	1	7,000	7,000
	Advanced Lab		37. Biomedical Engineering Lab	37.1 Biomedical Engineering Lab	12	Laboratory oven	New	1	1,500	1,500
	Advanced Lab		37. Biomedical Engineering Lab	37.1 Biomedical Engineering Lab	13	Vortex mixer	New	1	500	500
	Advanced Lab		37. Biomedical Engineering Lab	37.1 Biomedical Engineering Lab	18	Balance (4 digits)	New	1	2,000	2,000
	Advanced Lab		37. Biomedical Engineering Lab	37.1 Biomedical Engineering Lab	19	Balance (2 digits)	New	1	500	500
	Advanced Lab		37. Biomedical Engineering Lab	37.1 Biomedical Engineering Lab	20	MicroPipett (0,5-10uL, 2-20uL, 5-50uL, 10-100uL, 50-200uL, 100-1000uL)	New	1	1,500	1,500
	Advanced Lab		37. Biomedical Engineering Lab	37.1 Biomedical Engineering Lab	21	PH-meter	New	1	1,000	1,000
CoET	Advanced Lab	CoET	38. Electronic Circuit Lab	38.1 Electronic Circuit Lab	1	Emona TIMS telecommunications learning systems	New	1	60,000	60,000
	Advanced Lab	CoET	38. Electronic Circuit Lab	38.1 Electronic Circuit Lab	2	PCB-532006 L - PCB prototyping	New	1	35,000	35,000
	Advanced Lab	CoET	38. Electronic Circuit Lab	38.1 Electronic Circuit Lab	3	DE2i-150 FPGA Development Kit	New	5	600	3,000
	Advanced Lab	CoET	38. Electronic Circuit Lab	38.1 Electronic Circuit Lab	4	N9914A FieldFox Handheld RF Combination Analyzer, 6.5 GHz + Options	New	1	35,000	35,000
CoICT	Advanced Lab	CoICT	38. Electronic Circuit Lab	38.1 Electronic Circuit Lab	8	Laser Printers	New	2	750	1,500
	Advanced Lab	CoICT	38. Electronic Circuit Lab	38.1 Electronic Circuit Lab	9	Wireless Access Point	New	2	600	1,200
	Advanced Lab	CoICT	38. Electronic Circuit Lab	38.1 Electronic Circuit Lab	14	Projectors	New	2	1,500	3,000
	Advanced Lab	CoICT	38. Electronic Circuit Lab	38.1 Electronic Circuit Lab	15	Locks for mobile and other protection devices	New			2,000
	Advanced Lab	CoICT	38. Electronic Circuit Lab	38.1 Electronic Circuit Lab	10	High performance Server for mobile information system in Aquaculture	New	1	30,000	30,000
CoNS	Advanced Lab	Natural Science	Basic Science (New)	Advanced Equipment	1	Ductless Fume Hood	New	1	5,400	5,400
	Advanced Lab	Natural Science	Basic Science (New)	Advanced Equipment	2	Sub-Cell GT System	New	1	1,245	1,245
	Advanced Lab	Natural Science	Basic Science (New)	Advanced Equipment	3	30-well comb	New	1	90	90
	Advanced Lab	Natural Science	Basic Science (New)	Advanced Equipment	4	20-well comb	New	1	90	90
	Advanced Lab	Natural Science	Basic Science (New)	Advanced Equipment	5	Sub-Cell GT UV-Transparent Gel Tray15x10cm	New	1	186	186
	Advanced Lab	Natural Science	Basic Science (New)	Advanced Equipment	6	Sub-Cell GT UV-Transparent Gel Tray15x15cm	New	1	186	186
	Advanced Lab	Natural Science	Basic Science (New)	Advanced Equipment	7	Sub-Cell GT UV-Transparent Gel Tray15x20cm	New	1	186	186
	Advanced Lab	Natural Science	Basic Science (New)	Advanced Equipment	8	Gel Caster	New	1	335	335
	Advanced Lab	Natural Science	Basic Science (New)	Advanced Equipment	9	Power Pac Basic Power Supply	New	1	770	770
	Advanced Lab	Natural Science	Basic Science (New)	Advanced Equipment	10	Blotting system	New	1	5000	5,000
	Advanced Lab	Natural Science	Basic Science (New)	Advanced Equipment	11	SDS PAGE electrophoresis system	New	1	4,500	4,500
	Advanced Lab	Natural Science	Basic Science (New)	Advanced Equipment	12	VWR 3600 Orbital Shaker	New	1	1,950	1,950
	Advanced Lab	Natural Science	Basic Science (New)	Advanced Equipment	14	UV/Vis/NIR Spectrophotometer (Microbiology experiment)	New	1	10,378	10,378
	Advanced Lab	Natural Science	Basic Science (New)	Advanced Equipment	15	chair	furniture	20	20	400
	Advanced Lab	Natural Science	Basic Science (New)	Advanced Equipment	16	Experimental table	furniture	8	150	1,200
	Advanced Lab	Natural Science	Basic Science (New)	Advanced Equipment	17	Experimental shelf	furniture	4	150	600
	Advanced Lab	Natural Science	Basic Science (New)	Advanced Equipment	18	Table for install equipment	furniture	10	150	1,500
	Advanced Lab	Natural Science	Basic Science (New)	Advanced Equipment	19	sink	furniture	5	100	500
	Advanced Lab	Natural Science	Basic Science (New)	Sample preparation room	21	Oven	New	1	3,000	3,000
	Advanced Lab	Natural Science	Basic Science (New)	Sample preparation room	22	Refrigerator	New	2	1,000	2,000

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	Advanced Lab	Natural Science	Basic Science (New)	Sample preparation room	23	Analytical Balance 0.0001	New	1	3,500	3,500
	Advanced Lab	Natural Science	Basic Science (New)	Sample preparation room	24	Ductless Fume Hood	New	1	5,400	5,400
	Advanced Lab	Natural Science	Basic Science (New)	Sample preparation room	25	Board	furniture	1	100	100
	Advanced Lab	Natural Science	Basic Science (New)	Sample preparation room	26	chair	furniture	20	20	400
	Advanced Lab	Natural Science	Basic Science (New)	Sample preparation room	27	Experimental table	furniture	8	150	1,200
	Advanced Lab	Natural Science	Basic Science (New)	Sample preparation room	28	Experimental shelf	furniture	4	150	600
	Advanced Lab	Natural Science	Basic Science (New)	Sample preparation room	29	Table for install equipment	furniture	10	150	1,500
	Advanced Lab	Natural Science	Basic Science (New)	Sample preparation room	30	sink	furniture	5	100	500
	Advanced Lab	Natural Science	Basic Science (New)	academic staff office	31	air conditioner	furniture	1	500	500
	Advanced Lab	Natural Science	Basic Science (New)	academic staff office	32	lavabo	furniture	1	100	100
	Advanced Lab	Natural Science	Basic Science (New)	academic staff office	33	board	furniture	1	100	100
	Advanced Lab	Natural Science	Basic Science (New)	academic staff office	34	chair	furniture	15	20	300
	Advanced Lab	Natural Science	Basic Science (New)	academic staff office	35	working table	furniture	5	100	500
	Advanced Lab	Natural Science	Basic Science (New)	research office	37	air conditioner	furniture	1	500	500
	Advanced Lab	Natural Science	Basic Science (New)	research office	38	lavabo	furniture	1	100	100
	Advanced Lab	Natural Science	Basic Science (New)	research office	39	board	furniture	1	100	100
	Advanced Lab	Natural Science	Basic Science (New)	research office	40	chair	furniture	15	20	300
	Advanced Lab	Natural Science	Basic Science (New)	research office	41	working table	furniture	5	100	500
	Advanced Lab	Natural Science	General Biology (Existing lab)	General Biology (existing)	42	Microscope	New	30	1910	57,300
	Advanced Lab	Natural Science	General Chemistry (Existing lab)	General chemistry (Existing)	43	Hot plate stirrer	New	5	2,000	10,000
	Advanced Lab	Natural Science	General Chemistry (Existing lab)	General chemistry (Existing)	44	Thermostat	new	2	6,000	12,000
	Advanced Lab	Natural Science	General Chemistry (Existing lab)	General chemistry (Existing)	45	Analytical balance with 2 digital	new	2	2,000	4,000
	Advanced Lab	Natural Science	General Chemistry (Existing lab)	General chemistry (Existing)	46	vacuumn pump	new	2	4,000	8,000
	Advanced Lab	Natural Science	General Chemistry (Existing lab)	General chemistry (Existing)	47	laboratory oven	new	2	3,000	6,000
	Advanced Lab	Natural Science	General Chemistry (Existing lab)	General chemistry (Existing)	48	Vacuumn rotary evporatory+ freezer system	new	1	20,000	20,000
	Advanced Lab	Natural Science	Mechanics- Heat (Existing Lab)	Mechanics- Heat (Existing)	49	Heat capacity ratio meter	new	2	500	1,000
	Advanced Lab	Natural Science	Mechanics- Heat (Existing Lab)	Mechanics- Heat (Existing)	50	viscometer	new	2	800	1,600
	Advanced Lab	Natural Science	Mechanics- Heat (Existing Lab)	Mechanics- Heat (Existing)	51	Interface Pasco 750	new	2	2,500	5,000
	Advanced Lab	Natural Science	Mechanics- Heat (Existing Lab)	Mechanics- Heat (Existing)	52	ion purifier meter	new	1	6,000	6,000
	Advanced Lab	Natural Science	Mechanics- Heat (Existing Lab)	Mechanics- Heat (Existing)	53	microwave synthesizer CEM DISCOVER, f = 2455 MHZ Pmax = 300 W	new	1	16,000	16,000
	Advanced Lab	Natural Science	Mechanics- Heat (Existing Lab)	Mechanics- Heat (Existing)	54	Environments and Virtual Machines	new	1	5,000	5,000
	Advanced Lab	Natural Science	Mechanics- Heat (Existing Lab)	Mechanics- Heat (Existing)	55	Gravitationmeter	new	1	10,000	10,000
	Advanced Lab	Natural Science	Mechanics- Heat (Existing Lab)	Mechanics- Heat (Existing)	56	Digital Function Generator, USB	new	1	1,500	1,500
	Advanced Lab	Natural Science	Mechanics- Heat (Existing Lab)	Mechanics- Heat (Existing)	57	Cobra4 Sensor-Unit Energy	new	1	1,500	1,500
	Advanced Lab	Natural Science	Mechanics- Heat (Existing Lab)	Mechanics- Heat (Existing)	58	Cobra4 Wireless-Link	new	1	1,500	1,500
	Advanced Lab	Natural Science	Mechanics- Heat (Existing Lab)	Mechanics- Heat (Existing)	59	Cobra4 Wireless Manager	new	1	1,000	1,000
	Advanced Lab	Natural Science	Mechanics- Heat (Existing Lab)	Mechanics- Heat (Existing)	60	Power supply 0...12 V DC/ 6 V, 12 V AC, 230 V	new	1	1,000	1,000
	Advanced Lab	Natural Science	Mechanics- Heat (Existing Lab)	Mechanics- Heat (Existing)	61	Plug-in board,4mm plugs	new	1	1,000	1,000
	Advanced Lab	Natural Science	Mechanics- Heat (Existing Lab)	Mechanics- Heat (Existing)	62	DMM with NiCr-Ni thermo couple	new	1	1,000	1,000
	Advanced Lab	Natural Science	Mechanics- Heat (Existing Lab)	Mechanics- Heat (Existing)	63	Thermopile, Moll type	new	1	1,500	1,500
	Advanced Lab	Natural Science	Mechanics- Heat (Existing Lab)	Mechanics- Heat (Existing)	64	Universal measuring amplifier	new	1	1,500	1,500
	Advanced Lab	Natural Science	Mechanics- Heat (Existing Lab)	Mechanics- Heat (Existing)	65	Rheostat, 330 Ohm , 1.0A	new	1	1,000	1,000
	Advanced Lab	Natural Science	Mechanics- Heat (Existing Lab)	Mechanics- Heat (Existing)	66	Solar battery, 4 cells, 2.5 x 5 cm	new	1	1,000	1,000
	Advanced Lab	Natural Science	Mechanics- Heat (Existing Lab)	Mechanics- Heat (Existing)	67	Ceramic lamp socket E27	new	1	1,000	1,000

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	Advanced Lab	Natural Science	Mechanics- Heat (Existing Lab)	Mechanics- Heat (Existing)	68	Tripod base PHYWE	new	1	1,000	1,000
	Advanced Lab	Natural Science	Mechanics- Heat (Existing Lab)	Mechanics- Heat (Existing)	69	Hot/cold air blower, 1800 W	new	1	1,000	1,000
	Advanced Lab	Natural Science	Mechanics- Heat (Existing Lab)	Mechanics- Heat (Existing)	70	High voltage supply unit, 0-10 kV	new	1	1,500	1,500
	Advanced Lab	Natural Science	Mechanics- Heat (Existing Lab)	Mechanics- Heat (Existing)	71	Plate capacitor, d 260mm	new	1	1,000	1,000
	Advanced Lab	Natural Science	Mechanics- Heat (Existing Lab)	Mechanics- Heat (Existing)	72	Universal measuring amplifier	new	1	1,000	1,000
	Advanced Lab	Natural Science	Mechanics- Heat (Existing Lab)	Mechanics- Heat (Existing)	73	Voltmeter,0.3-300VDC,10-300VAC	new	1	1,000	1,000
	Advanced Lab	Natural Science	Mechanics- Heat (Existing Lab)	Mechanics- Heat (Existing)	74	Plastic plate 283 x 283 mm	new	1	500	500
	Advanced Lab	Natural Science	Mechanics- Heat (Existing Lab)	Mechanics- Heat (Existing)	75	High-value resistor, 10 MOhm	new	1	1,000	1,000
	Advanced Lab	Natural Science	Mechanics- Heat (Existing Lab)	Mechanics- Heat (Existing)	76	Glass plates f.current conductors	new	1	1,000	1,000
	Advanced Lab	Natural Science	Mechanics- Heat (Existing Lab)	Mechanics- Heat (Existing)	77	DC measuring amplifier	new	1	1500	1,500
	Advanced Lab	Natural Science	Mechanics- Heat (Existing Lab)	Mechanics- Heat (Existing)	78	Power supply, high voltage, 0-25 kV	new	1	1,000	1,000
	Advanced Lab	Natural Science	Mechanics- Heat (Existing Lab)	Mechanics- Heat (Existing)	79	Torsion dynamometer, 0.01 N	new	1	1,000	1,000
	Advanced Lab	Natural Science	Mechanics- Heat (Existing Lab)	Mechanics- Heat (Existing)	80	Support base DEMO	new	1	1,000	1,000
	Advanced Lab	Natural Science	Mechanics- Heat (Existing Lab)	Mechanics- Heat (Existing)	81	Plate capacitor, 283x283 mm	new	1	1,000	1,000
	Advanced Lab	Natural Science	Mechanics- Heat (Existing Lab)	Mechanics- Heat (Existing)	82	Conductor spheres, w. suspension	new	1	1,000	1,000
	Advanced Lab	Natural Science	Mechanics- Heat (Existing Lab)	Mechanics- Heat (Existing)	83	Digital multimeter	new	1	1,000	1,000
	Advanced Lab	Natural Science	Mechanics- Heat (Existing Lab)	Mechanics- Heat (Existing)	84	Power supply, universal	new	1	1,500	1,500
	Advanced Lab	Natural Science	Mechanics- Heat (Existing Lab)	Mechanics- Heat (Existing)	85	Software Cobra4 - multi-user licence	new	1	1,500	1,500
	Advanced Lab	Natural Science	Mechanics- Heat (Existing Lab)	Mechanics- Heat (Existing)	86	Cobra4 Wireless-Link	new	1	1,000	1,000
	Advanced Lab	Natural Science	Mechanics- Heat (Existing Lab)	Mechanics- Heat (Existing)	87	Cobra4 Wireless Manager	new	1	1,000	1,000
	Advanced Lab	Natural Science	Mechanics- Heat (Existing Lab)	Mechanics- Heat (Existing)	88	Cobra4 Sensor Tesla	new	1	1,000	1,000
	Advanced Lab	Natural Science	Mechanics- Heat (Existing Lab)	Mechanics- Heat (Existing)	89	Cobra4 Sensor-Unit Electricity	new	1	1,000	1,000
	Advanced Lab	Natural Science	Mechanics- Heat (Existing Lab)	Mechanics- Heat (Existing)	90	Hall probe, tangential, protection cap	new	1	1,500	1,500
	Advanced Lab	Natural Science	Mechanics- Heat (Existing Lab)	Mechanics- Heat (Existing)	91	Helmholtz coils, one pair	new	1	1,500	1,500
	Advanced Lab	Natural Science	Mechanics- Heat (Existing Lab)	Mechanics- Heat (Existing)	92	Power supply, universal	new	1	1,000	1,000
	Advanced Lab	Natural Science	Mechanics- Heat (Existing Lab)	Mechanics- Heat (Existing)	93	Torsion dynamometer,	new	1	1,000	1,000
	Advanced Lab	Natural Science	Mechanics- Heat (Existing Lab)	Mechanics- Heat (Existing)	94	Power supply variable 15 VAC/ 12 VDC/ 5 A	new	1	1,000	1,000
	Advanced Lab	Natural Science	Mechanics- Heat (Existing Lab)	Mechanics- Heat (Existing)	95	Conductors, circular, set	new	1	1,000	1,000
	Advanced Lab	Natural Science	Electricity -Optics (Existing lab)	Electricity -Optics (Existing)	96	Coil holder	new	1	1,000	1,000
	Advanced Lab	Natural Science	Electricity -Optics (Existing lab)	Electricity -Optics (Existing)	97	electrolytic meter	new	1	400	400
	Advanced Lab	Natural Science	Electricity -Optics (Existing lab)	Electricity -Optics (Existing)	98	Ball Mill machine - SpectroMill® Ball Pestle Impact	new	1	2,000	2,000
	Advanced Lab	Natural Science	Electricity -Optics (Existing lab)	Electricity -Optics (Existing)	99	Laser, He-Ne, 0.2/1.0 mW, 230 V AC	new	1	1,000	1,000
	Advanced Lab	Natural Science	Electricity -Optics (Existing lab)	Electricity -Optics (Existing)	100	Universal measuring amplifier	new	1	1,000	1,000
	Advanced Lab	Natural Science	Electricity -Optics (Existing lab)	Electricity -Optics (Existing)	101	Optical base plate with rubberfeet	new	1	1,000	1,000
	Advanced Lab	Natural Science	Electricity -Optics (Existing lab)	Electricity -Optics (Existing)	102	Sliding device, horizontal	new	1	1,000	1,000
	Advanced Lab	Natural Science	Electricity -Optics (Existing lab)	Electricity -Optics (Existing)	103	Photoelement f. opt. base plt.	new	1	1,000	1,000
	Advanced Lab	Natural Science	Electricity -Optics (Existing lab)	Electricity -Optics (Existing)	104	Diaphragm holder f.opt.base plt.	new	1	1,000	1,000
	Advanced Lab	Natural Science	Electricity -Optics (Existing lab)	Electricity -Optics (Existing)	105	Voltmeter,0.3-300VDC,10-300VAC	new	1	1,000	1,000
	Advanced Lab	Natural Science	Electricity -Optics (Existing lab)	Electricity -Optics (Existing)	106	Fabry-Perot interferometer	new	1	1,000	1,000
	Advanced Lab	Natural Science	Electricity -Optics (Existing lab)	Electricity -Optics (Existing)	107	Magnetic System, variable	new	1	1,000	1,000
	Advanced Lab	Natural Science	Electricity -Optics (Existing lab)	Electricity -Optics (Existing)	108	Cadmium lamp for Zeeman effect	new	1	1,000	1,000
	Advanced Lab	Natural Science	Electricity -Optics (Existing lab)	Electricity -Optics (Existing)	109	Power supply for spectral lamps	new	1	1,000	1,000
	Advanced Lab	Natural Science	Electricity -Optics (Existing lab)	Electricity -Optics (Existing)	110	Sliding device, horizontal	new	1	1,000	1,000
	Advanced Lab	Natural Science	Electricity -Optics (Existing lab)	Electricity -Optics (Existing)	111	Optical profile-bench, l 1000mm	new	1	1,000	1,000
	Advanced Lab	Natural Science	Electricity -Optics (Existing lab)	Electricity -Optics (Existing)	112	Exp.Set-Helium-Neon Laser	new	1	1,000	1,000

	Building	Faculty	New Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting /Furniture)	Quantity	Price/unit (USD)	Cost (USD)
	Advanced Lab	Natural Science	Electricity -Optics (Existing lab)	Electricity -Optics (Existing)	113	Sliding device, horizontal	new	1	1,500	1,500
	Advanced Lab	Natural Science	Electricity -Optics (Existing lab)	Electricity -Optics (Existing)	114	Protection glasses HeNe-laser	new	1	1,000	1,000
	Advanced Lab	Natural Science	Electricity -Optics (Existing lab)	Electricity -Optics (Existing)	115	Photoelement f. opt. base plt.	new	1	1,000	1,000
	Advanced Lab	Natural Science	Electricity -Optics (Existing lab)	Electricity -Optics (Existing)	116	Cleaning set for laser	new	1	1,000	1,000
	Advanced Lab	Natural Science	Electricity -Optics (Existing lab)	Electricity -Optics (Existing)	117	DMM, auto range, NiCr-Ni thermocouple	new	1	1,000	1,000
	Advanced Lab	Natural Science	Electricity -Optics (Existing lab)	Electricity -Optics (Existing)	118	Diffraction grating, 600 lines/mm	new	1	1,000	1,000
	Advanced Lab	Natural Science	Electricity -Optics (Existing lab)	Electricity -Optics (Existing)	119	He/Ne Laser, 5mW with holder	new	1	1,000	1,000
	Advanced Lab	Natural Science	Electricity -Optics (Existing lab)	Electricity -Optics (Existing)	120	Power supply for laser head 5 mW	new	1	1,000	1,000
	Advanced Lab	Natural Science	Electricity -Optics (Existing lab)	Electricity -Optics (Existing)	121	Cobra3 BASIC-UNIT, USB	new	1	1,500	1,500
	Advanced Lab	Natural Science	Electricity -Optics (Existing lab)	Electricity -Optics (Existing)	122	Si-Photodetector with Amplifier	new	1	1,000	1,000
	Advanced Lab	Natural Science	Electricity -Optics (Existing lab)	Electricity -Optics (Existing)	123	Optical base plate with rubberfeet	new	1	1,000	1,000
	Advanced Lab	Natural Science	Electricity -Optics (Existing lab)	Electricity -Optics (Existing)	124	Sliding device, horizontal	new	1	1,000	1,000
	Advanced Lab	Natural Science	Electricity -Optics (Existing lab)	Electricity -Optics (Existing)	125	LDA-Accessory-Set	new	1	1,000	1,000
	Advanced Lab	Natural Science	Electricity -Optics (Existing lab)	Electricity -Optics (Existing)	126	Solar ray collection	new	1	1,000	1,000
	Advanced Lab	Natural Science	Electricity -Optics (Existing lab)	Electricity -Optics (Existing)	127	Circulation pump	new	1	1,000	1,000
	Advanced Lab	Natural Science	Electricity -Optics (Existing lab)	Electricity -Optics (Existing)	128	power Supply	new	1	1,000	1,000
	Advanced Lab	Natural Science	Electricity -Optics (Existing lab)	Electricity -Optics (Existing)	129	Heat exchanger	new	1	1,000	1,000
	Advanced Lab	Natural Science	Electricity -Optics (Existing lab)	Electricity -Optics (Existing)	130	Halogen Lamp	new	1	1,500	1,500
							TOTAL			**1,161,456**

CoICT	**37,700**
CoET	**1,122,256**
CoNS	**1,500**

5 IETC

Faculty	Nw Lab and existing lab	Room Name (Specify New or Existing, and location e.g. room name of new buldg/room no. of existing bldg.)	Item	Equipment (New/Existing/Furniture)	Classification (New/Existing/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
DEC	Multimedia Room	International Education Training Center	1	Camera HD	New	2	9,000	18,000
DEC	Multimedia Room	International Education Training Center	2	Audio Video Mixing Switcher	New	1	7,000	7,000
DEC	Multimedia Room	International Education Training Center	3	Audio System (Include: Equalizer, Mixer, Amplifier, Speaker)	New	1	30,000	30,000
DEC	Multimedia Room	International Education Training Center	4	Wireless Microphone	New	4	400	1,600
DEC	Multimedia Room	International Education Training Center	5	Wireless Portable Microphone	New	2	300	600
DEC	Multimedia Room	International Education Training Center	6	Wire Microphone		2	300	600
DEC	Multimedia Room	International Education Training Center	7	Light System	New	1	6,000	6,000
DEC	Multimedia Room	International Education Training Center	8	Multimedia Workstation	New	4	6,000	24,000
DEC	Multimedia Room	International Education Training Center	9	Video & audio production software package	New	4	4,000	16,000
DEC	Multimedia Room	International Education Training Center	10	HDV VCR Recorder system		1	10,000	10,000
DEC	Multimedia Room	International Education Training Center	11	LCD Project 5500 lm	New	2	3,500	7,000
DEC	Multimedia Room	International Education Training Center	12	Blu-Ray/DVD/CD Automated Duplicator	New	1	9,000	9,000
DEC	Multimedia Room	International Education Training Center	13	Discproducer Autoprinter	New	1	6,000	6,000
DEC	Multimedia Room	International Education Training Center	14	TV LED 60'		2	2,000	4,000
DEC	Multimedia Room	International Education Training Center	15	Screen for Projector	New	2	1,000	2,000
DEC	Multimedia Room	International Education Training Center	16	Interactive whiteboard		1	3,000	3,000

Faculty	Nw Lab and existing lab	Room Name (Specify New or Existing, and location e.g. room name of new buldg/room no. of existing bldg.)	Item	Equipment (New/Existing/Furniture)	Classification (New/Existing/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
DEC	Multimedia Room	International Education Training Center	17	UPS 30KVA		1	20,000	20,000
DEC	Multimedia Room	International Education Training Center	18	Furniture (KOTOBUKI-Sea)		1	30,000	30,000
Sub Total								**194,800**
DEC	Video Conferencing - Online trainning	International Education Training Center	1	Camera HD P/T/Z	New	3	6,700	20,100
DEC	Video Conferencing - Online trainning	International Education Training Center	2	TelePresence MCU	New	1	56,000	56,000
DEC	Video Conferencing - Online trainning	International Education Training Center	3	HD Videoconference	New	1	10,000	10,000
DEC	Video Conferencing - Online trainning	International Education Training Center	4	Audio Video Mixing Switcher	New	1	7,000	7,000
DEC	Video Conferencing - Online trainning	International Education Training Center	5	Audio System (Include: Equalizer, Mixer, Amplifier, Speaker)	New	1	20,000	20,000
DEC	Video Conferencing - Online trainning	International Education Training Center	6	Wireless Microphone	New	4	400	1,600
DEC	Video Conferencing - Online trainning	International Education Training Center	7	Wireless Portable Microphone	New	2	300	600
DEC	Video Conferencing - Online trainning	International Education Training Center	8	Wire Microphone		2	300	600
DEC	Video Conferencing - Online trainning	International Education Training Center	9	Light System	New	1	10,000	10,000
DEC	Video Conferencing - Online trainning	International Education Training Center	10	LCD Project 5500 lm	New	2	3,500	7,000
DEC	Video Conferencing - Online trainning	International Education Training Center	11	Online training system		1	75,000	75,000
DEC	Video Conferencing - Online trainning	International Education Training Center	12	Multimedia Recording & Streaming Server		1	40,000	40,000
DEC	Video Conferencing - Online trainning	International Education Training Center	13	Video collaboration Server		1	25,000	25,000
DEC	Video Conferencing - Online trainning	International Education Training Center	14	Video Border Proxy/Firewall Server		1	25,000	25,000
DEC	Video Conferencing - Online trainning	International Education Training Center	15	Multimedia Laptop		2	3,500	7,000

Faculty	Nw Lab and existing lab	Room Name (Specify New or Existing, and location e.g. room name of new buldg/room no. of existing bldg.)	Item	Equipment (New/Existing/Furniture)	Classification (New/Existing/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
DEC	Video Conferencing - Online trainning	International Education Training Center	16	Video & audio production software package	New	2	4,000	8,000
DEC	Video Conferencing - Online trainning	International Education Training Center	17	Interactive whiteboard		1	3,000	3,000
DEC	Video Conferencing - Online trainning	International Education Training Center	18	TV LED 60'		2	2,000	4,000
DEC	Video Conferencing - Online trainning	International Education Training Center	19	Screen for Projector	New	2	1,000	2,000
DEC	Video Conferencing - Online trainning	International Education Training Center	20	UPS 40KVA		1	30,000	30,000
JAN	Video Conferencing - Online trainning	International Education Training Center	21	Furniture (KOTOBUKI-Sea), 40 seat and table		1	90,000	90,000
Sub Total								**441,900**
DAP	Auditorium 500	International Education Training Center	1	LCD Project 10,000 Lm	New	2	12,000	24,000
DAP	Auditorium 500	International Education Training Center	2	Screen		2	2,000	4,000
DAP	Auditorium 500	International Education Training Center	3	Laptop		1	2,000	2,000
DAP	Auditorium 500	International Education Training Center	4	Audio Mixer	New	1	2,000	2,000
DAP	Auditorium 500	International Education Training Center	5	Speaker System	New	6	3,000	18,000
DAP	Auditorium 500	International Education Training Center	6	Amplifier	New	1	3,000	3,000
DAP	Auditorium 500	International Education Training Center	7	Equalizer		1	3,000	3,000
DAP	Auditorium 500	International Education Training Center	8	Wireless Microphone	New	10	400	4,000
DAP	Auditorium 500	International Education Training Center	9	Wire Microphone	New	4	300	1,200
DAP	Auditorium 500	International Education Training Center	10	Headset microphones		2	400	800
DAP	Auditorium 500	International Education Training Center	11	Interactive whiteboard		1	3,000	3,000

Faculty	Nw Lab and existing lab	Room Name (Specify New or Existing, and location e.g. room name of new buldg/room no. of existing bldg.)	Item	Equipment (New/Existing/Furniture)	Classification (New/Existing/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
DAP	Auditorium 500	International Education Training Center	12	Light System		1	7,000	7,000
DAP	Auditorium 500	International Education Training Center	13	UPS 30KVA		1	20,000	20,000
DAP	Auditorium 500	International Education Training Center	14	Personal Computer		1	900	900
DAP	Auditorium 500	International Education Training Center	15	Multi-function device: copy, print, scan		1	5,000	5,000
DAP	Auditorium 500	International Education Training Center	16	TV LED 60'		1	2,000	2,000
DAP	Auditorium 500	International Education Training Center	17	Digital Camera		1	5,000	5,000
DAP	Auditorium 500	International Education Training Center	18	Video Camera (HandyCam)		1	3,000	3,000
DAP	Auditorium 501	International Education Training Center	19	Furniture (KOTOBUKI-Sea), 500 seat s		500	500	250,000
Sub Total								357,900
DAP	Auditorium 300	International Education Training Center	1	LCD Project 7000 Lm	New	2	10,000	20,000
DAP	Auditorium 300	International Education Training Center	2	Screen		2	1,000	2,000
DAP	Auditorium 300	International Education Training Center	3	Laptop		1	2,000	2,000
DAP	Auditorium 300	International Education Training Center	4	Audio Mixer	New	1	3,000	3,000
DAP	Auditorium 300	International Education Training Center	5	Speaker System	New	6	2,500	15,000
DAP	Auditorium 300	International Education Training Center	6	Amplifier	New	1	3,000	3,000
DAP	Auditorium 300	International Education Training Center	7	Equalizer		1	2,000	2,000
DAP	Auditorium 300	International Education Training Center	8	Wireless Microphone	New	10	400	4,000
DAP	Auditorium 300	International Education Training Center	9	Wire Microphone	New	4	300	1,200

Faculty	Nw Lab and existing lab	Room Name (Specify New or Existing, and location e.g. room name of new buldg/room no. of existing bldg.)	Item	Equipment (New/Existing/Furniture)	Classification (New/Existing/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
DAP	Auditorium 300	International Education Training Center	10	Headset microphones		2	400	800
DAP	Auditorium 300	International Education Training Center	11	Interactive whiteboard		1	3,000	3,000
DAP	Auditorium 300	International Education Training Center	12	Simultaneous Translation Systems		1	10,000	10,000
DAP	Auditorium 300	International Education Training Center	13	Light System		1	5,000	5,000
DAP	Auditorium 300	International Education Training Center	14	UPS 30KVA		1	20,000	20,000
DAP	Auditorium 300	International Education Training Center	15	Personal Computer		1	900	900
DAP	Auditorium 300	International Education Training Center	16	Multi-function device: copy, print, scan		1	5,000	5,000
DAP	Auditorium 300	International Education Training Center	17	TV LED 60'		1	2,000	2,000
DAP	Auditorium 300	International Education Training Center	18	Digital Camera		1	2,000	2,000
DAP	Auditorium 300	International Education Training Center	19	Video Camera (HandyCam)		1	2,500	2,500
DAP	Auditorium 301	International Education Training Center	20	Furniture (KOTOBUKI-Sea), 300 seat s		300	500	150,000
Sub Total								253,400
Total								**1,248,000**

6 IT

Faculty	Nw Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/ Furniture)	Quantity	Price/unit (USD)	Cost (USD)
INAC	Data Center	Level 4, Administration Building, Campus 2	1	BladeSystem Enclosure for Blade Server - 16 x Blade Server per Chassis - 2 x FCoE Blade Switch (24-port 10Gbps) - 4 x 10Gb Transceivers SR or equivalent. - 8 x 8Gb Transceivers SFP+ FC - Full Power Supply/Fan - 3 year warranty & support	New	2	62000	124000
INAC	Data Center	Level 4, Administration Building, Campus 2	2	High Performace Blade servers: - 4 x Multi-core CPUs. - 512GB RAM - 2 x 240GB SSD - 1 x 32GB Flash - 2 x 10Gbps NIC (CNA) - 3 year 4h 24x7 warranty & support	New	16	32,000	512000
INAC	Data Center	Level 4, Administration Building, Campus 2	3	Primary Storage: - Cluster Active-Active Architecture - Dual Controller. - 4 x 8Gb FC Ports. - 4 x 10Gbps FCoE Ports. - 24GB Cache - 80 x 4TB 7.2K SAS HDD - 48 x 900GB 10K SAS HDD - Include License for Report, Virtual Copy, Storage Replication Sync and Peer Persistence. - 3 year 4h 24x7 warranty & support	New	1	182,000	182000
INAC	Data Center	Level 4, Administration Building, Campus 2	4	Virtual Machine Software	New	64	900	57600
INAC	Data Center	Level 4, Administration Building, Campus 2	5	Virtual Manchine Center Management Software	New	1	5,000	5000
INAC	Data Center	Level 4, Administration Building, Campus 2	6	Oracle Database standard Edition & Software Update License & Support	New	10	17,000	170000
INAC	Data Center	Level 4, Administration Building, Campus 2	7	Primary Firewall/IPS for Internal Server Farm	New	1	100,000	100000
INAC	Data Center	Level 4, Administration Building, Campus 2	10	Tape Backup: - Tape Library - 24-Slots - 2 x LTO-6 Tape Drive FC. - 24 x LTO-6 Tape Cartridge - 2 x Cleaning Cartridge - 1 x LTO-6 Bar Code Label Pack (100 pcs) - 3 year 4h 24x7 warranty & support	New	1	33000	33000
INAC	Data Center	Level 4, Administration Building, Campus 2	11	Backup Software	New	1	50,000	50000
Sub Total								**1,233,600**

Faculty	Nw Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Classification (New/Exisiting/ Furniture)	Quantity	Price/unit (USD)	Cost (USD)
INAC	Campus - Network	Level 4, Administration Building, Campus 2	1	Core Switch: - 2 x Management/Supervisor Engine Modules - At leat 32 x 10Gbps ports (FO -SM) - 48 x 1Gbps ports (UTP) - 3 years Warranty & Support	New	1	91,000	91000
INAC	Campus - Network	Complexes, LRC Campus 2	2	Distribution Switch - 02 x Management/Supervisor Engine Modules - At leat 08 x 10Gbps ports (FO -SM) - 48 x 1Gbps ports (UTP) - 3 years Warranty & Support	New	2	63,000	126000
INAC	Campus - Network	Schools, Colleges & Departments at Campus 2	3	Distribution Switch - At leat 01 x 10Gbps Port (FO - SM) - 04 1Gbps Port (FO - SM) - 48 x 1Gbps (UTP) - Redundant Power Supply - 3 years Warranty & Support	New	18	6,500	117000
INAC	Campus - Network	Schools, Colleges & Departments at Campus 2	4	Access Switch - Stackable: - 04x1Gbps (FO SM) - 48x1Gbps (UTP) - 3 years Warranty & Support	New	41	3,300	135300
INAC	Campus - Network	Schools, Colleges & Departments at Campus 2	5	Access Switch - Stackable: - 48x1Gbps (UTP) - 3 years Warranty & Support	New	20	3,100	62000
INAC	Campus - Network	Schools & Colleges at Campus 2	6	Access Switch - Stackable: - 24x1Gbps (UTP) - 3 years Warranty & Support	New	20	2200	44000
INAC	Campus - Network	Schools, Colleges & Departments at Campus 2	7	10bps Transceiver (FO) SFP+ 10Gb LR Single-Mode	New	52	2,000	104000
INAC	Campus - Network	Schools, Colleges & Departments at Campus 2	8	1bps Transceiver (FO) SFP 1Gb LX Single-Mode	New	82	600	49200
INAC	Campus - Network	Schools, Colleges & Departments at Campus 2	9	Firewall/IPS for Internet Access	New	1	50,000	50000
Sub Total								**778,500**
INAC	Wifi-Network at Campus 2	Schools, Colleges & Departments at Campus 2	1	Access Point - DualBand 2.4/5GHz. - 802.11 n/ac	New	500	500	250000
INAC	Wifi-Network at Campus 2	Schools, Colleges & Departments at Campus 2	2	Wireless Controller for 500 APs - Campus 2	New	1	48,000	48000
Sub Total								**298,000**
Total								**2,310,100**

7 Governance

Faculty	Nw Lab and exisiting lab	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/Furniture)	Quantity	Price/unit (USD)	Cost (USD)
LRC	Library	LRC Building	1	To subcribe/buy e-books, new printed-books and e-journal	8	35,000	280,000
LRC	Library	LRC Building	5	Ezproxy software	1	12,000	12,000
Sub Total							**292,000**
Total							**292,000**

8 Hoa An Technology Transfer Center

Faculty	New Lab and exisiting lab - Building	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/ Furniture)	Classification (New/ Exisiting/ Furniture)	Quantity	Price/unit (USD)	Cost (USD)
I	**New Lab and exisiting lab**							**399,662**
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	1	Climate Chamber with Humidity Control	New	1	5,000	5,000
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	2	Rice huller	New	1	600	600
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	3	Rice whitening machine	New	1	800	800
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	4	Grain moisture tester	New	2	1,000	2,000
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	5	Leaf area meter	New	1	3,000	3,000
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	6	Respiratory meter	New	1	4,500	4,500
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	7	Stirring hot plate	New	1	720	720
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	8	Microscopes (optical)	New	10	3,533	35,330
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	11	Light Meter	New	3	2,000	6,000
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	13	Autoclave	New	1	2,700	2,700
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	15	Water Purifier	New	2	4,500	9,000
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	17	Incubator	New	1	2,380	2,380
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	18	Vacuum dryer oven	New	1	4,200	4,200
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	19	Handheld pH, EC meter	New	2	1,200	2,400
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	20	Table pH meter	New	2	952	1,904
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	22	High-Temperature Chamber Furnaces	New	1	3,100	3,100
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	23	Freezer (-20°C ® -80°C)	New	2	400	800
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	24	Waterbath	New	1	1,500	1,500
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	25	Power supply	New	2	2,000	4,000
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	26	Analytical balance	New	2	2,500	5,000
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	27	Micro balance	New	1	417	417
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	28	Sample shaker	New	1	1,500	1,500
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	29	NaCl- EC - pH-meter	New	1	2,000	2,000
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	30	Magnetic stirrer/Hot-plates	New	1	471	471

Faculty	New Lab and exisiting lab - Building	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/ Furniture)	Classification (New/ Exisiting/ Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	31	Drier	New	1	2,500	2,500
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	32	Centrifuge	New	1	3,000	3,000
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	34	Fume hood	New	2	1,500	3,000
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	35	Liquid nitrogen tank	New	2	250	500
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	36	Shacker	New	1	500	500
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	37	Desiccator	New	2	250	500
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	38	Microwave	New	1	175	175
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	39	Pynometer	New	1	2,000	2,000
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	40	Photosynthesis System	New	1	4,000	4,000
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	41	Research Stereomicroscope	New	2	1,500	3,000
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	42	Elisa analyzer	New	1	7,090	7,090
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	43	Biosafe flow cabinet	New	2	1,860	3,720
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	44	Electric stove	New	3	45	135
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	45	Fluorescent Microscopes (inverted)	New	1	10,000	10,000
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	47	Brix refractometer	New	2	1,500	3,000
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	48	Single ring and double ring system	New	1	1,000	1,000
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	49	Disintegrator	New	1	1,000	1,000
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	50	Penetrologger	New	1	3,000	3,000
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	51	Gel densitometer	New	1	4,042	4,042
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	52	Chemical storage	New	2	250	500
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	54	Protein electrophoresis system (SDS-PAGE)	New	2	10,000	20,000
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	55	Uninterruptible Power Supplier (UPS)	New	1	500	500
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	56	PCR machine	New	1	15,000	15,000
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	58	Rotor (24 place)	New	1	308	308
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	59	Cooler (200 litter)	New	2	400	800

Faculty	New Lab and exisiting lab - Building	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/ Furniture)	Classification (New/ Exisiting/ Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	59	Chemicals, standard kits, columns chromatography, microtubes, glasswares, multi-chanel pipettors, multi-dispenser etc	New	1	10,000	10,000
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	60	Desktop computer	New	4	500	2,000
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	61	Printer	New	1	500	500
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	Fu-1	Blackboard	Fu	4	71	286
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	Fu-2	Lab table	Fu	14	375	5,250
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	Fu-3	Chair	Fu	58	95	5,510
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	Fu-4	Bookshelf	Fu	4	286	1,143
Hoa An CTT	1. Applied crop science lab	1. Applied crop science lab	Fu-5	Cabinet	Fu	6	143	857
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal	1	Analytical electronic	New	1	1,680	1,680
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	3	Gas Production Technique system	New	1	1,063	1,063
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	4	Hot-Plate Analogue or Digital,	New	1	429	429
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	5	Ice bath	New	1	1,149	1,149
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	6	Kjeldahl Digestion Bank Units With Fume Tube & Individual Controller	New	1	4,286	4,286
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	7	Kjeldahl distillation apparatus	New	1	6,375	6,375
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	8	Orbital Shaker	New	2	215	430
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	9	Oven, Force Air Circulation	New	1	1,788	1,788
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	10	pH Benchtop Meters with glass electrode	New	1	616	616

Faculty	New Lab and exisiting lab - Building	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/ Furniture)	Classification (New/ Exisiting/ Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	11	pH Waterproof Portable Meters	New	1	248	248
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	13	Water Distillation Unit, Single distilled	New	1	1,100	1,100
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	14	Cell counter	New	5	165	825
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	15	Constant temperature incubators.	New	2	715	1,430
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	16	Egg analyzer	New	1	8,782	8,782
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	17	Haematocrit Centrifuge	New	1	3,875	3,875
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	18	Milk analyzer	New	1	7,500	7,500
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	19	Storage cupboard for microscopes	New	1	1,050	1,050
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	20	pH Blood Gas Analyzer	New	1	4,250	4,250
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	21	Anatomical charts and illustrations of cow	New	1	48	48
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	22	Anatomical charts and illustrations of dog	New	1	48	48
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	23	Anatomical charts and illustrations of chicken	New	1	48	48
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	24	Anatomical charts and illustrations of pig	New	1	48	48
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	25	Standard Digital Calipers	New	1	145	145
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	26	Lux Meters	New	1	319	319

Faculty	New Lab and exisiting lab - Building	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/ Furniture)	Classification (New/ Exisiting/ Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	27	Air temperature and humidity meter	New	2	48	96
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	28	Stopwatch	New	2	381	762
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	29	Dryer oven	New	1	4,808	4,808
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	30	Refrigerator	New	1	2,597	2,597
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	31	Vortex shaking machine	New	2	217	434
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	32	BOD sensor	New	1	3,365	3,365
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	34	Chemical cabinet	New	4	192	769
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	35	Cooled and Heated Incubators	New	1	4,712	4,712
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	36	Turbidity meter	New	1	1,443	1,443
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	37	EC meter	New	1	1,201	1,201
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	38	COD digester	New	1	721	721
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	39	Automatic Fibre Estimation System	New	1	9,375	9,375
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	40	Calorimeter system	New	1	10,000	10,000
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	41	Pulverizing mill for solid samples requiring uniform particle size	New	1	667	667
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	42	Advanced Bio Safety Cabinet	New	2	1,477	2,954

Faculty	New Lab and exisiting lab - Building	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/ Furniture)	Classification (New/ Exisiting/ Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	43	Electric floor scale, 1 tones	New	1	400	400
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	44	The iWorx 214 (Advanced Combination Animal Physiology Teaching Kit)	New	2	2,200	4,400
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	45	Trinocular Microscopes	New	1	5,375	5,375
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	46	Haemocytometer, Improved Neubauer Pattern	New	2	1,000	2,000
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	47	DSM Yolk Colour Fan	New	5	143	715
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	48	Low Force, Vernier Calipers	New	5	424	2,120
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	49	Angle Meter	New	1	95	95
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	50	Micropipettes	New	3	865	2,595
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	51	Lab equipment cabinet	New	2	481	962
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	52	Double Water Distillation	New	1	3,365	3,365
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	53	Heating plate	New	1	433	433
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	54	Karl Fischer Volumetric Titrator For Moisture Determination with the Magnetic Stirrer	New	1	4,762	4,762
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	55	Precision electronic balance Top-Pan	New	1	623	623

Faculty	New Lab and exisiting lab - Building	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/ Furniture)	Classification (New/ Exisiting/ Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	56	Pulverizing mill for grinding solid samples without moisture loss	New	1	667	667
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	57	Pulverizing mill for high-moisture, high-fat and fibrous samples	New	1	143	143
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	58	Soxhlets Extraction Bank Units With Individual Controller	New	1	6,313	6,313
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	59	Suction filtering device with trap in line and valve to break vacuum	New	5	1,563	7,815
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	60	UV-VIS spectrophotometer	New	1	4,813	4,813
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	61	Binocular Microscopes	New	5	1,488	7,440
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	62	Veterinary hematology analyzer	New	1	3,000	3,000
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	63	Dissection Kit for animal	New	5	100	500
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	64	Digital Thickness Gages	New	4	185	740
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	65	Standard Vernier Calipers, 0-450 mm, Resolution 0.01 mm	New	5	854	4,270
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	66	Muffle furnace with pyrometric controller	New	1	5,500	5,500

Faculty	New Lab and exisiting lab - Building	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/ Furniture)	Classification (New/ Exisiting/ Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	68	Chemicals, standard kits, columns chromatography, microtubes, glasswares, multi-chanel pipettors, multi-dispenser etc	New	1	10,000	10,000
Hoa An CTT	2. Applied aquaculture and anim	2. Applied aquaculture and animal science lab	69	Desktop computer	New	4	500	2,000
			Fu-1	Blackboard	Fu	4	71	286
			Fu-2	Lab table	Fu	14	375	5,250
			Fu-3	Chair	Fu	58	95	5,510
			Fu-4	Bookshelf	Fu	4	286	1,143
			Fu-5	Cabinet	Fu	6	143	857
II	**Hoa An technology transfer building**				**New**			**424,604**
Hoa An CTT	1. Preparation Room/Lecturer	1. Preparation Room/Lecturer Office	1	Desktop computer	New	1	500	500
Hoa An CTT	1. Preparation Room/Lecturer	1. Preparation Room/Lecturer Office	Fu-1	Long table	Fu	2	675	1,350
Hoa An CTT	1. Preparation Room/Lecturer	1. Preparation Room/Lecturer Office	Fu-2	Teacher table	Fu	5	375	1,875
Hoa An CTT	1. Preparation Room/Lecturer	1. Preparation Room/Lecturer Office	Fu-3	Chairs	Fu	20	95	1,900
Hoa An CTT	1. Preparation Room/Lecturer	1. Preparation Room/Lecturer Office	Fu-4	Board	Fu	1	71	71
Hoa An CTT	1. Preparation Room/Lecturer	1. Preparation Room/Lecturer Office	Fu-5	Bookshelf	Fu	2	286	571
Hoa An CTT	1. Preparation Room/Lecturer Office	1. Preparation Room/Lecturer Office	Fu-6	Filing cabinet	Fu	2	143	286
Hoa An CTT	2.Research Office (CAAB)	2.Research Office (CAAB)	Fu-1	Working tables/Desks	Fu	4	375	1,500
Hoa An CTT	2.Research Office (CAAB)	2.Research Office (CAAB)	Fu-2	Chairs	Fu	10	95	950
Hoa An CTT	2.Research Office (CAAB)	2.Research Office (CAAB)	Fu-3	Board	Fu	1	24	24
Hoa An CTT	2.Research Office (CAAB)	2.Research Office (CAAB)	Fu-4	Bookshelf	Fu	1	286	286
Hoa An CTT	2.Research Office (CAAB)	2.Research Office (CAAB)	Fu-5	Filing cabinet	Fu	1	143	143
Hoa An CTT	3.Research Office (CAF)	3.Research Office (CAF)	Fu-1	Working tables/Desks	Fu	4	375	1,500
Hoa An CTT	3.Research Office (CAF)	3.Research Office (CAF)	Fu-2	Chairs	Fu	10	95	950
Hoa An CTT	3.Research Office (CAF)	3.Research Office (CAF)	Fu-3	Board	Fu	1	24	24
Hoa An CTT	3.Research Office (CAF)	3.Research Office (CAF)	Fu-4	Bookshelf	Fu	1	286	286

Faculty	New Lab and exisiting lab - Building	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/ Furniture)	Classification (New/ Exisiting/ Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Hoa An CTT	3.Research Office (CAF)	3.Research Office (CAF)	Fu-5	Filing cabinet	Fu	1	143	143
Hoa An CTT	4.Research Office (CENRes)	4.Research Office (CENRes)	Fu-1	Working tables/Desks	Fu	4	375	1,500
Hoa An CTT	4.Research Office (CENRes)	4.Research Office (CENRes)	Fu-2	Chairs	Fu	10	95	950
Hoa An CTT	4.Research Office (CENRes)	4.Research Office (CENRes)	Fu-3	Board	Fu	1	24	24
Hoa An CTT	4.Research Office (CENRes)	4.Research Office (CENRes)	Fu-4	Bookshelf	Fu	1	286	286
Hoa An CTT	4.Research Office (CENRes)	4.Research Office (CENRes)	Fu-5	Filing cabinet	Fu	1	143	143
Hoa An CTT	5.Expert Room	5.Expert Room	Fu-1	L table	Fu	2	615	1,230
Hoa An CTT	5.Expert Room	5.Expert Room	Fu-2	Chair	Fu	10	95	950
Hoa An CTT	5.Expert Room	5.Expert Room	Fu-3	Board	Fu	1	24	24
Hoa An CTT	5.Expert Room	5.Expert Room	Fu-4	Bookshelf	Fu	1	286	286
Hoa An CTT	5.Expert Room	5.Expert Room	Fu-5	Filing cabinet	Fu	1	143	143
Hoa An CTT	6. Seminar Room	6.1. Seminar Room	1	LCD Projector	New	1	2,048	2,048
Hoa An CTT	6. Seminar Room	6.1. Seminar Room	Fu-1	Table	Fu	11	600	6,600
Hoa An CTT	6. Seminar Room	6.1. Seminar Room	Fu-2	Chair	Fu	41	95	3,895
Hoa An CTT	6. Seminar Room	6.1. Seminar Room	Fu-3	Board	Fu	2	71	142
Hoa An CTT	6. Seminar Room	6.2. Seminar Room	1	LCD Projector	New	1	2,048	2,048
Hoa An CTT	6. Seminar Room	6.2. Seminar Room	Fu-1	Table	Fu	11	600	6,600
Hoa An CTT	6. Seminar Room	6.2. Seminar Room	Fu-2	Chair	Fu	41	95	3,895
Hoa An CTT	6. Seminar Room	6.2. Seminar Room	Fu-3	Board	Fu	2	71	142
Hoa An CTT	6. Seminar Room	6.3.Seminar Room	1	LCD Projector	New	1	2,048	2,048
Hoa An CTT	6. Seminar Room	6.3.Seminar Room	Fu-1	Table	Fu	11	600	6,600
Hoa An CTT	6. Seminar Room	6.3.Seminar Room	Fu-2	Chair	Fu	41	95	3,895
Hoa An CTT	6. Seminar Room	6.3.Seminar Room	Fu-3	Board	Fu	2	71	142
Hoa An CTT	6. Seminar Room	6.4. Seminar Room	1	LCD Projector	New	1	2,048	2,048
Hoa An CTT	6. Seminar Room	6.4. Seminar Room	Fu-1	Table	Fu	11	600	6,600
Hoa An CTT	6. Seminar Room	6.4. Seminar Room	Fu-2	Chair	Fu	41	95	3,895
Hoa An CTT	6. Seminar Room	6.4. Seminar Room	Fu-3	Board	Fu	2	71	142
Hoa An CTT	7. PBL (Problem-Based Learning) Room	7.1. PBL (Problem-Based Learning) Room	Fu-1	Table	Fu	5	600	3,000
Hoa An CTT	7. PBL (Problem-Based Learning) Room	7.1. PBL (Problem-Based Learning) Room	Fu-2	Chair	Fu	20	95	1,900
Hoa An CTT	7. PBL (Problem-Based Learning) Room	7.1. PBL (Problem-Based Learning) Room	Fu-3	Board	Fu	1	24	24

Faculty	New Lab and exisiting lab - Building	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/ Furniture)	Classification (New/ Exisiting/ Furniture)	Quantity	Price/unit (USD)	Cost (USD)
	7. PBL (Problem-Based Learning) Room	7.2. PBL (Problem-Based Learning) Room	Fu-1	Table	Fu	5	600	3,000
	7. PBL (Problem-Based Learning) Room	7.2. PBL (Problem-Based Learning) Room	Fu-2	Chair	Fu	20	95	1,900
	7. PBL (Problem-Based Learning) Room	7.2. PBL (Problem-Based Learning) Room	Fu-3	Board	Fu	1	24	24
	7. PBL (Problem-Based Learning) Room	7.3. PBL (Problem-Based Learning) Room	Fu-1	Table	Fu	5	600	3,000
	7. PBL (Problem-Based Learning) Room	7.3. PBL (Problem-Based Learning) Room	Fu-2	Chair	Fu	20	95	1,900
	7. PBL (Problem-Based Learning) Room	7.3. PBL (Problem-Based Learning) Room	Fu-3	Board	Fu	1	24	24
	7. PBL (Problem-Based Learning) Room	7.4. PBL (Problem-Based Learning) Room	Fu-1	Table	Fu	5	600	3,000
	7. PBL (Problem-Based Learning) Room	7.4. PBL (Problem-Based Learning) Room	Fu-2	Chair	Fu	20	95	1,900
	7. PBL (Problem-Based Learning) Room	7.4. PBL (Problem-Based Learning) Room	Fu-3	Board	Fu	1	24	24
	7. PBL (Problem-Based Learning) Room	7.5. PBL (Problem-Based Learning) Room	Fu-1	Table	Fu	5	600	3,000
	7. PBL (Problem-Based Learning) Room	7.5. PBL (Problem-Based Learning) Room	Fu-2	Chair	Fu	20	95	1,900
	7. PBL (Problem-Based Learning) Room	7.5. PBL (Problem-Based Learning) Room	Fu-3	Board	Fu	1	24	24
Hoa An CTT	8. Computer Room	8. Computer Room	1	Desktop computer	New	60	500	30,000
Hoa An CTT	8. Computer Room	8. Computer Room	2	LCD Projector	New	1	2,048	2,048
Hoa An CTT	8. Computer Room	8. Computer Room	Fu-1	Tables	Fu	32	86	2,743
Hoa An CTT	8. Computer Room	8. Computer Room	Fu-2	Chairs	Fu	70	95	6,650
Hoa An CTT	8. Computer Room	8. Computer Room	Fu-3	Board	Fu	2	71	142
Hoa An CTT	9. Lecture room 40 seats	9.1. Lecture room 40 seats	1	LCD Projector	New	1	2,048	2,048

Faculty	New Lab and exisiting lab - Building	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/ Furniture)	Classification (New/ Exisiting/ Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Hoa An CTT	9. Lecture room 40 seats	9.1. Lecture room 40 seats	Fu-1	Student table and chair (set)	Fu	20	126	2,524
Hoa An CTT	9. Lecture room 40 seats	9.1. Lecture room 40 seats	Fu-2	Teacher table	Fu	1	375	375
Hoa An CTT	9. Lecture room 40 seats	9.1. Lecture room 40 seats	Fu-3	Chair	Fu	1	95	95
Hoa An CTT	9. Lecture room 40 seats	9.1. Lecture room 40 seats	Fu-4	Blackboard	Fu	2	71	142
	9. Lecture room 40 seats	9.2. Lecture room 40 seats	1	LCD Projector	New	1	2,048	2,048
	9. Lecture room 40 seats	9.2. Lecture room 40 seats	Fu-1	Student table	Fu	20	126	2,524
	9. Lecture room 40 seats	9.2. Lecture room 40 seats	Fu-2	Teacher table	Fu	1	375	375
	9. Lecture room 40 seats	9.2. Lecture room 40 seats	Fu-3	Chair	Fu	1	95	95
	9. Lecture room 40 seats	9.2. Lecture room 40 seats	Fu-4	Blackboard	Fu	2	71	142
	9. Lecture room 40 seats	9.3. Lecture room 40 seats	1	LCD Projector	New	1	2,048	2,048
	9. Lecture room 40 seats	9.3. Lecture room 40 seats	Fu-1	Student table	Fu	20	126	2,524
	9. Lecture room 40 seats	9.3. Lecture room 40 seats	Fu-2	Teacher table	Fu	1	375	375
	9. Lecture room 40 seats	9.3. Lecture room 40 seats	Fu-3	Chair	Fu	1	95	95
	9. Lecture room 40 seats	9.3. Lecture room 40 seats	Fu-4	Blackboard	Fu	2	71	142
	9. Lecture room 40 seats	9.4. Lecture room 40 seats	1	LCD Projector	New	1	2,048	2,048
	9. Lecture room 40 seats	9.4. Lecture room 40 seats	Fu-1	Student table	Fu	20	126	2,524
	9. Lecture room 40 seats	9.4. Lecture room 40 seats	Fu-2	Teacher table	Fu	1	375	375
	9. Lecture room 40 seats	9.4. Lecture room 40 seats	Fu-3	Chair	Fu	1	95	95
	9. Lecture room 40 seats	9.4. Lecture room 40 seats	Fu-4	Blackboard	Fu	2	71	142
	9. Lecture room 40 seats	9.5. Lecture room 40 seats	1	LCD Projector	New	1	2,048	2,048
	9. Lecture room 40 seats	9.5. Lecture room 40 seats	Fu-1	Student table	Fu	20	127	2,543
	9. Lecture room 40 seats	9.5. Lecture room 40 seats	Fu-2	Teacher table	Fu	1	375	375
	9. Lecture room 40 seats	9.5. Lecture room 40 seats	Fu-3	Chair	Fu	1	95	95
	9. Lecture room 40 seats	9.5. Lecture room 40 seats	Fu-4	Blackboard	Fu	2	71	142
Hoa An CTT	10. Lecture room 80 seats	10. 1. Lecture room 80 seats	1	LCD Projector	New	1	2,048	2,048
Hoa An CTT	10. Lecture room 80 seats	10. 1. Lecture room 80 seats	1	Silver screen (projector)	New	1	429	429
Hoa An CTT	10. Lecture room 80 seats	10. 1. Lecture room 80 seats	Fu-1	Student table	Fu	40	127	5,086
Hoa An CTT	10. Lecture room 80 seats	10. 1. Lecture room 80 seats	Fu-2	Teacher table	Fu	1	375	375
Hoa An CTT	10. Lecture room 80 seats	10. 1. Lecture room 80 seats	Fu-3	Chair	Fu	1	95	95
Hoa An CTT	10. Lecture room 80 seats	10. 1. Lecture room 80 seats	Fu-4	Blackboard	Fu	2	81	162
Hoa An CTT	10. Lecture room 80 seats	10. 1. Lecture room 80 seats	3	Microphone	New	2	81	162

Faculty	New Lab and exisiting lab - Building	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/ Furniture)	Classification (New/ Exisiting/ Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Hoa An CTT	10. Lecture room 80 seats	10. 1. Lecture room 80 seats	4	Amplifier	New	1	476	476
Hoa An CTT	10. Lecture room 80 seats	10. 1. Lecture room 80 seats	5	Loudspeaker	New	4	243	971
	10. Lecture room 80 seats	10.2. Lecture room 80 seats	1	LCD Projector	New	1	2,048	2,048
	10. Lecture room 80 seats	10.2. Lecture room 80 seats	Fu-1	Student table	Fu	40	127	5,086
	10. Lecture room 80 seats	10.2. Lecture room 80 seats	Fu-2	Teacher table	Fu	1	375	375
	10. Lecture room 80 seats	10.2. Lecture room 80 seats	Fu-3	Chair	Fu	1	95	95
	10. Lecture room 80 seats	10.2. Lecture room 80 seats	Fu-4	Blackboard	Fu	2	81	162
	10. Lecture room 80 seats	10.2. Lecture room 80 seats	3	Microphone	New	2	81	162
	10. Lecture room 80 seats	10.2. Lecture room 80 seats	4	Amplifier	New	1	476	476
	10. Lecture room 80 seats	10.2. Lecture room 80 seats	5	Loudspeaker	New	4	243	971
	10. Lecture room 80 seats	10.3. Lecture room 80 seats	1	LCD Projector	New	1	2,048	2,048
	10. Lecture room 80 seats	10.3. Lecture room 80 seats	Fu-1	Student table	Fu	40	127	5,086
	10. Lecture room 80 seats	10.3. Lecture room 80 seats	Fu-2	Teacher table	Fu	1	375	375
	10. Lecture room 80 seats	10.3. Lecture room 80 seats	Fu-3	Chair	Fu	1	95	95
	10. Lecture room 80 seats	10.3. Lecture room 80 seats	Fu-4	Blackboard	Fu	2	81	162
	10. Lecture room 80 seats	10.3. Lecture room 80 seats	3	Microphone	New	2	81	162
	10. Lecture room 80 seats	10.3. Lecture room 80 seats	4	Amplifier	New	1	476	476
	10. Lecture room 80 seats	10.3. Lecture room 80 seats	5	Loudspeaker	New	4	243	971
	10. Lecture room 80 seats	10.4. Lecture room 80 seats	1	LCD Projector	New	1	2,048	2,048
	10. Lecture room 80 seats	10.4. Lecture room 80 seats	Fu-1	Student table	Fu	40	127	5,086
	10. Lecture room 80 seats	10.4. Lecture room 80 seats	Fu-2	Teacher table	Fu	1	375	375
	10. Lecture room 80 seats	10.4. Lecture room 80 seats	Fu-3	Chair	Fu	1	95	95
	10. Lecture room 80 seats	10.4. Lecture room 80 seats	Fu-4	Blackboard	Fu	2	81	162
	10. Lecture room 80 seats	10.4. Lecture room 80 seats	3	Microphone	New	2	81	162
	10. Lecture room 80 seats	10.4. Lecture room 80 seats	4	Amplifier	New	1	476	476
	10. Lecture room 80 seats	10.4. Lecture room 80 seats	5	Loudspeaker	New	4	243	971
	10. Lecture room 80 seats	10.5. Lecture room 80 seats	1	LCD Projector	New	1	2,048	2,048
	10. Lecture room 80 seats	10.5. Lecture room 80 seats	Fu-1	Student table	Fu	40	127	5,086
	10. Lecture room 80 seats	10.5. Lecture room 80 seats	Fu-2	Teacher table	Fu	1	375	375
	10. Lecture room 80 seats	10.5. Lecture room 80 seats	Fu-3	Chair	Fu	1	95	95
	10. Lecture room 80 seats	10.5. Lecture room 80 seats	Fu-4	Blackboard	Fu	2	81	162
	10. Lecture room 80 seats	10.5. Lecture room 80 seats	3	Microphone	New	2	81	162
	10. Lecture room 80 seats	10.5. Lecture room 80 seats	4	Amplifier	New	1	476	476

Faculty	New Lab and exisiting lab - Building	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/ Furniture)	Classification (New/ Exisiting/ Furniture)	Quantity	Price/unit (USD)	Cost (USD)
	10. Lecture room 80 seats	10.5. Lecture room 80 seats	5	Loudspeaker	New	4	243	971
	10. Lecture room 80 seats	10.6. Lecture room 80 seats	1	LCD Projector	New	1	2,048	2,048
	10. Lecture room 80 seats	10.6. Lecture room 80 seats	Fu-1	Student table	Fu	40	127	5,086
	10. Lecture room 80 seats	10.6. Lecture room 80 seats	Fu-2	Teacher table	Fu	1	375	375
	10. Lecture room 80 seats	10.6. Lecture room 80 seats	Fu-3	Chair	Fu	1	95	95
	10. Lecture room 80 seats	10.6. Lecture room 80 seats	Fu-4	Blackboard	Fu	2	81	162
	10. Lecture room 80 seats	10.6. Lecture room 80 seats	3	Microphone	New	2	81	162
	10. Lecture room 80 seats	10.6. Lecture room 80 seats	4	Amplifier	New	1	476	476
	10. Lecture room 80 seats	10.6. Lecture room 80 seats	5	Loudspeaker	New	4	243	971
	10. Lecture room 80 seats	10.7. Lecture room 80 seats	1	LCD Projector	New	1	2,048	2,048
	10. Lecture room 80 seats	10.7. Lecture room 80 seats	Fu-1	Student table	Fu	40	127	5,086
	10. Lecture room 80 seats	10.7. Lecture room 80 seats	Fu-2	Teacher table	Fu	1	375	375
	10. Lecture room 80 seats	10.7. Lecture room 80 seats	Fu-3	Chair	Fu	1	95	95
	10. Lecture room 80 seats	10.7. Lecture room 80 seats	Fu-4	Blackboard	Fu	2	81	162
	10. Lecture room 80 seats	10.7. Lecture room 80 seats	3	Microphone	New	2	81	162
	10. Lecture room 80 seats	10.7. Lecture room 80 seats	4	Amplifier	New	1	476	476
	10. Lecture room 80 seats	10.7. Lecture room 80 seats	5	Loudspeaker	New	4	243	971
	10. Lecture room 80 seats	10.8. Lecture room 80 seats	1	LCD Projector	New	1	2,048	2,048
	10. Lecture room 80 seats	10.8. Lecture room 80 seats	Fu-1	Student table	Fu	40	127	5,086
	10. Lecture room 80 seats	10.8. Lecture room 80 seats	Fu-2	Teacher table	Fu	1	375	375
	10. Lecture room 80 seats	10.8. Lecture room 80 seats	Fu-3	Chair	Fu	1	95	95
	10. Lecture room 80 seats	10.8. Lecture room 80 seats	Fu-4	Blackboard	Fu	2	81	162
	10. Lecture room 80 seats	10.8. Lecture room 80 seats	3	Microphone	New	2	81	162
	10. Lecture room 80 seats	10.8. Lecture room 80 seats	4	Amplifier	New	1	476	476
	10. Lecture room 80 seats	10.8. Lecture room 80 seats	5	Loudspeaker	New	4	243	971
	10. Lecture room 80 seats	10.9. Lecture room 80 seats	1	LCD Projector	New	1	2,048	2,048
	10. Lecture room 80 seats	10.9. Lecture room 80 seats	Fu-1	Student table	Fu	40	127	5,086
	10. Lecture room 80 seats	10.9. Lecture room 80 seats	Fu-2	Teacher table	Fu	1	375	375
	10. Lecture room 80 seats	10.9. Lecture room 80 seats	Fu-3	Chair	Fu	1	95	95
	10. Lecture room 80 seats	10.9. Lecture room 80 seats	Fu-4	Blackboard	Fu	2	81	162
	10. Lecture room 80 seats	10.9. Lecture room 80 seats	3	Microphone	New	2	81	162
	10. Lecture room 80 seats	10.9. Lecture room 80 seats	4	Amplifier	New	1	476	476
	10. Lecture room 80 seats	10.9. Lecture room 80 seats	5	Loudspeaker	New	4	243	971

Faculty	New Lab and exisiting lab - Building	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/ Furniture)	Classification (New/ Exisiting/ Furniture)	Quantity	Price/unit (USD)	Cost (USD)
	10. Lecture room 80 seats	10.10. Lecture room 80 seats	1	LCD Projector	New	1	2,048	2,048
	10. Lecture room 80 seats	10.10. Lecture room 80 seats	Fu-1	Student table	Fu	40	127	5,086
	10. Lecture room 80 seats	10.10. Lecture room 80 seats	Fu-2	Teacher table	Fu	1	375	375
	10. Lecture room 80 seats	10.10. Lecture room 80 seats	Fu-3	Chair	Fu	1	95	95
	10. Lecture room 80 seats	10.10. Lecture room 80 seats	Fu-4	Blackboard	Fu	2	81	162
	10. Lecture room 80 seats	10.10. Lecture room 80 seats	3	Microphone	New	2	81	162
	10. Lecture room 80 seats	10.10. Lecture room 80 seats	4	Amplifier	New	1	476	476
	10. Lecture room 80 seats	10.10. Lecture room 80 seats	5	Loudspeaker	New	4	243	971
	10. Lecture room 80 seats	10.11. Lecture room 80 seats	1	LCD Projector	New	1	2,048	2,048
	10. Lecture room 80 seats	10.11. Lecture room 80 seats	Fu-1	Student table	Fu	40	127	5,086
	10. Lecture room 80 seats	10.11. Lecture room 80 seats	Fu-2	Teacher table	Fu	1	375	375
	10. Lecture room 80 seats	10.11. Lecture room 80 seats	Fu-3	Chair	Fu	1	95	95
	10. Lecture room 80 seats	10.11. Lecture room 80 seats	Fu-4	Blackboard	Fu	2	81	162
	10. Lecture room 80 seats	10.11. Lecture room 80 seats	3	Microphone	New	2	81	162
	10. Lecture room 80 seats	10.11. Lecture room 80 seats	4	Amplifier	New	1	476	476
	10. Lecture room 80 seats	10.11. Lecture room 80 seats	5	Loudspeaker	New	4	243	971
	10. Lecture room 80 seats	10.12. Lecture room 80 seats	1	LCD Projector	New	1	2,048	2,048
	10. Lecture room 80 seats	10.12. Lecture room 80 seats	Fu-1	Student table	Fu	40	127	5,086
	10. Lecture room 80 seats	10.12. Lecture room 80 seats	Fu-2	Teacher table	Fu	1	375	375
	10. Lecture room 80 seats	10.12. Lecture room 80 seats	Fu-3	Chair	Fu	1	95	95
	10. Lecture room 80 seats	10.12. Lecture room 80 seats	Fu-4	Blackboard	Fu	2	81	162
	10. Lecture room 80 seats	10.12. Lecture room 80 seats	3	Microphone	New	2	81	162
	10. Lecture room 80 seats	10.12. Lecture room 80 seats	4	Amplifier	New	1	476	476
	10. Lecture room 80 seats	10.12. Lecture room 80 seats	5	Loudspeaker	New	4	243	971
	10. Lecture room 80 seats	10.13. Lecture room 80 seats	1	LCD Projector	New	1	2,048	2,048
	10. Lecture room 80 seats	10.13. Lecture room 80 seats	Fu-1	Student table	Fu	40	127	5,086
	10. Lecture room 80 seats	10.13. Lecture room 80 seats	Fu-2	Teacher table	Fu	1	375	375
	10. Lecture room 80 seats	10.13. Lecture room 80 seats	Fu-3	Chair	Fu	1	95	95
	10. Lecture room 80 seats	10.13. Lecture room 80 seats	Fu-4	Blackboard	Fu	2	81	162
	10. Lecture room 80 seats	10.13. Lecture room 80 seats	3	Microphone	New	2	81	162
	10. Lecture room 80 seats	10.13. Lecture room 80 seats	4	Amplifier	New	1	476	476
	10. Lecture room 80 seats	10.13. Lecture room 80 seats	5	Loudspeaker	New	4	243	971
	10. Lecture room 80 seats	10.14. Lecture room 80 seats	1	LCD Projector	New	1	2,048	2,048

Faculty	New Lab and exisiting lab - Building	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/ Furniture)	Classification (New/ Exisiting/ Furniture)	Quantity	Price/unit (USD)	Cost (USD)
	10. Lecture room 80 seats	10.14. Lecture room 80 seats	Fu-1	Student table	Fu	40	127	5,086
	10. Lecture room 80 seats	10.14. Lecture room 80 seats	Fu-2	Teacher table	Fu	1	375	375
	10. Lecture room 80 seats	10.14. Lecture room 80 seats	Fu-3	Chair	Fu	1	95	95
	10. Lecture room 80 seats	10.14. Lecture room 80 seats	Fu-4	Blackboard	Fu	2	81	162
	10. Lecture room 80 seats	10.14. Lecture room 80 seats	3	Microphone	New	2	81	162
	10. Lecture room 80 seats	10.14. Lecture room 80 seats	4	Amplifier	New	1	476	476
	10. Lecture room 80 seats	10.14. Lecture room 80 seats	5	Loudspeaker	New	4	243	971
	10. Lecture room 80 seats	10.15. Lecture room 80 seats	1	LCD Projector	New	1	2,048	2,048
	10. Lecture room 80 seats	10.15. Lecture room 80 seats	Fu-1	Student table	Fu	40	127	5,086
	10. Lecture room 80 seats	10.15. Lecture room 80 seats	Fu-2	Teacher table	Fu	1	375	375
	10. Lecture room 80 seats	10.15. Lecture room 80 seats	Fu-3	Chair	Fu	1	95	95
	10. Lecture room 80 seats	10.15. Lecture room 80 seats	Fu-4	Blackboard	Fu	2	81	162
	10. Lecture room 80 seats	10.15. Lecture room 80 seats	3	Microphone	New	2	81	162
	10. Lecture room 80 seats	10.15. Lecture room 80 seats	4	Amplifier	New	1	476	476
	10. Lecture room 80 seats	10.15. Lecture room 80 seats	5	Loudspeaker	New	4	243	971
Hoa An CTT	11. Library	11. Library	1	Desktop computer	New	5	500	2,500
Hoa An CTT	11. Library	11. Library	Fu-1	Library table	Fu	4	114	457
Hoa An CTT	11. Library	11. Library	Fu-2	Table	Fu	6	375	2,250
Hoa An CTT	11. Library	11. Library	Fu-3	Chairs	Fu	32	95	3,040
Hoa An CTT	11. Library	11. Library	Fu-3	Board	Fu	1	24	24
Hoa An CTT	11. Library	11. Library	Fu-4	Bookshelf	Fu	15	286	4,290
Hoa An CTT	11. Library	11. Library	Fu-5	Cabinet	Fu	3	143	429
Hoa An CTT	12. Meeting Room	12. Meeting Room	2	LCD Projector	New	1	6,048	6,048
Hoa An CTT	12. Meeting Room	12. Meeting Room	3	Silver screen (projector)	New	1	429	429
Hoa An CTT	12. Meeting Room	12. Meeting Room	4	Microphone	New	19	81	1,539
Hoa An CTT	12. Meeting Room	12. Meeting Room	5	Amplifier	New	2	233	467
Hoa An CTT	12. Meeting Room	12. Meeting Room	6	Loudspeaker	New	8	286	2,286
Hoa An CTT	12. Meeting Room	12. Meeting Room	7	Mixer MFX-12	New	1	476	476
Hoa An CTT	12. Meeting Room	12. Meeting Room	8	EQ-2231	New	1	310	310
Hoa An CTT	12. Meeting Room	12. Meeting Room	Fu-1	Board	Fu	2	46	91
Hoa An CTT	12. Meeting Room	12. Meeting Room	Fu-2	Table	Fu	100	375	37,500
Hoa An CTT	12. Meeting Room	12. Meeting Room	Fu-3	Chair	Fu	400	95	38,000

Faculty	New Lab and exisiting lab - Building	Room Name (Specify New or Exisiting, and location e.g. room name of new buldg/room no. of exisiting bldg.)	Item	Equipment (New/Exisiting/ Furniture)	Classification (New/ Exisiting/ Furniture)	Quantity	Price/unit (USD)	Cost (USD)
Hoa An CTT	13. Manager Room	13. Manager Room	1	Desktop computer	New	1	500	500
Hoa An CTT	13. Manager Room	13. Manager Room	Fu-1	L Ttable	Fu	1	615	615
Hoa An CTT	13. Manager Room	13. Manager Room	Fu-2	Table	Fu	1	95	95
Hoa An CTT	13. Manager Room	13. Manager Room	Fu-3	Board	Fu	1	24	24
Hoa An CTT	13. Manager Room	13. Manager Room	Fu-4	Bookshelf	Fu	1	286	286
Hoa An CTT	13. Manager Room	13. Manager Room	Fu-5	Filing cabinet	Fu	1	143	143
Hoa An CTT	13. Manager Room	13. Manager Room	Fu-6	Chair	Fu	4	95	380
Hoa An CTT	14. Hoa An Campus	14. Hoa An Campus Management	1	Desktop computer	New	4	500	2,000
Hoa An CTT	14. Hoa An Campus	14. Hoa An Campus Management	2	Photocopy and printer	New	1	6,000	6,000
Hoa An CTT	14. Hoa An Campus	14. Hoa An Campus Management	Fu-1	L table	Fu	5	615	3,075
Hoa An CTT	14. Hoa An Campus	14. Hoa An Campus Management	Fu-2	Board	Fu	1	46	46
Hoa An CTT	14. Hoa An Campus	14. Hoa An Campus Management	Fu-3	Bookshelf	Fu	3	286	858
Hoa An CTT	14. Hoa An Campus	14. Hoa An Campus Management	Fu-4	Filing cabinet	Fu	2	143	286
Hoa An CTT	14. Hoa An Campus	14. Hoa An Campus Management	Fu-5	Chair	Fu	10	95	950
Hoa An CTT	15. Lounge	15. Lounge	Fu-1	Table	Fu	4	375	1,500
Hoa An CTT	15. Lounge	15. Lounge	Fu-2	Chair	Fu	16	95	1,520
Hoa An CTT	15. Lounge	15. Lounge	Fu-3	Board	Fu	4	24	96
Hoa An CTT	16. Cafeteria/Kitchen	16. Cafeteria/Kitchen	Fu-1	Table	New	20	188	3,750
Hoa An CTT	16. Cafeteria/Kitchen	16. Cafeteria/Kitchen	Fu-2	Plastic chair	New	100	5	524
Hoa An CTT	**Total (new Lab & Building)**							**824,265**

Appendix 4-9

Equipment Disposition Plan

CAAB

No	Laboratory	Location	Particulars
1	Plant Molecular Genetics	Advanced Tech Lab Building	New bldg.
2	Plant Breeding	Advanced Tech Lab Building	New bldg.
3	Seed Technology	Advanced Tech Lab Building	New bldg.
4	Cell Biotechnology	Advanced Tech Lab Building	New bldg.
5	Applied Biological Science	Advanced Tech Lab Building	New bldg.
6	Plant and Animal Biochemistry	Existing CAAB Building	Existing bldg.
7	Plant physiology	Existing CAAB Building	Existing bldg.
8	Soil Chemistry	Advanced Tech Lab Building	New bldg.
9	Soil Physics	Advanced Tech Lab Building	New bldg.
10	Soil Microbiology	Advanced Tech Lab Building	New bldg.
11	Soil Classification & Micromorphology	Advanced Tech Lab Building	New bldg.
12	Plant Protection Biological and Chemical Technology	Advanced Tech Lab Building	New bldg.
13	Plant Pathology	Existing CAAB Building	Existing bldg.
14	Entomology	Existing CAAB Building	Existing bldg.
15	Biological Control	NEDO Building	Existing bldg.
16	Rice research	Advanced Tech Lab Building	New bldg.
17	Edible and Pharmaceutical Mushroom	Advanced Tech Lab Building	New bldg.
18	Horticulture Science	Existing CAAB Building	Existing bldg.
19	Animal Biotechnology and Molecular Biology	Advanced Tech Lab Building	New bldg.
20	Animal Anatomy and Physiology	Existing CAAB Building	Existing bldg.
21	Animal Nutrition and Feed Technology	Existing CAAB Building	Existing bldg.
22	Non-ruminant Animal Production Techniques	Existing CAAB Building	Existing bldg.
23	Ruminant Animal Production Techniques	Existing CAAB Building	Existing bldg.
24	Experimental Animal Unit	Animal Farm	Existing bldg.
25	Hygiene and Safety of Animal-based Food	Advanced Tech Lab Building	New bldg.
26	Histology and Molecular Pathology	Advanced Tech Lab Building	New bldg.
27	Veterinary Pharmacology	Advanced Tech Lab Building	New bldg.
28	Immunology and Epidemiology	Advanced Tech Lab Building	New bldg.
29	Animal Clinic and Virology	Existing CAAB Building (Animal Clinic) & Advanced Tech Lab Building (Virology part)	Existing bldg.
30	Parasitology	Existing CAAB Building	Existing bldg.
31	Veterinary Bacteriology and Mycology	Existing CAAB Building	Existing bldg.
32	Food Nutrition	BioTech wing, Research building	New bldg.
33	Food Chemistry	BioTech wing, Research building	New bldg.
34	Food Microbiology	BioTech wing, Research building	New bldg.
35	Food Technology	BioTech wing, Research building	New bldg.
36	Postharvest Technology	BioTech wing, Research building	New bldg.
37	Food Process Engineering	BioTech wing, Research building	New bldg.
38	Food Biotechnology	BioTech wing, Research building	New bldg.
39	Molecular Biology	BioTech wing, Research building	New bldg.
40	Stem Cell	Advanced Tech Lab Building	New bldg.
41	Protein Technology and Natural Product	BioTech wing, Research building	New bldg.
42	Gene bank	MDI Building	Existing bldg.
43	Materials and Molecular Modeling	Advanced Tech Lab Building	New bldg.
44	Agricultural and Aquacultural Engineering Lab	44.1 Agricultural and Aquacultural Engineering Lab - Room 1 CoET wing	New bldg.

No	Laboratory	Location	Particulars
45	Material Engineering Lab	45.1 Material Engineering Lab - Room 1 CoET wing	New bldg.

CAF

No	Laboratory	Location to install	Particulars
1	Genetics and selective breeding	Advanced Tech Lab Building	New bldg.
2	Bio-Chemis- Pharma Technology	Advanced Tech Lab Building	New bldg.
3	Fish Biology	CAF wing, Research lab building	New bldg.
4	Product Processing		
4-1 4-2 4-3 4-4	Microbiology Lab Microbiology basic Lab Food safety Lab Food safety basic Lab	CAF wing, Research lab building	New bldg.
4-5 4-6	Aquatic Product Processing Techniques Lab (CAF Area); Aquatic Product Processing Basic Techniques Lab (CAF Area)	CAF existing building	Existing bldg..
5	Fish Pathology	CAF wing, Research lab building	New bldg.
6	Aquatic Environment	CAF wing, Research lab building	New bldg.
7	Fisheries Resources	CAF wing, Research lab building	New bldg.
8	Wet Lab (Hatchery)	CAF, Campus 2	Existing bldg..
9	Other facilities and equipment (books)	Library of CAF	Existing bldg..
10	Material Engineering Lab	CoET wing, Research lab building	New bldg.
11	Agricultural and Aquacultural Engineering Lab	CoET wing, Research lab building	New bldg.
12	Aquaculture & Environment Automation Lab	CoET wing, Research lab building	New bldg.
13	Basic Lab - IT for Aquaculture and Fisheries	College of Information Technology	New bldg.
14	Research Lab - IT for Aquaculture and Fisheries	College of Information Technology	New bldg.

CENREs

No	Laboratory	Location to install	Particulars
1	GIS and Remote sensing	CENREs wing, Research lab building	New bldg.
2	Land Resources	CENREs wing, Research lab building	New bldg.
3	Water and Soil Environment	CENREs wing, Research lab building	New bldg.
4	Environmental Biology	CENREs wing, Research lab building	New bldg.
5	Environmental toxicology	CENREs wing, Research lab building	New bldg.
6	Wastewater treatment	CENREs wing, Research lab building	New bldg.
7	Solid waste treatment	CENREs wing, Research lab building	New bldg.
8	Chemical Environmental Engineering	CENREs wing, Research lab building	New bldg.
9	Hydraulics	Existing CENREs	Existing bldg..

No	Laboratory	Location to install	Particulars
10	Environmental Modeling	CENREs wing, Research lab building	New bldg.
11	Advanced Techniques lab	Advanced Tech Lab Building	New bldg.
12	Climate Change and Environmental Observation	Advanced Tech Lab Building	New bldg.
13	Aquaculture & Environment Automation Lab	CoET wing, Research lab building	New bldg.
14	Environmental and Behavioral Economics Lab	Advanced Tech Lab Building	New bldg.
15	Air Pollution Control	CENREs wing, Research lab building	New bldg.
16	Clean and Renewable Energy	CoET wing, Research lab building	New bldg.
17	Center for Pilot Demonstration	New bldg.	New bldg.

CoET

No	Laboratory	Location to install	Remarks
1	Chemical Engineering	CoET wing, Research lab building	New bldg.
2	Advanced material	Advanced Tech Lab Building-2	New bldg.
3	Multifunctional, Bio-Eco-compatible materials	Advanced Tech Lab Building-2	New bldg.
4	Multicomponent Polymer	Advanced Tech Lab Building-2	New bldg.
5	Medical biology Engineering	Advanced Tech Lab Building-2	New bldg.
6	Electronic Circuit	Advanced Tech Lab Building-2	New bldg.
7	Basic Science	Advanced Tech Lab Building-2	New bldg.
8	General Chemistry	College of Natural Sciences	Existing bldg..
9	Mechanics- Heat	College of Natural Sciences	Existing bldg.
10	Electricity -Optics	College of Natural Sciences	Existing bldg.

Hoa An center for Technology Transfer

No	Laboratory	Location to install	Remarks
1	Student practice (Applied crop science)	Hoa An Center for T/T	New bldg.
2	Student practice (Applied aquaculture and animal science)	Hoa An Center for T/T	New bldg.
3	Preparation Room/Lecturer Office	Hoa An Center for T/T	New bldg.
4	Research Office (CAAB)	Hoa An Center for T/T	New bldg.
5	Research Office (CAF)	Hoa An Center for T/T	New bldg.
6	Research Office (CENRes)	Hoa An Center for T/T	New bldg.
7	Expert Room	Hoa An Center for T/T	New bldg.
8	Seminar Room	Hoa An Center for T/T	New bldg.
9	PBL (Problem-Based Learning) Room	Hoa An Center for T/T	New bldg.
10	Computer Room	Hoa An Center for T/T	New bldg.
11	Lecture room 40 seats	Hoa An Center for T/T	New bldg.
12	Lecture room 80 seats	Hoa An Center for T/T	New bldg.
13	Library	Hoa An Center for T/T	New bldg.
14	Meeting Room	Hoa An Center for T/T	New bldg.
15	Manager Room	Hoa An Center for T/T	New bldg.
16	Hoa An Campus Management Office	Hoa An Center for T/T	New bldg.
17	Lounge	Hoa An Center for T/T	New bldg.
18	Cafeteria/Kitchen	Hoa An Center for T/T	New bldg.

Governance

No	Laboratory	Location to install	Remarks
1	Library	LRC Building	Existing bldg.
2	Governance & Management	Administration Building, Campus 2	Existing bldg.

IETC

No	Laboratory	Location to install	Remarks
1	Multimedia Room	IETC building	New bldg.
2	Video Conferencing	IETC building	New bldg.
3	Auditorium 500	IETC building	New bldg.
4	Auditorium 300	IETC building	New bldg.

Appendix 4-10

Relationship among Research Theme, Laboratories and Equipment

CAAB

No.	Laboratories with Major Items of Equipment	Linkage with the research themes
1	Plant Molecular Genetics: -Biophotometer Plus -Realtime PCR system -Gel documentation system	This laboratory focuses on two major fields as follows: **1. Exploiting and conserving the plant genetic diversity and sustainable use of plant genetic resources in Mekong Delta for improvement and breeding of new plant cultivars on demand** **2. Genetics and breeding of major crops adapted to climate change and other environmental stresses.** To breed and release new major crop varieties (rice, soybean, fruit trees,) for sustainable production in climate change situation and other environmental stresses in MD.
2	Plant Breeding - Centrifuge - Microscope (Fluorescence microscope)	**Research on molecular genetic breeding:** The research theme plans to procure monitoring devices to determine various factors with use equipment for evaluation at molecular levels with modern devices support. To solve rice tolerant to climate change is a big problem, for rice molecular breeding need to co-operate several specific disciplines. This research is a trial in the data sharing with community of local community of MD to share influential data relating to most appropriate choice of crops and harvest season in MD in order to adopt climate changes. The planned equipment is essential to push forward the joint research with Japanese university in crop and harvest technology.
3	Seed Technology - Seed germination chamber - Cool storage room	**Research theme 1: To evaluate the rice quality problems** Quality including evaluation on physical purity of variety, seed classification, aroma, amylose content, protein content, it has a great beneficiary to Mekong Delta The department has ample experiences on this theme. **Research theme 2. Research on molecular genetic breeding** The research theme plans to procure monitoring devices to determine various factors with use devise for evaluation at molecular levels with modern devices support.
4	Cell Biotechnology - ELISA system - Bioreactor air lift bubble -Three dimensional fluorescence microscopy	**Research theme 1: Regeneration shoot from callus, cell fusion and stress tolerance in vitro.** The field of study has been carried out in many years for salinity tolerance of citrus. The lab also has served doctoral student who studied and produced pineapple plant with virus free by meristem culture. Now, there is the student who studied salinity tolerance of soybean from callus regeneration. The cell fusion culture is a new field for us but plant breeding lab (belong to Agriculture faculty) needs the technology in the future. So the existing facilities are not enough for the work. Therefore, we need a new equipment for research. **Research theme 2: Biosynthetic studies using biochemistry and structural biology.** In specially, the rice plant can tolerate to drought and salinity related to structural morphology adapted to climate change in the MK. Moreover, physiological and biochemical reactions in it should be studied in vitro. **Research theme 3: Plant cell culture** We carried out regeneration of plantlets from tissue or explants (micro propagation). The field of plant cell culture should be studied in another culture, especially in rice.
5	Applied Biological Science -Supercritical CO2 extraction system - High Performance liquid	The major research activities are collection, isolation and identification of local plant and micro-organism-derived compounds for agricultural and medical utility for the following three specific research topics:

No.	Laboratories with Major Items of Equipment	Linkage with the research themes
	chromatography - Freeze dryer	(i) collection of local and traditional plants for medical use, (ii) collection, isolation and identification of local micro-organisms for enzymes and plant growth regulators extraction, and (iii) biological activity evaluation of extracted compounds from potential plants and micro-organisms. These research activities aim to find out Potential plants and micro-organisms for biologically active compounds' extraction and application. The natural occurrence of biological active compounds is quite low but they usually show high potential application in medicine and agriculture. To achieve above mentioned goal, it is required to equip the new and up-to-date instruments for analysis and evaluation.
6	Plant and Animal Biochemistry -Low-pressure chromatography systems -Nucleic Acid Electrophoresis and Blotting -Fluorescence spectrophotometer	**1. Studies on natural biological active compounds and proteins/enzymes in agricultural production, pharmaceutical, and medical applications** Study on antioxidant compounds both enzymatic and non-enzymatic system on plants and animals to produce functional food. It is required to procure small equipment for sample preparation (sample homogenizer, vortex..), analysis with high accuracy of data about biochemistry change in plants and animal cell organism (spectrophotometer, fluorescence spectrophotometer) **2. Purification biological active protein and recombinant protein expression** It is required to equip this lab with new research equipment to study this new technique, recombinant protein expression, in this research plan.
7	Plant physiology -photosynthesis measurement -Colorimeter -Hand-held photosynthesis system	**Research theme 1. Plant responses and adaptation to environmental stresses** Environmental stresses, such as drought and high salinity, adversely affect plant growth and productivity. Various phytohormones, morphology of plants are known to be involved in regulation of plant stress responses. Role of endogenous hormone and exogenous hormone are also studied in stress condition. **Research theme 2. Plant nutrition and plant growth regulators: basic research and application.** Apply mineral nutrition on plant is necessary for rice/fruit tree to overcome stress to drought and salinity by measurement of water potential on root and leaf. Various biochemical and physiological reactions are also focused to achieve optimal yield of rice. Phytochrome and plant hormone are studied, too. Research theme 3. Post-harvest physiology Post-harvest physiology is the scientific study of physiology of living plant tissues after they have denied further nutrition by picking. It has direct application to postharvest handling in establishing the storage and transport conditions that best prolong shelf life of flower, vegetable, fruit.
8	Soil Chemistry - IC (Ion chromatography) - TOC analyzer - Microwave sample digester - Dumas analyzer	The research strategies aim at **reaching an optimal management of soil nutrition and soil degradation for sustainably agricultural production in the Mekong Delta.** Serving for teaching and research activities, the major items of the lab are listed including atomic absorption spectrometry, spectrophotometer, distillation system, centrifuges, pH, and EC meters. These analytical equipment items were equipped since

No.	Laboratories with Major Items of Equipment	Linkage with the research themes
		more than 10 years under the donation from Japanese government, which needs replacement.
9	Soil Physics -Electric transducer tension-meter -Mercury manometer tension-meter - Fume hood	**Research theme 1: Soil physical degradation and restoration methods for coastal areas in the Mekong delta, Vietnam under the impacts of climate changes. Research theme 2: Soil-water storage and available soil-water evolution of major soil groups in the Mekong delta for cash crop alternation with rice cultivation.** **Research theme 3: Relationship between soil physical properties and soil morphological characteristics of major soil groups in the Mekong delta, Vietnam. Research theme 4: Soil physical properties and suitable soil tillage on major soil groups in the Mekong delta, Vietnam.** **Research theme 5: Soil-water balance in cropped soils and irrigation requirement**
10	Soil Microbiology -LC/MS -ASE (accelerated solvent extractor) -Spectrophotomer for DNA (DNA nanodrop)	To study the diversity of the soil microbes and their ecological functions. Beside classical techniques, with use of sophisticated equipment items, in order to measure organic pollutants/organic plant growth-stimulating compounds for understanding the biodegradation/bio-simulation of these organic compounds and their metabolism, and To examine the microbial diversity and function in the soil/sediment ecosystem, molecular methods and finger-printing techniques as applied methods for studying soil microbes.
11	Soil Classification & Micromorphology -X-ray diffractor (XRD) -Digitizers - GPS -Microscope	To support research areas on: (1) Studying how soil forming factors (climate, vegetation, topography, parent material and time) contribute to soil characteristics from different locations in the Mekong Delta; (2) Classify and map the soils in the MD, and (3) Predict soil development in the MD.
12	Biological and Chemical Technology in Plant Protection	**Theme 1. To classify and map the soils in the Mekong Delta** - Soil map is one of basic and vital tools for teaching and researching in any soil research in the Mekong Delta.
13	Plant Pathology -Temperature-controlled centrifuge -Pulse power or electroporation	To carry out: Development of plant protection technologies; biopesticides and newly synthesized compounds for crop protection, Studies on interaction changes amongst insect pests, crops and beneficial organisms under climate change impacts Studies on newly emerging insect pests, prediction and forecast of the outbreak of important plant diseases, Studies on induced resistance in plants against insect pests and diseases Identification and application of insect semiochemicals, pathogenic inhibitors and plant-origin pesticidal compounds for plant protection, AND Application of molecular techniques in detection/identification of pathogens, insect pests, and beneficial organisms on plants
14	Entomology - Millipore machine - Incubator	
15	Biological Control - Incubator - Temperature-controlled shaker	
16	Rice research - Fully Motorized Rotary Microtome - Tissue processor - Autostainer	To build new lab for rice research, and To carry out how to grow rice adapted with climate changes, drought, saline, waterlogging and how to develop sustainable rice production. Therefore, the lab needs to be built and equipped with new equipment.
17	Edible and Pharmaceutical Mushroom	To optimize protocols to growing rice mushroom (Volvaiella volvacea) in house, Pleurotus spp and Auricularia spp using rice straw and sugarcane biogases as a substrate. will be studied with the employment of the suggested equipment.

No.	Laboratories with Major Items of Equipment	Linkage with the research themes
18	Horticulture Science -Microwave extractor - Autoclave - Digital Microscope Camera	**Theme 1. Study on flowering and fruit set characteristics of some valuable fruit trees, e.g. mangosteen, citrus (lime, mandarin)** - Observing stages of emergence of flower bud, flower initiation with either dissecting or compound microscope. Relating fruit set ratio, number of pollen and their viability would also be investigated under microscope. - The role of phytohormone on fruit set and young fruit abscission will be studied with the employment of HPLC, LC/MS, and so on. The effect of soil humidity on flowering will be carried out with the help of equipment such as: dry oven, water potential chamber (determine plant moisture stress), neutron moisture probe (measure soil moisture at 2m depth, pressure plate membrane apparatus (Soil moisture measurement, soil water retention) **Theme 2.Study on flowering induction methods** - Equipment necessary to determine effect of climate factors on off-season flowering, photosynthesis, respiration rate are: Meteorological data logger (To, RH%, light intensity), quantum sensor (Measurement of photosynthetically active radiation-PAR), LiCor - portable photosynthesis system (measure small photosynthesis rates and CO2 exchange), porometers (Measuring transpiration, stomatal conductance) - Effect of soil nutrient and water content on flowering and flowering induction are determined with: atomic absorbance spectroscopy (AAS), Automatic Kjeldahl analyzer, Konica-SPAD meter(chlorophyll measurement, non-destructive, water potential chamber (determine plant moisture stress), neutron moisture probe (measure soil moisture at 2m depth, pressure plate membrane The effect of flowering induction method on fruit quality is investigated with: digital refract meter (determine total solute solid), spectrophotometer (determine sugar content), Konica Minolta color meter (evaluate fruit skin color), soxhlet automatic solvent extraction system (determine oil content) **Theme 3. Nypa palm and Sago palm production in areas affected by climate change in the Mekong Delta** - Equipment necessary to determine effect of climate factors on growth of Nypa palm and Sagopalm: Meteorological data logger (To, RH%, light intensity), quantum sensor (Measurement of photosynthetically active radiation-PAR), LiCor - portable photosynthesis system (measure small photosynthesis rates and CO2 exchange), porometers (Measuring transpiration, stomatal conductance) - Suckers of Sago palm propagation is studies with the help of plant growth cabinet or controlled environmental rooms - CER (determine optimum conditions for the development of Sago palm sucker. Necessary nutrient conditions for Sago palm and Nypa palm are determined with the help of atomic absorbance spectroscopy (AAS), Automatic Kjeldahl analyzer, Konica-SPAD meter (chlorophyll measurement, non-destructive to determine content of nutrient elements in soil and plant.
19	Animal Biotechnology and Molecular Biology -Temperature-controlled shaker -Cell transporter type II	**Theme 1. Improvement of animal production and efficiency through animal genetics** This lab needs to equip some equipment related to this method such as Embryo collector, Automatic irrigator for collecting embryo, etc.

No.	Laboratories with Major Items of Equipment	Linkage with the research themes
	-Automatic irrigator for collecting embryo	**Theme 2.Genetics and selective breeding** Based on the new approaches for improving growth and reproduction performance, product quality and disease resistance the laboratory is needed to equipped the equipment such as DNA microarray chips, sequencing machine, PCR amplification and their accessories to fulfill three main researches, as followed as: **Theme 3.To build up the marker assisted genetic evaluation** Based on the evaluation of marker-assisted genetics can greatly increase the accuracy of genetic evaluation. **Theme 4. Bioinformatics application to animal genetics and breeding** The planned equipment is essential to push forward the joint research with Japanese university in crop and harvest technology. **Theme 5. Application of stem cell techniques for breeding and conservation of animal resources.**
20	Animal Anatomy and Physiology - Analox - Cattle anatomy model - Pig skeleton model	The research theme of the laboratory mainly focus on **physiological and biochemical criteria, nutrients, hormones in body fluid under different feeding systems and environmental conditions influencing on growth and reproductive performance of animals.** Besides, systematic and comparative anatomy of mammals is researched.
21	Animal Nutrition and Feed Technology -Kjeldahl Digestion apparatus - Distillators - Fiber analysis system,	**Theme 1. To apply new analytical methods for feed evaluation** 1.1 To determine the content of amino acid (AAs) and fatty acid (FA) profiles Amino acid analyzer, gas chromatography, and HPLC are used to determine these essential compounds. 1.2 To determine the content of essential minerals Atomic absorption spectrophotometer is very necessary to determine these minerals in feeds, diets or manure to handle environmental pollution 1.3 To be able to predict the feeding values for ruminant and non-ruminant animals Chemicals, enzymes to breakdown carbohydrate, glassware and automatic protein analyzer are needed. **Theme 5. To apply biotechnology in evaluating the effect of nutrient intake of poultry** In combination with the Animal breeding technology, some equipment of this lab like ABI Prism® 7000 SDS will be used to conduct real time PCR.
22	Non-ruminant Animal Production Techniques -Testing machine - Automatic Isoperibol Calorimeter - Ultra centrifugal Mill	**Research theme: Improvement of animal production systems towards biosafety and environmental challenges** Overall objectives: Modeling animal production systems towards biosecurity, product quality and environment challenges 1. Collecting and analyzing nutrients of feed samples, conducting feeding and digestion trials on Pig, chicken, duck, and bee. 2. Research on experimental farm.
23	Ruminant Animal Production Techniques - Infrared milk analyze - Biogas analyzer - CH4/N2O analyzer for environment	Research theme: **Studies on ruminant feeds and production systems for improving production performance, product quality and mitigating greenhouse gas emission and environmental pollution** 1. Collecting and analyzing nutrients of feed samples, conducting feeding and digestion trials on buffaloes, cattle, sheep, goat and rabbits. 2. Implementing animal performance studies of dairy cows, dairy goats, beef cattle and sheep; building up production models of ruminants and rabbits in the farms/households and analyzing data.

No.	Laboratories with Major Items of Equipment	Linkage with the research themes
		3. Implementing in vitro and in vivo experiments for reducing GHG production by using supplement agents (tannin, oils, microbial products, etc), feeding strategies, appropriate diets (TMR), feed treatments, dietary nutrient formulation, etc. 4. Implementing feeding and performance experiments on dairy and beef cattle, sheep, goats and rabbits with the best results got from the in vitro and in vivo studies.
24	Experimental Animal Unit -Artificial insemination instrument - Printing machine for semen tube - Automatic sperm counter	In ASVM, to conduct a study, it requires a certain amount of animals which are kept in each private cage or grouped in a pen especially designed for doing research (not for commercial production). During the experiment time, samples (feces, blood, urine, gas …) will be collected from animals and basically treated at the EAU before being removed to the other labs for analyzing further (DNA, blood parameters, glucose, CH4, and antibody titer).
25	Hygiene and Safety of Animal-based Food - Biosecurity clean bench Class II - Refrigerator -80 C -NanoDrop Spectrophotometer	**Research Theme: Identification of the main sources of Zoonosis diseases from animals, environments and Food of animal origin hygiene and safety and antibiotic resistant genes that can be transferred to human for public health protection** - The sources of Zoonosis diseases and antibiotic resistant genes that can be transferred from animal to human monitoring in the Mekong delta The research monitors MD areas by remote sensing and it has a great beneficiary to MD. The department has ample experiences on this theme. Possible research collaboration w/ Japanese university's in data sharing. This research is a trial in the Mekong Delta, the data of the research sharing with community of Veterinary and human medicine in this area to share main sources of zoonosis data relating epidemiological genes link between zoonosis diseases from animals to human and antibiotic genes transferring from animal to human to most appropriate choice of the ways of public Health control in MD in order to adopt climate changes. The planned equipment is essential to push forward the joint research with Japanese university in veterinary public health and zoonosis control.
26	Histology and Molecular Pathology - Pathology workstations - Tissue embedding system -Automatic rotary microtome	**Theme 1. Association analysis among clinical characteristics, histological diagnosis and molecular detection in diseases and histo-pathological database construction for disease diagnostics** **Theme 2. Implication of bio-techniques in rapid diagnostics of pathogenic diseases for strategic endemic control and surveillance of emerging avian influenza virus genotypes** The research makes use of available materials and resources especially in the MD, which has been neglected in recent years. Those data can be shared among the community to achieve the final role of establishing alternative approaches for effective disease prevention and control in order to improve animal health, environment and public health. Working with local animal breeds is also an advantageous point to exploit and to share with Japanese experts in conducting join research.
27	Veterinary Pharmacology - Dual-Action Shakers - Atomizing dryer - Karl Fisher titrator	**Outline of research plan and its justification:** **1. To select medicinal plants having good antibacterial activity** **2. To test their acute and subacute toxicity** **3. To evaluate their efficacy on preventing and treating diseases**

No.	Laboratories with Major Items of Equipment	Linkage with the research themes
		4. To analyze the active principles in medicinal plants **5. To test the drug quality** The research theme plans to procure monitoring devices to determine the active principle in medicinal plants and test the drug quality with High-performance liquid chromatography, UV-Vis spectrophotometer, Rotary evaporator, Dissolution tester, etc. The planned equipment items are essential to discover the medicinal plants having good antibacterial activity to replace the role of antibiotics being resisted by bacteria and to avoid the residue of drugs in animal products influencing to human health and environment.
28	Immunology and Epidemiology - Automated ELISA system - Automated ELISA system - Autoclave	**T**heme 1. Epidemiology, immunobiology and diagnostic aspects of animal viral, bacterial and parasitic infections and principles of host-pathogen interactions Research immunology of livestock and poultry to control diseases caused by bacterium, virus and parasite use of ELISA, PCR, real time PCR and other devices which was showed in equipment need to invest in the Lab. Theme 2. Studies on disease control systems for improving animal health involved in all types of pathogenic agents including bacteria, viruses, parasites and fungi Theme 3. The application of modern techniques in obstetrics, embryo transfer and artificial insemination to increase livestock productivity and breeding technology Artificial insemination To invest the electro ejaculator, artificial vagina, semen quality analysis system, semen evaluation kit, artificial insemination kit and other necessary devices. Estrus synchronization Devices as Ultrasonography, Estrus synchronization devices or medicines (PGF2α, CIDR, PRID tools) are actually necessary for determining the non-pregnant cows, development of follicle and ovulation time. Superovulation Superovulation technique also needs to be equip the devices such as Ultrasonography, Estrus synchronization devices or medicines and surgical kit Embryo transfer The research about embryo transfer is carried out for genetic and productivity improvement. However this is a complicated technique requires typical equipment such as ultrasonography, bio-safety cabinet, CO2 incubator, catheter, microscopy, medicines, and other devices and standard laboratory for breeding eggs and embryos. Obstetrics Surgical devices, ultrasonography, medicines and others should be equipped in the laboratory for practical training under graduate students and master degree students and for researching. Theme 4. Effects of timing prostaglandin F2α injection following controlled internal drug release insert removal on estrus response, follicular dynamics and pregnancy rate in cattle Estrus detection: blood collection for determining hormone concentrations, hormone assay Artificial insemination: Ultrasonography the dynamics of follicular, ovulation time and pregnancy

No.	Laboratories with Major Items of Equipment	Linkage with the research themes
29	Animal Clinic and Virology - 3D ultrasound scanner - Veterinary ultrasound scanner for small animal - Endoscope system	Theme 1. Diagnosis of pathological of animal diseases and examination of preventive and therapeutic methods. For achieving accurate conclusion, there are many tests need to be done: - Clinical examination by using stethoscope, sphygmomanometer, examination table - Medical examination such as blood and urine analysis by using blood oxygen meter, blood glucose meter, urine testing machine. - Diagnostic imaging techniques by using ultrasound scanner and X-ray system - Etiology diagnosis by using clean bench or safety cabinet, microscope and PCR system. Theme 2. Isolation and identification of infectious pathogens of important diseases in domestic animals in Mekong delta, development of vaccines and antibodies for disease prevention and control with paying much attention on zoonotic diseases with uses of biosafety cabinet, inverted microscope, fluorescent microscope, PCR system, The research theme is done in order to: - Identification type of viral pathogens are circulating in Mekong delta - Collection and selection of microorganisms for developing specific vaccines and antibodies Study on efficiency program for disease prevention and control based on specific vaccines and antibodies produced. The new equipment items will be operated by head of laboratory (Assoc. Prof. Ho Thi Viet Thu) and other staffers under supervising of lab head. Head of laboratory and staffs have experiences in viral isolation and identification as well as using the equipment devices for carried out these works. The equipment devices will be shared by animal clinic and virology lab.
30	Parasitology - Deep freezer (-80oC) - Biological safty cabinet - Automatic ELISA	Theme 1: Studies on disease control systems for improving animal health involved in all types of pathogenic agents including bacteria, viruses, parasites and fungi In the topic 1: Prevent the animal transmitted parasitic diseases to human. (Ex: Toxocara canis) We study the topic 1 in order to prevent the potential transmission disease from animal to human. We would like to research the prevalence of this disease to animal and in human. This theme plans to use ELISA and RT PCR to determine the prevalence and intensive infection of these diseases, respectively. ELISA helps us in fast diagnosis, and RT-PCR can quantify the amount of parasitic agents in the samples before and after treatments. To approach the purpose we follow the frame work below: - Investigate the prevalence and intensity of diseases in kept dogs, and people having pets (by microscope, ELISA method, and RT-PCR). - Figure out the correlation between those infected host who have dogs as pet and those having no dogs. - Suggest the effective methods to prevent the transmission. From the results of study, we can suggest the effective strategies to live harmony with pets without worrying about zoonosis diseases. Theme 2: Topic 1: The evolution of anthelmintic resistance genes of Nematoda in cattle diseases in order to increase the efficiency in

No.	Laboratories with Major Items of Equipment	Linkage with the research themes
		treatment. Topic 2: Faster and more accuracy diagnostic method in identifying blood parasites/ coccidiosis in poultry. Through the natural selection, there are many anthelmintic resistance breeds. It leads to detrimental economic and health damages. Therefore, understanding about the evolution of these resistance genes in order to figure out the effective methods to prevent this phenomenon. The planed equipment such as PCR, ELISA… is essential to decide the feasibility of these pr In the theme 3, we would like to research the immune response to parasite helminthes. Besides mentioned equipment as PCR, or ELISA, Western blotting technique is necessary to research about specific protein causing booting immune response when animals are infected by helminthes. Therefore, those devices related to protein techniques are really powerful tools for us to study this project. To achieve the goal, we are planning to reach small purposes below: - Identify specific protein causing boosting immune response. -Introduce recombinant protein with parasitic to mice, measure the antibodies were produce.(using Western blotting to confirm the presence of recombinant protein and ELISA to check the antibodies)
31	Veterinary Bacteriology and Mycology - CO2 incubator - Refrigerated centrifuge - Thermal cycler, PCR	1. Veterinary bacteriology 1.1 Microbial antibiotic resistances and virulence Studies on antibiotic resistances have been designed for long-time process; firstly we have started with preliminary stage by sample sampling, isolation and antibiotic-susceptible testing of common food-borne bacteria such as E coli spp., Salmonella spp., Staphylococcus aureus on animal, animal products and environment. Then, evolution, propagation and pathways of antibiotic resistant genes will be investigated by molecular techniques based on new equipment such as PCR, electrophoresis apparatus, regenerated centrifuge, spectrometer… 1.2. Roles of bacteria in viral-bacterial co-infection Our research aims are to evaluate occurrence and roles of co-infectious bacteria in epidemic viral-bacterial respiratory diseases in domestic animals Pathogenicity, virulence of bacteria is estimated different between co-infection and single infection. This requires equipment items of exo-endotoxin measurement device, API panel reading, and protein production system Epidemiological factors and roles of bacteria in viral-bacterial respiratory diseases will be analyzed.
32	Food Nutrition - HPLC system auto-sampler -Laboratory High Temperature Muffle Furnace -Bomb calorimeter	**Theme 1. Evaluation of nutritional status of different population groups in Mekong delta** 1.2 Assessment of nutritional status The research theme plans with use of microscope with 3D stage, Fatty acid analysis – GCMS, Miller, HPLC system with Guard column, Water/Oil bath, Particle sizing systems analyzer, titrator, Thermal analyzers, Ultra-freezer, Micropipette, Rotary evaporator, Refrigerated centrifuge, pH Meter, High temperature muffle furnace, Analytical balance, Spectrophotometer (UV/VIS), Laboratory water purification systems. Theme 3. To develop new food products by combination advance techniques to improve nutrients stability and enhance the bio-accessibility/bioavailability of nutrients The activities will be carried out based on: The research theme

No.	Laboratories with Major Items of Equipment	Linkage with the research themes
		plans with use of Fermentor, Rheometer, Alcohol analyzers, Mineral testing, Protein analyzer, Oven, Moisture analyzers, Oil analyzer, Sterilizer autoclave, Incubator, Refractometer, Soxhlet extraction, Refrigerator, Hot air dryer and some mentioned equipment, Free-Standing Vertical Laminar Flow Hoods, Thermal analyzers, Free-Standing Vertical Laminar Flow Hoods…
33	Food Chemistry - Freezer -High performance anion exchange chromatography (HPAEC) - LECO C-H-N analyzer	**Theme 1. Relationship of compositions (starch, non-starch, proteins and lipids), structural/physic-chemical characteristics and functionality of foods (cereals, fruit, vegetables, meat, fish…) in Mekong delta** - Using new equipment to analyze compositions (HPLC, GC-MS, HPAEC, Spectrophotometer, LECO C-H-N analyzer) and determine structural and physic-chemical characteristics (Differential Scanning Calorimeter, Mastersizer laser diffraction instrument) and functional properties (Rapid viscosity analysis). **Theme 2. Stability and degradation kinetics and modeling of bioactive constituents (vitamin C, carotenoid, anthocyanin, phenolic, minerals,..) in foods and raw materials (in the entire food chain** - Using new equipment to extract and analyze bioactive compounds (centrifuges, HPLC, GC-MS, HPAEC, Spectrophotometer), and perform kinetic study (water bath, oil bath and low temperature bath, chemical reactor, colorimeter) **Theme 3. Functionality of cereals (modified starch, retro-gradated starch and non-carbohydrate)** - Using new equipment items to produce and evaluate modified starch (water bath, oil bath and low temperature bath, chemical reactor, centrifuges) and retro-gradated starch (Artificial digestive system, freezers and refrigerators). **Theme 4. Utilizations and value enhancement of by - products from food industries** - Using new equipment's to extract, produce, purify and analyze value compounds (chemical reactors, centrifuges, HPLC, GC-MS, HPAEC, Spectrophotometer, Electrophoresis protein 2D (2D-PAGE), Amino acid analyzer).
34	Food Microbiology - Nucleic acid extractor by magnet technology - Ultra centrifuge - Micro-plate reader	**Theme 1. Studies on physiology, genetics, biochemistry, and bioactivities of useful microorganisms in food products of Mekong delta** The research focus on the useful microorganisms for food processing for the products in Mekong delta. This project can collaborate with TUAT teams thanks to their experiences in working with the same projects for traditional Japanese food. In order to procure this projects, the modern equipments as fluorescent microscope, phase contrast microscope, biology molecular equipments as PCR, electrophoresis machine, gel reader,... and also the basic equipment items as ultra-low temperature freezers, ice flake maker, micro centrifuge,... The researchers, PhD and master students will operate the new equipment items. As we already have many experiences in isolation of microorganisms in traditional food, these modern equipment items will help us to increase the reliability and efficiency of our works. **Theme 2. Identification and treatment of food pathogens: pathogens and antibiotic resistant bacteria** The modern equipment items such as Elisa reader, PCR machines, Electrophoresis system will support us in realizing this work.

No.	Laboratories with Major Items of Equipment	Linkage with the research themes
		Theme 3. Studies on probiotics and prebiotics in food products The modern equipment in molecular techniques will help us to realize PCR-based assay to detect specific bacteriocin-encoding genes.
35	Food Technology - Freeze dryer - Vacuum mincer - Vacuum mixer	**Theme 1. Developing value adding technologies for food processing in MD** The objective of this research was suggested the sustainable development of (new) food and beverage products and value added products from agro- product in the relation to reduce food loss and environmental protection and researching on enhancement the nutritional value of food products. There also show the essential in equipment at basic laboratory, which helps (i) measuring basic parameter, physiological and biochemical changes in food such as texture analyzer, pH meter, colorimeter, spectrophotometer (110-10.000 nm), moisture analyzers, spectrophotometer VIS, Soxhlet Extraction Apparatus 250mL/500 mL, Refractometer; electronic balances, Whiteness meter; Water Baths;(ii) food processing in different conditions: Freeze dryer, Freezer (-80oC), Low temperature bath, Combined microwave-air dryer, Bowl Cutters, Vacuum mincer, Vacuum mixer, Oil baths, Tray dryer, Forced Air Vacuum Ovens, Vacuum tumbler, Vacuum fryer, Wet grinder, Vacuum Rotary Evaporator. The planned equipment is essential to the development of (new) food products and value added products from typical agro-product of MD, meat, fish and milk products. Besides, it is also performed the potential modern technology in fruit and vegetables processing, alternate imported grains by using the MD cereals for food products compared with the product in market. In addition, with the help of modern equipment, fermentation and enzymatic hydrolysis will enrich the diet, preservative and biological substrates appear in cereal, dairy products Theme 2. Value added products from by-products of food processing The research offers solutions for converting by-products of food processing into value-added items. It brings a great beneficiary to solving environmental problems, facilitate the sustainable use of available natural resources and utilize by-products and wastes of food industries. The planned equipment is essential to push forward the joint research with food processing factory in Mekong Delta, recommend the technological process is applied to each product group which makes maximum use of agricultural produce while employing low-energy and cost-effective processes.
36	Postharvest Technology - GC-ECD - Freezer - Spectrofluorometer	**Theme 1 Study on effects of harvesting and storage conditions on postharvest loss of fresh fruit and vegetable, animal products, aquatic products, cereals and dairy products** The research theme plans to procure three groups of equipment, namely: Group of“Cook”equipment (equipment to treat materials) An automatic washing & packaging system for vegetable, 4 cooling stores to store produces at four different temperatures ranging from 0 to 20oC (30 m3 each) (2 available cooling stores of 16 m3 each will be kept remained at the site for other lab of

No.	Laboratories with Major Items of Equipment	Linkage with the research themes
		CAAB when the Postharvest Technology Lab to be moved to BioTech building), a set of gas mixer and controller (oxygen, carbonic, nitrogen, ethylen, vapour) to be installed for 4 cooling stores, a refrigerator (730L) to store small samples of produces, 3 freezer of -25, -40, -80 °C for storing produces at frozen state, a computer-controlled and progammable freezing machine to study the behavior of tissue during freezing processes. Group of "Look"equipment (equipment to analyze changes of produces attributes) A respirator for oxygen and carbon dioxide measurement, GC-MS, HPLC, spectro-fluorometer, spectrophotometer, UV-VIS, colorimeter, tenderometer for measuring texture properties of foods, automatic titrator, refractometer, clarck cell electrode for measurement of dissolved oxygen in solutions, wireless datalogger (oxygen, carbonic, nitrogen, temperature), oxygen/carbon dioxide monitor … for analyzing data collection. Group of support equipment Vacuum food packaging unit, automatic incubator, lyophilisator, microcentrifuge, centrifuge, water baths, homogenizer for supporting laboratory works. The group of "Cook" equipment items will be used for conducting MSc thesis works, practical course works, and works linked to postharvest research projects (high demands from Mekong delta
37	<u>Food Process Engineering</u> - Heat pump dryer - Membrane Separation Unit - Filter press	**1. To Control 3D characteristic of process rooms** **1.1. Monitor 3D temperature distribution in process room** The research monitors the temperature of airspace and product in 3D space of process room, to identify the well mixed zone in a process room. This research need data logger for data collection (multiple channels, thermocouples, wireless sensors,) **1.2 Monitor 3D quality of environment in process room.** To conduct this experiment the sensors: air velocity, CO2, humidity sensor, O2 sensor connect with computer need to be invested. Monitor parameters in 3D space of process room need to control uniformity of product quality, food safety and energy saving. **2. Application of extruder cooking to add value to agricultural products** **2.1 To develop a new product from extrusion** The research need to be invested extruder cooking (one screw, double screw), oil extraction screw press, filter press at the pilot scale to various type of products **2.2 To monitor this process** The parameters need to be collected in relation to process: moisture content (differential scanning calorimeter), physical properties of food (brabender, viscometer, color meter, water activity ...) **2.3 To dehydration of product** To reduce water in food product need to be used various of dryer: Heat pump dryer, convection dryer at pilot scale and to monitor the process strain gauge, temperature sensor, humidity connect with PC need to be invested. **3. Study on membrane technology** **3.1 Apply membrane technology in food processing**

No.	Laboratories with Major Items of Equipment	Linkage with the research themes
		The bio product need to separation at molecular level. The equipment need to invested membrane separation unit (with several type of membranes), Reverse osmosis/ Ultra filtration unit. **3.2 To monitor this process the equipment in relate to Food technology lab and Food chemistry lab.** **4. Thermal processing of Food** **4.1 Modeling for predicting product temperature during heat treatment.** Data logger with high temperature sensor need to be used for data collection the temperature of product and steam during heat treatment (This is the basic to model this process) **4.2 Development a new process** Application "Shaka retort" principle to develop new product. Wireless thermocouple sensor with high temperature devices need to invested.
38	Food Biotechnology - LC/MS - Autoclave -Process Controlled Bioreactor	**1. To identify and produce functional peptides using for food processing.** Functional food is used more and more now. Among the functional food, functional peptide or functional protein hydrolysate like collagen is very important for human health. So, in order to do that the first job is find out where is the functional protein or peptide may exist and purify. Hence, some protein and peptide analysis equipment is necessary like electrophoresis, using bioinformatics database well as well as have knowledge about life science and nutrition science. The research will be conducted by master, PhD students as well as researchers in the lab. So, they have enough experiences to do experiment well. **2. To improve the quality of final products based on the use of quality enzyme in food processing** The research purpose may divide into two branches. The first one is to improve the quality of enzyme. Secondly, to improve the quality of final products based on the use of quality enzyme in food processing. In order to do that useful enzyme should be identify first, then using biotechnology at molecular level, some interesting characteristics of enzyme can be modify and improve the quality. So, molecular biotechnology tool like DNA equipment as well as protein level equipment have to use for research. The research will be conducted by master, PhD students as well as researchers in the lab. So, they have enough experiences to do experiment well.
39	Molecular Biology: -Next generation DNA sequencer -Real time PCR	-1. Plant resource collection, evaluation and development (rice, other crops, animal forages, etc.) -2.Genetics and breeding of major crops adapted to climate change and other environmental stresses -4.Bioinformatics applications to plant genetics and breeding -8.Bioinformatics applications to animal genetics and breeding -10. Studies on plant responses and adaptation to environmental stresses in MD -12.Developing integrated management systems to improve rice productivity and quality -14. Studies on alternative strategies for production of rice and other crop plants under climate change impacts in MD -15.Development of plant protection technologies; biopesticides and newly synthesized compounds for crop protection -18. Studies on induced resistance in plants against insect pests and diseases

No.	Laboratories with Major Items of Equipment	Linkage with the research themes
		-20. Application of molecular techniques in detection/identification of pathogens, insect pests, and beneficial organisms on plants -23. Identification and application of enzyme activities of microorganisms in the MD soil toward soil pollution remediation -26.Development and application of high performance organic and bio-fertilizers -32.Application of molecular techniques in detection/identification of pathogens and beneficial micro-organisms on animals -45. Identification and treatment of food pathogens: pathogens and antibiotic resistant bacteria -48. Studies on physiology, genetics, biochemistry, and behavior of useful microorganisms in food products of MD
40	40. Stem Cell -DNA Sequencer - Real-Time PCR - Fluorescent Microscop	1. Biotechnology Research and Development Institute aim to carry out following research interests: - Preserving genome of endangered animals such as Turtle of Hoan Kiem lake (Rafetus vietnamensis), Fishing Cat (Felis viverrina) or Gaur (Bos gaurus). - In the field of veterinary, applications of stem cells for treatment diabetes in dogs. Base on this result, the similar technique will be applied on diabetes in human in the near future. - Producing transgenic cloned animals which can producing pharmaceutical protein - Basically produce media used for cultured stem cells to facilitate the research as well as application of stem cells in Vietnam generally and Mekong Delta specifically - Studying cell differentiation and regeneration of the cardiovascular system using embryonic stem (ES) and induced pluripotent stem (iPS) cells (with Yamashita Laboratory, Laboratory of Stem Cell Differentiation, Department of Cell Growth & Differentiation, Center for iPS Cell Research and Application (CiRA), (a.p) Institute for Frontier Medical Sciences, Kyoto University) - Investigation of molecular mechanism involved in the CNS disorders caused by damaged neural stem/precursor cells and identification of their therapeutic targets (with IGM Institute for Genetic Medicine, Hokkaido University). The researchers use the equipment and help other laboratories to do research in domain stem cell. This laboratory is helpful to train and support the formation of Master et Ph. D student in advanced technology. Stem Cell laboratory have 4 small laboratories: Cell separation and culture Laboratory, Cell storage system, Kitchen (Medium preparation room) and Washing, sterilizing and drying room. The cell of animal or human will be collected, separated and cultured at the Cell separation and culture Laboratory. We need these equipments such as Cell separator system using MACS technology (Machine + testing kits),..to do this essential step. Cell storage system and Kitchen (Medium preparation room) and Washing, sterilizing and drying room are necessary to store the cell et prepare all medium, all steps for the experience.
41	Protein Technology and Natural Product -Peptide Synthesizer - HPLC system	For peptide synthesis for Research or Production. It can synthesize one, two, four or up to six peptides at a time for efficient high throughput synthesis.

No.	Laboratories with Major Items of Equipment	Linkage with the research themes
42	Gene bank - Quality Grain inspector - Growth chamber	The new equipment will be used to accomplish the following development goal. The developmental goals of "Gene bank" are strengthening in-situ and ex-situ PGR conservation, conducting rice breeding and improving root crops for adaptation to climate change and evaluating adaptation and developing new varieties in large scale of rice-base production systems. In order to accomplish the mission of education and scientific research in high quality, Gene bank lab focuses on four major fields as follows. 1. Collection and conservation of PGR (Plant genetic Resources) in-situ and ex-situ; evaluation and documentation for PGR and rejuvenation for evolvement of PGR 2. Participatory plant breeding for rice and root crops for the effectible areas of salinity, drought, acid sulfate soil, submergence and tolerance to pests; On-farm experiments in participatory varietal selection of rice and root crops; Demonstration for adaptation evaluation of new varieties and participatory technology development for rice production 3. Strengthening seed supply systems for seed security at community level 4. Development of rice-base farming systems for agro-biodiversity and adaptation to climate change
43	Materials and Molecular Modeling -First computer system (normal system) -Second computer system (fat system) -Host machine	Three research topics are related to computational method for material in term of molecular scale. Therefore, the computer systems will be used full load for producing the accurate results to reduce the time and cost effort for experimental experts in material chemistry.
44	Agricultural and Aqua-cultural Engineering -DIC system -Data acquisition system	As mention in the introduction, this lab has been developed a few equipment for agriculture and aquaculture. The researchers have experience for researching in this research theme. With the new equipment for this lab, the research efficiency will be leveled up.
45	Material Engineering -CNC Turning -CNC Milling - Universal lathe machine - Universal milling machine	The research theme will be performed in metal material, including machining and heat treatment: To be used for testing or micro-indentation evaluation. The equipment for material testing: hardness testing, sample preparation. To make prototype, the machining machine will be used. This group is cooperated with the Agricultural and Aqua-cultural Engineering Lab for designing and fabrication agricultural and Aqua-cultural equipment. The equipment will be shared between two labs (CNC machine, machining).

CAF

No	Laboratories with Major Items of Equipment	Linkage with the research themes
1	1) Genetics and selective breeding: -Bio analyzer,	**Research themes: 1.1, 1.2, 2.1, 2.2, 3.2, 3.3** New equipment facilities of this lab is required to analyze commonly used and power molecular markers such as Ribozyme markers, restriction fragment length polymorphic (RFLP) markers, amplified fragment length polymorphic (AFLP) markers, polymorphic expressed sequence tag (EST) markers, microsatellites or simple sequence repeat (SSR) markers. In

No	Laboratories with Major Items of Equipment	Linkage with the research themes
		addition, some equipment such as Bio analyzer, real-time PCR is also used for studies of gene expression.
2	2) Bio-Chemis-Pharma -Micro plate reader -Preparative Liquid chromatography -Vacuum rotary evaporator	Research themes: The research plans will be focused on the assessment of natural bio-active products present in plants, animals and micro-organisms in Mekong Delta. For these active extracts collected, isolation and chemically structural determination of bio-active compounds will be carried out with new research equipment.
3	<u>3) Fish Biology</u> -Amino acid analyzer -Kjeldahl analysis system <u>4) Product Processing</u> -Atomic Absorption Spectrophotometer (AAS) -High performance liquid chromatography (HPLC)	**Research theme 1.1** High accurate analysis of chemical compounds, water environmental parameters, hematology parameters, enzymes activities, proximate composition and other parameters should be done. Moreover, the automated experimental system which adjust and control oxygen, carbon dioxide level as well as respiratory measurement system will be effectively used for monitoring the of fish and shrimp in terms of physiological responses. Analyzing of amino acid and fatty acid composition related to fish digestibility nutrition research will support the in-depth studies as well as enhance research capacity. **Research theme 1.2** In order to assess the mentioned research, high accurate analysis of chemical compounds, water environmental parameters, hematology parameters, enzymes activities, proximate composition and other parameters need to be done in our lab. Thus, new equipment/instruments will be satisfied the research needs. **Research theme 4.1** To assess the situation of chemical residue, validation of screening/confirmation method and residue/toxicology experiments in aquaculture intensive area and identification/quantification of the source of contamination like agricultural area or industrial zone, the proposed instruments will be helpful. For food borne microbiology, studies on screening/confirmation of pathogenic bacteria and in-depth studies on bacteria resistant pattern will be implemented which contribute to the safety on consuming aquatic products. To reach the proposed goals, the new and repaired instruments will make the lab sufficient for analysis and the result of analysis will meet the international standards on food safety related to chemical residue as well as food borne microbiology. **Research theme 4.2** Aquatic products processing takes an important role in the aquatic products supply chain. However, due to a short of chill facilities and a lack of cold-chain systems, there is serious loss of quality and quantity before the products reach the consumers. This situation has become one of the main reasons for serious food incidents that often happen, and the demand for Cold-Chain improved. The planned equipment is essential to improve the quality of aquatic products in cold chain transportation system. **Research theme 4.3** The research plans to take advantages of new equipment on study of applied biology in aquatic product processing which bioreactor, cool incubator, incubated shaker, and other equipment will be used. Characteristics and utilization of potential products for growing of bacteria, yeast, cells and some biological active substances from aquatic resources such as active substances extracted from plan/by products, functional proteins, enzymes, amino acid in aquatic products processing.

No	Laboratories with Major Items of Equipment	Linkage with the research themes
5	5) Fish Pathology: -Realtime PCR	**Research themes:1.1, 1.2** In order to conduct research plans, it is required to procure better and advanced equipment/instruments to facilitate the application of advanced techniques for high accurate analysis of water environmental parameters, histology, hematology parameters, immune parameter, genetic analysis, biochemical analysis and other parameters.
6	6) Aquatic Environment: -Atomic Absorption Spectrophotometer (AAS) -Gas Chromatography (GC) -Fluorescence Spectrophotometer	**Research themes:2.2** In order to perform the research plan live food isolation and mass culture trials are very important points. It is very effective to isolate and identify new live food species from aquatic environment, with use of new equipment such as Fluorescence Microscope, Stereomicroscope Digital Camera, incubator, Refrigerated Micro centrifuge, which will satisfy the research needs. For the mass culture of live food and trials on use of these live food on shrimp/fish larvae rearing, the new equipment are required to support the in depth studies as well as enhance research capacity.
7	7) Fisheries Resources -Micro Grinding machine -Manual histological processing set	Research themes:1.1 Fisheries resources in the Mekong Delta have been decreased, specially the Mekong river fishes. So that the equipment in the Fish Biology Lab and Fisheries Resources Lab will support for the studies such as fish abundance, fish distribution and migration, etc. **Research themes: 1.2** Fisheries resources in the Mekong Delta have been decreased only in abundance but also in diversity. Many native fishes are now very rare; so that studies on monitoring biodiversity are needed for sustainable development of fisheries in the Mekong Delta; these studies will be supported by using the equipment of the lab of Fisheries Resources and Fish Collection Room. **Research themes:1.3** For sustainable use fisheries resources, studies on fish stock assessment and management are needed; those studies will be supported by using the equipment in the Fish Population Dynamics Lab, and Fishing Technology and Management Lab. **Research themes:2** In this research theme, there are three study activities on: i) Impacts of environmental changes on socioeconomics of aquaculture activities in Mekong Delta region, ii) Evaluation on the impacts and roles of policies on sustainable development of aquaculture and fisheries, and iii) Value chain in aquaculture and fisheries. These research activities will not carried in the labs in general; however, these studies based on and/or need to go together with the studies of the first theme on Fisheries Resources Management and Conservation that need to use all the equipment in the labs of Fisheries Resources.
8	8) Wet lab (Hatchery) -Recirculation aquaculture production tanks for brood stock	**Research themes:1.1** The study on aquatic biology, physiology, nutrition, fish health and fish diseases management will be carry out at Wet-Labs with completed experimental tank system in the same condition. **Research themes:1.2** Adaptation measures to climate changes through selective breeding, environmental manipulation, nutrition and feed improvement, health management To carry out the experimental on selective breeding, effect by environment, and feed improvement. **Research themes:2.1**

No	Laboratories with Major Items of Equipment	Linkage with the research themes
		- To study on marine seed production and apply farming system in the Mekong Delta. -To study on genetic diversity and gene conservation of indigenous aquatic species. - To develop seed production techniques of indigenous aquatic species, especially marine fish. - To study on domestication processes and aquatic seed quality managements. - To transfer seed production technology by organizing seminars, training courses. -To supervise undergraduate, Master and PhD. students, doing thesis researches. -To publish scientific papers. **Research themes:2.2** - To study on fresh water seed production and apply farming system in the Mekong Delta.
9	9) Other facilities and equipment Books on Aquaculture	To seek for references on the research themes.
10	10) Material Engineering Lab -Mixer -Tensile testing machine -Large centrifuge	The material engineering lab (Composite and Polymer Lab) includes one workshop for material production and one room for material characterization. The activities in the lab are focused on undergraduate and post-graduate education, and research. Composite and Polymer Lab only has some basic equipment which can perform fundamental practical training for students, and needs to update.
11	11) Agricultural and Aqua-cultural Engineering Lab -Gear hobbing machine -Dynamic balancing -machine Instrument system for data acquisition	**The research theme for this lab in this project is mechanization aquaculture production (as aquaculture industry). The specific topic for this research theme is given as follows:** + designing and fabrication of aquaculture production in term of industry production, such as, fish production, scrimp production, crap production, etc. + equipment for water treatment in pond. + equipment for bottom pond processing. + establish a relation between aquatic animal and environment conditions. + aquaculture logistics (computers with installed software for aquaculture logistics analysis).
12	12 Aquaculture & Environment Automation Lab -Equipment for monitoring control the environment of a industrial aquaculture ponds	**2.3.1. Constructing a model to regulate water exchange in aquaculture pond**s Currently, water exchange management in these semi-intensive systems is carried out manually by means of a gates system namely ‘grid gates’. For this, the aqua-culturist puts between two guides located in the pond input a series of grids and planks made of wood to control roughly the water discharge to the pond. The number of grids and planks to put in the guides is depending only on the experience and knowledge of the aqua-culturist whom makes a heuristic decision in function of the values of several water quality parameters as water temperature, ammonia, turbidity or dissolved oxygen concentration. Therefore, there is a need of a support system for the water exchange

No	Laboratories with Major Items of Equipment	Linkage with the research themes
		management, which would significantly reduce the risk of a failure in the system as a consequence of a human contingence. The research theme plans to constructing a model and implementing the experiments to regulate water exchange in aquaculture ponds.
13	13 Basic Lab - IT for Aquaculture and Fisheries -Projector	To teach and research in advanced IT for many fields including Aquaculture and Fisheries. The existing equipment (computers) are quite old and obsolete, which needs to replace with advanced equipment.
14	14 Research Lab - IT for Aquaculture and Fisheries -High performance Server	The overall objective is to develop and effectively apply the advanced information technology for monitoring, management, and contributing to the modernization and efficiency in aquaculture area. The specific purposes are to: - Build the software to effectively store and manage the aquaculture databases - Build and exploit the systems for monitoring, forecasting as well as warning environment in aquaculture - Construct and effectively apply the information networks which are related to productions, commercial transactions, business, and exporting in aquaculture - Effectively apply advanced information technology, GIS, and remote sensing for planning and management in aquaculture - Effectively apply information and communication networks for information exchange/management in aquaculture

CENREs

No	Laboratories with Major Items of Equipment	Linkage with the research themes
1	GIS and Remote sensing -GPS two frequencies high accuracy (set)	**1. To evaluate the environmental problems** **1.1. Water & land resources monitoring** The research monitors MD areas by remote sensing and it has a great beneficiary to MD. The department has ample experiences on this theme. Possible research collaboration with Japanese university in data sharing and some ideas could be done using remote sensing approaches such as: Remote sensing for Land-use change detection Using micro-satellites for the assessment of water quality and quantity. Evaluation of ecosystem changes for the whole Mekong Delta including mangrove ecosystem, agriculture ecosystem, coral reef ecosystem. To evaluate the environmental problems, the monitoring system has to be used. In the Mekong Delta, changes of environment are rapidly. For example monitoring the changes of land uses, quarter quality and quantity as well as ecosystems. In order to monitor the changes in large area, remote sensing needs to be used. For example, one idea could be using Hyper-spectral Image processing for mangrove species; 2-RADAR image processing for mangrove species or Remote sensing for peat-land estimation or Rice production estimation using SAR data just to name a few.

No	**Laboratories with Major Items of Equipment**	**Linkage with the research themes**
2	Land Resources - Spectrometer -Kjeldahl distillation	This laboratory provides practical training for under-graduate and master degree students and has equipment such as Table below. At the moment, all the equipment existing in the Laboratory of Land Resources are very limited and used mainly for the teaching purposes.
3	Soil and Water Environment - TOC Analyzers -UV-VIS Spectrophotometer_	**1. To evaluate the environmental problems** **1.1. Water & land resources monitoring** We would like to conduct some researches on the monitoring water of the irrigation canals, water bodies connected to the industrial zones, or intensive aquaculture in the MD. Besides, more researches will be on soil quality related to intensive rice-farming: applying excess agro-chemical, quality degradation. **2. To identify the measures to mitigate the environmental problems** **2.2. To study possible techniques to treat the soil, water and air pollutions in the specific context of the Vietnamese Mekong Delta** -Constructed wetland for wastewater treatment (domestics, aquaculture, irrigation, industry) and soil treatment in the MD. -Studies on the mechanism of biofilm activity, the role of biofilms in water purification -Clarify the adsorption mechanism of the self-made materials -Determination of microbial species with molecular biology techniques PCR -Studies on using different kinds of soil to make water purification materials
4	Environmental Biology: -Environmental chamber - Centrifuge	**2.5. To study possible solutions to protect the existing biodiversity and natural resources** [1] Under impacts of sea level rise and climate change in the Mekong Delta, aquatic organism biodiversity in fresh water, brackish water and salt water are affected. Especially, water pollution cause the large change of aquatic organism biodiversity. Vietnam government is building the policies to keep biodiversity for every province in the Mekong Delta. Therefore, studying on Aquatic resources management and conservation is necessary. [2] In condition of climate change, the environmental pollution is more serious more. Environmental factors in ecosystem change and then they will affect to organism. The understanding on the changing of forms of environmental elements (C, N, O, S,...) in ecosystems, can explain the reason why the variation of the environmental factors and find the good ways to deal them. Because of above reasons, study on nutrition dynamic (C, N, O,H ...) in ecosystem is necessary.
5	Environmental toxicology -Solid phase extraction system -Gas/solvent separator	**1. To evaluate the environmental problems** **1.1. Water & land resources monitoring** The new equipment that equipped for environmental toxicology lab in this project will contribute in monitoring some toxic substances in water & land. Pesticides, heavy metal are the major matters that will be monitor by the lab. **1.2. Analyzing & modelling water & land resources** Analyzing the concentration of heavy metal, pesticide s and toxic substances in water, soil and air in the monitoring program was done by environmental toxicology lab. Base on the monitoring data, modelling water and land resources can be analyze mitigating

No	**Laboratories with Major Items of Equipment**	**Linkage with the research themes**
		the harmful effects **2. To identify the measures to mitigate the environmental problems** **2.1. To study the possible mitigation strategies to eliminate impacts of natural disasters on agriculture, aquaculture and water supply (including both urban & industry sections)** The lab will contribute to some research related to eliminate impacts on agriculture, aquaculture and water supply. **2.2. To study possible techniques to treat the soil, water and air pollutions in the specific context of the Vietnamese Mekong Delta** The lab will cooperated with other labs such as Envi quality, Water & wastewater treatment, solid wastes treatment, land resources, Envi biology, ChemEnviEng, Hydraulics in order to find out the possible solution o treat the soil, water and air pollutions **2.3. To study changes of the farming systems to support eliminate pollutants loaded to the environment (including GHG)** With the GC, the lab can analyze GHGs emission in many types of farming systems in the Mekong delta. GHGs emission data can be used for studying changes of the farming systems. **2.5. To study possible solutions to protect the existing biodiversity and natural resources** The environmental toxicology lab will concentrated in some research topics as follows: • To study on the effect of pesticide and heavy metal on organism • To study on pesticides residues in food and environment • To study on risk assessment of the use of pesticides and heavy metal in agriculture and aquaculture
6	Wastewater treatment -Ion Chromatography UV-VIS-NIR -Spectroscopy_	**Water and Wastewater treatment/ Rural water supply** Several city/ urban areas of the Vietnamese Mekong Delta are predicted that water environment quality will be worse in the future due to urbanization and industrialization. On the other hand, industry activity in the delta is becoming more intensive. This is a potential cause of water pollution. In order to mitigate water pollution, we want to co-operate with Universities/institutes in Japan or other developed countries in the world for monitoring water quality and wastewater treatment in the city, at representative industrial zones and at craft villages. Based on monitoring results, mitigating measures will be suggested and assessed the efficiency.
7	Solids waste treatment - Elemental Analyzers -Automatic distillation unit for nitrogen determination_	**Solid waste treatment/Research on degradation mechanism of organic substances** Solid waste is currently pressing issues of the developing countries in general and the Mekong Delta in particular. So the study of the treatment is necessary. The strengthening of the modern equipment to study the solid waste handling is important.
8	Chemical Environmental Engineering -Oil in water Instrument -Vacuum tube Furnace	The laboratory of chemical environmental Engineering with suggested equipment is established in the project aiming to service teaching and researching purposes. The equipment will be invested in studying to possible techniques to treat water and soil pollution in the specific context of the Vietnamese Mekong Delta as the outline in the following.
9	Hydraulics -Sentinel V ADCP	**1. To evaluate the environmental problems** **1.1. Water & land resources monitoring**

No	Laboratories with Major Items of Equipment	Linkage with the research themes
	-RTK_GPS	- To provide in-situ measurement of hydraulics nature of natural river network and human-made canals especially where there are sudden changes of the hydraulics nature (e.g. before and after the application of hydraulic constructions) **1.2. Analyzing & modelling water & land resources** - To provide in-situ measurement of hydraulics nature of natural river network and man-made canal especially where there are sudden changes of the hydraulics nature (e.g. before and after the hydraulic constructions) for calibrating and validating the applied hydraulic models. **1.3. Evaluating changes of the agro-ecological changes under great threats of the in-situ development and climate change** - Agro-ecological zone in the VMD, a concrete base for any development plan, is strongly modified by the water resources changes. In order to realize the changes of agro-ecological zones, understanding the changes of water resources both in terms of quality and quantity is an actual requirement. **2. To identify the measures to mitigate the environmental problems** **2.1. To study the possible mitigation strategies to eliminate impacts of natural disasters on agriculture, aquaculture and water supply (including both urban & industry sections)** - To understand possible impacts of hard measures in both lab and in-situ experiments. **2.2. To study possible techniques to treat the soil, water and air pollutions in the specific context of the Vietnamese Mekong Delta** - To measure water quality and quantity changes before, during and after the implementation of the chard measures. **2.5. To study possible solutions to protect the existing biodiversity and natural resources** The existing natural resources depend highly on the current water resources condition. This lab can be used to quantify the water resources nature of a current environmental system and can provide strong base for estimating changes of the natural resources via the mechanism of interaction between changes of the water resources and natural resources which is realized from other study areas. **3. To define the measures to improve resilience & adaptive capacity of local residents under changes (climate changes & socio-economic development)** **3.1. To study on the resilience of different farming systems in the context of extreme weather events and environmental degradation** This lab is used to quantify changes of the agro-environmental zones according to impacts of the extreme weather events and environmental degradation. **3.2. To study on the adaptation strategies on sustainable uses of natural resources in the context of climate change and environmental degradation** - This lab is used to quantify changes of the agro-environmental zones according to impacts of the extreme weather events and environmental degradation. In addition, given impacts of the adaptation strategies, the lab can also be used to realize the changes of the hydraulic natures, providing strong base to evaluate the effectiveness of the applied measures.

No	**Laboratories with Major Items of Equipment**	**Linkage with the research themes**
10	Environmental Modeling -Powerful Desktop - Mike Software	**1. To evaluate the environmental problems** **1.1. Water & land resources monitoring** The research theme plans are to receive monitored data from devices and automatically process after showing results to users with use of server and computer system. **1.2. Analyzing & modelling water & land resources** - The research theme plans are uses of models to simulate water resources dynamics under different conditions. The simulated results in combination with monitored data will help to understand the current and predict the future. **1.3. Evaluating changes of the agro-ecological changes under great threats of the in-situ development and climate change** - The research theme plans are to evaluate suitability between environment and production. Especially changes in the future are difficult and uncertainty. The required devices are needed for evaluation.
11	Advanced Techniques lab -ICP-MS - Chromatography ion machine	**1. To evaluate the environmental problems** **1.1. Water & land resources monitoring** - To provide in-situ measurement of toxicants such as pesticide, heavy metals, antibiotics, natural toxins in water and soil under intensive in agriculture, aquaculture activities and other threats such as industrialization, urbanization, impact of climate change. **1.2. Analyzing & modelling water & land resources** - To provide data for estimate trend of toxicants in environment, including in abiotic and biotic environment. **1.3. Evaluating changes of the agro-ecological changes under great threats of the in-situ development and climate change** In-situ development intensive in agriculture, aquaculture activities and other threats such as industrialization, urbanization, impact of climate change may release toxic chemicals into environment and cause direct and indirect health effects for animal or plant species in natural and cultural systems. **2. To identify the measures to mitigate the environmental problems** **2.1. To study the possible mitigation strategies to eliminate impacts of natural disasters on agriculture, aquaculture and water supply (including both urban & industry sections)** **2.2. To study possible techniques to treat the soil, water and air pollutions in the specific context of the Vietnamese Mekong Delta** To measure water quality and quantity changes before, during and after the implementation of the chard measures. **2.5. To study possible solutions to protect the existing biodiversity and natural resources** - The existing natural resources depend highly on the current water resources condition. This lab can be used to quantify the water resources nature of a current environmental system and can provide strong base for estimating changes of the natural resources via the mechanism of interaction between changes of the water resources and natural resources which is realized from other study areas. **3. To define the measures to improve resilience & adaptive capacity of local residents under changes (climate changes & socio-economic development)** **3.1. To study on the resilience of different farming systems in the context of extreme weather events and environmental**

No	Laboratories with Major Items of Equipment	Linkage with the research themes
		degradation - This lab is used to quantify changes of the agro-environmental zones according to impacts of the extreme weather events and environmental degradation. **3.2. To study on the adaptation strategies on sustainable uses of natural resources in the context of climate change and environmental degradation** - This lab is used to quantify changes of the agro-environmental zones according to impacts of the extreme weather events and environmental degradation. In addition, given impacts of the adaptation strategies, the lab can also be used to realize the changes of the hydraulic natures, providing strong base to evaluate the effectiveness of the applied measures.
12	Climate Change and Environmental Observation -AMI (Airborne Multispectral Imager) -Network Analyzer	**1. To evaluate the environmental problems** **1.1. Water & land resources monitoring** The research theme plans are to observe and collect climate-related and environmental data (surface and underground water, land use…) from devices. The data will be stored in computer system and used for other research activities such as water and land resource management, prediction of future changes, modeling climate change effects' mitigation and adaptation… Possible research collaboration with Japanese Universities in data sharing will be occurred. **1.2. Analyzing & modelling water & land resources** The research theme plans are uses of models to simulate water and land resources dynamics under different conditions. The simulated results in combination with monitored data will help to understand the current water and land resource status and predict changes in the future. **1.3. Evaluating changes of the agro-ecological changes under great threats of the in-situ development and climate change** Agro-ecological zone in the VMD, a concrete base for any development plan, is strongly modified by the water and land resources changes. In order to realize the changes of agro-ecological zones, understanding the changes of water and land resources is an actual requirement. The research theme plans are uses of collected data to monitor, compare and evaluate the agro-ecological changes relating to water and land resource changes under great threats of the in-situ development and climate change **2. To identify the measures to mitigate the environmental problems** **2.1. To study the possible mitigation strategies to eliminate impacts of natural disasters on agriculture, aquaculture and water supply (including both urban & industry sections)** To understand possible impacts of hard measures in both lab and in-situ experiments. **2.2. To study possible techniques to treat the soil, water and air pollutions in the specific context of the Vietnamese Mekong Delta** To measure natural resource (water, land…) quality and quantity changes before, during and after the implementation of the chard measures. **2.5. To study possible solutions to protect the existing biodiversity and natural resources** This lab can be used to seek and evaluate interaction between

No	Laboratories with Major Items of Equipment	Linkage with the research themes
		biodiversity and natural resources and can provide strong base for estimating changes of the biodiversity via the mechanism of interaction between changes of the natural resources. **3. To define the measures to improve resilience & adaptive capacity of local residents under changes (climate changes & socio-economic development)** **3.1. To study on the resilience of different farming systems in the context of extreme weather events and environmental degradation** This lab is used to quantify changes of the agro-environmental zones according to impacts of the extreme weather events and environmental degradation. **3.2. To study on the adaptation strategies on sustainable uses of natural resources in the context of climate change and environmental degradation** This lab is used to quantify changes of the agro-environmental zones according to impacts of the extreme weather events and environmental degradation. In addition, given impacts of the adaptation strategies, the lab can also be used to realize the changes of natural resources in the context of climate change and environmental degradation, providing strong base to evaluate the effectiveness of the applied measures.
13	Aquaculture & Environment Automation Lab -SCADA System -Automated Micromanipulation System	**1. To evaluate the environmental problems** **1.1. Water & land resources monitoring** **Automated Environmental Monitoring and Control** 1) Forecasting and controlling the flood in large area using Supervisory Control and Data Acquisition (SCADA) system in combination with GIS 2) SCADA System for supervisory control of water treatment process 3) Early warning system for forest fires using image analysis technology 4) Unmanned Aerial Vehicle (UAV) based remote sensing and its integration with GIS
14	Environmental and Behavioral Economics Lab - Desktops -Software packages_	**1. Analysis of economic efficiency of natural resources uses and problems in natural resource uses and management** Environmental and Behavioral Economics Lab would be utilized for efficiency estimation of uses of natural resources. The lab would assist with quantitative analysis for efficiency evaluation. 2. **Study the feasibility of the mitigation solutions for environmental and resource problems** Most of economic and management models assume that human agents are fully rational when making their decisions for many problems ranging from environment to economics. However, it has been shown that people in reality have bounded rationality which explains the failures of many policy applications relying on the classical assumption of unbounded rationality of human beings. The lab, hence, serves as a tool to study human behaviors and as a test bed for mitigation solutions applied to environmental and resource issues. **3. Study on the resilience and adaptive capacity of local residents in the context of environmental changes** Behavioral study of human agents and simulation of environment changes would be targeted in proposing solutions for adaptation and resilience of local residents in the context of environmental changes.

No	**Laboratories with Major Items of Equipment**	**Linkage with the research themes**
15	Air Pollution Control -UV - Visible NIR spectrophotometer -Portable natural gas chromatograph	**2. To identify the measures to mitigate the environmental problems** **2.2. To study possible techniques to treat the air pollutions in the specific context of the Vietnamese Mekong Delta** a. Controlling air pollution from industrial activities: Ambient air environment in some industrial zones expected to be polluted. Surveys will be conducted to find pollution sources and air quality will be assessed. Then, measures of mitigating/controlling air pollution will be suggested to be applied and assessed the efficiency. b. Controlling air pollution at craft villages: Ambient air environment in several craft villages expected to be polluted. Surveys will be conducted to find pollution sources and air quality will be assessed. Then, measures of mitigating/controlling air pollution will be suggested to be applied and assessed the efficiency. c. Transportation is expected causing air pollution considerably in the some cities of the Vietnamese Mekong Delta: Ambient air quality along main streets will be monitored and assessed. Mitigation measures will be suggested. d. Indoor air quality: The air quality in house will be measured by the proposed equipment. Sources of pollutants from domestic activities will be investigated. Measures of mitigating/controlling air pollution will be suggested to be applied and assessed the efficiency. e. Greenhouse gases reduction from agricultural emissions: agricultural activities in the regions such as paddy rice cultivation, cattle breeding, fish cultivating, etc. were considered causing greenhouse gases. Emission of gases from these activities will be measured and assessed by the equipment of the air pollution control lab. Measures of mitigating/controlling emission from agricultural activities will be suggested to be applied and assessed the efficiency. All above research goals will not be achieved if there are not planned equipment and technology exchange from Universities/Institutes in Japan and other developed countries. The results of planned research will be shared and applied, especially for the local community in the Mekong Delta.
16	Clean and Renewable Energy -Wind generator -Solar cell module	**3. To define the measures to improve resilience & adaptive capacity of local residents under changes (climate changes & socio-economic development)** **3.2. To study on the adaptation strategies on sustainable uses of natural resources in the context of climate change and environmental degradation** This laboratory is designed for researching of not only chemical engineering students but also electrical engineering students. The master program of chemical engineering will begin on August 2014, and the master program of electrical engineering will begin in 2016. This will be the master programs of the college of engineering. For this program, a number of students will use the equipment. Furthermore, this laboratory is the place for exchanging of researchers (students, lecturers, or professors) that research of clean and renewable energy. The new equipment will be used to cater to study the conversion of energy from solar, wind, waste from agriculture generates clean

No	Laboratories with Major Items of Equipment	Linkage with the research themes
		power, stable energy source, using waste from the source to reduce agricultural pollution; Applying this research to use solar energy in the household; research using wind energy for the shrimp farms in the Mekong Delta. Research on transmission system performance to a new energy saving, monitoring solutions, energy savings for industrial plants, residential and public lighting.
17	Center for Pilot Demonstration - Recycling model, automatic classification - Dust and air pollution processing model_	- In the Mekong Delta, the water issues related to safety water supply and water protection have been concerned in the last decade. The fast industrialization and urbanization in the region caused environmental problems related water sources e.g. groundwater declines in both quality and quantity, wastewater generation from fish pond and fish processing or other industrialized processing. For that reason, research on clean water supply related to water treatment and groundwater treatment will be the most interesting issue related water sources. Wastewater treatment, especially for the main stream of wastewater from fish pond and fish/food processing, is also important issue. - Renewable energy is also one of the most interesting aspects in Vietnam. We are focusing on the biogas production and biogas use (e.g. lighting, biogas engine). Moreover, available rich solar energy in the Mekong Delta needs to be used as renewable energy source as an alternative. - Waste recycling, one priority issue of 3R. There is lack of research in this field in the past. However, there are more research related to waste recycling is established by the PhD student and researchers in our College.

Hoa An Technology Transfer Center

No	Major Items of Equipment	Supporting activities
1	1) Applied lab: Protein electrophoresis system, PCR machine Ion Chromatography System 2) Technology transfer: audiovisual equipment 3) Lecture rooms: PCs, audiovisual equipment	To collect data and conduct experiments, To make lectures

Governance

No	Major Items of Equipment	Supporting activities
1	1) Library: Library management software 2) Governance & Management: High speed Copier, High Speed Scanners, and A3/A4 Printers	To improve collecting reference through library management, and To share the information with students and researchers.

IETC

No	Major Items of Equipment	Supporting activities
1	1) Multimedia room : Audio System 2) Video conferencing: Multimedia Recording & Streaming Server 3) Auditorium: Audio System	To carry out lectures, and to hold a video conferencing and an international conference to present results of research works and so on.

IT Development

CTU plans to develop the present IT system to apply a cloud computing system, which will enable each faculty to secure required capacity in the main server. Researchers and students can store experiments and measurement data in the PC and can make data processing and then can access the virtual server which is

dedicated for each faculty to accumulate and share the data in and at the same time the data is tentatively stored in the server of each faculty as back-up. Besides, wireless network will cover the whole CTU. Major items of IT equipment are show in the following table.

No	Major Items of Equipment	Supporting activities
1	Blade System Enclosure for Blade Server, High Performance Blade servers, and Wireless network system	To store and share the experiments and measurement data among researchers in CTU, and To provide wireless internet service to researchers and students mainly for this project area.

Notes:) indicates lab no. in the equipment list

Appendix 4-11

Major Equipment and Laboratory Functions

CAAB

No.	Labs /Major Equipment	Major Laboratory Functions
1	Plant Molecular Genetics: -Biophotometer Plus -Realtime PCR system -Gel documentation system	To conduct research works and practical training focusing on evaluation of varieties in molecular level, identification of hybrid lines/cultivars, determination of genetic segregation rules, evaluation of genetic diversity, and marker assisted selection (MAS), and To supply the basic information for varietal improvement and new plant breeding in Mekong Delta of Vietnam.
2	Plant Breeding - Centrifuge - Microscope (Fluorescence microscope)	To undertake practical training, in rice research, for undergraduate students and post- graduate students, To conduct the research on crop, focusing on fruit trees such as, Mango, Okra, and Pomelo, and To conduct research works for theses, based on techniques waxy protein for selection (rice quality) accompanied with agronomical traits (high yield).
3	Seed Technology - Seed germination chamber - Cool storage room	To develop in parallel with seed tech techniques, to solve quality problems, in accompany with plant breeding lab, To carry experiments, analyzing on quality of crops such as, Rice, Mango, Okra, and Pomelo, and To train undergraduate students and post- graduate students for practical theses particularly in rice research, based on techniques waxy protein for selection (rice quality) accompanied with agronomical traits (high yield).
4	Cell Biotechnology - ELISA system - Bioreactor air lift bubble -Three dimensional fluorescence microscopy	To undertake practical training for under-graduate and master degree students for tissue culture, and To conduct research works related to Plant Physiology and Biochemistry departments.
5	Applied Biological Science -Supercritical CO2 extraction system - High Performance liquid chromatography - Freeze dryer	To undertake practical training for under-graduate and master degree students with analytic methodology, and To conduct research works by collection, isolation and identification of local plants and micro-organism-derived compounds for agricultural and medical utility with specific research topics.
6	Plant and Animal Biochemistry -Low-pressure chromatography systems -Nucleic Acid Electrophoresis and Blotting -Fluorescence spectrophotometer	To conduct with some simple equipment for practical training for under-graduate and master degree students, and To carry out research themes on natural biological active compounds and proteins/enzymes in agricultural production, pharmaceutical, and medical applications.
7	Plant physiology -photosynthesis measurement -Colorimeter -Hand-held photosynthesis system	To undertake practical training for under-graduate and master degree students, and To conduct as a fundamental agriculture lab, the research works on: (1) Control of crop physiological processes in relation to genetic, enzymatic, hormonal and phytochrome systems, (2) Crop water status, nutrition and energy metabolism in relation to yield, (3) Photosynthesis, transport, and accumulation of photosynthesis, (4) Use of plant growth regulators in agriculture, (5) Crop growth and development in relation to environment, and

No.	Labs /Major Equipment	Major Laboratory Functions
		(6) Stresses and their effects on crop growth, adaptations, and acclimatization.
8	Soil Chemistry - IC (Ion chromatography) - TOC analyzer - Microwave sample digester - Dumas analyzer	To undertake both students training and research activities, focusing on the chemical properties of different soil types located in different ecological zones in relation to sustainable uses of soil for agricultural production in the Mekong delta. The main teaching and research areas consist of: (1) Nutrient cycling under different cropping systems and soil management, (2) Mechanisms and amelioration of inorganic and organic pollutants in soil and in ground water/ surface water, (3) Changes in soil physicochemical properties in the paddies under intensive and mono rice cropping systems and in the orchards under long-term use of inorganic fertilizers, (4) Changes of soil chemical properties under extreme conditions (saline intrusion, drought, flooding) caused by climate change and adaptation strategies, and (5) Fluxes of greenhouse gases in different cropping systems related to soil types and management.
9	Soil Physics -Electric transducer tension-meter -Mercury manometer tension-meter - Fume hood	To provide practical training basic course of soil physics for under-graduate and advanced course of soil physics for graduate students of the following teaching programs: Soil Science, Land management, Crop Science, Agronomy, Plant Protection, Plant Breeding, Ornamental Plant Science.
10	Soil Microbiology -	To provide practical training and research activities for thesis researches for undergraduate students, master students and PhD students.
11	Soil Classification & Micromorphology -X-ray diffractor (XRD) -Digitizers - GPS -Microscope	The functions of the labs for Soil Chemistry, Soil Physics and Soil Microbiology are as follows: - To provide undergraduate programs and also offer graduate programs at two degrees: Master of Soil Science degree and Doctor of Philosophy degree in Soil Science, - To understand major soil forming processes in the Mekong Delta and enhance soil mapping and soil classification skills for better management of soils in the Mekong Delta of Vietnam, The function of Soil Classification and Micromorphology Lab: - To offer facilities for both teaching and research activities, focuses on soil forming process, soil classification and soil mapping.
12	Biological and Chemical Technology in Plant Protection	To conduct research works on identification, synthesis and application of natural compounds, named semiochemicals, which keep a role in communication between organisms relating to solution of pesticide residue contamination issue.
13	Plant Pathology -Temperature-controlled centrifuge -Pulse power or electroporation	To serve for teaching and researches for undergraduate, master and PhD students in plant protection.

No.	Labs /Major Equipment	Major Laboratory Functions
14	Entomology - Millipore machine - Incubator	To serve for undergraduate students and research works for these three divisions: 1) Biological control of pest insects, 2) Biological control of plant pathogen, and 3) Biological control of weeds.
15	Biological Control - Incubator - Temperature-controlled shaker	To serve for teaching and researches for undergraduate, master and PhD students in Biological Control.
16	Rice research - Fully Motorized Rotary Microtome - Tissue processor - Autostainer	To undertake research and teaching activities: 1) Practical session of the Plant nutrition unit to train undergraduate students, and 2) Regarding research activities, to conduct rice quality analyzing (hard extension, quality of grain, N, P, K content, and so on).
17	Edible and Pharmaceutical Mushroom	To undertake research and teaching activities as an option credit for agricultural students. Nowadays the need from the society and the use of agricultural wastes has become a compulsory credit in the crop science course.
18	Horticulture Science -Microwave extractor - Autoclave - Digital Microscope Camera	To conduct research and teaching activities: 1) Practical session of the Plant nutrition unit for undergraduate students, and 2) Regarding research activities; to serve for fruit and vegetable quality analyzing.
19	Animal Biotechnology and Molecular Biology -Temperature-controlled shaker -Cell transporter type II -Automatic irrigator for collecting embryo	To provide practical training for undergraduate and master students whose majors on the subjects of Animal molecular Genetics, Animal Biotechnology, Animal genetics, Agricultural Biotechnology, and To conduct research themes focusing on enhancing of the quality of breeding animals to improve animal production and increase the competitiveness of animal breeds of the Mekong Delta at national and international markets.
20	Animal Anatomy and Physiology - Analox - Cattle anatomy model - Pig skeleton model	To provide practical training for under-graduate and master degree students which study on anatomy and physiology of domestic animals, To conduct the research theme mainly focusing on physiological and biochemical criteria, nutrients, hormones in body fluid under different feeding systems and environmental conditions influencing on growth and reproductive performance of animals, and To conduct also systematic and comparative anatomy of mammals.
21	Animal Nutrition and Feed Technology -Kjeldahl Digestion apparatus - Distillators - Fiber analysis system,	To provide practical training of undergraduate and graduate and postgraduate students. The major function is Feed evaluation of this lab.
22	Non-ruminant Animal Production Techniques -Testing machine - Automatic Isoperibol Calorimeter - Ultra centrifugal Mill	To provide practical training, researching on nutrition and feeding trials, analyzing data of feeding trial, quality of pig, poultry, egg production, and To conduct some other simple research works on feed resources, feeding and animal performance.
23	Ruminant Animal Production Techniques	To provide practical training for under-graduate and graduated students with the basic equipment items,

No.	Labs /Major Equipment	Major Laboratory Functions
	- Infrared milk analyze - Biogas analyzer - CH4/N2O analyzer for environment	mainly for evaluation on feed resources, feeding and ruminant performance and GHG production in in-vitro, and To study on methane production from cattle in in-vivo with a small room and respiration hoods on project basis.
24	Experimental Animal Unit -Artificial insemination instrument - Printing machine for semen tube - Automatic sperm counter	1) To conserve and develop genetic resource of indigenous animals with high disease resistance, good meat quality which have not been researched yet, and (ii) To provide means and animal models to practice, train, study, research, for students at different levels and staff members.
25	Hygiene and Safety of Animal-based Food - Biosecurity clean bench Class II - Refrigerator -80 C -NanoDrop Spectrophotometer	To provide practical training, experimental theses for under-graduate, master degree and doctor students, and To carry out research works especially in molecular analysis related zoonosis diseases.
26	Histology and Molecular Pathology - Pathology workstations - Tissue embedding system -Automatic rotary microtome	To perform research woks focusing on enhancing advanced scientific research in veterinary histology and molecular pathology by bioscience application for the purposes of grouping various research themes, and To perform new diagnostic alternatives for infectious diseases by histology and molecular diagnostics in MD.
27	Veterinary Pharmacology - Dual-Action Shakers - Atomizing dryer - Karl Fisher titrator	To provide practical training for under-graduate and master degree students and also PhD degree students, and To aim in the future to provide practical training for Veterinary pharmacology, and a new program, including new courses such as Drug quality control, Veterinary Pharmacology, Veterinary pharmaceutics and bio-pharmacology, and Pharmaceutical chemistry.
28	Immunology and Epidemiology - Automated ELISA system - Automated ELISA system - Autoclave	To provide practical training for under-graduate and master degree students and also for researching in the areas of immunology, epidemiology, obstetric and artificial insemination.
29	Animal Clinic and Virology - 3D ultrasound scanner - Veterinary ultrasound scanner for small animal - Endoscope system	To provide practical training for undergraduate and postgraduate students as well as for doing scientific researches.
30	Parasitology - Deep freezer (-80oC) - Biological safty cabinet - Automatic ELISA	To provide practical training for under-graduate and master degree students and also for researching., To obtain conclusion about diseases and having immediate medication as major function of this lab.
31	Veterinary Bacteriology and Mycology - CO2 incubator - Refrigerated centrifuge - Thermal cycler, PCR	To conduct identification, quantification and antibiotic-susceptible tests of common microorganisms in veterinary for example (detection, quantification food-borne pathogens on animal, animal products, slaughterhouses, environment and so on). To carry out several urgent research topics, particularly boosting molecular research in antibiotic resistance and virulence; surveillance of viral-bacterial co-infection and its impacts; establishment rapid diagnostic and detection methods caused by bacteria; and mycotoxin in animal feed in Mekong Delta.
32	Food Nutrition - HPLC system auto-sampler	To perform the research focusing on nutrition across the life course, such as nutrition on specific stages of the

No.	Labs /Major Equipment	Major Laboratory Functions
	-Laboratory High Temperature Muffle Furnace -Bomb calorimeter	lifecycle, such as on complementary feeding and on nutrition of school age children, contribute in improvement of community life quality, and. To perform research relating to nutrition, exercise metabolism and multidisciplinary research studies as a research-based laboratory.
33	Food Chemistry - Freezer -High performance anion exchange chromatography (HPAEC) - LECO C-H-N analyzer	To train practically in the laboratory for the Food chemistry course about determination methods of food compositions (protein, starch, sugar, lipid, water...). for the undergraduate and master programs of Food technology, and To perform experiments for food chemistry such as determination of food compositions, food bioactive compounds (vitamin C, anthocyanin, polyphenol), Physic-Chemistry properties and functionality of starch, and enzyme activities (amylase, pectinase, protease, phenolase) by undergraduate and master students (Food technology and Postharvest technology), as well as, doctoral students (Food technology) .
34	Food Microbiology - Nucleic acid extractor by magnet technology - Ultra centrifuge - Micro-plate reader	To provide practical training for under-graduate and master degree students as well as PhD students for Food Microbiology.
35	Food Technology - Freeze dryer - Vacuum mincer - Vacuum mixer	To provide practical training for under-graduate, master degree and PhD students, and To research by lecturers and professors.
36	Postharvest Technology - GC-ECD - Freezer - Spectrofluorometer	To function as a research unit for a combination of MSc thesis works and MSc courses practice of the Postharvest Technology MSc program, To support sometimes the MSc and BSc thesis works of Food Technology programs, and To support the research activities linking to different postharvest research projects funded by Mekong delta authorities as their requirement.
37	Food Process Engineering - Heat pump dryer - Membrane Separation Unit - Filter press	To apply engineering principles to the storage, processing and distribution of food materials and their bio-products, and To conduct: - Teaching: supply for student the knowledge in field of fluid mechanics, heat and mass transfer, physical properties of food, food machinery, and - Researching: Physical properties of food in relation to quality of food, thermal processing of food in relate to quality of products, food safety and energy saving, 3D product temperature distribution in large process room i.e. cooking chamber, frozen storage room, cooling storage room to maintain the uniformity of products.
38	Food Biotechnology - LC/MS - Autoclave -Process Controlled Bioreactor	To provide practical training on food microbiology practice course, food chemistry practice course and for research as well, and To carry out research activities focusing on various topics like enzyme production and application in food processing, studying on protein hydrolysis, germinated brown rice and biochemical studies and antibiotic resistance bacteria.

No.	Labs /Major Equipment	Major Laboratory Functions
39	Molecular Biology: -Next generation DNA sequencer -Real time PCR	To function as a shared lab (both research- and basic-lab functions), To carryout Teaching practical courses for BSc, Master courses, To carry out research works on: - Development of biodiversity and basic gene database and classification systems of biological resources including plants, animals, and microorganisms; - Germplasm collection, breeding (traditional methods and transformation), and marker-aided selection of major crops, e.g., rice, soybean, etc.; - Application of molecular techniques in detection and identification of plant, fish, and animal pathogens and other beneficial microorganisms; and - Sustainable control of plant pests by environmentally friendly means to take part in the GAP (Good Agricultural Practices) model, To serve as a common place for molecular works of CTU (BiRDI and other Colleges/Units): those of the staffs, PhD students, and MS/BS students having molecular works in their theses, and To offer services: DNA sequencing, detection and identification of microorganisms.
40	40. Stem Cell -DNA Sequencer - Real-Time PCR - Fluorescent Microscop	There is no current activity since this laboratory will be established newly through this project. It is planned to function as a research and technology transfer center of Mekong Delta.
41	Protein Technology and Natural Product -Peptide Synthesizer - HPLC system	To function as a shared lab (both research- and basic-lab functions), To carryout teaching practical courses for BSc, Master courses, To carry out research works on: Studying the protein, enzyme and natural products which are extracted from plants, animals, fungi and bacteria... then identified and purified them to applications for science and life, To serve as a common place for protein, enzyme and natural product works of CTU (BiRDI and other Colleges/Units): by staff members, PhD students, and MS/BS students having there researches, and To offer services: Protein and enzyme analysis and extraction of natural products.
42	Gene bank - Quality Grain inspector - Growth chamber	To perform research and practical training in rice genetic and plant breeding field, and To store rice seed, evaluate genetic diversity, and quality and to breed new varieties in rice and root crops.
43	Materials and Molecular Modeling -First computer system (normal system) -Second computer system (fat system) -Host machine	There is no current activity since this laboratory will be established newly through this project. It is planned: To function as a multidisciplinary research center that belongs to Department of Chemical Engineering, College of Engineering Technology, Can Tho University, Vietnam, and To focus on frontier researches in major areas: environmental chemistry, materials for storage and adsorption of CO2, materials for hydrogen energy.

No.	Labs /Major Equipment	Major Laboratory Functions
44	Agricultural and Aqua-cultural Engineering -DIC system -Data acquisition system	To provide practical training for undergraduate students, To carry out the research project for feasibility study on rice growing method by trans-planter, and To perform other university projects in the post-harvest technology, farm machinery, agricultural logistics for higher value chain of agricultural products and automation in agriculture.
45	Material Engineering -CNC Turning -CNC Milling - Universal lathe machine - Universal milling machine	To provide practical training of BSc students, and To carry out research works by students and lecturers, focusing on metal material testing and heat treatment technology for metal as the main topic.

CAF

No	Labs /Major Equipment	Major Laboratory Functions
1	Genetics and selective breeding: -Bioanalyzer,	To study to improve aquatics seed quality and aquaculture production, particularly of valuable indigenous species, To teach and research on applied genetics in aquaculture such as fish identification, breeding program, and applied molecular genetics, and To provide practical courses on Fish Genetic and selective breeding (BSc.), Genetics in Aquaculture (MSc), and Fish population genetics and enhancement (MSc).
2	Bio-Chemis-Pharma -Micro plate reader -Preparative Liquid chromatography -Vacuum rotary evaporator	To develop eco-friendly supplements to reduce drugs and chemicals used for aquaculture, and To develop natural bioactive products as functional food for human and for aquaculture.
3	Fish Biology -Amino acid analyzer -Kjeldahl analysis system	To provide teaching, research and out-reach activities on aquatic eco-toxicology, physiology and nutrition, and To conduct practical courses on aquatic physiology, nutrition and toxicology for bachelor and master students as well as doctorate students.
4	Product Processing -Atomic Absorption Spectrophotometer (AAS) -High performance liquid chromatography (HPLC)	To provide teaching, research and out-reach activities on processing technologies and food safety, and To provide bachelor educational program on Aquatic Products Processing.
5	Fish Pathology: -Realtime PCR	To provide lectures and conduct researches which cover most areas of aquatic pathology and spans both undergraduate and postgraduate levels.
6	Aquatic Environment: -Atomic Absorption Spectrophotometer (AAS) -Gas Chromatography (GC) -Fluorescence Spectrophotometer	A. Teaching and researching on water and sediment quality analysis with more than 20 water quality parameters, B. Teaching and researching on phytoplankton, periphyton, zooplankton, and zoo benthos qualitative and quantitative. C. Teaching on live food culture in aquaculture. D. Teaching and researching on probiotics in aquaculture. E. Teaching and researching on marine biology, marine biodiversity and marine conservation.

No	Labs /Major Equipment	Major Laboratory Functions
7	Fisheries Resources -Micro Grinding machine -Manual histological processing set	A. Practice courses on the basic methods of fish biology and fisheries biology, and also using for the bachelor and for master and PhD students B. Practice courses on the fish diversity, abundance, distribution and migration of the freshwater and marine fishes. C. Practice courses on the fish gears, fishing technology and fisheries management. D. The fish collection room using such as a mini-museum of the fisheries resources in the Mekong Delta. E. Advanced lab using for practice course on the fish stock assessment.
8	Wet lab (Hatchery) -Recirculation aquaculture production tanks for brood stock	To training student to know in many fields of aquaculture and fisheries. The hatcheries (Wet-Labs) are necessary to practice for students in order to gain skill and actual knowledge related to aquaculture and fisheries fields.
9	Other facilities and equipment -Books on Aquaculture	To refer to books and references in CAF library.
10	Materials engineering - Mixer - Tensile testing machine	To provide undergraduate and post-graduate education, and research.
11	Agricultural and Aqua-cultural Engineering Lab - Gear hobbling machine - Dynamic balancing machine	To research on designing and fabrication of aquaculture equipment.
12	Automation for Aqua-culture and Fisheries Laboratory -Equipment for monitoring control the environment	To promote students in practice of construction and installation of mechatronics and automation systems. To enhance studies for the construction of complex mechatronics systems, and to play an important role in supporting other units to implement control systems, mechatronics systems in related disciplines.
13,14	IT for Aquaculture and Fisheries: - High performance Server	To teach and research in advanced IT for many fields including Aquaculture and Fisheries.

CNEREs

No	Labs /Major Equipment	Major Laboratory Functions
1	GIS and Remote sensing -GPS two frequencies high accuracy (set)	To advance understanding of the Earth system sciences to use Earth observation methods by combining fundamental and applied research in the domain of remote sensing.
2	Land Resources - Spectrometer -Kjeldahl distillation	To teach practice and chemical studies in soil and land resources, To support the research and education on basic indicators of soil physical and chemical, To conduct service activities within the framework of the project and the teaching, research cooperation, and To teach graduate students, MSc and PhD students, intensive research depth in the field of management and exploitation of land resources.
3	Soil and Water Environment - TOC Analyzers - UV-VIS Spectrophotometer	To teach (graduate students and post-graduate students), and To research and analyze the parameters related to water & soil quality subjects

No	Labs /Major Equipment	Major Laboratory Functions
4	Environmental Biology -Environmental chamber - Centrifuge	To teach (graduate students and post-graduate students), researching, and To analyze the parameters related to biological subjects.
5	Environmental toxicology -Solid phase extraction system -Gas/solvent separator	To provide practical training course for under-graduate, master and PhD students in environmental science, and environmental management field.
6	Wastewater treatment -Ion Chromatography UV-VIS-NIR -Spectroscopy	To teach under graduates, and To research for possible techniques to treat water in the specific context of the Mekong Delta
7	Solids waste treatment - Elemental Analyzers -Automatic distillation unit for nitrogen determination	To serve for the analysis and evaluation of components and criteria pollutants from industrial waste and urban, and To teach under-graduated students.
8	Chemical Environmental Engineering -Oil in water Instrument -Vacuum tube Furnace	To serve practices of environmental chemistry for undergraduate student and other research-related activities, To provide the infrastructure needed for in-house research projects in the field of chemistry, and To provide support to the users (lecturers, students and researchers) for the purpose of testing wastewater quality indicators & treatment.
9	Hydraulics -Sentinel V ADCP -RTK_GPS	To support the undergraduate program of Water Resources Engineering, master programs of Integrated Coastal Management and Hydraulics Engineering.
10	Environmental Modeling - Powerful Desktop - Mike Software	To enhance the environmental simulation to support better management of the environment and natural resources in the Vietnamese Mekong Delta.
11	Advanced Techniques lab -ICP-MS - Chromatography ion machine	To provide in-situ measurement of toxicants, To provide data for estimate trend of toxicants in environment To make In-situ development intensive in agriculture, aquaculture activities and other threats To quantify the water resources nature of a current environmental system, To quantify changes of the agro-environmental zones, and To study the changes of water dynamics.
12	Climate Change and Environmental Observation -AMI (Airborne Multispectral Imager) -Network Analyzer	To observe and collect climate-related and environmental data, and To simulate water and land resources dynamics under different conditions with use of models.
13	Aquaculture & Environment Automation Lab -SCADA System -Automated Micromanipulation System	To conduct research works to improve the fish and shrimp raising process for aquaculture automation.
14	Environmental and Behavioral Economics Lab - Desktops - Software packages	To analyze economic efficiency of natural resources uses and problems in natural resource uses and management, To study the feasibility of the mitigation solutions for environmental and resource problems, and To study on the resilience and adaptive capacity of local residents in the context of environmental changes.
15	Air Pollution Control -UV - Visible NIR spectrophotometer	To serve for teaching and researching purposes. To study possible techniques to treat air pollutions in the specific context of the Vietnamese Mekong Delta.

No	Labs /Major Equipment	Major Laboratory Functions
	-Portable natural gas chromatograph	
16	Clean and Renewable Energy -Wind generator -Solar cell module	To research clean and renewable energy on electrochemistry for sustainable energy (fuel cell and Lithium ions batteries).
17	Center for Pilot Demonstration - Recycling model, automatic classification - Dust and air pollution processing model	To serve as new laboratories where students can learn or demonstrate their research result, and To serve for both teaching and research.

Appendix 4-12

Organization Modification for Each College

Existing		New (future plan)
Dep. Agricultural Genetics & Breeding		**Dep. Agricultural Genetics & Breeding**
Plant Genetics Lab	Modified	Plant Molecular Genetics Lab (Adv. Tech. Lab. Buid.)
Electrophoresis Lab	Modified	
Plant Breeding Research Lab	Modified	Plant Breeding (Adv. Tech. Lab. Buid.)
	New	Seed Technology (Adv. Tech. Lab. Buid.)

Faculty: CAAB

Existing		New (future plan)
Dep. Plant Physiology & Biochemistry		**Dep. Plant Physiology & Biochemistry**
Plant Physiology Lab	Modified	Plant Physiology Lab (CAAB)
Biochemistry Lab	Modified	Plant and Animal Biochemistry Lab (CAAB)
Tissue Culture Lab	Modified	Cell Biotechnology Lab (Adv. Tech. Lab. Buid.)
	New	Applied Biological Science Lab (Adv. Tech. Lab. Buid.)

Existing		New (future plan)
Dep. Soil Science		**Dep. Soil Science**
Soil Chemistry Lab	Modified	Soil Chemistry Lab (Adv. Tech. Lab. Buid.)
Soil Physics Lab	Modified	Soil Physics Lab (Adv. Tech. Lab. Buid.)
Soil Microbiology Lab	Modified	Soil Microbiology Lab (Adv. Tech. Lab. Buid.)
	New	Soil Classification and Micromorphology Lab (Adv. Tech. Lab. Buid.)

Existing		New (future plan)
Dep. Plant Protection		**Dep. Plant Protection**
Plant Pathology Lab	Modified	Plant Pathology Lab (CAAB)
Entomology Lab	Modified	Entomology Lab (CAAB)
Biological Control Lab	Modified	Biological Control Lab (CAAB)
	New	Biological and Chemical Technology in Plant Protection Lab (Adv. Tech. Lab. Buid.)

Existing		New (future plan)
Dep. Crop Science		**Dep. Crop Science**
Crop Science Lab	Modified	Horticulture Science Lab (CAAB)
	New	Rice Research Lab (Adv. Tech. Lab. Buid.)
	New	Edible and Pharmaceutical Mushroom Lab (Adv. Tech. Lab. Buid.)

Existing		New (future plan)
Dep. Animal Sciences		**Dep. Animal Sciences**
Anatomy Lab	Modified	Animal Anatomy and Physiology Lab (CAAB)
Animal Physiology Lab	Modified	
Genetics & Animal Breeding Lab	Modified	Animal Nutrition and Feed Technology Lab (CAAB)
Animal Feed Lab	Modified	
Animal Nutrition Lab	Modified	
Apiculture Lab	Modified	Non-ruminant Animal Production Techniques Lab (CAAB)
Animal Product Q/C Lab	Modified	
Special Zootechnology Lab	Modified	
	New	Ruminant Animal Production Techniques Lab (CAAB)
	New	Animal Biotechnology and Molecular Biology (Adv. Tech. Lab. Buid.)
	New	Experimental Animal Unit (Farm)

Existing		New (future plan)
Dep. Veterinary Medicine		**Dep. Veterinary Medicine**
Obstetrics & Artificial Insermination Lab	Modified	Veterinary Bacteriology and Mycology Lab (CAAB)
Microbiology & Immunology Lab	Modified	
Animal Pathology Lab	Modified	
Parasitic Disease Lab	Modified	Parasitology Lab (CAAB)
Infection & Parasitic Disease Lab	Modified	
Clinical Diganostic Lab	Modified	Animal Clinic and Virology Lab (Adv. Tech. Lab. Buid.)
Veterinary Clinic Lab		
Histology Lab	Modified	Histology and Molecular Pathology Lab (Adv. Tech. Lab. Buid.)
Animal Feed Hygiene Lab	Modified	Hygiene and Safety of Animal-based Food Lab (Adv. Tech. Lab. Buid.)
Pharmacology Lab	Modified	Veterinary Pharmacology (Adv. Tech. Lab. Buid.)
	New	Immunology and Epidemiology (Adv. Tech. Lab. Buid.)

Existing		New (future plan)
Dep. Food Technology		**Dep. Food Technology**
Food Technology Lab	Modified	Food Technology Lab (Bio-Tech Wing)
Postharvest Technology Lab	Modified	Postharvest Technology Lab (Bio-Tech Wing)
Food Process Engineering Lab	Modified	Food Process Engineering Lab (Bio-Tech Wing)
Food Biotechnology Lab	Modified	Food Biotechnology Lab (Bio-Tech Wing)
	New	Food Nutrition Lab (Bio-Tech Wing)
	New	Food Chemistry Lab (Bio-Tech Wing)
	New	Food Microbiology Lab (Bio-Tech Wing)
Pilot Plant 1	Modified	Cereal Processing Pilot Plant (Bio-Tech Wing)
Pilot Plant 2	Modified	Beverage Processing Pilot Plant (Bio-Tech Wing)
	New	Post Harvest Technology Pilot Plant (Bio-Tech Wing)
	New	Fish & Meat Processing Pilot Plant (Bio-Tech Wing)

Faculty : BiRDI

Existing		New (future plan)
Dep. Molecular Biotechnology		**Dep. Molecular Biotechnology**
Molecular Biology Lab	Modified	Molecular Biology Lab (Bio-Tech Wing)
Enzyme Technology Lab	Modified	Protein Technology and Natural Products Lab (Bio-Tech Wing)
	New	Stem Cell Lab (Adv. Tech. Building)

2. Faculty: CAF (College of Aquaculture and Fisheries)

Existing labs		New (future plan) labs
Department: Aquatic Nutrition and Products Processing		
Fish Nutrition Basic Lab	Modified	Fish Nutrition Basic Lab
Fish Physiology Basic Lab	Modified	Fish Physiology Basic Lab
Microbiology Basic Lab	Modified	Microbiology Basic Lab
Food Safety Basic Lab	Modified	Food Safety Basic Lab
Aquatic Product Processing Basic Techniques (CAF Area)	Modified	Aquatic Product Processing Basic Techniques (CAF Area)
	New	Fish Nutrition Research Lab
	New	Fish Physiology Research Lab
	New	Microbiology Research Lab

	New	Food Safety Research Lab
	New	Aquatic Product Processing Techniques Research Lab (CAF Area)

Existing labs		New (future plan) labs
Department: Aquatic pathology		
Bacteriology lab.	modified	Bacteriology lab.
Hictology lab.	modified	Hictology lab.
Virology lab	modified	Parasitology and Mycology lab.
Biotecnology	modified	PCR and Virology lab
Mycology	new	Immunology and tissue culture lab.
	new	Basis lab.

Existing labs		New (future plan) labs
Department: Applied Hydrobiology		
Plankton and Invertebrate Lab	Modified	Algae Toxins & Plankton/ Periphyton Biodiversity Lab
Live Food Study Lab	Modified	Live Food Study Lab
Probiotics Study Lab	Modified	Probiotics Study Lab
Marine Biology Lab	Modified	Marine Biodiversity & Bioactive Products Lab
Shrimp/Fish Taxonomy Lab		
Water Quality Study Lab	Modified	Water Quality/Aquatic Invertebrate/Fish Taxonomy Basic Lab
	New	Aquaculture Ponds Water/ Sediment Lab

Existing labs		New (future plan) labs
Department: Fisheries Management and Economics		
Fish Collection Room	modified	Fish Collection Room
	new	Fish Biology Lab
	new	Fish Distribution and Migration Lab (Fisheries Resources Lab)
	new	Fish Stock Assessment and Management Lab (Fishing Technology and Management Lab)
	new	Fish Population Dynamics Lab

Existing labs		New (future plan) labs
Department of Coastal Aquaculture and Department of Freshwater Aquaculture		
Brackish water wetlabs (hatcheries)	Modified	Brackish water wetlabs (hatcheries)
Freshwater wetlabs (hatcheries)	Modified	Freshwater wetlabs (hatcheries)
	Modified	Other research and practive wetlabs

Faculty: College of Natural Sciences (CoNS)

Existing labs		New (future plan) labs
Department: Biology		
	New	Advanced Equipments Lab
	New	Bioassay Lab
	New	Natural Products Chemistry Lab

Faculty: College of Environment and Natural Resources (CENREs)

EXISTING		NEW (future plan)
Department of Environmental Sciences		
Lab of Soil and Water Environment	Modified	Lab of Soil and Water Environment
Lab of Environmental Toxicology	Modified	Lab of Environmental Toxicology
Lab of Environmental Biology	Modified	Lab of Environmental Biology
	New	Lab of Advanced Techniquest Equipment

EXISTING		NEW (future plan)
Department of Environmental Engineering		
Lab of Solid Waste Treatment	Modified	Lab of Solid Waste Treatment
Lab of Wastewater Treatment	Modified	Lab of Wastewater Treatment
Lab of Chemical Environmental Engineering	Modified	Lab of Chemical Environmental Engineering
Lab of Microbiology in Environmental Engineering	New	Lab of Air Pollution Control
	New	Center for Pilot Demonstration

EXISTING		NEW (future plan)
Department of Land Resources		
Lab of GIS and Remote Sensing	Modified	Lab of GIS and Remote Sensing
Lab of Land Resources	Modified	Lab of Land Resources

EXISTING		NEW (future plan)
Department of Environment and Natural Resource Management		
Lab of Hydraulics	New	Lab of Environmental Modelling
	New	Lab of Climate Change and Environmental Observation

EXISTING		NEW (future plan)
Department of Water Resources		
	Modified	Lab of Hydraulics

Faculty: Shool of Economics - Business Aministration SEBA

EXISTING		NEW (future plan)	
1	Department of Agricultural Economics and Natural Resource and Environmental Economics	1	Department of Agricultural Economics
		2	Department of Natural Resource and Environmental Economics
		New	Lab of Environment and Behavioral Economics

Faculty: College of Engineering Technology CoET

Existing		New (future plan)	
Department of Electrical Engineering			
Electric Material lab.	modified	Electric Material lab.	High Voltage Lab.
Electrical Engineering lab.	modified	Electrical Engineering lab.	
Industrial Power lab.		Industrial Power lab.	
Measurement Techniques lab.		Measurement Techniques lab.	
Power Systems lab.	modified	Power Systems lab.	
Power Electronics and Electrical Drives lab.	modified	Power Electronics and Electrical Drives lab.	Power Converter Lab.
Protection Relay lab.	modified	Protection Relay lab.	Electric Circuit lab.
Electrical Skill lab.		Electrical Skill lab.	
	new	Elecrical machine design lab.	Analyze and simulation by ANSYS Maxwell; MotorSolve
	new	Power Plant lab	
	new	Clean and Renewable Energy Lab	

EXISTING		NEW (future plan)	
Department of Civil Engineering			
Construction Materials Lab.	modified	Construction Materials Lab.	Upgrading existing Lab. Focusing on utilizing agricultural waste to produce new building materials
Soil Mechanics Lab.	modified	Soil Mechanics Lab.	
Land Survey Lab.	modified	Land Survey Lab.	
Structural Engineering Lab.	modified	Structural Engineering Lab.	
	new	Geological engineering Lab.	
	new	Hydraulic Engineering Lab.	
	new	Road Engineering Lab.	
	new	Bridge Engineering Lab.	

EXISTING		NEW (future plan)	
Department of Chemical Engineering			
Inorganic Chemistry lab.		Inorganic Chemistry lab.	
Unit Operations in Chemical Engineering lab.	modified	Chemical Enigineering Lab.	
Organic Chemistry lab.	modified	Chemical Enigineering Lab.	
Polymer & Composite Materials lab.	modified	Material Engineering Lab.	
	new	Multifunctional Bio-Ecocompatible Material Lab	
	new	Multicomponent Polymer Lab	
	new	Advanced Materials lab.	
	new	Biomedical Engineering lab.	
	new	Materials and Molecular Modeling lab.	
	new	Chemical Enigneering Lab	
	new	Electrochemistry for sustainable energy lab.	Clean and Renewable Energy

EXISTING		NEW (future plan)	
Department of Mechanical Engineering			
Hydraulics and pneumatics technology		Pneumatics technology	
Material technology	modified	Material engineering	
Mechanical design	modified	Mechanical design	
CAD/CAM/CNC	modified	CNC workshop	
Thermal engineering		Thermal engineering	
Farm machinery	modified	Agricultural and aquacultural engineering	
Food processing technology		Food processing technology	
	new	Engineering vibration	

EXISTING		NEW (future plan)	
Department of Electronics and Telecommunication Engineering			
Open Lab		Open Lab	
Digital & Analog Circuits Lab		Digital & Analog Circuits Lab	
Digital Signal Processing Lab		Digital Signal Processing Lab	

Telecommunications Lab		Telecommunications Lab	
Microcontrolers & Microprocessors lab		Microcontrolers & Microprocessors lab	
FPGA & Embedded Systems Lab		FPGA & Embedded Systems Lab	
	new	Wireless Communications Lab	
	new	Telecommunications Switching & Transmission Systems Lab	
	new	Projects Lab	
	new	Computer Engineering Lab	

EXISTING NEW (future plan)

Department of Automation Technology			
Control Engineering Lab.		Control Engineering Lab.	
Mechatronics Lab.		Mechatronics Lab.	
Measurement and Sensors Lab.		Measurement and Sensors Lab.	
PLC and Industrial Network Lab.		PLC and Industrial Network Lab.	
Automation and Energy Management Lab.		Automation and Energy Management Lab.	
Open Lab.		Open Lab.	
	new	Automation in Aquaculture and Environment Lab.	

EXISTING NEW (future plan)

Department of Industrial Management			
Computer Lab		Computer Lab	
	new	Supply chain Lab	

Appendix 4-13

Candidate Equipment for Short Term Training as a Part of Procurement

CAAB

No	Laboratory	Description
1	1. Plant Molecular Genetics	Realtime PCR system
2	8. Soil Chemistry	TOC analyzer
3	10. Soil Microbiology	LC/MS
4	11. Soil Classification & Micromorphology	X-ray diffractor
5	39. Molecular Biology	DNA Sequencer
6	40. Stem Cell	Cell Separators from tissue
7	-ditto-	Fluorescent Microscope
8	41. Protein Technology and Natural Product	Peptide Synthesizer
9	-ditto-	Protein Extraction System
10	-ditto-	Protein Analyzer
11	42. Gene bank	Quality Grain inspector
12	44. Agricultural and Aqua-cultural Engineering Lab	Universal testing machine
13	-ditto-	Hydraulics training equipment set
14	-ditto-	DIC system
15	-ditto-	Data acquisition system
16	45. Material Engineering Lab	CNC Turning
17	-ditto-	CNC Milling
18	-ditto-	Universal lathe machine
19	-ditto-	Universal milling machine
20	-ditto-	Hydraulics shearing machine
21	-ditto-	Automated welding

CAF

No	Laboratory	Description
1	1 Genetics and selective breeding	Bioanalyser
2	2 Bio-Chemis- Pharma Technology	Microplate reader
3	-ditto-	Preparative LC (UV-Vis and ELSD detector)
4	4 Product Processing	Atomic Absorption Spectrophotometer
5	-ditto-	HPLCwith UVD/DAD
6	-ditto-	Bioreactor
7	5 Fish Pathology	Realtime PCR
8	6 Aquatic Environment	Automatic Total Nitrogen Analyzer
9	-ditto-	Shallow Water Multibeam system
10	-ditto-	Gas Chromatography
11	-ditto-	Fluorescence Spectrophotometer
12	7 Fisheries Resources	Electronic tag receiver
13	-ditto-	Hydroacoustic gear and software
14	8 Wet Lab (Hatchery)	Sand filter
15	-ditto-	Automatic water quality Testing systems
16	-ditto-	Camera and software for observation fish behavior
17	-ditto-	Microchip reader
19	-ditto-	Recirculation aquaculture production tanks for brood stock
20	-ditto-	Completed recirculating tank systems for nursing
22	-ditto-	Completed recirculating tank systems for grow-out
23	10 Material Engineering Lab	Mixer
24	-ditto-	Tensile testing machine
25	-ditto-	Large centrifuge
26	-ditto-	Falling dart impact tester for rigid plastic
27	11 Agricultural and Aqua-cultural Engineering Lab	Gear hobbling machine
28	-ditto-	Dynamic balancing machine

No	Laboratory	Description
29	-ditto-	Instrument system for data acquisition
30	12 Aquaculture & Environment Automation Lab	Equipment for monitoring control the environment of a industrial aquaculture ponds

CENREs

No	Laboratory	Description
1	Soil and Water Environment	TOC Analyzers
2	-ditto-	IC (Ion Chromatography)
3	Environmental Biology	Microscope (Fluorescent microscope)
4	-ditto-	Element analyzer and Isotope ratio mass spectrometer (EA-IRMS)
5	-ditto-	Continuous flow analyzer
6	-ditto-	C/N Analyzer
7	Wastewater treatment	Nano-filtration (aqueous media)
8	-ditto-	Nano-filtration (non-aqueous media)
9	-ditto-	Amino acid analysis system
10	Solids waste treatment	Elemental Analyzers
11	-ditto-	Twin-screw extruder
12	-ditto-	Aging tester by temperature
13	-ditto-	Aging tester by humidity and light
14	-ditto-	Aging tester by ozone
15	-ditto-	Gyratory compactor
16	Hydraulics	3D wave current meter
17	Advanced Techniques lab	ICP-MS
18	-ditto-	Chromatography ion machine
19	Climate Change and Environmental Observation	AMI (Airborne Multispectral Imager)
20	-ditto-	Network Analyzer
22	-ditto-	Agilent N9010A-513 EXA - Signal Analyzer
23	-ditto-	Quartus II Subscription Edition (Fixed subscription, Model Sim - Altera Edition software)
24	-ditto-	Spectrum Analyzer
25	-ditto-	Vector Signal Generator
26	-ditto-	Channel Portable Logic Analyzer
27	-ditto-	Series Dual Channel Power Meter
28	Aquaculture & Environment Automation Lab	SCADA System for supervisory control of water treatment process
29	-ditto-	Automated Micromanipulation System of Micro-Objects
30	-ditto-	SCADA system network in combination with GIS
31	Air Pollution Control	Exhaust gas analyzer
32	-ditto-	Nitrogen oxides, sulfur dioxide
33	Clean and Renewable Energy	Oxidation stability device

CoET & others

No	Laboratory	Description
1	5. Chemical Engineering	High performance liquid chromatography (HPLC)
2	-ditto-	Gas chromatography (GC)
3	-ditto-	Fiber-coupled Spectrophotometer
4	35. Multifunctional, Bio-Eco compatible materials	Microbial Oxidative Degradation Analyzer
5	36. Multicomponent Polymer Lab	Fluorescence Microscope
6	38. Electronic Circuit Lab	Telecommunications learning systems
7	-ditto-	PCB prototyping
8	-ditto-	Handheld RF Combination Analyzer

Appendix 4-14

Ratio of O&M Cost against Equipment Cost

AGRICULTURE

Equipment	Q'ty	Price/unit (USD)	Cost (USD)	Maintenance Expense	
				Spare Parts & Consumables	Expense
Next Seq 500 (Illumina)	1	450,640	450,640	Output kit	$7,500
Thermocycler, PCR (Realtime PCR system)	1	81,000	81,000	Probes, Focus panels, Single Assays, etc.	$3,000
LC/MS	1	75,000	75,000	Column, Reagents	$6,000
X-ray diffractor	1	50,000	50,000		$500
CNC Turning (150MS)	1	99,000	99,000	Tools	$5,000
CNC Milling (430FZS)	1	98,000	98,000	Tools	$5,000
HPLC (High-performance liquid chromatography) and accessories	1	60,000	60,000	Column, Reagents	$3,200
Spray Dryer	1	30,000	30,000	Micro tube holder, etc.	$2,100
Centrifuge	1	10,000	10,000	Rotor, Tubes	$550
High Performance liquid chromatography	1	45,000	45,000	Column, Reagents	$2,500
Freeze dryer	1	25,000	25,000	Micro tube holder, etc.	$5,000
High Performance Liquid Chromatography	1	50,000	50,000	Reagents	$2,500
Ultracentrifuge	1	21,900	21,900	Rotor, Tubes	$550
Temperature-controlled centrifuge	1	10,000	10,000	Rotor, Tubes	$2,100
Plate centrifuge	1	10,000	10,000	Micro plate	$1,200
Atomic absorption	1	120,000	120,000	-	$1,200
Centrifuge machine (16,000 g)	1	10,000	10,000	Rotor, Tubes	$550
Freeze dryer	1	20,000	20,000	Micro tube holder, etc.	$2,000
LC/MS	1	75,000	75,000	Column, Reagents	$3,500
Centrifuge, Digital-13000 RPM	1	10,000	10,000	Rotor, Tubes	$550
Clean benches	3	15,000	45,000	-	$450
Centrifuge specialized for separation of cells	1	22,000	22,000	Rotor, Tubes	$550
Qualty grain inspector	1	100,000	100,000	-	$2,000
Universal lathe machine	1	50,500	50,500	Tools	$1,250
Universal testing machine	1	50,000	50,000	Tools	$500
Universal milling machine	1	47,000	47,000	Tools	$1,250
Radial arm drilling machine	1	11,500	11,500	Tools	$2,000
Automated welding (welding robot)	1	43,500	43,500	Welding rod	$1,500

AQUACULTURE

Realtime PCR and accessories	1	85,000	85,000	Probes, Focus panels, Single Assays, etc.	$3,000
High performance liquid chromatography with UVD/DAD and fluorescence detector	1	90,000	90,000	Column, Reagents	$6,000
Vacuum refrigerated centrifuge	1	20,000	20,000	Rotor, Tubes	$550
Vacuum Freeze Dryer	1	20,000	20,000	Micro tube holder, etc.	$650
Nitrogen generator	1	14,375	14,375	Nitrogen	$800
Parafin emmbeding machine	1	30000	30,000	Parafin	$1,200

ENVIRONMENT

computer, projector and model simulation using computer	1	70,000	70,000	Lamp, Filter	$1,200
Fermentor	1	52,000	52,000	Sensor, Aseptic Joints	$2,200
Grinding machine for agricultural by products or waste	1	15,865	15,865	Grinding wheel	$1,200
Cutting Mill	1	21,000	21,000	Cutting tools	$500
Centrifuge (with temperature control)	1	18,000	18,000	Rotor, Tubes	$600

Total equipment cost	**¥215,627,970**	**Total Maintenance Cost**	**¥8,190,000**

Ratio (%) - Maintenance Cost against Equipment cost	**3.798**

Appendix 4-15

Breakdown of Personnel Expenses

Breakdown of Personnel Expenses (1,000 VND)

1. Personnel Increase Cost for CAAB

Staff members	Present Nos.	Wages/yr. VND	sub-total	Future Nos.	Wages/yr. VND	sub-total
Year	2013			2020		
Prof.	4	105,432	421,728	23	144,000	3,312,000
Asst. prof.	25	81,213	2,030,325	33	123,000	4,059,000
Lecturers	93	47,776	4,443,131	88	92,000	8,096,000
Total	122	-	6,895,184	144	-	15,467,000

2. Personnel Increase Plan for CAF

Staff members	Present Nos.	Wages/yr. VND	sub-total	Future Nos.	Wages/yr. VND	sub-total
Year	2013			2020		
Professors	1	105,432	105,432	12	144,000	1,728,000
Asst. prof.	12	81,213	974,556	20	123,000	2,460,000
Lecturers	42	47,776	2,006,575	51	92,000	4,692,000
Total	55	-	3,086,563	83	-	8,880,000

3. Personnel Increase Plan for CENREs

Staff members	Present Nos.	Wages/yr. VND	sub-total	Future Nos.	Wages/yr. VND	sub-total
Year	2013			2020		
Professors	1	105,432	105,432	6	144,000	864,000
Asst. prof.	8	81,213	649,704	17	123,000	2,091,000
Lecturers	46	47,776	2,197,678	35	92,000	3,220,000
Total	55	-	2,952,814	58	-	6,175,000

Appendix 4-16

Additional Equipment O&M Cost

Typical Advanced Research Equipment of CEOC

Equipment	Q'ty	O & M Fee/Yr. (JPY): (a)	Unit Price (JPY): (b)	(a)/(b) %
X-ray diffractor	1	¥150,000	¥15,000,000	1.0%
DNA Sequencer	1	¥1,351,000	¥45,064,000	3.0%
Cryopreservation system	1	¥600,000	¥6,000,000	10.0%
Bio-analyzer	1	¥502,500	¥7,500,000	6.7%
Micro plate reader	1	¥600,000	¥6,000,000	10.0%
IC (Ion chrotomography)	1	¥910,000	¥9,100,000	10.0%
HPLC (High-performance liquid chromatography)	1	¥995,000	¥9,950,000	10.0%
ICP-MS (Induced Couple Plasma-Mass Spectrometer)	1	¥3,800,000	¥38,000,000	10.0%
EA-IRMS (Element Analyzer and Isotope ratio Mass Spectrometer)	1	¥1,250,000	¥12,500,000	10.0%
TOC analyzer	1	¥960,000	¥9,600,000	10.0%
Total		¥11,118,500	¥158,714,000	

Appendix 4-17

PhD Opening Process

MINISTRY OF EDUCATION AND TRAINING
CAN THO UNIVERSITY

SOCIALIST REPUBLIC OF VIETNAM
Independence – Freedom – Happiness
----------***----------

Can Tho, date month year 2014

PROCEDURE ON ASSESSMENT AND APPROVAL OF PROPOSAL FOR OPENING NEW COURSE

Pursuant to Article 36, Chapter VIII of "Charter of Universities" promulgated together with Decision No. 58/2010/QĐ-TTg, dated September 22, 2010 of Prime Minister on stipulating power and responsibility of rectors' universities.

Pursuant to Article 5 of Circular No. 38/2010/TT-BGDĐT, dated December 22, 2010 providing the conditions, dossiers and process for permitting training, suspending enrolment or revoking decisions permitting the training of disciplines of master or doctorate degree;

Can Tho University stipulate procedure on assessment and approval of proposal for opening undergraduate course as follows:

I. Assessment of opening course conditions

1) Undergraduate training unit (generally called to be training unit, abbreviated to be TU) based on regulations of opening course conditions (Circular No. 38/2010/TT-BGDĐT dated December 22, 2010) (see on the Website of Graduate School) makes document on proposal for opening new course together with interpretation of satisfied conditions for opening course in order to submit Graduate School (GS).

2) GS will check up conditions, if such conditions are met with requirements, GS will submit document to Standing Council of Science and Training (a copy will be sent to TU) to be approved for opening course.

3) TU will appoint representative to present/ interpret to Standing Council of Science and Training on proposal for opening new course together with representative of Graduate School (TU will archive minutes of meeting which approves conditions for opening course made by Secretariat, Standing Council of Science and Training)

II. Compilation of proposal for opening course

1) When obtaining agreed minutes for opening new course, TU will compile proposal according to stipulated form of Ministry of Education and Training (see instructions of content and format regulations of proposal on the Website of Graduate School)

2) Submit proposal to Graduate School to read and make suggestions.

III. Assessment of proposal dossier

1) When proposal has been prepared in accordance with regulations of Ministry of Education and Training, Graduate School will make and submit document on forming Assessment Council for proposal dossier to Managing board (MB).

2) After MB agrees, TU will send expected list of members in the council (chairman, 2 opponents, member, and secretary), Graduate School will make decision on forming Assessment Council for proposal dossier based on the expected list and submit MB to approve.

3) After receiving decision on forming Assessment Council, Council's secretary will contact and send document to members (including 1 proposal draft volume, a dossier approving card and decision).

4) When Council makes meeting, draft committee will present main contents of proposal; members will give their ideas and chairman will make conclusion; secretary will record minutes and member's ideas in Council, collect dossier approving cards (5 cards).

5) TU will adjust the proposal according to Council's suggestions.

6) Secretary will check up the adjusted proposal and make presentation minutes of adjusted proposal as Council' suggestions, with signature of Chairman and secretary

7) Secretary submits the adjusted proposal and minutes (suggestion minutes of Council, adjusted presentation minutes, 5 dossier approving cards) to TU.

8) TU completes the adjusted proposal and relevant minutes, binds volume and submits to Graduate School (03 volumes to Department of Education and Training and 01 volume to Graduate School).

IV. Capacity assessment of training facility

1) Graduate Scholl will compile and submit MB to sign document on proposing Department of Education and Training to form Assessment Council of capacity assessment of training facility.

2) Graduate School gathers dossier (including 03 proposal volumes and document) to Department of Education and Training.

3) TU prepares necessary dossiers so that Department of Education and Training assesses (wages sheet of lecturers in list of opening course…)

4) After receiving replying document from Department of Education and Training, TU will adjust according to suggestions of Department of Education and Training, then print out and resent 01 volume to Department of Education and Training.

V. Assessment of training programs

1) Graduate Scholl will compile and submit to MB and Ministry of Education and Training on appointing assessment unit for training programs (implementing at the same time with proposal to Department of Education and Training).

2) After getting document on appointing assessment unit for training programs from Ministry of Education and Training, TU will contact with the assessment unit to preparation the form of Council.

3) After obtaining decision on forming Council, TU will contact with Council's secretary to send documents (including 05 proposal draft volumes, dossier approving cards and decision) to members of Council.

4) When Council makes meeting, secretary will record minutes and specific ideas from members in Council, collect dossier approving cards (5 cards).

5) TU will adjust the proposal according to Council's suggestions.

6) Secretary will check up the adjusted proposal and make presentation minutes of adjusted proposal as Council' suggestions, with signature of Chairman and secretary

7) Secretary submits the adjusted proposal and minutes (suggestion minutes of Council, adjusted presentation minutes, 5 dossier approving cards) to TU.

VI. Submission of proposal to Ministry of Education and Training

1) Graduate School compile Proposal to submit Ministry based on contents supplied by TU.

2) For proposal for opening Master course: TU will submit 06 proposal volumes to Graduate School to be approved by Ministry, permitting to open training course (03 volumes to Ministry, 01 volume to Ministry's specialists, 01 volume to Department of Education and Training and 01 volume archived at Graduate School).

3) For proposal for opening Doctoral course: TU will submit 06 proposal volumes to Graduate School to be approved by Ministry, permitting to open training course (04 volumes to Ministry, 01 volume to Ministry's specialists, 01 volume to Department of Education and Training and 01 volume archived at Graduate School)

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Appendix 4-18

Project Design Matrix (PDM) with Plan of Operation

Project Design Matrix of the Project for CTU Enhancement Project

Group targeted directly: Teaching and research staff of Can Tho University that involve in the fields of agriculture, aquaculture/fisheries, environment, and interdisciplinary fields

Version No. 2 of PDM

Project period: from October 2014 to September 2019

Targeted Area:

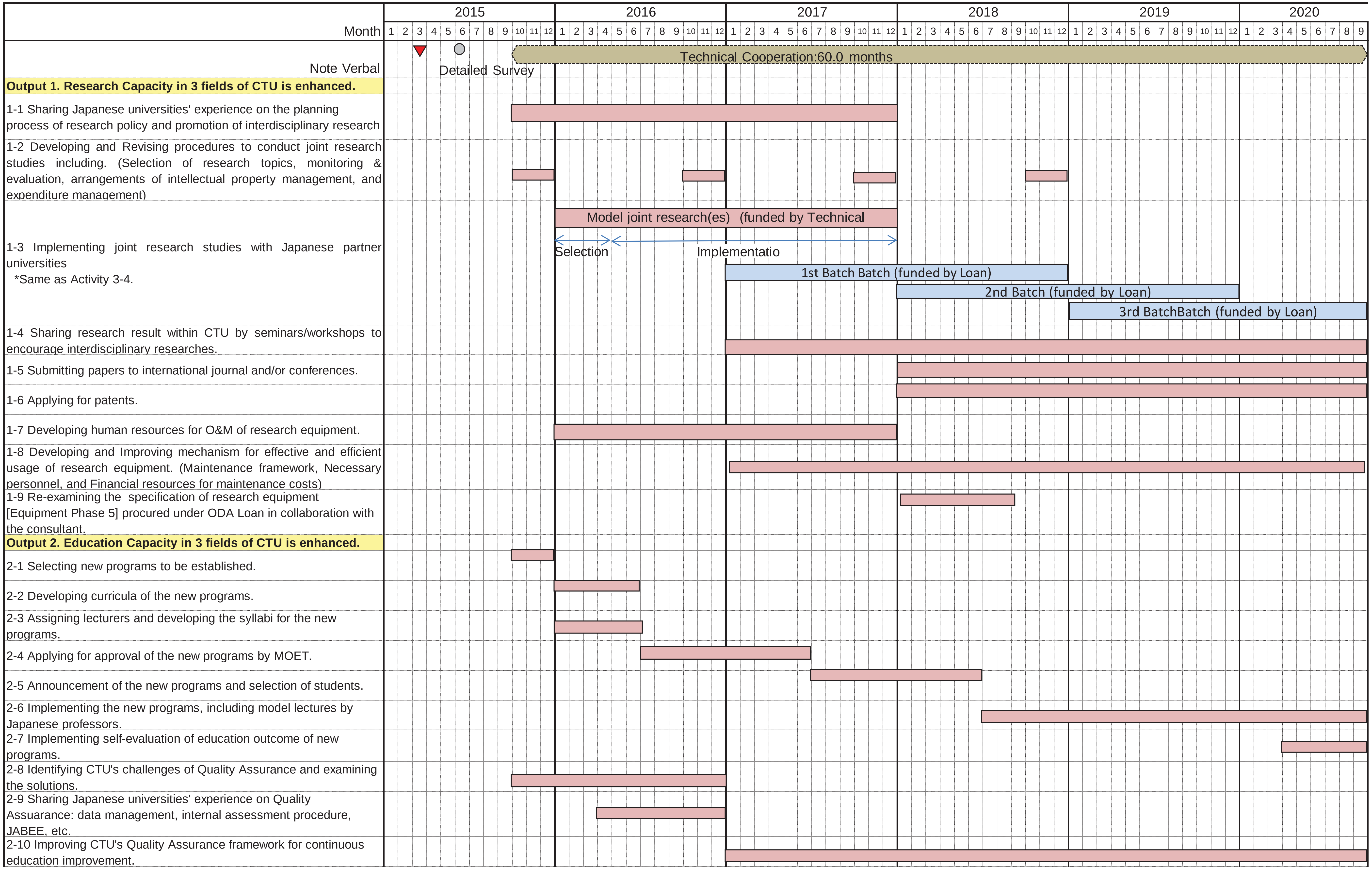
Group targeted indirectly:

Date: Aug. 27, 2014

Narrative Summary	Objectively Verifiable Indicators *	Means of verification	Important Assumptions
Overall Goal: Strengthen CTU's capacity to deliver high quality academic and research work in three fields (agriculture, fisheries/aquaculture and environment) and interdisciplinary fields, which result in contributing to climate change issues and value-added agriculture and aquaculture of Mekong Delta River	1. # of published papers in international journals 2. # of expansion in research network	1.CTU's report 2.CTU's report	
Project purpose: (After the project ends) Mechanism to enhance education and research capacity of CTU is established in agriculture, aquaculture/fisheries, environment, and the interdisciplinary fields, in order to be internationally recognized.	1. Presence of policies, manuals, and guidelines that have been created, modified and operated for implementation 2. Presence of modification of administrative procedures 3. Students satisfaction rate at education programs	1. Project Report 2. Project Report 3. Questionnaire Survey	There is no change in the policy of the Ministry of Education and Training-MOET for CTU to be a university that is internationally recognized one.
Outputs: 1. Research capacity in 3 fields of CTU is enhanced. 2. Education capacity in 3 fields of CTU is enhanced. 3. Governance capacity of CTU necessary for enhancement of research and education is strengthened.	1.1 # of staff receiving short term training 1.2 # of researchers and researches that have involved in joint research with Japanese partner universities 2.1 # of staff receiving short term training 2.2 # of education program introduced newly 2.3 # of model lecturers or presence of organized manuals 2.4 # of education programs receiving certified Quality Assurance (QA) 3.1 # of staff receiving short term training 3.2 Presence of proposed countermeasures	1.1 Project Report 1.2 Project Report 2.1 Project Report 2.2 Project Report 2.3 Project Report 2.4 Certificate of quality assurance 3.1 Project Report 3.2 Project Report	There is no significant change in the CTU strategy.
Activities: 1-1 Sharing Japanese universities' experience on the planning process of research policy and promotion of interdisciplinary research. 1-2 Developing and revising procedures to conduct joint research studies including selection of research topics, monitoring & evaluation, arrangements of intellectual property management and expenditure management. 1-3 Implementing joint research studies with Japanese partner universities. *Same as Activity 3-4. 1-4 Sharing research result within CTU by seminars/workshops to encourage interdisciplinary researches. 1-5 Submitting papers to international journal and/or conferences. 1-6 Applying for patents. 1-7 Developing human resources for O&M of research equipment. 1-8 Developing and improving mechanism for effective and efficient usage of research equipment. (maintenance framework, necessary personnel and financial resources for maintenance costs) 1-9 Re-examining the specification of research equipment. [Equipment Phase 4] procured under ODA loan in collaboration with the consultant 2-1 Selecting new programs to be established. 2-2 Developing curricula of the new programs. 2-3 Assigning lecturers and developing syllabi for the new programs. 2-4 Applying for approval of the new programs by MOET. 2-5 Announcement of the new programs and selection of students. 2-6 Implementing the new programs, including model lectures by Japanese professors. 2-7 Implementing self-evaluation of education outcome of new programs. 2-8 Identifying CTU's challenges of Quality Assurance and examining solutions. 2-9 Sharing Japanese universities' experience on Quality Assurance: data management, internal assessment procedure, JABEE etc. 2-10 Improving CTU's Quality Assurance framework for continuous education improvement. <Industry-government –academia collaboration> 3-1 Sharing Japanese universities' experience on industry-government –academia collaboration with related colleges of 3 fields. -Patent management, ways of the matching of needs and seeds, necessary personnel and organization, contract management, patent applications, profit sharing, etc. 3-2 Holding seminars/workshops to share seeds of 3 fields with industries. 3-3 Inviting industries' staff as guest lecturers to understand research needs of industries. 3-4 Implementing joint research studies with Japanese partner universities, with special attention to involvement of industries. *Same as Activity 1-5. 3-5 Developing/revising policy on industry-government-academia collaboration of 3 fields. <Personnel Affairs of CTU> 3-6 Sharing Japanese universities' experience on personal affairs. (incentives of researchers and supporting staff, recruitment policy, treatment, training content, recruitment/training of excellent staff and researchers). 3-7 Implementing short-term training of administrative staff necessary for enhancement of research and education capacity.	(Input) Japanese Side Dispatching experts Long term experts Chief advisor /education program Coordinator / research network) Short term experts Experts in three fields and governance/management based on necessity Training(s) in Japan Provision of minimum equipment and expense to conduct the project Vietnamese Side Arrangement of counterparts (C/Ps) personnel Preparation of facilities such as project office Bearing of local costs	1. Counterpart can spend enough time on the activities of the project. 2. The JICA loan project starts as scheduled. (Preconditions)

*Concrete numerical targets will be set to the above-mentioned indicators respectively through discussing with C/Ps after starting the Project.

Plan of Operation (PO) of Technical Cooperation Project (Tentative, as of August 2014)



Month	2015	2016	2017	2018	2019	2020
Output 3. Governance capacity of CTU necessary for enhancement of research and education capacity is enhanced.						
<Industry-government-academia collaboration >						
3-1 Sharing Japanese Universities' experience on Industry-government-academia collaboration with related colleges of 3 fields. -Patent management -Ways of the matching of needs and seeds -Necessary personnel and organization -Contract management -Patent applications -Profit sharing, etc						
3-2 Holding seminars/workshop to share seeds of 3 fields with industries.						
3-3 Inviting industries' staff as guest lecturers to understand research needs of industries						
3-4 Implementing joint research studies with Japanese partner universities, with special attention to involvement of industries. **Same as Activity 1-5.*			1st Batch Batch (funded by Loan)	2nd Batch (funded by Loan)	3rd BatchBatch (funded by Loan)	
3-5 Developing/Revising policy on Industry-government-academia collaboration of 3 fields.						
<Personnel Affairs of CTU >						
3-6 Sharing Japanese universities' experience on personnel affairs. (incentives of researchers and supporting staff, recruitment policy, treatment, training content, recruitment/training of excellent staff and researchers)						
<Administrative staff>						
3-7 Implementing short-term training of administrative staff necessary for enhancement of research and education capacity.						

Appendix 5-1

TOR for Consulting Services

Terms of Reference for Consulting Services on Implement Support for the Project for Strengthening Can Tho University to Be an Excellent Institution of Education, Scientific Research, and Technology Transfer

Chapter1. Background

The Government of Viet Nam has received a loan from the Japan International Cooperation Agency (hereinafter referred to as "JICA") to finance the (Name of the Project) which is to strengthen CTU as an excellent and internationally recognized institution in agriculture, aquaculture and environment and other interrelated fields, which will also contribute to the socio-economic development of the MDR and the country as a whole in a long run.

The Project comprises of the following components: (i) human resources development, (ii) research project, (iii) Facility development and (iv) Equipment development. The Government of Viet Nam intends to use part of the proceeds of the loan for eligible payments for consulting services for which this ToR is issued. The Project is expected to be completed by March, 2022. Location of the Project is Can Tho University in the Can Tho City, Viet Nam. Executive Agency is Can Tho University. To implement the Project, Project Management Unit (PMU) will be established. To smoothly and successfully implement the Project, a technical cooperation project will be implemented.

Chapter2. Objectives of Consulting Services

The consulting services shall be provided by an international consulting firm (hereinafter referred to as “the Consultant”) in association with national consultants in compliance with Guidelines for the Employment of Consultants under Japanese ODA Loans, April 2012. The objective of the consulting services is to achieve the efficient and proper preparation and implementation of the Project through the following works:

(1) Project Management/Project Implementation Support
(2) Training of Human Resources Development
(3) Academic Research Project Management
(4) Facility Planning and Construction Supervision
(5) Equipment Planning and Installation Supervision

Chapter3. Scope of Consulting Services

(1) Project Management/Project Implementation Support

The Consultant shall:

1) For overall project management,

(i) Manage, monitor and supervise all project activities and identify implementation issues and propose remedy actions to PMU;

(ii) Establish the effective reporting system to the concerned organizations and propose them to PMU;

(iii) Prepare project implementation and monitoring and evaluation frameworks and propose them to PMU; and

(iv) Assist PMU in

- communicating and coordinating with JICA, Japanese partners universities and the JICA technical cooperation project smoothly and timely,
- getting familiarized themselves with project implementation, financial management, procurement and contract management in accordance with the JICA’s operation policies and guidelines;
- Preparing the Project’s overall implementation plan and the annual project implementation plans (implementation plan by component, financial and disbursement plan) and the project monitoring and evaluation plan;
- Preparing detailed implementation plans by activity;
- Changing/revising/updating various project plans and documents ;

- Helping PMU's timely and effective disbursements of the Project cost;
- Fulfilling the requirements and preparing for the JICA's review/evaluation missions;
- Preparing for the Project Steering Committee meetings;
- and
- Preparing the key project reports including quarterly progress reports, the midterm report and the completion report.

2) For finance and disbursement management,
(i) Reviewing the capacity of PMU's Finance unit, setting up financial management system and providing training on JICA's procedures of finance and disbursement management to PMU staff; and
(ii) Helping PMU to prepare withdrawal applications and process other financial documents in accordance with JICA's regulations in a timely manner.

3) For project monitoring and evaluation,
(i) Assisting PMU in monitoring and evaluating the project's activities based on the developed operation and effect indicators;
(ii) Identifying changes in the project scopes and the implementation arrangements since appraisal, assess performance against indicators, and re-assess impact on implementation and sustainability; and
(iii) Building PMU's staff capacity and skills in project monitoring and evaluation

4) For procurement management,
(i) Assisting PMU in preparing procurement plan and procurement schedule;
(ii) Assisting PMU for tendering process;
(iii) Assisting PMU in preparing bid documents including evaluation criteria; and
(iv) Assisting PMU in bid evaluation and preparing evaluation reports

(2) Academic Coordination on Human Resources Development
The Consultant shall:
for Long Term Training,
(a) Provide information on research topics acceptable by Japanese universities
(b) Support for applications, admission and arrangement of visa and flight
(c) Implement Japanese language training courses before the visit to Japan
(d) Pick up CTU staff members at airports in Japan, and implement post arrival orientation
(e) Support for enrollment formalities and settle down in Japan such as registration of one's residence to local government, application of National Health Insurance, arrangement of accommodation and others
(f) Implement periodic monitoring meeting
(g) Support in emergency situations (sickness or accident)
(h) Support for vacating accommodation, and termination of public utilities and others.

For Short Term Training,
(a) Provide information on research topics acceptable by Japanese universities
(b) Coordinate with accepting universities
(c) Pick up CTU staff members at airports, and implement post arrival orientation

(3) Research Project Management
The Consultant shall:
(i) Assisting PMU in establishing a management system of research budget and managing research budget under the Project

(ii) Assisting PMU in identifying the suitable Japanese partner universities for research studies
(iii) Assisting PMU in reviewing and evaluating progress and results of research studies under the Project

(4) Facility Design

The Consultant shall the following services at each phase of their services:

(i) Schematic Design Work

- Previous Study Review: Reviewing SAPROF Report, other previous studies & Campus Master Plan, etc.
- Decrees and Regulations: Surveying the relevant decrees, regulations and standards to reflect the contents on the proposed buildings designs.
- Site Pre-Condition Analysis: Analyzing site's physical (geological/topological), legal and technical conditions. Implementing & reviewing soil condition & topographic conditions of the project sites.
- Infrastructure Analysis: Surveying site's current utility conditions/capacity, gathering application information.
- Operation (Research Plan) Analysis: Analyzing CTU's staff/visitors/supply flows and security systems.
- Design Strategy & Schedule: Preparing study strategy & Overall Project Implementation Schedule (OPIS)
- Functional Space Programming:
  - Existing Facilities Review: Reviewing existing buildings & obtaining CTU's requirements.
  - Use Conditions Analysis: Surveying use condition of the existing facilities & discussing with CTU staff to gather design requirements of the proposed facilities.
  - Activities Analysis: Reviewing and analyzing CTU's current/future research activities and staff allocations.
  - Functional Space Program (FSP): Studying room-by-room space needs and finalizing "Functional Space Program" (FSP) of the proposed facilities.
  - Stacking Plans: Preparing stacking plan showing sectional relationship and room adjacency.
- Schematic Design Stage
  - Cut Sheet: Preparing "Cut Sheet" of research laboratories illustrating equipment layout/utility requirements and discussing with CTU.
  - Scope of Facility Work: Finalizing scope of facility work (Demarcation of equipment/facility work).
  - Façade Design: Proposing façade design/color of buildings (with 3D rendering drawings).
  - Architectural Design: Finalizing site layout/design concepts/functional space programs/pre-conditions.
  - Structural Design: Making preliminary structural drawings and calculation sheets.
  - Electrical/mechanical Design: Making preliminary structural drawings and calculation sheets.
  - Design Development Drawings: Making design development drawings, and preparing all the necessary drawings to obtain "Basic Design Comments/Approval" permission.
  - Preliminary Costs Estimation: Estimating preliminary project/construction costs.
- Schematic Design Report: Gathering all study results and preparing Schematic Design Report to finalize the aforementioned study results & obtaining CTU's approval.
- Existing Facilities: Assisting PMU to demolish or relocate existing building on the proposed facilities' sites on schedule.

(ii) Detail Design Phase

- Ippan-zu Drawings: Preparing architectural base plans/sections/elevations/other major drawings.
- Finalization of Room Requirements: Finalizing equipment layout and utility requirements by confirming "Room Data Sheet".
- Design Conditions: Finalizing structural/electrical/mechanical design conditions.
- Construction Method Analysis: Surveying local construction and optimizing construction methods.
- Detailed Drawings: Preparing architectural/structural/electrical/mechanical and other necessary detailed drawings.
- Technical Calculation Sheet: Preparing structural/electrical/mechanical design calculation sheets.
- Cost Estimate:
  - Cost Information: Gathering information on building costs (Architectural, Structural, Electrical/mechanical and other related works).
  - Making B/Q and Costs: Calculating quantities of materials/labors of the proposed buildings, making Bill of Quantities (B/Q) and estimating project costs.
  - Operation & Maintenance Costs: Calculating operation & maintenance costs incurred by the proposed buildings and proposing operation & maintenance organization.
- Building Permission Drawings: Preparing necessary drawings to obtain following permissions:
  - Revision of 1/500 Master Plan Approval
  - Investment Approval
  - Basic Design Approval
  - Technical Design Approval

(iii) Tender Assistance Phase

- Tender Documentation: Preparing a set of tender documents (including Tender Procedure, Employer's Requirements and Conditions of Contract) in accordance with latest version of Standard Tender Documents under Japanese ODA Loans for Procurement of Works. Preparing a draft and final Contract Agreement documents.
- Tender Assistance: Assisting CTU (Executing Agency) to issue Tender Invitation, to conduct pre-tender conference, to issue Addendum and to prepare answers to tender questions.
- Tender Evaluation:
  - Evaluation: Evaluating the tenders in accordance with evaluation criteria set in the Tender Documents.
  - Report: Preparing a Tender Evaluation Report to obtain the Bid Evaluation Committee's approval.
- Negotiation Assistance: Assisting CTU (Executing Agency) to negotiate with candidate contractor by preparing Agenda and facilitating the negotiation with Minutes of Meetings, etc.

(iv) Construction Supervision Phase

- Supervision Policies: Discussing and explaining the consultant's construction supervision policies.
- Interpretation of Contract Documents:
  - Reviewing and grasping the contents of Contract Documents and design policies.
  - Approving construction work schedule.
- Briefing to Contractor: Conveying design policies correctly to Contractor and holding discussions with the Contractor
- Contractor's Work in Compliance with Contract Documents

- Reviewing progress of construction work based on approved construction schedule
- Reviewing construction work plan, construction drawings and shop drawings and making necessary advice and report to PMU
- Reviewing materials building equipment and finish samples of construction work.
- Reviewing interface between building construction work and research equipment work.

- Periodic Progress Report: Preparing the periodic progress reports to the CTU (Executing Agency).
- Inspections: Attending construction site inspections and the completion inspection.
- Variation Orders:
  Issuing variation orders and instructing the Contractor to undertake variations on a daywork basis, as stipulated in Tender Document.

(5) Equipment Planning

The Consultant will undertake the services in accordance with International Competitive Bidding (ICB) procedures stipulated in JICA guideline as follows:

(i) Schematic Design

- Reviewing JICA Preparatory Survey Report, other related Master Plans and surveys,
- Study of existing facilities
  Surveying existing facilities to confirm infrastructure situations of the proposed equipment installation sites, including room space, and utility conditions,
- Consolidating equipment specifications and other conditions based on the Preparatory Survey, and developing schematic design of the proposed equipment items, and
- Estimating equipment procurement costs, the operation & maintenance costs and preparing the Schematic Design Report.

(ii) Detail Design Phase

- Developing detailed design based on the schematic design, developing utility requirements, required equipment functions, equipment layout plan, scope of equipment work and the installation schedule following the facility work, and
- Calculating and adjusting equipment cost based on the detailed equipment plans, and preparing a project cost estimation report, and
- Preparing a set of the tender documents including Tender instructions, Technical specifications, General conditions and Layout drawings.

(iii) Tender Assistance Phase

- Assisting implementing the P/Q by using the evaluation and qualification criteria, and
- Soliciting tendering and its evaluation referring to the tender documents.

(iv) Equipment Installation Supervision.

- Supervising equipment work in accordance with the tender documents and other related documents, and
- Assisting in inspecting and commissioning in the equipment hand-over.

Chapter4. Expected Time Schedule

The total duration of consulting services will be 70 months followed by 12 months of defects liability period. The implementation schedule expected is as shown in Table 1.

Table 1: Expected Implementation Schedule

Key Activities	Date	Duration in Months
Commencement of Consulting Services	1 October 2015	
Human Resources Development		
PhD Studies in Japan (First Batch)	October 2016 to September 2019	36
PhD Studies in Japan (Second Batch)	October 2017 to September 2020	36
PhD Studies in Japan (Third Batch)	October 2018 to September 2021	36
Master's Study in Japan (First Batch)	October 2016 to September 2018	24
Master's Study in Japan (Second Batch)	October 2017 to September 2019	24
Master's Study in Japan (Third Batch)	October 2018 to September 2020	24
Short-term Training	January 2016 to March 2022	75
Research Project		
	January 2016 to March 2022	75
Civil Works		
Completion of detail design, preparation of drawings and tender documents	30 September 2016	11 (from commencement of consulting services)
Tender process including prequalification	1 October 2016 to 31 December 2017	15
Commencement of civil works	1 January 2018	32
End of civil works	31 August 2020	
Defect Liability Period	1 September 2020 to 31 August 2021	12
Equipment		
Completion of detailed design, preparation of drawings and tender documents (Phase-1 IT+ Basic Research equipment for existing facility+ Phase-2: Basic Research equipment for research lab complex, IETC, and Hoa An Campus + Phase-3: Basic Research equipment for Advanced Technology Research Lab Building)	30 September 2016	9 (from commencement of consulting services)
Completion of detailed design, preparation of drawings and tender documents (Phase-4: Research equipment for Advanced Technology Research Lab Building)	1 June 2018 to 31 October 2018	5
Tender process including prequalification for Phase -1, -2 & -3	1 August 2016 to 31 December 2017	17
Tender process including prequalification for Phase-4	1 September -2018 to 31 October 2019	14
Commencement of Equipment work for Phase-1	1 February 2018	8
End of Equipment work for Phase-1	30 September 2018	
Commencement of Equipment work for Phase-2	1 August 2018	9
End of Equipment work for Phase-2	30 April 2019	
Commencement of Equipment work for Phase-3 & Phase-4	1 December 2019	9
End of Equipment work for Phase-3 & Phase-4	31 August 2020	
Warranty Period for Phase 1	1 October 2018 to 30 September 2019	12
Warranty Period for Phase 2	1 May 2019 to 30 April 2020	12
Warranty Period for Phase 3 & 4	1 September 2020 to 31 August 2021	12
Termination of Consulting Services	31 December 2021	

Chapter5. Staffing (Expertise required)

22 Professional (A) consultants, 21 Professional (B1) consultants and 11 Professional (C) consultants will be engaged, over 70 months' duration of consulting services, for a total of 259 man-months for Professional (A), 260.5 man-months for Professional (B1) consultants and 342.0 man-months for Professional (C) consultants. Total consulting input is 861.5 man-months. A detailed schedule of consulting services and a distribution of man-months is shown in Attachment 1.

(1) Qualification of Key Team Members
The qualification of Key Team Members is shown in Table 2-1 and Table 2-2.

Table 2-1 : Qualification of Key Team Members (International Professionals)

Designation	Qualification
Project Management Specialist (Team Leader)	1) The consultant is required to have at least 15 years experiences in project management. 2) The consultant is required to have enough knowledge and experiences on/in implementation procedures of projects loaned by international development banks for procurement, contractual management, disbursements and monitoring and evaluation. 3) The consultant is required to have enough knowledge and experiences on/in coordination between or among Japanese universities and administration works for human resources development and/or for research promotion especially in foreign countries. 4) Experiences in education projects in Vietnam will be an asset. 5) Experiences with projects implemented by a combination of JICA loan and technical cooperation schemes are preferable. 6) The consultant is required to have excellent English communication skills.
Academic Coordinator in Japan	1) The consultant is required to have a thorough knowledge of and familiarity with the Japanese higher education system, university administration system, as well as acceptance of international students in Japan. 2) The consultant is required to have experience in formulating short-term training or other fellowship activities for trainees from foreign countries. 3) The consultant is required to have at least 10 years' experience in the management of sponsored fellowship programs or similar projects experience in higher education or human resource development sector.
Academic Coordinator in Vietnam	1) The consultant is required to have a thorough knowledge of and familiarity with the Japanese higher education system, university administration system, as well as acceptance of international students in Japan. 2) The consultant is required to have experience in recruitment and selection of international students in foreign countries for studying at graduate schools in Japan. 3) The consultant is required to have at least 8 years' experience in the management of sponsored fellowship programs or similar projects experience in higher education or human resource development sector.
Facility Design Team Leader	1) The consultant is required to be a licensed architect and to have at least 20 years of experience as a planner/designer of educational facilities 2) The consultant is required to have experiences in Japanese ODA Loan projects and to be strongly familiar with regulations/guidelines on ODA Loan projects. 3) The consultant is required to have a good command of English language and is able to work and effectively communicate in a multi-cultural environment.
Architect-1	1) The consultant is required to be a licensed architect and to have at least 15 years of experience as project architect of educational facilities. 2) The consultant is required to have a good command of English language and is able to work and effectively communicate in a multi-cultural environment.
Laboratory Design Specialist	1) The consultant is required to be a licensed architect and to have at least 15 years of experience in laboratory facilities including university research buildings. 2) The consultant is required to have a throughout knowledge of the advanced/standard laboratory facility design standard in Japanese and other developed countries.
Structural Engineer	1) The consultant is required to be a licensed structural engineer (1st Class Structural Engineer) with more than 10 years of experience in structural engineering design. 2) The consultant is required to have project experiences in Vietnam and to be strongly familiar with decrees/regulations/standards on structural design in Vietnam.
Electrical Engineer	1) The consultant is required to be a licensed electrical engineer with more than 10 years of experience in electrical engineering design. 2) The consultant is required to have project experiences in Vietnam and to be strongly familiar with decrees/regulations/standards on electrical engineering design in Vietnam.

Designation	Qualification
Mechanical Engineer	1) The consultant is required to be a licensed mechanical engineer (1st Class Mechanical Engineer) with more than 10 years of experience in mechanical engineering design. 2) The consultant is required to have project experiences in Vietnam and to be strongly familiar with decrees/regulations/standards on mechanical engineering design in Vietnam.
Equipment Planning Team Leader	Education: 1) Graduate in Engineering Experience: 1) Experience in equipment planning related field for more than 25-years in Japanese ODA projects, and for higher educational facilities in Asian countries.
Equipment Planner (Agriculture and other concerning field)	Education: 1) Graduate in Engineering Experience: 2) Experience in equipment planning for more than 15-years as an equipment planner of educational facilities.
Equipment Planner (Aquaculture, Fishery and other concerning field)	Education: 1) Graduate in Engineering Experience: 2) Experience in equipment planning for more than 15-years as an equipment planner of educational facilities.
Equipment Planner (IT)	Education: 1) Graduate in Engineering or Arts Experience: 2) Experience in IT equipment related field for more than 15-years as an IT equipment specialist of educational facilities in Asian countries.
Cost Expert	Education: 1) Graduate in Engineering or Arts Experience: 2) Experience in equipment cost estimate specialist with more than 10-year experiences in ODA projects, and survey(s) in Vietnam is desirable.
Installation Supervisor	Education: 1) Graduate in Engineering or Arts Experience: 1) Experience in equipment work supervision for more than 10yesras -in ODA projects.

Table 2-2: Qualification of Key Team Members (Local Professionals)

Designation	Qualification
Project Finance and Disbursement Management Specialist:	1) The consultant is required to have at least 15 years of experience in project finance and disbursement management in similar projects and/or projects in Vietnam. 2) The consultant is required to be familiar with regulations/guidelines on finance and disbursement management in ODA projects of the Vietnam Government and JICA. 3) The consultant is required to have a good command of English language and is able to work and effectively communicate in a multi-cultural environment.
Monitoring and Evaluation Specialist:	1) The consultant is required to have at least 15 years of experience in project monitoring and evaluation of similar projects and/or projects in Vietnam. 2) The consultant is required to be familiar with regulations/guidelines on monitoring and evaluation of ODA projects of the Vietnam Government and JICA. 3) The consultant is required to have a good command of English language and is able to work and effectively communicate in a multi-cultural environment
Procurement Specialist	1) The consultant is required to have at least 15 years of experience in tender assistance (preparation of bidding documents, evaluation reports and contract documents and so on) for equipment and civil works in similar projects and/or projects in Vietnam. 2) The consultant is required to be strongly familiar with regulations/guidelines on procurement of the Vietnam Government and JICA. 3) The consultant is required to have a good command of English language and is able to work and effectively communicate in a multi-cultural environment.

Designation	Qualification
Facility Design Team Leader (National)	1) The consultant is required to be a licensed architect in Vietnam and to have at least 20 years of experience as a planner/designer of large scale facility project. 2) The consultant is required to have experiences in public projects in Vietnam and to be strongly familiar with regulations/guidelines on public works in Vietnam. 3) The consultant is required to have a good command of English language and is able to work and effectively communicate in a multi-cultural environment.
Equipment and Procurement Planner	Education: 1) Graduate in Engineering Experience: 1) Experience in equipment planning and procurement for more than 10-years as an equipment planner of educational facilities.
Equipment Planner (Agriculture and other concerning field)	Education: 1) Graduate in Engineering, and Graduates of Agriculture is preferable Experience: 1) Experience in equipment planning for more than 10-years as an equipment planner of educational facilities. Experience of Agriculture related equipment work is preferable.
Equipment Planner (Aquaculture, Fishery and other concerning field)	Education: 1) Graduate in Engineering, and Graduates of Aquaculture is preferable. Experience: 1) Experience in equipment planning for more than 10-years as an equipment planner of educational facilities. Experience of Aquaculture related equipment work is preferable.
Equipment Planner (IT)	Education: 1) Graduate in Engineering, Graduates of IT, Electronics are preferable. Experience: 1) Experience in IT equipment related field for more than 5-years as an IT equipment specialist of educational facilities.
Cost Expert	Education: 1) Graduate in Engineering or Arts Experience: 1) Experience in cost estimation for more than 10 years on project basis.

Consultant may propose other experts and supporting staffs required to accomplish the tasks outlined in the ToR. It is the Consultant's responsibility to select the optimum team and to propose the professionals which he believes best meets the needs of Can Tho University.

(2) Scope of works for the respective personnel of key team members
Detailed information on the major tasks and duties of key team members is provided as follows:

Table 3: Scope of Works for the Respective Personnel of Key Team Members

No.	Position	I or L	Major Tasks and Duties
A-1	Project Management Specialist (Team Leader)	I (Pro-A)	1) Lead the consultant team. Ensure all deliverables are prepare in accordance with quality and time constraints; 2) Keep good working relationships between consultant team members, PMU and related organizations; 3) Manage, monitor and supervise all project activities and identify implementation issues and propose remedy actions to PMU 4) Establishing the effective reporting system to the concerned organizations and propose them to PMU 5) preparing project implementation and monitoring and evaluation frameworks and propose them to PMU 6) Assisting PMU in communicating and coordinating with JICA, Japanese partners universities and the JICA technical cooperation project smoothly and timely, 7) Assisting PMU in getting familiarized themselves with project implementation, financial management, procurement and contract management in accordance with the JICA's operation policies and guidelines; 8) Assisting PMU in preparing the Project's overall implementation plan and the annual project implementation plans (implementation plan by

No.	Position	I or L	Major Tasks and Duties
			component, financial and disbursement plan) and the project monitoring and evaluation plan; 9) Assisting PMU in preparing detailed implementation plans by activity; 10) Assisting PMU in changing/revising/updating various project plans and documents ; 11) Assisting PMU's timely and effective disbursements of the Project cost; 12) Assisting PMU in fulfilling the requirements and preparing for the JICA's review/evaluation missions; 13) Assisting PMU in preparing for the Project Steering Committee meetings; and 14) Assisting PMU in preparing the key project reports including quarterly progress reports, the midterm report and the completion report.
A-2	Academic Coordinator in Japan	I (Prof-A)	(1) Long-term degree training 1) Service before visiting Japan Provision of information on research topics acceptable by Japanese universities, support for admission applications and for arrangement of visa and flight, and implementation of Japanese language training courses before the visit to Japan. 2) Post arrival service Pick up at airports, implementation of post arrival orientation, and support for enrollment formalities and settle down in Japan (registration of one's residence to local government, application of National Health Insurance, arrangement of accommodation and others) 3) Implementation of monitoring meeting Implementation of periodic monitoring meetings, and support in emergency situations (sickness or accident). 4) Supporting service for return Support for vacating accommodation, and termination of public utilities and others. (2) Short-term research training 1) Provision of information on research topics acceptable by Japanese universities 2) Coordination with accepting universities 3) Post arrival service 4) Pick up at airports, implementation of post arrival orientation
A-3	Academic Coordinator in Vietnam	I (Prof-A)	(1) Long-term degree training 1) Service before visiting Japan Provision of information on research topics acceptable by Japanese universities, support for admission applications and for arrangement of visa and flight, and implementation of Japanese language training courses before the visit to Japan. (2) Short-term research training 1) Provision of information on research topics acceptable by Japanese universities 2) Coordination with accepting universities (3) Academic Research Project Management (i) Assisting PMU in establishing a management system of research budget and managing research budget under the Project (ii) Assisting PMU in identifying the suitable Japanese partner universities for research studies (iii) Assisting PMU in reviewing and evaluating progress and results of research studies under the Project
A-4	Facility Team Leader	I (Prof-A)	1) Lead the engineering team. Ensure all deliverables are prepare in accordance with quality and time constraints; 2) Review SAPROF Report, other previous studies & Campus Master Plan, etc;

No.	Position	I or L	Major Tasks and Duties
			3) Survey the relevant decrees, regulations and standards to reflect the contents on the proposed buildings designs: 4) Analyze site's physical (geological/topological), legal and technical conditions. Implementing & reviewing soil condition & topographic conditions of the project sites; 5) Preparing study strategy & Overall Project Implementation Schedule (OPIS); 6) Lead to prepare room-by-room space needs and finalizing "Functional Space Program" (FSP) of the proposed facilities; 7) Finalize scope of facility work (demarcation of equipment/facility work); 8) Lead to Finalize site layout/design concepts/functional space programs/pre-conditions; 9) Lead to prepare design development drawings, and preparing all the necessary drawings to obtain "Basic Design Comments/Approval" permission; 10) Lead to estimate preliminary project/construction costs; 11) Gather all study results and prepare Schematic Design Report to finalize the aforementioned study results & obtaining CTU's approval; 12) Ensure all the design to be complied with EIA requirements and other environmental requirements set by CTU and other authorities; 13) Lead to finalize detailed design work; 14) Lead to calculate quantities of materials/labors of the proposed buildings, prepare Bill of Quantities (B/Q) and estimate project costs; 15) Lead to prepare necessary drawings to obtain following permissions; 16) Lead to prepare tender documents with assistance of Tender Document Specialist; • Revision of 1/500 Master Plan Approval • Investment Approval • Basic Design Approval • Technical Design Approval 17) Assist PMU to appraise tenders and evaluate them; 18) Prepare monthly progress reports and other related reports specified in the Consultant Agreement; 19) Lead to develop consultant's construction supervision policy; 20) Prepare completion inspection and obtain PMU's approval.
A-5	Architect-1	I (Prof-A)	1) Review SAPROF Report, other previous studies & Campus Master Plan, etc; 2) Survey the relevant decrees, regulations and standards to reflect the contents on the proposed buildings designs; 3) Analyze CTU's staff/visitors/supply flows and security systems; 4) Review existing buildings & obtaining CTU's requirements; 5) Surveying use condition of the existing facilities & discussing with CTU staff to gather design requirements of the proposed facilities; 6) Analysis: Reviewing and analyzing CTU's current/future research activities and staff allocations; 7) Prepare stacking plan showing sectional relationship and room adjacency; 8) Prepare "Cut Sheet" of research laboratories illustrating equipment layout/utility requirements and discussing with CTU; 9) Develop façade design/color of buildings (with 3D rendering drawings); 10) Finalize site layout/design concepts/functional space programs/pre-conditions; 11) Prepare design development drawings, and preparing all the necessary drawings to obtain "Basic Design Comments/Approval" permission; 12) Assist Facility Team Leader to prepare Schematic Design Report to finalize the aforementioned study results & obtaining PMU's approval;

No.	Position	I or L	Major Tasks and Duties
			13) Assist Facility Team Leader to finalize detailed design work; 14) Assist Facility Team Leader to calculate quantities of materials/ labors of the proposed buildings, prepare Bill of Quantities (B/Q) and estimate project costs;
A-6	Architect-2	I (Prof-A)	1) Assist Architect-1 to finalize schematic design work; 2) Prepare architectural base plans/sections/elevations/other major drawings; 3) Finalizing equipment layout and utility requirements by confirming "Room Data Sheet" 4) Survey local construction and optimizing construction method; 5) Prepare architectural and other necessary detailed drawings; 6) Prepare Technical .Specifications of architectural work; 7) Prepare necessary drawings to obtain following permissions.
A-7	Laboratory Design Specialist	I (Prof-A)	1) Gather and analyze CTU's current/future research activities and staff allocations; 2) Propose laboratory design policy and concept to define the proposed facilities; 3) Studying room-by-room space needs and finalizing "Functional Space Program" (FSP) of the proposed facilities; 4) Finalize laboratory layout and design standard to meet CTU's research requirements; 5) Lead to prepare "Cut Sheet" of research laboratories illustrating equipment layout/utility requirements and discussing with CTU. 6) Finalize equipment layout and utility requirements by confirming "Room Data Sheet"; 7) Lead to develop detailed design of laboratories in the proposed facilities.
A-8	Interior Designer	I (Prof-A)	1) Propose interior design policy and concept to define the proposed facilities; 2) Develop interior design/material/color concepts of major functioning rooms; 3) Preparing design development drawings of major interior portions; 4) Assist Architect-1 to finalize detailed design of major interior portions.
A-9	Landscape Architect	I (Prof-A)	1) Propose landscape design policy and concept to define the proposed facilities; 2) Develop landscape design/material/color concepts of major exteriors; 3) Preparing design development drawings of major landscape design; 8) Assist Architect-1 to finalize detailed design of landscape design.
A-10	Structural Engineer	I (Prof-A)	1) Assist Facility Team Leader to analyze site's physical (geological/topological) conditions. Implement & review soil condition & topographic conditions of the project sites; 2) Review SAPROF Report, other previous studies & Campus Master Plan, etc; 3) Survey the relevant decrees, regulations and standards to reflect the contents on the proposed buildings designs; 4) Prepare schematic structural drawings and calculation sheets; 5) Prepare Schematic Design Report to finalize the aforementioned study results & assist Facility Team Leader to obtaining PMU's approval; 6) Finalize structural design conditions to develop detailed design; 7) Survey local construction and optimizing construction method of the proposed facilities; 8) Prepare structural and other necessary detailed drawings; 9) Assist Cost Experts to Gather information on structural building costs and other related works, Calculate quantities of materials/labors of the proposed buildings and prepare Bill of Quantities (B/Q) and estimating project costs; 10) Assist Tender Document Specialist to prepare tender documents and prepare Technical Specification of structural work; 11) Reviewing construction work plan, construction drawings and shop drawings and make necessary advice and report to PMU; 12) Attend site inspection and review construction work compliance with

No.	Position	I or L	Major Tasks and Duties
			Contract Documents, and make necessary advice and report to PMU. 13) Attend construction work completion inspection and prepare completion report of structural work.
A-11	Electrical Engineer	I (Prof-A)	1) Survey site's current utility conditions/capacity, gather application information; 2) Review SAPROF Report, other previous studies & Campus Master Plan, etc; 3) Survey the relevant decrees, regulations and standards to reflect the contents on the proposed buildings designs; 4) Prepare schematic electrical drawings and calculation sheets; 5) Prepare Schematic Design Report to finalize the aforementioned study results & assist Facility Team Leader to obtaining PMU's approval; 6) Finalize electrical design conditions to develop detailed design; 7) Survey local construction and optimizing construction method of the proposed facilities; 8) Prepare electrical and other necessary detailed drawings; 9) Assist Cost Experts to Gather information on electrical engineering costs and other related works, Calculate quantities of materials/labors of the proposed buildings and prepare Bill of Quantities (B/Q) and estimating project costs; 10) Assist Tender Document Specialist to prepare tender documents and prepare Technical Specification of electrical work; 11) Reviewing construction work plan, construction drawings and shop drawings and make necessary advice and report to PMU; 12) Attend site inspection and review construction work compliance with Contract Documents, and make necessary advice and report to PMU. 13) Attend construction work completion inspection and prepare completion report of electrical engineering work.
A-12	Mechanical Engineer	I (Prof-A)	1) Survey site's current utility conditions/capacity, gather application information; 2) Review SAPROF Report, other previous studies & Campus Master Plan, etc; 3) Survey the relevant decrees, regulations and standards to reflect the contents on the proposed buildings designs; 4) Prepare schematic mechanical drawings and calculation sheets; 5) Prepare Schematic Design Report to finalize the aforementioned study results & assist Facility Team Leader to obtaining PMU's approval; 6) Finalize mechanical design conditions to develop detailed design; 7) Survey local construction and optimizing construction method of the proposed facilities; 8) Prepare mechanical and other necessary detailed drawings; 9) Assist Cost Experts to Gather information on mechanical engineering costs and other related works, Calculate quantities of materials/labors of the proposed buildings and prepare Bill of Quantities (B/Q) and estimating project costs; 10) Assist Tender Document Specialist to prepare tender documents and prepare Technical Specification of mechanical work; 11) Reviewing construction work plan, construction drawings and shop drawings and make necessary advice and report to PMU; 12) Attend site inspection and review construction work compliance with Contract Documents, and make necessary advice and report to PMU. 13) Attend construction work completion inspection and prepare completion report of mechanical engineering work.
A-13 A-14	Cost Expert-1, Cost Expert-2	I (Prof-A)	1) Estimate preliminary project/construction costs during Schematic Design Phase; 2) Survey condition and construction of the existing facilities and gather information on local building materials and construction methods; 3) Survey local construction and optimizing construction methods; 4) Gather information on building costs (Architectural, Structural, Electrical/mechanical and other related works); 5) Calculate quantities of materials/labors of the proposed buildings

No.	Position	I or L	Major Tasks and Duties
			make Bill of Quantities (B/Q) and estimate project costs. 6) Assist PMU to evaluate tenders.
A-15	Tender Document Specialist	I (Prof-A)	1) Assist PMU to prepare a set of tender documents (including Tender Procedure, Employer's Requirements and Conditions of Contract) in accordance with latest version of Standard Tender Documents under Japanese ODA Loans for Procurement of Works. 2) Assist PMU to prepare a draft and final Contract Agreement documents 3) Assist other engineers to prepare Employer's Requirements including Technical Specifications and other documents; 4) Assist PMU to evaluate the tenders in accordance with evaluation criteria set in the Tender Documents; 5) Assist PMU to prepare Tender Evaluation Report to obtain the Bid Evaluation Committee's approval.
A-16	Construction Supervision Specialist	I (Prof-A)	1) Lead construction supervision team; 2) Discuss and explain the consultant's construction supervision policies; 3) Review and grasp the contents of Contract Documents and design policies. 4) Approve construction work schedule proposed by Contractor; 5) Brief to Contractor to convey design policies correctly and hold discussions with the Contractor; 6) Ensure contractor's work to be compliance with Contract Document; 7) Review progress of construction work based on approved construction schedule; 8) Review construction work plan, construction drawings and shop drawings and make necessary advice and report to PMU; 9) Review materials building equipment and finish samples of construction work; 10) Review interface between building construction work and research equipment work; 11) Prepare the periodic progress reports to PMU; 12) Attend construction site inspections and the completion inspection; 13) Issue necessary Variation Orders.
A-17	Equipment Planning Team Leader	I (Prof-A)	1) Leading the equipment work team, and ensuring that all the technical documents are prepared in accordance with quality and time constraints; 2) Assisting PMU in preparing the overall schedule of the equipment work; 3) Assisting PMU in preparing detailed design for the equipment work, 4) Assisting PMU in preparing equipment procurement plan and schedule, 5) Assisting PMU in conducting tendering process for the equipment work; 6) Assisting PMU in preparing prequalification (P/Q) documents including evaluation criteria, 7) Assisting PMU in preparing tender documents including evaluation criteria, 8) Assisting PMU in PQ evaluation and preparing evaluation reports, 9) Assisting PMU in bid evaluation and preparing evaluation reports, and 10) Assisting in preparing the reports including monthly, quarterly progress reports, and the completion report.
A-18	Equipment Planner (Agriculture, and other concerning field)	I (Prof-A)	1) Assisting PMU's preparing the tender documents preparation work schedule to explain it to the researchers in charge of all the relevant departments, 2) Assisting PMU's inspecting the proposed sites of the existing buildings and places of the Campus 2, to confirm the status of utility and requirements of preparation work such as space, load capacity, power supply, air conditioning and partition work, 3) Assisting PMU's collecting all the technical documents, and information, from the manufacturers and/or local agents, 4) Assisting PMU's considering and preparing the technical documents

No.	Position	I or L	Major Tasks and Duties
			including technical specifications, utility list for the new buildings, general conditions, and equipment layout drawings, and 5) Assisting PMU's discussing with the researchers in charge of the relevant departments on the prepared documents according to the said schedule, and 6) Assisting PMU's compiling all the tender documents of this field.
A-19	Equipment Planner (Aquaculture, Fishery and other concerning field)	I (Prof-A)	1) Assisting PMU's preparing the tender documents preparation work schedule to explain it to the persons in charge of all the relevant departments, 2) Assisting PMU's inspecting the proposed sites of the existing buildings and places of the Campus 2, to confirm the status of utility and requirements of preparation work such as space, load capacity, power supply, air conditioning and partition work, 3) Assisting PMU's collecting all the technical documents, and information, from the manufacturers and/or local agents, 4) Assisting PMU's considering and preparing the technical documents including technical specifications, utility list for the new buildings, general conditions, and equipment layout drawings, and 5) Assisting PMU's discussing with the researchers in charge of the relevant departments on the prepared documents according to the said schedule, and 6) Assisting PMU's compiling all the tender documents of this field.
A-20	Equipment Planner (IT)	I (Prof-A)	1) Assisting PMU's preparing the tender documents preparation work schedule to explain it to the persons in charge of all the relevant departments, 2) Assisting PMU's inspecting the proposed site, the new administration building of the Campus 2, to confirm the status of utility and requirements of preparation work such as space, load capacity, power supply, air conditioning and partition work, 3) Assisting PMU's collecting all the technical documents, and information, from the manufacturers and/or local agents, 4) Assisting PMU's considering and preparing the technical documents including technical specifications, utility list for the new buildings, general conditions, and equipment layout drawings, and 5) Assisting PMU's discussing with the engineers in charge of the relevant departments on the prepared documents time to time, 6) Assisting PMU's compiling all the tender documents of this fields.
A-21	Cost Expert	I (Prof-A)	1) Assisting PMU's preparing equipment cost estimation work schedule, 2) Assisting PMU's collecting price quotation from the manufacturers of Japan as well as the manufacturers of candidate countries, transportation agents, insurance companies for each package in accordance with JICA procurement guideline, 3) Assisting PMU's compiling documents necessary for concurrence of JICA to get an approval to float the tender for each package, including equipment cost calculation, price comparison sheets of 3 manufacturers, and installation schedule.
A-22	Installation Supervisor	I (Prof-A)	1) Assisting PMU's figuring out equipment installation work schedule, 2) Assisting PMU's inspecting shop drawings to lay out the equipment, 3) Assisting PMU's preparing engineering documents, equipment utility list based upon contracted items of equipment, . 4) Assisting PMU's organizing and controlling equipment operation and maintenance training at site for users, 5) Assisting PMU's inspecting and commissioning in each item of the equipment, 6) Assisting PMU's approving handing-over of the equipment in the light of the scope of work of the supplier, and 7) Assisting PMU's issuing the handing-over certificate.
B1-1	Project Finance and Disbursement Management Specialist	L (Prof-B1)	1) Review the capacity of PMU's Finance unit, setting up financial management system and providing PMU staff training on JICA's procedures of finance and disbursement management; and 2) Help PMU in preparing withdrawal applications and processing other financial documents in accordance with JICA's regulations in a timely manner.

No.	Position	I or L	Major Tasks and Duties
B1-2	Monitoring and Evaluation Specialist	L (Prof-B1)	1) Assist PMU in monitoring and evaluating project activities based on the developed operation and effect indicators; 2) Identify changes in the project scopes and the implementation arrangements after appraisal, assessing performance against indicators, and re-assessing impact on implementation and sustainability; and 3) Build PMU's staff capacity and skills in project monitoring and evaluation
B1-3	Procurement Specialist	L (Prof-B1)	(v) Supporting PMU in preparing procurement plan and procurement schedule; (vi) Supporting PMU in conducting tendering process; (vii) Support PMU in preparing tender documents including evaluation criteria; and (viii) Support PMU in bid evaluation and preparing evaluation reports
B1-4	Facility Team Leader	L (Prof-B1)	1) Lead the local engineering team. Ensure all deliverables are prepare in accordance with quality and time constraints; 2) Lead to survey the relevant decrees, regulations and standards to reflect the contents on the proposed buildings designs; 3) Lead to analyze site's physical (geological/topological), legal and technical conditions. Lead to implementing & reviewing soil condition & topographic conditions of the project sites; 4) Lead to prepare design development drawings, and preparing all the necessary drawings to obtain "Basic Design Comments/Approval" permission; 5) Lead to prepare necessary drawings to obtain following permissions: • Revision of 1/500 Master Plan Approval • Investment Approval • Basic Design Approval • Technical Design Approval 6) Lead to finalize detailed design work; 7) Lead to calculate quantities of materials/labors of the proposed buildings, prepare Bill of Quantities (B/Q) and estimate project costs; 8) Attend construction site inspections and the completion inspection to ensure contractor's work to be compliance with Contract Document; with assistance of Construction Supervision Specialist.
B1-5	Architect-1	L (Prof-B1)	1) Assist Facility Team Leader (L) to survey the relevant decrees, regulations and standards to reflect the contents on the proposed buildings designs; 2) Lead to prepare and finalize architectural detailed design drawings; 3) Assist Tender Document Specialist to prepare a set of tender documents (including Technical Specifications); 4) Assist Cost Experts and Quantity Surveyors to calculate quantities of materials/labors of the proposed buildings, to make Bill of Quantities (B/Q) and to estimate project costs; 5) Attend construction site inspections and the completion inspection to ensure contractor's work to be compliance with Contract Document; with assistance of Construction Supervision Specialist.
B1-8	Senior Structural Engineer	L (Prof-B1)	1) Assist Facility Team Leader to analyze site's physical (geological/topological) conditions. Implement & review soil condition & topographic conditions of the project sites; 6) Assist Facility Team Leader (L) to survey the relevant decrees, regulations and standards to reflect the contents on the proposed buildings designs; 2) Lead to prepare and finalize structural detailed design drawings; 3) Assist Tender Document Specialist to prepare a set of tender documents (including Technical Specifications); 4) Assist Cost Experts and Quantity Surveyors to calculate quantities of materials/labors of the proposed buildings, to make Bill of Quantities (B/Q) and to estimate project costs; 5) Attend construction site inspections and the completion inspection to ensure contractor's work to be compliance with Contract Document; with assistance of Construction Supervision Specialist.

No.	Position	I or L	Major Tasks and Duties
B1-10	Senior Electrical Engineer	L (Prof-B1)	1) Assist Electrical Engineer (I) to survey site's current utility conditions/capacity, gather application information; 2) Assist Electrical Engineer (I) to survey the relevant decrees, regulations and standards to reflect the contents on the proposed buildings designs; 3) Lead to prepare and finalize electrical detailed design drawings; 4) Assist Tender Document Specialist to prepare a set of tender documents (including Technical Specifications); 5) Assist Cost Experts and Quantity Surveyors to calculate quantities of materials/labors of the proposed buildings, to make Bill of Quantities (B/Q) and to estimate project costs; 6) Attend construction site inspections and the completion inspection to ensure contractor's work to be compliance with Contract Document; with assistance of Construction Supervision Specialist.
B1-12	Senior Mechanical Engineer	L (Prof-B1)	1) Assist Mechanical Engineer (I) to survey site's current utility conditions/capacity, gather application information; 2) Assist Mechanical Engineer (I) to survey the relevant decrees, regulations and standards to reflect the contents on the proposed buildings designs; 3) Lead to prepare and finalize mechanical detailed design drawings; 4) Assist Tender Document Specialist to prepare a set of tender documents (including Technical Specifications); 5) Assist Cost Experts and Quantity Surveyors to calculate quantities of materials/labors of the proposed buildings, to make Bill of Quantities (B/Q) and to estimate project costs; 6) Attend construction site inspections and the completion inspection to ensure contractor's work to be compliance with Contract Document; with assistance of Construction Supervision Specialist.
B-13	Equipment and Procurement Planner	L (Prof-B1)	1) Assisting the team leader in overall Equipment Planning 2) Assisting the team leader in Procurement work
B-14	Equipment Planner (Agriculture and other concerning field)	L (Prof-B1)	1) Assisting in Equipment Planning, and 2) Specifications preparation for Agriculture and other concerning field
B-15	Equipment Planner (Aquaculture, Fishery and other concerning field)	L (Prof-B1)	1) Assisting the Equipment Planner in Equipment Planning for Aquaculture & fishery, and 2) Assisting the Equipment Planner other concerning field
B-16	Equipment Planner (IT)	L (Prof-B1)	1) Assisting in IT equipment related planning, and 2) specifications preparation
B-17	Cost Expert	L (Prof-B1)	1) Assisting in Cost estimation work

Chapter6. Reporting

Within the scope of consulting services, the Consultant shall prepare and submit reports and documents to PMU as shown in Table 4. The Consultant shall provide electronic copy of each of these reports.

Table 4: Reporting Requirements

Category	Type of Report	Timing	No. of Copies
General Report	Inception Report	Within1 month after commencement of the services	10
	Monthly Progress Report	Every Month	10
	Project Completion Report (for submission to JICA)	At the end of Services	10
Facility Design	Schematic Design Report	Completion of Schematic Deign	
	Tender Document Report		
	P/Q Result Report		

Category	Type of Report	Timing	No. of Copies
	Tender Evaluation Report		
	Construction Work Completion Report & As-built Drawings	Completion of Construction work	
Equipment planning	Schematic Design Report	Completion of Schematic Design	
	Tender Documents Report		
	P/Q Evaluation Report		
	Tender Evaluation Report		
	Equipment Inspection Report	Completion of equipment installation	

Chapter7. Obligations of the Executing Agency

A certain range of arrangements and services will be provided by the Executing Agency to the Consultant for smooth implementation of the Consulting Services. In this context, the Executing Agency will:

(1) Report and data

Make available to the Consultant existing reports and data related to the Project.

(2) Office space

Provide an office space in the Campus 2 of the Executing Agency with necessary equipment, furniture and utility. However, the Consultant's requirement for office space, including necessary equipment, furniture and utilities, should be clearly stated in the proposal with its rental cost for the case where Can Tho University would be unable to provide such facilities;

(3) Cooperation and counterpart staff

Appoint counterpart officials, agent and representative as may be necessary for effective implementation of the Consulting Services;

(4) Assistance and exemption

Use its best efforts to ensure that the assistance and exemption, as described in the Standard Request for Proposal issued by JICA, will be provided to the Consultant, in relation to

- work permit and such other documents;
- entry and exit visas, residence permits, exchange permits and such other documents
- clearance through customs;
- instructions and information to officials, agent and representatives of the Borrower's Government;
- exemption from any requirement for registration to practice their profession; and
- privilege pursuant to the applicable law in the Borrower's Country.

Attachment 1 Manning Schedule of Consulting Service

No.	Name of Expert / Position		Year 1 2015												Year 2 2016												Year 3 2017												Year 4 2018												Year 5 2019												Year 6 2020												Year 7 2021												Total Person-Months Inputs		
			J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	Home	Field	Total
	International Consultants:																																																																																										
1	Project Management Specialist	home																																																																																							0.0		0.0
		field										1.0	1.0			1.0	1.0	1.0	1.0			1.0	1.0	1.0	1.0			1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0				1.0	1.0	1.0				1.0	1.0	1.0				1.0	1.0	1.0				1.0	1.0	1.0				1.0	1.0	1.0				1.0	1.0				1.0	1.0						40.0	40.0
2	Academic Coordinator in Japan	home													1.0			1.0	1.0				1.0	1.0						1.0	1.0				1.0	1.0						1.0	1.0				1.0	1.0											1.0														1.0														1.0				16.0		16.0
		field																																																																																									0.0	0.0
3	Academic Coordinator	home																																																																																							0.0		0.0
		field										1.0					1.0	1.0											1.0	1.0											1.0	1.0																																																		7.0	7.0
4	Facility Design Team Leader	home																																																																																							0.0		0.0
		field										1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.3	0.3	0.3	0.3	0.3	0.3				0.3	0.3			0.3	0.3	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5																					31.0	31.0
5	Architect-1	home																																																																																							0.0		0.0
		field										1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.5	0.5																																																																					11.0	11.0
6	Architect-2	home										1.0		1.0		1.0	1.0	1.0	1.0	1.0	1.0																																																																			8.0		8.0
		field																																																																																						0.0	0.0
7	Laboratory Design Specialist	home										0.5		0.5		0.5	0.5	0.5	0.5	0.5	0.5																																																																				4.0		4.0
		field																																																																																						0.0	0.0
8	Interior Designer	home										0.5		0.5		0.5	0.5	0.5	0.5	0.5	0.5																																																																				4.0		4.0
		field																																																																																						0.0	0.0
9	Landscape Architect	home																0.5	0.5	0.5																																																																					1.5		1.5
		field										0.5		0.5		0.5	0.5				0.5																																																																				2.5	2.5
10	Structural Engineer	home											1.0	1.0		0.5	0.5	0.5		0.5	0.5	0.5																																																																			5.0		5.0
		field										1.0			0.5				0.5				0.5																0.3			0.3			0.3			0.3			0.3			0.3			0.3			0.3			0.3			0.3				0.5																				6.0	6.0
11	Electrical Engineer	home											1.0	1.0		0.5	0.5	0.5		0.5	0.5	0.5																																																																			5.0		5.0
		field										1.0			0.5				0.5				0.5																0.3			0.3			0.3			0.3			0.3			0.3			0.3			0.3			0.3			0.3				0.5																				6.0	6.0
12	Mechanical Engineer	home											1.0	1.0		0.5	0.5	0.5		0.5	0.5	0.5																																																																			5.0		5.0
		field										1.0			0.5				0.5				0.5																0.3			0.3			0.3			0.3			0.3			0.3			0.3			0.3			0.3			0.3				0.5																				6.0	6.0
13	Cost Expert-1	home																																																																																						0.0		0.0
		field													0.5	0.5					1.0	1.0	1.0					0.5	0.5				0.5	0.5			0.5	0.5																																																				7.0	7.0
14	Cost Expert-2	home																																																																																						0.0		0.0
		field													0.5	0.5					1.0	1.0	1.0																																																																			4.0	4.0
15	Tender Document Specialist	home																																																																																						0.0		0.0
		field																0.5	0.5	1.0	1.0	1.0	1.0					0.5	0.5				0.5	0.5			0.5	0.5																																																				8.0	8.0
16	Construction Supervision Specialist	home																																																																																						0.0		0.0
		field																																					1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0																				32.0	32.0
17	Equipment Planning Team Leader	home																																																																																						0.0		0.0
		field													1.0	1.0	1.0	1.0	1.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5						1.0	1.0	1.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5											0.5																		25.0	25.0
18	Equipment Planner (Agriculture and other concerning field)	home																																																																																					0.0		0.0
		field													1.0	0.5			1.0	1.0																								1.0	0.5		1.0	1.0																																										7.0	7.0
19	Equipment Planner (Aquaculter, Fishery and other concerning field)	home																																																																																						0.0		0.0
		field														0.5	1.0				1.0	1.0																						0.5	1.0		1.0	1.0																																									7.0	7.0
20	Equipment Planner (IT)	home																																																																																						0.0		0.0
		field																0.5					0.5																							0.5		0.5																																									2.0	2.0
21	Cost Expert	home																																																																																						0.0		0.0
		field																0.5	0.5														0.5													1.0								0.5																																				3.0	3.0
22	Installation Supervisor	home																																																																																					0.0		0.0
		field																																								0.5							1.0	1.0												0.5						1.0	1.0	1.0																			6.0	6.0
		home																																																																																					0.0		0.0
		field																																																																																						0.0	0.0
																																																																																							48.5	**210.5**	**259.0**
	National Consultants (Professional B):		J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D			
1	Project Finance and Disbursement Specialist	field										1.0	1.0				1.0												1.0																			1.0																																									5.0	5.0
2	Project Monitoring and Evaluation Specialist	field											1.0							1.0														1.0													1.0																																									4.0	4.0
3	Procurement Specialist	field										1.0	1.0									1.0	1.0					1.0	1.0						1.0	1.0						1.0	1.0																																													10.0	10.0
4	Facility Team Leader	field										1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0																				51.5	51.5
5	Architect-1	field										1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0																0.5			0.5			0.5			0.5			0.5			0.5			0.5			0.5			0.5			0.5				0.5																				17.5	17.5
6	Architect-2	field														1.0	1.0	1.0	1.0	1.0	1.0																																																																					6.0	6.0
7	Landscape Architect	field														1.0	1.0	1.0	1.0	1.0	1.0																																																																					6.0	6.0
8	Senior Structural Engineer	field										0.5	0.5	0.5	0.5	0.5	1.0	1.0	1.0	1.0	1.0	0.5	0.5																																																																			8.5	8.5
9	Structural Engineer	field														1.0	1.0	1.0	1.0	1.0	1.0																		0.5			0.5			0.5			0.5			0.5			0.5			0.5			0.5			0.5			0.5				0.5																				11.5	11.5
10	Senior Electrical Engineer	field										0.5	0.5	0.5	0.5	0.5	1.0	1.0	1.0	1.0	1.0	0.5	0.5																																																																			8.5	8.5
11	Electrical Engineer	field														1.0	1.0	1.0	1.0	1.0	1.0																		0.5			0.5			0.5			0.5			0.5			0.5			0.5			0.5			0.5			0.5				0.5																				11.5	11.5
12	Senior Mechanical Engineer	field										0.5	0.5	0.5	0.5	0.5	1.0	1.0	1.0	1.0	1.0	0.5	0.5																																																																			8.5	8.5
13	Mechanical Engineer	field														1.0	1.0	1.0	1.0	1.0	1.0																		0.5			0.5			0.5			0.5			0.5			0.5			0.5			0.5			0.5			0.5				0.5																				11.5	11.5
14	Civil Engineer	field														1.0	1.0	1.0	1.0	1.0	1.0																		0.5						0.5						0.5						0.5						0.5							0.5																				9.0	9.0
15	Quantity Surveyor-1	field																		1.0	1.0	1.0	1.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0																				43.5	43.5
16	Quantity Surveyor-2	field																		1.0	1.0	1.0	1.0																																																																			4.0	4.0
17	Equipment Planning and procurement	field													1.0	1.0	1.0	1.0	1.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5						1.0	1.0	1.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5											0.5																		25.0	25.0
18	Equipment Planner (Agriculture and other concerning field)	field													1.0	0.5			1.0	1.0																								1.0	0.5		1.0	1.0																																									7.0	7.0
19	Equipment Planner (Aquaculter, Fishery and other concerning field)	field														0.5	1.0				1.0	1.0																						0.5	1.0		1.0	1.0																																									7.0	7.0
20	Equipment Planner (IT)	field																0.5					0.5																							0.5		0.5																																									2.0	2.0
21	Cost Expert	field																0.5	0.5														0.5													1.0								0.5																																				3.0	3.0
																																																																																							0.0	**260.5**	**260.5**
	National Consultants (Supporting Staff):		J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D			
1	CAD Operater-1	field										1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0																1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0																				44.0	44.0
2	CAD Operater-2	field										1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0																																																																			12.0	12.0
3	CAD Operater-3	field													1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0																																																																			9.0	9.0
4	CAD Operater-4	field													1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0																																																																			9.0	9.0
5	Inspector-1	field																														1.0	1.0						1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0																				34.0	34.0
6	Inspector-2	field																																					1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0																				32.0	32.0
7	Inspector	field																																								0.5							1.0	1.0												0.5						1.0	1.0	1.0																			6.0	6.0
8	CAD Operator	field													1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.5																					1.0	1.0	1.0	1.0	1.0																																										13.5	13.5
9	Management Assistant	field													1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5				0.5		1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		0.5						1.0	1.0	1.0																			32.5	32.5
10	Office Manager	field										1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		75.0	75.0
11	Office Supporting Staff	field										1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		75.0	75.0
																																																																																							0.0	**342.0**	**342.0**
																																																																																				TOTAL	**48.5**	**813.0**	**861.5**

Notes: "Field" means assigmnets in Vietnam for national consultants.

Appendix 8-1

Report on Examination of Project Implementation and Management Arrangements

The Preparatory Survey on “The Project on Strengthening Can Tho University to be an Excellent Institution of Education, Scientific Research and Technology Transfer”

A. Analysis on the Most Appropriate Project Implementation and Management Framework

1. Whether the proposed project will successfully be implemented and achieve the expected impact, outcome and outputs depends not only on the quality of the design but also the appropriateness of the options of project implementation and management framework. This section will discuss the suitable framework and arrangement which will help the timely, effective and transparent project implementation and management. To select the most feasible framework, the different types of the project implementation arrangements will be compared and examined. The analysis will be made based on the following points:(i) lessons learned from the Higher Education Development Support Project on ICT[1] has faced; (ii) challenges faced by other New Model University Projects[2], (iii) assessment of the project implementation and management capacity of the Can Tho University (CTU); and (iv) Vietnamese regulations and practices related to the ODA project managements including the Law on Public Investment, Public Procurement Law, Decree on ODA Management and Guiding Circular of ODA Management[3]. The summary of the analysis is presented in Table 1 below.

[1] Higher Education Development Support Project on ICT in Vietnam (JICA loan project, 2006-On-going)

[2] New Model University Project in Vietnam (WB loan, 2010-On-going), University of Science and Technology of Ha Noi (New Model University) Project in Vietnam (ADB loan, 2010-On-going)

[3] They include Law on Public Investment dated June 18, 2014 (No.49/2014/QH13), Public Procurement Law approved November 26th, 2013 (No.43/2013/QH13), Decree on Management and Use of Official Development Assistance (ODA) and Concessional Loans of Donors dated April 23rd, 2013 (No. 38/2013/ND-CP) (hereinafter "Decree 38"), and Circular Guiding Implementation of Decree No. 38/2013/ND-CP dated January 09th, 2014 (No. 01/2014/TT-BKHDT) (hereinafter "Circular 01").

Table1: Analysis of the Project Implementation and Management Framework

Points		Analysis/Findings
(i)	Lessons learned from the Higher Education Development Support Project on ICT	• Ministry of Education and Training (MOET) is Executing Agency (EA) and the Project Owner (PO) and directly manages the project as PO. • Project Implementation Unit (PIU) was set at the Hanoi University of Science and Technology (HUST). However no Project Management Unit (PMU) had not been established in MOET (EA/PO) until a very late stage of implementation, which has resulted in unclear reporting and consultation lines between MOET and PIU. • Even after the establishment of PMU in MOET, the PMU has not fully functioned and been less motivated to address numerous implementation issues which had happened before they have started involved in the implementation. • PIU performed well at the beginning of the implementation period due to the effort and commitment of the first PIU deputy director. However, after this person left the Project in his retirement, PIU has not worked well. This proves the fact that the performance of the executing/implementing agencies often depends on individual management skills and commitment of the persons in the management positions and the Government has not successfully established a solid project implementation and management framework regardless of the personnel and monitoring framework which could help PIU to resolve the implementation issues whoever the PIU manager is. • (Joint) Steering Committee was established. However it did not fulfill the expected roles. • No systematic evaluation and monitoring mechanisms were not introduced so that the concerned focused on issues on an ad hoc basic. • Disbursement rate is very low[4], comparing the F/S approved by the Vietnamese Government.
(ii)	Challenges faced by the other New Model Universities Projects	• The University of Science and Technology of Hanoi (USTH) and Vietnam and German University (VGU) have been newly established as new model universities respectively by France and Asian Development Bank (ADB), and Germany and World Bank (WB). In both projects, MOET is EA and directly manages the Project with roles of PO. • MOET has established the PMU, which is responsible for civil works such as construction of a new campus. PIU was also set at universities as University Implementation Unit (UIU), responsible for academic matters such as development of curricula and faculty and staff. • These arrangements were designed, supposing to utilize experiences and resources of both MOET and universities because both projects aimed to establish new universities so that no existing units who were familiar with project management and implementation were available at universities. However, considering huge delays of the project implementation, these arrangements don't work well up to achieve targets. • As both projects have been significantly delayed such as delays in resettlement (USTH Project) and design completion of campus designs (USTH Project and VGU Project), there are on-going discussions on management of the projects: whether MOET continues to work as PO or authority of PO should be transferred to universities. • In addition to issues at the project management level, coordination issues among project components are significant at the implementation level, because PMU, responsible for civil works and PIU, responsible for academic matters tend to work independently and huge time is required for coordination. In the USTH Project, the geographical distance between PMU in Hanoi and PIU in Ho Chi Minh exaggerates the coordination issues.

[4] The original project period (8 years) elapsed. However, disbursement rate is about 16%. The project will extend the period by 2 years.

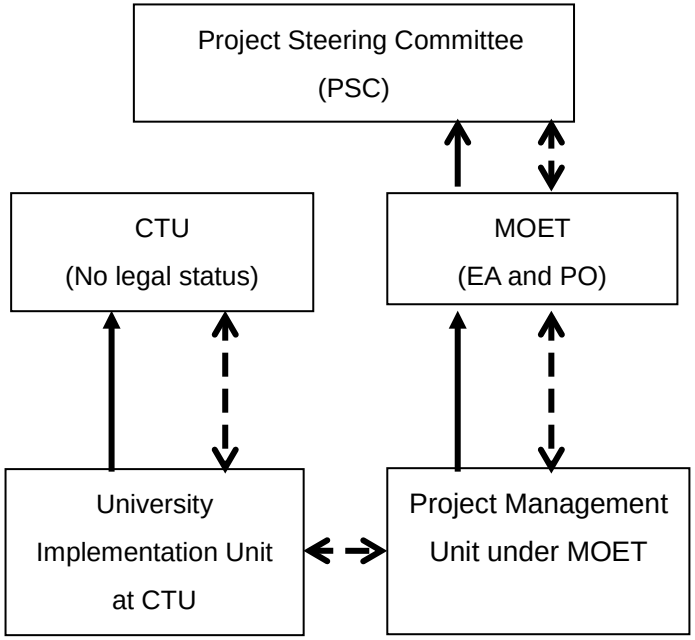
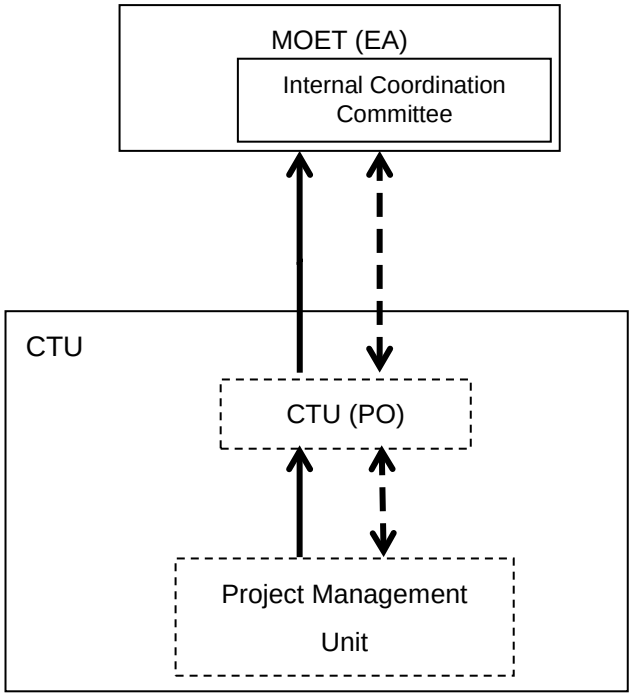
Points	Analysis/Findings
(iii) Assessment of Project Implementation and Management Capacity of CTU	• The CTU has rich experiences in the similar ODA activities to the Project such as (i) procurement for civil works, research and education equipment and consulting services, (ii) staff development (in-country and overseas), (iii) international and national research projects, and (iv) management of donor-supported projects. • The CTU has the approved regulations/guidelines on procurement (goods, works and services) and financial management (budgeting, accounting, and auditing) and has a history of satisfactory quality of procurement. • Regarding procurement work, CTU has many experiences with the use of national and international competitive bidding procedures and are familiar with procedures of international development banks through World Bank-funded projects. (Attachment 1: List of CTU' experiences in procurement of goods, works and services.) • The Facility Management Department plays a key role in procurement cooperating with related colleges and has a solid organizational structure for successfully implementing the project activities. The Department has 25 staff including a head and a deputy head, and includes three teams: Facility Management Team, Equipment Management Team and Study Room Management Team. The head of the Department has 25 year's experiences and all key staff have over 5 years' experiences in procurement work. In addition, they have all certificates as requirements of the Vietnamese Government in equipment and civil works management such as certificate in procurement of equipment or civil works, certificate in construction supervision, certificate in construction management, and certificate in construction and equipment quality management. Furthermore extensive procurement trainings are provided for all staff. • The CTU has good capacity and experiences in managing an investment budget up to VND 160 billion per year in the period of 2009-2013 and projects funded by external donors. The Financial Management and Accounting Department are familiar with international donors' procedures and Vietnamese Government's disbursement procedures.
(iv) Vietnamese Regulations and Practices on ODA project implementation and management	• Project Steering Board shall include representatives of EA and relevant agencies. It shall be responsible for giving directions, coordinating with relevant agencies and supervising the project implementation. On the basis of agreements with donors, the Board can include representatives of donors. (Decree 38: Item 4 in Article 4) However, according to Decree 38, Setting up the Project Steering Board is not mandatory. • EA shall decide a project management form among three options: managed by (i) EA, (ii) PO and (iii) Advisory organization hired by PO. (Decree 38: Article 36) PO shall establish PMU including nominations of Director, Deputy Director and Chief accountant. (Decree 38: Article 39, Circular 01: Article 14 and15) • EA's roles and powers are defined in the regulations. (Law on Public Investment: Item 4 and 10 in Article 4, Decree 38: Item 1 in Article 4 and Article 37) PO's roles and powers are defined in the regulations. (Public Investment Law: Item 6 in Article 4 and Article 102, Decree 38: Item 2 in Article 4 and Article 38) PMU's roles and powers are defined in the regulations. (Public Investment Law: Article 103, Decree 38: Item 3 in Article 40, Circular 01: Article 16) • Decree 38 stipulates tender is to be performed as prescribed by current public procurement law both in EA and PO' roles. (Decree 38: Article 37 and 38) The Public Procurement Law recently issued uses the wording of "The Employer", instead of EA or PO and stipulates duties and tasks of "The Employer" in contractor selection plan and process in chapter III, saying "Employer is the organization who owns the funds, or who is authorized to directly manage project implementation on behalf of the owner or the borrower of such funds". (Item 4 in Article 4 and Chapter III) • PMU Director shall propose the organizational structure to EA or EA itself. (Circular 01: Item 3 in Article 15)

2. Based on these findings, the JICA Study Team has developed two different types of the project implementation and management framework as options as shown in the Figure 1. To determine the better arrangements, the strengths and weakness of these two options are analyzed as follows:

3. Under Option 1, MOET will work as both EA and PO and directly manage the Project as PO. At the implementation level, MOET will set PMU under MOET and University Implementation Unit (UIU) will be established at CTU. The Higher Education Development Support Project on ICT and new model university projects apply for this option though there are some variations in roles of PMU and UIU. In the Higher Education Development Support Project on ICT, PMU only has duties to provide guidance for UIU when needed and UIU is responsible for all daily work for project implementation. On other hands, PMU is responsible for civil works and UIU is responsible for academic matters in new model university projects.

4. Considering issues in the three projects, capacity of CTU and Vietnamese regulations and practices on ODA management analyzed above, the JICA Study Team has developed another option. Under this option, MOET is EA and Can Tho University is PO. At the implementation level, Can Tho University as PO will set up PMU and PMU will support PO to manage and implement the Project.

5. After the development of the two options, the JICA Study Team has evaluated them in terms of timely decision-making, response to implementation issues, coordination and consultation among stakeholders, division of responsibilities and so on. Figure 1 below summarizes the structures of the options and their strengths and weakness.

<table>
<tr>
<td>Option1: Managed by EA with roles of Project Owner and Implemented by PMU and UIU
 
</td>
<td>Option 2: Managed by Project Owner and implemented by PMU
 
</td>
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<tr>
<td colspan="3">Repotting Line: ⟶ Consultation Line: - - ⟶</td>
</tr>
<tr>
<td>Strengths</td>
<td>• MOET gets directly involved in the project implementation and management and develops its project ownership.
• Having been located in Hanoi, it is easy for MOET to communicate with JICA and the Project Steering Committee as necessary.</td>
<td>• Having CTU as PO and no Project Steering Committee, the organizational structure for the implementation is streamlined which will enable more timely and effective decision making and project implementation actions compared to the case where MOET is appointed as PO.
• Internal Coordination Committee will strengthen information sharing and coordination within MOET.
• Responsibility and function of each stakeholder is clearer and</td>
</tr>
</table>

		communication among the participating agencies will improve. • Quality of the counterpart's input is better if CTU is PO as they have higher level of the project ownership and the technical expertise compared to those of MOET. • As CTU has participated in the project design process, they are already familiar with the objectives, impact, outcome, outputs and activities of the project and their responsibility and functions. • In case PMU will encounter the implementation challenges, PMU will be able to seek immediate advice from CTU directly, rather than waiting for MOET's guidance. • JICA and its consultants can focus on the capacity development on the CTU/PMU and provide more focused assistance which can address the immediate needs of the CTU.
Weakness	• Complicated organizational structure. No responsible agencies found to solve implementation issues. • Dual reporting lines of PMU- MOET - PSC and UIU – CTU, However, no structure and opportunities for UIU to receive official guidance from MOET and PSC and to report the situation to MOET and PSC to solve issues • CTU's guidance to UIU without any regal status and responsibilities, • No system to reflect CTU's needs, expectations and requests in response to the situation into project implementation • MOET's difficulties to timely identify UIU's issues and to efficiently provide guidance for UIU due to geographical distance with UIU and limited understanding of UIU's activities • CTU's weak ownerships • Poor coordination among project components because of limited communication between UIU and PMU • Low efficiency in terms of costs and human resources by establishing independent project management unit under MOET with a number of full time qualified staff • No good records of MOET's capacity of managing university projects, considering significantly delayed progress in the HUST project and new model university projects	• Difficulties to receive MOET's positive support, weakening MOET's direct involvement • Dependence on human resources within the University, resulting in managing the Project on individual skills

Figure 1: Comparison of 2 Options for Project Implementation and Management Framework

6. Considering co-relations among project components and highly research-oriented scopes of the Project design and MOET's performance as the Project Owners of the other ongoing three ODA-funded higher education projects, the JICA Study Team would suggest the Project be managed and implemented in accordance with the project implementation and management framework proposed under Option 2 with the following reasons:

(i) Unlike other two ongoing new model university projects in HCMC and Hanoi which help develop the new resource universities in the new project sites, the JICA's project aims to develop the CTU to be the model university in the region through strengthening the existing human resources and academic and improving its research environment. For other model university project, MOET has been appointed as the Executing Agency as well as the Project Owner as these universities are newly established. However, in case of the proposed Project, it is considered that CTU could be the Project Owner, rather than MOET since CTU is more familiar with their own challenges, project purposes, outcome, outputs and activities, and their duties and responsibility for project implementation. This will lead to produce synergy effects among project components. Also, the Project implementation will need high level academic knowledge and close collaboration with the key stakeholders including the Japanese universities and the local communities, which are available only in the CTU.

(ii) The lessons learned from other higher education projects prove that one of the most important factors for the successful implementation is a streamlined organizational structure of the project implementation which enables the timely, effective and transparent decision making and problem solving. Compared to the Option 2 where only 3 levels of the agencies (Project Steering Committee, MOET and CTU/PMU) will get involved in the project with the clear demarcation of the responsibilities, Option 1 shows numerous management weaknesses and potential risks:
    i) the MOET will take too much responsibilities as the Executing Agencies and Project Owner while it is difficult for MOET to effectively monitor and supervise the day-to-day implementation both in terms of the distance and limited knowledge of local needs and networking;
    ii) overall decision making will take longer time as there are no direct reporting lines between UIT-MOET, CTU-MOET, and CTU-PSC under Option 1;
    iii) Under Option 1, CTU will not have the legal status as the Project Owner and their guidance and ownership will tend to be limited while the actual project activities needs to be done by the university implementation unit;
    iv) The project impact and outcome are expected to be more sustainable if the CTU is the Project Owner since MOET will not be able to step in the follow-up actions and budget allocation of the operation and maintenance costs after the Project completion; and
    v) many functions and roles are duplicated with MOET PMU and CTU UIU and it is not cost effective to establish the MOET PMU with full time qualified staff who are located in Hanoi.

(iii) MOET is in the better position to coordinate with the other oversight governmental agencies and monitor the project progress and quality. As the Executing Agency, MOET is expected to allocate the necessary counterpart fund and approve the procurement plan and financial plan submitted by the CTU and provide the guidance on the general project management issues based on MOET's experiences and knowledge about JICA's operational policies as necessary.

7. In case Option 2 will be applied, it is important to understand that even though the Option 2 is recommended and the JICA Study Team observes that the project owner and PMU are capable, some challenges are still foreseen during the project implementation. To address and mitigate these challenges, appropriate measures should be set out in advance as follows:

(i) To establish a systematic monitoring and evaluation system
- The CTU should evaluate i) project progress by component, ii) financial performance and iii) performance of contract awards and disbursement, and iv) monitoring and evaluation indicators, comparing them with original plans or annual plans, and identify issues and actions to be taken.
- CTU should organize project regular review meetings and should report the results of the comprehensive evaluation above and find solutions, inviting the concerned.

(ii) To invite resources outside the CTU
- The CTU has good capacity and experiences. However, this is the first time for the CTU to implement JICA loan projects and the Project in size is larger than their experiences. If the CTU have limited resources and knowledge in specific expertise within the CTU, the CUT should invite experts outside into PMU who can work as advisors in addition to receive support from consulting services under the Project.

B. Proposed Organization Chart of the Project Management and Implementation Arrangements

8. Based on discussions in the previous sections, the JICA Study Team proposes (i) roles and responsibilities of project implementation organizations, (ii) project organization structure, (iii) PMU's organization chart and (iv) PMU staffing and duties and qualification of each position.

(1) **Project Implementation Organizations – Roles and Responsibilities**

1) General Roles and Responsibility

Project Implementation Organization	Roles and Responsible
Line Agency (LA)	➢ To approve overall implementation plan of the Project, collect data on budget allocation and approve annual budget allocation plan of the Project ➢ To supervise and assess the project implementation situation, to ensure the project is in line with the schedule and quality and reaches targets as set out ➢ To take responsibility for loss, waste, corruption and wrongs or violations in the management and use of ODA loan under their management competence ➢ To perform other tasks and powers as prescribed by law, international treaties on ODA and concessional loans of the Project
Internal Coordination Committee (ICC)	➢ The ICC, consisting of representatives of the MOET including the Department of Higher Education, Department of Educational Facilities, Department of Planning and Finance, International Cooperation Department, Department of Overseas Training, and Department of Science, Technology and Environment shall be chaired by a Vice Minister of MOET and set-up within MOET. ICC shall be responsible for sharing the information on the Project among different Department in MOET, so as to promptly provide support to PO whenever needed.
Project Owner (PO)	➢ To organize the units for management and performance of the Project based on the decision of LA ➢ To develop and submit overall implementation plan of the Project to LA, develop and submit annual implementation plan of the Project to LA which becomes a foundation for LA to approve annual budget allocation plan ➢ To formulate the action plan for each quarter in order to serve for the administration, supervision and assessment over the Project ➢ To organize appraisal and approval of technical design, total estimation and estimation of work items (for the Project which includes investment in construction work) ➢ To perform the tender as prescribed by current public procurement law ➢ To negotiate, conclude, supervise the performance of contracts and handle violations of contracts ➢ To coordinate with the local authorities to perform compensation, assistance and resettlement as prescribed by law, specific International treaties on ODA and concessional loans of the Project which includes investment in construction work ➢ To supervise the Project aiming to ensure that the Project is performed in line with the schedule, quality and reaches the targets as set out ➢ Under their management competence, to take responsibility for loss, waste, corruption and wrongs or violations in the management and performance of the Project causing the socio-economic or environmental damages, influence to the target and general effectiveness of the Project ➢ Other task and powers as prescribed by law, international treaties on ODA and concessional loans of the Project ➢ Establish the PMU to support it to manage and implement the Project.

Project Implementation Organization	Roles and Responsible
Project Management Unit (PMU)	• The PMU shall be responsible for Project implementation, including procurement, planning, budgeting, monitoring, coordinating, retaining supporting documents, submitting required documents including annual reports and financial statements, establishing and maintaining accounts. Tasks and duties of the PMU are indicated in Item3 of Article 40 of Decree 38 as follows. ➢ To assist the PO in develop overall implementation plan and annual implementation plan of the Project ➢ To support the PO in preparation for implementation and implementation of the Project ➢ To support the PO in performance of tender activities and contract management ➢ To support the PO in the disbursement work, the financial and asset management of the Project ➢ To follow up and assess the situation of performance of the Project ➢ To prepare for acceptance of and handing over the output results of the Project by the PO after completion, finish the audit work, hand over assets of the Project, make the completion report and finalization statements of the Project ➢ To perform other tasks in the framework of the Project assigned by the PO.
Japan International Cooperation (JICA)	• JICA shall (i) oversee project implementation, (ii) ensure compliance with the Loan Agreement, (iii) ensure the expected outputs and outcomes, safeguards and anti-corruption measures, (iv) provide concurrence for procurement activities and withdrawal applications, (v) disburse funds for allowable expenditures, and (vi) conducts evaluations

2) Roles and Responsibilities of LA and PO in Major Project Activities

The following shows the roles responsibilities of MOET(LA) and Can Tho University (PO) in major project activities : construction of facilities, equipment procurement, Ph.D and short-term studies, and research support activities. Attachment 2 and Attachment 3 analyze responsibilities in procurement procedures in goods, civil works and services and disbursement flow.

Construction of facilities

Total cost to be approved by MOET at the approval process of Investment Plan. Construction process is managed by Project Owner.

Equipment procurement

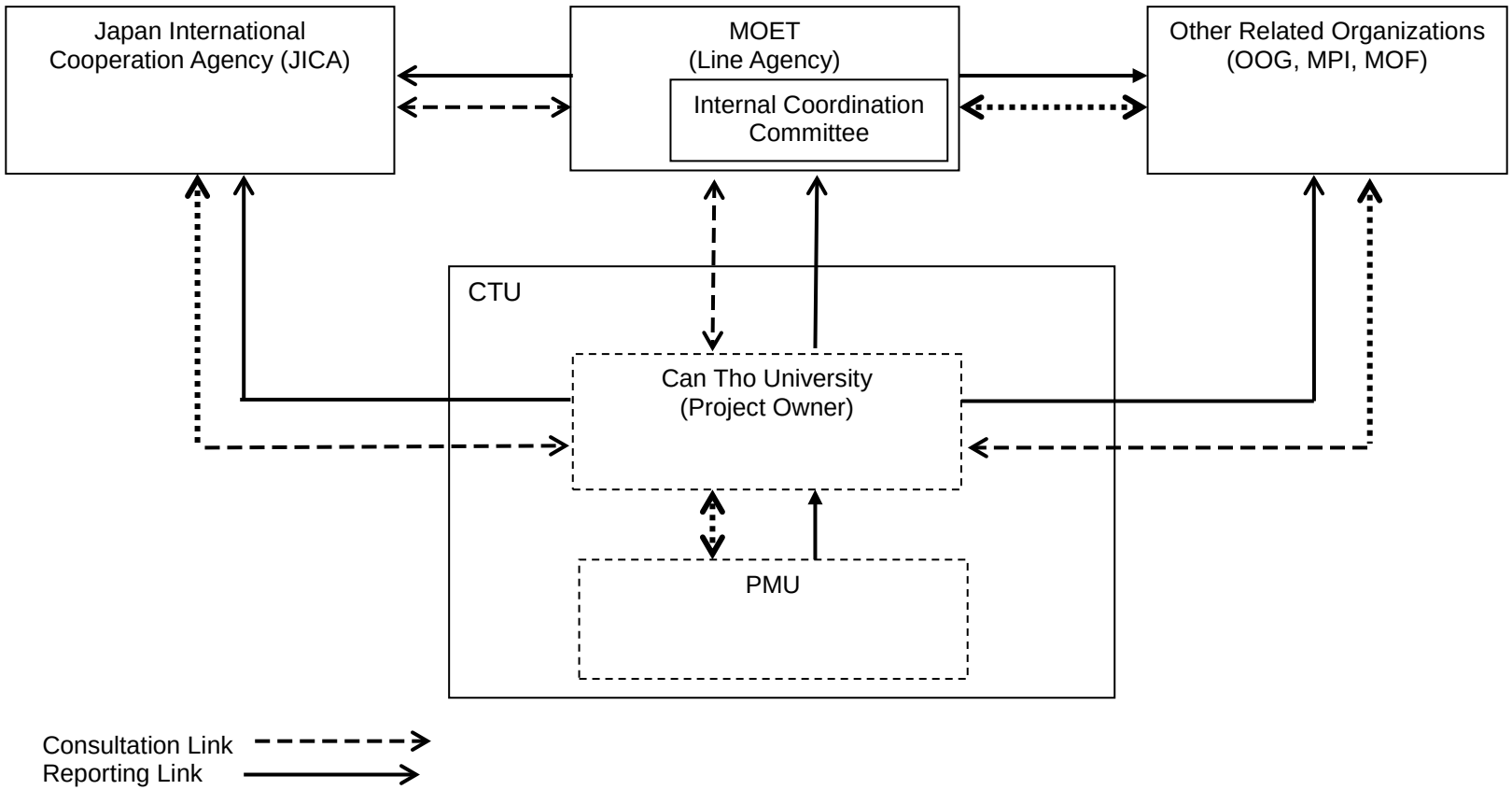
Total cost will be approved by MOET at the approval process of Investment Plan, and the detail items will be designed by Project Owner. Procurement process is managed by Project Owner.

Ph.D and short-term studies

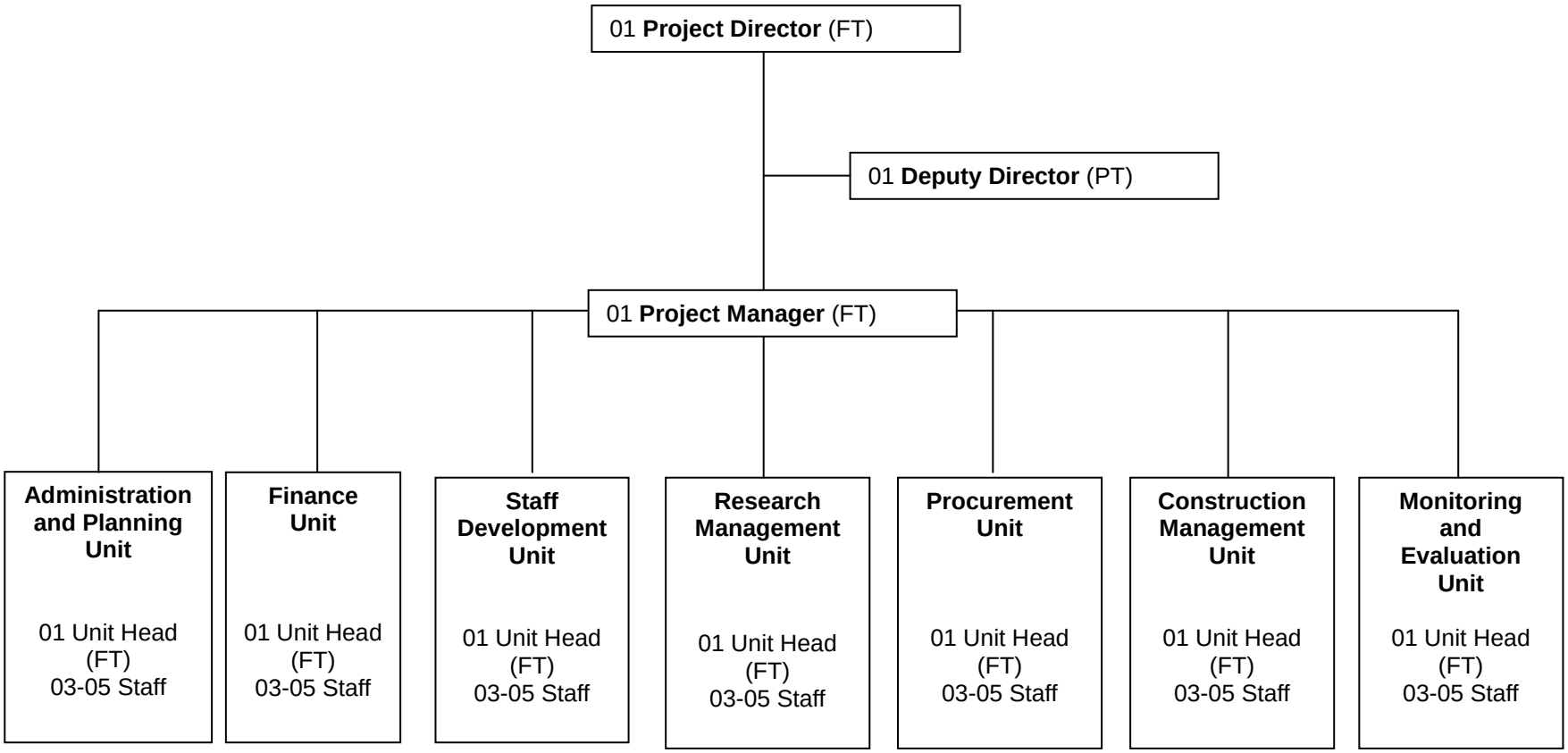
Total number of personnel (=total cost) to study in Japan will be approved by MOET based on Vietnamese F/S developed from M/D for appraisal, and selection onward will be managed by Project Owner.

Research support activities
Total cost for research support activities will be approved by MOET based on Vietnamese F/S developed from M/D for appraisal, and detail funding process will be managed by Project Owner.

(2) **Project Organization Structure**



(3) Organization Chart for Project Management Unit



(4) PMU Staffing and Tasks and Qualification of Each Position

Position	Number of staff	Tasks and Qualification	Working time
Director	1	Task: To carry out overall project management Qualification: · Having abundant experience in management of donor-funded projects · Having good knowledge on the donor's procedures, mechanism and policies · Having enough capacity for coordination with related ministries of GOV and JICA	Full time
Deputy Director	1	Task: To assist the director in carrying out overall project management Qualification: · Having sufficient experience in management of donor-funded projects · Having good knowledge on the donor's procedures, mechanism and policies · Having enough capacity for coordination with related ministries of GOV and JICA	Part time
Project Manager	1	Task: To assist the director and the deputy director, and supervise six units of the PMU in accordance with JICA ODA loan guideline and regulations of GOV Qualification: · Having experience in management of donor-funded projects · Having good knowledge on the donor's procedures, mechanism and policies · Having enough capacity for coordination with related ministries of GOV and JICA	Full time
Chief Administrator	1	Task: To lead the Administration and Planning Unit and arrange any administrative and planning issues related to the project in accordance with JICA ODA loan guideline and regulations of GOV Qualification: Having abundant experiences as administrator in similar projects.	Full time
Administrator	6	Task: To deal with overall administrative and planning work for the Project and support the PMU staff in administrational matters through following works: · Preparing the various workshops, seminars and meetings · Filing the corresponding and the project documents · Receiving visitors · Arranging field trips · Planning overall project activities	Full time (5) Part time (1)

Position	Number of staff	Tasks and Qualification	Working time
		・ Supervising project activities in terms of legal aspect ・ Other necessary works Qualification: ・ Having experiences as administrator in similar projects.	
Chief Accountant	1	Task: To lead the Finance Unit and arrange any financial issues related to the project in accordance with JICA ODA loan guideline and regulations of GOV. Qualification: ・ Having abundant experiences as accountant in similar projects.	Full time
Accountant	4	Task: To implement following works necessary for appropriate management of loan and counterpart fund: ・ Preparing disbursement plan of loan and counterpart fund, and annual financial plans ・ Monitoring and evaluating disbursement progress ・ Keeping records and financial statements ・ Managing financial documents and contractual documents ・ Preparing the financial audits ・ Controlling payments in line with contracts ・ Opening the bank accounts ・ Preparing withdrawal applications and checking supporting documents ・ Other necessary works Qualification: ・ Having experiences as accountant in similar projects.	Full time (3) Part time (1)
Cashier	1	Task: To manage cash related to the Project. Qualification: ・ Having experiences as casher in similar projects.	Full time
Chief Academic Coordinator	1	Task: To lead the Staff Development Unit and arrange any academic coordination issues related to the project in accordance with JICA ODA loan guideline and regulations of GOV. Qualification: ・ Having abundant experiences as academic coordinator in similar projects.	Full time

Position	Number of staff	Tasks and Qualification	Working time
Academic Coordinator	3	Task: To design and carry out the effective mechanism of human resource development through following works: ・ Preparing an implementation plans for long-term and short-term staff development ・ Setting up the selection criteria for the training participants ・ Selecting candidates and the Japanese partner universities ・ Negotiating and coordinating with the partner Japanese universities ・ Preparing agreements with the Japanese partner universities ・ Supporting candidates to complete admission documents ・ Monitoring and evaluating study in Japan ・ Conducting the tracer study ・ Other necessary works Qualification: ・ Having experiences as academic coordinator in similar projects.	Full time (2) Part time (1)
Chief Research Coordinator	1	Task: To lead the Research Management Unit and arrange any research management issues related to the project in accordance with JICA ODA loan guideline and regulations of GOV Qualification: ・ Having abundant experiences in research coordination of similar project	Full time
Research Coordinator	3	Task: To design and carry out the effective mechanism of strengthening research activities through following works: ・ Establishing the appropriate mechanism to manage research projects and competitive research budget ・ Setting criteria to select research plans ・ Organizing research committee and selecting research studies ・ Monitoring and evaluating selected research studies ・ Supporting dissemination of research results ・ Checking the budget expenditure request related to research studies ・ Promoting research collaboration among academia-industry cooperation ・ Supporting contractual management ・ Other necessary works Qualification: ・ Having experiences in research coordination of similar projects	Full time (2) Part time (1)

Position	Number of staff	Tasks and Qualification	Working time
Chief Procurement Officer	1	Task: To lead the Procurement Unit and arrange any procurement issues related to the project in accordance with JICA ODA loan guideline and regulations of GOV Qualification: ・ Having abundant experiences in procurement of similar loan projects ・ Having qualification on procurement certified by GOV	Full time
Procurement Staff	5	Task: To carry out quality and transparent procurement through following works: ・ Preparing procurement plans ・ Preparing TORs of consultants ・ Checking specifications of equipment ・ Conducting tendering of the consulting services, equipment and civil works ・ Coordinating with the beneficiaries to receive and test new equipment from suppliers ・ Supervising the contractors ・ Doing site inspections ・ Other necessary activities Qualification: ・ Having experiences in procurement of similar loan projects ・ Having qualification on procurement certified by GOV	Full time (4) Part time (1)
Chief Construction Management Officer	1	Task: To lead the Construction Management Unit and arrange any procurement issues related to the project in accordance with JICA ODA loan guideline and regulations of GOV Qualification: ・ Having abundant experiences in construction management of similar loan projects ・ Having qualification on construction management certified by GOV	Full time
Construction Management Staff	5	Task: To carry out quality construction management through following works: ・ Designing construction supervision policies ・ Approving construction work schedule ・ Reviewing progress of construction work based on approved construction schedule ・ Reviewing interface between building construction work and research equipment work ・ Construction site inspections and the completion inspection ・ Other necessary activities	Full time (4) Part time (1)

Position	Number of staff	Tasks and Qualification	Working time
		Qualification: ・ Having experiences in monitoring and evaluation of similar loan projects	
Chief M&E Officer	1	Task: To lead the Monitoring and Evaluation unit and arrange any monitoring and evaluation issues related to the project in accordance with JICA ODA loan guideline and regulations of GOV Qualification: ・ Having abundant experiences in monitoring and evaluation of similar loan projects	Full time
M&E Staff	2	Task: To design and conduct monitoring and evaluation through following works: ・ Designing and conducting baseline survey ・ Designing and conducting the tracer study ・ Reviewing progress of achievements ・ Identifying implementation challenges and proposing remedial actions ・ Preparing reports (monthly progress reports, quarterly progress reports ・ Annual progress reports, mid-term progress report and completion report) ・ Other necessary activities Qualification: ・ Having experiences in monitoring and evaluation of similar loan projects	Full time (1) Part time (1)

END of the Report

Attachment 1 CTU's Major Experiences in Procurement of Goods, Civil Works and Services

(1) CTU's Major Experiences in Equipment Procurement

Note:

1. In case of international development banks' projects such as WB loan projects and ADB loan projects, experiences over 10 years are listed up.
2. In case of other financing sources, experiences over 5 years are listed up.

No	Major Equipment of Procured	Contract Amount (USD)	Roles of CTU (Assigned Descriptions)	Funding Sources	Selection Method	Completion of Contract
No.1	EEC1.1.1: Equipment and technical laboratory environment and experimental studies of aquatic	418,086.90	Preparation of equipment specifications, Approval of contractor selection form, The bid invitation notice, Evaluation of bids, Approval of bidding results Announcement of bidding results, Submit signed contract, between Can Tho University and the contractor, Coordinate with the beneficiaries receiving device package, Minutes of the signing process and test equipment handover, Liquidation reports submitted for signing contracts.	IDA	ICB	2010
No.2	EEC1.1.2: Laboratory equipment advanced breeding and processing of animal products	377,042.40	Preparation of equipment specifications, Approval of contractor selection form, The bid invitation notice, Evaluation of bids, Approval of bidding results Announcement of bidding results, Submit signed contract, between Can Tho University and the contractor, Coordinate with the beneficiaries receiving device package, Minutes of the signing process and test equipment handover, Liquidation reports submitted for signing contracts.	IDA	ICB	2010
No.3	EEC1.1.3: Basic Equipment Laboratory Chemical Physics Students	256,737.05	Preparation of equipment specifications, Approval of contractor selection form, The bid invitation notice, Evaluation of bids, Approval of bidding results Announcement of bidding results, Submit signed contract, between Can Tho University and the contractor, Coordinate with the beneficiaries receiving device package, Minutes of the signing process and test equipment handover, Liquidation reports submitted for signing contracts.	IDA	ICB	2010

No	Major Equipment of Procured	Contract Amount (USD)	Roles of CTU (Assigned Descriptions)	Funding Sources	Selection Method	Completion of Contract
No.4	EEC1.2.1: Computer equipment, peripherals and software applications for research and teaching	224,159.40	Preparation of equipment specifications, Approval of contractor selection form, The bid invitation notice, Evaluation of bids, Approval of bidding results Announcement of bidding results, Submit signed contract, between Can Tho University and the contractor, Coordinate with the beneficiaries receiving device package, Minutes of the signing process and test equipment handover, Liquidation reports submitted for signing contracts.	IDA	ICB	2010
No.5	EEC2: Books, newspapers, magazines and scientific databases	78,379.00	Preparation of equipment specifications, Approval of contractor selection form, The bid invitation notice, Evaluation of bids, Approval of bidding results Announcement of bidding results, Submit signed contract, between Can Tho University and the contractor, Coordinate with the beneficiaries receiving device package, Minutes of the signing process and test equipment handover, Liquidation reports submitted for signing contracts.	IDA	NCB	2010
No.6	EEC1.4.1: Computers	39,828.00	Preparation of equipment specifications, Approval of contractor selection form, The bid invitation notice, Evaluation of bids, Approval of bidding results Announcement of bidding results, Submit signed contract, between Can Tho University and the contractor, Coordinate with the beneficiaries receiving device package, Minutes of the signing process and test equipment handover, Liquidation reports submitted for signing contracts.	IDA	NCB	2011
No.7	EEC1.6: Audio-visual equipment for classrooms	80,997.28	Preparation of equipment specifications, Approval of contractor selection form, The bid invitation notice, Evaluation of bids, Approval of bidding results Announcement of bidding results, Submit signed contract, between Can Tho University and the contractor, Coordinate with the beneficiaries receiving device	IDA	NCB	2011

No	Major Equipment of Procured	Contract Amount (USD)	Roles of CTU (Assigned Descriptions)	Funding Sources	Selection Method	Completion of Contract
			package, Minutes of the signing process and test equipment handover, Liquidation reports submitted for signing contracts.			
No.8	Laboratory equipment serving chemical basic science research and applications	332,500.00	Preparation of equipment specifications, Approval of contractor selection form, The bid invitation notice, Evaluation of bids, Approval of bidding results Announcement of bidding results, Submit signed contract, between Can Tho University and the contractor, Coordinate with the beneficiaries receiving device package, Minutes of the signing process and test equipment handover, Liquidation reports submitted for signing contracts.	Central Government (for science and technology)	NCB	2011
No.9	Laboratory Equipment for composite materials	127,990.00	Preparation of equipment specifications, Approval of contractor selection form, The bid invitation notice, Evaluation of bids, Approval of bidding results Announcement of bidding results, Submit signed contract, between Can Tho University and the contractor, Coordinate with the beneficiaries receiving device package, Minutes of the signing process and test equipment handover, Liquidation reports submitted for signing contracts.	Central Government (for science and technology)	NCB	2009
No.10	Laboratory Equipment Livestock serving basic science research and applications 2011	99,086.00	Preparation of equipment specifications, Approval of contractor selection form, The bid invitation notice, Evaluation of bids, Approval of bidding results Announcement of bidding results, Submit signed contract, between Can Tho University and the contractor, Coordinate with the beneficiaries receiving device package, Minutes of the signing process and test equipment handover, Liquidation reports submitted for signing contracts.	Central Government (for science and technology)	NCB	2011

No	Major Equipment of Procured	Contract Amount (USD)	Roles of CTU (Assigned Descriptions)	Funding Sources	Selection Method	Completion of Contract
No.11	Equipment procurement project "Physics Laboratory serves intensive basic science research and applications 2012"	49,671.43	Preparation of equipment specifications, Approval of contractor selection form, The bid invitation notice, Evaluation of bids, Approval of bidding results Announcement of bidding results, Submit signed contract, between Can Tho University and the contractor, Coordinate with the beneficiaries receiving device package, Minutes of the signing process and test equipment handover, Liquidation reports submitted for signing contracts.	Central Government (for science and technology)	NCB	2012
No.12	Device Physics Laboratory serves intensive basic science research and applications 2013	285,380.95	Preparation of equipment specifications, Approval of contractor selection form, The bid invitation notice, Evaluation of bids, Approval of bidding results Announcement of bidding results, Submit signed contract, between Can Tho University and the contractor, Coordinate with the beneficiaries receiving device package, Minutes of the signing process and test equipment handover, Liquidation reports submitted for signing contracts.	Central Government (for science and technology)	NCB	2013

(2) CTU's Major Experiences with Civil Works

Notes: Experiences over 10 years are listed up.

No	Contents of Civil works and total floor areas (m^2)	Contract Amount (USD)	Roles of CTU (Assigned Descriptions)	Funding Sources	Selection Method	Completion of Contract
1	New Administration Building (10,000m2)	9,000,000	Pre-Qualification, Preparation of contract document for contractors, Tendering, Evaluation of Bidding, Contract Negotiation, Supervision of Contract	Central Government	ICB	on-going
2	Cantho University Learning resource center (7,200m2)	9,140,000	User	Sponsorship of Bermuda-based Atlantic Philanthropies, a non-profit foundation		done
3	College of Aquaculture & Fisheries (7,190m2)	1,873,000	Pre-Qualification, Preparation of contract document for contractors, Tendering, Evaluation of Bidding, Contract Negotiation, Supervision of Contract	Central Government	NCB	done
4	Student house (35,000m2)	12,735,889	Supervision of Contract	Central Government	EPC	done
5	Administration Building (18,990m2)	9,338,162	Pre-Qualification, Preparation of contract document for contractors, Tendering, Evaluation of Bidding, Contract Negotiation, Supervision of Contract	Central Government	NCB	on-going
6	Center For National Defence Education	8,032,512	Pre-Qualification, Preparation of contract document for contractors, Tendering, Evaluation of Bidding, Contract Negotiation, Supervision of Contract	Central Government	NCB	on-going

(3) CTU's Major Experiences with Procurement of Consultancy Services (hiring Consulting Firms)

Note:

In case of international development banks' projects such as WB loan projects and ADB loan projects, experiences over 10 years are listed up.

In case of other financing sources, experiences over 5 years are listed up.

No	Contents of Consultanvy Services procured	Contract Amount (USD)	Roles of CTU (Assigned Descriptions)	Funding Sources	Selection Method	Completion of Contract
1	Design consultant for details desing of Cantho University Learning resource center (7,200m2)		User	Sponsorship of Bermuda-based Atlantic Philanthropies, a non-profit foundation		2004
2	College of Aquaculture & Fisheries (7,190m2)	45,240	EOI, Preparation of TOR, Preparation of contract document for contractors, Tendering, Evaluation of Bidding, Contract Negotiation, Monitoring and Evaluation of consultancy services	Central Government	QCBS	2005
3	Design consultant for details desing of Student house	171,494	Contract Negotiation, Monitoring and Evaluation of consultancy services	Central Government	EPC	2009
4	Design consultant for details desing of Administration building	98,095	EOI, Preparation of TOR, Preparation of contract document for contractors, Tendering, Evaluation of Bidding, Contract Negotiation, Monitoring and Evaluation of consultancy services	Central Government	NCB	2008
5	Center For National Defence Education		EOI, Preparation of TOR, Preparation of contract document for contractors, Tendering, Evaluation of Bidding, Contract Negotiation, Monitoring and Evaluation of consultancy services	Central Government	QCBS	2010

Attachment 2 Preliminary Analysis on Comparisons in Responsible Organizations in Procurement Procedures for Services, Goods and Works between Different Implementation Arrangements

This attachment preliminarily analyzes responsible organizations in each step of procurement procedures in two cases: (1): MOET is the Executing Agency (EA) and Project Owner (PO) and (2): MOET is the Executing Agency (EA) and Can Tho University is Project Owner.

As shown in parts highlighted in gray in the following three tables, Most of approval responsibilities move to Can Tho University when PO changes to Can Tho University from MOET except for approval of procurement plan (PP). MOET has responsibilities to approve PP under authorities of the EA.

1. RECRUITMENT OF CONSULTANTS (QCBS)

No.	Procedures Step by Step	Organizations in Charge	
		EA:MOET, PO:MOET	EA: MOET PO: CTU
1	Develop Procurement Plan (PP)	PMU	PMU,
2.1	Submit PP to JICA	PMU	PMU
2.2	Approve PP	JICA	JICA
3.1	Submit PP to MOET	PMU	PMU
3.2	Approve PP	MOET	MOET
4	Establish BEC （Bid Evaluation Committee）	PMU	PMU
5	Approve BEC	MOET	CTU
6	Develop TOR	PMU	PMU
7	Submit TOR to JICA	PMU	PMU
8	Approve TOR	JICA	JICA
9	Develop Request for EOI	PMU	PMU
10	Submit Request for EOI to MOET	PMU	PMU
11	Approve Request for EOI	MOET	CTU
12	Advertise on newspaper (calling for EOI)	PMU	PMU
12.1	Sending copy of advertisement to JICA	PMU	PMU
13	Issue Request for EOI	JICA	JICA
14	Evaluating EOI to prepare the short list, prepare Submission 1 (short list and Request for Proposal)	PMU, CSC	PMU, CSC
15	Submit Submission 1 to JICA	PMU	PMU
16	JICA review and approve Submission 1	JICA	JICA
17	Submit the short list to MOET (to CTU in case that CTU is PO)	PMU	PMU
18	MOET approve the Submission 1 (in case that CTU is PO, CTU approve the Submission 1)	MOET	CTU
19	Sending Request for Proposals to Consultants in the short list	PMU	PMU
20	Bid closing (deadline to submit RFP)	PMU	PMU
21	Public opening of Technical Proposal	PMU	PMU
22	Evaluation for Technical Proposals and prepare Submission 2 (report on evaluation of technical proposals)	PMU, CSC	PMU, CSC
23	Submit Submission 2 to JICA	PMU	PMU
24	Review and Approve Submission 2	JICA	JICA
25	Submit Submission 2 to MOET (in case that CTU is PO, Submit Submission 1 to CTU)	PMU	PMU
26	Approve Submission 2	MOET	CTU

No.	Procedures Step by Step	Organizations in Charge	
		EA:MOET, PO:MOET	EA: MOET PO: CTU
27	Sending Invitation letter to consultants that achieve requirement on technical proposals' evaluation	PMU	PMU
28	Public Opening of Financial Proposals	PMU	PMU
29	Sending Bid Opening Record for Financial Proposals to JICA	PMU	PMU
30	Evaluation of Financial Proposals and prepare submission 3 (Report on Evaluation of FPs)	PMU, CSC	PMU, CSC
31	Submit Submission 3 to JICA	PMU	PMU
32	Review and Approve Submission 3	JICA	JICA
33	Submit Submission 3 to MOET (in case that CTU is PO, Submit Submission 3 to CTU)	PMU	PMU
34	Approve Submission 3	MOET	CTU
35	Sending invitation letter for contract negotiation/	PMU	PMU
36	Contract negotiation and preparing Submission 4 (contract negotiation minutes and draft of contract)/	PMU	PMU
37	Sending Submission 4 to JICA	PMU	PMU
38	Review and approve Submission 4	JICA	JICA
39	Submit Submission 4 to MOET (in case that CTU is PO, Submit Submission 4 to CTU)	PMU	PMU
40	Approve Submission 4	MOET	CTU
41	Signing contract and sending copy to JICA (Submission 5)	PMU	CTU
42	Issuing Notice to Proceed/	PMU	CTU
43	Sending notification to unsuccessful consultants	PMU	CTU
44	Information to be made public	JICA	JICA
45	Advertise bid result on Procurement Newspaper	PMU	PMU

2. PROCUREMENT OF GOODS AND WORKS (ICB)

(1) GOODS (Single Stage-One envelop Bidding)

No.	Description	Organizations in Charge	
		EA:MOET, PO:MOET	EA: MOET PO: CTU
1	Develop Procurement Plan (PP)	PMU	PMU
2.1	Submit PP to JICA	PMU	PMU
2.2	Approve PP	JICA	JICA
3.1	Submit PP to MOET/	PMU	PMU
3.2	Approve PP	MOET	MOET
4	Establish Bid Evaluation Committee	PMU	PMU
5	Approve Bid Evaluation Committee	MOET	CTU
6	Develop the list of equipment and cost estimation	PMU	PMU
7	Approve list of equipment and cost estimation	JICA	JICA
8	Approve list of equipment and cost estimation	MOET	CTU
9	Develop Bidding document	PMU	PMU
10	Submit Bidding document to JICA	PMU	PMU
11	Approve Bidding Document	JICA	JICA
12	Submit Bidding Document to MOET (In case that CTU is PO, Submit Bidding Document to CTU)	PMU	PMU
13	Approve Bidding Document	MOET	CTU
14	Advertisement, Bid Invitation	PMU	PMU
14.1	Sending copy of advertisement to JICA	PMU	PMU
15	Sell Bidding document	PMU	PMU
16	Bid closing (deadline to submit bid document)	PMU	PMU
17	Bid opening	PMU	PMU

No.	Description	Organizations in Charge	
		EA:MOET, PO:MOET	EA: MOET PO: CTU
17.1	Sending copy of Bid Opening Record to JICA	PMU	PMU
18	Bid Evaluation	PMU, BEC	PMU, BEC
19	Submit Bid Evaluation Report to JICA	PMU	PMU
20	Approve BER	JICA	JICA
21	Submit BER to MOET (In case that CTU is PO, Submit BER t to CTU)	PMU	PMU
22	Approve BER	MOET	CTU
23	Contract negotiation	PMU	PMU
24	Sending award notice and notification to unsuccessful bidders	PMU	PMU
25	Information to be made public	JICA	JICA
26	Advertise bid result on Procurement Newspaper	PMU	PMU

(2) WORKS (Single Stage – One envelop bidding)

No.	Description	Person in charge	
		EA:MOET, PO:MOET	EA: MOET PO: CTU
0	Develop, appraisal, approve investment project according to Decree 12/2009/ND-CP	PMU, MOET	CTU, PMU, MOET
1	Develop Procurement Plan (PP)	PMU	PMU
2.1	Submit PP to JICA	PMU	PMU
2.2	Approve PP	JICA	JICA
3.1	Submit PP to MOET	PMU	PMU
3.2	Approve PP	MOET	MOET
4	Establish Bid Evaluation Committee	PMU	PMU
5	Approve Bid Evaluation Committee	MOET	CTU
6	Develop Bidding document	PMU	PMU
7	Submit Bidding document to JICA	PMU	PMU
8	Approve Bidding Document	JICA	JICA
9	Submit Bidding Document to MOET (In case that CTU is PO, Submit Bidding Document to CTU)	PMU	PMU
10	Approve Bidding Document	MOET	CTU
11	Advertisement, Bid Invitation	PMU	PMU
11.1	Sending copy of advertisement to JICA	PMU	PMU
12	Sell Bidding document	PMU	PMU
13	Bid closing (deadline to submit bid document)	PMU	PMU
14	Bid opening	PMU	PMU
15	Sending copy of Bid Opening Record to JICA	PMU	PMU
16	Bid Evaluation	PMU, BEC	PMU, BEC
16.1	Submit Bid Evaluation Report to JICA	PMU	PMU
17	Approve BER	JICA	JICA
18	Submit Bid Evaluation Report to MOET (In case that CTU is PO, Submit BER to CTU)	PMU	PMU
19	Approve BER	MOET	CTU
20	Contract negotiation	PMU	PMU
21	Sending award notice and notification to unsuccessful bidders	PMU	PMU
22	Information to be made public	JICA	JICA
23	Advertise bid result on Procurement Newspaper	PMU	PMU

Attachment 3: Analysis of Disbursement Mechanisms

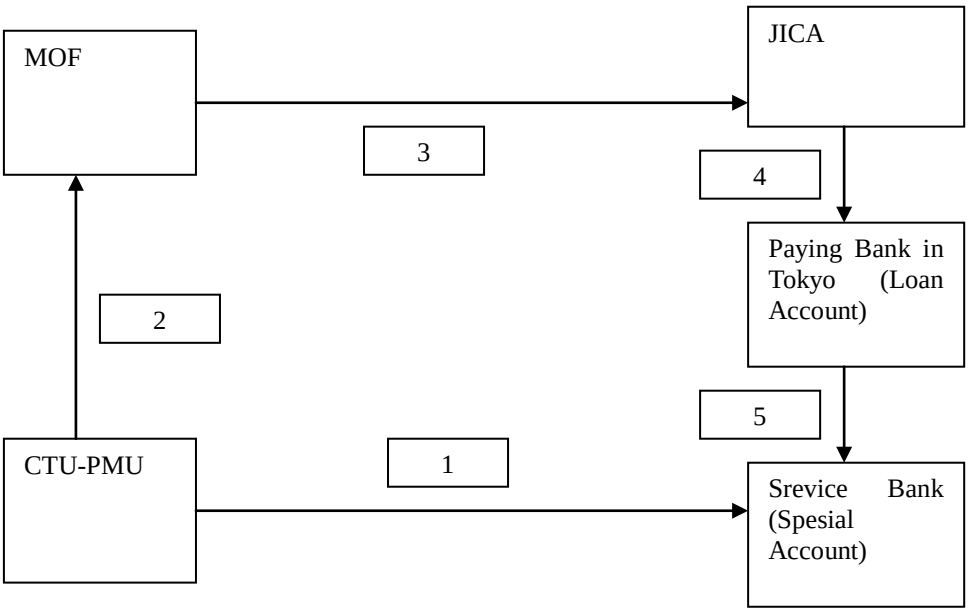
1. Preparation for Analysis

1) Project Implementation and Management Arrangements
   EA:MOET, PO:CTU, PMU under CTU
2) Payment procedure and project components
   HRD: Special Account Procedure
   Research: Special Account Procedure
   Equipment (ICB): Letter of Commitment Procedure
   Civil Works (ICB): Letter of Commitment Procedure
   Consulting Services Letter of Commitment Procedure
3) Government regulations
   Circular No.218/2013/TT-BTC dated December 31st 2013 by MOF

2. Disbursement Mechanisms

2.1 Special Account Procedure

(1) Initial Disbursement and Replenishment



For Initial Disbursement:

(1) CTU-PMU opens a Spesial Account (SA) in a comercial bank in Vietnam (service bank). SA should be started and maintained in japaness yen and monthly statements on the expenditures paid out of the SA;
(2) CTU-PMU prepare the Request for Initial Disbursement (Form RFD (S-IN)); Official letter on Initial Disbursement to MOF; Document evidencing the opening of the SA; The amount of the Initial Disbursement stipulated in the Loan Agreeent and send to MOF (DMEF);
(3) MOF review and sign to the Request for Initial Disbursementand send to JICA;
(4) JICA pay into the Loan Account in Paying bank in Tokyo within 15 business days form the day of receipt of RFD;
(5) Paying bank transfer the amount to SA.

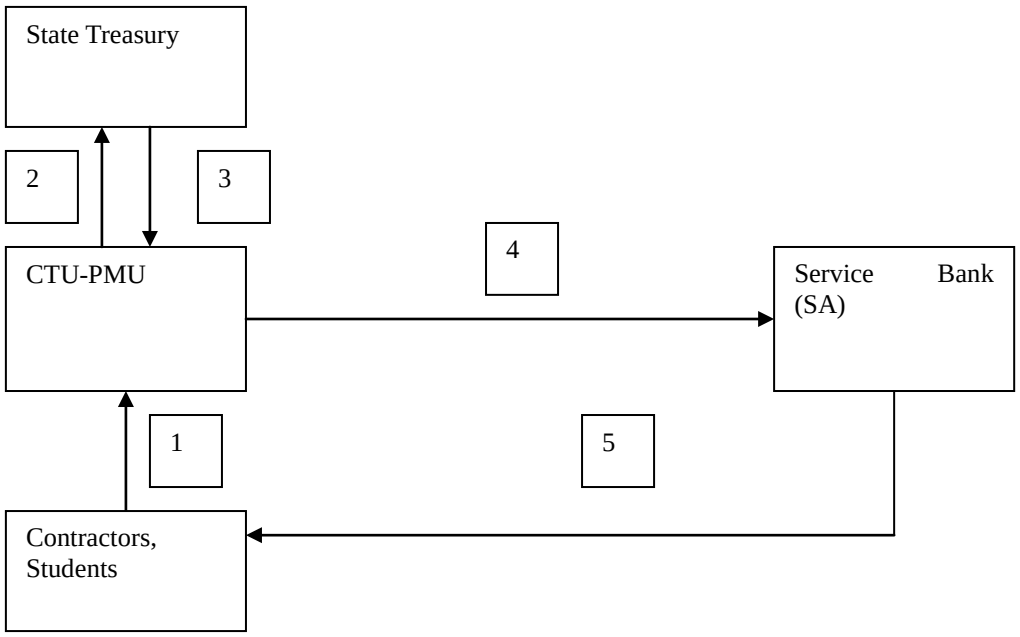
For Replenishment:

(2) CTU-PMU prepare
   - The Request for Request for Replenishment (Form RFD (S-RP));
   - Official letter on Request for Replenishment to MOF;
   - Summary Sheet of Payment (Form SSP (S))

- Supporting documents evidencing each payment;

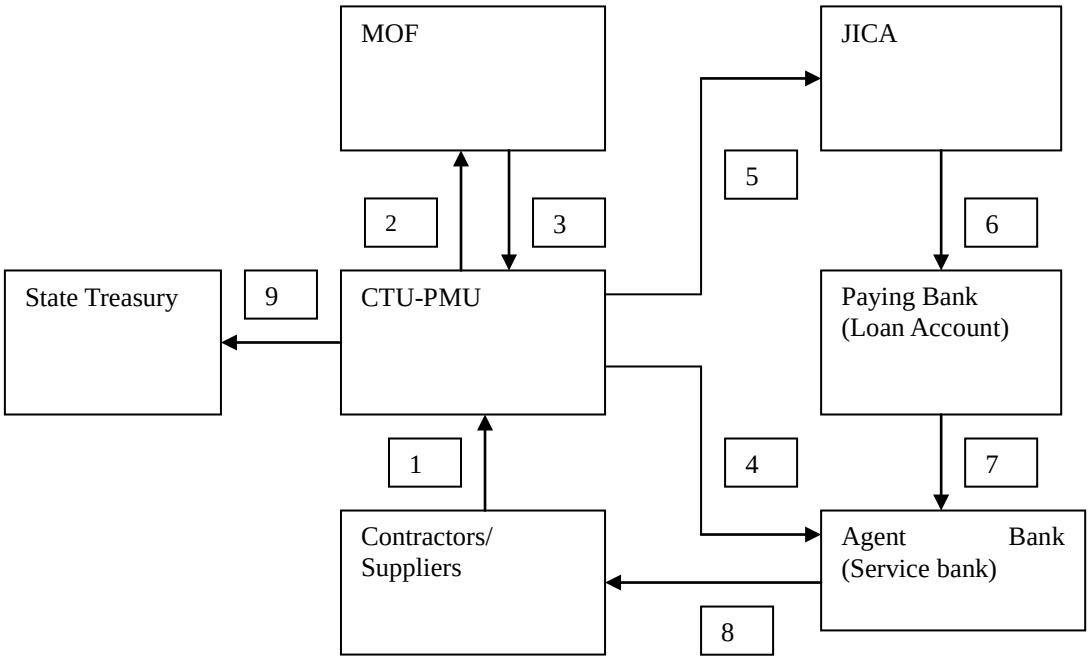
(3) MOF review and sign to the Request for Replenishment and send to JICA;
(4) JICA pay into the Loan Account in Paying bank in Tokyo within 15 business days form the day of receipt of RFD;
(5) Paying bank transfer the amount to SA.

(2) Payment from the Special Account



(1) Contractors, students send to CTU-PMU the payment requests;
(2) CTU-PMU review and send payment documents to State Treasury for expenditure control;
(3) State Treasury review and verifies payment documents and send back to CTU-PMU;
(4) CTU-PMU prepares payment order and send to the service bank;
(5) Service Bank pays to contractors and students.

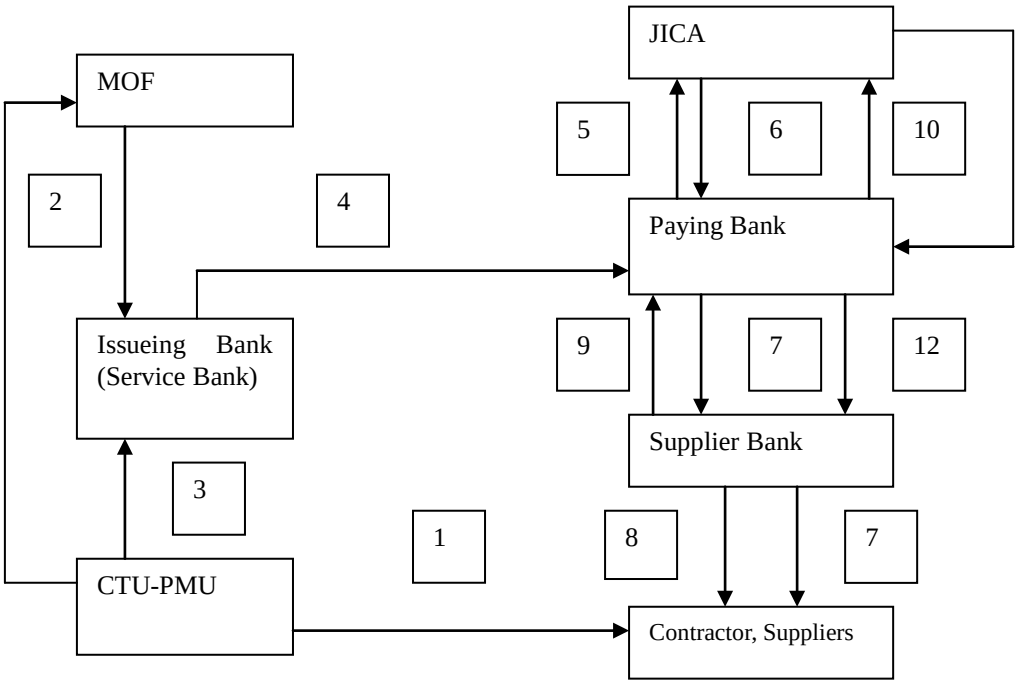
2.2 Money Transfer Procedure



(1) Suppliers send payment claim to CTU-PMU in Vietnam dong;
(2) CTU-PMU review and accept payment request and prepare Request for Disbursement (Form RFD (T)) and accopanied by supporting documents:
- Official letter on Request for Disbursement to MOF;
- Summary Sheet of Payment (Form SSP (T));
- Copy of Transfer instructionfor type B addressed to the Agent Bank (Form TI-B);
- Claim for payment evidencing the aount to be paid to the supplier;
- Supporting documents evidencing each payment and its usage.

CTU-PMU all these documents to MOF;
(3) MOF review and sign to the Request for Disbursement and return to CTU-PMU;
(4) CTU-PMU send to the Agent Bank Transfer instruction for type B accompanied by copy of Request for Disbursement and Claim for payment;
(5) CTU-PMU send all disbursement documents to JICA and Transfer instruction to Paying Bank;
(6) JICA review, accept and pay into Loan Account in Paying bank in Tokyo within 15 business days form the day of receipt of RFD;
(7) Paying Bank makes a cable advice to the Agent Bank.
(8) Agent Bank immediately transfer the amount actually payable to supplier in VND;
(9) CTU-PMU sends payment documents to State Treasury (ST) for payment post review. The verification of the ST will be documented for the next Request for Disbursement of the same Contractor.

2.3 **Letter of Commitment Procedure**



1. Procedure of Letter of Credit (L/C)
(1) CTU-PMU and contractor, supplier sign the contract;
(2) MOF is the agency aproved the payment provision of the contract;
(3) CTU-PMU (or Aplicant) requests the Issuing Bank to issue a L/C;
(4) Issuing Bank issues a L/C (in Form LC) and send L/C to Paying Bank;
(5) Paying Bank send a copy of the L/C to JICA in order to obtain the letter of Commitent (L/COM) for JICA;
(6) JICA check the L/C with the term of the relevant to contract between CTU-PMU and the supplier, issue an L/COM to the Paying Bank. The L/C became effective;
(7) Paying Bank send the L/C to the Supplier through the Supplier Bank.

2. Procedure of Disbursement
(8) Supplier Bank shall make payment to the supplier pursuant o the said L/C;
(9) Supplier Bank request the Paying Bank to reimburse the funds by sending documents specified in the L/C;
(10) Paying Bank check request and documents, if they are in order, send to JICA the Request for Disbursement (Form RFD (C));
(11) JICA makes disbursement in Japanese yen of the requested amount to the Paying Bank;
(12) Paying Bank shall make payment to the Supplier Bank.

2.4 Reimbursement Procedure
Reimbursement procedure is not applicable in Vietnam because of constrain of state budget allocated for the Project.