No.

Ministry of Agriculture, Animal Industry and Fisheries
The Republic of Uganda

BASIC DESIGN STUDY REPORT
ON
THE PROJECT FOR ESTABLISHMENT OF
THE REGIONAL RICE RESEARCH AND TRAINING CENTER
IN THE NATIONAL CROPS RESOURCES RESEARCH INSTITUTE
IN
THE REPUBLIC OF UGANDA

February 2009

JAPAN INTERNATIONAL COOPERATION AGENCY

NTC INTERNATIONAL CO. LTD.

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PREFACE

In response to a request from the Government of the Republic of Uganda, the Government of Japan decided to conduct a basic design study on the Project for Establishment of the Regional Rice Research and Training Center in the National Crops Resources Research Institute and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Uganda a study team from August 2 to August 31, 2008.

The team held discussions with the officials concerned of the Government of Uganda, and conducted a field study at the study area. After the team returned to Japan, further studies were made. Then, a mission was sent to Uganda in order to discuss a draft basic design, and as this result, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of Uganda for their close cooperation extended to the teams.

February, 2009

Ariyuki Matsumoto
Vice-President
Japan International Cooperation Agency

February 2008

Letter of Transmittal

We are pleased to submit to you the basic design study report on the Project for Establishment of the Regional Rice Research and Training Center in the National Crops Resources Research Institute (NaCRRI) in the Republic of Uganda.

This study was conducted by the NTC International Co., Ltd., under a contract to JICA, during the period from July 2008 to February 2009. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Uganda and formulated the most appropriate basic design for the project under Japan's Grant Aid scheme.

Finally, we hope that this report will contribute to further promotion of the project.

Very truly yours,

Takahiro Kato
Project manager,
Basic design study team on the Project for Establishment of the Regional Rice Research and Training Center in NaCRRI
NTC International Co., Ltd.

Summary

The Government of Uganda (GOU) considers the agricultural sector, which is the main industry of the country, as one of the most important sectors in eradicating poverty in line with the national plan of "Poverty Eradication Action Plan (PEAP)". Hence, it has been tackling to enhance the agricultural and rural development sector since the adoption of "Plan for Modernization of Agriculture (PMA)" in 2001. Four main goals of the PMA are:

1) to increase income and improve the quality of life of poor subsistence farmers,
2) to improve household food security through market,
3) to generate gainful employment in the agricultural sector, and
4) to promote sustainable use and management of natural resources.

In this circumstance, the GOU has a strong interest in the rice promotion and in particular the dissemination of "New Rice in Africa (NERICA)" to create employment and advance a market oriented agriculture in relation to the PMA.

The paddy rice in Uganda has been introduced as a crop suitable for land reclamation in swamp areas since last two decades, and well known as a main cash crop. Recently, the consumption and production of rice have been rapidly increasing; for example the total rice production was 162,000 ton in 2007, and in a decade the production increased by approximately twofold compared to that of 1997. This increase is mainly attributable to increase in rice cultivation area, though the unit yield per ha remains at a low level such as about 1.5 ton/ha. Moreover, the increase ratio of rice consumption is higher than that of rice production; therefore, Uganda has to import rice to satisfy its demand. The quantity of imported rice has been slightly increasing since 1997 and it reached at 81,400 ton in 2005 (43.5% of demand). Although rice is important fungible import goods, the import of farm inputs such as fertilizer and insecticide causes often outflow of foreign currency.

The facilities in the National Crops Resources Research Institute (NaCRRI), which is a core center for the rice experiment, research and dissemination in Uganda, has been deteriorated in 60 years after construction, furthermore, most of the laboratories and experiment facilities are fully being used for other crop research, e.g., maize, cassava, etc. It is therefore necessary to acquire additional facilities for the rice research and training purposes. Also, equipment for agricultural research and training has been decrepit, thus troubled with frequent failures. In addition shortage and failure of the workshop equipment hindered necessary repair and maintenance works for agricultural machineries, e.g. tractors, etc. The shortage of equipment for the post harvest machinery,

accommodation facilities for visitors and long stay researchers, demonstration and trial farms for a variety selection and seed production of rice terribly obstruct expected result in research and training of rice cultivation in the NaCRRI.

The Japan International Cooperation Agency (JICA) recognized the rice promotion as a core of Japan's cooperation in line with the agricultural development strategy of Uganda, and has been cooperating to improve a training and dissemination system and establish a technological basis of rice cultivation by dispatching long term experts to "the Promotion, Development and Dissemination of NERICA Rice in Uganda" to the NaCRRI since June 2004. However, the human resources, dissemination system and institutional infrastructure have not been strong enough in the field of rice research and dissemination in Uganda. For these reasons, the GOU requested the technical cooperation on "the NERICA Rice Promotion Project" and the grant aid assistance to construct "the Regional Rice Research and Training Center" aiming at enhancing the capability of the NERICA research and training programs in the NaCRRI, developing researchers and extension workers around the country, and improving production and productivity of NERICA through reorganizing the dissemination system.

In response to the request, the JICA conducted the First Preparatory Study to examine relevance and effectiveness of the Project in relation to the development policy stated in the PEAP, and also effectiveness of research and dissemination activities of the Promotion, Development and Dissemination of NERICA Rice Project. In addition, the JICA formulated research and training programs of two technical cooperation projects, i.e., "the NERICA Rice Promotion Project" and "the Sustainable Irrigated Agriculture Development Project in Eastern Uganda". In the study, the framework, components and scope of the Project was discussed with the GOU considering all possible conditions related to the above technical cooperation projects, such as a synergistic effect of the technical cooperation and grant aid schemes, etc.

The JICA sent the Basic Design Study Team to Uganda from August 2 to August 31, 2008 to formulate project concept, project components, implementation plan including project cost estimation with careful examination of the "Rice promotion" program from the view points of relevance, effectiveness and efficiency of the program, and also for foregoing two technical cooperation projects. After the team returned to Japan, the project components requested by the GOU and relevance of the Project were analyzed. Consecutively the JICA sent the Draft Report Explanation Team to Uganda from December 13 to December 22, 2008 to explain the project formulation and components. As a result of discussions, both parties confirmed the details of the project components comprising of the facility construction and equipment procurement necessary for rice research and training in the NaCRRI in line with the basic principles for facility and equipment plan for the research and training programs shown below:

- As a core research and training center for the rice promotion in Uganda, research and training environment of NaCRRI shall be improved with completion of the facilities and equipment procurement, aiming at enhancing extension of rice cultivation and increasing rice production and productivity.

- With respect to the research and training program, research and training for rice cultivation, cropping patterns, mechanized agriculture, intercropping and post harvest technology shall be carried out in the complete laboratories, lecture rooms and trial farms constructed by the Project. The facilities and equipment shall be planned to meet these research and training needs.

- Researchers and trainees should be composed of those from NaCRRI, the National Agricultural Research Organizations (NARO), the Zonal Agricultural Research and Development Institutes (ZARDI), District Agricultural Officer, etc. The facilities shall be appropriately designed according to the number of users in each research and training field, occupation period, etc.

(1) Facilities

Facilities	Details	Floor area (m^2)
Research and administration block	Laboratory (4 rooms), seed processing/ storage room, administration room, reception room, panel display room, library and data storage room, equipment storage room, working room, toilet, passway, etc.	700
Training block	Lecture rooms (2 rooms, capacity 90 persons)	424
Canteen/ kitchen block	Canteen, kitchen and storage room	216
Dormitory block for researchers	Dormitory (6 rooms for 12 researchers), common room (1 room)	252
Screen house with glass roofing	Cultivation of rice varieties, installation of lysimeters	600
Warehouse for agricultural machinery	Storage of agricultural machinery and working space for experiment using thresher and winnowing fan	270
Drying yard	Dry up of rice	450
Workshop	Repair and maintenance works of the equipment and vehicles	348
Rice mill demonstration and working shop	Installation of the huller- rice mill machinery, and training space	200
Common toilet	Use by researchers and trainees	40
Generator room	Installation of emergency generator	12
Septic tank, infiltration wells	Disposal of waste and sewage water	1site
Total		3,512
Irrigation facilities	Trial farm	2 ha
	Main irrigation canal	650 m
	Lateral irrigation canal	700 m
	Drainage canal	320 m
	Farm road	1,200 m

(2) Equipment

Category	Equipment	Q'ty	Specifications
Laboratory equipment	Generator	1	Power supply in power failure, 100 kVA, diesel power, soundproof type
	Solar battery system	1	Supply for refrigerator for seed storage, power for light and personal computer in night time About 3 kW solar panel, battery
Research equipment	Meteorological observation equipment	2	United type, tripod mounted Thermometer, hygrometer, rainfall gauge, sunshine meter, wind speed and direction meter
	Lysimeter	8	Collection of fundamental data for irrigation of rice, etc. Lysimeters are installed both inside and outside of screen house. Squire type (100 x 100 x 60 cm)
Equipment for trial farm	Tractor	2	Ride type, 4WD, 80 PS
	Disc plow	2	3 blade type, for 80 PS tractor
	Bottom plow	2	3 blade type, for 80 PS tractor
	Seeder (1) Seeder (2)	1 1	For paddy, width: 2.5 m or more For various crops, width: 3.0 m or more Both for 80 PS tractor
	Sprayer	1	Tank capacity: 800 lit, width: 12 m or more, for 80 PS tractor
	Cultivator	1	9 claws or more, for 80 PS tractor
	Trailer (Traction type)	2	Capacity: 5 ton, for 80 PS tractor
Post-harvest equipment for demonstration	Huller/Rice mill	1	Training of post harvest equipment One-pass type, capacity: 700 kg/hr,
Workshop equipment	Arc welding machine	1	Repair and maintenance of equipment procured by the Project and those of NaCRRI
	Gas (Acetylene) welding machine	1	
	Upright drilling machine	1	
	High speed cutter	1	
	Bench (Electric) grinder	1	
	Pipe threading machine	1	
	Electric repairing tools	1set	
	High pressure washing machine	1	
	Hydraulic jack	3	
	Other tools	1set	

The total project period is about 18 months including 6 months for the detailed design, tendering and contract, and 12 months for the construction work when the Project is implemented by

Japan's grant aid program. The project cost shared by the Ugandan side is estimated at approximately Japanese yen 7.6 million.

In the implementation of the Project, the MAAIF is the responsible agency, and the NARO is the implementation agency which shall substantially coordinate and manage the whole project. The NaCRRI is a leading agency to take responsibility for the Rice promotion program. The NARO has established staff capacity of 879, of which 248 are researchers, 233 technicians and 398 support staff, and the NaCRRI has 127 staff, of which 36 are researchers, 52 technicians and 39 support staff. According to the present achievements on the research and training programs of the NERICA Rice Promotion Project, it is concluded that both organizations have sufficient capability to coordinate and manage the whole project. The Administration section of the NaCRRI is responsible for operation and maintenance works of the facilities and equipment after the completion of the Project. Since an especially high skilled technique is not required for the facility and equipment maintenance, the section is capable of the maintenance of the facilities and equipment. Operation and maintenance cost is estimated at about Ug.Shs. 310 million, which is equivalent to 8.7% of total annual cost of Ug.Shs. 3,600 million of the NaCRRI in the fiscal year of 2006/07. It is thus considered that the NaCRRI is capable of managing the operation and maintenance works of the center from the institutional and financial points of views.

Through the effective use of facilities and equipment under the Project, about 2,600 persons, comprising of researchers, government staff and farmers are benefited per annum in participating the training programs for the rice cultivation. Project effects are summarized as follows:

- The researchers achieve steady study results through the effective use of facilities and equipment installed by the technical cooperation projects of the Rice promotion program.

- Under the training programs prepared by the technical cooperation projects of the JICA, trainees improve their own capacities of rice cultivation by the use of the facilities and equipment procured by the Project. In addition, the trainees are benefited through the use of the canteen/ kitchen, such as convenience for taking meals and reduction of its expense.

- The procurement of the equipment such as for seed production, trial farm cultivation and post harvest enables to effectively conduct field training, thus considerably improves training effects.

- Workshop facility provides comfortable working environment, and procurement of equipment reduces maintenance cost of equipment for not only those procured by the Project but those owned by the NaCRRI. Proper repair and maintenance works enable to secure a long term use of equipment beyond durable year.

- Dormitory is effectively utilized by the researchers who live in far from the NaCRRI. In addition the dormitory reduces the expenses of the researchers.

- Construction of the trial farm enables to carry out an experimental cultivation of several rice varieties through the year. It is also expected that research and on-the-job training in the trial farm contribute to steady accomplishments of the research and training programs.

In addition to the direct effects above, the Project contributes to a capacity development of agricultural researchers, rice promotion in Uganda, and improvement of planning, research, dissemination, monitoring and evaluation quality related to the rice promotion. Furthermore, an increase of rice production raises farm income and improves rural living condition. The facilities provide opportunities of holding meetings and conferences by the International organizations, donors, NGOs, and it consequently contributes to rice promotion in Uganda.

The NaCRRI shall undertake following tasks to maximize and continuously maintain project effects of the research and training programs for a long period, using facilities and equipment procured by the Project.

1) Ordinary repair and maintenance work for the facilities and equipment

2) Provision of researchers and assistant staff, especially in the field of training

3) Close cooperation with the Continuing Agricultural Education Center (CAEC) of the Makerere University, the Mukono Agricultural Resaerch and Development Center (ARDC), Agricultural Engineering and Appropriate Technology Research Institute (AEATRI), and other donors and NGOs, aiming at exchange and share of human resources and skills.

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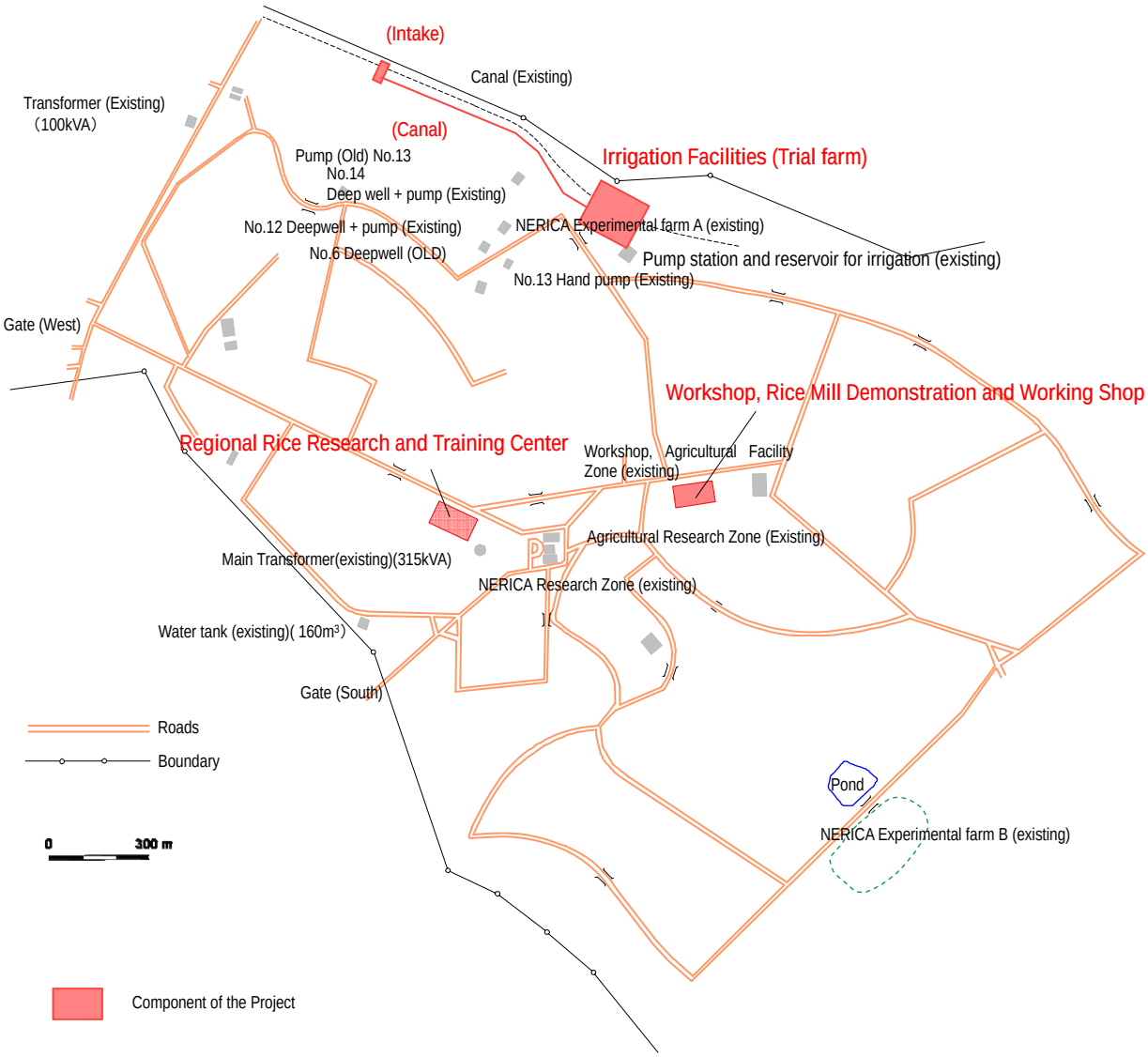

Layout of the National Crops Resources Research Institute

Perspective of Regional Rice Research and Training Center

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Abbreviations

General

AEATRI	Agricultural Engineering and Appropriate Technology Research Center
AGRA	Alliance for a Green Revolution in Africa
AO（AAO）	Agricultural Officer（Assistant Agricultural Officer）
CARD	Coalition for African Rice Development
DAO	District Agriculture Officer
EIA	Environment Impact Assessment
EU	European Union
FAO	Food and Agricultural Organization of United Nations
FARA	Forum for Agricultural Research in Africa
IRRI	International Rice Research Institute
JICA	Japan International Cooperation Agency
JIRCAS	Japan International Research Center for Agricultural Science
JOCV	Japan Overseas Cooperation Volunteers
MAAIF	Ministry of Agriculture, Animal Industry and Fisheries
MWHC	Ministry of Works, Housing and Communication
NAADS	National Agriculture Advisory Services
NaCRRI	National Crops Research Institute
NARO	National Agricultural Research Organizations
NEMA	National Environment Management Authority
NEPAD	New Partnership for Africa's Development
NERICA	New Rice for Africa
NGO	Non-Governmental Organization
PEAP	Poverty Eradication Action Plan
PMA	Plan for Modernization of Agriculture
SG2000	Sasakawa Global 2000
WARDA	West Africa Rice Development Association
ZARDI	Zonal Agricultural Research and Development Institutes

Length, area, volume, weight, pressure, force

mm	millimeter
cm	centimeter
m	meter
km	kilometer
ha	hectare
lit	liter
m^2	square meter
cc	cubic centimeter
m^3	cubic meter
kg	kilogram
ton	ton
MPa	Mega-Pascal
PS	Pferdestärke

Currency

US$	US dollar
Ug.Shs.	Uganda shilling
¥	Japanese yen

Others

CCTV	Closed Circuit Television
O&M	Operation and Maintenance
PDM	Project Design Matrix
PVC	Polyvinyl Chloride

Chapter 1 Background of the Project

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1-1 Background of the Project

The Government of Uganda (GOU) considers the agricultural sector, which is the main industry of the country, as one of the most important sectors in eradicating poverty in line with the national plan of "Poverty Eradication Action Plan (PEAP)". Hence, it has been tackling to enhance the agricultural and rural development sector since the adoption of "Plan for Modernization of Agriculture (PMA)" in 2001. Four main goals of the PMA are:

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The Japan International Cooperation Agency (JICA) has been cooperating to improve a training and dissemination system and to establish a technological basis of rice cultivation by dispatching long term experts of the technical cooperation project of "the Promotion, Development and Dissemination of NERICA Rice in Uganda" to the National Crops Resources Research Institute (NaCRRI) since June, 2004. However, the human resources, dissemination system and institutional infrastructure have not been strong enough in the field of rice research and dissemination in Uganda. For these reasons, the GOU requested a technical cooperation, "the NERICA Rice Promotion Project" and the grant aid assistance to construct "the Regional Rice Research and Training Center" to enhance the capability of NERICA research and training programs in the NaCRRI, to develop researchers,

District Agricultural Officers and extension workers around the country, and to improve production and productivity of NERICA through reorganizing the dissemination system.

In response to the request, the JICA conducted the First Preparatory Study in March 2008 to discuss framework of the long term and strategic rice promotion program so as to fully utilize mobility and rapidity of preparatory process of the project formulation and synergistic effect of the technical cooperation project and grant aid schemes. In succession, the Basic Design Study for the Project for the Establishment of the Regional Rice Research and Training Center was conducted in the Second Preparatory Study in August 2008 to confirm the basic project concept, as well as project framework, components, scope, etc. between the GOU and the JICA.

Table- 1.1.1 shows requested components attached in the Minutes of the Meeting of the First Preparatory Study.

Table- 1.1.1 Requested Components with Priority

Category	Item	Q'ty	Priority	Comment
Facility	Administration block and offices (capacity 15 people)	1	A	Capacity and design will be examined
	Canteen/ Kitchen	1	A	Capacity and design will be examined
	Lecture room (capacity 40 people each)	2	A	Capacity and design will be examined
	Laboratory	4	A	Capacity and design will be examined
	Water supply system for the laboratory	1	A	Capacity and design will be examined
	Irrigation facilities for 2ha trial farm	1	A	Capacity and design will be examined
	Sewage disposal system	1	A	Capacity and design will be examined
	Storage rooms	1	A	Capacity and design will be examined
	Renovation of assortment of stores/ workshop	1	A	Capacity and design will be examined
	Screen house with glass roofing	2	A	Capacity and design will be examined
	Drying yard	1	A	Capacity and design will be examined
	Conference room (capacity 100 people)	1	B	Capacity and design will be examined
	Dormitory for guest researchers	1	B	Capacity and design will be examined
	Dormitory A (Females)	1	C	Utilize Makerere University
	Dormitory B (Males)	1	C	Utilize Makerere University
	Electricity supply and solar system		D	Undertaking by the Government of Uganda
	Staff houses for trainers and senior staff (10 people)	1	D	
	Glass green house	2	D	Not necessary
	Guard house/ First aid/ Clinic		D	Undertaking by the Government of Uganda
	Road works		D	Undertaking by the Government of Uganda
	Fencing		D	Undertaking by the Government of Uganda
Equipment	Automatic diesel generator	1	A	Capacity and design will be examined
	Lysimeter	2	A	Other equipment will be procured through Technical Cooperation, if necessary
	Lecture rooms equipment excluding general furniture	1	A	Capacity and design will be examined
	Refrigerator for seed storage	2	A	Capacity and design will be examined

Category	Item	Q'ty	Priority	Comment
	Tractor with attachment	2	A	Other equipment will be procured through Technical Cooperation, if necessary
	Post harvest equipment for demonstration	1	A	Capacity and design will be examined
	Voice and data system for the Central/ CCTV system	1	C	
	Transport means (1 bus, 1 mini bus)	1	D	Procured through Technical Cooperation
	Stabilizer for cold storage	1	D	
	Drier	1	D	Procured through Technical Cooperation, if necessary

Priority: A: High Priority B: Less than "A" C: Less than "B" D: Out of subject under Grant Aid

1-2 Natural Condition

(1) Climate

Uganda is located at the center of East Africa with the total area of 241 thousand km^2, and a population of about 29.6 million estimated in 2008. Uganda belongs to a tropical climate with two wet seasons from March to May and from September to November. Annual rainfall is about 1,300 mm. Most of the rainfall is observed through the year, especially in the two wet seasons mentioned above, in addition a little rainfall of about 50 % of the wet seasons is observed between these two wet seasons. Average elevation of the entire Uganda is about 1,100 m, and the land descends towards Sudan Plain in the north. The temperature ranges between 21º and 25º on an average in the Kampala city located at the north shore of the Victoria lake with elevation of 1,100 m.

Figure- 1.2.1 shows average rainfall amount and temperature (maximum and minimum in daily basis) in Namulonge in the last decade (1998 - 2007). Annual average rainfall is about 1,300 mm. Monthly rainfall is more than 125 mm from March to May, and September to November. Temperature is constant through the year. Maximum and minimum temperature is 28º and 16º, respectively. It is recommended to schedule the construction work of the irrigation facility in the light rainfall season from January to February and from June and August, especially for the earth work.

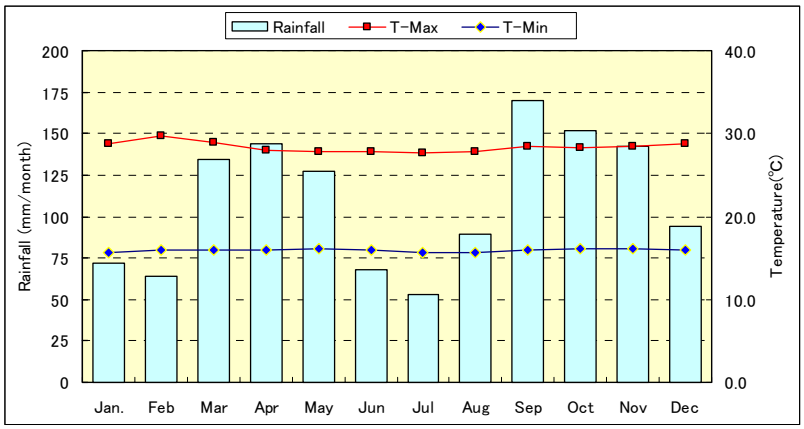

Figure- 1.2.1 Meteorological Data (Rainfall, Temperature)

(2) Geological condition

Field penetration test and test pit observation were conducted to investigate geological condition in the project sites. Table- 1.2.2 shows test results.

Table- 1.2.2 Geological Test Results

Test Items	Sites		
	Rice Research and Training Center site	Workshop site	Trial farm site
Penetration test	2 sites (3m depth)	1 site (3m depth)	—
Test pit	1 site (3m depth)	—	1 site (2m depth)
Geology	Gl.− 0.45m: Silt (Top soil) 0.45-3.0m: Clayey laterite	Clayey laterite	Gl.− 0.2m: Loam (Top soil) 0.2-0.5m: Clay (yellowish brown color) 0.5-2.0m: Clay (gray color)
Unconfined compression strength	189～645 kN/m^2 (Upper site) 144～331 kN/m^2 (Lower site)	99～189 kN/m^2 (0～2.5m)	No investigation

1-3 Socio-Environmental Consideration

The National Environment Management Authority (NEMA), which was established in 1995 controls environmental management, and coordination, monitoring and environmental activities in Uganda.

Since the project facilities are composed of one story buildings and constructed in the compound of NaCRRI, the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) and the National Agricultural Research Organizations (NARO) consider that the Environmental Impact Assessment (EIA) is not necessary and an officer of EIA in the NEMA approves this.

In the general process of the EIA, an implementer should submit a Project Brief, which describes types of construction, superficies, activities, design and materials of construction to the NEMA, and the NEMA examines the necessity of conducting the EIA and respond to the implementer within 21 days.

If there might be no considerable impact on environment or if there is careful countermeasure to any impact, the EIA can be neglected, and therefore, the Certificate of Approval will be issued to the implementer.

In the Project, the Project Brief will be prepared by the NARO when the details of the Project becomes more clear, and it will be sent to the NEMA through the MAAIF.

Chapter 2 Contents of the Project

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2-1 Basic Concept of the Project

2-1-1 Development Plan

The GOU has been promoting several poverty eradication policies in line with the PEAP. Since agricultural sector plays an important role in poverty eradication, the GOU has been tackling to enhance the agricultural and rural development sector since the adoption of the PMA.

Under this circumstance, the JICA has selected agricultural sector as a main assistant sector taking into account further potential of increase in domestic demand and export of agricultural products, as well as sufficient experiences and technical advantage of Japan in the sector. Among prioritized three cooperation programs in the agricultural sector, i.e., promotion of 1) rice, 2) animal industry and 3) local industry, rice promotion is recognized as a core of Japan's cooperation, thus the GOJ decided to implement "Rice Promotion" program in line with the agricultural development strategy of Uganda. The target area of the rice promotion program covers whole Uganda and two main outputs are expected such as:

1) to increase rice production by increasing in productivity, expansion of the cultivated area, and improvement of rice quality including post-harvest and value addition of technologies,

2) to improve rice research and development system, and build capacity for rice research development.

2-1-2 Outline of the Project

The Project aims to contribute rice promotion in Uganda through construction of facilities and equipment procurement, which are required to research and training activities of on-going technical cooperation projects of the NERICA Rice Promotion, and the Sustainable Irrigated Agriculture Development Project in Eastern Uganda in relation to rice promotion program.

The project objective is to equip facilities and equipment at NaCRRI to achieve following goals:

1) improvement of quality of planning, dissemination and evaluation of rice promotion in Uganda

2) increase of rice production and productivity through improvement of research and dissemination of rice

3) human resources development for research and dissemination of rice production

The MAAIF is the responsible agency, and the NARO is the implementation agency which shall substantially coordinate and manage the whole project.

The project components were carefully examined as shown in Table- 1.1.1 in accordance with the request of the GOU, field survey and discussions between the GOU and GOJ during the First Preparatory Study.

Project design matrix (PDM) is shown in Table- 2.1.1 for smooth implementation of the Project and monitoring and evaluation purposes under the Japan's grant aid program.

Table- 2.1.1 Project Design Matrix (PDM)

Project title: The Establishment of the Regional Rice Research and Training Center
Project area: NaCRRI compound, Namulonge, Wakiso District
Target group: Researchers of NARO, NaCRRI, ZARDI, NAADS, District Agricultural Officer, Farmers
Project period: 2009 − 2010 (Tentative)

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goal - Increase rice production of Uganda - Increase of farm income of Uganda	- Increase of production and cultivation area for rice.	Agricultural statistic data of MAAIF	
Project Purpose - Improvement of quality of planning, dissemination and evaluation of rice promotion in Uganda	- Research outputs of researchers - The number of trainees of Government officials and farmers	- Results of research on farm practice, irrigation, Phytopathology of plant, etc. - Training records	
Outputs - Facilities and equipment for research and training of rice cultivation are procured in NaCRRI	- Increase of rice production and productivity of rice in the project area - The number of research and training programs	- Maintenance record of NaCRRI	
Activities - Facility construction and equipment procurement are completed in NaCRRI aiming at research and training purposes for rice cultivation.	Inputs (The Japanese side) Facility construction - Research and administration block, canteen/ kitchen block, training block, dormitory block, warehouse for agricultural machinery, screen house with glass roofing, drying yard, workshop, rice mill demonstration and working shop, irrigation facilities (trial farm, intake, irrigation, drainage canals, farm road, etc.) Equipment - Generator, lysimeter, laboratory equipment, tractor and attachments, post harvest equipment for demonstration, workshop equipment, solar system, etc.	(The Ugandan side) - Land for facility construction - Removal of existing facilities - Research and training - Maintenance of facilities and equipment - Provision of research and trainees - Financial support and human resources	Pre-conditions - Security is maintained over a country

2-2 Basic Design of the Requested Japanese Assistance

2-2-1 Design Policy

(1) Basic principles

Through a series of discussions and field survey, the scope of Japanese assistance, construction of facilities and equipment procurement, were formulated to realize the PMA policy, i.e., increase production and productivity of rice in collaboration with the NaCRRI, which is a core center of the rice research and training in Uganda.

The following are basic principles for facility construction and equipment procurement plan:

1) As a core research and training center for rice promotion, research and training environment of the NaCRRI shall be improved with completion of the facilities and equipment procurement, aiming at enhancing extension of rice cultivation and increasing rice production and productivity

2) Human development shall be accelerated in the additional fields of soil, phytopathology of plant, insect and noxious insect, inter cropping, agricultural meteorology, rural society and agro economy in addition to the breeding, cropping technique, upland irrigation, agricultural machinery by the technical cooperation projects. With respect to the research and training program, research and trainings for rice cultivation, cropping patterns, mechanized agriculture, intercropping and post harvest technology shall be carried out in the complete lecture rooms and trial farms constructed by the Project. The facilities and equipment shall be planned to meet these research and training needs.

3) Researchers and trainees should be composed of those from NaCRRI, NARO, the Zonal Agricultural Research and Development Institutes (ZARDI), District Agricultural Officer, etc. The facilities shall be appropriately designed according to the number of users in each research and training field, occupation period, etc.

(2) Basic principles of the facility plan

1) Namulonge area is blessed with relatively mild climate at an elevation of 1,100m. Because of this, the facilities such as a laboratory and lecture rooms can be so designed in natural lighting and gravity ventilation that it may provide a best environment of light and air condition to minimize O&M cost.

2) The facilities should be constructed of local construction materials and equipment on condition that the facilities are repaired and maintained by the staff of the NaCRRI. A generator should be equipped as a backup of power supply during electrical power failure.

3) Floor areas should be determined to meet a demand of each research field and training programs with reference to guidelines of associations in Japan. A structural analysis should be carried out in conformity to a design standard of Uganda, i.e., loading condition, allowable strength, concrete classification, etc.

4) Irrigation facilities should be designed based on the research and training programs of on-going two technical cooperation projects. The facility plan includes farm reclamation, construction of intake, irrigation and drainage canals and farm road, etc.

(3) Basic principles of equipment plan

1) It is essential to select research and training equipment which are widely sold and used in Uganda, so that it is easy to repair and maintain them. The following are basic principles of equipment planning:

i) Maintenance of the equipment by the NaCRRI

ii) Adequacy of technical levels of the equipment

iii) Relevance of the equipment procured by the technical cooperation projects by the JICA

iv) Specification considering durable year of each equipment

2) Research equipment and farm machinery which are frequently used by experts and researchers should be procured by the technical cooperation projects in principle. While, the equipment closely related to the facilities constructed under the grant aid project and also widely used for various research and training purposes are procured by the Project.

3) The equipment and their specifications should be determined by technical and financial capability of the Ugandan side, in addition, considering supply condition of consumable stores, after-sales service of agents, repair in local manufacturers, etc.

4) Several research and training programs may be commenced in an earlier stage of the construction works. Delivery and turnover schedule of equipment should be adjusted in the limits of the possibility to comply with research and training needs.

(4) Consideration on natural conditions

1) Geological condition

A concrete spread foundation is applicable to the facilities because bearing capacity is sufficient, 100 kN/m^2 or more.

2) Earthquake

A structural analysis was conducted with earthquake condition of the acceleration coefficient of 0.1 in accordance with the structural design guideline of Uganda. Following are estimates of acceleration coefficient against earthquake. Design coefficient of 0.1 includes safety factor.

C_d=CZIK=0.08×0.7×1.5×1.0=0.084

C_d:	Horizontal seismic coefficient	
C:	Basic seismic coefficient (=0.08)	
Z:	Seismic zone factor (=0.7)	Zone 3, Kampala
I:	Structure importance factor (=1.5)	Category II, schools, assembly halls, cultural institutes, etc.
K:	Structural performance factor (=1.0)	Frame as in ductile moment-resisting frame

3) Floor elevation of facilities

The proposed site is located at a hilly area. Drainage canals are placed around the site to smoothly drain the water flowing from pasture land (golf course) immediately upstream of the site. The foundation on embankment is not allowed to prevent from concrete cracks of the facilities caused by uneven settlement of the embankment itself, so foundation is placed in the existing ground. The facilities are constructed on the terrace shaped ground. It is notable that agricultural facilities such as a screen house should be located at where facilities are independent of natural climate.

4) Consideration on natural climate

The annual rainfall is 1,300mm or more at the site. It is preferable to install water tanks to supply water for farm practices and another purpose such as water sprinkling in the site. The rainfall from the roof is gathered in the tanks.

(5) Local condition on construction

1) Construction materials

Most of the construction materials are available in Uganda. Structural steel such as H-beam, channel could be directly imported from the Republic of South Africa because of low price including marine and inland transportation cost. Aluminum material should be used to the roof flame of the screen house because of its strength, less weight and durability, etc. Aluminum material for screen house roofing could be procured from Japan to ensure accurate manufacturing technique.

2) Equipment procurement

The equipment is categorized by procurement country, i.e., Uganda, third countries or Japan. It is recommended to procure equipment in Uganda from a point of repair and maintenance services. Equipment such a huller/ rice mill machine may be preferably procured in Japan because Japanese products have been improved based on many years' experience of rice cultivation.

(6) Local contactor

Local contractors are available for the construction works because the construction works do not require higher technology on construction method. (Prime contractor shall be Japanese contractor in line with Japan's grant aid scheme.)

(7) Management by the responsible agencies of Ugandan side

The NaCRRI is responsible for project management and O&M activities. Since facilities and equipment procured by the Project require less advanced skills for their O&M, the NaCRRI is capable to manage whole O&M works. Accurate equipment such as the huller/ rice mill, lysimeters and meteorological observation equipment require assembly and initial operation guidance by the Project.

(8) Grade of facilities and equipment

It is a notable point that a grade of facilities and equipment should be determined with reference to specifications of similar local product, as well as operation and maintenance capability of the NaCRRI.

(9) Permission and construction period

With respect to the permission of the construction works, the NARO or the MAAIF submits a building permit to the District, and the Ministry of Works, Housing and Communication finally approves it after examination.

The construction works are composed of reinforced concrete work, brick work, steel roof frame work and clay roof tile or steel plate roof works. Most of the construction equipment is delivered by cargo trucks from Kampala city. Since bearing stress of the natural ground is sufficient for one story building, therefore, ordinary construction method is applicable to the whole construction works. Construction period is scheduled about 12 months including preparatory works. Demolition of existing facilities and land leveling are completed by the responsibility of recipient country prior to the construction works of the Project.

2-2-2 Basic Plan

2-2-2-1 Outline of the Project by Japan's Grand Aid Scheme

After the study of project relevance and necessity of the components requested by the GOU, the project components were determined through related government agencies as shown in Table-2.2.1 and Table- 2.2.2.

Table- 2.2.1 Requested Facilities, Equipment and Components Implemented by Japan's Grant Aid Assistance (Facilities)

Category	Facilities	Request Components					Components implemented by Japan's Grant Aid			
		Rehabilitation	Priority		Q'ty	Capacity	Rehabilitation	Q'ty	Capacity	Floor area (m^2)
			Preparatory study	Basic Design						
Building	Research and administration block		A	A	1			1		
	Laboratory		A	A	4			4		288 (Laboratory) 36 (Work room) 108 (Administration room) 36 (Library, data storage room) 36 (Storage room for equipment) 160 (Toilet, hallway) Total 664m^2
	Lecture rooms		A	A	2	40person /room		2	40person /room	424m^2
	Canteen/ Kitchen		A	A	1			1		216 m^2
	Water supply system for laboratory		A	A	1			1		
	Sewage disposal system		A	A	1			1		
	Seed processing/ storage room		A	A	1			1		36 m^2
	Warehouse for agricultural machinery		A	A	1			1		234 (Warehouse for agricultural equipment) 36 (Work room) Total 270m^2
	Workshop	Rehab.	A	A	1		New	1		348 m^2
	Screen house with glass roofing		A	A	2			2		600 m^2
	Drying yard		A	A	1			1		450 m^2
	Conference room		B	B	1	100person		–		
	Dormitory (Researcher)		B	B	1			1	12 person	252m^2 (excluding outside passage)
	Dormitory A (Female)		C							
	Dormitory B (Male)		C							
	Electricity supply and solar system		D							
	Staff houses for trainers and senior staff		D							
	Glass green houses		D							
	Guard house / First aid / Clinic		D							
	Road works		D							
	Fencing		D							

Category	Facilities	Request Components					Components implemented by Japan's Grant Aid			
		Rehabilitation	Priority		Q'ty	Capacity	Rehabilitation	Q'ty	Capacity	Floor area (m^2)
			Preparatory study	Basic Design						
	Rice mill demonstration and working shop			A	1			1		200 m^2
	Generator room (Outside)			A	1			1		12 m^2
	Common toilet (Latrine type)			A	1			1		40 m^2
	Total (Rooms) Warehouse, workshop Drying yard Screen house									1,644 m^2 818 m^2 450 m^2 600 m^2
	Total									3,512 m^2
Civil work	Irrigation facilities		A	A	1			1		2ha

Priority: A: High Priority
B: Less than "A"
C: Less than "B"
D: Out of subject under Grant Aid

Table- 2.2.2 Requested Facilities, Equipment and Components Implemented by Japan's Grant Aid Assistance (Equipment) (1/2)

Category	Equipment	Request Components		Components Implemented by Japan's Grant Aid			
		Priority	Q'ty	Priority	Q'ty	Justifications	Required quantity
	Generator	A	1	A	1	● Power supply for research and training purpose during power failure, mainly in day time	Generator capacity should meet power demand of offices.
	Lysimeter	A	2	A	8	● Collection of fundamental data for rice cropping, e.g., soil moisture, etc. ● 8 lysimeters are necessary to respond to increase of rice varieties, incremental cropping tests in different water supply conditions	Six (6) rice varieties in the screen house Two (2) rice varieties for paddy and upland rice
Laboratory equipment (excluding general furniture)	Weight scale	A	1	B	–		
	Microscope	A	1	A	–		
	Stereoscopic microscope	A	1	A	–		
	pH meter	A	1	B	–		
	Meteorological observation equipment						
	Thermometer	A	2	A	2	● Meteorological observation equipment is installed in the trial farm and agricultural facility zone to examine correlation between crop growth and meteorological condition, and to provide detailed measurement data of water balance in the lysimeter.	2 meteorological equipment are installed at trial farm and agricultural facility zone.
	Hygrometer	A	2	A	2		
	Rainfall gauge	A	2	A	2		
	Sunshine meter	A	2	A	2		
	Wind speed/ direction meter	A	2	A	2		
	Refrigerator for seed storage	A	2	A	–		
Tractor and attachments	Tractor	A	2	A	2	● Equipment owned by NaCRRI was decrepit, and necessary for replacement. ● Tractor is useful for tilling, land leveling, seeding and hauling in the trial farm and paddy, upland field.	Tractor is used in intercropping 100 ha farmland, in addition used for training purpose.
	(Attachments below)						
	Disc plow	A	2	A	2	● Equipment owned by NaCRRI was decrepit, and necessary for replacement. ● Disc plow is applicable to tilling and land leveling for relatively hard soil.	Same number of tractor is procured.
	Disc harrow	A	2	A	–	(Bottom plow was recommended instead of disc plow during the field survey)	
	Bottom plow	A	–	–	2	● Equipment owned by NaCRRI was decrepit, and necessary for replacement. ● Bottom plow is applicable to tilling and land leveling for relatively soft soil.	Same number of tractor is procured.

Category	Equipment	Request Components		Components Implemented by Japan's Grant Aid			
		Priority	Q'ty	Priority	Q'ty	Justifications	Required quantity
	Seeder 1), 2)	A	2	A	2	● Equipment owned by NaCRRI was decrepit, and necessary for replacement.	Different type of seeder is procured, one is for research of rice cultivation and another is for intercropping (maize and beans)
	Sprayer	A	1	A	1	● Equipment owned by NaCRRI was decrepit, and necessary for replacement.	
	Cultivator	A	1	A	1	● Equipment owned by NaCRRI was decrepit, and necessary for replacement. ● Cultivator is used for inter tillage cultivation and weeding	
	Cutter	A	1	A	–		
	Trailer (Traction type)	A	2	A	2	● Equipment owned by NaCRRI was decrepit, and necessary for replacement. ● Trailer is used to haul farm products, as well as materials in the trial farm.	Same number of tractor is procured.

Table- 2.2.2 Requested Facilities, Equipment and Components Implemented by Japan's Grant Aid Assistance (Equipment) (2/2)

Category	Equipment	Request Components		Components Implemented by Japan's Grant Aid			
		Priority	Q'ty	Priority	Q'ty	Priority	Q'ty
Post Harvest Equipment for Demonstration	Thresher for experiment	A	1	B	–		
	Winnowing fan for experiment	A	1	B	–		
	Huller	A	1	A	1	● Huller/ rice mill is used for research and demonstration purposes in training program	Huller/ rice mill is used for training and 55 ton milling cultivated in the trial farm.
	Rice mill	A	1	A			
	Seed drier	A	1	B	–		
	Power tiller with trailer	A	3	B	–		
Workshop Equipment	Welding machine	A	1	A	1	● Equipment owned by NaCRRI was decrepit. It is necessary to replace those equipment to maintain equipment procured by the Project and technical cooperation projects. ● Various machinery for steel processing, portable machine, equipment to inspect agricultural machinery and equipments, as well as tool set are selected.	Welding work of steel
	Gas (acetylene) welding machine	A	1	A	1		Welding and cutting work of steel
	Upright drilling machine	A	1	A	1		Processing of steel materials
	High speed cutter	A	2	A	1		Cutting of steel materials
	Bench (electric) grinder	A	2	A	1		Processing of steel materials
	Pipe threading machine	A	2	A	1		Tapping of small diameter pipe
	Electric repairing tools	A	1	A	1		Electric drill, disc sander, portable grinder
	High pressure washing machine	A	1	A	1		Washing work of agricultural machinery before regular inspection, and repair works
	Hydraulic jack	A	4	A	3		Hydraulic garage jack: 1 jack, portable hydraulic jack:2jack
	Other tools	A	1	A	1		Air compressor and its attachments, tool kit, tap die set, torque wrenches, circuit tester, mobile crane, etc.
	Solar system	A	1	A	1	● Solar system is preferable to supply electricity in the limited area during the power failure in nighttime.	Solar power is sent to a part of facilities such a laboratory use, refrigerator for seed storage.

2-2-2-2 Facility Plan

(1) Layout of facilities

The following are basic consideration of the facility layout:

i) The proposed site is located at 700 m distance from both west and south gates of the NaCRRI. The research, training and administration zone is located at the center, agricultural facilities zone is at the west, the dormitory zone is at the east, considering the objective of each facility and topographical feature in and around the proposed site.

ii) Since proposed site has a slightly steep slope from the road towards inside, facilities are constructed parallel with the road. The research and administration block is placed along the road, and the training block and the canteen/ kitchen block are placed behind the research and administration block. Those are placed on the different terraces. The training block is placed near the research and administration block to maintain a path of flow. The canteen/ kitchen block is placed next to the training block for easy access to the canteen during lunch and a break time, etc. It is also close to the dormitory block for researchers' convenience.

iii) The agricultural facility zone is placed on the different three terraces in the order of the drying yard, screen house and warehouse for agricultural machinery from the road. The drying yard is placed along the road to facilitate a loading and unloading work of rice crop. The screen house is located on the middle terrace with keeping certain distance from the warehouse in order to avoid the change of environment, i.e., wind, which would affect rice cultivation. The difference of terrace elevation is minimized at 1.0 m between screen house and warehouse. Warehouse for agricultural machinery is located far from the road to assure its safety.

iv) The generator room and the common use toilet are separately located from other facilities, and placed between the research and administration and the dormitory blocks.

v) The workshop is constructed after a demolition of the existing workshop. The rice mill demonstration and working shop is located adjacent to the workshop to prevent floating dust by a rice milling work from flowing into other offices as well as to prevent noise disturbance to the researchers and trainees.

Figure- 2.2.1 and 2.2.2 show layout of facilities.

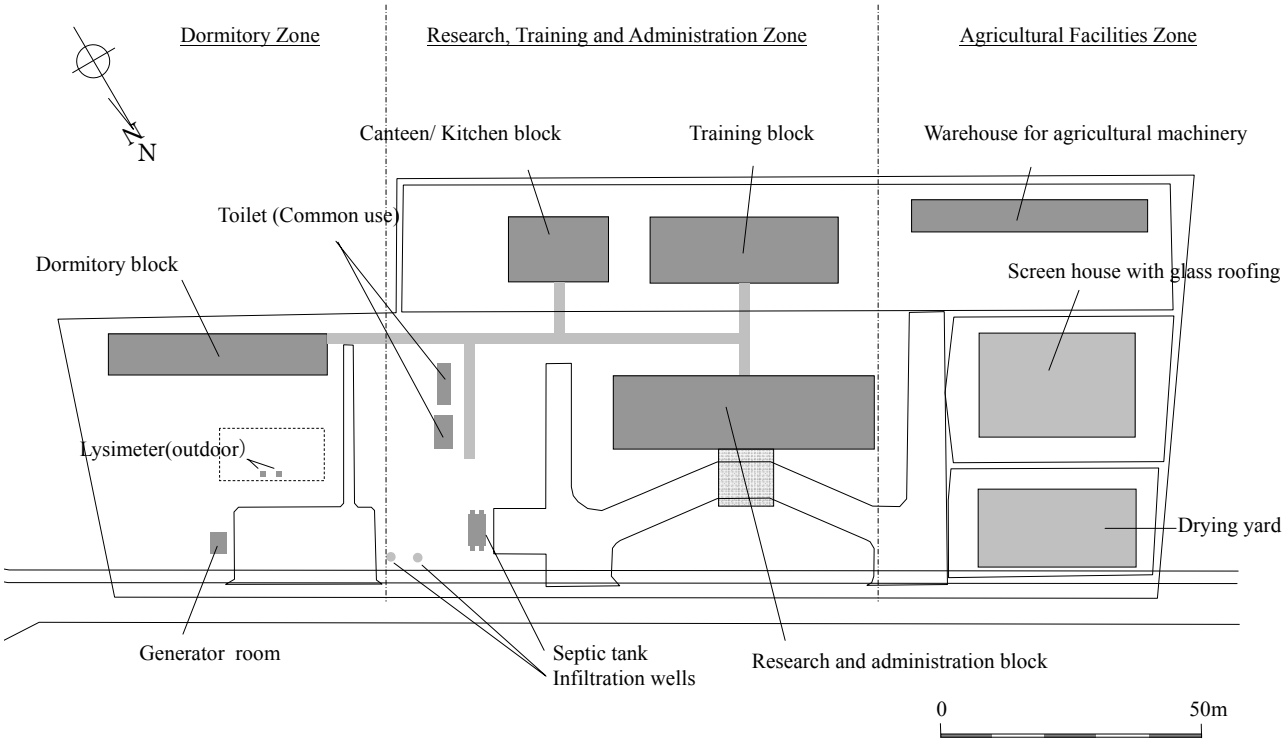


Figure- 2.2.1 Layout of Facilities (Regional Rice Research and Training Center)

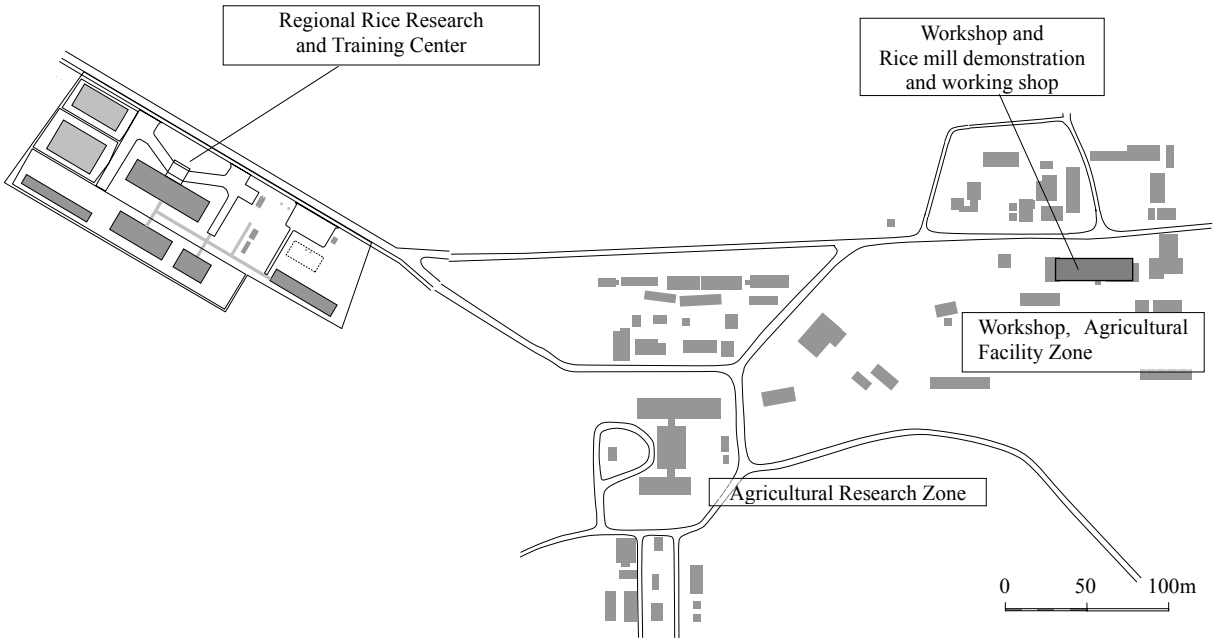


Figure- 2.2.2 Layout of Facilities (Whole Facilities in NaCRRI)

(2) Policy of the facilities' grade

Grades of the facilities are determined with reference of standard criteria, related guidelines in Uganda. However, design criteria in Japan are applicable to a structural analysis.

(Research and administration block)

Traditional and harmonized appearance is applied to the facilities taking into account the entire structure in a state of equilibration of existing facilities. Building has a framed reinforced concrete structure and a single or double bricks wall referring to the local construction methods. As for the roof frames of the facilities, steel frame trusses with a clay roof tile is applied. In addition, the entrance roof is installed for passenger's convenience in rainy days.

(Training block, canteen/ kitchen block)

The training block and canteen/ kitchen block have the same structures as the research and administration block because these are located adjacent to the research and administration block, and composed of a part of the research, training and administration zone.

(Dormitory block for researchers)

The dormitory block also has the same structures as the research and administration block. Proposed seven rooms are placed within a row and parallel to the road for better natural lighting. Outside passage is available to access to the other rooms.

(Generator room and common use toilet)

The generator room is composed of reinforced concrete structure. The common use toilet is composed of framed concrete structure and brick wall.

(Screen house with glass roofing)

The screen house with glass roofing is composed of structural steel for column and beam, and aluminum frame to install glass plates in order to minimize frame weight and maintenance works of glass roof.

(Warehouse for agricultural machinery)

The warehouse for agricultural machinery is composed of framed concrete structure and brick wall. As for the roof frame of the facilities, steel frame trusses with a galvalume steel plate is applied. A symmetrical double door is adopted to bring in and out the agricultural machinery. Doors are comprised of steel frame with wire netting to reduce weight of doors.

(Workshop, Rice mill demonstration and working shop)

These facilities are composed of framed concrete structure and brick wall. As for the roof frame of the facilities, steel frame trusses with a galvalume steel plate is applied. Doors are composed of a sliding door.

(Sanitation facilities)

Sanitation facilities are composed of septic tank and infiltration wells. The septic tank is made of concrete to prevent leakage of untreated sewage water into the ground. The infiltration wells are composed of concrete wall in the upper portion and brick wall in the lower infiltration portion. Two infiltration wells are proposed for operation and maintenance.

(3) Floor plan

The floor plan of the facilities were studied in consideration of the floor area required for each room, as well as the function and site layout plan. A sample facility plan in Uganda and information of the Architectural Institute of Japan were applicable to the floor plan.

1) Research and administration block

a) Laboratory room

The floor plan of the research and administration block was studied in accordance with the research and training programs of the NERICA Rice Promotion Project and the Sustainable Irrigated Agriculture Development Project in Eastern Uganda.

In addition to the fundamental research and training subjects, i.e., breeding, cropping technique, upland irrigation, agricultural machinery, the technical cooperation projects above include additional research and training themes such as soil, phytopathology, insect and noxious insect, inter cropping, agricultural meteorology, rural society and agro economy, etc. For the floor planning, these subjects were categorized into four themes, thus four laboratory rooms were proposed as shown in the table below.

Table- 2.2.3 Laboratory Rooms and Projected Themes (Subjects)

Laboratory	Theme (Subject) of research and training
1.	Breeding, cropping technique, mechanized agriculture, intercropping
2.	Paddy irrigation, upland irrigation, meteorology for agriculture, soil
3.	Phytopathology of plant (rice, plant, etc.), insect and noxious insect
4.	Training, post harvest technology, marketing, rural society and agro economy

Projected themes, research contents and required working space are detailed in Table- 2.2.6., and the number of researchers and staff are summarized in Table- 2.2.4. (Details are shown in Appendices 6.1)

A standardized calculation method of floor area is not practicable, because each laboratory room has different desk layout, experiment and work tables, sink, etc., therefore it is difficult to find a certain relevance between the number of staffs and floor area. Accordingly, the floor area is independently estimated by working area for staffs, experiment work area, preparation work area, data storage area, etc. Table- 2.2.5 indicates necessary floor area for each laboratory. Required floor area for a researcher and an assistant researcher is based on the condition below:

Floor area is $3.3m^2$×converted number, herein conversion factor is 2.5 for researcher and 1.0 for assistant researchers or staff. Required floor area for a person is estimated at $8.25m^2$ for a researcher, $3.3m^2$ for an assistant researcher or staff. A rate of researchers and assistant researchers or staff is assumed at 1:1.

Table- 2.2.4 The Number of Researchers including Assistants

Research Theme		JICA Expert	No. of Personnel				
			NaCRRI Researcher	NARO Researcher	ZARDI Researcher	DAO	Total
1.	Breeding, cropping technique, mechanized agriculture, intercropping	4 (3)	3 (3)	1 (1)	3 (3)	1 (1)	12 (11)
2.	Paddy irrigation, upland irrigation, meteorology for agriculture, soil	3 (3)	3 (3)	2 (1)	2 (2)	1 (1)	11 (10)
3.	Phytopathology of plant (rice, plant, etc.), insect and noxious insect	1 (1)	2 (2)	1 (1)	1 (1)	0 (0)	5 (5)
4.	Training, post harvest technology, marketing, rural society and agro economy	6 (3)	0 (0)	2 (1)	3 (3)	1 (1)	12 (8)
	Total	14 (10)	8 (8)	6 (4)	9 (9)	3 (3)	40 (34)

Note: Number of person in the parenthesis shows the maximum number of personnel in monthly basis.
DAO: District Agricultural Officer

Table- 2.2.5 Required Floor Area by Laboratory

	Research Theme	Floor Area (m^2)	Working Room (m^2)
1.	Breeding, cropping technique, mechanized agriculture, intercropping	102	36
2.	Paddy irrigation, upland irrigation, meteorology for agriculture, soil	72	
3.	Phytopathology of plant (rice, plant, etc.), insect and noxious insect	42	
4.	Training, post harvest technology, marketing, rural society and agro economy	72	
	Total	288 (Floor dimension: 6m× 12m×4 rooms)	36 (Floor dimension:6m×6m)

b) Seed storage room

Refrigerators (2 sets) and wooden deep shelves are equipped mainly to store rice seed for research and training purposes.

c) Administration room

The floor area for a total 10 staff members is required to engage in administrative works related to research and training programs. In addition, a reception room and panel display room are equipped to disseminate project activities as well as outputs of the project.

d) Library and data storage room

The floor area is estimated for book shelves for project information, reference books, publications and bookbinding space.

e) Storage room for equipment

The storage space for equipment related to research and training programs are secured in the room.

Table- 2.2.6 Research Theme and Subjects

Research Theme		Activities (PDM)	Subjects of Research	Work Items in Laboratory and Affiliated Working Room
1.	Farming, cropping technique, mechanized agriculture, intercropping	(NERICA rice promotion) ● New technology to evaluate and specify rice varieties ● Specify characteristics of NERICA varieties ● Introduction of post harvest skill ● Installation of trial farm ● Production of high-quality rice seed (Sustainable Irrigated Agriculture Development Project in Eastern Uganda) ● Utilization of proper agricultural tools ● Introduction of irrigation skill (proper use of fertilizer, cultivation control)	● Dissemination of farming skill (Cultivation, post harvest) ● Examination of introducing double cropping using blessed weather condition ● Research of drought resistance variety ● Dissemination of inter cropping ● Study for farm mechanization (rice mill, reduction of post harvest loss, etc.) ● Adequate use of fertilizer, insecticide (Countermeasures against shortage of organic fertilizer, labor force) ● Dissemination of high yield seed and improvement of seed selection ability ● Study of nutrition and taste of rice ● Examination of production loss of upland rice by repeated cultivation, and effect of rotation cultivation against loss of repeated cultivation	(Laboratory) ● Cultivation test for various rice varieties ● Test of nutrition of several varieties of rice ● Sample study of rice production (Working room) ● Research and training using thresher for experiment ● Drying for research purpose ● Research and training using winnowing fan for experiment ● Preparation of farming tools, assembly
2.	Paddy irrigation, upland irrigation, meteorology for agriculture, soil	(NERICA rice promotion) ● Cultivation skill for upland and paddy rice ● Proper farm mechanization, cropping pattern (Sustainable Irrigated Agriculture Development Project in Eastern Uganda) ● Introduction of irrigation skill (Farmland consolidation, on-farm management) ● Water management, O&M skill	● Measurement of production increase by supplementary irrigation ● Evaluation of irrigation method against drought, e.g., water saving irrigation, rotation irrigation, etc. ● Monitoring of production loss by drought ● Dissemination of NERICA in lower swamp area ● Study of cultivation region for rice ● Study of Hydro-meteorological observation, water requirement in depth ● Monitoring and evaluation of rice productivity, by elevation of farm land, moisture contents, etc. ● Study of relation between fertilizer input and soil appropriateness (fertility) ● Soil classification (Phosphorus, iron, zinc, salinity, etc.)	(Laboratory) ● Database preparation for hydro-meteorological information, observed data, etc. ● Preparation of irrigation manual ● Study on hydraulic and structural analysis related to irrigation system design (Working room) ● Preparation and assembly of irrigation tools, equipment ● Physical and chemical analysis of soil samples ● Test of fertilizer ingredients
3.	Phytopathology of plant (rice, plant, etc.), insect and noxious insect	(NERICA rice promotion) ● Phytopathology of plant (Sustainable Irrigated Agriculture Development Project in Eastern Uganda) ● Irrigated agriculture skill (insect and noxious insect, weeding) ● EIA (Impact assessment of water quality and soil caused by the use of fertilizer and insecticide)	● Bird, insect plague (African rice gall midge, stem sorer, etc.) ● Blight plague (Rice yellow mottle virus, blast etc.) ● Study to identify pathogen, noxious insect, and countermeasures ● Inspection study of noxious insect in the farm ● Prediction damages by outbreak of blight and noxious insect ● Study to control harmful insect without insecticide use ● Monitoring of weeding effect ● Production of insect resistance variety of rice, and market research	(Laboratory) ● Observation of noxious insect ● Study of breeding of a noxious insect, blight plague ● Monitoring and analysis of environmental impact (Working room) ● Preparation of cultivation test against noxious insect, blight plague ● Test for water quality and soil
4.	Training, post harvest technology, marketing, rural society and agro economy	(NERICA rice promotion) ● Manual preparation for training program ● Training for DAO and farmers (Sustainable Irrigated Agriculture Development Project in Eastern Uganda) ● Preparation of training program ● Preparation of training manual and text ● Irrigated agricultural skill (Post harvest) ● Establishment of farmers' organizations by participatory approach	● Change of marketability and rice variety for domestic consumption of rice ● Economic analysis on rice pricing affected by increase of domestic demand (Marketability in east African regional market) ● Selection of rice variety, which promises stable and high yield ● Cost and benefit analysis of rice cultivation by small scale farmers ● Estimates of social economic development through improvement of employment condition by rice promotion ● Study of improvement of added value of agricultural product by food processing ● Distribution of manuals for farm practice dissemination ● Enhancement of dissemination system of farm practice ● Statistic data collection of rice production using database (expansion of NERICA cultivation land, improvement of unit production of rice)	(Laboratory) ● Preparation of manual of farm practice ● Preparation of training program, and distribution ● Preparation and compilation of training records, etc. (Working room) ● Preparation of cultivation test

2) Training block

The required floor area is estimated based on the training programs scheduled by the technical cooperation projects, the NERICA Rice Promotion and the Sustainable Irrigated Agriculture Development Project in Eastern Uganda. Training programs of each project are shown in Table-2.2.9 and 2.2.10, respectively.

Required floor area is shown in Table- 2.2.7. Figure- 2.2.3 explains the floor area occupied by various training programs for reference. Since the number of trainees are variable by the training level and subjects, required floor area is fluctuated according to the number of participants. It is concluded that 2 lecture rooms with 200m^2 area for each room can be appropriate judging from floor occupation in Figure- 2.2.3.

Table-2.2.7 Required Floor Area of Lecture Rooms

(Unit:m^2)

	Lecture		Practice	Lecture stand[1]	Storage room	Total area
	Number of trainees	Required floor area[2]	Require floor area			
NERICA Rice Promotion Project						
1) Cropping technique (Beginning class)	5 – 30 persons	12 – 70m^2	64	42	30	148 – 206m^2
2) Cropping technique (Middle class)	5 – 30 persons	12 – 70m^2	64	42	30	148 – 206m^2
Sustainable Irrigated Agriculture Development Project in Eastern Uganda						
1) Cropping technique (Beginning class)	22 – 44 persons	50 – 100m^2	64	42	30	186 – 236m^2
2) Cropping technique (Middle class) and irrigation and drainage skill	22 – 44 persons	50 – 100m^2	64	42	30	186 – 236m^2

Note: [1] Lecture stand area includes a space for OA equipment such as personal computer, projector, screen, etc.
[2] Required floor area is estimated by 2.3m^2 per trainee

Table- 2.2.8 indicates percentage of utilization of the lecture rooms according to the training program. Annual utilization percentage is estimated at 88.5 % (max. 100% to min. 75% in monthly basis). The number of training days is 425 days by two lecture rooms in total.

Table- 2.2.8 Percentage of Utilization of the Lecture Rooms and the Number of Training Days

Month	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
1) Number of monthly training opening (92 trainings per annum)	7	7	8	6	7	8	6	7	7	8	6	8
2) Utilization of lecture rooms (88.5% per annum)	87.5	87.5	100.0	75.0	87.5	100.0	75.0	87.5	87.5	100.0	75.0	100.0
3) Monthly training opening days (425 days per annum)	35	35	40	30	35	40	30	35	35	40	30	40

Note: 2) Percentage of utilization＝1) Number of monthly training opening / Max. number of training opening by month (8times: 2 rooms×4 weeks per month)
When utilization of lecture rooms is 100%, lecture rooms are fully occupied for the trainings.
3) Monthly training opening days＝Number of monthly training opening×5 days (Total 5 days are required for a training, i.e., 3 days training, 1 days each before and after training days for training preparation and rearrangement)

Table- 2.2.9 Training Program of the NERICA Rice Promotion Project

Training	The number of Trainees (Person)	Training Program	Floor Area for Training
NERICA cropping (Beginning class)	DAOs 10 NGOs 5 Farmers' groups 30 JOCV 10 JOCV (NERICA) 10 Trainees from east and south African countries 5 JOCV (East and south African countries) 10	(Training in lecture room) 1) Introduction of NERICA 2) Exhibition and explanation of NERICA varieties 3) Farming practice using plant pots 4) Practice to select high quality rice seed 5) Measurement of quantity of unhulled rice and its exhibition 6) Explanation of fertilizer, insecticide (Training in the trial farm) 1) Practice of seeding (selection of seed, seeding depth, drilling, hill seeding, terrace reclamation) 2) Weeding, additional manure 3) Harvesting (reaping, threshing, drying, milling)	1) Exhibition of NERICA and paddy rice: $2m \times 1m = 2m^2$ 2) – 3) Working table (1 set): $6m \times 7m = 42m^2$ (including 1m working space around the table) 4) Working table (2 sets)$3m \times 4m = 12m^2$ (including 1m working space around the table) 5) Exhibition of measurement equipment of rice production at farm (1 set): $6m \times 7m = 42m^2$ (including 1m working space around the table) 6) Exhibition of samples of fertilizer, sprayer of insecticide, rice plant damaged by insect and blight (Floor area) Working tables (2 sets): $3m \times 4m = 12m^2$, Table for equipment: $6m \times 7m = 42m^2$, Total is about $64m^2$
Training at site for NERICA cropping (Beginning class)	20 – 30 trainees / training	On-site observation of good farmers, NERICA cultivation, rice mill factory, agricultural machinery	
Paddy rice cropping (Middle class)	DAOs 10 NGOs 5 Farmers' groups 30 JOCV (NERICA) 10 Trainees from east and south African countries 5 JOCV (East and south African countries) 10	(Training in lecture room) 1) Introduction of NERICA 2) Exhibition and explanation of paddy rice varieties 3) Farming practice using plant pots 4) Practice to select high quality rice seed 5) Measurement of quantity of unhulled rice and its exhibition 6) Explanation of fertilizer, insecticide (Training in the trial farm) 1) Practice of seeding (selection of seed, seeding depth, drilling, hill seeding, terrace reclamation) 2) Weeding, additional manure 3) Harvesting (reaping, threshing, drying, milling)	1) – 6) Total $64m^2$ (see above)
Training at site for paddy rice cropping (Middle class)	20 – 30 trainees / training	On-site observation of good farmers, NERICA cultivation, rice mill factory, agricultural machinery	

Table- 2.2.10 Training Program of the Sustainable Irrigated Agriculture Development Project in Eastern Uganda

Training	The number of Trainees (Person)	Training Program	Floor Area for Training
Paddy rice cropping (Beginning class)	DAOs 22 AOs 44 AAOs 44 Model farmers (A group), existing P/P 24 Model farmers (B group), existing D/F 36 Model farmers (C group), existing D/F 36 Leaders of independent farmers' groups 44 Independent farmers 44 NAADS service providers 44	(Training in lecture room) 1) Introduction of NERICA 2) Exhibition and explanation of NERICA varieties 3) Farming practice using plant pots 4) Practice to select high quality rice seed 5) Measurement of quantity of unhulled rice and its exhibition 6) Explanation of fertilizer, insecticide (Training in the trial farm) 1) Practice of seeding (selection of seed, seeding depth, drilling, hill seeding, terrace reclamation) 2) Weeding, additional manure 3) Harvesting (reaping, threshing, drying, milling)	1) Exhibition of NERICA and paddy rice: 2m×1m=2m^2 2)-3) Working table (1 set): 6m×7m=42m^2 (including 1m working space around the table) 4) Working table (2 sets)3m×4m=12m^2 (including 1m working space around the table) 5) Exhibition of measurement equipment of rice production at farm (1 set): 6m×7m=42m^2 (including 1m working space around the table) 6) Exhibition of samples of fertilizer, sprayer of insecticide, rice plant damaged by insect and blight (Floor area) Working tables (2 sets): 3m×4m=12m^2, Table for equipment: 6m×7m=42m^2, Total about 64m^2
Paddy rice cropping and irrigation (Middle class)	DAOs 22 AOs 44 AAOs 44 Model farmers (A group), existing P/P 24 Model farmers (B group), existing D/F 36 Model farmers (C group), existing D/F 36 Leaders of independent farmers group 44 Independent farmers 44 NAADS service providers 44	(Training in lecture room) 1) Introduction of NERICA 2) Exhibition and explanation of paddy rice varieties 3) Farming practice using plant pots 4) Practice to select high quality rice seed 5) Measurement of quantity of unhulled rice and its exhibition 6) Explanation of fertilizer, insecticide 7) Guidance for topographic survey equipment 8) Guidance for construction materials for land reclamation, canal, etc. 9) Instruction of current meter 10) Guidance for hydro-meteorological observation equipment 11) Explanation of characteristics of earth materials used for canals and embankment (Training in the trial farm) 1) Practice of seeding (selection of seed, seeding depth, drilling, hill seeding, terrace reclamation) 2) Weeding, additional manure 3) Harvesting (reaping, threshing, drying, milling) 4) Topographic survey and discharge measurement (Primary level) 5) Land reclamation for paddy, nursery bed construction	1) – 6) Total 64m^2 (see above) 7) Area for explanation of equipment use, such as theodolite, auto level, electro-optical distance meter, as well as equipment adjustment: 3m×10m=30m^2 8) Area for explanation of construction materials such as sand back, brick, concrete aggregate, as well as storage of the materials: 5m×5m=25m^2 9) Area for practice of current meter operation: 5m×5m=25m^2 10) Area for handling of rainfall gauge, staff gauge for water level measurement, preliminary training of current meter operation 11) Test of soil
Training at site for Paddy rice cropping (Both classes)	5 – 10trainees / training	On-the-job training at Doho area, good farmers, rice mill factory, farm machinery	

Note: P/P Pilot Project, D/F Demonstration Farm NAADS: National Agriculture Advisory Services

Table- 2.2.11 Training Program

Lecture Room NERICA Rice Promotion Project, Sustainable Irrigated Agriculture Development Project in Eastern Uganda

Project	Trainees	Day	No.			Person	Total	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
NERICA Rice Promotion Project	1) NERICA cropping (First class)				Lecture room occupied			2	2	1	1	1	2	2	1	1	3	2	1
	DAOs	3	3			10	30		10					10			10		
	NGOs	3	3			5	15		5					5			5		
	NAADS Service Providers																		
	Farmers' groups	3	3			30	90			30					30			30	
	JOCV	3	4			10	40	10			10					10		10	
	JOCV (NERICA)	3	1			10	10						10						
	Trainees from east and south African cou	3	3			5	15	5				5					5		
	JOCV (East and south African countries)	3	2			10	20						10						10
				(Sub-Total of Trainees)			220	15	15	30	10	5	20	15	30	10	20	40	10
	2) Paddy rice cropping (Second class)				Lecture room occupied			1	1	1	1	1	2	0	2	1	1	0	3
	DAOs	3	3			10	30			10					10				10
	NGOs	3	3			5	15				5		5						5
	NAADS Service Providers																		
	Farmers' groups	3	2			30	60		30							30			
	JOCV (NERICA)	5	1			10	10								10				
	Trainees from east and south African cou	3	3			5	15	5				5					5		
	JOCV (East and south African countries)	3	2			10	20						10						10
				(Sub-Total of Trainees)			150	5	30	10	5	5	15	0	20	30	5	0	25
	3) Training at site				Lecture room occupied			1	1				1	1	1			1	1
				(Sub-Total of Trainees)			150	20	30				20	20	20			20	20

Project	Trainees	Day	No.	District	Trainee	Person	Total	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Sustainable Irrigated Agriculture Development Project in Eastern Uganda	1) Paddy rice cropping (First class)				Lecture room occupied			2	2	4	2	2	2	2	2	2	2	2	2
	DAOs	3	1	22	1	22	22	22											
	Amos	5	3	22	2	44	132		44		44					44			
	AAOs	5	3	22	2	44	132	44		44			44						
	Model farmers (A group), existing P/P	5	3	4	6	24	72			24		24					24		
	Model farmers (B group), existing D/F	5	3	9	4	36	108		36				36		36				
	Model farmers (C group), existing D/F	5	3	9	4	36	108			36						36		36	
	Leaders of independent farmers group	5	3	22	2	44	132				44			44				44	
	Independent farmers	5	3	22	2	44	132							44			44		44
	NAADS service providers	3	4	22	2	44	176			44		44			44				44
				(Sub-Total of Trainees)			1014	66	80	148	88	68	80	88	80	80	68	80	88
	2) Paddy rice cropping (Second class)				Lecture room occupied			2	2	2	2	3	2	2	2	3	2	2	2
	DAOs	3	1	22	1	22	22												22
	Amos	5	3	22	2	44	132	44					44			44			
	AAOs	5	3	22	2	44	132		44					44				44	
	Model farmers (A group), existing P/P	5	3	4	6	24	72	24				24				24			
	Model farmers (B group), existing D/F	5	3	9	4	36	108				36				36		36		
	Model farmers (C group), existing D/F	5	3	9	4	36	108			36				36				36	
	Leaders of independent farmers group	5	3	22	2	44	132			44		44					44		
	Independent farmers	5	3	22	2	44	132				44		44		44				
	NAADS service providers	3	4	22	2	44	176		44			44				44			44
				(Sub-Total of Trainees)			1014	68	88	80	80	112	88	80	80	112	80	80	66
	3) Training at site				Lecture room occupied			1	1			1	1	1	1			1	1
				(Sub-Total of Trainees)			50	5	5			5	10	5	5			5	10

Summary Table

Month		Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Total number of Trainees	2598	179	248	268	183	195	233	208	235	232	173	225	219
Total number of Training (Total of 2 lecture rooms)	425	35	35	40	30	35	40	30	35	35	40	30	40
Average occupation rate of the Lecture rooms (%)	88.5	87.5	87.5	100.0	75.0	87.5	100.0	75.0	87.5	87.5	100.0	75.0	100.0

Project	Trainees	time	Floor Area required for Lectures (m^2)
			0 50 100 150 200 250
A-1	Leaders of farmers' groups	2	
B-1	Model farmers (B group), existing D/F	1	
B-2	AAOs (Assistant Agroculural Offocers)	1	
A-1	Leaders of farmers' groups	3	
B-1	Model farmers (B group), existing D/F	2	
B-2	AAOs (Assistant Agricululral Officers)	2	
A-1	JOCV(NERICA)	1	
B-1	Leaders of independent farmers' groups	1	
B-2	Model farmers (B group), existing D/F	3	
A-1	DAOs (District Agricultural Officers)	1	
A-2	NGOs	1	
B-1	NAADS service providers	2	
B-2	Model farmers (C group), existing D/F	1	
B-1	Aos (Agricultural Officers)	2	
A-1	DAOs (District Agricultural Officers)	2	
A-2	Trainees from east and south African countries	1	
B-2	AAOs (Assistant Agroculural Offocers)	3	
B-1	Aos (Agricultural Officers)	3	
B-2	Leaders of independent farmers' groups	3	
A-1	JOCV(NERICA)	2	
B-1	Leaders of independent farmers' groups	2	
B-2	Independent farmers	1	
A-2	NGOs	2	
A-1	DAOs (District Agrocultural Officers)	3	
B-1	AAOs (Assistant Agroculural Offocers)	1	
B-2	Independent farmers	2	
A-1	JOCV (Newly engaged)	1	
B-1	NAADS service providers	3	
B-1	Leaders of independent farmers' groups	3	
A-2	Trainees from east and south African countries	2	
B-2	Model farmers (A group), existing P/P	1	
B-1	AAOs (Assistant Agroculural Offocers)	2	
B-2	Independent farmers	3	
A-1	NGOs	1	
A-1	JOCV (Newly engaged)	2	
A-2	NGOs	3	
B-1	NAADS service providers	4	
A-1	NGOs	2	
A-1	Trainees from east and south African countries	3	
B-1	AAOs (Assistant Agroculural Offocers)	3	
A-1	JOCV (East and south African countries)	1	
A-2	Trainees from east and south African countries	3	
B-2	Model farmers (A group), existing P/P	2	
A-1	JOCV (Newly engaged)	3	
B-1	Model farmers (A group), existing P/P	1	
B-1	Independent farmers	1	
A-1	JOCV (East and south African countries)	2	
B-2	DAOs (District Agrocultural Officers)	1	
B-2	Model farmers (C group), existing D/F	2	
A-2	Leaders of independent farmers' groups	1	
B-1	Model farmers (B group), existing D/F	3	
B-2	Model farmers (C group), existing D/F	3	
B-1	Model farmers (C group), existing D/F	1	
B-2	Model farmers (A group), existing P/P	3	
B-2	NAADS service providers	1	
A-2	DAOs (District Agrocultural Officers)	1	
A-2	JOCV (East and south African countries)	1	
B-1	Independent farmers	2	
B-2	NAADS service providers	2	
B-2	NAADS service providers	3	
A-1	NGOs	3	
B-1	Model farmers (A group), existing P/P	2	
B-2	Aos (Agricultural Officers)	1	
A-1	JOCV (Newly engaged)	4	
B-1	Model farmers (C group), existing D/F	2	
B-2	Leaders of independent farmers' groups	1	
A-1	Leaders of farmers' groups	1	
A-2	JOCV (East and south African countries)	2	
B-2	Aos (Agricultural Officers)	2	
A-2	Leaders of farmers' groups	2	
B-1	Independent farmers	3	
B-2	Model farmers (B group), existing D/F	1	
A-2	DAOs (District Agricultural Officers)	2	
B-1	Model farmers (C group), existing D/F	3	
B-2	Leaders of independent farmers' groups	2	
A-2	DAOs (District Agricultural Officers)	3	
B-1	DAOs (District Agricultural Officers)	1	
B-2	Model farmers (B group), existing D/F	2	
A-2	JOCV(NERICA)	1	
B-1	Model farmers (A group), existing P/P	3	
B-1	NAADS service providers	1	
A-1	JOCV(NERICA)	1	
B-1	Aos (Agricultural Officers)	1	
B-2	Aos (Agricultural Officers)	3	
B-2	NAADS service providers	4	

Floor area of Lecture rooms: 200m^2

A-1 NERICA Rice Promotion Project, 1) NERICA cropping (First class)
A-2 NERICA Rice Promotion Project, 2) Paddy rice cropping (Second class)
B-1 Sustainable Irrigated Agriculture Development Project in Eastern Uganda, Paddy rice cropping (First class)
B-2 Sustainable Irrigated Agriculture Development Project in Eastern Uganda: Paddy rice cropping (Second class), Irrigation and drainage
P/P Pilot Project
D/F Demonstration Farm

Figure- 2.2.3 Floor Area of Lecture Rooms by Training Program

3) Canteen/ kitchen block

The canteen/ kitchen block has a capacity of 72 persons (80% of trainees out of maximum 90 trainees) to have a meal at the same time. The floor area is estimated on condition that floor area of 2.2 m^2 (average of 1.9 to 2.5 m^2 according to dormitory in Japan) is occupied by a trainee. Floor plan of the kitchen is exactly designed considering required spaces for cooking and other kitchen equipment, thus the area is estimated at about 25 % of the floor area of the canteen.

4) Dormitory block for researchers

The dormitory is utilized by a long stay researchers of NARO, ZARDI, DAO, etc. In this regard, shower and toilet are equipped in each room. One room is used by two persons, and total seven rooms including one common room are planned. The utilization rate is calculated according to the research program of the technical cooperation projects, and is shown in Table- 2.2.12. (Details are shown in Table- 2.2.13) Maximum and minimum number of the researchers are 16 and 12, respectively. Since the capacity of the dormitory of 12 persons is not enough, the dormitory of the Makerere University will be used.

Table- 2.2.12 The Number of Researchers Staying in the Dormitory

Month	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
No. of researchers (person)	12	16	14	12	16	14	12	16	14	12	16	14

Table- 2.2.13 Assignment Schedule of Researchers

Laboratory	Organization	Month	Arp.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	JICA Experts
Farming	JICA	Breeding, cultivation	1	1	1	1	1	1	1	1	1	1	1	1	(1) Rice cultivation, dissemination
Cropping technique		Agricultural machinery		1	1	1				1	1	1			6) Post harvest
Mechanized agriculture		Agricultural machinery		1	1	1				1	1	1			9) Agricultural machinery
Intercropping		Intercropping					1	1					1	1	8) Breeding/ agro industry
	NaCRRI	Breeding	1	1	1	1	1	1	1	1	1	1	1	1	
		Cultivation skill	2	2	2	2	2	2	2	2	2	2	2	2	
	NARO	Agricultural machinery		**1**			**1**			**1**			**1**		
	ZARDI	Cultivation skill	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	
		Intercropping	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	
	DAOs	Cultivation skill	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	
	Total	Researchers in laboratory	8	11	10	10	10	9	8	11	10	10	10	9	
	Total	Researchers in dormitory	4	5	4	4	5	4	4	5	4	4	5	4	
Paddy irrigation	JICA	Paddy irrigation	1	1	1	1	1	1	1	1	1	1	1	1	(2) Irrigated agriculture
Upland irrigation		Paddy irrigation	1	1				1	1	1				1	1) Irrigation facilities
Meteorology -agriculture		Upland irrigation	1	1				1	1	1				1	5) Rural infra
Soil	NaCRRI	Paddy irrigation	1	1	1	1	1	1	1	1	1	1	1	1	
		Upland irrigation	1	1	1	1	1	1	1	1	1	1	1	1	
		Meteorology -agriculture	1	1	1	1	1	1	1	1	1	1	1	1	
	NARO	Paddy irrigation		**1**			**1**			**1**			**1**		
		Soil			**1**			**1**			**1**			**1**	
	ZARDI	Upland irrigation	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	
	DAOs	Upland irrigation	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	
	Total	Researchers in laboratory	9	10	8	7	8	10	9	10	8	7	8	10	
	Total	Researchers in dormitory	3	4	4	3	4	4	3	4	4	3	4	4	
Phytopathology of plant	JICA	Insect and noxious insect	1	1				1	1	1				1	11) Phytopathology
Insect and noxious insect	NaCRRI	Phytopathology of plant	1	1	1	1	1	1	1	1	1	1	1	1	
		Insect and noxious insect	1	1	1	1	1	1	1	1	1	1	1	1	
	NARO	Phytopathology of plant		**1**			**1**			**1**			**1**		
	ZARDI	Insect and noxious insect	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	
	Total	Researchers in laboratory	4	5	3	3	4	4	4	5	3	3	4	4	
	Total	Researchers in dormitory	1	2	1	1	2	1	1	2	1	1	2	1	
Training,	JICA	Training 1	1	1	1	1	1	1	1	1	1	1	1	1	(3) Coordinator, training
Post harvest		Training 2	1	1				1	1	1				1	4) Preparation of text
Marketing		Post harvest, marketing		1	1	1				1	1	1			
Rural society		Rural society			1	1					1	1			2)Rural society, organization
Agro economy		Social environment					1	1					1	1	3) Social environment
		Gender	1					1	1					1	10) Gender
	NARO	Training		**1**			**1**			**1**			**1**		
		Agro economy			**1**			**1**			**1**			**1**	
	ZARDI	Post harvest, marketing	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	
		Rural society	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	
	DAOs	Post harvest, marketing	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	
	Total	Researchers in laboratory	7	8	8	7	7	9	7	8	8	7	7	9	
	Total	Researchers in dormitory	4	5	5	4	5	5	4	5	5	4	5	5	
	Total (JICA experts)		8	10	7	7	5	10	8	10	7	7	5	10	Total 94M/M
	Researchers in dormitory		12	16	14	12	16	14	12	16	14	12	16	14	

Note: In the most right column, parenthesis in both sides shows long term experts, parenthesis in one side shows short term experts
Values in the table means the number of researchers
Colored cell means maximum assignment month in each laboratory.
Values in bold letter means the number of researchers from NARO, ZARDI and DAOs, stay in dormitory (or other accommodation facilities)

5) Rice mill demonstration and working shop

Having estimated the floor area of the rice mill demonstration and working shop, training space for 40 persons comprising of trainers and trainees is necessary other than the spaces for huller-rice mill machinery and storage of rice seeds before and after milling. In addition to these indoor facilities, temporary storage yard for chaff is prepared outside of the facilities. Accordingly the total floor area of 200 m^2, consisting of 150 m^2 indoor and 50m^2 outdoor is necessary for the rice mill demonstration and milling practice.

6) Screen house with glass roofing

Rice cultivation pots in the existing screen house and the six sets of lysimeters are placed in the screen house. Rice cultivation pots and lysimeters occupy about 450 m^2 of the screen house. Screen house of its floor area of 600 m^2 (10m×30m×2 houses: integrated type) is constructed taking the following further requirements into account.

- Wider floor area should be secured for an extension of rice research items as well as increase in the number of researchers on farming and irrigation fields,
- Wider floor area should be secured corresponding to the expansion of research fields of breeding and phytopathology of rice, insect and noxious insect, etc.

7) Warehouse for agricultural machinery

Agricultural machinery procured by the Project and other machinery such as power tillers and their attachment which are procured by the technical cooperation projects are stored in the warehouse for agricultural machinery. In addition, work space for experiment using thresher and winnowing fan is secured in the warehouse.

8) Workshop

The workshop has a floor area for the repair and maintenance works of the equipment procured by the Project. Existing repair shop for vehicles are transferred next to the workshop. The workshop for vehicles is located between the workshop and the rice mill demonstration and working shop, and steel roof only constructed to maintain a present work environment.

9) Sanitation plant

A septic tank has two tanks divided by a concrete wall to separately treat sewage water, one for waste water drained mainly from the canteen/ kitchen block, and human waste from toilets. The treated water flows into infiltration wells. Two infiltration wells are also proposed for operation and maintenance, e.g., alternative removal of foreign materials clogged in the filter material.

(4) Irrigation facilities

1) Outline

Trial farm of 2ha is established as irrigation facilities. Target varieties planted in the trial farm are selected from the following varieties: eighteen (18) upland rice varieties, sixty (60) varieties lowland rice of NERICA, and other rice varieties of WAB56, FOFIFA-3729 and SUPARICA-1.

The farm plots in the trial farm are classified into two types as follows;

- An experiment plot for rice plant: Twelve (12) standard plots of 0.1ha (20m×50m=1,000m^2) are designed for experimental purpose. Those standard plots have an convenient advantage for measuring and evaluating input and output such as the consumed amount of fertilizer and workforce, and rice yield.
- A collection plot for rice seed: Nine (9) irregularly-shaped plots are designed to use for the purpose of collecting rice seed. Measurement of the input and output is not required in those seed collection plots.

Table - 2.2.14 Land Use Plan of the Trial Farm

Purpose	Target variety	Number of plots	Area
Experiment plot for rice plant	Six (6) varieties from upland rice and six (6) varieties from lowland rice are selected as target varieties in order to verify their adaptability in the trial farm.	A total of twelve (12) varieties are cultivated in each plot under the same condition of water management.	0.1ha×12plots=1.2ha
Seed collection plot for rice seed	Dissemination of rice varieties of local specified based on the result of cultivation experiment in NaCRRI are planted for the purpose of collection of the rice seed.	Selected nine (9) varieties are cultivated in each irregularly-shaped plot under the specified condition of water management.	Total 0.8ha
Total		21 plots	2.0 ha

2) Design plan of trial farm

Basic design plan of the trial farm are summarized as follows:

- As the elevation of existing irrigation farm is slightly higher than the water level of the existing canal, it is impossible to divert the irrigation water from nearby existing canal during the dry season. For the stable intake of irrigation water, intake is constructed at upstream of the existing canal. Water level elevated with the intake is expected approximately 0.8 m.
- Besides, new irrigation canal is constructed from the intake to the trial farm with the following dimension: Main irrigation canal: B=0.4m×H=0.4m, length L=650m, Lateral irrigation canal: B=0.25m×H=0.25m, length L=700m.
- Irrigation canal and drainage canal are constructed separately in the shape of open canal.

- To measure intake discharge, water flow meter (Parshall flume) is installed at the end of the main irrigation canal. Water discharge flowing in the irrigation canal is estimated using the relation between the water depth an discharge with specified equation.
- The amount of irrigation water supplied to each plot should be precisely estimated during rice cultivation period, therefore, concrete lining is applied to the irrigation canal so that measured intake discharge is conveyed to each plot without conveyance loss.
- The standard size of the plot is designed in 0.1 ha (20m×50m).
- Earth lining canal is constructed so as to drain the water discharged from each plot to the existing canal. Total length of the drainage canal is estimated at 320 m.
- Farm road with 1.2 km of length is constructed for serving transportation of the agricultural materials and the harvested rice, operation and maintenance equipment for the intake work, and so on. The farm road is 3.5 m wide (gravel pavement 3.0 m) which is the same width as existing access road.
- For the improvement of the existing canal, the shape arrangement is exclusively made, and protection work is not made in principle.

(5) Structural plan

1) Materials plan

Structure is rigid frame structure of reinforced concrete, and the walls are made of brick. Floor slab is structurally independent from firm structure, i.e., column and beam. A structural steel frame is used for a roof. Either clay tile or steel sheet is used for a roof. The former is used for the research and administration block, the training and canteen/ kitchen blocks and the dormitory block. The latter is for the warehouse for agricultural machinery, workshop and the rice mill demonstration and working shop. Elevation of the foundation is about 1.5m under the ground surface to support structure.

2) Design load

- Design load : Dead load is calculated in actual load of materials.
- Seismic load : Horizontal seismic load is estimated at 0.1 in accordance with the Structural Design Guidelines (Ministry of Works and Transport, October 2006) in Uganda
- Wind load : The wind load is calculated based on the design wind speed of 30.0m/sec in line with the design guideline of Uganda. Load distribution of wind load is estimated in conformity to the design criteria in Japan.

3) Construction materials and allowable stress

- Concrete Fc_{28} = 25N/mm^2、Allowable compressive strength= 8.0 N/mm^2 (Reinforced concrete)
- Deformed bar (Grade 460, tensile strength: 460 N/mm^2, Allowable tensile strength=150 N/mm^2)
- Structural steel (H shape steel, L shape steel, channels, square shape steel, etc (Grade 43A, Yield point: 240 N/mm^2, tensile strength: 430 N/mm^2, allowable tensile strength: 140 N/mm^2)
- Bolt (High tension bolt : F10T, general: Grade 43A)

(6) Utility plan

1) Electrical works

Since the capacity of the existing transformer (100 kVA) is insufficient to supply electricity to the proposed facilities, additional transformer should be installed with its capacity of 100 kVA through the existing aerial line. Considering present frequent power failure, a generator is also installed near the transformer to supplementary supply electricity to the facilities with its capacity of 100 kVA. A solar system is also recommended to supply electricity to the equipment which consumes less electricity, such as refrigerator for seed storage as well as lighting and other use in offices for night works. Solar panels and batteries are installed on the roof and in the office of the warehouse for agricultural machinery, respectively. Existing aerial line is available for the power supply in the workshop.

Lightning conductors are placed on the roof of the research and administration block, the training and canteen/ kitchen blocks, the dormitory block, the warehouse for agricultural machinery and workshop to prevent damages by lightning.

2) Water supply and sewerage systems

The existing water tank, capacity of 160 m^3, is sufficient to supply water to the proposed facilities. Main water supply pipe (diameter 50mm) is connected to the existing water network with its extension length of 240 m at the existing administration zone of the NaCRRI. The water for the workshop is supplied through the existing pipe network by diameter 23mm pipe and extension length of about 60 m for connection.

Sewage water is composed of waste water from facilities and human waste from toilets. Sewage water is separately collected to the septic tank. Waste water after settled in the septic tanks flows into the infiltration wells and infiltrated into ground through gravel and fine sand filters.

3) Hot water supply

The hot water supply tank for shower is solely equipped in the dormitory.

4) Fire extinguishers

Fire extinguishers are provided in the facilities corresponding to the floor area of each facility. Fire extinguisher is placed at noticeable location.

(7) Construction material plan

The following materials are selected considering local availability and longer durability.

Structure: Unglazed brick is widely used in Uganda. A single or double bricks wall is placed by wall thickness.

Column, beam: Rigid concrete frame (reinforced concrete)

Roof: Steel frame trusses with a clay roof tile or steel plate (galvalume plate) is applied from the view point of the longer durability.

Fitting: Lattice type steel door is placed outside of building door of the research and administration block and training block for security purpose. Window frame is made of aluminum to attain strength and ease of maintenance. Lattice type steel frame is installed outside of all windows except windows installed at higher portion on the wall. Wooden fitting such as a door is placed in the building, and steel fitting is recommended for door frame to secure sufficient strength.

Ceiling: A gypsum board is used for ceiling.

Painting: Table- 2.2.15 shows specification of paints.

Table- 2.2.15 Specification of Paints

Member	Specifications
Inside wall*[1]	Glossy synthetic resin emulsion paint (EP-G)
Outside wall and inside wall near water system	Glossy synthetic resin emulsion paint (EP-G)
Ceiling	Synthetic resin emulsion paint (EP)
Steel fittings	Synthetic resin paint (SOP)
Wooden fitting	Synthetic resin paint (SOP)

*[1]: EP-G is applicable to inside wall paint to minimize maintenance cost such as re-painting due to a stain on the walls by agricultural experiment and works.

Others: Facility name plate, room name plate are placed on all facilities and rooms.

(8) Exterior works

1) Exterior works

- An approach way in the Regional Rice Research and Training Center should be paved with concrete to protect ways from erosion by traffic since the center is located in the slope area.
- Laterite surface becomes muddy during and after rainfall. The terrace yard around the training, canteen/ kitchen blocks, warehouse for agricultural machinery should be paved with gravel for vehicle.
- Drainage ditch should be constructed around the building and building site. In addition, road crossing drainages should be constructed to smoothly drain rainfall water.

2) Exterior equipment works

- Electric and telephone lines are buried underground. Hand hole should be installed for line installation as well as maintenance works of these lines.
- Sewage water is gathered to the septic tanks through PVC pipe buried underground.

The facilities constructed under the Project are summarized in Table- 2.2.16.

Table- 2.2.16 Proposed Facilities

Facilities	Capacity and details	Floor area, structure
Research and administration block	Laboratory (4 rooms), seed storage room, administration room, reception room, panel display room, library and data storage room, storage room for equipment, working room, toilet, hallway, etc.	700m^2 Column, beam: RC structure Wall: Brick Roof: Steel frame trusses, clay tile One-story building
Training block	The number of lecture room and floor area was estimated based on the technical cooperation project. Two lecture rooms is constructed.	424m^2 (ditto)
Canteen/ kitchen block	Canteen/ kitchen has a capacity for 72 persons (max. 90 persons × 80%) to take a meal at the same time.	216m^2 (ditto)
Dormitory block	The number of room and floor area was estimated based on the assignment schedule of the technical cooperation project.	252m^2 (except outside passway) (ditto)
Screen house with glass roofing	Screen house area is estimated to install present rice pot, lysimeter (6 sets) and further requirement for research and training	600m^2 Column, beam: Structural steel Roof: Aluminum and glass One-story building
Warehouse for agricultural machinery	Agricultural machinery procured by the Project and other machinery such as power tillers and their attachment which are procured by the technical cooperation projects are stored in the warehouse. In addition, work space for experiment using thresher and winnowing fan is secured in the warehouse.	270m^2 Column, beam: RC structure Wall: Brick Roof: Steel frame trusses, steel sheet One-story building
Dry yard	Dry yard is used to dry up rice from trial farm (2ha) and existing farm (15ha)	450m^2 Concrete slab
Workshop	Required area is estimated for the space of equipments procured by the project and existing equipment. In addition, workshop for vehicles are constructed.	348m^2 Column, beam: RC structure Wall: Brick Roof: Steel frame trusses, steel sheet One-story building
Rice mill demonstration and working shop	Facility is used for rice mill demonstration (40 persons including trainers), storage of storage of rice seeds before and after milling and spaces for huller- rice mill machinery inside of the shop, and temporary storage yard for chaff is prepared outside of the facilities.	200m^2 (ditto)
Common use toilet	Area is estimated according to the number of researchers and trainees.	40m^2 Column, beam: RC structure Wall: Brick Roof: Steel frame trusses, clay tile
Generator room	Generator room is uses to install generator.	12m^2 RC structure
Sanitation facilities	Sanitation facilities are composed of septic tank and infiltration wells. Septic tank has two separated tanks to separately treat the sewage water. Two infiltration wells are installed for maintenance.	Septic tank: RC structure Infiltration well: Brick with filter gravel filling
Irrigation facilities	Irrigation facilities are constructed for experiment plot for rice plant, collection of rice seed under the technical cooperation projects. Irrigation facilities include: Main irrigation canal 650 m Lateral irrigation canal 700 m Drainage canal 320 m Farm road 1,200 m	Trial farm: 2ha Intake: RC structure Main, lateral canal: Concrete Drainage: Erath lining Farm road: Gravel pavement

2-2-2-3 Equipment Plan

(1) Equipment procurement

In line with a policy of equipment procurement plan, following equipments are selected:

Table- 2.2.17 Selection of Equipment

Facilities/ Purposes	Equipment	Selection guideline
Research and administration block	Generator	Generator is necessary to supply power during a power failure. NaCRRI has generators for the same purpose. Capacity of generator meets power demand in the projected facilities as well as equipment procured by the Project.
Laboratory equipment	Scale (100kg), microscope, stereoscopic microscope, pH meter, meteorological observation equipment, lysimeter (Scale, microscope, stereoscopic microscope, pH meter will be procured by the technical cooperation projects.)	In line with a basic policy, scale, microscope, stereoscopic microscope, pH meter will be procured by the technical cooperation projects because these are for technical transfer by the technical cooperation project, and also not directly related to the facilities under the Project. Meteorological equipment is installed at the screen house and the trial farm. Lysimeters are installed in the screen house and outside to meet research purposes.
Equipment for seed storage	Refrigerator for seed storage	In line with a basic policy, refrigerators are procured by the technical cooperation project because these are not directly related to the facilities under the Project..
Equipments for farming	Tractor with attachments	The tractors and attachment are procured because those owned by the NaCRRI are old and not useful. The tractors has 80 PS as same power as those the NaCRRI has, and attachments are selected according to the specification of the tractors. Bottom plows are procured because of its shortage in the NaCRRI, instead of the disc harrow, which the NaCRRI has 2 sets. Tractors with attachments are procured from third country through sales agents. The cutter is excluded from procurement because such a maintenance equipment should be procured by the Ugandan side.
Post harvest equipment for demonstration	Thresher for experiment, winnowing fan for experiment, huller, rice mill, seed drier, power tiller with trailer (Thresher, winnowing fan, seed drier, power tiller will be procured by the technical cooperation projects.)	In line with a basic policy, thresher, winnowing fan, seed drier will be procured by the technical cooperation projects because these are for technical transfer by the technical cooperation project, and also not directly related to the facilities under the Project. Power tiller with trailer is procured by the technical cooperation project. The one-pass type huller/rice mill is commonly used in Uganda, accordingly one-pass type is selected for the demonstration purpose.
Workshop equipment	Welding machine, gas welding machine, upright drilling machine, high speed cutter, bench grinder, pipe threading machine, electric repairing tools, high pressure washing machine, hydraulic jack, other tools	Equipment owned by the NaCRRI was decrepit. It is necessary to replace those equipment to maintain equipment procured by the Project. The equipment will be procured in local with careful examination of after-sales services of agents and repair work.
Research and administration block	Solar battery system	Solar power is used for a part of facilities such as refrigerators for seed storage and laboratory use in night time experiment work, etc.

(2) Necessity and quantitative evaluation of major equipment

Regarding the major equipment, the necessity and quantitative evaluation are described below:

A. Laboratory Equipments

A-1 Automatic Diesel Generator

In Namulonge area, power failure occurs frequently such as once in 2 days, and the duration of power failure is 3 hours to more than 10 hours. This scheduled power failure can further continue considering the recent power supply balance in Uganda. The NaCRRI has 135 kVA class generator to supply power to existing facilities, but its capacity is not enough for the facilities constructed by the Project.

Therefore, the generator is quite necessary for additional activities for research and trainings. The necessary power is estimated at 100 kVA to floor area of 1,340 m^2 of research and administration block, training and canteen/ kitchen blocks, referring to the standard of construction and equipment guideline in Japan. One unit of the automatic diesel generator is installed.

A-2 Solar Battery System

The peak time of electricity demand is 19:00 to 22:00 in Uganda, and the scheduled power failure occurs frequently in the night time. As the electricity demand in the night time is small only for the refrigerator for seed storage and lighting for research work, the operation of the high-power generator is not efficient from the view point of economy. To save fuel cost for the generator operation, the solar battery system shall be equipped as a back-up power supply system instead of the generator. The capacity of the solar battery system is calculated for lighting system of four laboratory rooms, eight personal computers and two 400 lit refrigerators.

B. Laboratory Equipments

B-1 Lysimeter

NERICA and other rice varieties are selected as target varieties for dissemination purpose, however, fundamental technical data on irrigation is limited at present. An accumulation and analysis of fundamental data shown below and its systematization is one of the research subject to accelerate rice production in south-east African countries including Uganda.

1) Crop water requirement of NERICA and upland rice varieties at each growing stage
2) Crop water requirement of paddy rice varieties at each growing stage
3) Experiment data showing the relation between soil water content and crop growth under the different irrigation condition.

In order to collect those data, the lysimeters are installed. Lysimeter is an instrument that specializes in obtaining evapo-transpiration by measuring directly decreasing water amount in the tank filled with soil.

The research results provide the basic technical information on crop coefficient (Kc- value) and irrigation scheduling necessary for irrigation planning, through analysis and compiling the evapo-transpiration data measured by the lysimeter.

Note) Evapo-transpiration = Evaporation + Transpiration

Evaporation: evaporation from water surface (paddy field), evaporation from soil surface (upland field)

Transpiration: water amount released from above-ground part of crops (leaf surface)

The followings research subjects are proposed by using eight (8) sets of lysimeters; six (6) sets are placed in the screen house, and 2 (two) sets are placed outside.

1) (Research using lysimeters placed in the screen house) (6 study cases)

Variation in evapo-transpiration and growth rate are studied for 36 cases in total. For the rice variety, six (6) upland rice varieties (NERICA: No.1, 4, 10, WAB 3 varieties) are selected. As to irrigation condition, six different experiment cases are selected, comprising of irrigation interval days (e.g. 3, 5, 7, 9, 11, 13days) and irrigation water volume (e.g. 2, 3, 4, 5, 6, 7mm/day). In order to conduct the experiment, at least six (6) sets of the lysimeter are required. Since it needs several cropping seasons to complete 36 case studies, the experiment study shall be carried out by properly combining rice varieties, irrigation interval and irrigation water volume.

2) (Research using lysimeter placed outside of the screen house)（2 study cases）

Variation in evapo-transpiration in each growing stage is studied for 2 cases under the natural climate condition. Rice varieties are as follows:

- Upland rice: One (1) variety selected from NERICA No.1, 4, 10
- Paddy rice: One (1) variety

Specification of lysimeter

- Soil tank: Shape: Square type (1.0m×1.0m), height: 0.6m, stainless material
- Weight sensor: Accuracy: ±100g, alkaline battery operation
- Data logger: Small scale electrical pressure logger (Record interval: 2 to 60 seconds, Memory capacity: 16,000 data, alkaline battery operation)
- Data collection device: Record capacity: 16,000 data×16 loggers, USB connection, alkaline battery operation, analyzed by specific soft ware

B-2 Meteorological Observation Equipment

The weather conditions differs remarkably within the sites in the NaCRRI, for example, the time and amount of rainfall at the Regional Rice Research and Training Center and the trial farm. In addition to such locality of the weather conditions, the meteorological observation equipment should satisfy the following specifications to accurately measure micro weather conditions:

1) The equipment should be installed near the lysimeter in order to calculate the crop coefficient (Kc) at every growing stage based on the evapotranspiration (ET) measured by the lysimeter and evapotranspiration (ETo) calculated by meteorological data.

2) The equipment should be installed in the trial farm in order to study the relationship between crop growth and weather conditions.

Feature of the meteorological equipment

- Measuring item: Rainfall, temperature, relative humidity, duration and solar radiation, wind velocity and direction
- Installation: Tripod mounted type

Quantity of the meteorological equipment

- Inside the Regional Rice Research and Training Center 1 unit
- The trial farm (near existing irrigation pump station) 1 unit

C. Equipments for Farming (Tractor with Attachments)

The tractors and attachments are used in the trial farm, the existing upland paddy fields and other intercropping cultivation fields in the NaCRRI. The total area of these fields is about 100 ha. The NaCRRI has intension to expand the trial farm in the arable area of 200 ha. The NaCRRI has 20 and 7-years used tractors, however these tractors are used only for light work such as a traction of trailer.

C-1 Tractor

A tractor is the basic equipment for field works, such as tillage and land preparation, seeding, weeding, and transportation. The tractor is used in the trial farm, the existing upland paddy fields and other intercropping cultivation fields in the NaCRRI. When a tractor has a cultivation area of 50 ha, two 80 PS tractors which are the same class as the existing one in the NaCRRI are procured for the total farm land of 100 ha. Assuming the working capacity of 0.2 ha/hr and work hours of 5 hr/day in tillage by 60-80 PS tractor, the work capacity is estimated at 1 ha/day/unit. Therefore, 50 days or about two months are necessary for the tillage of 100 ha of field by two tractors.

The seeding needs the same working days, i.e., 50 days or about two months. As a result, the annual working days of the tractor is about four months (2 months x 2 works a year). In addition, these tractors are used for material and crop transportation.

Furthermore, these tractors are used as a training equipment in the training program of "NERICA Rice Promotion Project" and "Sustainable Irrigated Agriculture Development Project in Eastern Uganda ". These training programs include tillage and seeding by tractor and also maintenance of tractors. In the 19 training programs for the extension workers, farmers' leaders and model farmers, the tractor is used for 54 days in a year.

In conclusion, two tractors are necessary for smooth operation of the farming in the test field (100 days a year) and training programs (54 days a year).

C-2 Disc Plow

The disc plow is an attachment of the tractor for tillage. The disc plow is suitable for the hard soil and soil with weed or roots due to high capacity of soil cutting. It is commonly used in tillage, and two units of 3-disc type disc plows are procured for the two tractors.

C-3 Bottom Plow

The bottom plow is an attachment of the tractor for tillage. The bottom plow is high capacity of turning of soils. The turning of large soil blocks with large space between blocks has higher dried soil effect (increasing Nitrogen due to promotion of microorganism's activity). It is also commonly used in tillage, and two units of 3-blade type bottom plows are procured for the two tractors.

C-4 Seeder (1)

The paddy seeder is procured for the training program of seeding. It is necessary for the training on seeding of upland paddy by tractor, because there is no seeder in the NaCRRI. One unit of the seeder, which is an attachment of the tractor, is procured for the training and also for 30 ha grass field of the NaCRRI, where the test of intercropping cultivation with paddy is carried out.

C-5 Seeder (2)

The maize and pulse seeder is installed for the training and demonstration of secondary crop seeding. The seeder in the NaCRRI is very old and needs to be replaced. One unit of the seeder, which is an attachment of the tractor, is procured.

C-6 Sprayer

The sprayer is used for the training on agricultural machinery for paddy and whole farm land of the NaCRRI. There is no sprayer in the NaCRRI, but it is necessary for the training on

agro-chemical application by machinery. The sprayer is also used for paddy and many kinds of secondary crops. The consumption of agro-chemicals is 300 - 400 lit/ha in general, based on the field study in Uganda. The capacity of the tank is 800 lit, which is able to spray 2 ha at a time. One unit of the boom type sprayer to be attached to the tractor is procured.

C-7 Cultivator

The cultivator is used for the training on inter-tillage weeding and harrowing. It is a ordinary attachment of the tractor for inter-tillage weeding of paddy and upland fields, and it can be used for intercropping cultivation with rice. One unit of the plow-type cultivator is procured as a attachment of the tractor.

C-8 Trailer (Traction type)

The trailer is a common attachment of the tractor for the transportation of crops and farming tools in and around the fields. It is used for the training of farm mechanization as a demonstration. The existing trailer in the NaCRRI is so old that it needs replacement. Considering the specification of the tractors, the trailer shall be 5-ton capacity and hydraulic rear dump type. As the trailer is commonly and frequently used for transportation, two units of trailers are procured in conformity to the number of tractors.

D. Post-harvest Equipments for Demonstration

D-1/2 Huller/Rice Mill

The one-pass type huller/rice mill, which can deal with a series of works from hulling to polishing of rice is commonly used by rice traders in these days in Uganda. This type of the huller/mill has been used in the project by the JICA, SG2000 and AEATRI to provide these services in the remote area. One unit of the one-pass type huller/rice mill is procured for the demonstration in the training. Operation day of the huller/rice mill is estimated at about 70 days a year. The capacity shall be 700 kg/hr for the following reasons:

- Assuming that the working hour is 6 hr/day, the amount of milling is 4.2 ton/day (0.7 ton/hr x 6 hr/day)
- The total production of paddy from the trial farm and existing farmland is 55 ton/year (referring to the estimation of the dry yard), and 13 days are necessary for milling all harvested paddy (55 ton ÷ 4.2 ton/day).
- As the dry period is calculated at 60 days in the estimation of the dry yard, the rice mill works every 5 days.
- The rice milling is an important training item. It is used for the practical operation and maintenance trainings in 54 training courses in a year, and the demonstration of 15 study tours in a year.

E. Workshop Equipments

The existing workshop equipments are too old and tools for repair are also scarce. Therefore, the replacement of the workshop equipment is necessary to maintain the equipment procured by the Project and the technical cooperation projects.

E-1 Arc Welding Machine

The arc welding machine is for welding of various metal parts and steel materials. Considering the electric supply in the NaCRRI, the welding machine with diesel engine generator is selected. The electric current should be more than 250 kVA and electricity generation should be more than 10 kVA. Since the machine has generation function, it can supply electricity to other electric equipments as an emergency electric supply. One unit of the arc welding machine is procured.

E-2 Gas (Acetylene) Welding Machine

The gas welding machine is for welding and cutting of various metal parts and steel materials. It consists of regulator of oxygen and acetylene, welding and cutting torch, etc. One unit of the gas welding machine is procured.

E-3 Upright Drilling Machine

The upright drilling machine is for processing of various metal parts and steel materials. It should have 40 mm drilling capacity and consist of drill set and vise. One unit of the upright drilling machine is procured.

E-4 High Speed Cutter

The high speed cutter is for cutting of various metal parts. The diameter of blade is 350 mm. One unit of the high speed cutter with 20 spare blades is procured.

E-5 Bench (Electric) Grinder

The bench (electric) grinder is for processing of various metal parts and steel materials. The diameter of wheel is 205 mm. One unit of the bench (electric) grinder with 20 spare blades is procured.

E-6 Pipe Threading Machine

The pipe threading machine is for threading of small-diameter steel pipes, mainly for maintenance of water pipes in the NaCRRI. It should be manual-operation type and suitable for the diameter of 15 - 50 mm. One unit of the pipe threading machine is procured.

E-7 Electric Repairing Tools

The electric repairing tools are small tools for drilling, grinding, etc. They consist of electric drill, disc sander, portable grinder, etc. One unit tool is procured for each equipment.

E-8 High Pressure Washing Machine

The high pressure washing machine is for washing of the tractors and their attachments. The washing of agricultural machines is necessary before maintenance and repair. The washing machine should be 900 lit/hr class in water vomiting capacity and motor-drive type. One unit of high pressure washing machine is procured.

E-9 Hydraulic Jack

The hydraulic jack is for lifting up of heavy equipment such as tractors. One unit of the hydraulic garage jack and two units of the portable hydraulic jacks are procured.

- Hydraulic garage jack: It is used for lifting up of bodies of tractors and vehicles for maintenance works. One unit is necessary.
- Portable hydraulic jack: It is used for lifting up of parts of vehicles and equipments in maintenance works. Two units are necessary for effective maintenance works for several vehicles and equipments.

E-10 Other Tools

Various pieces of equipment and tools necessary for maintenance and repair of equipment is procured. Several sets of the tools are procured as necessary. The contents of the equipment and tools are listed in Appendices 6.3.

- Air compressor with attachment
- Mechanic tool set
- Tap and dice set
- Torque wrench set
- Circuit tester
- Floor moving crane

The list of the equipment is shown in Table-2.2.18.

Table-2.2.18 List of Equipment

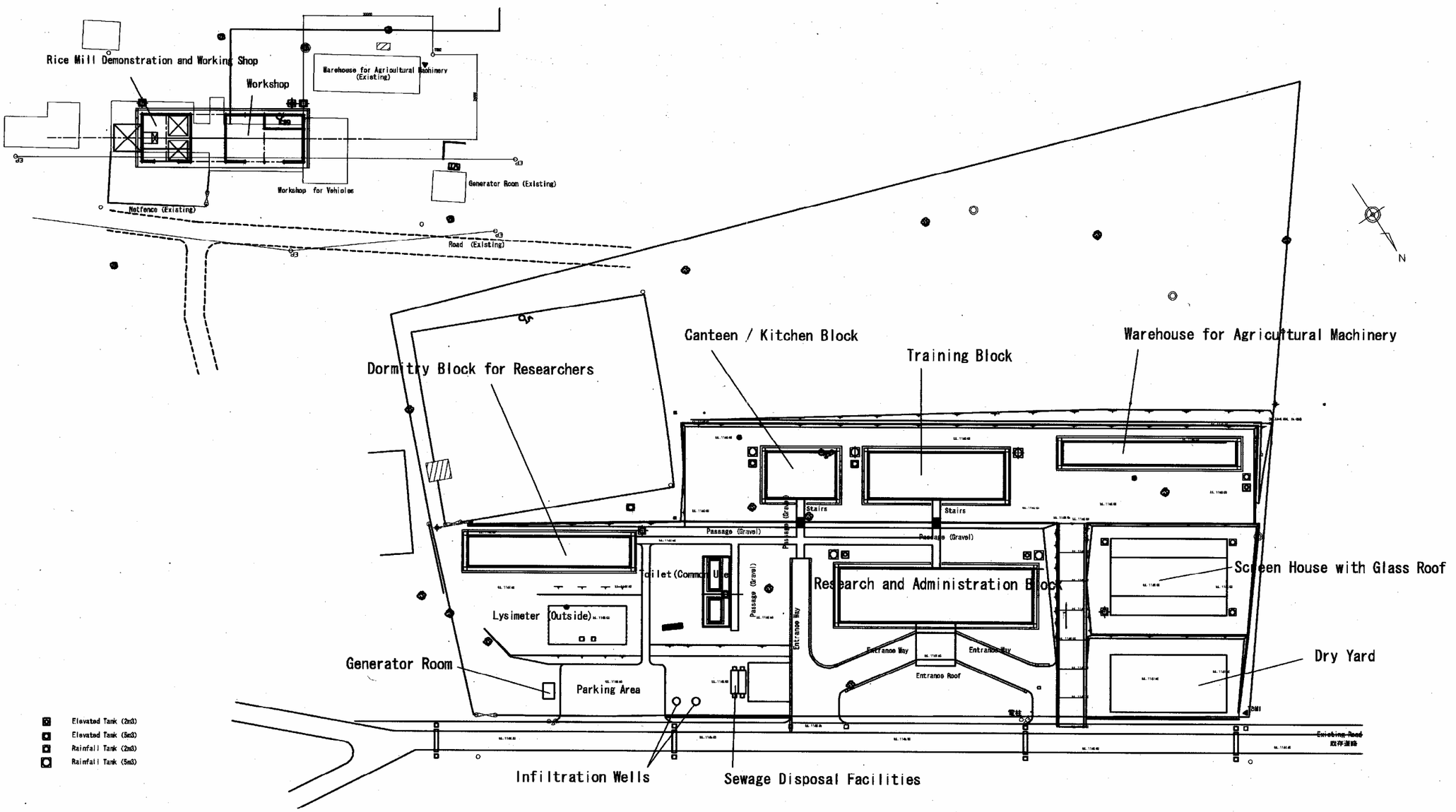
Category	Equipment		Code	Q'ty	Main Feature
Laboratory Equipment	Automatic Diesel Generator		A-1	1	100 kVA, Diesel power, soundproof type
	Solar Battery System		A-2	1	About 3 kW solar panel, battery
Research Equipment	Lysimeter		B-1	8	Squire type (100 x 100 x 60 cm), data logger
	Meteorological Equipment	Thermometer	B-2	2	United type, tripod mounted, data logger
		Hygrometer	B-2	2	
		Rainfall Gauge	B-2	2	
		Sunshine Meter	B-2	2	
		Wind Speed/ Direction Meter	B-2	2	
Equipment for Trial Farm (Tractor with Attachments)	Tractor		C-1	2	Ride type, 4WD, 80 PS, safety frame
	Attachments	Disc Plow	C-2	2	3 blade type, for 80 PS tractor
		Bottom Plow	C-3	2	3 blade type, for 80 PS tractor
		Seeder (1) Seeder (2)	C-4 C-5	1 1	For paddy, width: 2.5 m or more For various crops, width: 3.0 m or more Both for 80 PS tractor
		Sprayer	C-6	1	Tank capacity: 800 lit, width: 12 m or more, for 80 PS tractor
		Cultivator	C-7	1	9 claws or more, for 80 PS tractor
	Trailer (Traction type)		C-8	2	Capacity: 5 ton, for 80 PS tractor, hydraulic rear damp type.
Post-harvest Equipment for Demonstration	Huller/Rice Mill		D-1/2	1	One-pass type, capacity: 700 kg/hr, bucket elevator
Workshop Equipment	Arc Welding Machine		E-1	1	current: 250 kVA or more
	Gas (Acetylene) Welding Machine		E-2	1	Pressure regulator for oxygen and acetylene
	Upright Drilling Machine		E-3	1	Drilling capacity: 40 mm for steel
	High Speed Cutter		E-4	1	Diameter of blade: 350 mm, spare blades
	Bench (Electric) Grinder		E-5	1	Diameter of wheel: 205 mm, spare blades
	Pipe Threading Machine		E-6	1	Manual type, 15 - 50 mm
	Electric Repairing Tools		E-7	1 set	Electric drill, disc sander, portable grinder
	High Pressure Washing Machine		E-8	1	Water vomiting capacity: 900 lit/hr
	Hydraulic Jack		E-9	1 set	Hydraulic garage jack (1 unit), Portable hydraulic jack (2 units)
	Other Tools		E-10	1 set	Air compressor with attachment Mechanic tool set Tap and dice set Torque wrench set Circuit tester Floor moving crane

2-2-3 Basic Design Drawings

Table- 2.2.19 List of Drawings

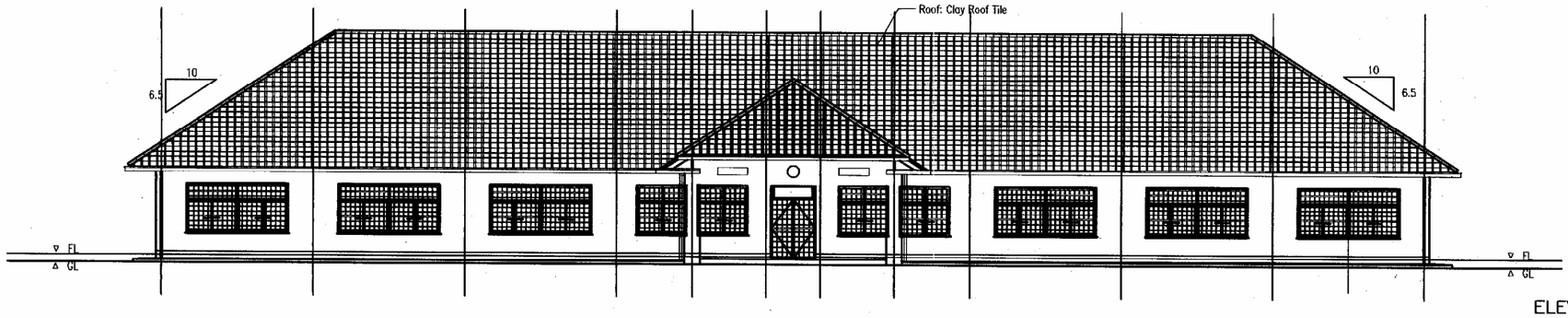
	Drawing Title
1.	Site Plan of Regional Rice Research and Training Center
2.	Elevation of Research and Administration Block
3.	Plan of Research and Administration Block
4.	Plan and Elevation of Training Block
5.	Plan and Elevation of Canteen/ Kitchen Block
6.	Plan and Elevation of Dormitory Block
7.	Plan and Elevation of Warehouse for Agricultural Machinery
8.	Plan and Elevation of Workshop, Rice Mill Demonstration and Working Shop
9.	Plan and Elevation of Screen House with Glass Roof, Generator Room
10.	Plan of Toilet (Common Use), Sewage Disposal Facilities
11.	Plan of Irrigation Facilities (Trial Farm)
12.	Plan and Section of Irrigation Facilities

SITE PLAN OF REGIONAL RICE RESEARCH AND TRAINING CENTER

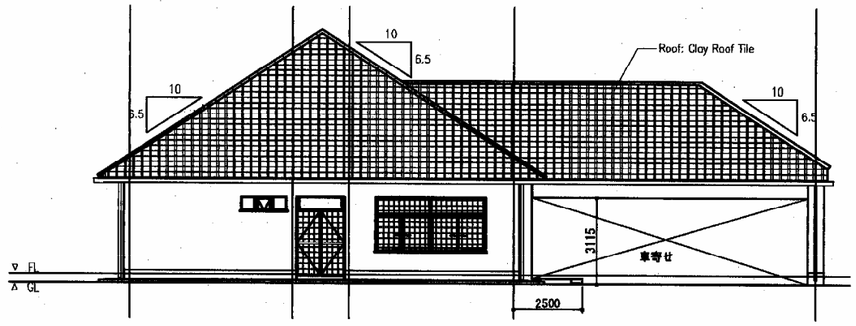


THE PROJECT FOR ESTABLISHMENT OF REGIONAL RICE RESEARCH AND TRAINING CENTER IN THE NATIONAL CROPS RESOURCES RESEARCH INSTITUTE	Site Plan of Regional Rice and Training Center	DATE	DWG. NO. 1
			DESIGN NO.

ELEVATION OF RESEARCH AND ADMINISTRATION BLOCK



ELEVATION OF NORTH SIDE S = 1 : 100



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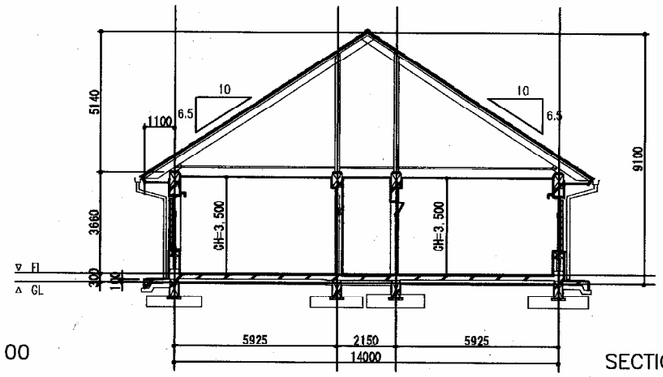

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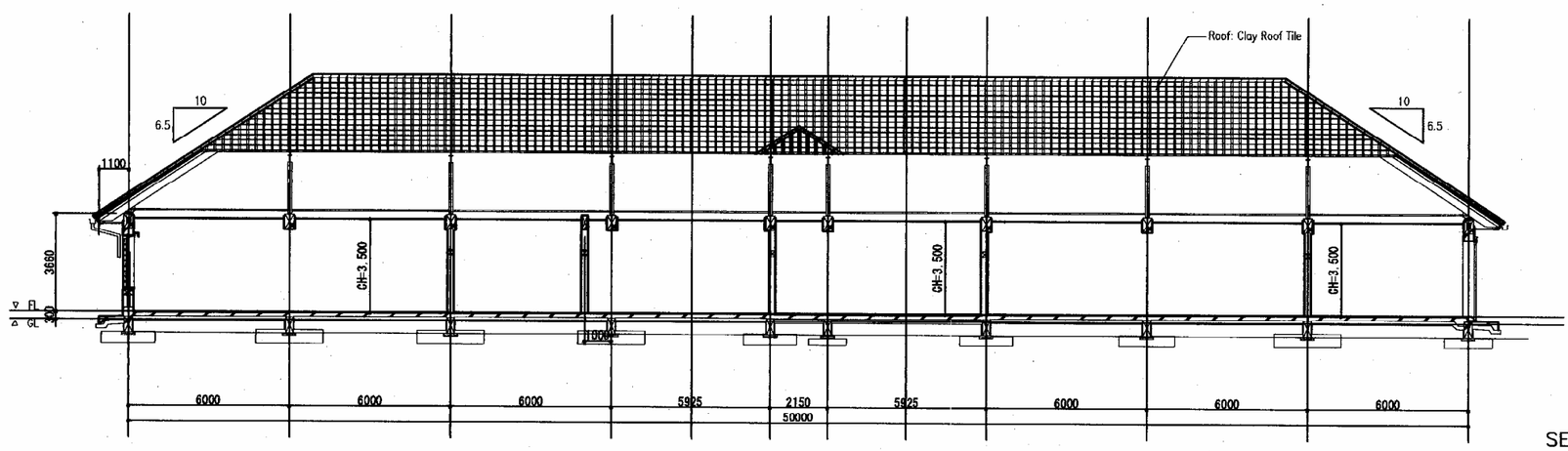
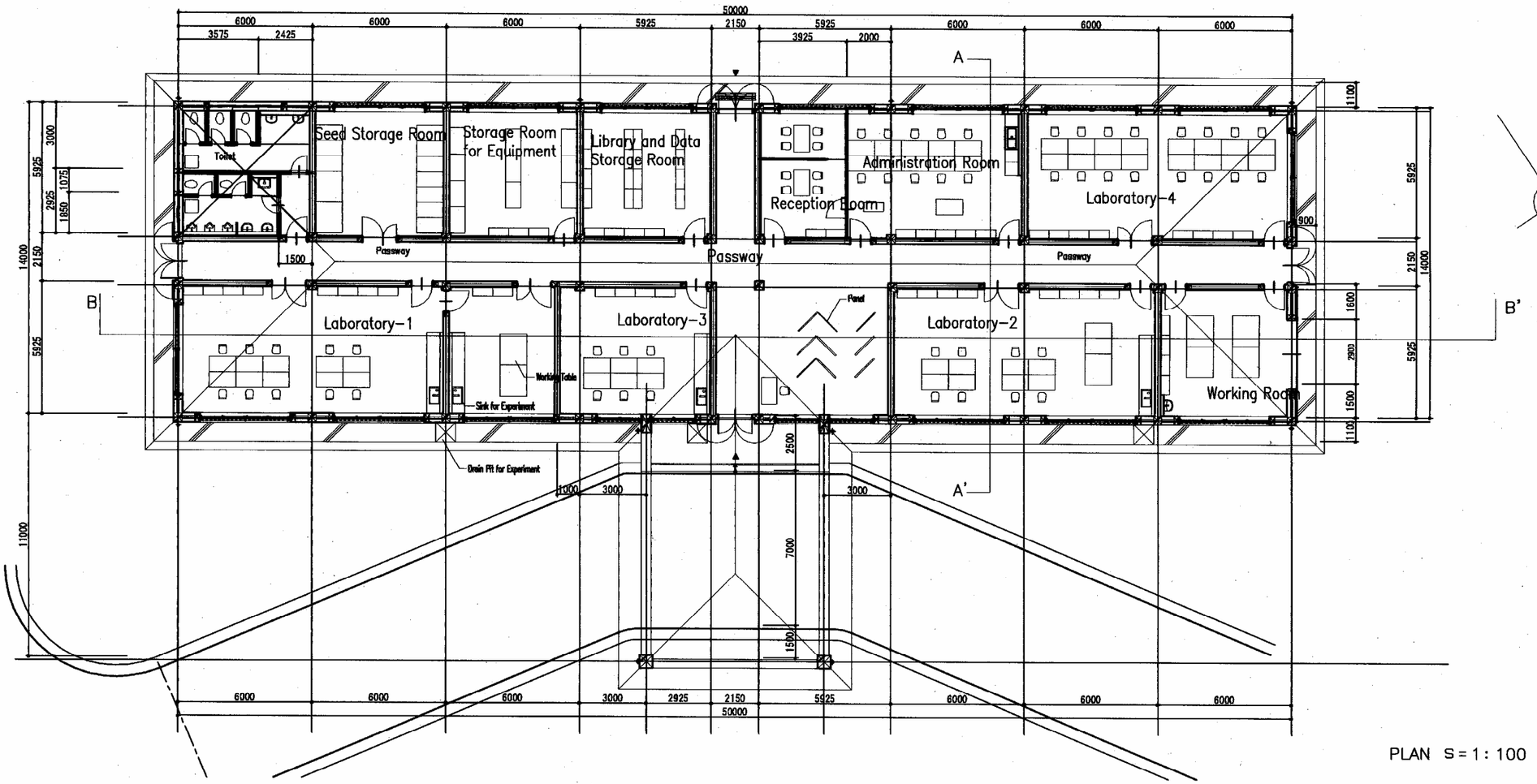


SECTION S = 1 : 100

THE PROJECT FOR ESTABLISHMENT OF REGIONAL RICE RESEARCH AND TRAINING CENTER IN THE NATIONAL CROPS RESOURCES RESEARCH INSTITUTE	Elevation of Research and Administration Block	DATE	DWG. NO. 2
			DESIGN NO.

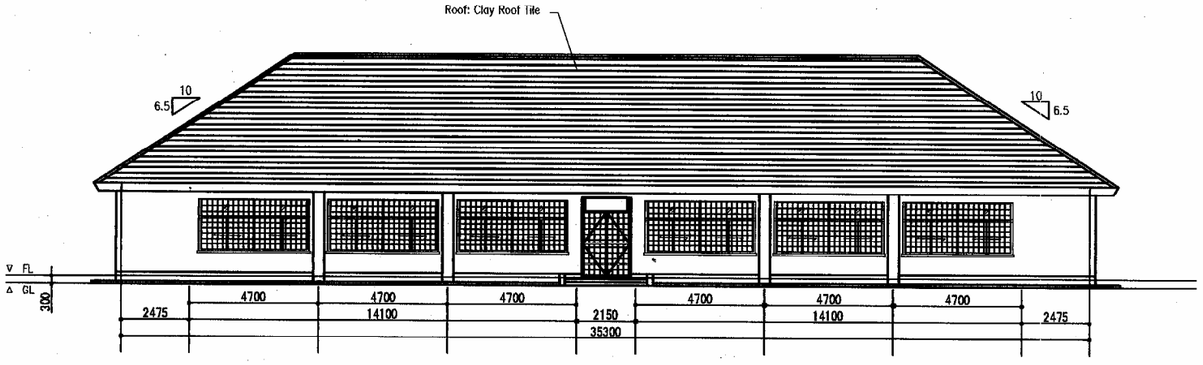
PLAN OF RESEARCH AND ADMINISTRATION BLOCK



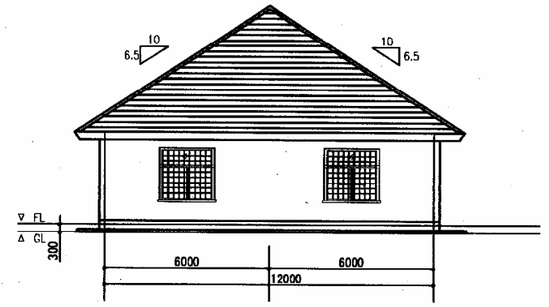
PLAN S = 1 : 100

THE PROJECT FOR ESTABLISHMENT OF REGIONAL RICE RESEARCH AND TRAINING CENTER IN THE NATIONAL CROPS RESOURCES RESEARCH INSTITUTE	Plan of Research and Administration Block	DATE	DWG. NO. 3
			DESIGN NO.

PLAN AND ELEVATION OF TRAINING BLOCK



ELEVATION OF NORTH SIDE S = 1 : 100



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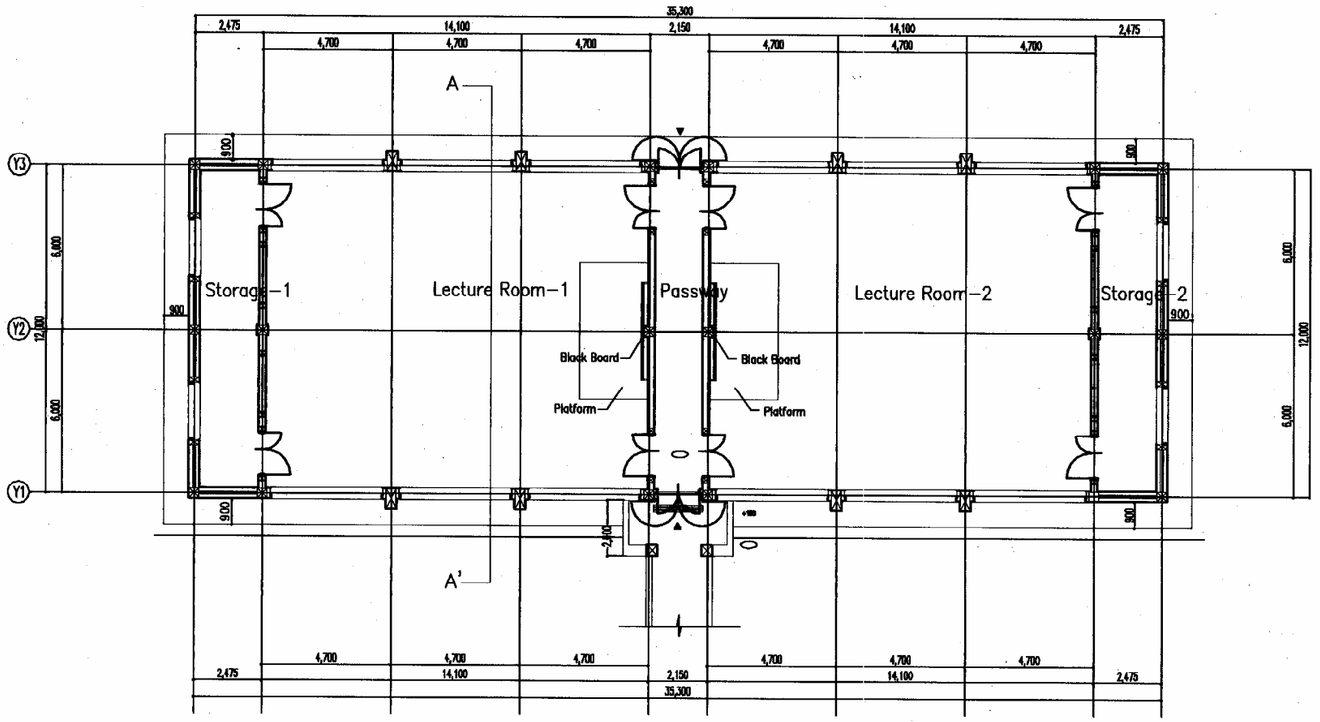
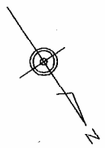
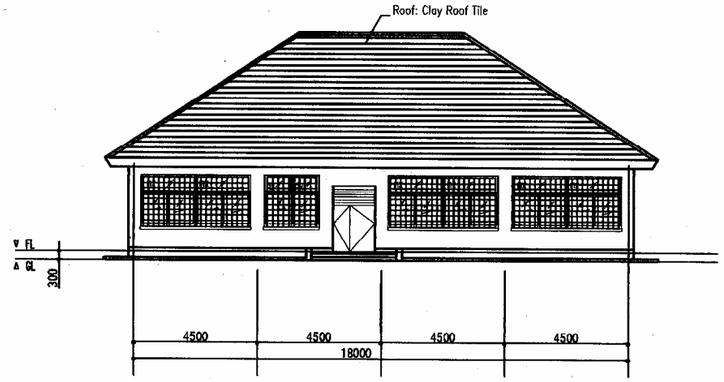


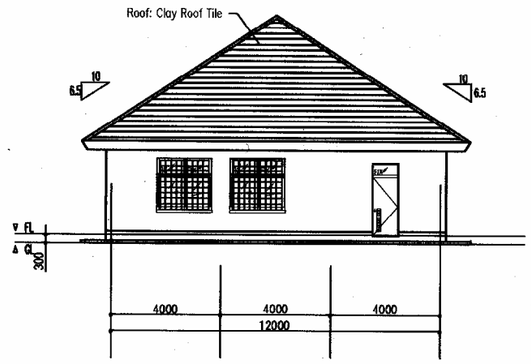


THE PROJECT FOR ESTABLISHMENT OF REGIONAL RICE RESEARCH AND TRAINING CENTER IN THE NATIONAL CROPS RESOURCES RESEARCH INSTITUTE	Plan and Elevation of Training Block	DATE	DWG. NO. 4
			DESIGN NO.

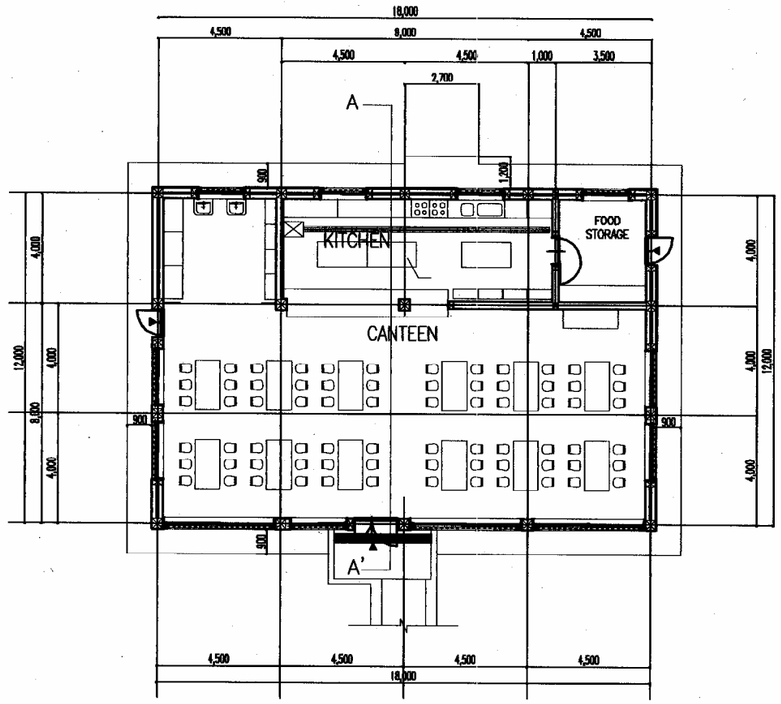
PLAN AND ELEVATION OF CANTEEN/ KITCHEN BLOCK



ELEVATION OF NORTH SIDE S = 1 : 100

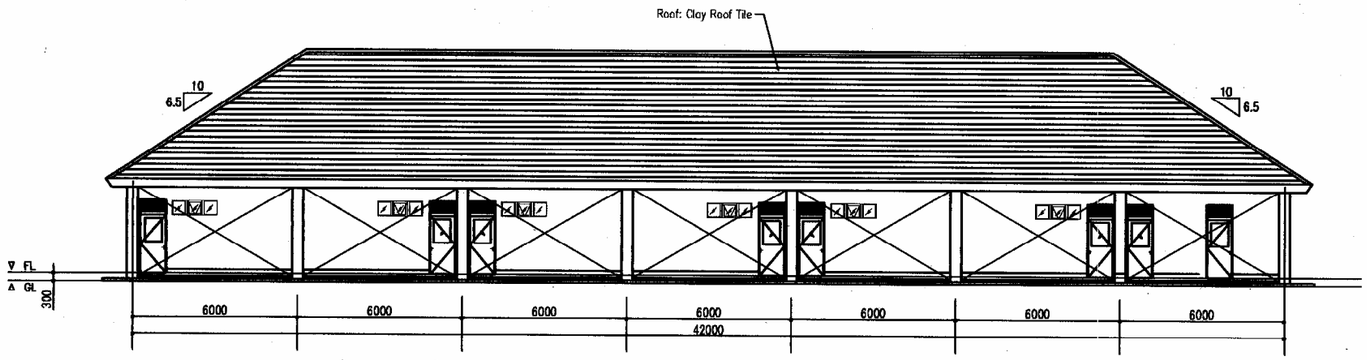


ELEVATION OF WEST SIDE S = 1 : 100

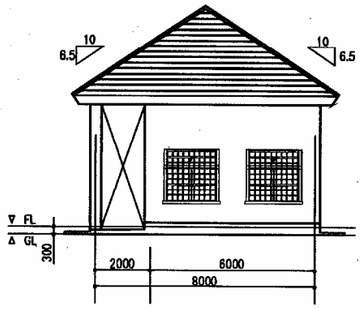


THE PROJECT FOR ESTABLISHMENT OF REGIONAL RICE RESEARCH AND TRAINING CENTER IN THE NATIONAL CROPS RESOURCES RESEARCH INSTITUTE	Plan and Elevation of Canteen / Kitchen Block	DATE	DWG. NO. 5
			DESIGN NO.

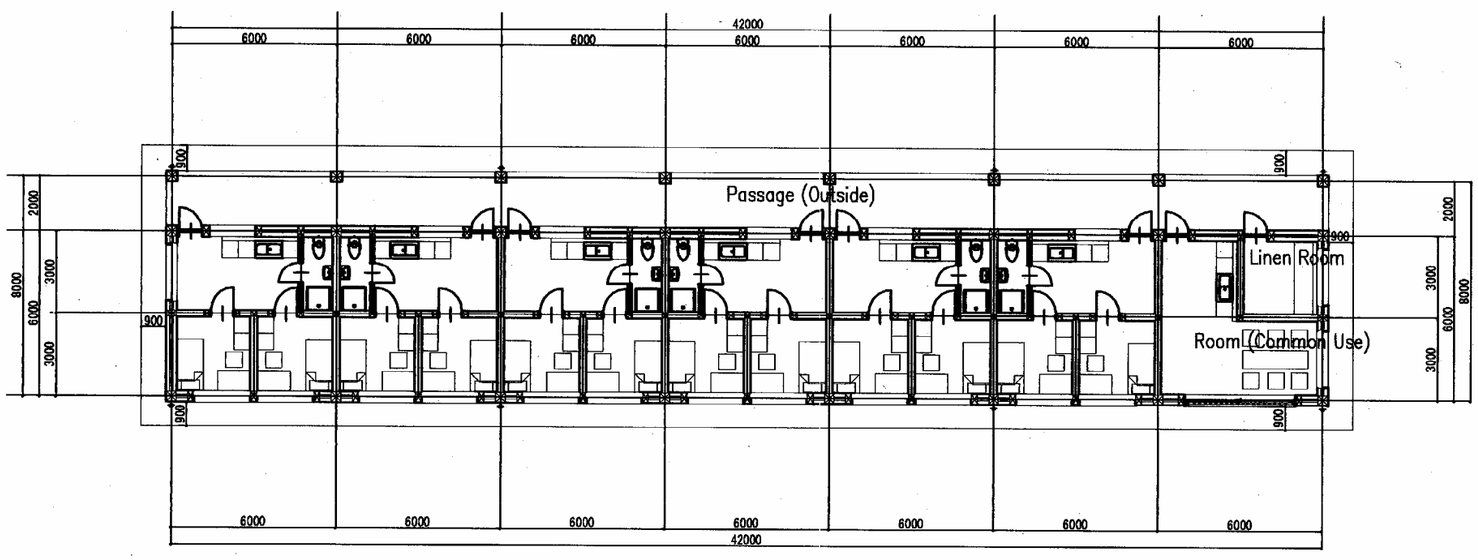
PLAN AND ELEVATION OF DORMITORY BLOCK



ELEVATION OF NORTH SIDE S=1:100

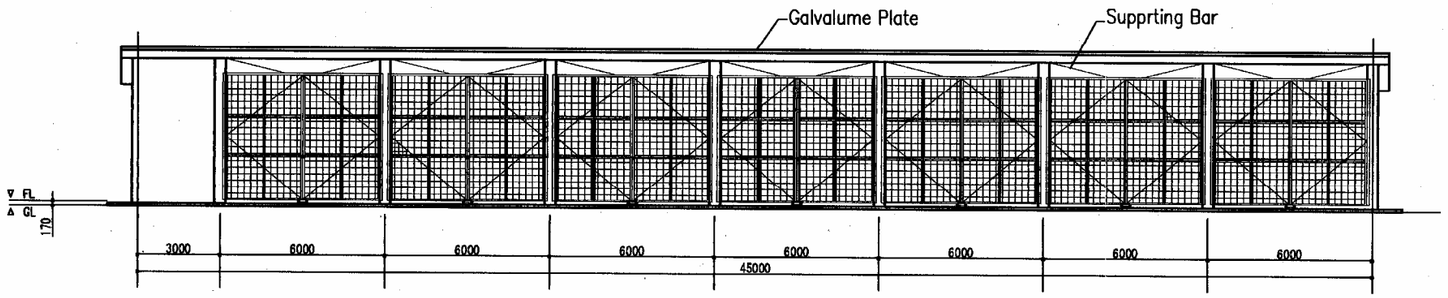


ELEVATION OF WEST SIDE S=1:100

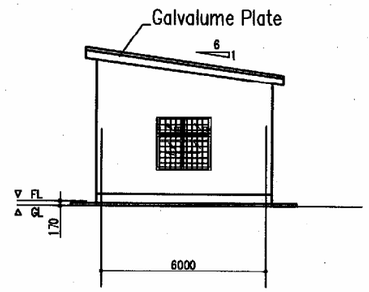


THE PROJECT FOR ESTABLISHMENT OF REGIONAL RICE RESEARCH AND TRAINING CENTER IN THE NATIONAL CROPS RESOURCES RESEARCH INSTITUTE	Plan and Elevation of Dormitory Block	DATE	DWG. NO. 6
			DESIGN NO.

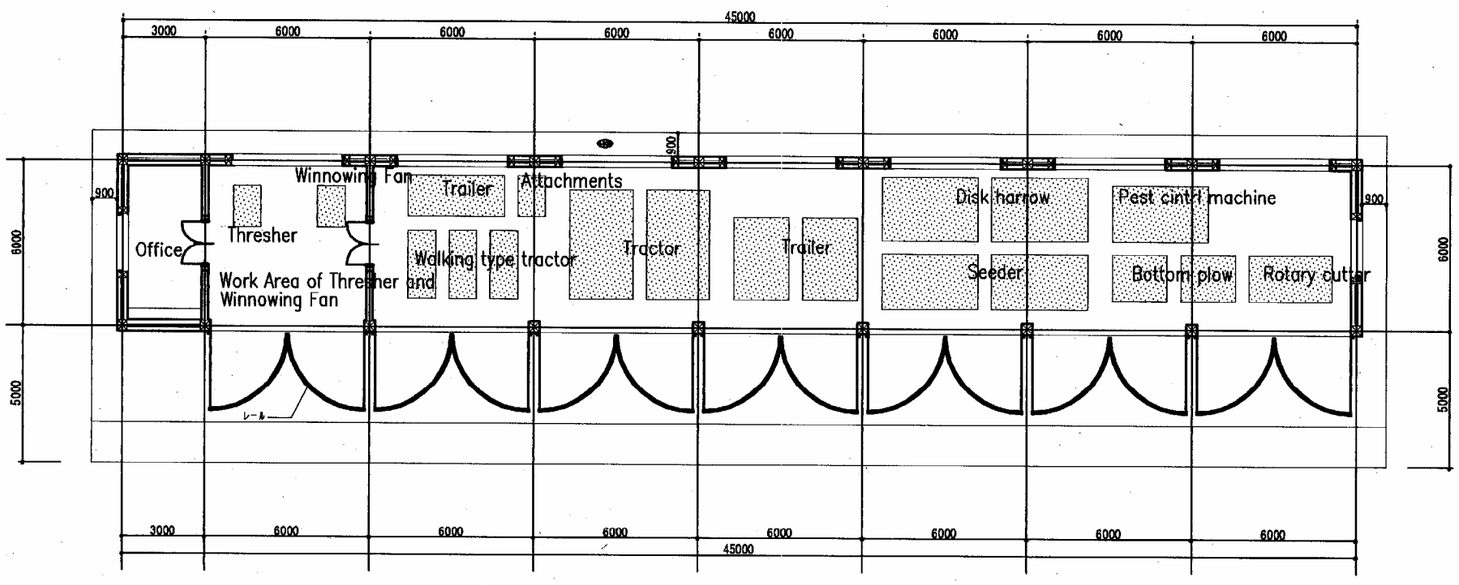
PLAN AND ELEVATION OF WAREHOUSE FOR AGRICULTURAL MACHINERY



ELEVATION OF NORTH SIDE S=1:100

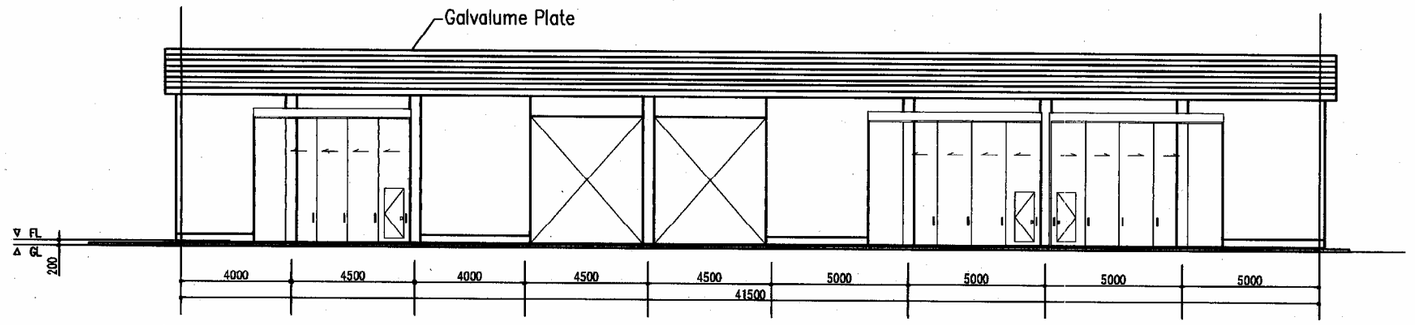


ELEVATION OF WEST SIDE S=1:100

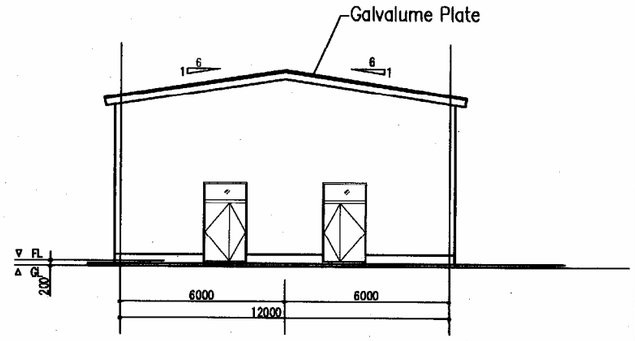


THE PROJECT FOR ESTABLISHMENT OF REGIONAL RICE RESEARCH AND TRAINING CENTER IN THE NATIONAL CROPS RESOURCES RESEARCH INSTITUTE	Plan and Elevation of Warehouse for Agricultural Machinery	DATE	DWG. NO. 7
			DESIGN NO.

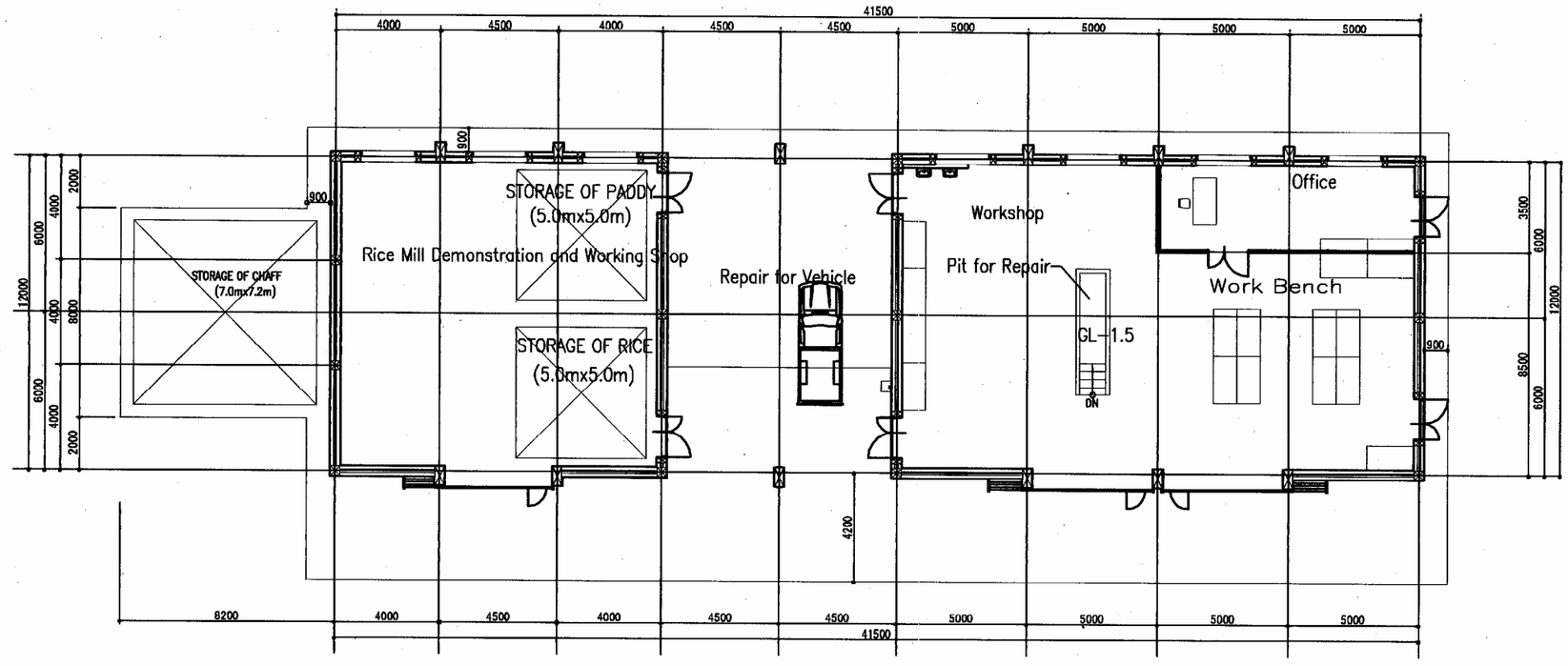
PLAN AND ELEVATION OF WORKSHOP, RICE MILL DEMONSTRATION AND WORKING SHOP



ELEVATION OF NORTH SIDE S = 1 : 100

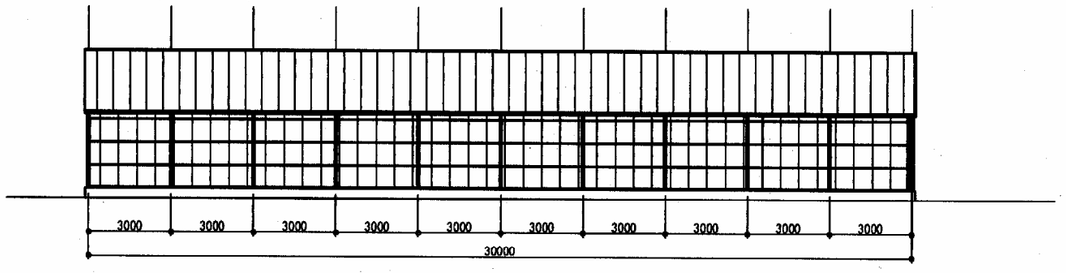


ELEVATION OF WEST SIDE S = 1 : 100

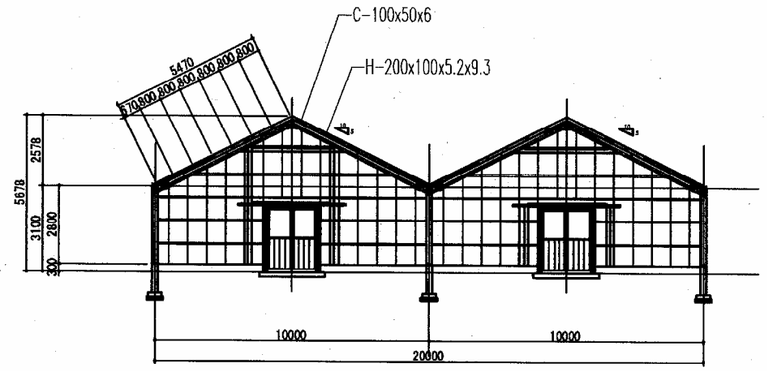


THE PROJECT FOR ESTABLISHMENT OF REGIONAL RICE RESEARCH AND TRAINING CENTER IN THE NATIONAL CROPS RESOURCES RESEARCH INSTITUTE	Plan and Elevation of Workshop, Rice Mill Demonstration and Working shop	DATE	DWG. NO. 8
			DESIGN NO.

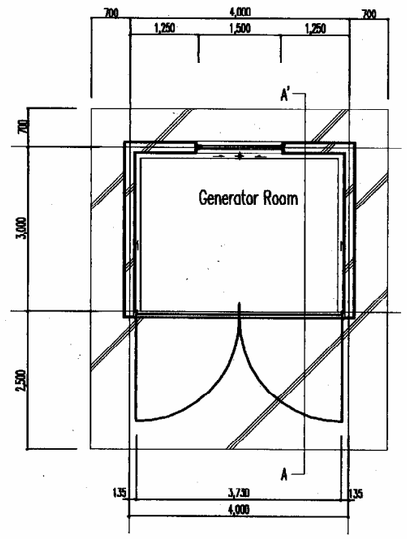
PLAN AND ELEVATION OF SCREEN HOUSE WITH GLASS ROOF, GENERATOR ROOM



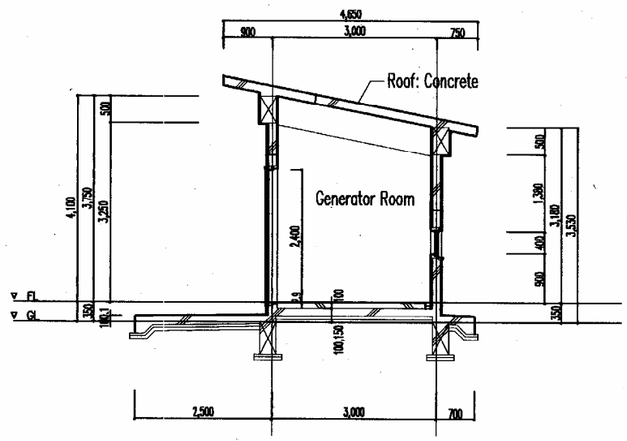
ELEVATION S = 1 : 1000



ELEVATION X1 – X1



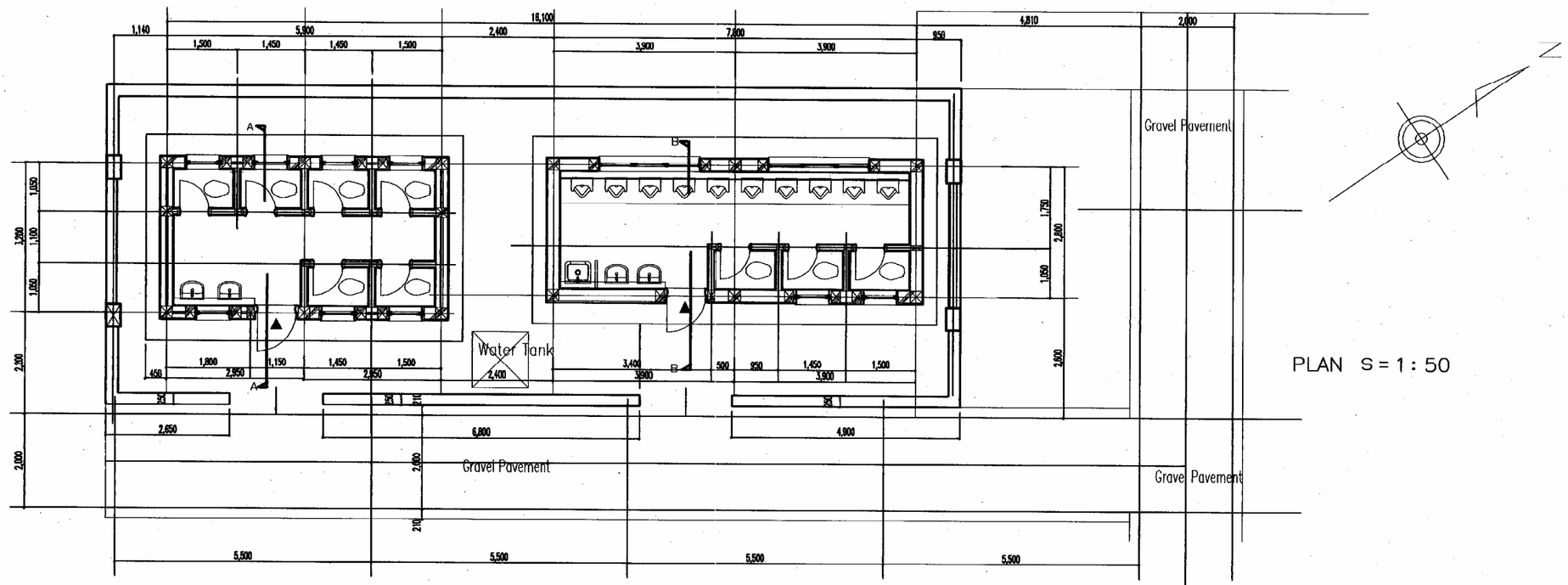
DETAILS S = 1 : 25



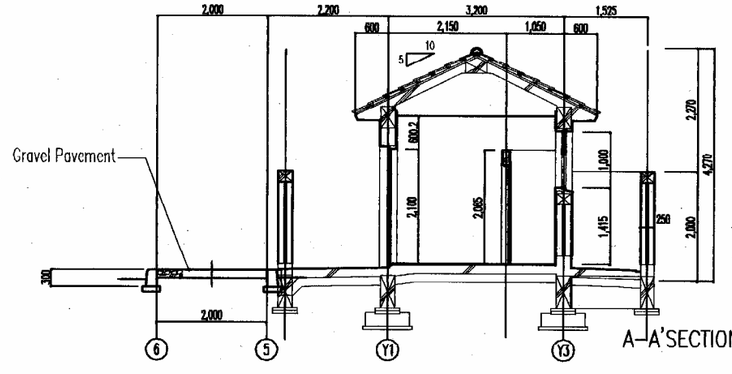
A–A'SECTION S = 1 : 25

THE PROJECT FOR ESTABLISHMENT OF REGIONAL RICE RESEARCH AND TRAINING CENTER IN THE NATIONAL CROPS RESOURCES RESEARCH INSTITUTE	Plan and Elevation of Screen House with Glass Roof, Generator Room	DATE	DWG. NO. 9
			DESIGN NO.

PLAN OF TOILET (COMMON USE), SEWAGE DISPOSAL FACILITIES

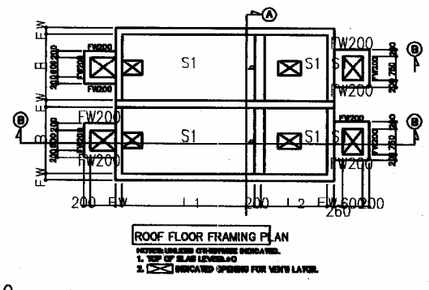


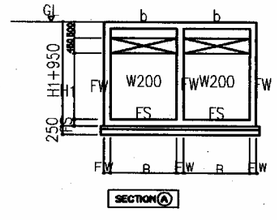
PLAN OF TOILET (COMMON USE)

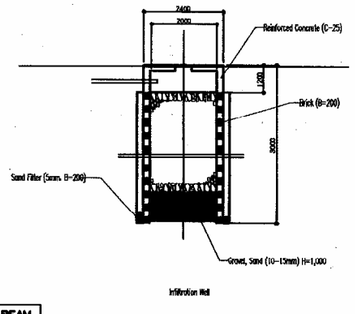


A-A'SECTION S=1:50

PLAN OF SEWAGE DISPOSAL FACILITIES





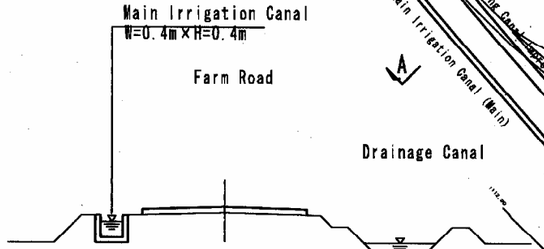


SITE	INTERNAL DIMENSIONS				SLAB		WALL	SUB BEAM
	L1	L2	H1	B	S	FS	FW	b
NaCRRI Namlonge	4.000	2.000	1,500	1,500	S1	FS2	FW350	b500

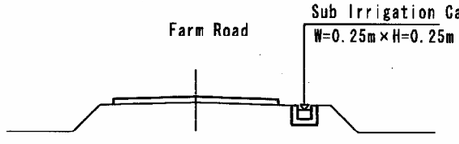
THE PROJECT FOR ESTABLISHMENT OF REGIONAL RICE RESEARCH AND TRAINING CENTER IN THE NATIONAL CROPS RESOURCES RESEARCH INSTITUTE	Plan of Toilet(Common Use), Sewage Disposal Facilities	DATE	DWG. NO. 10
			DESIGN NO.

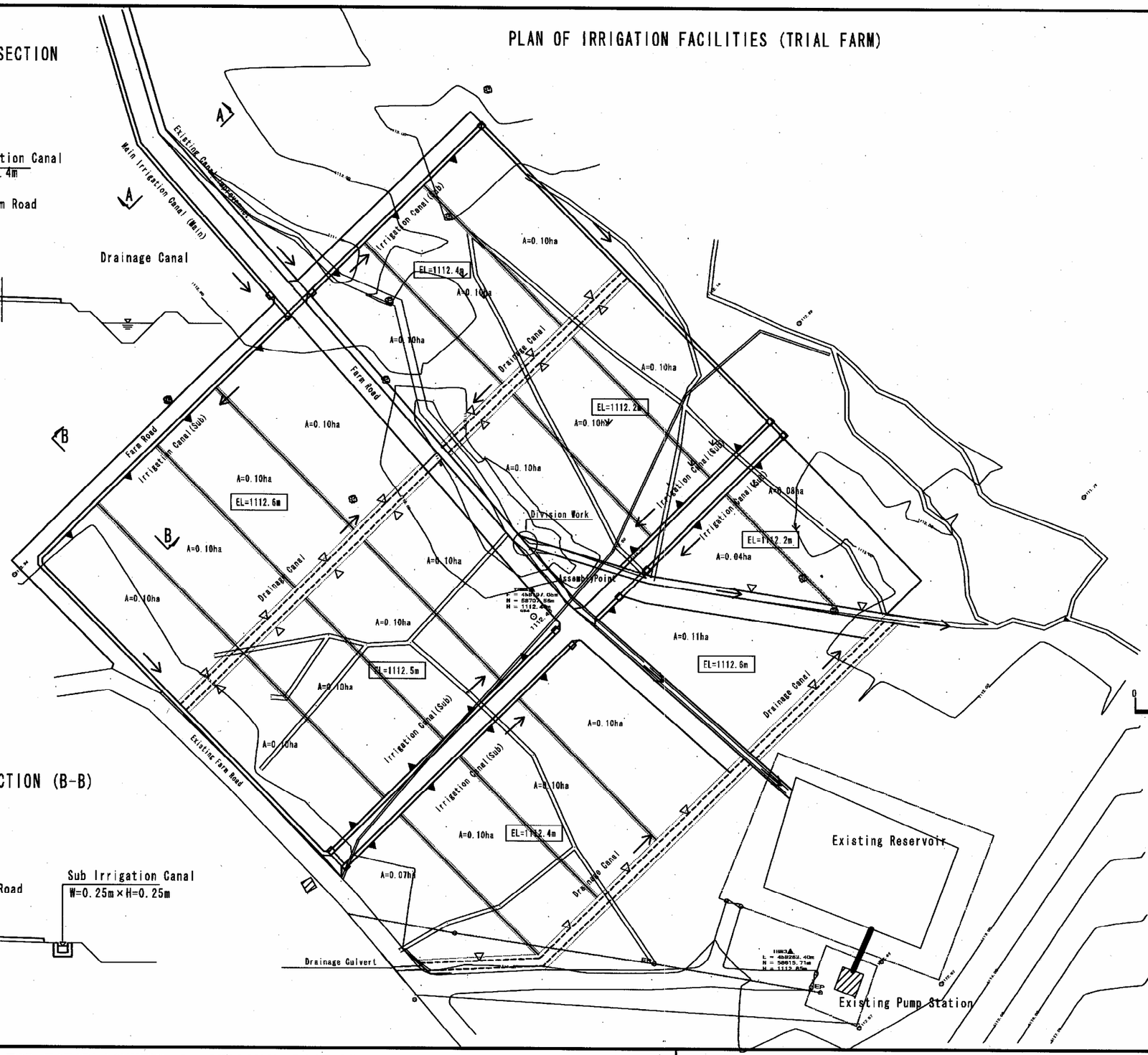
PLAN OF IRRIGATION FACILITIES (TRIAL FARM)

STANDARD SECTION (A-A)



STANDARD SECTION (B-B)





LEGEND

- House
- Rice Field
- Spot Height
- Tree
- Contours
- Road
- Electricity Pole
- Gate
- Fence
- Temporary Bench Mark
- Anthill
- Geological Survey Point
- Channel
- Pipe
- Stream
- Inlet
- Outlet
- Pit

N

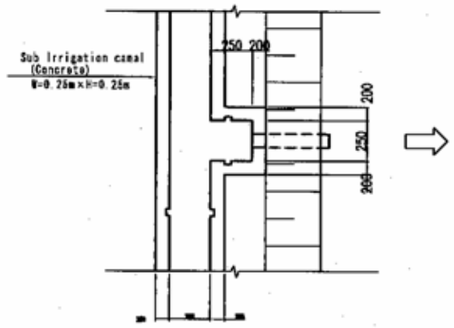
SCALE=1:500

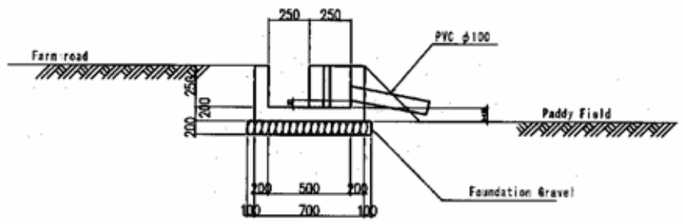
0 10 20 30 40 50m

THE PROJECT FOR ESTABLISHMENT OF REGIONAL RICE RESEARCH AND TRAINING CENTER IN THE NATIONAL CROPS RESOURCES RESEARCH INSTITUTE	Plan of Irrigation Facilities (Trial Farm)	DATE	DWG. NO. 11
			DESIGN NO.

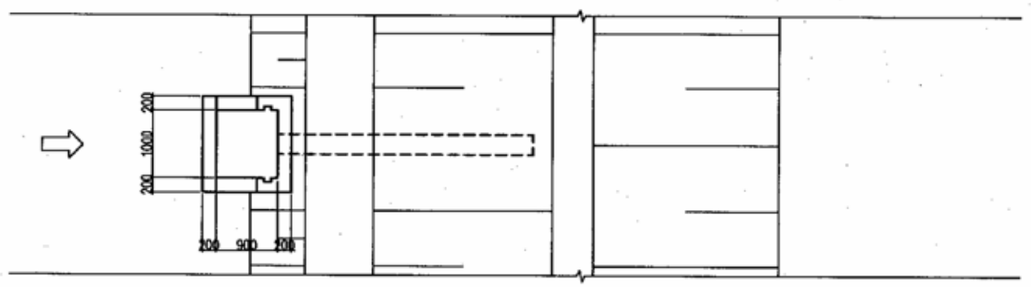
PLAN AND SECTION OF IRRIGATION FACILITIES

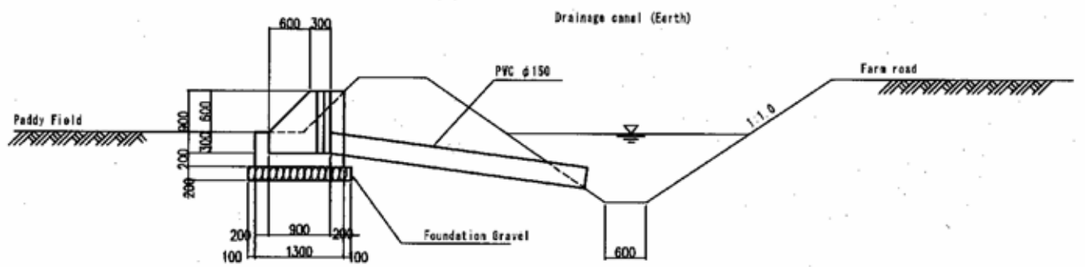
INLET



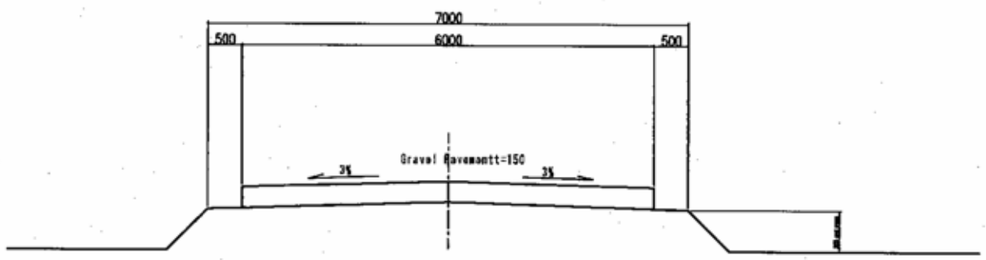


OUTLET

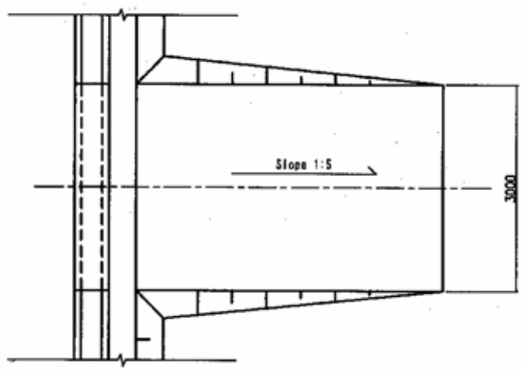


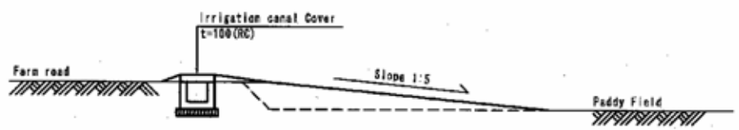


FARM ROAD



ACCESS SLOPE





THE PROJECT FOR ESTABLISHMENT OF REGIONAL RICE RESEARCH AND TRAINING CENTER IN THE NATIONAL CROPS RESOURCES RESEARCH INSTITUTE	Plan and Section of Irrigation Facilities	DATE	DWG NO. 12
			DESIGN NO.

2-2-4 Implementation and Procurement Plan

2-2-4-1 Implementation and Procurement Policy

(1) Construction of facilities

1) Responsible agencies

The Project shall be under the responsibility of related government offices of the MAAIF as the responsible agency, the NARO as the implementing agency in the Ugandan side. The NARO shall substantially coordinate and manage the whole project. The MAAIF shall sign Contract Agreements with Japanese consulting firm and Japanese contractor. A contract of consulting services includes the detailed design and construction supervisory works. After the approval by the Cabinet of the GOJ, the GOU (the MAAIF) and the GOJ sign the Exchange of Notes (E/N) for the Project and the Bank Arrangement (B/A). The MAAIF and the NARO, in collaboration with related governmental agencies, are responsible for demolition of existing facilities, land leveling, procedure for the EIA, building permits, tax clearance of equipment, exemption of customs duties, internal taxes and other fiscal levies against Japanese engineer as an obligation of the recipient country.

The contract with contractor may supposedly include procurement of equipment[1]. After signing of the E/N between both governments, the MAAIF shall, in his expenses, acquire necessary personnel and budget for the project, and commence Consultant employment (detailed design and supervision of construction and equipment procurement), selection of contractor for construction/ equipment procurement, and tendering work.

2) Consultant

A consultant is to prepare detailed design and supervisory works for construction of facilities and procurement including installation of the equipment related to the Project in accordance with a Consultant Agreement between the MAAIF, responsible agency concerned of the Ugandan side. A consultant prepares tender documents and assists the responsible governments to conduct pre-qualification of tenderers, tender works and contract signing between successful tenderer. Furthermore, a consultant is responsible for reporting to the Embassy of Japan, JICA and other related governmental agencies during the construction period.

3) Contractor

In line with the procedure of Japan's grant aid scheme, the successful Japanese

[1] Equipment is supposedly procured by the Contractor. In this regard, the report describes like to contract with contractor includes equipment procurement, however procurement of equipment may separately signed in other contract package between a Japanese supplier.

contractor selected in open tender will conduct the facilities construction and equipment procurement. It is notable points that an eligible contractor shall be selected so as to make a after services such as repair and maintenance works of the facilities and equipment consecutively after the completion of the Project. The contractor completes the construction work and procurement of equipment within a contract period. After final inspection of the works, the contractor turns over the facilities and equipment to the MAAIF together with technical guidance for an initial operation and maintenance method.

4) Equipment procurement

The following items are remarkable points for procurement of the equipment:

- To select widely used equipment in Uganda among several products made in local, third countries and Japan, considering present technical level and maintenance conditions
- To select eligible equipment giving full consideration of all items related to easiness of spare parts and consumable stores purchase, maintenance service system of manufacturers and sales agents as well as local condition to the actual use, temperature, humidity, etc.
- To adjust delivery schedule, i.e., ordering of manufacturing, transportation route, considering progress of research and training programs of the Ugandan side
- The contractor shall complete equipment procurement and turn over within the contract period. In this regard, the contractor shall be well informed about local procurement condition and sales agents. Proposed equipment needs commissioning, e.g., inspection, initial operation, turn over, etc. by Japanese engineer/ specialist. Accordingly, the contractor is requested to frequently contact with related governmental agencies of the Ugandan side.

2-2-4-2 Implementation Conditions

(1) Conditions of facilities construction

1) Contractors

There are several large local contractors in Kampala city. As the NaCRRI, where the construction site is located, is situated at 25 km to the north of Kampala city, employment condition is good, i.e., skilled labor and labor force are sufficiently provided from Kampala city. It is necessary to employ well experienced and reliable contractors so as to ensure progress control and higher quality of entire construction works. Contractor's experiences, technical level, material procurement, labor management, and equity capital are major points for the evaluation of the contractors.

2) Labor force

A well practiced skilled labor is not so required for the facilities construction. Skilled labors (e.g., a reinforcing bar placer, form worker, painter, electrician, mechanic, joiner, etc.), supervisory engineers specialized to building construction, machinery and electric works as well as common labors, security guards are locally employed from Kampala city with 40 minutes drive.

3) Construction materials and equipment

Most of the construction materials are available in Uganda. Structural steel such as H-beam and channel could be directly imported from the Republic of South Africa or other third countries because of its low price including transportation cost. Aluminum material for screen house roofing is procured from Japan to ensure accurate manufacturing technique. Materials for electric and water supply are available at sales agents in Kampala.

4) Safety plan

Safety management shall be strictly carried out for works in the construction site. Safety net and safety belt are installed to prevent from accident, such as falling from elevated portion of the buildings. Safety seminar is periodically held to enhance a sense of safety of workers. Security guards are also available to prevent from robbery in day and night time.

(2) Conditions of equipment procurement

Equipment procurement plan is established in consideration of the following items:

- The Ugandan side is responsible for taking necessary procedures and expenses for customs clearance of imported equipment. Customs exemption, permission of import, customs formalities, and other several procedures for trading shall be smoothly conducted prior to a commencement of commissioning (inspection, adjustment, initial operation, etc.) by engineers sent by the contractor.

- A contractor prepares procurement plan in earlier construction period, particularly for the equipment imported from abroad, and keeps close coordination with related governmental agencies.

2-2-4-3 Scope of Works

The Project is implemented with intimate collaboration with the GOU and the GOJ in line with Japan's grant aid scheme. Both governments are individually responsible for facility construction and equipment procurement as indicated in the table below:

Table- 2.2.20 Responsibility of Both Governments

Responsibility	GOJ	GOU	Remarks
1. Land			
1) Land for facilities		○	Including demolition of obstacles and embedded structures
2) Land for temporary yards		○	Temporary yards are in NaCRRI compound
2. Construction of facilities			
1) Construction of proposed facilities of the project	○		Including water and electricity supply
2) Temporary fence and gates during construction	○		
3) Water and power supply facilities		○	Permission to use existing system
3. Procurement of equipment			
1) Procurement of equipment of the project	○		Including installation work
2) Procurement of other equipment uncovered by the project		○	
3) Land or yard to temporarily store construction materials, equipment, etc.		○	
4) Transferring existing equipment		○	Including removal, movement (retirement), reinstallation
4. Procedures			
1) Procedures for facility construction		○	Including expenses for procedures
2) Tax exemption		○	
3) Inland transportation	○		
4) Customs clearance		○	
5) Issue of Bank Arrangement (B/A) and the Authorization to Pay (A/P)		○	
6) All expenses uncovered by Japanese side		○	
7) Support of Japanese consultants and contractors whose services may be required in connection to the Project		○	

2-2-4-4 Consultant Supervision

(1) Detailed design

In line with a design policy of the basic design study, a consultant team is responsible for the detailed design, tendering, supervision of facility construction and equipment procurement as well as turn over of facilities and equipment to the Ugandan side in accordance with the set procedure of Japan's grant aid program. The following items are principal consultant services for smooth implementation of the project during the detailed design stage:

- Field works and detailed design
- Review of cost estimation in the basic design stage
- Detailed design and tender document preparation

(2) Construction supervision and equipment procurement plan

The consultant provides technical and administrative assistances for tender works, tender evaluation and concluding contracts. After the tender, the consultant provides supervisory services such as construction plan, quality control, work quantity and safety supervision, in addition, the consultant maintains closed cooperation between the implementation organizations of the Ugandan side and Japanese contractor during the supervisory stage for the construction and equipment procurement.

A resident engineer of the consultant is responsible for undertaking overall supervisory works and keeping in close contact with related organizations through the construction period. In addition to the resident engineer, an engineer is engaged for inspection, installation and initial operational test of the equipments. Local engineers are engaged in the construction supervision for supporting the resident engineer, and other engineers are assigned for short period in the course of the construction works for inspections and technical instruction to the contractor.

(3) Scope of works of the supervisory works

Since supervisory works include various works, i.e., procurement of the construction materials and equipments, temporary works, foundation works, building works, equipment works, interior works, exterior works, etc., it is necessary for the consultant to conduct following supervisory works with close cooperation with implementation agency of the Ugandan side, related government offices and the contractor.

Table- 2.2.21 Supervisory Works by the Consultant

	Scope	Descriptions
1.	Supervision of the works	● Inspection and approval of the construction drawings, materials, samples, equipment works, etc. ● Inspection, approval, instructions of quality control, quantity inspection of each works ● Progress reporting, solution of problems ● Management of construction schedule ● Attending meeting and reporting to related organizations ● Assessment of payment of the contract price
2.	Construction schedule	● Control of construction quantity ● Confirmation of delivery of the construction materials ● Checking a temporary work and operation condition of the construction machinery and equipment.
3.	Equipment	● Inspection and witnessing of the handing over of the equipment ● Pre-shipment inspection and approval of equipment ● Inspection and approval of the quality and performance of the installation of equipment ● Assistance for payment procedure ● Meeting and reporting on the procurement progress to the related organizations

(4) Implementation organization

The responsible organization for the project implementation on both Ugandan and Japanese sides is shown on Figure- 2.2.4.

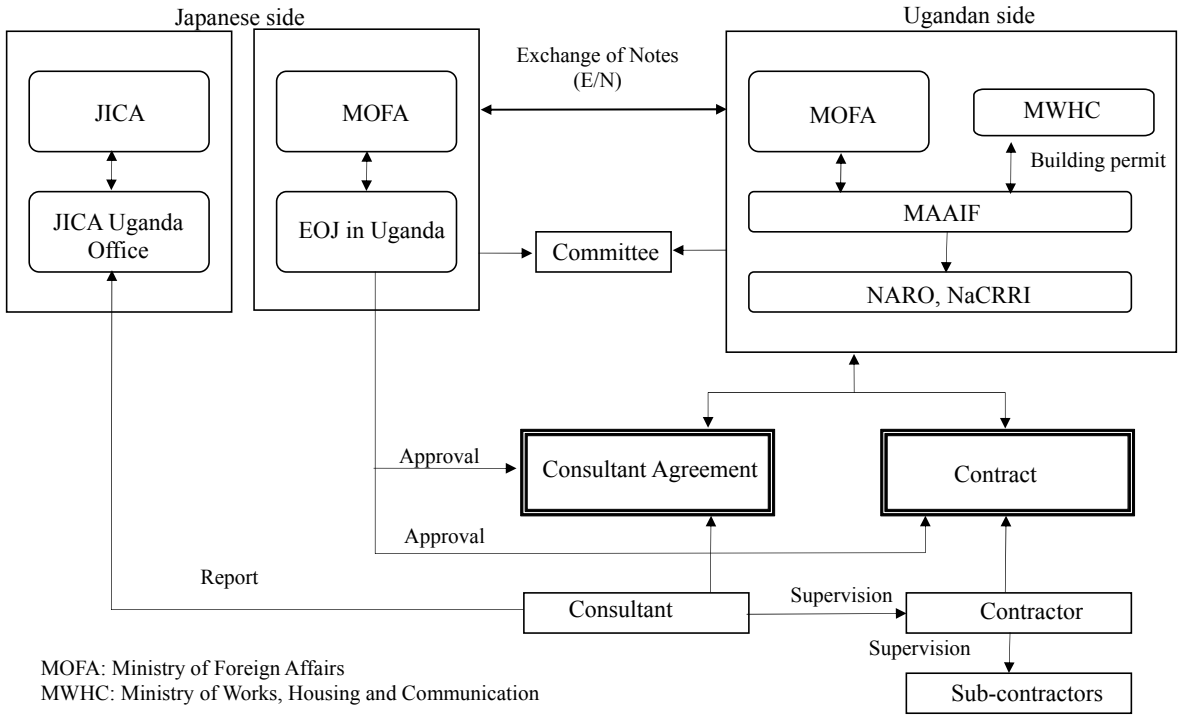


Figure-2.2.4 Organization Structure for Project Implementation

2-2-4-5 Quality Control Plan

Various items of foundation, quality of concrete members, construction materials and accuracy of finishing work are inspected to improve the quality of the facilities. Furthermore, the inspection, measurement and operational test are conducted to secure operational performance of electric and plumbing systems.

- Verification of construction drawings and results of tests of various construction materials
- Verification of drawings of fittings, furnishing and specification of these materials
- Inspection of material production, processing at manufacturer at the site, verification of test results
- Confirmation of drawing for equipment fitting and its manual
- Supervision of work quantity and finishing

It is furthermore important to draw concrete safety policies upon deliberation of a safety manager of the contractor, for example safety rules to avoid accidents of workers and a third party during the construction period. The following items are remarkable points to assure safety management in the construction site:

- Establishing regulation for safety supervision, and assignment of safety manager

- Planning of inspection rule of construction machinery and equipment
- Investigation of traffic route of the heavy machinery and full control of safety drive
- Installation of safety facilities

2-2-4-6 Procurement Plan

(1) Construction materials and equipment

Table-2.2.22 indicates procurement plan of major construction materials. Most of the construction materials, except aggregates for concrete, bricks, fittings and glass are imported from a third country, and these are possible to purchase in Kampala city. It is also possible to mobilize heavy earth moving machinery such as bulldozer and backhoe from Kampala city.

Table-2.2.22 Procurement Plan of Major Materials and Machinery

Materials/Machinery	Procurement (Origin)			Remarks
	Local	Japan	Third country	
Building works				
Cement			○	Kenya
Aggregate (Fine materials)	○			
Aggregate (Coarse materials)	○			
Reinforcing bar			○	South Africa
Structural steel			○	South Africa
Form (Plywood)			○	Kenya
Brick	○			
Galvalume plate			○	Kenya
Clay roof tile	○			
Fittings	○		○	Kenya
Glass	○		○	Kenya
Aluminum building material (Screen house)		○		
Oil and paint	○			Kenya
PVC pipe			○	Kenya
plumbing			○	Kenya
Elevated water tank			○	Kenya
Electric wire materials			○	Kenya
Lighting fixture			○	Kenya
Lightening conductor			○	Kenya
Heavy machinery				
Bulldozer			○	EU
Backhoe			○	EU
Dump truck			○	EU

(2) Equipment procurement plan

The equipment procurement plan is shown in Table-2.2.23. A generator, solar battery system, tractor and their attachments are procured in Uganda or imported from third countries since consumables, spare parts and technical services such as repair works are available in Uganda. Lysimeters and meteorological observation equipment are procured from Japan to meet higher specification for precise measurements. Huller- rice mill is also procured from Japan due to its higher reliability. The workshop equipment is available in Uganda or imported from third countries because the equipment is widely used and maintenance work is also easily available in Uganda.

Table-2.2.23 Procurement of Equipment

Category	Items	Procurement	
		Uganda (Third country)	Japan
Power supply	Generator	○	
Solar system for backup	for refrigerator for seeds, lights for overtime experiment, etc.	○	
Research for rice	Lysimeter		○
Laboratory equipment	Meteorological equipment		
	- Thermometer		○
	- Hygrometer		○
	- Rainfall gauge		○
	- Sunshine meter		○
	- Wind velocity/direction meter		○
Farm equipment	Tractor	○	
	Disc plow	○	
	Bottom plow	○	
	Seeder	○	
	Sprayer	○	
	Cultivator	○	
	Trailer for tractor	○	
Post harvest equipment for demonstration	Huller- rice mill		○
Workshop equipment	Welding machine	○	
	Gas welding machine	○	
	Upright drilling machine	○	
	High speed cutter	○	
	Bench (electric) grinder	○	
	Pipe threading equipment	○	
	Electric repairing tools	○	
	High pressure washing machine	○	
	Hydraulic jack	○	
	Other tools	○	

(3) Transportation plan

The equipment procured in Japan will be loaded at the Yokohama seaport and transported to the Mombassa seaport in Kenya by marine transport. Marine transport may take about 30 days. After unloading at the Mombassa seaport, the equipment will be transported on land to the NaCRRI, Namulonge, and turned over to the Ugandan side. Inland transportation is about 1,240 km, 970 km from Mombasa to Tororo located at eastern region of Uganda and 270km from Tororo to the NaCRRI. Road is well maintained with asphalt pavement in Kenya and Uganda. Heavy cargo trucks are also passable the gravel pavement road in the Namulonge area. Container is used for marine and overland transports as a general cargo. All expense for inland transportation is covered by the contractor.

Equipment from a third country is procured through sale agents in Uganda. Most of sale agents have their business offices in Kampala city. The equipment is turned over to the Ugandan side at the NaCRRI after 45 km inland transport.

(4) Installation plan

Installation of the equipment is, in general, carried out by engineers of the contractor. The equipment such as generator, solar battery system, farm and workshop equipment are installed by the contractor with technical support by the local suppliers. Adjustment and initial test of automatic operation system of the generator and solar battery system is particularly important. The lysimeters, meteorological observation equipment, huller- rice mill are installed with a technical support by engineers from Japan because the equipment requires high technical skill for assembly, installation, adjustment and initial operation. It is notable that lysimeter requires accurate adjustment during its installation of the weight sensor and data logger so as to ensure reliability of the observed data after the measurement for the research purpose.

2-2-4-7 Initial Operation and Maintenance Plan

An operation method is explained to the engineers in the NaCRRI for the generator, solar batter system, farm equipment, meteorological observation equipment, huller- rice mill, lysimeter, workshop equipment, etc. Detailed operation and maintenance work is also explained for the equipment which are most frequently used. Since lysimeter, meteorological observation equipment and huller- rice mill require relatively frequent inspection and maintenance works to secure rigorous accuracy after their installation, engineers from Japanese manufacture and the contractor shall transfer technical operation method and conduct initial operation guidance to the engineers in the NaCRRI.

2-2-4-8 Implementation Schedule

(1) Implementation schedule

The entire project implementation period is estimated at about 18 months including the detailed design and tendering work period.

(2) Construction work

The construction period is estimate at 12 months including 1.5 months of preparatory work, construction work for 9.5 months and inspection and finishing work for 1.0 month.

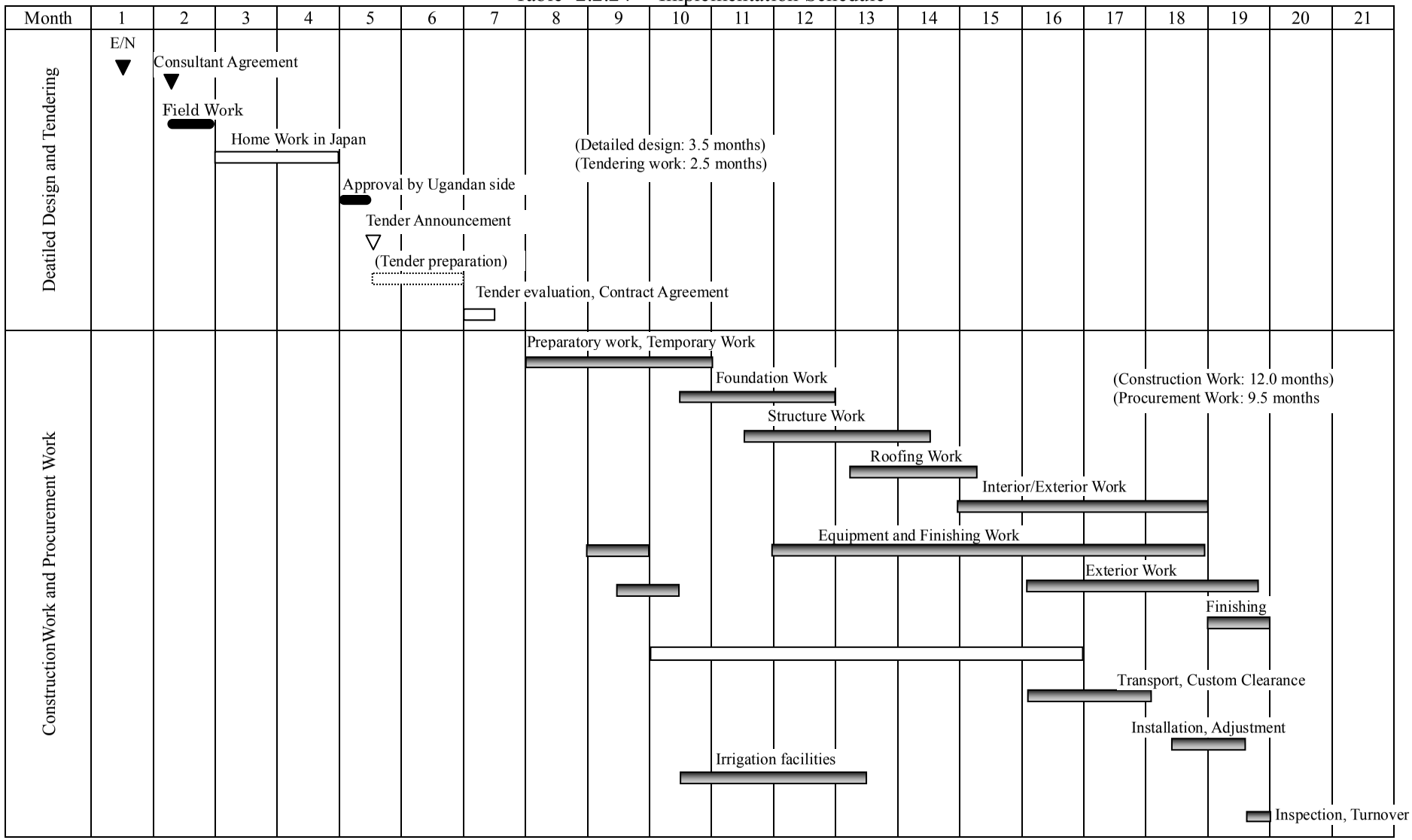
(3) Procurement plan

The equipment is procured in Uganda, a third country and Japan. It takes about 9.5 months for a procurement in Japan, 6 months for manufacturing of equipment, 2 months for marine transport, and 1.5 months for inspection and turn over. It is possible to procure local equipments within 9.5 months including 2 to 5 months of manufacturing period.

(4) Implementation schedule

Implementation schedule is shown in Table- 2.2.24.

Table- 2.2.24 Implementation Schedule



2-3 Obligation of Recipient Country

For smooth implementation of the Project, the GOU undertakes such necessary measures enumerated below:

(1) General

1) To provide necessary information and data for detailed design by the Japanese consultant after the decision of the project implementation

2) To bear all commission, handing charges and other necessary fees for banking services related to the Bank Arrangement (B/A) and the Authorization to Pay (A/P)

3) To ensure customs clearances and tax clearances of the equipment procured under the project.

4) To accord Japanese nationals and Japanese corporations whose services may be required in connection to the products and services under the Verified Contracts, such facilities as may be necessary for their entry into the Uganda and stay therein for the performance of their works.

5) To exempt Japanese nationals and Japanese corporations from customs duties, internal taxes and other fiscal levies which will be imposed in Uganda with respect to the supply of the products and services under the Verified Contracts

6) To obtain building permit, facility usage permission and other formalities from related governmental agencies necessary for the project implementation.

7) To ensure effective and proper operation and maintenance of the facilities and equipment under the Project.

8) To assure safety and provide necessary safeguards for Japanese nationals whose services may be required to the Project.

9) To bear all expenses which are uncovered by the Japan's grant aid scheme for the facilities as well as for the transportation and installation of the equipment.

(2) Construction works by the recipient country

Construction works by the recipient country are as follows:

1) To secure land in the NaCRRI compound necessary for the construction of the Project

2) To bear all expenses and actual work for demolishing, removal of existing facilities and land leveling for construction of facilities.

3) To provide facilities for the distribution of electricity, water supply necessary for the construction works prior to the commencement of the construction works.

4) To take official procedure required for Environment Impact Assessment of the Project

5) To supply furniture, fittings and consumable stores which are not procured by the Project

6) To take necessary measures to prevent from accident and burglary during the construction works

Expenses for infrastructures such as power and water supply facilities necessary for the facilities and construction works by the Ugandan side would be minimized because these infrastructures were already equipped in the NaCRRI compound. The Ugandan side agreed to conduct related works during the fields survey stage through discussions with the Team.

2-4 Project Operation Plan

(1) Operation and maintenance plan

The NARO and the NaCRRI are responsible for operation and maintenance works after completion of the Project. The NaCRRI substantially manage the Project. Research sections and rice groups in cereal program are in charge of research and training program of the Project. Administration section is responsible for operation and maintenance of the facilities and equipment.

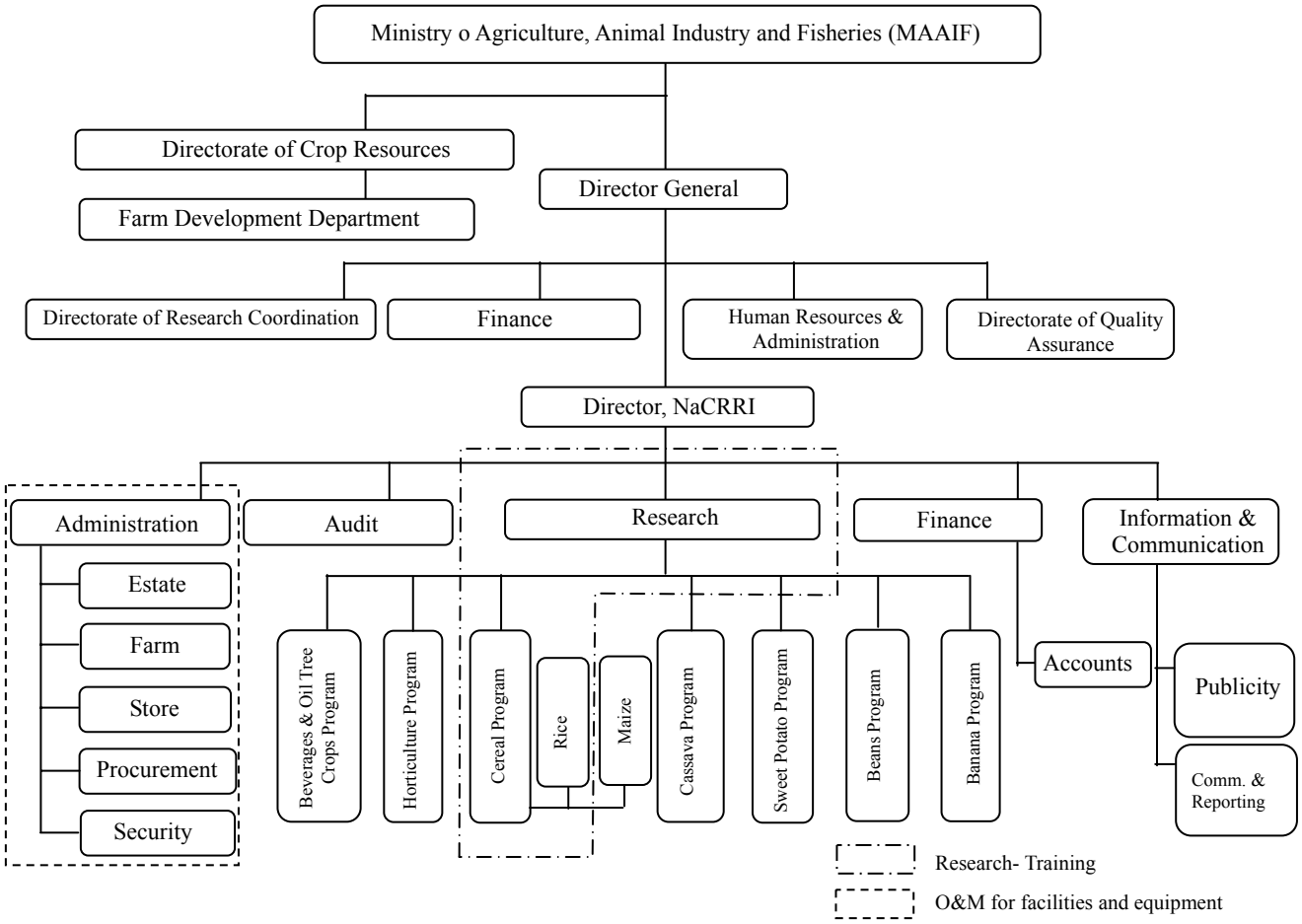


Figure- 2.4.1 Organization of MAAIF, NARO and NaCRRI

(2) Project implementation plan

The administration section in the NaCRRI is in charge of O&M of the facilities and equipment procured by the Project after the completion of the construction works. Since facilities and equipment procured by the Project require less advanced skills for O&M, technical staff previously organized in the existing workshop and agricultural machinery operation in the NaCRRI are able to maintain these facilities and equipment. Repair and maintenance works for generator, water pump, tractor have been satisfactorily carried out in the existing workshop with staff of five (5) mechanical engineer and assistant staff, two (2) plumbing workers and one (1) electrical worker. In this regard, the NaCRRI has enough capacity for O&M works for the Project. Table- 2.4.1 indicates remarkable points of O&M activities of each equipment.

Table- 2.4.1 Remarkable Points for O&M Activities

Category	Items	Remarks
Electric supply backup system	Generator	Procurement of consumable stores, spare parts and technical services such as repair works are available in the sales agent in Uganda.
Solar battery system	Refrigerator for seed storage, and experiment works at night, etc.	Procurement of consumable stores, spare parts and technical services such as repair works are available in the sales agent in Uganda. Battery is replaced every 5 to 7 years.
Equipment for rice research	Lysimeter	Data from four (4) weight sensors of a lysimeter is automatically transferred data and recorded them in data logger. No consumable store is required. In case weight sensor breaks down, sensor is much less liable to troubles, and sensor shall be replaced.
Laboratory equipment	Meteorological equipment	Observed data are recorded in data logger. No consumable store is required.
Farm equipment	Tractor and attachments	Procurement of consumable stores, spare parts and technical services such as repair works are available in the sales agent in Uganda.
Post harvest equipment for demonstration	Huller- rice mill	Assembling, instruction of initial operation and maintenance by technical staff are scheduled when equipment is installed at the site so as to transfer O&M method of the equipment. In addition, O&M manual is prepared for distribution.
Workshop equipment	Welding machine, etc.	Procurement of consumable stores, spare parts and technical services such as repair works are available in sales agent in Uganda.

2-5 Project Cost Estimation

2-5-1 Initial Cost Estimation

The project cost shared by the Ugandan side is estimated at approximately Japanese yen 7.6 million. Table- 2.5.1 shows breakdown of the cost.

(1) Project Cost borne by the Ugandan Side

Table- 2.5.1 Project Cost shared by the Ugandan Side

Category	Amount（1,000Ug. Shs）	
Removal and ground leveling of existing workshop facilities	76,500	(¥4.97million)
Installation of Transformer	28,769	(¥1.87million)
Customs Clearance Cost	1,550	(¥0.10million)
Banking Cost	10,554	(¥0.69million)
Total	117,373	(¥7.63million)

Note: Figures in parenthesis show Japanese Yen equivalent.
Cost for removal of workshop and installation of transformer include VAT (value-added tax) of 18%.

(2) Conditions of Estimation

i) Date of estimation base : September 2008

ii) Exchange rate : US$ 1.00 = Japanese yen 106.18 (Average of the past 6 months)

2-5-2 Operation and Maintenance Cost

(1) Operation and maintenance cost

Table- 2.5.2 indicates the annual operation and maintenance cost of the NARO (NaCRRI) for the Project. Operation and maintenance cost was estimated according to the items below:

1) Salaries (Salaries for researchers, staff, operators of irrigation facilities are estimated except Japanese experts engaged in the technical cooperation projects. Salaries for canteen/ kitchen staff is excluded because their salaries are paid from expense of the canteen users.)

2) Consumable stores (The cost for consumable stores is composed of office expenses, such a copy charge, etc.)

3) Water and electricity charges

4) Fuel for generator (Because of excessively large fluctuation of power failure by season, fuel consumption was estimated with reference to recent power failure data of 6 months in

Namulonge area.)

5) Operation cost of equipment procured by the Project

6) Maintenance cost of facilities (Labor cost for office cleaning and other manageable repair works)

7) Maintenance cost for equipment (The cost for consumable stores is estimated at 3% of equipment cost and operation cost)

8) Service cost (Cost for researches commissioned, 3% of total cost above 1) to 7) according to the expenses of NaCRRI in recent years)

9) Other expenses (3% in total of 1) to 8) above)

Table- 2.5.2 Operation and Maintenance Cost for Facilities and Equipment

Items	Operation and Maintenance (O&M)	O&M Cost (1,000Ug.Shs)	Percentage (%)
1) Personnel expenditure	Researchers, assistant researchers, clerks, training managers, assist workers, etc.	178,500	57.0
2) Consumable stores	Expense for copy, etc for research and training programs	25,200	8.0
3) Electric charge	Electric power supply for research and administration block, training block, canteen/ kitchen block, dormitory block, workshop, etc.	15,000	4.8
4) Fuel for generator	Generator during power failure	22,500	7.2
5) Operation of equipment	Operation cost for thresher, huller/ rice mill, tractor, power tiller, etc. (Thresher, power tiller are to be procured by technical cooperation project)	8,180	2.6
6) Maintenance cost for facilities	Repair and maintenance cost for research and administration block, training block, canteen/ kitchen block, dormitory block, workshop, etc.	12,800	4.1
7) O&M cost of equipment	Purchase for consumable stores of equipment (3% of equipment price)	33,000	10.5
8) Service cost	Researches commissioned (3% of 1) to 7) above)	8,860	2.8
9) Other expense	(3% of 1)～8)above)	9,120	2.9
Total		313,160	100.0

Operation and maintenance cost is estimated at about Ug.Shs. 310 million, which is equivalent to 8.7 % of total annual cost of Ug.Shs. 3,600 million of the NaCRRI in the fiscal year 2006/07. It is thus considered that the NaCRRI is able to manage the operation and maintenance works with proper budget sharing with other program. Table- 2.5.3 below shows organization of the staff of the existing workshop. Since most of the equipment require less advanced skill for the O&M, present staff in the workshop and machinery operators are able to maintain the equipment.

Table- 2.5.3 Organization of Workshop

Section	Speciality	No. of staff	Experience (NaCRRI)
Repair of machinery	Mechanic engineer	1	10 years
	Assistants	2	5 years
	Welders	2	5 - 10 years
Plumbing work	Plumbing workers	2	5 - 10 years
Electric work	Electrician	1	8 years
Carpenter	Carpenter, wood worker	Not employed	---
Farm machinery	Tractor operators	3	5 - 8 years

A farm manager controls operations as well as assignment of the personnel among several sections in the workshop. Proper operation and management work is expected with well experienced engineer and technicians in each section after the procurement of the equipment by the Project. In addition, it is expected that the maintenance cost for equipment is reduced when the repair works of engine, chassis, etc. are carried out in the workshop of the NaCRRI since those works have been entrusted to other workshop or factories outside of the NaCRRI. Operators of tractors and other machinery customarily have enough knowledge and experience to maintain and repair the machinery in the NaCRRI.

2-6 Other Relevant Issues

Following issues are notable to smoothly implement Japanese assistance in the Project:

(1) Obligation of the recipient country

1) Construction works by the recipient country shall be completed prior to the commencement of the Project. In this regard, the MAAIF shall request a supplementary budget to the Ministry of Finance Planning and Economic Development for the works as a development budget of the MAAIF before the project implementation. The request of the budget is made in appropriate timing so as to commence the construction of the proposed facilities as scheduled.

2) The MAAIF is responsible for a budget preparation for custom duties, internal taxes and other fiscal levies with respect to the supply of the products and services under the Project. It is notified that the MAAIF shall prepare necessary budget for customs duties, internal taxes without delay so as to smoothly implement the Project.

3) It is also necessary to take official procedures required for an application of the Authorization to Pay (A/P) according to the Bank Arrangement (B/A) and customs formalities. Since construction materials, equipment procured in Japan and third countries are generally unloaded at Mombassa seaport in Kenya and transported to the site by land, preliminary survey is prerequisite to ensure prompt and smooth unloading and customs formalities.

(2) Consensus between parties concerned to the Project

1) Equipment procured by the Project is utilized for the activity of the technical cooperation projects. It is preferable to procure the equipment in an earlier stage to make effective use of the equipment by the technical cooperation projects. Since huller- rice mill and lysimeters are installed in the proposed facilities, installation timing at site shall be adjusted according to the construction schedule.

2) The workshop is newly constructed after a demolition of the existing workshop. It is necessary to tentatively secure workshop site for the repair work of the farm equipment during the construction period.

3) Proposed construction site is located along the existing road connecting from the east gate to the existing research and administration zone of the NaCRRI. Regulation of the traffic control shall be agreed to secure safety in work operation and traffic between the NaCRRI, consultant and contractor.

Chapter 3 Project Evaluation and Recommendations

Chapter 3 Project Evaluation and Recommendations

3-1 Project Effect

(1) The number of the beneficiaries

After the completion of the Regional Rice Research and Training Center by the Japan's grant aid scheme, research and training activities of the NaCRRI are enhanced as a key station in Uganda. The number of the beneficiaries is estimated at about 26 persons of researchers, agricultural officers and extension workers of the NARO, NaCRRI, ZARDIs, and about 2,600 trainees per annum participating the training programs of the technical cooperation projects. Table- 3.1.1 indicates the number of the beneficiaries at present and after the project implementation.

Table- 3.1.1 The Number of the Beneficiaries

	Present (2008)	After project implementation (2012)
The number of trainees*	Total 1,300 persons*	2,600 persons per annum
(Details)		
Government researchers	50 persons	980 persons
Farmers	1,190 persons	1,460 persons
Researchers of foreign countries and NGOs	60 persons	160 persons

Note: *: The number of trainees participated in the training programs of the Promotion, Development and Dissemination of NERICA Rice Project and the NERICA Promotion Project (Estimated in December 2008)

With regard to the indirect effects of the Project, an increase of rice production raises farm income and improves rural living condition. The project effects will extensively cover whole area of Uganda, and the number of the beneficiaries is extensively increased about 4,151 thousand farm household according to the statistic data in 2005/06.

(2) Project effects

Present constraints, direct and indirect effects expected after the project implementation are summarized in Table- 3.1.2.

Table- 3.1.2 Project Effects and Extents

Present constraints	The NaCRRI is a core center for research and dissemination of NERICA in the east-south African countries. However, deterioration of the facilities and shortage of equipment hindered to achieve steady results on rice for research and training programs
Japanese assistance	• Facility construction for research and training • Equipment procurement for research and training

Direct effects by project implementation	• The researchers in the NARO, NaCRRI and other agencies achieve steady study results in each specified field planned in the technical cooperation projects under the "the Rice Promotion" project by the effective use of facilities and equipment under the Project implementation. • Under the training programs prepared by the technical cooperation projects of the JICA, trainees improve their own capacities of rice cultivation more effective by the use of the facilities and equipment procured by the Project. While the trainees are benefited by the use of the canteen/ kitchen, such as a convenience for taking meals and reduction of its expense. • The procurement of the equipment such as for seed production, trial farm cultivation and post harvest enables to effectively conduct field training, thus improves training effects. • Workshop facility provides comfortable working environment, and procurement of equipment reduces maintenance cost of equipment for not only those procured by the Project but those owned by the NaCRRI. Proper repair and maintenance works enable to secure a long term use of equipment beyond durable period. • Dormitory is effectively utilized by the researchers who live in far from the NaCRRI. In addition the dormitory reduces the expenses of the researchers. • Construction of the trial farm enables to carry out a cultivation test of several rice varieties through the year. It is also expected that research and on-the-job training in the trial farm contribute to steady accomplishments of the research and training programs.
Indirect effects by project implementation	• Facilities and equipment procurement by the Project contributes to a capacity development of researchers, and consequently enhance rice promotion activities in Uganda. • Quality of planning, research, dissemination of rice cultivation, and monitoring and evaluation for the rice promotion is developed. • Increase of rice production raises farm income and improves rural living condition. • The facilities provide opportunities of holding meetings and conferences by the International organizations, donors, NGOs, and it consequently contributes to rice promotion in Uganda. • Agricultural education*[1] is addressed through the National Agricultural Education Policy, developed by the PMA. Lecture rooms and other facilities provide place for agricultural education for the schools in Uganda, and it enhance an awareness of importance of agriculture for food security in Uganda.

*[1]: Agricultural education is one of the important policies in the PMA. Accordingly, agricultural education has been extended in nationwide in line with the National Agricultural Education Policy: (NAEP, 2004-2015)

3-2 Recommendations

3-2-1 Major Task of Recipient Country

The NaCRRI shall undertake following tasks to effectively and continuously maintain project effects of the research and training programs, using facilities and equipment procured by the Project.

(1) Maintenance of the facilities and equipment

Ordinary repair and maintenance works are indispensable to effectively and continuously utilize the facilities and equipment. The NaCRRI shall manage and monitor the operation and maintenance conditions including institutional and financial supports for the works. The durable year of the equipment procured by the Project is assumed at about ten years. It is important to

properly appropriate a budget for maintenance and replacement of research and training equipment of the NaCRRI even after ten years durable period.

(2) Trainers

Several training programs are scheduled by the technical cooperation projects. Since the total number of trainees are more than 2,600 persons per annum, additional trainers and instructors specialized in farming practice, agricultural machinery and irrigation including financial support are ensured in addition to the present researchers who have been undertaking training programs in the NaCRRI. The NaCRRI provides training services to the remote areas in the north and east regions by radio communication, etc., it is recommended to establish communication system using information technology, such as an internet service.

(3) Cooperation with related organizations

The Continuing Agricultural Education Center (CAEC) of the Makerere University, the Mukono Agricultural Resaerch and Development Center (ARDC: established under Japan's grand aid program in 1998), the AEATRI are well known as the public research institutes for agriculture and rice promotion in Uganda. The CAEC is located at 10 minutes distance from the NaCRRI. The CAEC is well equipped with accommodations and training facilities, thus it is preferable to establish close relations with the CAEC, such as accommodations for trainees from regions. The Mukono ARDC is located at the eastern region of Uganda, and specialized in the research, training programs for rice cultivation, accordingly it is expected to have a close cooperation with related fields. The AEATRI is also specialized in the field of the agricultural machinery and irrigation practice, so that mutual technical cooperation is expected for rice promotion. As for the NAADS, the agricultural advisory services program aims at assisting dissemination of the farm practice to improve agricultural production at farmer level. It is essential to establish mutual support systems to improve the technical skill of the researchers of these organizations by exchange and share of researchers and trainers.

3-2-2 Cooperation with Technical Cooperation Project and Other Donors

(1) Technical cooperation project

A highly skilled technique is not particularly required since facilities and equipment procured by the Project require less advanced skills for the O&M. On the other hand, quite a number of research, training and post harvest equipment are procured by the technical cooperation projects. In this regard, it is recommended to strengthen support system in the NaCRRI, such as a technical support by manufacturers, as well as related government organization to continuously maintain the equipment procured by not only the Project but the technical cooperation projects.

(2) Cooperation with other donors

As shown in Chapter 1, the National Plan has been implemented based on the PEAP, and the International organizations and donor countries has been supporting the agricultural and rural development sector under the adoption of the PMA policy. Among those organizations, the Food and Agricultural Organization of United Nations (FAO) has been instructing NERICA cultivation, paddy rice cultivation and marketing for the farmers in poverty. The NGOs represented by the Sasakawa Global 2000 (SG2000), West Africa Rice Development Association (WARDA) have been also earnestly supporting cooperation programs on rice cultivation in Uganda and surrounding African countries. It is greatly expected the Regional Rice Research and Training Center in the NaCRRI will cooperate with these organizations and countries for further rice promotion.

To mitigate widening of demand -supply gap and increase of debt by an excess of rice import in the African countries, the Coalition for African Rice Development (CARD) has been launched under the initiative of the committee composed of seven core organizations of the Alliance for a Green Revolution in Africa (AGRA), New Partnership for Africa's Development (NEPAD), Forum for Agricultural Research in Africa (FARA), WARDA, International Rice Research Institute (IRRI), JICA and Japan International Research Center for Agricultural Science (JIRCUS). Total of twelve (12) African countries including Uganda agreed to prepare the National Rice Development Strategy (NRDS) by each country during the First conference held in Kenya on October 2008. It is expected that the Project and technical cooperation projects of the JICA will play a much more active contribution to realizing the NRDS under the CARD program.

Appendices

1. Member List of the Study Team

1. Member List of the Study Team

(Basic Design Study)

	Name	Title Organization
1.	Dr. Hirofumi Hoshi	Team Leader Director, East & Southern Africa Division, Rural Development Department, JICA HQs
2.	Mr. Hitoshi Fujiie	Planning of Cooperation Program/ Grant Aid Cooperation Assistant Resident Representative, JICA Uganda Office
3.	Mr. Takahiro Kato	Consultant Leader/ Construction Planning NTC International Co., Ltd.
4.	Mr. Hiroshi Azegami	Construction Designing/ Facility Planning NTC International Co., Ltd.
5.	Mr. Hironori Honma	Research and Training Planning/ Equipment Planning NTC International Co., Ltd.
6.	Mr. Tomoki Hotta	Irrigation Farming Field Planning/ Environmental and Social Consideration NTC International Co., Ltd.
7.	Mr. Mitsunari Sadano	Estimation/ Work Planning/ Procurement Planning NTC International Co., Ltd.

(Draft Report Explanation)

	Name	Title Organization
1.	Mr. Tetsuo Seki	Team Leader Chief Representative, JICA Uganda Office
2.	Mr. Masato Koinuma	Program Officer Project Management Officer, East & Southern Africa Division, Rural Development Department, JICA HQs
3.	Mr. Takahiro Kato	Consultant Leader/ Construction Planning NTC International Co., Ltd.
4.	Mr. Mitsunari Sadano	Estimation/ Work Planning/ Procurement Planning NTC International Co., Ltd.

2. Study Schedule

2. Study Schedule

(Basic Design Study)

No.	Date	Day	Official Members	Consultant Leader/ Construction Planning	Construction Designing/ Facility Planning	Research and Training Planning/ Equipment Planning	Irrigation Farming Field Planning/ Environmental and Social Consideration	Estimation/ Work Planning/ Procurement Planning
1	Aug. 2	Sat		Movement (Japan – Dubai)				
2	Aug. 3	Sun		Movement (Dubai – Entebbe – Kampala)				
3	Aug. 4	Mon	Supplementary field survey on M/D					
4	Aug. 5	Tue	Submission and discussion of IC/R with NaCRRI and JICA Experts					
5	Aug. 6	Wed	Supplementary field survey on M/D, preparation for sub contract (Topographical survey, geological & soil survey, and research, training needs and follow-up survey)					
6	Aug. 7	Thu	Submission and discussion of IC/R with MAAIF and NARO					
7	Aug. 8	Fri	Discussion on IC/R & M/D, field survey	Data collection from NaCRRI				
8	Aug. 9	Sat	Site investigation					
9	Aug. 10	Sun	Team meeting, arranging data and information, and preparation for M/D					
10	Aug. 11	Mon	Discussion on M/D Courtesy calls to Embassy of Japan	Site investigation, data collection				
11	Aug. 12	Tue	Signing of M/D (Entebbe– Dubai)	Discussion on survey schedule and methods with NaCRRI Discussion of scope of sub contract works, etc.				
12	Aug. 13	Wed	(Dubai – Japan)	Field survey, data collection				
13	Aug. 14	Thu	Discussion of IC/R with NARO NARO					
14	Aug. 15	Fri		• Survey for present O&M activities for facilities and irrigation and farms • Task analysis for training programs • Study of organization, budget and technical level • Data collection of assistant programs of other donors • Baseline survey	• Survey for existing facilities • Data collection of design criteria • Supervision for sub-contract works (Topo and geological survey) • Task analysis for training programs	• Task analysis for training programs • Supervision for sub-contract works (Needs survey of research & training programs) • Survey of machinery & equipment • Interview survey to farmers and researchers	• Survey of natural and environment • Survey of present O&M activities for facilities • Investigation of Infrastructure (electricity, water, communication) • Investigation on irrigation and farms Infrastructure	• Survey for present O&M activities for facilities and irrigation and farms • Data collection for construction planning and cost estimates • Survey on construction circumstances • Data collection for procurement
15	Aug. 16	Sat						
16	Aug. 17	Sun		Team meeting, arranging data and information, and field report preparation				
17	Aug. 18	Mon		• Survey for present O&M activities for facilities and irrigation and farms • Study of organization, budget and technical level • Data collection of assistant programs of other donors • Study of design criteria	• Survey for existing facilities • Data collection of design criteria Supervision for sub-contract works (Topo and geological survey) • Task analysis for training programs	• Study of equipment of NaCRRI • Survey for present O&M activities • Survey of present infrastructure and equipment • Supervision for sub-contract works (Needs survey of research & training programs) • Survey of cost estimates of equipment • Supervision for sub-contract works (Needs survey • Interview survey to farmers and researchers	• Survey of natural and environment • Survey of present O&M activities for facilities • Investigation of Infrastructure (electricity, water, communication) • Investigation on irrigation and farms Infrastructure • Environmental survey	• Survey for present O&M activities for facilities • Data collection for construction planning and cost estimates • Survey on construction circumstances • Survey of transportation • Data collection for procurement
18	Aug. 19	Tue						
19	Aug. 20	Wed						
20	Aug. 21	Thu						
21	Aug. 22	Fri						
22	Aug. 23	Sat						
23	Aug. 24	Sun		Team meeting, arranging data and information				
24	Aug. 25	Mon		(continued) • Supplementary data collection • Report preparation	(continued) • Supplementary data collection • Report preparation	(continued) • Supplementary data collection, interview results • Report preparation	(continued) • Supplementary data collection, environment survey • Report preparation	(continued) • Supplementary data collection • Report preparation
25	Aug. 26	Tue						
26	Aug. 27	Wed						
27	Aug. 28	Thu		Reporting and discussion of field survey with NARO, NaCRRI				
28	Aug. 29	Fri		Reporting to JICA and relevant organizations				
29	Aug. 30	Sat		Movement (Kampala – Entebbe – Dubai)				
30	Aug. 31	Sun		Movement (Dubai – Japan)				

(Draft Report Explanation)

No.	Date	Day	Official Members	Consultant Leader/ Construction Planning	Estimation/ Work Planning/ Procurement Planning
1	Dec. 13	Sat		Movement (Japan – Dubai)	
2	Dec. 14	Sun		Movement (Dubai – Entebbe – Kampala)	
3	Dec. 15	Mon	Movement (Japan – Dubai)	Discussion with JICA Uganda Office and JICA Experts Explanation and discussion of Draft Basic Design Report with NARO	
4	Dec. 16	Tue	Movement (Dubai – Entebbe – Kampala) Discussion with JICA Uganda Office and JICA Experts	Supplementary field survey Explanation and discussion of Draft Basic Design Report with NaCRRI	
5	Dec. 17	Wed	Explanation and discussion of Draft Basic Design Report and M/D with NARO and NaCRRI Data collection		
6	Dec. 18	Thu	Brief explanation of the project components to NEMA Meeting with Embassy of Japan		
7	Dec. 19	Fri	Signing of M/D, data collection		
8	Dec. 20	Sat	Movement (Kampala – Entebbe – Dubai)	Supplementary field survey	
9	Dec. 21	Sun	Movement (Dubai – Japan)	Movement (Kampala – Entebbe – Dubai)	
10	Dec. 22	Mon		Movement (Dubai – Japan)	

3. List of Parties Concerned in the Recipient Country

3. List of Parties Concerned in the Recipient Country

(Basic Design Study)

Japanese side

	Name	Title
1.	Mr. Kazuaki Kameda	Counsellor, Embassy of Japan
2.	Ms. Kotoha Itakura	Secretary, Head of Economic Cooperation Section, Embassy of Japan
3.	Mr. Takehiro Susaki	Resident Representative, JICA Uganda Office
4.	Mr. Hitoshi Fujiie	Assistant Resident Representative, JICA Uganda Office
5.	Dr. Ryuzo Nishimaki	JICA Expert (Chief Adviser) on Sustainable Irrigated Development Project in East Uganda
6.	Mr. Tatsushi Tsuboi	JICA Expert on promotion, development and dissemination of NERICA Rice
7.	Dr. Yusuke Tada	JICA Expert, Advisor for agricultural planning
8.	Mr. Yukinori Ito	JICA Expert, Coordinator/ Training, Sustainable Irrigated Agriculture Development Project in Eastern Uganda
9.	Mr. Takamasa Ando	JICA Expert, Farming, Sustainable Irrigated Agriculture Development Project in Eastern Uganda
10.	Mr. Toshimasa Kobayashi	JICA Expert, Irrigated Agricultural Engineer, Sustainable Irrigated Agriculture Development Project in Eastern Uganda

Ugandan side

(Ministry of Agriculture, Animal Industry and Fisheries)

	Name	Title
1.	Mr. Vincent R. Rubarema	Permanent Secretary, MAAIF
2.	Mr. Okaasai S. Opolot	Commissioner, Department of Crop Production, MAAIF
3.	Mr. Akena Frank	Senior Agriculture Officer, Department of Farm Development

(National Agricultural Research Organizations)

	Name	Title
1.	Dr. Denis T. Kyetere	Director General
2.	Dr. Cyprian Ebong	Director Quality Assurance
3.	Mr. J. Magyembe Mwesigwa	Coordinator, Agricultural Research Competitive Fund Scheme
4.	Mr. Stephen Ojangole	Senior Planning Officer
5.	Dr. Emily Kabushenga Twinamasiko	Director Research Coordination
6.	Mr. Mores Mazune	Head Procurement
7.	Dr. Frederick Kiwanuka	Consultant Civil Engineer

(National Crops Resource Research Institute)

	Name	Title
1.	Dr. James A. Ogwang	Director of Research
2.	Dr. Godfrey Asea	Plant Breeder, Cereals Research Program
3.	Dr. Bua O. Anton	Agric-Economist, Team leader, National Cassava Program

	Name	Title
4.	Mr. Jimmy Lamo	Rice Breeder
5.	Dr. Michael A. Ugen	Principal Research Officer, Beans research Program
6.	Mr. Ali Amisi Kaboggoza	Senior Administrative Officer
7.	Dr. Michael H. Otim	Crop Entomologist
8.	Mr. Robert Kiggundu	Farm Manager
9.	Mr. Sali Andrew	Meteorological Assistant

(National Environment Management Authority)

	Name	Title
1.	Mr. Onesimus Muhwezi	Director, Environmental Monitoring and Compliance
2.	Mr. George Lubega Matovu	National Resource Specialist

(National Agriculture Advisory Services)

	Name	Title
1.	Mr. Joseph Kyamanwa	Finance & Administration, Manager, NAADS
2.	Mr. Andren Kilama	Finance & Administration, Manager, NAADS (Replacement)
3.	Ms. Alyce Nakagwa	Information & Communication Officer/ PRO
4.	Ms. Ruth M. Kunihira	Executive Assistant, NAADS

(International organization, donors and NGOs)

	Name	Title
1.	Mr. Anyand Robert	Agronomist, Sasakawa- Global 2000
2.	Mr. Kayaayo Battson R. Emmanuel	Program Coordinator, Sasakawa- Global 2000
3.	Dr. Charles Sembatya	Program specialist, Sasakawa- Global 2000
4.	Mr. Percy W. Misika	FAO representative in Uganda
5.	Mr. Charles Owach	Assistant FAO representative (Programs)
6.	Dr. Paul Laboke	Project Coordinator, FAO
7.	Ms. Rilla Norslund	Senior Advisor, ASPS, DANIDA
8.	Ms. Rachel Miwanda	Office Manager, ASPS, DANIDA
9.	Dr. Mukaila A. Ojelade	Resident Representative, AfDB
10.	Mr. Daniel Rutabingwa	Investment Officer, AfDB
11.	Mr. Asaph Nuwagira	Agricultural and Rural Development Specialist, AfDB
12.	Ms. Florence Asienzo Wamala	Executive Assistant, AfDB

(Draft Report Explanation)

Japanese side

	Name	Title
1.	Mr. Masaki Shiga	Counsellor, Embassy of Japan
2.	Ms. Kotoha Itakura	Secretary, Head of Economic Cooperation Section, Embassy of Japan
3.	Mr. Tetsuo Seki	Chief Representative, JICA Uganda Office
4.	Mr. Hitoshi Fujiie	Assistant Resident Representative, JICA Uganda Office
5.	Ms. Yuko Naito	Assistant Resident Representative, JICA Uganda Office
6.	Dr. Ryuzo Nishimaki	JICA Expert (Chief Adviser/Irrigation) on NERICA Promotion Project
7.	Mr. Tatsushi Tsuboi	JICA Expert (Rice culture/Training) on NERICA Promotion Project
8.	Mr. Akio Goto	JICA Expert (Project Coordinator/NERICA Disseminator) on NERICA Promotion Project
9.	Dr. Yusuke Tada	JICA Expert, Advisor for agricultural planning

Ugandan side

(Ministry of Agriculture, Animal Industry and Fisheries)

	Name	Title
1.	Dr. William Olaho Mukani	Acting Permanent Secretary, MAAIF
2.	Mr. Okaasai S. Opolot	Commissioner, Department of Crop Production, MAAIF

(National Agricultural Research Organizations)

	Name	Title
1.	Dr. Denis T. Kyetere	Director General
2.	Mr. J. Magyembe Mwesigwa	Coordinator, Agricultural Research Competitive Fund Scheme
3.	Dr. Emily Kabushenga Twinamasiko	Director Research Coordination
4.	Mr. Mores Mazune	Head Procurement
5.	Dr. Frederick Kiwanuka	Consultant Civil Engineer
6.	Mr. John Ocitti	Chief Accountant
7.	Mr. Bagonza Robert	Head, Human Resources and Administration

(National Crops Resource Research Institute)

	Name	Title
1.	Dr. James A. Ogwang	Director of Research
2.	Mr. Kaboggoza Ali	Administrator
3.	Dr. Godfrey Asea	Plant Breeder, Cereals Research Program
4.	Mr. Jimmy Lamo	Rice Breeder
5.	Mr. Robert Kiggundu	Farm Manager

(National Environment Management Authority)

	Name	Title
1.	Mr. Waiswa Ayazika Arnold	Environmental Impact Assessment Co-ordinator
2.	Mr. George Lubega Matovu	National Resource Specialist

4. Minutes of Discussions

4. Minutes of Discussion (Field survey)

4.1 Field survey

MINUTES OF DISCUSSIONS
ON THE BASIC DESIGN STUDY
ON THE PROJECT FOR ESTABLISHMENT OF REGIONAL RICE RESEARCH AND TRAINING CENTER
IN THE NATIONAL CROPS RESOURCES RESEARCH INSTITUTE
IN THE REPUBLIC OF UGANDA

Based on the results of the Preparatory Study, the Government of Japan decided to conduct a Basic Design Study on the Project for Establishment of Regional Rice Research and Training Center (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent the Basic Design Study Team (hereinafter referred to as "the Team") to the Republic of Uganda (hereinafter referred to as "Uganda"), which is headed by Dr. Hirofumi HOSHI, Director, Eastern and Southern Africa Division, Rural Development Department, JICA, and is scheduled to stay in the country from 3rd August 2008 to 30th August 2008.

The Team held discussions with the officials concerned of the Government of Uganda and conducted a field survey at the study area.

As a result of discussions and field survey, both parties have confirmed the main items described on the attached sheets. The Team will proceed to further studies and prepare the Basic Design Study Report.

Entebbe, 12th August, 2008

Dr. Hirofumi Hoshi
Team Leader
Basic Design Study Team
Japan International Cooperation Agency
Japan

Mr. Vincent R. Rubarema
Permanent Secretary
Ministry of Agriculture, Animal Industry and Fisheries
The Republic of Uganda

Dr. Denis T. Kyetere
Director General
National Agriculture Research Organization
The Republic of Uganda

ATTACHMENT

1. Title of the Project

The title of the Project is "the Project for Establishment of Regional Rice Research and Training Center".

2. Objective of the Project

The objective of the Project is to improve quality and production of rice through establishment of Regional Rice Research and Training Centre.

3. Project Site

The site of the Project is located in the National Crops Resources Research Institute (NaCRRI), Wakiso District, as shown in ANNEX-I.

4. Responsible and Implementing Agency

4-1 The Responsible Agency is the Ministry of Agriculture, Animal Industry and Fisheries.

4-2 The Implementing Agency is the National Agriculture Research Organization, the Ministry of Agriculture, Animal Industry and Fisheries.

5. Items Requested by the Government of Uganda

The items requested by the Ugandan side at the preparatory study stage and their priority level are tabulated in ANNEX II. The Team explained that JICA would assess the appropriateness of the request after further study and analysis, and will recommend to the Government of Japan for approval.

6. Japan's Grant Aid Scheme

The Ugandan side understands the Japan's Grant Aid Scheme and the necessary measures to be taken by the Government of Uganda as explained by the Team and described in Appendix 4 of the Minutes of Discussions signed by the Preparatory Study Team and the Government of Uganda on 6th March, 2008.

7. Schedule of the Study

7-1 The consultants will proceed to further studies in Uganda until 30th August, 2008.

7-2 JICA will prepare the draft report in English and dispatch a mission on the Draft Final Report Explanation Study in order to explain its contents in December, 2008.

7-3 In case that the contents of the report are accepted in principle by the Government of Uganda, JICA will complete the final report (the Basic Design Study Report) and send it to the Government of Uganda by the end of March, 2009.

8. Other Relevant Issues

8-1 Operation and Management of Regional Rice Research and Training Center

The Ugandan side presented the organization chart for operation and management of the Regional Rice Research and Training Center attached as ANNEX-III. The Ugandan side explained that the organization for operation and management of the Regional Rice Research and Training Center would be established in the National Crops Resources Research Institute (NaCRRI) prior to the completion of the Project.

The Ugandan side confirmed that NaCRRI would take responsibility for the operation and management of the Regional Rice Research and Training Center, including appropriate staffing and financial support.

8-2 Removal of Existing Facilities

The Ugandan side agreed to remove the existing facilities and clear the land with its own expenses prior to the announcement of tender on the Project and promptly inform the result to the JICA Uganda Office by the end of October 2009. Facilities subject for removal are as follows:

- Workshop and storehouse for farm equipment located at the existing workshop, agricultural facility zone

8-3 Basic Infrastructure Preparation

The Ugandan side agreed to provide basic infrastructure such as electricity, water supply, etc. to the Project site with its own expense before the commencement of construction works of the Project.

8-4 Permissions Necessary for the Project

The Ugandan side agreed to get permissions necessary for the Project from the Ministry of Works, Housing and Communication prior to the construction works.

8-5 Solar Battery System

Considering frequent power cuts in NaCRRI, the Ugandan side insisted on the installation of a solar battery back-up system for the related facilities and equipment for the Project. The Team explained that a solar battery back-up system would be installed only for those facilities and equipment considered critical to the project activities, mainly refrigerator for seeds, lights for overtime experiment, etc. The Ugandan side agreed that point.

8-6 Environmental Impact Assessment (EIA)

The Ugandan side explained that EIA is not necessary for the project implementation. After further consideration, in the case of requirement of EIA, the Ugandan side takes all necessary procedures for EIA.

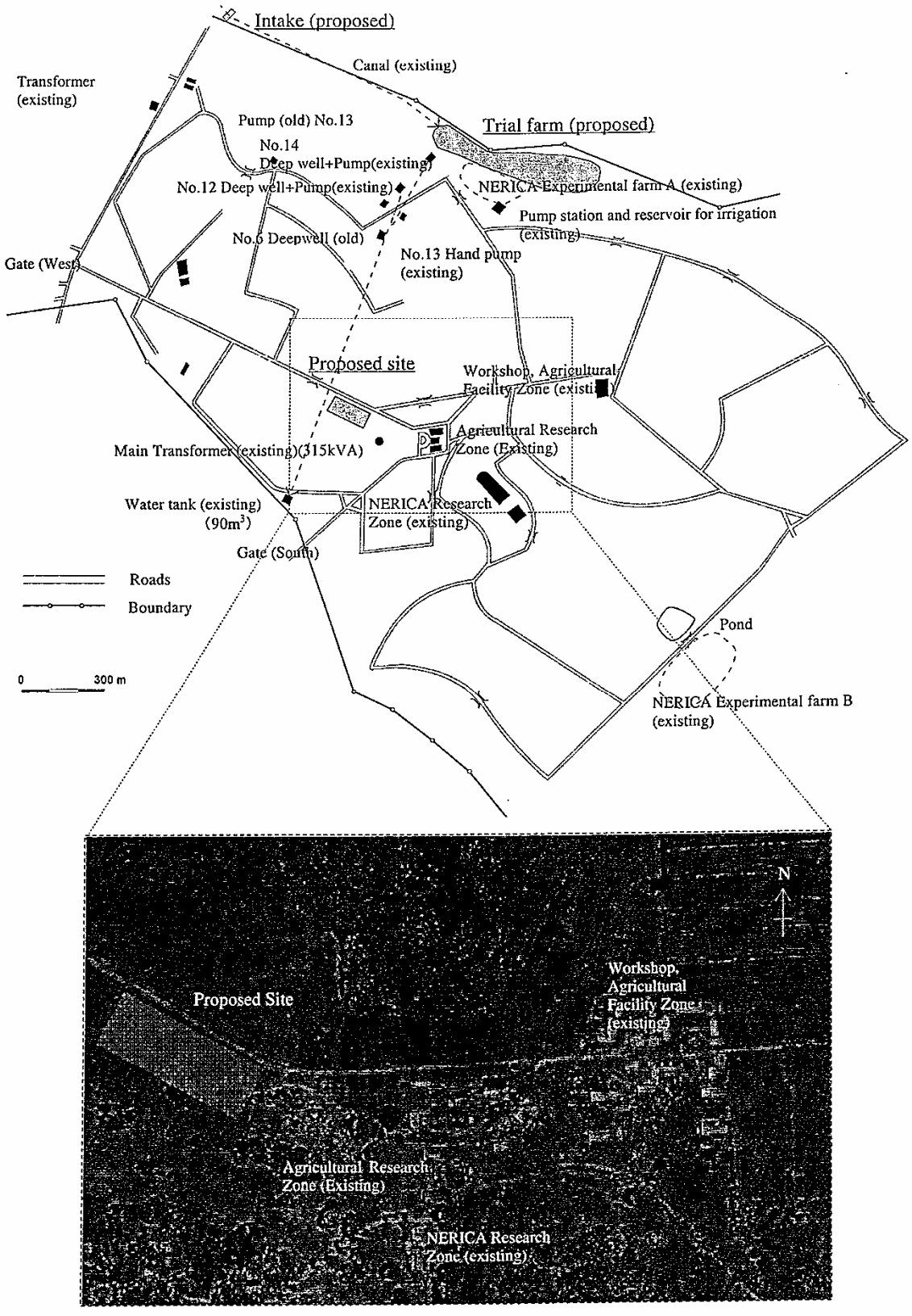
8-7 Additional request from the Ugandan side

The Ugandan side requested to construct the demonstration yard for post harvest activities such as rice milling and hulling. The Team explained that JICA would assess its appropriateness of the request after further study and analysis, and will recommend to the Government of Japan for approval. Details of the demonstration yard are in Attachment-5, ANNEX-II.

ANNEX-I Location of the Project Site

ANNEX-II Facilities and Equipment Requested by the Ugandan Side

ANNEX-III Proposed Organization Chart for Project Operation and Management


Intake (proposed)
Canal (existing)
Transformer (existing)
Pump (old) No.13
No.14 Deep well+Pump(existing)
Trial farm (proposed)
No.12 Deep well+Pump(existing)
NERICA Experimental farm A (existing)
Pump station and reservoir for irrigation (existing)
No.6 Deepwell (old)
No.13 Hand pump (existing)
Gate (West)
Proposed site
Workshop, Agricultural Facility Zone (existing)
Agricultural Research Zone (Existing)
Main Transformer (existing)(315kVA)
Water tank (existing) (90m3)
NERICA Research Zone (existing)
Gate (South)
Roads
Boundary
0 300 m
Pond
NERICA Experimental farm B (existing)
N
Proposed Site
Workshop, Agricultural Facility Zone (existing)
Agricultural Research Zone (Existing)
NERICA Research Zone (existing)

Facilities and Equipment Requested by the Ugandan Side

Level of priority according to the preparatory study is as follows:
A: High priorityB: Less than "A" C: Less than "B" D: Out of focus under grant aid

Category	Items	Q'ty	Preparatory Study Stage	Basic Design Stage	Observations / Comments
Facility	Administration Block and Offices	1	A	A	
	Canteen / Kitchen	1	A	A	
	Lecture Rooms (Capacity 40 peoples/each)	2	A	A	
	Laboratory	4	A	A	
	Water Supply System for the Laboratory	1	A	A	
	Irrigation Facilities	1	A	A	
	Sewage Disposal System	1	A	A	
	Storage Rooms	1	A	A	
	Renovation of Assortment of Stores/Workshop	1	A	A	In case necessary, the existing Stores/Workshop are removed for proposed Stores/Workshop, or Stores/ Workshop for the Project are constructed in other proper site in NaCRRI as an alternative.
	Screen House with Glass Roofing	2	A	A	
	Drying Yard	1	A	A	
	Conference Room (Capacity 100 people)	1	B	B	
	Dormitory for Guest Researchers	1	B	B	
	Dormitory A	1	C		
	Dormitory B	1	C		
	Electricity Supply and Solar System		D		
	Staff Houses for Trainers & Senior Staff (capacity 10 people)	1	D		
	Glass Green Houses	2	D		
	Guard House / First Aid / Clinic		D		
	Road Works		D		
	Fencing		D		
Equipment	Automatic Diesel Generator	1	A	A	
	Lysi Meter	8	A	A	The number is increased from 2 to 8.
	Laboratory Equipment excluding General Furniture	1	A	A	See Attachment-1

Category	Items	Q'ty	Preparatory Study Stage	Basic Design Stage	Observations / Comments
Equipment	Refrigerator for Seed Storage	2	A	A	
	Tractor with Attachment	2	A	A	See Attachment-2
	Trailer	2	---	A	Newly requested
	Post Harvest Equipment for Demonstration	1	A	A	See Attachment-3
	Workshop Equipment	1	---	A	Newly requested See Attachment-4
	Solar battery system for refrigerator for seeds, lights for overtime experiment, etc.	1	---	A	Newly requested Solar battery system is applicable when solar system rather becomes an advantage comparing to diesel generation from an economical point of view according to its respective application.
	Voice and Data System for the Center / CCTV System	1	C		
	Transport Means (1 Bus, 1 Mini Bus)	1	D		
	Stabilizer for Cold Storage	1	D		
	Drier	1	D		

Attachment-1

Category	Items	Q'ty	Basic Design Stage	Observations / Comments
Laboratory Equipment	Scale	1	B	
	Microscope	1	A	
	Stereoscopic microscope	1	A	
	pH meter	1	B	
	Meteorological equipment			
	- Temperature meter	2	A	
	- Humidity meter	2	A	
	- Rainfall	2	A	
	- Sunshine meter	2	A	
	- Wind velocity/ direction	2	A	

Attachment-2

Category	Items	Q'ty	Basic Design Stage	Observations / Comments
Tractor with Attachment	Disc Plow	2	A	
	Disc Harrow	2	A	
	Seeder	2	A	
	Sprayer	1	A	
	Cultivator	1	A	
	Cutter	1	A	

Attachment-3

Category	Items	Q'ty	Basic Design Stage	Observations / Comments
Post Harvest Equipment for Demonstration	Thresher for experiment	1	A	
	Winnowing fan for experiment	1	A	
	Huller	1	A	
	Rice mill	1	A	
	Seed drier	1	A	
	Power tiller with trailer	3	A	

Attachment-4

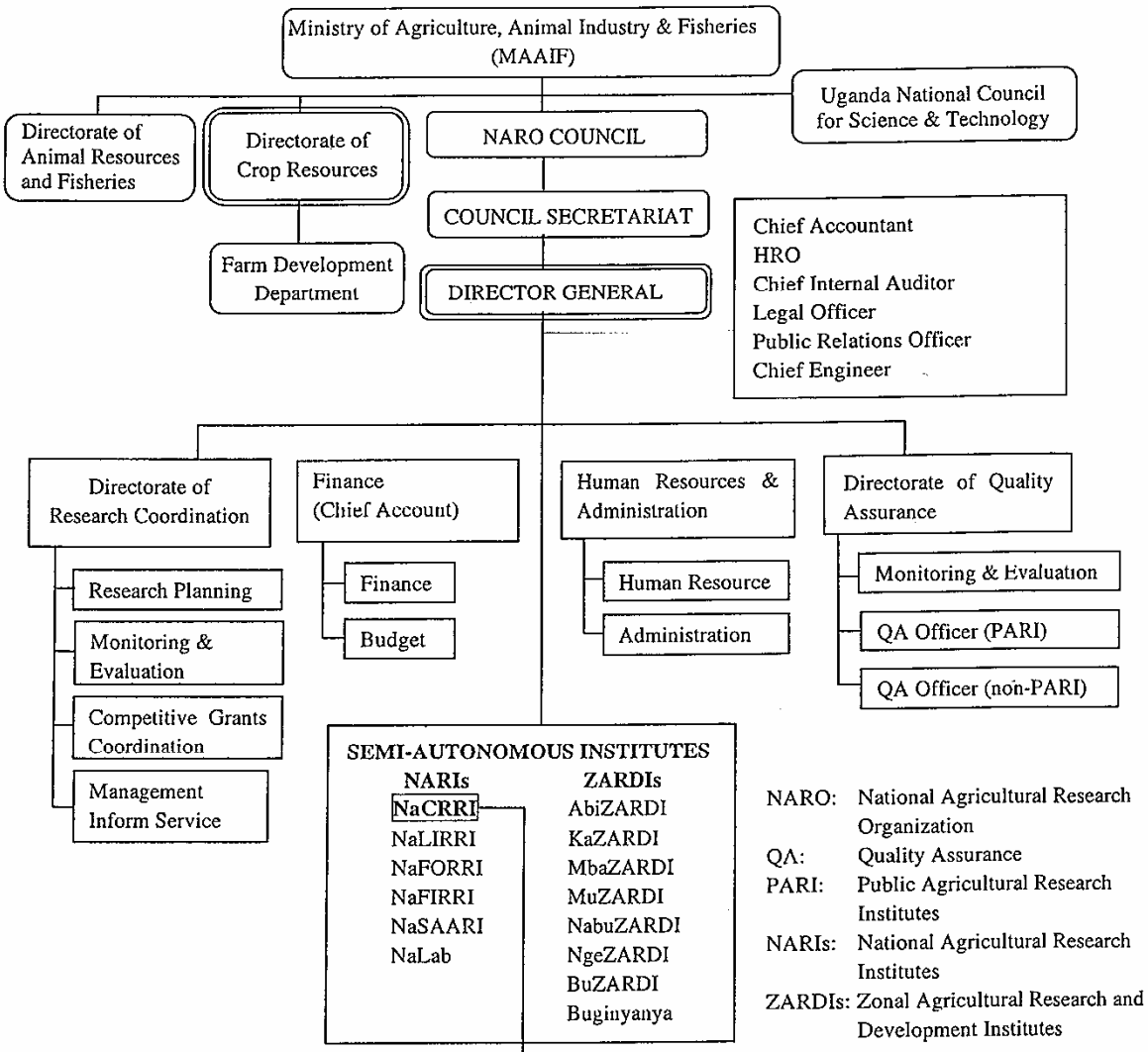
Category	Items	Q'ty	Basic Design Stage	Observations / Comments
Workshop Equipment	Arc welding machine	1	A	
	Gas (acetylene) welding machine	1	A	
	Upright drilling machine	1	A	
	High speed cutter	2	A	
	Bench (electric) grinder	2	A	
	Pipe threading machine	2	B	
	Electric repairing tools	1	A	
	High pressure washing machine or equivalent	1	B	
	Hydraulic jack	4	A	
	Other tools	1	A	

Attachment-5

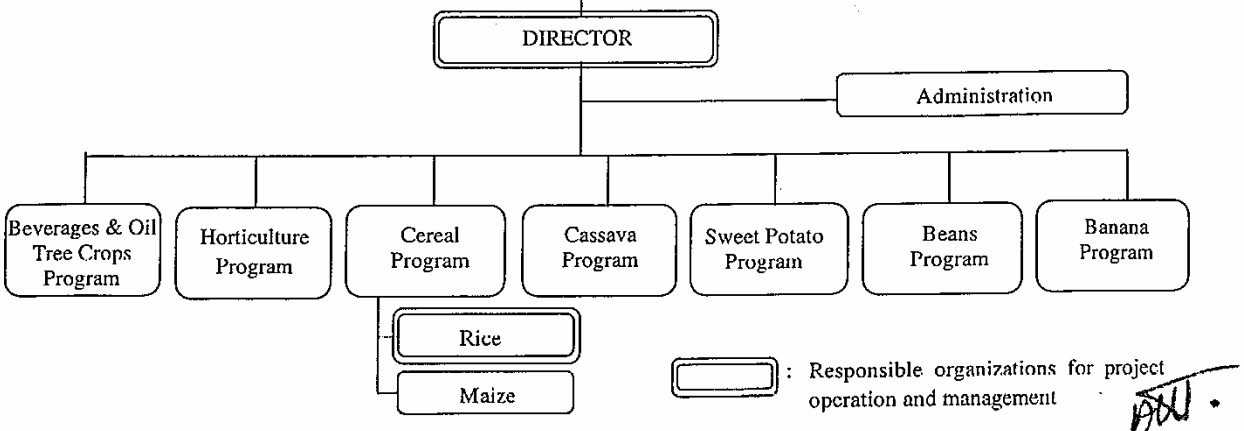
Category	Purposes	Q'ty	Basic Design Stage	Observations / Comments
Demonstration yard for post harvest activities	Demonstration and working purposes for the research and training program of rice. (Approximately 200 m^2)	1	A	It is proposed to separately construct the demonstration yard to avoid entering dust into other offices.

Proposed Organization Chart for Project Operation and Management

MAAIF and NARO Organogram



NaCRRI Organogram



4.2 Draft Report Explanation

MINUTES OF DISCUSSIONS
ON
THE BASIC DESIGN STUDY
ON
ESTABLISHMENT OF REGIONAL RICE RESEARCH AND TRAINING CENTER
IN
THE REPUBLIC OF UGANDA
(EXPLANATION ON DRAFT REPORT)

In August, 2008, the Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched a Basic Design Study Team on the Project for Establishment of Regional Rice Research and Training Center (hereinafter referred to as "the Project") to the Ministry of Agriculture, Animal Industry and Fisheries, the Government of Uganda (hereinafter referred to as "MAAIF"), and through discussion and field survey in Uganda, and technical examination of the results in Japan, JICA prepared a draft report of the study.

In order to explain and to consult MAAIF on the components of the draft report, JICA sent the Draft Report Explanation Team (hereinafter referred to as "the Team"), which is headed by Mr. Tetsuo SEKI, Chief Representative, JICA Uganda Office, to the Republic of Uganda from 14th to 21st December, 2008.

As a result of discussions, both parties confirmed the main items described on the attached sheets.

Entebbe, 19th December, 2008

Mr. Tetsuo SEKI
Leader
Draft Report Explanation Team
Japan International Cooperation Agency
Japan

Dr. William Olaho-Mukani
for: Permanent Secretary
Ministry of Agriculture, Animal Industry and Fisheries
The Republic of Uganda

ATTACHMENT

1. Components of the Draft Report

MAAIF agreed and accepted in principle the components of the draft report explained by the Team.

2. Japan's Grant Aid scheme

MAAIF understood the Japan's Grant Aid Scheme and the necessary measures to be taken by MAAIF as explained by the Basic Design Study Team and described in item 6 in Attachment of the Minutes of Discussions signed by both parties on 12th August, 2008.

3. Schedule of the Study

JICA will complete the final report in accordance with the confirmed items and send it to MAAIF by February, 2009.

4. Confidentiality of the Project

4-1 Detailed specifications of the Facilities and Equipment

Both parties confirmed that all information related to the Project including detailed specifications of the facilities, equipment and other technical information should not be released to any outside party before the signing of all the Contract(s) for the Project.

4-2 Confidentiality of the Project Cost Estimation

The Team explained the cost estimation of the Project as described in Annex-I. Both parties agreed that the Project Cost Estimation should never be duplicated or released to any outside parties before signing of all the Contract(s) for the Project. MAAIF understood that the Project Cost Estimation attached as Annex-I was not final and subject to change.

5. Other relevant issues

5-1 Operation and Management of Regional Rice Research and Training Center

Both parties confirmed that NARO would take responsibility for the operation and management of the Regional Rice Research and Training Center, including appropriate staffing and financial support. MAAIF explained that the organization for operation and management of the

Regional Rice Research and Training Center would be established in the National Crops Resources Research Institute (NaCRRI) prior to the completion of the Project, as described in Attachment 8-1. of the Minutes of Discussions signed by both parties on 12th August, 2008..

5-2 Environmental Impact Assessment (EIA)

MAAIF explained that EIA would not be necessary for the project implementation. However, both parties confirmed that MAAIF would take all responsibilities for necessary procedure on the environmental consideration, such as NARO's drafting the project brief, submission of it to NEMA through MAAIF, and having permission or an official letter which ensure that EIA would not be necessary, from NEMA by the end of March 2009.

5-3 The site for temporary site offices and storage

MAAIF made sure for the site for temporary site offices and storage, prior to the signing of the Exchange of Notes. Location of the candidate site is indicated in Annex III.

5-4 Removal of existing facilities

MAAIF agreed to remove the existing workshop facilities and clear the land with its own expenses, and promptly inform the result to the JICA Uganda Office by the end of October 2009.

5-5 The site for soil disposal

MAAIF made sure for the disposal site of the excavated soil, prior to the signing of the Exchange of Notes. Locations of the candidate sites for the soil disposal are indicated in Annex III.

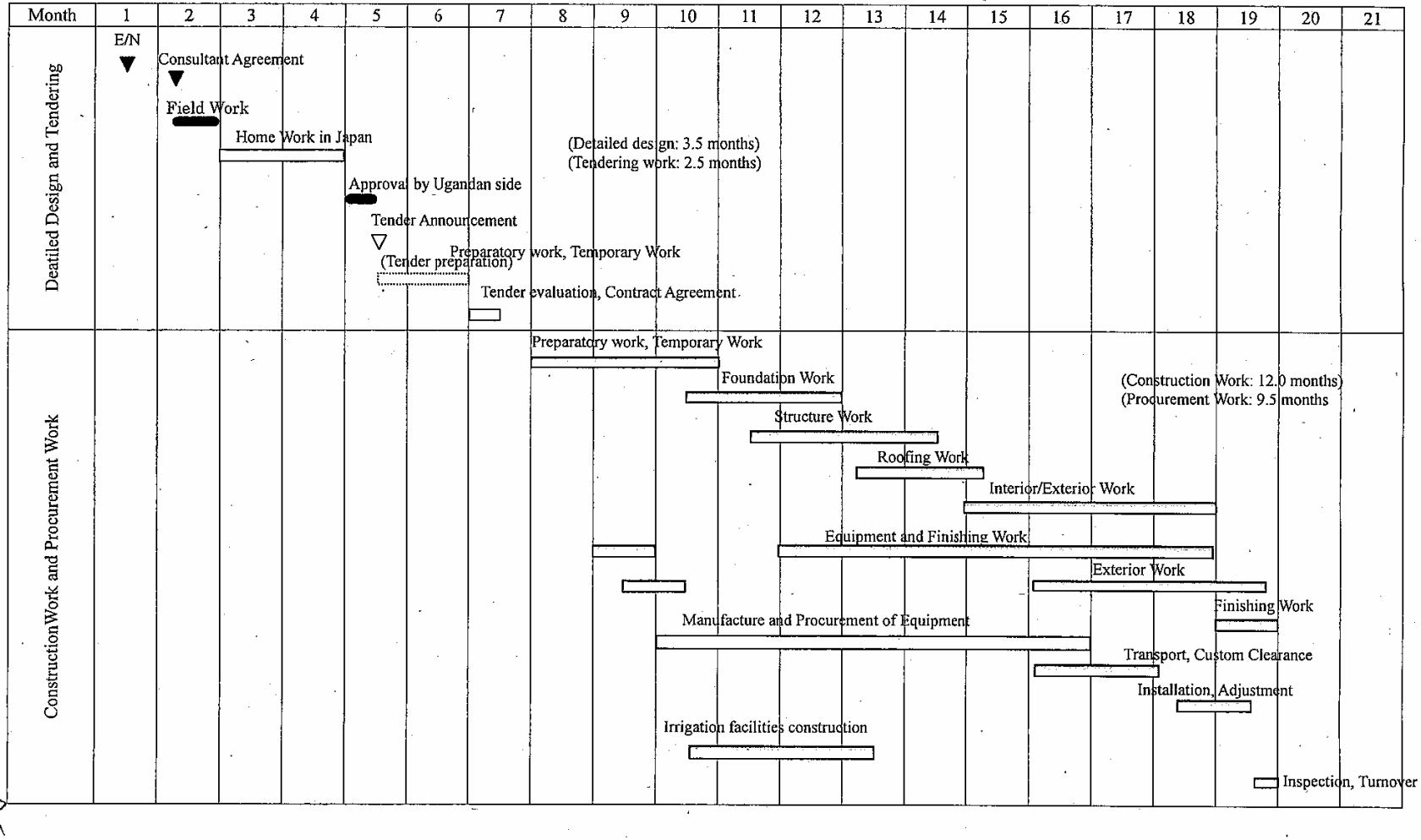
5-6 Electricity supply preparation

MAAIF agreed to install a transformer for power supply to the Project site with its own expense before the commencement of construction works of the Project.

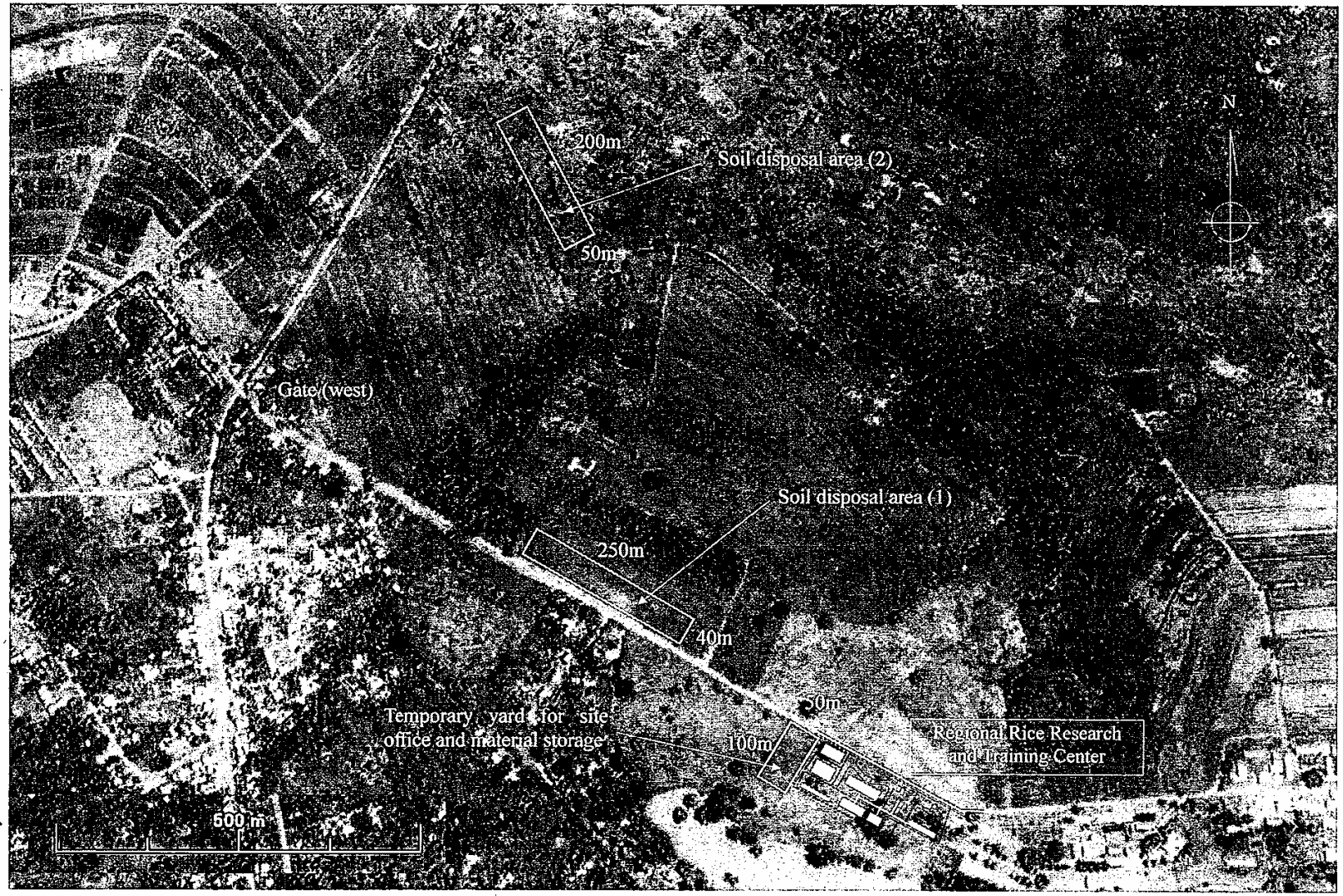
END

Annex I	Project Cost Estimation
Annex II	Tentative Schedule of the Project
Annex III	Temporary Yard for Site Offices and Material Storage / Soil Disposal Areas

Annex II Tentative Schedule of the Project



Annex III Temporary Yard for Site Offices and Material Storage / Soil Disposal Areas



5. Reference

5. Reference

Plan, regulations

No	Title	Form Book, video, map, photograph, etc.	Original/ Copy	Publishment	Year
	Plan, regulations				
1.	National Budget Framework Paper FY2008/09-FY2012/2013	A4	Original	Ministry of Finance, Planning and Economic Development	2008
2.	The Occupational Safety and Health ACT,200	A5	Original	Uganda Printing and Publishing Corporation	2006
3.	The Employment ACT,2006	A5	Original	Uganda Printing and Publishing Corporation	2006
4.	The Labour Disputes (Arbitration and Settlement) ACT,2006	A5	Original	Uganda Printing and Publishing Corporation	2006
5.	The Labour Unions ACT,2006	A5	Original	Uganda Printing and Publishing Corporation	2006
6.	The National Social Security Fund Act (Cap. 222)	A5	Original	Uganda Printing and Publishing Corporation	---
7.	The Workers Compensation ACT, 2000	A5	Original	Uganda Printing and Publishing Corporation	2000
8.	The Arbitration and Conciliation ACT, 2000	A5	Original	Uganda Printing and Publishing Corporation	2000
	Statistics				
9.	Uganda National Household Survey 2005/2006 Socio-Economic Module	A4	Original	Uganda Bureau of Statistics	2006
10.	Uganda National Household Survey 2005/2006 Agricultural Module	A4	Original	Uganda Bureau of Statistics	2007
11.	Key Economic Indicators 68thIssue: Second quarter 2007/2008	A4	Copy	Uganda Bureau of Statistics	2008
12.	2008 Statistical Abstract	A4	Original	Uganda Bureau of Statistics	2008
13.	Construction Sector Indices, Explanatory Handbook	A5	Original	Uganda Bureau of Statistics	2007
14.	Construction sector indices Fourth quarter 2006	CD	---	Uganda Bureau of Statistics	2007
15.	Construction sector indices Fourth quarter 2007	CD	---	Uganda Bureau of Statistics	2007
16.	Construction sector indices First quarter 2008	CD	---	Uganda Bureau of Statistics	2008
17.	Construction sector indices Second quarter 2008	A4	Copy	Uganda Bureau of Statistics	
	Agriculture, environment				
18.	NARO at Glance	A5	Original	NARO	2008
19.	A Joint Evaluation, Uganda's Plan for the Modernization of Agriculture	A4	Original	PMA office	2006
20.	PMA Annual Report FY2003-2004	A4	Original	PMA office	2004
21.	PMA Annual Report FY2004-2005	A4	Original	PMA office	2005
22.	PMA Annual Report FY2006-2007	A4	Original	PMA office	2007
23.	The National Environment (Minimum Standards for Management of Soil Quality) regulations	A5	Original	Uganda Law Reform Commission	2001
24.	The National Environment (Standards for Discharge of Effluent into Water or on Land) regulations	A5	Original	Uganda Law Reform Commission	---
25.	The National Environment (Waste Management) regulations	A5	Original	Uganda Law Reform Commission	---

No	Title	Form Book, video, map, photograph, etc.	Original/ Copy	Publishment	Year
26.	The National Environment (Conduct and Certification of Environmental Practitioners) Regulation	A5	Original	GOU	2003
27.	The National Environment (Audit) Regulation	A5	Original	GOU	2006
28.	The Environment Impact assessment Regulation	A5	Original	GOU	1998
29.	The National Environment Act CAP. 153	A5	Original	Uganda Law Reform Commission	1995
30.	The National Environment Management Policy for Uganda	A4	Original	Ministry of Water, Lands and Environment	1994
31.	The National Environment Action Plan for Uganda	A4	Original	Ministry of Water, Lands and Environment	1995
32.	Guidelines for Environmental Impact Assessment in Uganda	A4	Original	National Environment Management Authority	1997
33.	Annual Report 2006-07, NAADS	A4	Copy	NAADS	2008
34.	National Agricultural Advisory Services Programmed (NAADS)	B5	Original	NAADS	2000
	Construction				
35.	Standard Specifications for Building Works	CD	---	MWHC	2005
36.	Structural Design Guidelines	CD	---	MWHC	2006
37.	Regulations for Electrical Installation and Equipment in Buildings	CD	---	MWHC	2006
38.	Regulations for Sanitary Installation in Buildings	CD	---	MWHC	2006
39.	Building Control Regulations	CD	---	MWHC	2006
	International organization, donors				
40.	African Development Report 2007	A4	Original	AfDB	2007
41.	Second Agricultural Research and Training Project	A4	Original	World Bank	2007
42.	Project Progress Report (Annex 32), Dissemination of NERICA and Improved Rice Production Systems to Reduce Poverty and Food Deficit in Uganda (3 copy)	CD	---	FAO	2007
43.	FAO/Government Cooperative Programme, Agriculture and Rural Development through improved rice based farming systems for food security and poverty reduction in northern Uganda	CD	---	FAO	2008
44.	FAO/Government Cooperative Programme, Dissemination of NERICA and Improved Rice Production Systems to Reduce Poverty and Food Deficit in Uganda	CD	---	FAO	2006
45.	National Medium Term Priority Framework, FAO in Uganda, 2006-2010	CD	---	FAO	2006
	NGOs				
46.	Regional Rice program, 2006-2010 Project Design	A4	Copy	SG2000	---
47.	Annual Report 2005-2006	A4	Original	SG2000	2008
48.	Uganda Action Plan, SAA Extension Project	CD	---	SG2000	2008

6. Other Relevant Data

6.1 Estimates of required floor area of facilities

6. Other Relevant Data

6.1 Estimates of required floor area of facilities

Table- A6.1.1 Calculation result of the required area for laboratory and working room

	Laboratory	Researcher and required area	Research activities	Laboratory area	Total
1.	Breeding 、 Cropping technique, Mechanized agriculture, Intercropping	Researcher: 6×8.3m^2=50m^2 Assistant researcher: 5×3.3m^2=17m^2 Sub-total: 67m^2	Laboratory table for cultivation experiment: 1m×6m (Platform weighting machine、Table for even balance) Laboratory table for cultivation experiment: 1m×4m (Platform weighting machine、Table for even balance) Laboratory table: 1.75m×2m Quality analysis of rice	2m×6m=12m^2 2m×4m=8m^2 3.75m×4m=15m^2 Sub total: 35m^2	102m^2
2.	Paddy irrigation, Upland irrigation (for upland rice and other crops), Meteorology for agriculture, soil	Researcher: 5×8.3m^2=42m^2 Assistant researcher: 5×3.3m^2=17m^2 Sub-total:59m^2	Laboratory table for soil physical analysis: 1m×6m	2m×6.5m=13m^2	72m^2
3.	Phytopathology of plant (rice and other crops), Insect and noxious insect	Researcher: 3×8.3m^2=25m^2 Assistant researcher: 2×3.3m^2=7m^2 Sub-total： 32m^2	Laboratory table for entomology, pestology: 1m×5m Pest research Optical microscope：2sets	2m×5m=10m^2	42m^2
4.	Training, Post harvest technology, Marketing, Rural society and agro economy	Researcher: 4×8.3m^2=33m^2 Assistant researcher: 4×3.3m^2=13m^2 Sub-total:46m^2	Laboratory table: 1m×6m Laboratory table: 2m×3m	2m×6m=12m^2 3.5m×4m=14m^2 Sub-total: 26m^2	72m^2
				Total	288m^2
5.	Working room		Working table for rice drying: 2mx3m Working table for germination test: 2mx5m Storage space for unhulled rice sample Storage space for polished rice sample Drying machine for soil: 2mx3m Rack for soil sample: 1 set, 90×50×200cm Rack for plant sample: 2 sets, 90×50×200cm	3mx3m=9m^2 3mx6m=18m^2 3mx4m=12m^2 3mx3m=9m^2 3mx4m=12m^2 2m×2m×1=4m^2 2m×2m×2=8m^2 Total 72 m^2	72m^2×50%=36m^2 50% of the estimated area is allocated to the working room, because the activities listed on the left do not occur at the same instant

Remarks: Gain threshing and sorting by using fanning mill are conducted in the working room of warehouse for agricultural equipment.
Working space of one (1) meter is included in the above calculation.

Room name	Scale		Remarks
6. Seed treatment and storage room	Refrigerator: 400lit×2 Seed storage rack Working space	3m×3m=9m^2 5m×1.5m×2lines=15m^2 2m×6m=12m^2 Total 36m^2	The space for refrigerator and rack for seed storage are required, and open space is also kept at the center of the storage room for picking seeds out from the bags and stuffing seeds into the bags. Floor shape: 6m×6m
7. Administration room			
7.1 Chief administrator room	3 persons	Researcher: 3×8.3m^2=25m^2	Partitioned room is prepared for chief administrator for the occasion of receiving guests and outside researchers. The space for table, chair, storage cabinet, rack is prepared.
7.2 Administration office	7 persons	Assistant researcher: 7×3.3m^2=23m^2	Required space is prepared for the following purpose: administrative work for the project, logistics for maintenance on facilities, electricity, machine, etc. The space for table, chair, storage cabinet, rack is prepared. General office work including typing and other works is conducted in this room.
7.3 Reception room		4×6m^2=24m^2	Reception room is prepared for receiving guests and outside research. Two sets of reception table with fur (4) chairs are prepared.
7.4 Activity record and PR panel		6×6m^2=36m^2	Research and training output is displayed to the visitors on the panel. One room is prepared as open space at the side of entrance, which is utilized to present the activity record and public information to the visitors.
Total		108m^2	(Floor shape: 6m×18m)
8. Library and data storage room			
8.1 Book shelves	Wall side	6m×0.5m×2 line=6m^2 3m×0.5m×2 line=3m^2 Space between shelves: 6m×1.5m×2line=18m^2	Tables and chairs, screen, and portable black board for training Cabinets

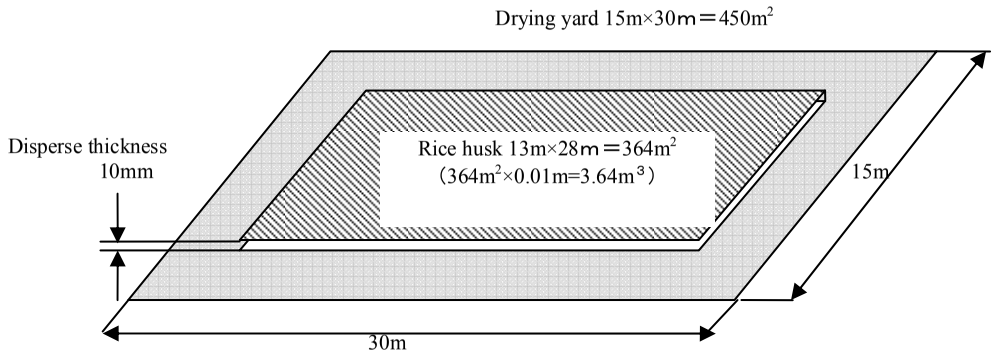
Room name	Scale		Remarks
8.2 Copy machine, and working space for bookbinding	Copy machine Working space for bookbinding	2m×2.5m =5m^2 2m×2m =4m^2	Storage space for equipment is prepared.
Total		36m^2	（Floor shape：6m×6m）
9. Storage room for equipment			
9.1 Storage shelves	Wall side Center	6m×0.75m×2 line=9m^2 3m×0.75m =2m^2 Space between shelves 6m×1.4m×2line=17m^2 4m×1.0m×2line=8m^2	Storage capacity for equipment: 22m^3 Storage capacity of shelves: (6+6+3)m×0.75m×0.5m×4steps=22.5m^3
Total		36m^2	（Floor shape：6m×6m）
Training block			
1. Lecture room	Trainees 40persons/room	Area for one lecture room is required 200m^2. Total 200m^2×2rooms=400m^2 (424m^2 including corridor)	Capacity: 40persons The following space is prepared for the lecture room: Distance between blackboard and front table: 42m^2 (3.5m×12m) Indoor practical training for rice cultivation: 64m^2 Storage (equipment, working table, table, chair, computer, screen, etc.): 30m^2(2..475m×12m)
Canteen/Kitchen block			
1. Canteen and hand wash stand	80% of 90 trainees take lunch at same time.	90×0.8×2.2+4.0=162m^2	It is assumed that 80% of 90 trainees take lunch at same time. Hand wash stand of 4 m^2 is prepared at the corner of the canteen.
2. Kitchen	Proposed kitchen area is determined from required area for cooking equipment such as sink, burner, and working space.	40 m^2	(Kitchen area is roughly estimated at 25% of canteen area.)

Room name	Scale		Remarks
3. Storage		3.5m×4m=14m^2	The following space is prepared for the lecture room: Storage space for food, cooking material, soft drinks Space for tray service, refrigerator.
Total		216m^2	
Dormitory block			
1. Dormitory	6 rooms×2persons	36m^2×6=216m^2	Dormitory is utilized for long stay of guest researcher; therefore, bathroom with shower and toilet is furnished with each room.
2. Public space	1 room	36m^2	Dinning and kitchen room for common use, Storage space for kitchen instruments, and linen room.
3. Others	Corridor	(Width=2m)	Out side pathway is used as corridor.
Total		252m^2	（excluding outside corridor）
Generator room			
Generator room	1site, 12m^2	3m×4m=12m^2	Noise proof type generator is installed, and generator room is placed keeping a proper distance from research and administration block.
Toilet			
	Assuming that 100 trainees consisting of 70 men and 30 women.	41m^2	Toilet is designed in reference to “Table for estimating the required number of sanitary apparatus in school. Urinary for man: 10 sets, Toilet bowl for man: 10 sets, Toilet bowl for women: 6 sets.

Table- A.6.1.2 Calculation of the required area for agricultural facilities

<table>
<tr><th>Item</th><th>Scale</th><th>Remarks</th></tr>
<tr><td>a) Rice mill demonstration and working shop</td><td>Rice mill demonstration and working shop needs 150 m^2 indoor space and 50m^2 (7.0m×7.2m) outdoor space, in total 200 m^2.
Outdoor space is used as temporarily storage area for rice husk blown off from rice mill, which is constructed with concrete including 0.5m allowance at each side. (8.0m×8.2m)</td><td>Required area
<table>
<tr><th colspan="2">Item</th><th>Required area(m^2)</th><th>Remarks</th></tr>
<tr><td rowspan="7">Indoor</td><td>Temporary stock of husked rice</td><td>5m×5m = 25</td><td></td></tr>
<tr><td>Temporary stock of milled rice</td><td>5m×5m = 25</td><td></td></tr>
<tr><td>Rice mill machine</td><td>1.5m×3m = 5</td><td></td></tr>
<tr><td>Training instructor</td><td>2 persons×4m^2 = 8</td><td>2 persons</td></tr>
<tr><td>Trainees</td><td>40 persons×1m^2 = 40</td><td>40persons（Maximum）</td></tr>
<tr><td>Clearance</td><td>47</td><td></td></tr>
<tr><td>Sub total</td><td>150</td><td></td></tr>
<tr><td>Outdoor</td><td>Temporary stock for rice husk</td><td>7.2m×7m = 50</td><td></td></tr>
<tr><td>合計</td><td></td><td>200 m^2</td><td></td></tr>
</table></td></tr>
<tr><td>b) Screen house with glass roof</td><td>Cultivation plots being used in existing screen house are transferred and six (6) sets of lysimeter are additionally placed in the proposed screen house.

600m^2: 10m×30m×2 houses:
(semidetached type）
(refer to attached Figure- A6.1.1)</td><td>Cultivation pots being used in existing screen house.
<table>
<tr><th>Item</th><th>Size（L×W）</th><th>Number</th><th>Remarks</th></tr>
<tr><td>Plant pot A</td><td>1.0m×1.0m</td><td>6</td><td>Wooden made</td></tr>
<tr><td>Plant pot B</td><td>1.0m×1.0m</td><td>6</td><td>Wooden made</td></tr>
<tr><td>Plant pot C</td><td>1.2m×1.7m</td><td>10</td><td>Wooden made on concrete basin</td></tr>
<tr><td>Plant pot D</td><td>1.25m×7.5m</td><td>4</td><td>Wooden made</td></tr>
<tr><td>Plant pot E</td><td>φ30cm</td><td>200</td><td>Plastic made</td></tr>
<tr><td>Long table</td><td>1.0m×6.0m</td><td>2</td><td>Wooden made</td></tr>
</table></td></tr>
<tr><td>c) Warehouse for agricultural machinery</td><td>Agricultural machineries procured in the project are stored in this warehouse.
For easy carrying the machineries in and out, clearance between machineries and two machineries each are kept 0.5 m, and 0.9m respectively. One office room (3m×6m) is prepared for storage and maintenance of the equipments.
Minimum required area is estimated 39m×6m=234m^2 as warehouse for agricultural machinery. Working room is provided for research activity using rice mill and fanning mill.
Area of 36m^2 (6m×6m) is presented for above activity. (refer to attached Figure-A6.1.2) Total 270m^2</td><td>Agricultural machinery to be procured
<table>
<tr><th>Item</th><th>Size(B×L)</th><th>Quantity</th></tr>
<tr><td>Walking type tractor</td><td>1.0m×2.5m</td><td>3 台</td></tr>
<tr><td>Trailer</td><td>3.5m×1.5m</td><td>1 台</td></tr>
<tr><td>Attachments</td><td>1.0m×2.0m</td><td>1 式</td></tr>
<tr><td>Tractor</td><td>2.3m×4.0m</td><td>2 台</td></tr>
<tr><td>Trailer</td><td>2.0m×3.0m</td><td>2 台</td></tr>
<tr><td>Disk harrow</td><td>3.5m×2.3m</td><td>2 台</td></tr>
<tr><td>Bottom plow</td><td>3.5m×2.0m</td><td>2 台</td></tr>
<tr><td>Seeder</td><td>2.0m×2.0m</td><td>2 台</td></tr>
<tr><td>Cultivator</td><td>3.0m×2.0m</td><td>1 台</td></tr>
<tr><td>Pesticide spraying machine</td><td>3.5m×2.0m</td><td>1 台</td></tr>
</table></td></tr>
</table>

<table>
<tr><th>Item</th><th>Scale</th><th>Remarks</th></tr>
<tr><td>d) Drying yard</td><td>New trial farm of 2ha and existing trial farm (upland NERICA) of 15ha are expected produce rice yield 55 tons in one time harvesting a year.
Drying yard of 450m^2 is needed to dry up the rice yield separately by 60 times as follows;
Paddy rice : 2ha×5ton/ha＝10ton
Upland rice : 15ha×3ton/ha＝45ton
Total 55ton
Required number of drying
＝55ton÷0.91ton/time＝60times
(3.64m^3×0.25ton/m^3=0.91ton)</td><td> 
</td></tr>
<tr><td>e) Work shop</td><td>Proposed area of 348 m^2 is estimated from required area for the space of equipments to be purchased and repair work.</td><td>Required area
<table>
<tr><th colspan="2">Item</th><th>Required area(m^2)</th><th>Remarks</th></tr>
<tr><td rowspan="14">Indoor</td><td>Administration office</td><td>3m×10m = 30</td><td>Office work、Maintenance</td></tr>
<tr><td>Repairing booth for vehicle</td><td>5m×6m = 30</td><td>Ditch including working space</td></tr>
<tr><td>Arc welding machine</td><td>3m×2m 6</td><td>Storage space</td></tr>
<tr><td>Gas welding machine</td><td>3m×2m 6</td><td>Storage space</td></tr>
<tr><td>Upright drilling machine</td><td>3m×3m 9</td><td>Working space</td></tr>
<tr><td>High speed cutter</td><td>3m×3m 9</td><td>Including working space</td></tr>
<tr><td>Bench grinder</td><td>－ 0</td><td>Installed on working table</td></tr>
<tr><td>Pipe threading machine</td><td>－ 0</td><td>Installed on working table</td></tr>
<tr><td>High pressure washing machine</td><td>3m×2m 6</td><td>Storage space</td></tr>
<tr><td>Hydraulic jack</td><td>3m×3m 9</td><td>Storage space</td></tr>
<tr><td>Working table : 2 sets</td><td>8m×3m×2sets = 48</td><td>Working space with 1.0m clearance</td></tr>
<tr><td>Storage rack for spare parts</td><td>5m×3m = 15</td><td>Working space with 2.0m clearance</td></tr>
<tr><td>Space for shifting machine</td><td>16m×2m+10m×2m = 52</td><td></td></tr>
<tr><td>Clearance at the entrance</td><td>10m×2m 20</td><td></td></tr>
<tr><td>Sub total</td><td>240</td><td></td></tr>
<tr><td>Outdoor</td><td>Repair yard for vehicle</td><td>9m×12m = 108</td><td>Only steel roof is constructed.</td></tr>
<tr><td>Total</td><td></td><td>348 m^2</td><td></td></tr>
</table></td></tr>
</table>

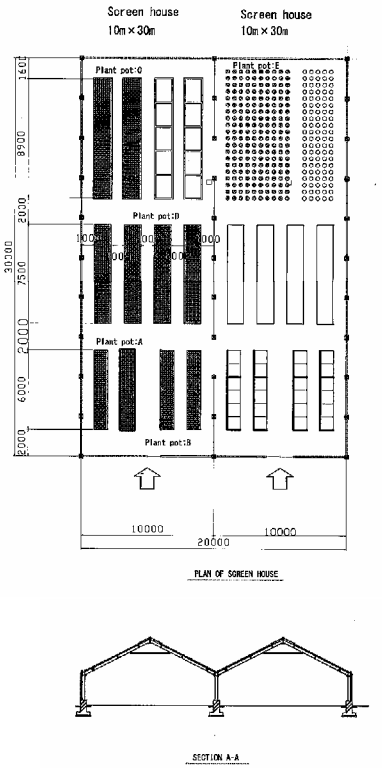


Figure-A6.1.1 Screen house with glass roof

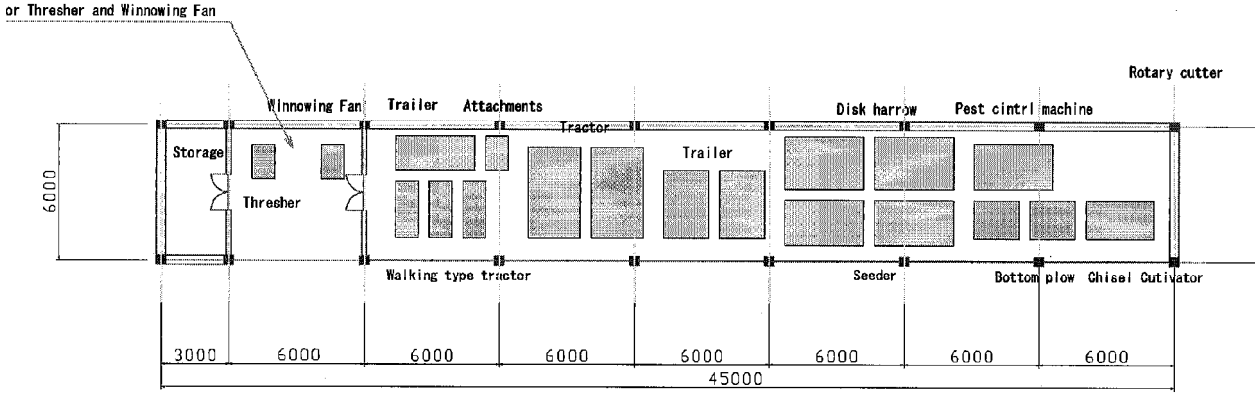


Figure-A6.1.2 Warehouse for agricultural machinery

6.2 List of furniture and fittings and elevated water tank and rainfall tank

6.2 List of furniture and fittings and elevated water tank and rainfall tank

Name	Specification	Quantity	Unit
Research and administration block			
Office desk (Wooden), Chair (Steel))	W=1.2m, D=0.8m, H=0.75m	51	set
Reception table	Including 4 chairs	2	set
Steel book shelf (Rack type)	W=0.9m, D=0.3m, H=2.0m	60	set
Wooden rack	W=0.8m, D=1.2m, H=2.0m	10	set
Wooden rack	W=1.2m, D=0.7m, H=2.0m	10	set
Wooden rack	W=0.9m, D=0.4m, H=2.0m	4	set
Wooden working table	W=1.4m, D=1.2m, H=0.7m	8	set
Laboratory table (Wooden)	W=3.6m, D=0.6m, H=0.7m	4	set
Demonstration panel (Wooden)	W=1.2m, H=1.7m	9	set
Training block			
Table (Wooden)	W=1.8m, D=0.5m, H=0.75m	30	set
Chair (Wooden)		90	set
Platform (Wooden)	W=5.0m, D=2.5m, H=0.3m	2	set
Blackboard (Wooden)	W=3.6m, H=0.9m	2	set
Canteen/Kitchen block			
Table (Steel legs, Plastic board)	W=1.8m, D=0.9m, H=0.75m	12	set
Chair (Steel pipe legs, Plastic back, Plastic seat)		72	set
Counter (Wooden)	W=6.0m, D=0.8m, H=0.9m	1	set
Counter (Wooden)	W=2.0m, D=0.6m, H=0.9m	1	set
Wooden rack	W=3.175m, D=0.6m, H=2.0m	1	set
Wooden rack	W=1.2m, D=0.7m, H=2.0m	3	set
Wooden rack	W=0.9m, D=0.4m, H=1.03m	8	set
Cooking table (Steel)	W=2.0m, D=0.65m	1	set
Cooking table (Steel)	W=2.7m, D=0.65m	1	set
Cooking table (Steel)	W=0.825m, D=0.65m	1	set
Cooking table (Steel)	W=0.9m, D=0.65m	1	set
Cooking table (Steel)	W=1.8m, D=0.9m	3	set
2 basin sink	W=2.1m, D=0.65m	1	set
Burner and trivet (Steel)	W=0.65m, D=0.65m	2	set
Dormitory block			set
Wooden bed	With mattress	12	set
Desk (Wooden), Chair(Wooden)	W=1.2m, D=0.8m, H=0.75m	12	set

Table (Common use) (Steel legs, Plastic board)	W=1.8m, D=0.9m, H=0.75m	1	set
Chair (Common use) (Wooden)		6	set
Closet （Wooden）	W=1.2m, D=0.6m, H=2.0m	12	set
Small kitchen (with sink)	W=2.8m, D=0.6m	7	set
Workshop			set
Office desk (Wooden), Chair (Steel)	W=1.2m, D=0.8m, H=0.75m	1	set
Steel book shelf (Rack type)	W=2.0m, D=0.3m, H=2.0m	2	set
Steel rack	W=1.8m, D=0.7m, H=2.0m	7	set
Working table （Steel）	W=1.8m, D=0.9m	8	set
Warehouse for agricultural machinery			set
Wooden rack	W=2.675m, D=0.4m, H=2.0m	1	set

Elevated water tank and rainfall tank

Name	Specification	Quantity	Unit
Elevated water tank（$2m^3$）	Plastic made	4	set
Elevated water tank（$5m^3$）	Plastic made	4	set
Rainwater re-use tank（$2m^3$）	Plastic made	6	set
Rainwater re-use tank（$5m^3$）	Plastic made	7	set

6.3 List of equipment

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Equipment	Specifications		Q'ty	Unit
Generator	100 kVA, diesel power, soundproof type		1	unit
Solar battery system	About 3 kW solar panel, battery		1	set
Lysimeter	Squire type (100 x 100 x 60 cm)	Indoor type	6	unit
	Data logger	Outdoor type	2	unit
[Research equipment]				
Meteorological observation equipment	Thermometer, hygrometer, rainfall gauge, sunshine meter, wind speed/ direction meter United type, tripod mounted		2	set
[Equipment for trial farm]				
Tractor	4WD, Water cooled diesel engine, 80 PS, ROPS (Roll-Over Protective Structure)		2	unit
Disc plow	3 blade type, for 80 PS tractor		2	unit
Bottom plow	3 blade type, for 80 PS tractor		2	unit
Seeder (1)	For paddy, width: 2.5 m or more, for 80 PS tractor		1	unit
Seeder (2)	For various crops, width: 3.0 m or more, for 80 PS tractor		1	unit
Sprayer	Tank capacity: 800 lit, width: 10 m or more, for 80 PS tractor		1	unit
Cultivator	9 claws or more, for 80 PS tractor		1	unit
Trailer (Traction type)	Capacity: 5 ton, for 80 PS tractor, rear dump		2	unit
[Post-harvest equipment for demonstration]				
Huller/Rice mill	One-pass type, capacity: 700 kg/hr, paddy cleaner, bucket elevator		1	unit
[Workshop equipment]				
Arc Welding Machine	Diesel engine drive, welding current: 250A or more, generator capacity: 10kVA以上or more		1	unit
Gas (Acetylene) Welding Machine	Oxygen, acetylene gas regulator, welding and cutting torch, gas cylinder set, etc.		1	unit
Upright Drilling Machine	Drilling capacity: 23mm (steel), drill set, drill press vise		1	unit
High Speed Cutter	Grinding stone: 350mm, cutting wheel: 20 pcs		1	unit
Bench (Electric) Grinder	Wheel diameter: 200 mm, grinding wheel: 20 pcs, pedestal		1	unit
Pipe Threading Machine	Manual operation, threading capacity: 15-50mm		1	unit
Electric drill	Drilling capacity: 13 mm (steel), drill set		1	unit
Disc sander	Wheel diameter: 100mm, grinding wheel: 20 pcs		1	unit
Mini grinder	Chuck diameter: 6mm, grinding wheel: 20 pcs		1	unit
Electric cord reel	Electric cord		2	pcs
Garage lump	AC100W		2	pcs

Equipment	Specifications	Q'ty	Unit
High Pressure Washing Machine	Discharge volume: 700 liter /hour	1	pc
Garage jack	Lifting capacity: 10 ton or more	1	unit
Portable jack	Lifting capacity: 10 ton or more	2	unit
Rigid rack	Capacity: 3 ton or more	4	pcs
Service creaper	With caster	2	pcs
[Other Tools]			
Air compressor with accessories	Working pressure: 0.9 MPa or more Accessories: air hose, air blow gun, etc.	1	unit
Mechanic tools (for workshop)	Mechanic tools for workshop, more than 100 tools	2	set
Mechanic tools (portable)	Mechanic tools portable, more than 45 tools	2	set
Tap and dies set	Tap, dies, size: M3 – M20	1	set
Torque wrench	5 – 700 Nm, 4 pcs in 1 set	1	set
Lever block	0.75、1.5、3.0ton, each 1 pc/set	1	set
Screw clamp	C type, 100, 125, 150, 200mm, each 1 pc/set	2	set
Solder less terminal kit	30 m	2	set
Circuit tester	Circuit tester (Current, voltage, battery meter, etc.)	1	unit
Hand tachometer	Measuring range: 1 – 10,000 rpm	1	unit
Battery hydrometer	Hydrometer with thermometer	1	set
Battery charger	DC output capacity: 6 – 12V: 70A, 18 – 24V: 35V	1	unit
Grease gun	Capacity: 300 cc	1	pc
Oil bucket pump	Delivery: 40cc/ stroke, container capacity: 20 liter	1	unit
Drum pump	Manual type	2	unit
Portable gantry crane	Lifting capacity: 3 ton, max. lifting height: 3m, accessories: Nylon sling 2 pcs, sling chain: 2 pcs	1	unit
Movable work bench	With caster, mechanic vise	2	unit
Tire service tool set	Tire pressure gauge, valve repair tool, soft hammer, etc.	1	set