資　　料

1　合同評価報告書

NOTE OF UNDERSTANDING OF JOINT EVALUATION ON THE JAPANESE TECHNICAL COOPERATION FOR DEVELOPMENT OF THE DEPARTMENT OF BIOTECHNOLOGY AT THE FACULTY OF FOOD SCIENCE AND BIOTECHNOLOGY UNIVERSITI PERTANIAN MALAYSIA

With about six months left to the termination of cooperation period of " the Development of the Department of Biotechnology at the Faculty of Food Science and Biotechnology, Universiti Pertanian Malaysia (hereinafter referred to as "the Project") " on May 31, 1995, which started on June 1, 1990, as stated in the Record of Discussions, the Japanese Evaluation Team organized by Japan International Cooperation Agency (hereinafter referred to as "JICA"), headed by Prof. Dr. KYOZO CHIBA, Dean, Faculty of Agriculture, Okayama University and the Malaysian Evaluation Team headed by Prof. Dr. MOHAMED SULEIMAN, Deputy Vice-Chancellor (Academic Affairs), Universiti Pertanian Malaysia, composed the Joint Evaluation Team (hereinafter referred to as "the Joint Team") in order to conduct an overall evaluation of the Project.

The Joint Team conducted interviews with the Japanese experts and the Malaysian counterpart personnel assigned to the Project, had a series of discussion with the Malaysian authorities concerned, made field surveys and exchanged views.

As a result, the Japanese Evaluation Team and the Malaysian Evaluation Team agreed upon forwarding to their respective Governments the summary of the evaluation which is referred to in the document attached hereto.

Serdang, Selangor
December 6, 1994

Prof. Dr. KYOZO CHIBA
Leader,
Japanese Evaluation Team
Japan International
Cooperation Agency

Prof. Dr. MOHAMED SULEIMAN
Leader,
Malaysian Evaluation Team
Malaysia

JOINT EVALUATION REPORT ON THE JAPANESE TECHNICAL COOPERATION
FOR
DEVELOPMENT OF THE DEPARTMENT OF BIOTECHNOLOGY
AT THE FACULTY OF FOOD SCIENCE AND BIOTECHNOLOGY
UNIVERSITI PERTANIAN MALAYSIA

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1. INTRODUCTION

Based upon the Record of Discussion (hereinafter referred to as "the R/D") signed by Resident Representative in Malaysia, JICA and Vice-Chancellor, Universiti Pertanian Malaysia (hereinafter referred to as "UPM") on April 19, 1990, the Government of Japan and the Government of Malaysia have been implementing the Project since June 1, 1990. The Project is scheduled to be implemented for five years and is to be completed on May 31, 1995.

The main objective of the Project is to enhance the Department of Biotechnology in UPM through technical guidance and advice to the academic staff for promoting and strengthening education and research activities in the field of biotechnology.

In order to attain the above-mentioned objective, the following cooperation activities have been implemented.

(1) Increasing research capability of the academic staff of the department
   1) To elevate the technical competence of the academic staff and the technical staff by means of technical guidance and advice as well as joint research
   2) To heighten the academic level of the tutors through instruction on researches leading to post-graduate degrees

(2) Overall guidance and advice on the following technical fields:
   1) Enzyme and fermentation technology
   2) Tissue culture
   3) Molecular biology and genetic engineering
   4) Bioprocess engineering

(3) Seminars/workshops on the above-mentioned fields in order to share and confirm the outcomes of the research activities and the progress of the Project

2. MEMBERS OF THE JOINT EVALUATION TEAM

(1) Japanese Members

Dr. Kyozo Chiba : Leader
Dean and Professor, Faculty of Agriculture, Okayama University

Dr. Kazuyoshi Kawazu : Research Planning
Professor, Faculty of Agriculture, Okayama University

Mr. Yukitsugu Okamoto : Management and Administration
International Affairs Planning Division,
Science and International Affairs Bureau, Ministry of Education Science and Culture

Ms. Mayumi Hamada : Effect on Technical Cooperation
Program Officer, Department of Planning and Program,
Foundation for Advanced Studies on International Development

Mr. Masayuki Takahashi : Coordination
Staff, Agricultural Technical Cooperation Division,
Agricultural Development Cooperation Department, JICA

(2) Malaysian Members

Dr. Mohamed Suleiman : Leader
Deputy Vice-Chancellor (Academic Affairs)
Universiti Pertanian Malaysia

Dr. Mohamed Mahyuddin Dahan : Research Planning
Dean and Professor, Faculty of Food Science and Biotechnology
Universiti Pertanian Malaysia

Mr. Mohamed Sani Mistam : Management and Administration
Assistant Director, External Assistance Section
Economic Planning Unit, Prime Minister's Department

Dr. Yaakob B. Che Man : Management and Administration
Deputy Dean and Associate Professor, Faculty of Food Science and Biotechnology
Universiti Pertanian Malaysia

Dr. Gulam Rusul Rahmat Ali : Effect on Technical Cooperation
Head of the Department of Food Science and Associate Professor,
Faculty of Food Science and Biotechnology, Universiti Pertanian Malaysia

Mr. Rashid Abdullah : Coordination
Assistant Registrar, Faculty of Food Science and Biotechnology
Universiti Pertanian Malaysia

3. OBJECTIVES OF THE EVALUATION

3-1. To make a comprehensive and objective evaluation on the achievement of the Project with regard to the contents of the R/D and other official agreements concerned. (The period of the Project subject to the evaluation is five years from June 1, 1990 to May 31, 1995, including scheduled activities and outputs).

3-2. To provide as feedback the results and lessons obtained from the evaluation of the Project to planning and implementation of other projects in the future.

4. EVALUATION OF THE PROJECT

4-1. ITEMS OF THE EVALUATION

The joint team conducted an evaluation survey with regard to the following items:

(1) Project inputs
  1) Inputs from Japan:
    a) Dispatch of experts
    b) Provision of equipments
    c) Acceptance of counterpart (hereinafter referred to as C/P) trainees
    d) Dispatch of survey teams
    e) Supplement of local cost expenditure
  2) Inputs from Malaysia
    a) Provision of land, buildings and facilities
    b) Assignment of Malaysian C/P personnel
    c) Allocation of budget
(2) Project activities and accomplishments
(3) Impacts of the Project

(4) Prospect of project sustainability
(5) Conclusion and recommendations

4-2. METHOD OF THE EVALUATION

(1) The evaluation was conducted in terms of the investigation of the accomplishment of the Project with regard to the items listed in the R/D and the Tentative Schedule of Implementation (hereinafter referred to as "the TSI").
(2) The evaluation was carried out mainly by means of interviews and discussions with personnel concerned, and investigation of the project facilities.

5. RESULTS OF THE EVALUATION

5-1.ACCOMPLISHMENT IN TERMS OF THE INPUT

5-1-1 Contribution of Japan

(1) Dispatch of Experts

Dispatch of experts was defined in the four fields such as Enzyme & Fermentation Technology, Tissue Culture, Molecular Biology & Genetic Engineering, and Bioprocess Engineering. During the five-year project, seven long-term experts were dispatched, and twenty-two relayed short-term experts were dispatched replacing long-term experts as mentioned in the R/D. Twenty-three short-term experts were also dispatched in the fields as mentioned in the R/D.The number of short-term experts mentioned above includes those who will be dispatched by the end of the Project.
(see APPENDIX 1)

(2) Acceptance of Counterpart Trainees

Fifteen counterparts received training in Japan, and three are now under training.
As all the trainees were supervised by the experts who had been dispatched to the Project, they acquired very effective training.
All the counterparts received training at least once, and some of them did twice depending on the progress of technology transfer.
Two laboratory assistants were dispatched in the final year for the training of more effective operation and maintenance of the sophisticated equipments provided.
Two students in the doctoral course to be employed as academic staff are now studying in Japan under the Monbusho Scholarship specially provided for JICA projects.
(see APPENDIX 2)

(3) Provision of Equipments

Equipments provided or brought by the experts have contributed to develop and enhance the research activities in the Department of Biotechnology, and it is also expected that they will contribute more for the future development.
Most of these equipments were locally purchased for quick delivery and easy maintenance.

Fiscal Year	Main Equipments	Total Amount (JPY)
1990	Table Top Ultracentrifuge, FPLC, Micromanipulator, Cell Culture Fermentor	55,353,000
1991	Protein Sequencer, DNA Synthesizer, FT-IR Spectrophotometer, Fermentor System	63,420,000
1992	DNA Sequencer, Ultracentrifuge, HPLC, Jar Fermentor, Programmable Freezer	64,835,000
1993	HPLC with RI Detector, Shaker Incubator, Atomic Absorption Spectrophotometer	38,622,000
1994	Baby Jar Fermentor, Membrane Separator, Gas Chromatography, 2-D Page Electrophoresis	25,000,000 (Estimated)
Total		247,230,000

* Japanese Fiscal Year : April 1-March 31
(see APPENDIXES 3 and 4)

(4) Supplement of Local Cost Expenditure

Besides providing the project site management cost, Japan side has borne other project management cost which is supposed to be borne by the recipient country.
(see APPENDIX 3)

1) Emergency Countermeasure Program

Renovation of the laboratories was done for installation of new equipments.

FY1990 : JPY 2,253,000
FY1991 : JPY 755,000

2) Project Seminar Program

a) A seminar was held in Kuantan to see the progress of technology transfer.
JICA bore a part of the cost of conference room, printing proceedings and so on.
FY1992 : JPY 905,000

b) The second seminar is scheduled to be held on 12-14 January, 1995 to see the results of the project activities.
FY1994 : JPY 850,000 (estimated)

3) Publications for Extension

A brochure was made to introduce the project activities, and it has been widely distributed.

FY1992 : JPY 381,000

4) Model Infrastructure Construction Program

A phytotron facility was constructed in August 1993.

* Phytotron Facility : composed of electronically controlled plant growth cabinets for the research of plant tissue culture and genetic engineering.

FY1992 : JPY 27,126,000

5) Local Recurrent Cost Expenditure Support

To support activities of the experts, JPY12,559,000 was provided as the project site management cost from FY1990 to FY1993. The estimated cost for FY 1994 is JPY3,728,000.

(5) Dispatch of Survey Teams

1) Consultation Survey Team

A consultation survey team was dispatched in April 1991. The team discussed details of the project activities with Malaysia side, and exchanged the minutes, signed by both parties.

2) Technical Guidance Survey Team (Mid-Term Evaluation)

In the third year of the Project, August 1993, the mid-term evaluation was conducted by the dispatched technical guidance team. The team acknowledged that the Project was being implemented as scheduled, and suggested to modify some of research items in the TSI.

During the stay, the Joint Steering Committee was held and the progress report was presented by C/P.

5-1-2 Contribution of Malaysia

(1) Provision of Land, Buildings, and Facilities

1) Buildings

a) Administration

Six rooms were offered for experts and local staff.

- 5 rooms (14 x 18 ft.sq x 5)--Main Building
- 1 room (12 x 16 ft.sq x 1)--Tissue Culture Building

b) Research

Existing research laboratories were offered for collaborative research space.

- Enzyme Technology (1,200 sq.ft.)
- Animal Cell Technology (450 sq.ft.)
- Plant Tissue Culture (1,200 sq.ft.→9,000 sq.ft. after renovation)
- Molecular Biology (1,200 sq.ft.)
- Bioprocess Engineering (1,200 sq.ft.)
- Animal Breeding Shed (210 sq.ft.)

c) Education

Five lecture rooms and two meeting rooms were offered for seminars and meetings.

- 5 Lecture Rooms (22 x 50 sq.ft. x 4, 2,100sq.ft.)
- 2 Meeting Rooms (20 x 21 sq.ft., 45 x 21 sq.ft.)

2) Facilities

a) Furnished office rooms for the team leader, the project coordinator and other experts were offered.

b) Lecture Rooms, Research Laboratories

The above-mentioned space for seminars and research is properly maintained for effective use of the equipments provided.

3) Space for Installation of Equipments

Two rooms (225sq.ft., 90 sq.ft.) were offered for installation of sophisticated equipments, and one room (375 sq.ft.) for analytic equipments.

The space for installation of equipments became insufficient because the equipments increased. The faculty prepared more space for research and installation by renovating an existing building.

4) Land for Phytotron Facility

For the implementation of the Model Infrastructure Construction in FY 1992, the site

(92 x 115 ft.sq) for the phytotron facility was prepared.

5) Parking Space
Enough parking space is available.

(2) Supply and Replacement of Equipments
Replacement and purchase of spare parts for the equipments provided by JICA has been properly done by Malaysia side.

(3) Allocation of Running Expenses (see APPENDIX 5)
1) Official Local Traveling Cost for JICA Experts
None

2) Incidental Expenses for Equipments Provided
The local transportation and installation expenses were included in the cost quoted by competitive bidding, since most of the equipments were purchased from Malaysian agents. The maintenance and operation costs are borne by UPM.

3) Tariff and Taxes Imposed on Equipments
UPM took necessary procedures for exemption of all taxes imposed on the equipments provided.

(4) Assignment of Counterparts and Other Personnel
The counterparts were assigned as follows. (see APPENDIX 6)

	1990	1991	1992	1993	1994
Counterpart	12	16	14	16	15
Project Manager	1	1	1	1	1
Office Staff, Secretary	2	2	2	2	2
Others (Driver, etc.)	1	1	1	1	1
Total	16	20	18	20	19

5-2.PROJECT ACTIVITIES AND ACHIEVEMENTS

5-2-1 Improving Research Capability of the Academic Staff of the Department

(1) Activities
The dispatch of experts and the acceptance of C/P trainees in the fields of Tissue Culture, Enzyme and Fermentation Technology, Molecular Biology and Genetic Engineering started in the first year, and the experts contributed to set up the foundation of the research.
The activities in the field of Bioprocess Engineering started in July 1993.
The dispatched experts have provided C/P with guidance and advice on the researches after they returned to Japan by communicating with their C/P.
As a result of the development of research capability, forty-nine papers were published in five years. Among them, twenty-two papers in total were published in international journals ; two in 1990, one in 1991, two in 1992, six in 1993, and eleven in 1994.
(see APPENDIX 7)

(2) Achievements
The published research papers have increased in number year by year. C/P are actively involved in research works and have capability of conducting research by themselves.

The Joint Team considers the project objective has been achieved.

5-2-2 Overall Guidance and Advice in the Four Technical Fields.

(1) Enzyme and Fermentation Technology

1) Activities

The basic knowledge and techniques mentioned in the TSI was all transferred to C/P, and the research work has been continued on the basis of technology transfer.

The fundamental study of Kojic Acid was completed, and a paper is now being submitted to a journal. On the basis of the result, the research of immobilized microorganism and enzyme is being carried out as a subject of ph.D. thesis by C/P of bioprocess engineering.

2) Achievements

The technology transfer mentioned in the TSI was all implemented. The Joint Team considers the objective has been achieved.

(2) Tissue Culture

1) Activities

The research programs mentioned in the TSI were all implemented, and the fundamental techniques were transferred.

The research on the production of pigment by plant cells needs a novel skill for solution of the problem encountered, and it will take more time to write a paper.

2) Achievements

The research programs mentioned in the TSI were all implemented and fundamental techniques were transferred. The Joint Team considers the objective has been achieved.

(3) Molecular Biology and Genetic Engineering

1) Activities

The technology transfer mentioned in the TSI was fully implemented.

The counterparts acquired the techniques to regenerate transformed plants (musk melon and tobacco). C/P are now writing a paper on gene control system in transformed melon with foreign gene.

The microorganism research group published one paper and more papers were expected to be written.

2) Achievements

As the technology transfer mentioned in the TSI was fully implemented, the objective has been achieved.

(4) Bioprocess Engineering

1) Activities

The technology transfer mentioned in the TSI was almost implemented.

The two counterparts chose two research items in the TSI as their ph.D. thesis subjects, and both of them are now working hard.

The research of this group started in the latter part of the Project, however one paper on production of Kojic Acid derivatives by immobilized enzyme was submitted to a journal as an interim report.

The counterpart working on isolation of α-carotene from crude palm oil is now at the stage of writing a paper.

These researches are progressing well, however they will require three or four more

years to be completed.
A notable result has been obtained in the research on anti-tumor and anti-tumor promoting activities of palm oil.

2) Achievements
The technology transfer mentioned in the TSI was almost completed, and the objective has been almost achieved.

5-2-3 Seminars/ Workshops in the Four Fields
(1) Activities
UPM/ JICA monthly seminar started in 1991, and thirty-eight seminars were held almost every month. This monthly seminar has greatly contributed to develop the research capabilities of C/P.
(see APPENDIX 8)
Kuantan Seminar held in 1992 also stimulated motivation among C/P to do more active research work. (see APPENDIX 9)
The final seminar is scheduled to be held in January 1995 to finalize the project activities and present the results to those concerned.
Through these seminars the experts gave the latest information in the fields, and C/P presented the progress of the researches. These seminars played another important role of enhancing the research capabilities of C/P.

(2) Achievements
Though the final seminar has not been implemented yet, other seminars were implemented as planned and brought about favorable results. Thus the objective has been achieved.
(see APPENDIX 10)

5-3.IMPACTS OF THE PROJECT
5-3-1 Impact
(1) Technical Impact
As mentioned in 5-2-1 (1), forty-nine research papers were published from 1990 to 1994, utilizing the technique and knowledge acquired under the Project. Among them, twenty-two were accepted by international academic journals.
The equipments provided were also utilized by academic staff in other departments of the faculty, which promoted their research activities. As the result, some of the academic staff outside the department jointly conducted research with C/P and became co-authors of some of the papers mentioned above.
C/P have disseminated their knowledge acquired by organizing workshops for those in and outside UPM. Apart from the seminars / workshops supported by JICA, three workshops have been organized by UPM to present the results of researches.
One of the counterparts was invited to an international meeting organized by UNESCO for presentation of his research.

(2) Institutional Impact
Some plans have been formulated such as the Centre for Genetics and Biotechnology, UPM, and Tropical Crops Germplasm Centre in the Faculty of Agriculture. As for the former, the plan was accepted by the government, and UPM is to set up the Centre for Genetics and Biotechnology in the near future.

5-3-2 Influence of the Impact and Range of the Beneficiaries
(1) Impact at the Project Level

The department has been conducting a five-year research program under IRPA (Intensification of Research in Priority Area) funded by the Ministry of Science and Technology.
Also, the department is recognized as the center of reference in the field, and C/P are sometimes requested to give technical advice to policy-makers for R&D in biotechnology.

(2) Impact at the Sector Level

The workshops mentioned in 5-3-1 (1) made technical contribution to the academic community in Malaysia. C/P participated in some national or international seminars / workshops to present their research findings during 1990-1994.
(see APPENDIX 7-A and 7-B)

(3) Impact at Macro Level

Macro level impact has not been observed at this stage. Through the Project, the foundation to develop and enhance the research capability in biotechnology in Malaysia has been established. It is expected that UPM will contribute to the development of human resources in the field in the long term.

5-4 PROSPECT OF PROJECT SUSTAINABILITY

5-4-1 Organizational Prospect of Sustainability

(1) Government Support for Continuance of the Organization

The Department of Biotechnology was established as the initial higher education institution in this field under the government policy to strengthen potential in the development of agriculture and industry in Malaysia.
It is foreseen that the support from the government to UPM in this field will be maintained.

(2) Management and Implementation System

The dean of the faculty, the Project Manager, is capable to manage and supervise three departments in the faculty.
There would not be any problem concerning the management of the institution.

5-4-2 Economic Prospect of Sustainability

(1) Prospect of Resources of Fund

The recurrent cost of the department is covered by the budget from the government as a part of general support to a national university.
There would not be any problem in the budget system.

(2) Fund Generating by Independent Resources

The department has no section for fund-raising.

(3) Other Resources of Fund

Additional research funds are provided by research programs if the proposals are accepted. The department has received funds under the Sixth National Development Plan and support under the Seventh Plan is expected. Besides, each C/P can get research grants by applying for various schemes by themselves.

(4) Necessity of Bearing Recurrent Cost

No necessity is observed.

5-4-3 Physical and Technical Prospect of Sustainability

Basic knowledge and fundamental techniques were transferred in the four fields described in the R/D.
C/P also learned from the experts the practical way of conducting research in UPM.

(2) Allocation of Staff

Dean, Faculty of Food Science and Biotechnology (Project Manager)	--- 1
Head, Department of Biotechnology (Site Manager)	--- 1
Academic Staff	
Enzyme and Fermentation Technology	--- 3
Tissue Culture	--- 2
Molecular Biology and Genetic Engineering	--- 3
Bioprocess Engineering	--- 2
Laboratory Assistant	--- 4
Research Assistant	--- 25
Laboratory Worker	--- 5
Assistant Registrar	--- 1
Faculty Office Staff	--- 14
Department Office Staff	--- 2

(3) Sustainability of Technology Transfer

The techniques transferred have been sustained and used to conduct research by C/P.
In order to ensure the sustainability of the techniques, it is essential that C/P continue research work in UPM utilizing the techniques acquired under the Project.

(4) Plan to Foster Successors

Two students studying in Japan under the Monbusho Scholarship are to be employed as academic staff of the department after they acquire the degree.

(5) Other Restriction on Management and Implementation

There is no particular restriction.

6.Conclusion and Recommendations

6-1 Conclusion

This project was implemented in order to develop the Department of Biotechnology, UPM, the first institution awarding the bachelor degree in Biotechnology in Malaysia aiming at developing biotechnology in Malaysia in the future. This project was performed in line with the fifth (1986-1990) and the sixth (1991-1995) National Development Plans.
The technology transfer described in the TSI has been completed to improve capabilities of C/P in doing research works and enhance their expectation for fruitful research works. C/P now publish much more papers than at the time when this project started.
The enhancement of research activities in this academic field in UPM partly gave impetus to designing new plans of the Centre for Genetics and Biotechnology, UPM and Tropical Crops Germplasm Centre in the Faculty of Agriculture.
The success of this project depends on a lot of factors. For example, the Supporting Committee in Japan with unified and consistent policy strongly supported the implementation of this project. Dispatch of relayed short-term experts replacing a long-term expert made it possible to transfer techniques and skills even in rapidly advancing academic fields.
These would be suggestive for implementing other technical cooperation.
The Joint Team appreciates those who have been concerned in this project, and hope that C/P

will keep their active attitude toward research to produce big glorious fruits in the development of biotechnology in Malaysia in the future.

6-2 Recommendations

(1) The Project should be terminated at the end of May, 1995 as scheduled.

(2) A long-term strategy for human resources development in the field of biotechnology at national level should be formulated by Malaysia side. This will contribute to consolidation of research in biotechnology utilizing the techniques and knowledge obtained through the Project.

(3) Malaysia side requested the channel of technical cooperation be maintained between the two institutions involved in the Project. Both countries should make effort to pursue and strengthen the relationship established through the Project. To this end, the parties concerned should seek the possibility to conduct collaborative work in use of research exchange programs or under JICA schemes to enhance scientific cooperation and exchange between the two countries.

APPENDIX 1. LIST OF JAPANESE EXPERTS

(1) LONG-TERM EXPERTS

1990	1991	1992	1993	1994
KAZUYUKI MORIHARA (TEAM LEADER / ENZYME AND FERMENTATION TECHNOLOGY)				
(91.1.20 - 92.1.31)				
KOJI MITSUGI (TEAM LEADER / MOLECULAR BIOLOGY)				
		(92.1.20 - 93.1.19)		
SUSUMU NAGASAKI (TEAM LEADER / ENZYME AND FERMENTATION TECHNOLOGY)				
				(93.4.28 - 95.1.16)
NOBUO MIYASHITA (COORDINATOR)				
(90.6.20 - 92.12.19)				
HISAKO YAMAMOTO (COORDINATOR)				
			(92.12.10 - 95.5.31)	
OSAMU KIMURA (TISSUE CULTURE)				
	(91.4.1 - 92.3.31)			
HIROSHI SUGISAWA (TISSUE CULTURE)				
			(92.10.1 - 93.9.30)	

APPENDIX 1. LIST OF JAPANESE EXPERTS (CONTINUED)

(2) SHORT-TERM EXPERTS (RELAYED) (* SCHEDULED)

1990	1991	1992	1993	1994
	(ENZYME AND FERMENTATION TECHNOLOGY) TAKESHI SUGIO (91.4.10 - 91.7.9) TATSUO TANO (91.7.3 - 91.9.8) MIKIROU TADA (91.8.27 - 91.11.20) HIROSHI KANZAKI (91.12.21 - 92.3.7)	(MOLECULAR BIOLOGY AND GENETIC ENGINEERING) KENJI INAGAKI (92.7.4 - 92.9.30) TETSUJI YAMADA (92.9.25 - 92.12.16) SHINJI NAGATA (92.12.12 - 92.3.6) (TISSUE CULTURE) SACHIKO MATSUBARA (92.4.28 - 92.6.27) KENJI MURAKAMI (92.7.4 - 92.9.30) (ENZYME AND FERMENTATION TECHNOLOGY) TAKESHI SUGIO (92.7.4 - 92.9.30)	(MOLECULAR BIOLOGY AND GENETIC ENGINEERING) YOSHIHIRO SAWA (93.4.21 - 93.7.15) HIDEHIKO TANAKA (93.7.13 - 93.10.2) NOBUHIRO MORI (93.9.28 - 94.1.3) YUKI ICHINOSE (93.12.28 - 94.1.3) (BIOPROCESS ENGINEERING) SHIGEAKI TAKAGI (93.7.2 - 93.9.30) TAKAHISA OYAIZU (93.9.27 - 93.12.31) MICHIAKI MURAKOSHI (93.12.28 - 94.3.31)	(BIOPROCESS ENGINEERING) TAKAHIRO TANAKA (94.4.5 - 94.7.4) KAZUHIRO NAKANISHI (94.6.28 - 94.7.11) YOSHIHITO SHIRAI (94.7.12 - 94.8.21) SHUICHI YAMAMOTO (94.8.19 - 94.9.7) *SHIGEAKI TAKAGI (94.12.19 - 95.2.18)

APPENDIX 1.- LIST OF JAPANESE EXPERTS (CONTINUED)

(3) SHORT-TERM EXPERTS (GENERAL) (* SCHEDULED)

1990	1991	1992	1993	1994
(TISSUE CULTURE) KAZUYOSHI KAWAZU (90.7.28 - 90.8.15) (ENZYME AND FERMENTATION TECHNOLOGY) KAZUYUKI MORIHARA (90.7.28 - 90.8.10) HIROSHI KANZAKI (90.90.7.28 - 90.8.15) (GENETIC ENGINEERING) KENJI INAGAKI (90.7.28 - 90.8.15) (LEADER / TISSUE CULTURE) KAZUYOSHI KAWAZU (90.11.5 - 91.2.1)	(ENZYME AND FERMENTATION TECHNOLOGY) NORIAKI KISHIMOTO (91.7.23 - 91.8.11) KEN IZUMORI (91.8.20 - 91.9.8) (TISSUE CULTURE) TETSUJI YAMADA (91.7.26 - 91.8.23)	(MOLECULAR BIOLOGY / GENETIC ENGINEERING) HIROSHI KANZAKI (92.7.21 - 92.8.21) HIDEHIKO TANAKA (92.8.6 - 92.8.17) (TISSUE CULTURE) SANETAKA SHIRAHATA (92.7.24 - 92.8.21) KAZUYOSHI KAWAZU (92.8.6 - 92.8.16) (ENZYME AND FERMENTATION TECHNOLOGY) TATSUO TANO (92.8.6 - 92.8.17)	(ENZYME AND FERMENTATION TECHNOLOGY) OSAO ADACHI (93.7.16 - 93.8.9) (BIOPROCESS ENGINEERING) KENJI SONOMOTO (93.7.24 - 93.8.16) (MOLECULAR BIOLOGY / GENETIC ENGINEERING) MANABU SUGIMOTO (93.7.27 - 93.8.19) (TISSUE CULTURE) FUSAO MOTOYOSHI (93.7.27 - 93.8.21)	(MOLECULAR BIOLOGY / GENETIC ENGINEERING) TETSUJI YAMADA (94.4.20 - 94.5.10) *HIDEHIKO TANAKA (95.1.10 - 95.1.17) (BIOPROCESS ENGINEERING) *TSUNEO YAMANE (94.12.23 - 95.1.5) (TISSUE CULTURE) -LEADER- *KAZUYOSHI KAWAZU (95.1.6 - 95.5.31) *TETSUJI YAMADA (95.1.10 - 95.1.17) (ENZYME AND FERMENTATION TECHNOLOGY) *KOJI MITSUGI (95.1.10 - 95.1.17)

APPENDIX 2. JAPANESE INPUT: LIST OF TRAINEES ACCEPTED

1990	1991	1992	1993	1994	TOTAL
Ms. Hasanah Mohd. Ghazali (90.8.20 - 90.10.19) Dr. Gan Yik Yuen (90.8.20 - 90.10.19) Dr. Lee Kong Hung (90.11.05 - 91.1.24) Dr. Baharuddin Abdul Ghani (90.11.5 - 91.1.24) (4 PERSONS)	Dr. Mohamed Mahyuddin M. D. (91.5.16 - 91.5.30) Dr. Abdul Manaf Ali (91.5.13 - 91.8.4) Dr. Norihan K. T. Mohd. Saleh (91.10.24 - 91.12.15) (3 PERSONS)	Mr. Mohamed Ali Hassan (92.5.7 - 92.7.5) Dr. Suhaimi Napis (92.10.15 - 92.12.12) Dr. Noor Aini A. Rashid (92.10.12 - 92.12.12) (3 PERSONS)	Dr. Mohd. Ismail A. Karim (93.4.13 -93.6.30) Dr. Junainah Abd. Hamid (93.4.13 - 93.6.30) Mr. Badlishah Sham Baharin (93.11.16 - 94.2.9) (3 PERSONS)	Mr. Arbakariya B. Ariff (94.4.12 - 94.7.2) Mr. Md. Ali B. Hassan (94.4.12 - 94.6.24) Dr. Norihan Mohd. Saleh (94.10.3 - 94.12.17) Ms. Noorliza H.M. Shariff (94.10.31 - 94.12.17) Mr. Rosli Bin Aslim (94.10.31 - 94.12.17) (5 PERSONS)	18 PERSONS

APPENDIX 3. JAPANESE INPUT : PROVISION OF EQUIPMENTS, AND SUPPLEMENT OF LOCAL COST EXPENDITURE

(Costs are in 1000 JPY)

TYPE\FY		1990	1991	1992	1993	1994	TOTAL
EQUIPMENT	PROVISION OF EQUIPMENTS	55,353	63,420	64,835	38,622	25,000 (estimated)	247,230 (estimated)
	EQUIPMENTS BROUGHT BY EXPERTS	2,828	3,161	4,443	4,087	2,400 (estimated)	16,919 (estimated)
MODEL INFRASTRUCTURE CONSTRUCTION PROGRAM		0	0	27,126	0	0 (estimated)	27,126 (estimated)
PUBLICATIONS FOR EXTENSION		0	0	381	0	0 (estimated)	381 (estimated)
EMERGENCY COUNTERMEASURE PROGRAM		2,253	755	0	0	0 (estimated)	3,008 (estimated)
LOCAL RECURRENT COST EXPENDITURE		2,495	3,186	4,303	2,575	3,728 (estimated)	16,287 (estimated)
PROJECT SEMINAR PROGRAM		0	0	905	0	850 (estimated)	1,755 (estimated)
DISPATCH OF SURVEY TEAMS			Consultation Survey (91.4.22 - 5.01)		Technical Guidance Survey (93.8.10 - 93.8.19)	Evaluation Survey (94.11.29 - 12.8)	

APPENDIX 4
LIST OF EQUIPMENTS PROVIDED BY JAPAN

I T E M	Unit	Pledge	Arrival	Utili.	Mainte.
I .Research Use Equipment					
1.Table Top Ultra Centrifuge	1	1990	11/90	A	Good
2.French Pressure Cell	1	1990	12/90	D *1	Good
3.Baby Fermentor	1	1990	3/91	D *2	Good
4.Chromatogram-Scanner	1	1990	12/90	C	Good
5.Micromanipulator	1	1990	12/90	C	Good
6 Cell Culture Fermentor	1	1990	11/90	C	Good
7.Electric Cell Fusion	1	1990	12/90	C	Good
8.High Speed Refrig.Centrifuge	1	1990	11/90	A	Good
9.FPLC	1	1990	12/90	C	Good
10.Generator	1	1990	3/91	C	Good
11.Single Fermentor Control System	1	1990	11/90	C	Good
12.Scanning Spectrophotometer	1	1990	12/90	A	Good
13.Shaker Incubator	1	1990	12/90	A	Good
14.Water Purification System	3	1990	12/90	A	Good
15.Ultra Low Temperature Freezer	1	1990	2/91	A	Good
16.Fraction Collector	2	1990	12/90	B	Good
17.Freeze Dryer	1	1990	12/90	A	Good
18.Autoclave(HA-300M)	1	1990	3/91	A	Good
19.Autoclave(HA-240M)	1	1990	3/91	A	Good
20.Growth Cabinet	1	1990	12/90	D *3	Good
21.Microflex Fully Auto.Camera	1	1990	12/90	C	Good
22.Inverted Microscope	1	1990	12/90	C	Good
23.Fiber Optics Bifurcated Illumi.	1	1990	12/90	C	Good
24.Stereoscopic Zoom Micrscope	1	1990	12/90	C	Good
25.Co2 Incubator	1	1990	3/91	A	Good

APPENDIX 4 (continued)

26. Air Conditioner	2	1990	1/91	A *4	Good
27. Rotary Vacuum Evaporator	1	1990	7/90	A	Good
28. Test Tube Concentrator	1	1990	/90	B	Good
29. Protein Sequencer	1	1991	10/91	D *5	Good
30. DNA Synthesizer	1	1991	12/91	D *6	Good
31. Electrophoresis	1	1991	12/91	B	Good
32. Elisa Reader	1	1991	10/91	B	Good
33. Fermentor Control System	1	1991	10/91	D *7	Good
34. Universal Research Microscope	1	1991	11/91	C	Good
35. FT-IR Spectrophotometer	1	1991	12/91	D *8	Good
36. Gas Chromatograph	1	1991	1/92	B	Good
37. PCR (DNA Thermal Cycler)	1	1991	10/91	C	Good
38. Micro Refrigerated Centrifuge	1	1991	12/91	A	Good
39. Water Pressure Pump	1	1991	9/91	D *9	--
40. Cell Mill Homogenizer	1	1991	10/91	A	Good
41. Biological Safety Cabinet	1	1991	9/91	A	Good
42. Hollow Fiber Concentrator	1	1991	11/91	B	Good
43. Ultrasonic Wave Washer	1	1991	12/91	C	Good
44. Air Lift Fermentor	1	1992	12/92	B	Good
45. Jar Fermentor	1	1992	11/92	B	Good
46. High Speed Centrifuge	1	1992	11/92	A	Good
47. Ultracentrifuge	1	1992	2/93	B	Good
48. HPLC	1	1992	3/93	A	Good
49. Potentiostat	1	1992	2/93	C	Good
50. Programmable Deep Freezer	1	1992	12/95	C	Good
51. Cell Counter & Analyser	1	1992	11/92	B	Good
52. DNA Sequencer	1	1992	12/92	D *10	Good
53. Nucleic Acid Sequencing Gel Sys	1	1992	11/92	C	Good
54. Ice Flake Machine	1	1992	12/92	A	Good
55. Polaroid Camera	1	1992	10/92	A	Good

APPENDIX 4 (continued)

56. Blotting System	1	1992	3/93	C	Good
57. Sonicator	1	1992	12/92	C	Good
58. Laminar Flow Cabinet	1	1992	10/92	A	Good
59. Filtration System	1	1992	11/92	C	Good
60. Oxygen Controller	1	1992	5/93	B	Good
61. pH Controller	1	1992	3/93	C	Good
62. Viscometer	1	1992	2/93	C	Good
63. Spectrophotometer	1	1992	10/92	B	Good
64. Swing Out Rotor for Centrifuge	1	1992	2/93	B	Good
65. Fume Cupboard	1	1992	11/92	A	Good
66. Autoclave (120 ℓ)	1	1992	8/93	A	Good
67. Autoclave (47 ℓ)	1	1992	12/92	A	Good
68. Cooling Aspirator	1	1992	3/93	A	Good
69. Voltage Stabilizer	3	1992	10/92	A	Good
70. Trans Illuminator	1	1992	7/92	C	Good
71. HPLC with RI Detector	1	1993	3/94	A	Good
72. Incubator Shaker	4	1993	3/94	A	Good
73. Orbital Shaker	2	1993	3/94	A	Good
74. Electroporator	1	1993	2/94	C	Good
75. Microtome & Tissue Processing	1	1993	1/94	C	Good
76. Atomic Absorption Spectrophoto.	1	1993	3/94	D*11	Good
77. Bench Top Refrig. Centrifuge	1	1993	12/93	B	Good
78. Deep Freezer	1	1993	2/94	A	Good
79. Angle Rotor for Centifuge	1	1993	12/93	A	Good
80. Refrigerator (500 ℓ)	1	1993	11/93	A	Good
81. Refrigerator (1,000 ℓ)	1	1993	12/93	A	Good
82. Bench Top Autoclave	3	1993	11/93	A	Good
83. Ultrafiltration System	1	1993	1/94	C	Good
84. Gel Electrophoresis & PowerPack	1	1993	1/94	B	Good
85. Cell Centrifuge	1	1993	2/94	C	Good

APPENDIX 4 (continued)

86.Process Controll Package	1	1993	1/94	B	Good
87.Hybridization Oven	1	1993	1/94	A	Good
88.Dehumidifier	4	1993	11/94	A	Good
89.Microcentrifuge	1	1993	12/93	B	Good
90.Illuminated Growth Rack	1	1993	12/93	A	Good
91.Dark Incubator	1	1993	3/94	A	Good
92.CO2/O2/N2 Incubator	1	1993	3/94	A	Good
93.Roller Bottle System	1	1993	2/94	C	Good
94.External Filter	1	1993	3/94	C	Good
95.Peristaltic Pump	1	1993	1/94	B	Good
96.Filter Sterilization	1	1993	1/94	D*12	Good
97.FPLC Column	1	1993	2/94	C	Good
98.Rotor for High Speed Centrifuge	1	1993	3/94	B	Good
99.Gradient & Mixing Pump for HPLC	1	1993	3/94	C	Good
100.Transilluminator Camera	1	1993	7/93	C	Good
101.Baby Jar Fermentor	1	1994	10/94	Just Installed	
102.Membrane Separator	1	1994	not yet delivered		
103.HPLC	1	1994	not yet delivered		
104.Gas Chromatography	1	1994	not yet delivered		
105.Stereoscopic Microscope	1	1994	9/94	Just Installed	
106.Preparative Fraction Collector	1	1994	10/94	Just Installed	
107.Deep Freezer	1	1994	not yet delivered		
108.Laminar Flow Cabinet	2	1994	not yet delivered		
109.2-D Page Electrophoresis	1	1994	10/94	Just Installed	
110.Isoelectric Focusing System	1	1994	10/94	Just Installed	
111.Ice Flake Machine	1	1994	not yet delivered		
112.Fume Cupboard	1	1994	not yet delivered		
113.UV Visible Sepctrophotometer	1	1994	not yet delivered		
114.Homogenizer	1	1994	not yet delivered		
115.Growth Cabinet	1	1994	not yet delivered		

APPENDIX 4 (continued)

116. Electronic Analytical Balance	2	1994	10/94	Just Installed	
117. Electronic Top Pan Balance	2	1994	10/94	Just Installed	
118. Vacuum Oven	1	1994	not yet delivered		
II. Office Use Equipment					
1. Vehicle (Ford)	1	1990	10/90	A	Good
2. Vehicle (Subaru)	1	1990	11/90	A	Good
3. Wordprocessor			6/90	A	Good
4. Copy Machine	1	1990	9/90	A	Good
5. Facsimile Machine	1	1990	8/90	A	Good
6. Personal Computer (NEC)	1	1990	11/90	A	Good
7. Personal Computer (McCintosh)	1	1990	12/90	A	Good
8. Camera	1	1991	91	C	Good
9 Wordprocessor	1	1991	1/92	A	Good
10. Vehicle (Toyota)	1	1992	1/93	A	Good
11. Copy Machine	1	1992	9/92	A	Good
12. Wordprocessor	1	1992	10/92	A	Good
13. Facsimile Machine	1	1993	12/93	A	Good
14. Computer	1	1994	not yet delivered		

APPENDIX 4 (continued)

Note: Utili.--Utilization

A=Daily Used

B=Weekly Used

C=Occasionally Used for Its Function

D=Seldom Used

Mainte.--Maintenance Condition

Good

Fair

Poor

*1 --Function is not sufficient for the present research

*2 --Under repairing

*3 --Not used during MKT renovation work

*4 --1 unit was broken down

*5 --No sample is available yet

*6 --No sample is available yet

*7 --Certificate for the boiler room is not available yet

*8 --No sample is available yet

*9 --Broken down and replaced by a new one

*10 -No sample is available yet

*11 -No sample is available yet

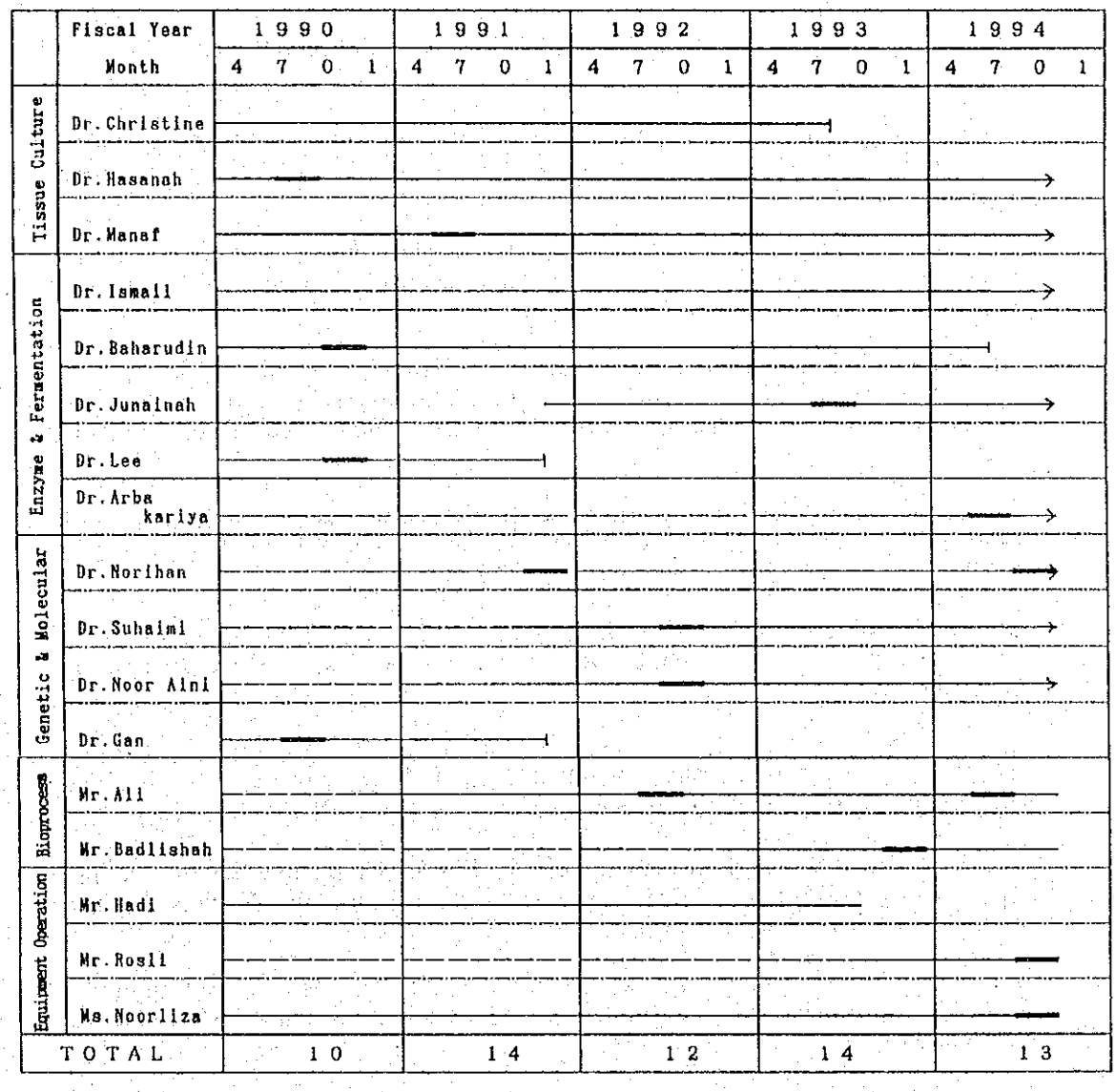
*12 -Delay of research progress

APPENDIX 5 MALAYSIAN INPUT

	1 9 9 0	1 9 9 1	1 9 9 2	1 9 9 3	1 9 9 4
ProjectManager	Project Manager --1	Project Manager --1	Project Manager --1	Project Manager --1	Project Manager --1
Allocation of Couterparts	Site Manager --1 Enzyme&Fermentation --3 Tissue Culture --3 Molecure & Genetic --2 Laboratory Assistant--2	Site Manager --1 Enzyme&Fermentation --4 Tissue Culture --3 Molecure & Genetic --4 Bioprocess Engineer.--1 Laboratory Assistant--2	Site Manager --1 Enzyme&Fermentation --3 Tissue Culture --3 Molecure & Genetic --3 Bioprocess Engineer.--1 Laboratory Assistant--2	Site Manager --1 Enzyme&Fermentation --4 Tissue Culture --3 Molecure & Genetic --3 Bioprocess Engineer.--2 Laboratory Assistant--2	Site Manager --1 Enzyme&Fermentation --4 Tissue Culture --2 Molecure & Genetic --3 Bioprocess Engineer.--2 Laboratory Assistant--2
Financial Contribution (RM)	Management 50,000 Research Allocation 270,000	Management 65,000 Research Allocation 1,298,000	Management 75,000 Research Allocation 1,041,000	Management 88,000 Research Allocation 716,500 Phytotron 31,800 Renovation 5,000	Management 100,000 Research Allocation 747,730 Renovation 980

APPENDIX 6

ALLOCATION OF COUNTERPART PERSONNEL



APPENDIX 7-A

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APPENDIX 7-B (continued)

Tee, G.B., Ghazali, H.M., Junainah, A.H. and Jamilah, B. (1994). Isolation, purification and characterisation of cholesterol ester hydrolase from *Staphylococcus* sp. Dalam 'Proceedings of the Second Symposium in Trends in Biotechnology - Meeting the Challenges of the 21st Century' [Eds. Ghazali, H.M., Norihan, M.S. and Noor Aini, A.R.], UPM, ms 190-191.

APPENDIX 8

UPM/JICA MONTHLY SEMINAR

	DATE	SPEAKER	TOPIC
1	3/ 4/1991	Prof.K.Morihara	Molecular Genetic Study of Pseudomonas Aeruginosa Elastase
		Dr.M.Ismail A.K.	Highlights on Fermentation Technology Reserach at the Faculty of Food Science and Biotechnology
2	8/ 4/1991	Mrs.Zaiton (Dep.Food Science)	Pigments from Monascus sp.
		Dr.Baharuddin	Study on Thermostable Amylase
3	6/ 6/1991	Dr.Hasanah	Enzymes and Plant Cell Culture: The Twain Shall Meet
		Prof.T.Sugio	The Mechanism pf Sulfur Oxidation by Thiobacillus Ferrooidans
4	3/ 7/1991	Dr.Lee Kong Hung	Protein Analysis
		Dr.Abdullah Sipat	Rennin-like Protease from Kesinai (Streblus Asper)
5	7/ 8/1991	Prof.T.Tano	Some Properties and Utilization of Acidophilic,Mesophilic and Heterotrophic Bacteria
		Mr.Ali Hassan	Promotive Effects of Zinc on the Performance of UASB Reactors
6			No Record
7	9/10/1991	Prof.K.Morihara	1) Some Topics in Workshop on "Enzyme in Peptide Synthesis" (2-6/9/'91 Germany) 2) Thermolysin Catalyzed Semisynthesis of Peptide Hormones by Introduction of Phe-NH or Tyr-NH at the Carboxyl Termini
		Dr.Nasir	Sago Starch Research at FSMB
8	6/11/1991	Prof.M.Tada	Photoregulation of Carotenogenesis in Red Yeast
		Dr.Abdul Manaf Ali	Production of Hybridomas

APPENDIX 8 (continued)

9	4/12/1991	Mr.O.Kimura	Pigment Production by Using Plant Cell Culture
		Dr.Zaliha	In Vitro and Molecular Studies on Sago Palm
10	15/ 1/1992	Dr.Suhaimi Napis	Methods for Genetic Mapping/Genome Fingerprinting with Special Reference to RFLP and Rapid Analyses on Oilseed Rape (Brassica Napusl.) Varieties
		Dr.Norihan Salleh	Molecular Studies of Wild-Abortive and Fertile Cytoplasms in Rice
11	19/ 2/1992	Dr.H.Kanzaki	Three-Dimensional Structure and Site-Directed Mutagenesis of Tryptophan Synthase from Salmonella Typhimurium
		Mrs.Noor Aini	Cloning and Expression of CDNA for Aspergillus Niger Glucoamylase
*	4/ 3/1992	Dr.H.Kanzaki	Kojic Acid Fermentation
12	11/ 3/1992	Dr.Junainah	Biosensors in Food Analysis
*	20/ 3/1992	Mr.O.Kimura	Red Pigment Production by 'Senduduk' Culture
13	12/ 5/1992	Dr.Abdullah Sipat	DNase in Latex
		Dr.K.Mitsugi	Enzymatic Production of Adenine-Arobinose (Ara-A:Anti-Viral Agent) --One of 'Serendipitous' Experiences--
14	18/ 6/1992	Dr.Christine	1) Towards the Developement of an Improved Cultivar of Muskmelon for Malaysia 2) Research Project of the National Plant Biotechnology Commiittee
15	15/ 7/1992	Dr.K.Inagaki	Gene Cloning, Purification and Characterization of 3-Isopropylmalate Dehydrogenase from Chemolithoautotroph Thibacillus Ferrooxidans
		Mr.K.Murakami	Callus and Protoplast Culture of Colocasia Esculenta

APPENDIX 8 (continued)

16	26/ 9/1992	Dr.K.Inagaki	Progress Report of Joint Projects on Molecular Biological Studies of Micro-organisms
		Mr.K.Murakami	Protoplast Culture and Somatic Embryo-genesis of Muskmelon (Cucumis Melo)
17	30/10/1992	Prof.H.Sugisawa	Aroma Profiles of Peel Oils of Acid Citrus
18	11/12/1992	Dr.T.Yamada	1) Progress in Joint Research on Plant Genetic Transformation 2) Recent Progress on the Study of Plant Active Defense Genes
		Mr.Shaifulddin Wahi bin Wahab (RA)	Construction of Plant Expressible Recombinant DNA
		Mr.Tan Siang Hee (RA)	GUS Assay in Transgenic and Transiently Transformed Plants
19	13/ 1/1993	Mrs.Noor Aini	Cloning and Expression of Alkaline Proteinase from Pseudomonas Aeruginosa
		Dr.Suhaimi	All Sorts of Genetic Engineering Strategy to Protect Plants from Viral and Pathogen Infections
		Miss Madihah Md. Saleh (RA)	Kojic Acid Fermentation Using Local Fungi (Strain 44-1)
20	3/ 3/1993	Dr.S.Nagata	My Strategy in Genetic and Protein Engineering
		Dr.Kamaruzaman Ampon (Dept.of Biochemistry, FSAS)	The Effect of Attachment of Hydrophobic Modifier on the Catalytic Activities of Lipase and Trypsin
21	14/ 4/1993	Mr.Mohd.Ali Hassan	Enzymatic Hydrolysis of Sago Starch from the Laboratory to Pilot Plant
22	5/ 5/1993	Dr.Halim Hamat	Molecular Biology Research in Rice; Cloning of Nitrate Reduetace Gene and Tungro Virus in Rice.
23	23/ 6/1993	Dr.Y.Sawa	Structure and Function of Bacterial Enzymes in Amino Acid Metabolism

APPENDIX 8 (continued)

24	28/ 7/1993	Prof.O.Adachi	Pyrroloquinoline Quinone, PQQ, a Novel Coenzyme and Oxidative Fermentation
		Dr.Ismail Dr.Junainah	Report on UPM/JICA Counterpart Training Programme in Japan
25	18/ 8/1993	Prof.F.Motoyoshi	Biocontrol of Plant Virus Diseases 1)Attenuated Viruses 2)Transgenic Plants
		Mr.Ali Hassan	Nitrification and Denitrification with Immobitised Cells in Gas-Lift Bioreactor
*	22/ 9/1993	Prof.H.Sugisawa	Useful Secondary Metabolites from Plant Tissue Culture --Volatiles and Pigments--
26	29/ 9/1993	Prof.S.Takagi	Absorption and Metabolism of β-Carotene by Rat Inversed Intestine
		Prof.H.Tanaka	My Research Life--Past and Present--
		Dr.Baharuddin	Development of Cloning Strategies of Thermophiric Bacilli Strain SB-1
		Dr.Junainah	Isolation and Purification of Microbial Enzymes
		Mrs.Noor Aini	
27	20/10/1993	Mr.Badlishah	Controlled Operation of Microfiltration for Clarification of Microbial Broth
			Studies of Isolation of α-Carotene and Other Related Compounds from Palm Oil
28	24/11/1993	Dr.N.Mori	Screening, Purification and Properties of Carnitine Dehydrogenase Having a Low Km Value for L-Carnitine
			Cloning, Sequencing and over Expression of Betaine Aldehyde Dehydrogenase Gene from Xanthomonas Translucens
29	22/12/1993	Mr.T.Oyaizu	Commercial Scale Recovering Process and Biological Activities of Palm Fruit Carotene
			Isolation of α-Carotene from Crude Palm Oil and Fundamental Studies for Its

APPENDIX 8 (continued)

			Commercialization -Progress Report on the Isolation Study-
30	26/ 1/1994	Dr. Arbakariya	Kinetics and Modelling of Glucoamylase Fermentation by Aspergillus Awamori
31	23/ 2/1994	Dr. M. Murakoshi	Cancer Preventive and Anti-Cancer Activity of Natural Carotenes and Tocopherols from Palm Fruit Oil
		Dr. Hanaf	Establishment of Mouse Hybridomas for the Production of Monoclonal Antibodies
32	23/ 3/1994	Dr. Y. Ichinose	Molecular strategy for the Elucidation of the Regulation of Plant Disease Resistance-and Susceptible-Related Genes
		Dr. Norihan	Regulation of PAC Gene in Muskmelon
33	27/ 5/1994	Ms. Kartini (RA)	Isolation and Separation of Carotene from Plam Oil
		Ms. Madihah (RA)	Fermentation Study of Kojic Acid Producing Fungus Strain 44-1
34	22/ 6/1994	Prof. Kawazu	A Novel Method of Screening Glucose-Rich Microbial Culture Filtrates for Insect Trehalase Inhabitors with Removal of the Glucose
		Mr. Tanaka	Analysis of Glycolipids in Palm Oil
		Ms. Sharifah (Ph. D. Student)	2-D Electrophoresis of Plant Protein
35	6/ 7/1994	Prof. Nakanishi	Some Topics in Enzyme Engineering, Fermentation Technology and Membrane Technology
36	17/8/1994	Dr. Shirai	Production of Biodegradable Plastics by Photosynthetic Bacteria Coupling with Waste Water Treatment
		Mr. Ali Hassan	Modification of Kojic Acid with β-Galactosidase
37	3/9/1994	Dr. S. Yamamoto	Engineering Analysis of Chromatographic Separation of Bioproducts -Towards Simple and Reliable Methods for Rational Design, Optimization & Scale up

APPENDIX 8 (continued)

38	26/10/1994	Mr.Mohi Uddin (Ph.D.Student)	Optimization of Regeneration and Agrobacterium Mediated Transformation of Cucumber(Cucumis Sativus) and Molecular Evaluation of Genetic Fidelity of the Regenerants/Transformants

APPENDIX 9

KUANTAN SEMINAR (10-12 August, 1992)
PROGRAMME

Field A: Enzyme and Fermentation Technology

* Purification and Some Properties of an Acidic ß-Glucosidase from *Acidobacterium capsulatum*
Tano, T.

Kojic Acid Fermentation by a Local Fungus, Strain 44-1
Baharuddin. A. G., H., Sugio, T., Tada, M., Mohamed Ismail, A.K., Mohd. Ali, H., Madihah,S., Mitsugi,K and Tano. T.

Formation of Ferric Chloride-Positive Compound by a Local Fungus, Strain 33-2
Baharuddin, A. G., Sugio, T., Zulkifli, H., Kishimoto, N., Mohamed Ismail, A.K. and Tano, T.

Isolation and Chracterization of a Mo^{6+}- Reducing Bacterium
Baharuddin,A.G., Sugio, T., Zulkifli, H., H., Kishimoto,N., Mohamed Ismail,A.K. and Tano,T.

The Mechanism of Mo^{6+}-Reduction by *EnterobacterPY SP. strain 48*
Baharuddin,A. G., Takai,M., Mohamed Ismail, A.K. Tano,T. and Sugio, T.

* *Organisational Integration of Agriculture Biotechnology R & D in MARDI*
Mohamed Tamin, M.S.

The Application of Elastase in Peptide Synthesis: Aspartame Precursor
Siaw,Y.S., Lee, P.M., Lee, K.H. and Morihara, K.

Field B: Tissue Culture

* *Production of Novel Secondary Metabolites by Plant Cell Cultures*
Kawazu,K.

Preliminary Studies on the Induction of Coloured Calli from Melastoma melabathricum*(Senduduk) Fruits and Identification of the Major Pigments Produced*
Hasanah,M.G., Kimura,O, Asma,M., Siti Zakiah,R., Alang, Z.C. and Kawazu,K.

*Callus Culture and Protoplasts studies of Muskmelon (*Cucumis melo L.)
Saleh,N.M., Tan,S.H., Murakami,K., Alang,Z.C., Matsubara,S., and Kawazu,K.

*Studies on Regeneration and Transformation in Chilli (*C.annum cv.*Lnagkap)*
Alang,Z.C., Chow,S.M., Yamada,T. and Kawazu,K.

APPENDIX 9 (continued)

* *The Chemistry of Medicinal Plants and Some Elements in Collaborative Research*
Nordin,H.L.

Enhancement of Productivity of Animal Cells for Production of Useful Substances
Shirahata,S. and Murakami,H.

Establishment of Human-Human Hybridomas Secreting Monoclonal Antibodies against Stomach Cancer Cell and Cultivation in Serum-Free Medium
Ali,A.M., Kawahara,H., Hayashida,M., Sugahara,T., Akiyama,K., Shirahata,S. and Murakami,H.

Productionm of Monoclonal Antibodies against New Castle Disease Virus(NDV)
Ali,A.M., Yusof,K.M., Hamid,ddddM., Misnan,H., Sikas,M.K.M., Napis,S., Mitsugi,K. Shirahata,S., Murakami,H. and Ibrahim,L.

Field C: Molecular Genetics, Genetic Engineering and Others

* Biological Aspects of Selenium Amino Acids and Selenium Peptides
Tanaka,H.

Site-Directed Mutagenesis of Alkaline Proteinase from *Pseudomonas aeruginosa* IFO 3455
Abdul Rashid,N., Sipat,A., Hasanah,M.G., Adly,S.S., Inagaki,K., Abdullah,S., and Morihara,K.

Preliminary Studies on *Agrobacterium* Transformation of Muskmelon var. Birdie using Leaf Discs
Alang,Z.C., Saimat,R., Yamada,T. and Kawazu,K.

Exo-Nucleolytic Reaction of Deoxyribonuclease from the latex of *Hevea brasiliensis*
Sipat,A., Yusof,K.M., Ampon,K. and Mohd. Arif,S.

Preminary Study on the Effect of Dissolve Oxygen on the Growth and Sporulation of *Bacillus sphaericus* 2362
Mohamed Ismail,A.K. and Rogers,P.L.

Multi-Enzyme Membrane Electrodes for the Analysis of Starch in a Flowing Stream
Junainah,A.H., Moody,G.J., and Thomas,J.D.R.

Specific Cake Resistances of *Escherichia coli* Broths during Membrane Filtration
Mohd. Ali, H., Yakagi,S., Tanaka,T. and Nakanishi,K.

A Hind III Family of Satellite DNA in *Brassica napusL.*
Napis,S. and Croy,R.R.D.

APPENDIX 10

JICA/UPM Research Project Progress Report (1993/1994)

A. ENZYME AND FERMENTATION TECHNOLOGY

The overall objectives of the research are geared towards understanding of fundamental aspect and application of enzymes; study of beneficiai microorganisms and establishment of some fundamental techniques of enzymes and fermentation technology.

Research Projects: Current Status

A1. Beneficial microorganisms in production of organic acids.

A1-(1) Studies on isolation of potential high kojic and itaconic producing microorganisms and the production of organic acids by fermentation technology.

Out of the 171 cultures previously being isolated strain 44-1 has been identified to produce high yield of kojic acid. The mutant strain was able to produce 50g/L kojic acid using suitable identified medium. Kinetic study work done indicated production of kojic acid by *Aspergillus flavus* Link was greatly influenced by the degree of aeration, Na Cl, methanol and addition of antifoam. Work is also in progress on using immobilization technique on kojic acid production. The use of various polymers for the immobilization process in being looked into. The study is slightly being hampered due to the unavailability of polymers which has been consumed earlier in the experiment. However, arrangements has been made to get the polymers from Japan. The strain *Aspergillus* was also found to synthesize a compound which react positively with ferric chloride. Work is in progress to purify the Fe Cl_3-positive compound which is hydrophilic and acidic by nature.

On itaconic acid production 149 local isolates were screened and only 1 strain (strain 22-3-1) has been found to yield 10.95 g/L itaconic acid when grown in peptone fructose media. Work to improve cultural conditions to get better yield has not been very successful.

Publications/Conferences

As per last project evaluation report with some addition as follows:-

Madihah, M.S., Baharuddin, G., Abdul karim, M.I., Hassan , M.A., Mitsugi, K., Tano, T., Sugio, T., Tada, M., Kanzaki, H. and Sonomoto, K. 1994. Kojic acid production by a locally isolated Aspergillus flavus link. in free and immobilised form. Proceedings of the 2nd Symposium on Trends in Biotechnology: Meeting the Challenges of the 21st Century. Universiti Pertanian Malaysia, Serdang, Selangor, Malaysia. 27-29 April, 1994.

Madihah Md. Salleh, Baharuddin Abdul Ghani, Mohamed Ismail Abdul Karim, Mohd. Ali Hassan, Koji Mitsugi, Tatsuo Tano, Tsuyoshi Sugio, Mikio Tada and Hiroshi Kanzaki. 1994. Influence of methanol and ultra violet light radiation on kojic acid production by Aspergillus flavus sp. ST 44-1. (Submitted to Journal of Fermentation Technology)

Hassan, M.A., Abdul Karim, M.I., Yamamoto, S. and Nakanishi, K. 1994. Production and separation of transgalactosylated kojic acid. Proceedings International Symposium on Bio and Food Separation Engineering, 14-15 November, 1994, Yamaguchi, Japan.

A1-(2). Studies on Molybdenum Resistance Bacteria.

Isolation and characterization of molybdenum resistant bacteria was carried out. A bacterial strain *Enterobacter cloacae* strain 48 was isolated which is able to reduce molybdenum. Work is in progress to isolate and purify the molybdenum reductase enzyme responsible for molybdenum reduction. Some difficulty is encountered as the enzyme isolated are known to be unstable. The enzyme purification studies are currently being conducted at Okayama University. Work is also in progress on the development of a process for the removal of molybdenum from effluent/media using the bacteria.

Publications/Conferences

As per last project evaluation report.

Baharuddin Ghani, M. Takai, N.Z. Hisham, N. Kishimoto, A.K. Mohamed Ismail, T. Tano, and T. Sugio. 1993. Isolation and characterization of a Mo= - Reducing bacterium. Appl. Microbiology. 59 (4): 1176-1180.

A1-(3) Studies on production of bioplastics from photosynthetic bacteria.

Preliminary research work is underway on production of bioplastic from Palm Oil Mill Effluent (POME) using photosynthetic bacteria. Certain fermentation parameters are being tested out to optimise fermentation process to increase the production yield of bioplastics.

Publications/Conferences

It is a new project.

A1-(4) Study on site-directed mutagenesis of alkaline proteinase from Pseudomonas aeruginosa.

Research on the alkaline proteinase gene from Pseudomonas aeruginosa has been subcloned into another strain of *E. coli* K12 known as Abte C obtained from stragene. This strain has several important features for regulating level of expression therefore rendering the gene more stable. This strain has Lac I q which produces repressor molecules and also posses the ability to regulate copy numbers therefore maintaining the numbers to as low as 10 even under induced condition.

The earlier problem has been that in JM109 and DH5 alpha which allows high copy numbers, the gene has been very unstable and becomes delected. Therefor this problem has been alleviated in Abte C.
Presently we are still waiting to obtain the oligonucleotide for site-directed mutagenesis.

Publications/Conferences.

None so far.

A1-(5) Studies on gene cloning of thermostable alpha-amylase from thermohilic Bacillus sp.

Research indicated it is difficult to detect recombinant plasmids containing amylase gene of Bacillus sp. SB-1 by using a conventional method (detection of alpha-amyláse activity). Prof. Tanaka suggested a method to detect ones from DNA library using DN probes designed from DNA sequence corresponding to N-terminal amino acid sequence of thermophilic Bacillus alpha-amylase and from consensus sequences estimated by computer analysis.

Dr. Inagaki, Okayama University purified the enzyme band (69K) on the SDS-gel electroblotted to PVDF membrane using Sartorius electroblotter was subjected directly to automated Edman degradation with an Applied biosystems gas-liquid phase protein sequencer. Clear peaks were not detected and more enzyme preparation is required.

Southern hybridization analysis of chromosomal DNA with a probe designed from concensus sequence suggested by Dr. Sawa, Shimane University was tried. At first, oligonucleotides (17 mer, 64 mixed) with an Applied Biosystems DNA synthesizer was synthesized. Its 3'-terminal was labelled with fluorescein-11-dUTP. Detection was performed according to the recommeded method, however, the specific band was not detected.

Publications/Conferences.

None at this stage.

B. TISSUE CULTURE.

B1. Secondary metabolites

B1-(1) Studies on the induction of pigmented Senduduk callus and the chemical analysis of its pigments.

The use of explants other than fruit has been carried out and the evaluation is still ongoing.

B1-(2) Studies on the induction of pigmented telang callus and the chemical analysis of its pigments.

The project is temporarily stopped on the advice of Prof. Kawazu due to problems of not being able to induce the blue pigments wven after using different media composition and addition of chemical precursors.

Publications/Conferences.

As per last project evaluation report.

B2. Development of novel strain of tropical plants through *in vitro* techniquies.

B2-(1) Transformation and regeneration in muskmelon.

The regeneration studies has been completed and fine-tuned. Currently, the project continues under C2-2 focussed on transformation using Agrobacterium sp. as a MSc. student project.

B2-(2) Regeneration and transformation in chilli.

A lot of problem has been encountered in the regeneration and transformation of chili including browning and inability of shoot to elongate. Currently, a PhD research student is working on different combination of media and additives in trying to solve the problem. The use of some chemical additives has shown promising results. Further studies i s on-going.

Publications/Conferences

Napis, S., A.K.M. Mohi uddin, and Ramlan Saimat., 1994. Efficient regeneration system forf Family Cucurbitaceae. Manuscript in preparation.

C1. MOLECULAR BIOLOGY AND GENETIC ENGINEERING.

a). Establishment of fundamental techniques on general genetic engineering.
b). DNA cloning and structure analysis of some genes using genetic engineering techniques.

C2. Molecular studies/analyses on plants.

C2-(1) Mass propagation of virus particle and the isolation of viral single stranded RNA.

Managed to get a MS student from Department of Biochemistry and Microbiology, UPM to work on the isolation of CMV RNA and through the use of Reverse Transcriptase Plymerase Chain Reaction (RT-PCR) the coat protein gene of CMV has been amplified. Currently, work is in progress on the cloning of the gene for use in plant transformation of muskmelon and chili.

Publications/Conferences.

None at this stage.

C2-(2) Plant Transformation studies.

C2-(2)-(1) Construction of vectors.

The work has been completed and vectors are currently used in transformation studies of muskmelon and chili as in project C2-(2)-(3).

C2-(2)-(2) Transient transformation of chimeric DNA carrying reporter gene into muskmelon protoplasts.

Using optimised eléctroporation parameters and the availability of suitable electroporation equipment from JICA, routine electroporation of muskmelon protoplasts can be achieved. Currentluy, studies involving the use of abiotic and biotic elicitors is being carried out on muskmelon portoplasts transformed with vectors carrying PAL and CaMV promoters and results are expected to be available soon. Further works on this projects is also currently being carried out at Okayama Universituy by Dr. Norihan who is now there under JICA training programme.

C2-(2)-(3) Stable gene transfer by Agrobacterium-mediated transformation.

C2-(2)-(3)A Expression of GUS in transformed shoots of muskmelon.

Plasmids pKTY03 and pB1121 has been successfully introduced into Agrobacterium tumefaciens strain LBA 4404 and confirmed. Earlier trials on the co-infection of the bacteria to muskmelon explants gave rise to some shoots but upon assaying for GUS activitgy, negative result was obtained. Currently, major effort has been put forward for the co-infection experiment in a larger scale using different explants in an effort to generate transformed shoots ready for GUS assay. This is an MS student project.

C2-(2)-(3)B Expression of GUS in hairy roots of muskmelon.

Above plasmids was also introduced in A. rhizogenes and subsequently co-infected to muskmelon in the hope of generating transformed hairy roots. This is a parallel study to project C2-(2)-(2). Co-infection experiments is ongoing and now awaiting hairy roots. The same MS student as above is working on this project.

Publications/Conferences.

None at this stage. Results on the regeneration and transformation studies will be prepared for publication soon.

C3. Studies on Animal Tissue Culture.

C3-(1) Establishment of hybridomas secreting monoclonal antibodies against Newcastle Disease Virus (NDV).

Currently several clones already established and the monoclonal antibodies reacted to various NDV strains. Monoclonal antibodies were reacted to F2 NDV protein and did not neutralize the virus activity. Two of the clones were shown capable of growing in ERDF serum-free medium.

Publications/Conferences.

None.

D4. BIOPROCESS ENGINEERING.

Objectives:

1. Bioreactor Technology of Immobilised Enzymes and Cells.
   a) Prepartion of Immobilised enzymes and cells.
   b) Mastering bioreactor design.
   c) Continuous operation of immobilised enzyme or cell for the production of useful substances.

2. Purification and separation technology for useful products.

D4-(1) Mastering immobilisation of microbial cells.

This skill is taught by JICA Expert Dr. Sonomoto to the counterparts in UPM in 1993. Immobilisation using various polymers were carried out on microbial cells.

D4-(2) Continuous operation of kojic acid with immobilised cells.

This project is still on-going. The immobilised fungal cells (Aspergillus sp.) is repeatedly sub-cultured in shake flasks to ascertain their ability to produce kojic acid is maintained, before continuous bioreactor operation is carried out.

D4-(3) Application of b-galactosidase for the synthesis of galactosylated compounds and continuous operation using an immobilised enzyme bioreactor.

A new compound, galactosyl-kojic acid has been obtained and purified and was identified by NMR. Work is continuing to optimise the reaction conditions and separation techniques. Use of an immobilised enzyme reactor system will be followed.

D4-(4) Fundamental studies on isolation of alpha-carotene and other components from crude palm oil

Carotene have been extracted by the trigliceride method. Currently, a large column system is being used for separation and concentration of the carotenes.

APPENDIX 10 (continued)

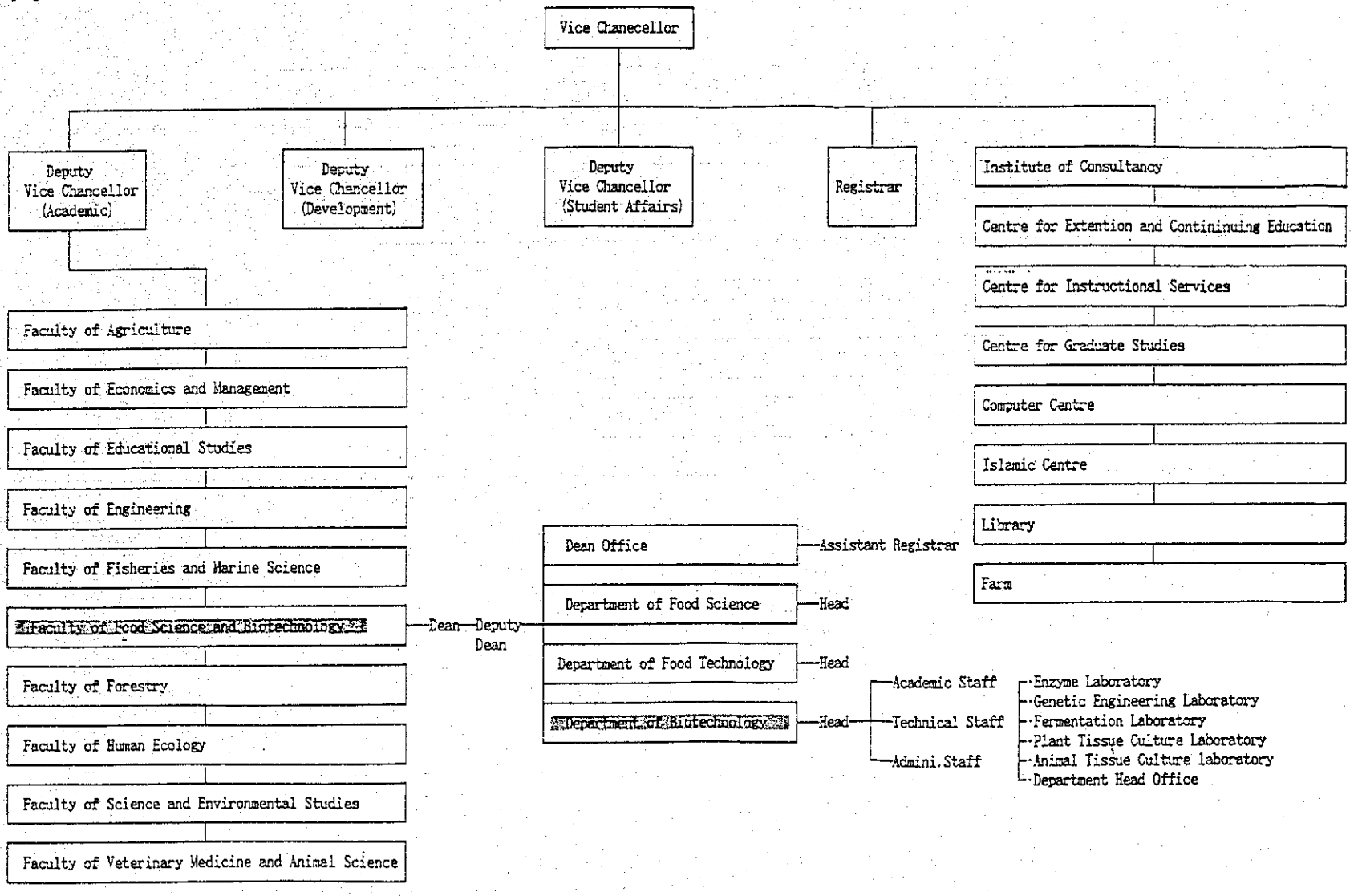
Publications/Conferences.

Hassan, M.A. and Nakanishi, K. 1994. Production of transgalactosylated kojic acid by immobilised b-galactosidase. (Submitted to Journal of Biochem. Biotech. and Bioeng.)

Kartini, Badlishah, S.B., Oyaizu, T. and Takagi, S. 1994. Preliminary studies on the isolation of palm fruit carotene with accompanying production of edible oil. Proceedings of the 2nd Symposium on Trends in Biotechnology: Meeting the Challenges of the 21st Century. Universiti Pertanian Malaysia, Serdang, Selangor, Malaysia. 27-29 April, 1994.

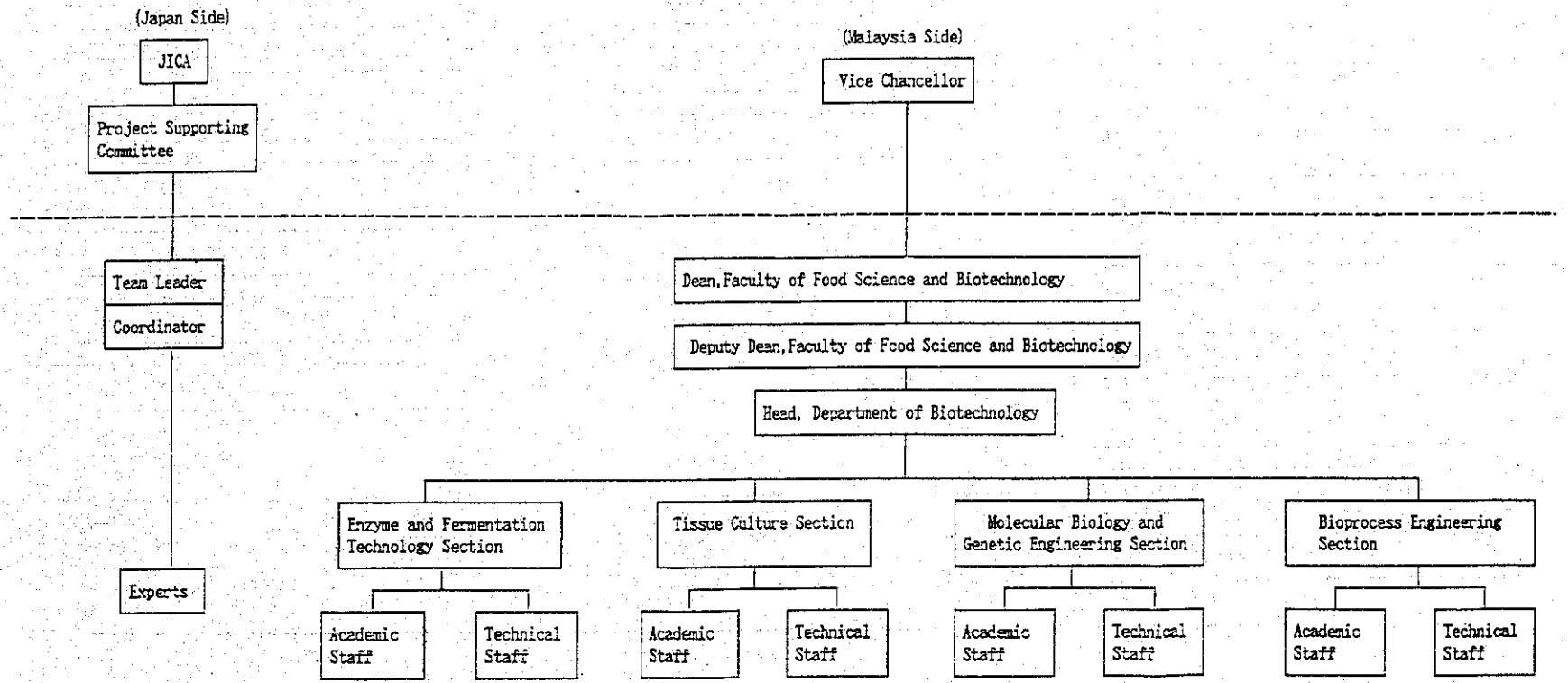
APPENDIX 11 ORGANIZATION CHART OF THE PROJECT

[Organization Chart of UPM]



APPENDIX 11 (continued)

[Project Implementation Chart]



RECORD OF DISCUSSIONS
BETWEEN THE JAPAN INTERNATIONAL COOPERATION AGENCY AND THE AUTHORITIES CONCERNED OF THE GOVERNMENT OF MALAYSIA ON TECHNICAL COOPERATION FOR DEVELOPMENT OF THE DEPARTMENT OF BIOTECHNOLOGY AT THE FACULTY OF FOOD SCIENCE AND BIOTECHNOLOGY UNIVERSITI PERTANIAN MALAYSIA

With regard to the recommendations of the Minutes of Discussions of the Preliminary Study on Technical Cooperation for Development of the Department of Biotechnology at the Faculty of Food Science and Biotechnology, Universiti Pertanian Malaysia, dated January 16,1990, the resident representative of the Japan International Cooperation Agency (hereinafter referred to as "JICA") in Malaysia and the authorities concerned of the Government of the Malaysia had a series of discussions for the purpose of working out the details of technical cooperation for development of the Department of Biotechnology at the Faculty of Food Science and Biotechnology, Universiti Pertanian Malaysia (hereinafter referred to as "the Project").

As a result of the discussions, both sides agreed upon the details of the technical cooperation program and agreed to recommend to their respective governments desirable measures to be taken by both governments, as referred to in the documents attached hereto.

Serdang, Selangor
April 19, 1990

K. Okabe

Mr. Kazuo Okabe
Resident Representative in Malaysia,
Japan International Cooperation Agency,
Japan

Professor Tan Sri Dato
Dr. Nayan bin Ariffin
Vice-Chancellor,
Universiti Pertanian Malaysia,
Malaysia

ATTACHMENT

I. COOPERATION BETWEEN BOTH GOVERNMENTS

The Government of Japan and the Government of Malaysia will cooperate with each other in implementing the Project based on the Master Plan in I of the Annex.

II. MEASURES TO BE TAKEN BY THE GOVERNMENT OF JAPAN

In accordance with the laws and regulations in force in Japan, the Government of Japan will take, at its own expense, the following measures through JICA according to normal procedures under its technical cooperation scheme.

1. Dispatch of Japanese Experts

The Government of Japan will provide the services of Japanese experts as listed in II of the Annex.

2. Provision of Equipment

The Government of Japan will provide such equipment, machinery and other materials (hereinafter referred to as "the Equipment") as listed in III of the Annex.

(The Equipment will become the property of the Government of Malaysia upon delivery by CIF to the Malaysian authorities concerned at the ports and/or airports of disembarkation, and will be utilized for implementation of the Project in consultation with the Japanese experts.)

3. Training of Malaysian Counterpart Personnel in Japan

The Government of Japan will train the Malaysian counterpart personnel in Japan.

(The Government of Malaysia will take necessary measures to ensure that the knowledge and experience acquired by the Malaysian counterpart personnel will be utilized effectively for the Project.)

III. MEASURES TO BE TAKEN BY THE GOVERNMENT OF MALAYSIA

In acordance with the laws and regulations in force in Malaysia, the Government of Malaysia will take, at its own expense, the following measures.

1. Assignment of Malaysian Counterpart Personnel

The Government of Malaysia will secure the services of qualified Malaysian counterpart personnel as listed in IV of the Annex.

2. Provision of Land, Buildings and Incidental Facilities

The Government of Malaysia will provide such land, buildings and incidental facilities as listed in V of the Annex.

3. Supply and Replacement of Equipment and Machinery

The Government of Malaysia will supply and/or replace equipment, machinery, vehicles, instruments, tools, spare parts and other materials necessary for implementation of the Project except for the Equipment referred to in II-2 above.

4. Allocation of All Running Expenses

The Government of Malaysia will meet all running expenses necessary for implementation of the Project, including :

(1) transportation facilities and travel allowances for official travel of the Japanese experts within Malaysia;

(2) housing and other allowances referred to in General Circular No.1 of 1979 of the Government of Malaysia;

(3) expenses necessary for transportation of the Equipment within Malaysia, as well as for installation, operation and maintenance thereof; and

(4) costoms duties, internal taxes and any other charges imposed on the Equipment in Malaysia.

IV. ADMINISTRATION OF PROJECT

Administration of the Project will be organized in the following manner, in accordance with the organization chart in VII of the Annex.

1. Vice-Chancellor of Universiti Pertanian Malaysia (UPM)

The Vice-chancellor of UPM will bear overall responsibility for project implementation.

2. Dean of the Faculty of Food Science & Biotechnology

The Dean of the Faculty of Food Science and Biotechnology will be responsible, as Head of the Project, for administrative and managerial matters of the Project.

3. Japanese Experts

(1) The Japanese team leader will provide necessary recommendations and advice to the Head of the Project on technical and administrative matters concerning project implementation.

(2) The Japanese experts will give necessary technical guidance and advice to the Malaysian counterpart personnel on matters pertaining to project implementation.

4. Joint Committee

For effective and successful implementation of the Project, a joint committee will be established with the functions and composition as described in VI of the Annex.

V. CLAIMS AGAINST JAPANESE EXPERTS

The Government of Malaysia shall undertake to bear all claims, if any should arise, against the Japanese experts asigned in the Project, resulting from, occurring in the course of, or otherwise connected with, the discharge of their official functions in Malaysia, except for those arising from the willful misconduct or gross negligence of the Japanese experts.

VI. PRIVILEGES, EXEMPTION AND BENEFITS GRANTED TO JAPANESE EXPERTS

The Government of Malaysia will grant privileges, exemptions and benefits as referred to in General Circular No.1 of 1979 of the Government of Malaysia to the Japanese Experts and their families in Malaysia.

VII. MUTUAL CONSULTATION

There will be mutual consultations between the two governments on any major issues arising from or in connection with this document.

VIII. TERM OF COOPERATION

The duration of technical cooperation for the Project will be five (5) years beginning in June 1, 1990.

ANNEX

I. MASTER PLAN

1. Goal of the Project

The goal of the Project is to expand research activities in the field of biotechnology in Malaysia.

2. Objective of technical cooperation

The objective of the technical cooperation is to enhance the Department of Biotechnology in UPM through technical guidance and advice to the academic staff for promoting and strengthening education and research activities in the field of biotechnology.

3. Cooperation activities of the Project

In order to attain the above-mentioned objective, the following cooperation activities will be implemented .

(1) Increasing research capability of the academic staff of the Department
   1) To elevate the technical competence of the academic staff and the technical staff by means of technical guidance and advice as well as by joint research
   2) To heighten the academic level of the tutors through instruction on researches leading to post-graduate degrees

(2) Overall guidance and advice on the following technical fields :
   1) Enzyme and fermentation technology
   2) Tissue culture
   3) Molecular biology and genetic engineering
   4) Bioprocess engineering

(3) Seminars/workshops on the above-mentioned fields in order to share and confirm the outcomes of research activities and the progress of the Project

II. LIST OF JAPANESE EXPERTS

1. Team leader

2. Project coordinator

3. Experts in the fields of :
   (1) Enzyme and fermentation technology
   (2) Tissue culture
   (3) Molecular biology and genetic engineering
   (4) Bioprocess engineering

Notes : 1) One of the experts listed in 3 above will be designated as the Team Leader by JICA.
2) An array of short-term experts in the fields mentioned above may be dispatched in place of a long-term expert.
3) Short-term experts in other related fields will be dispatched, as necessary, for smooth implementation of the Project.

III. LIST OF EQUIPMENT

1. Equipment, apparatus, instruments, tools, spare parts and other materials necessary for project implementation

2. Audio-visual aids, books and other printed matter

3. Vehicles

4. Other necessary equipment and materials related to the Project

IV. LIST OF MALAYSIAN COUNTERPART PERSONNEL

1. Dean, Faculty of Food Science and Biotechnology

2. Deputy Dean, Faculty of Food Science and Biotechnology

3. Head, Department of Biotechnology

4. Academic staff in the fields of :
   (1) Enzyme and fermentation technology
   (2) Tissue culture
   (3) Molecular biology and genetic engineering
   (4) Bioprocess engineering

V. LIST OF LAND, BUILDINGS AND INCIDENTAL FACILITIES

1. Land and buildings for the following sectors and other incidental Buildings :
   (1) administrative sector
   (2) research sector
   (3) educational sector

2. Facilities such as :
   (1) offices for the Japanese team leader, project coordinator and other experts
   (2) class/seminar rooms, teaching/research laboratories, lecture halls/ theaters and workshops
   (3) storage space for machinery, equipment and materials
   (4) parking space

VI. JOINT COMMITTEE

1. Functions

The joint comittee will meet at least once a year, and whenever necessary, and work :

   (1) to formulate the Annual Work Plan of the Project in line with the Tentative Schedule of Implementation planned under the framework of this Record of Discussions,
   (2) to review the overall progress of the Project as well as the achievement of the above-mentioned Annual Work Plan, and
   (3) to discuss and exchange views on major issues arising from or in connection with the Project.

2. Composition
   (1) Chairman : Vice-chancellor, UPM or his representative
   (2) Malaysian side :
      1) Dean, Faculty of Food Science and Biotechnology, UPM
      2) Deputy Dean, Faculty of Food Science and Biotechnology, UPM
      3) Head, Department of Biotechnology, UPM
      4) Representative of the Ministry of Education
      5) Representative of Economic Planning Unit

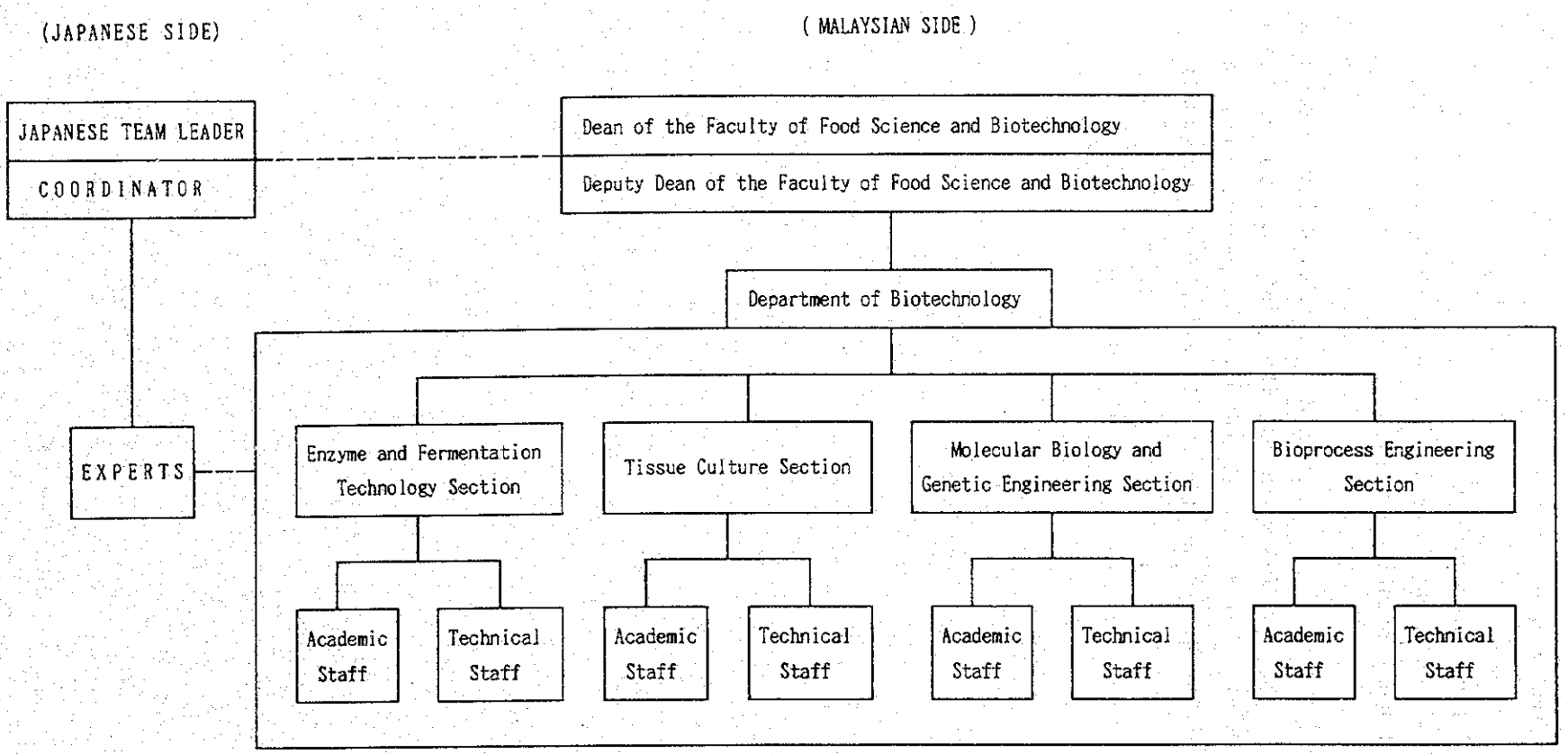
(3) Japanese side :

1) Team Leader
2) Project Coordinator
3) Experts appointed by the Team Leader, if necessary
4) Representative of JICA

Notes : 1) Officials of the Embassy of Japan and faculty members designated by the Chairman may attend the Joint Committee as observers.

2) The Chairman can co-opt any other person from among the members of the Malaysian side to sit at any committee meeting.

VII ORGANIZATION CHART FOR THE IMPLEMENTATION OF THE PROJECT



TENTATIVE SCHEDULE FOR IMPLEMENTATION OF THE TECHNICAL COOPERATION PROGRAM FOR DEVELOPMENT OF THE DEPARTMENT OF BIOTECHNOLOGY AT THE FACULTY OF FOOD SCIENCE AND BIOTECHNOLOGY UNIVERSITI PERTANIAN MALAYSIA

The Japan International Cooperation Agency (hereinafter referred to as "JICA") and the Malaysian authorities concerned have jointly formulated the Tentative Schedule for Implementation of the Technical Cooperation Program for Development of the Department of Biotechnology at the Faculty of Food Science and Biotechnology, Universiti Pertanian Malaysia (hereinafter referred to as "the Project").

This Schedule has been formulated on the basis of the Attached Document of the Record of Discussions for the Project signed between the resident representative of JICA in Malaysia and the Malaysian authorities concerned on condition that the necessary budget will be allocated by both sides for implementation of the Project, and that the above-mentioned Schedule and Program be subject to change within the framework of the Record of Discussions, whenever necessary, in the course of project implementation.

Serdang, Selangor
April 19, 1990

K. Okabe

Mr. Kazuo Okabe
Resident Representative in Malaysia,
Japan International Cooperation
Agency,
Japan

Professor Tan Sri Dato'
Dr. Nayan bin Ariffin
Vice-Chancellor,
Universiti Pertanian Malaysia,
Malaysia

I. Project Activities

(1) Technical and research guidance/advice to the involved staff of the Department and joint research activities in the following fields ;

Categories	1990	1991	1992	1993	1994	1995
1) Enzyme & Fermentation Technology (-Microbiological conversion of primary tropical products, -Development & utilization of enzymes catalyzing the above reaction)		———	———			
2) Tissue Culture (-Production of useful substances using cultured cells, -Development of novel strains of tropical plants through cell culture)		———	———	———		
3) Molecular Biology & Genetic Engineering (-Structural & functional analyses of enzymes, -Genetic engineering of bacteria & yeasts, -Genetic analysis of tropical plants)			———	———	———	
4) Bioprocess Engineering (-Bioreactor technology for plant and animal cells)				---	———	

(2) Seminars/workshops in the above-mentioned fields to be jointly organized by UPM and the JICA Team

	1990	1991	1992	1993	1994	1995
Seminars and Workshops			o		o	

II. Japanese Contribution

Categories	1990	1991	1992	1993	1994	1995
1) Dispatch of Experts						
<Long-term>						
- Enzyme & Fermentation Technology		——	4-			
- Tissue Culture	—		-4	——		
- Molecular Biology & Genetic Engineering			-3 4	——	4-	
- Bioprocess Engineering				--3	-2	4
- Project Coordination	——	——	——	——	——	——
<Short-term>	-	----	----	----	----	-
2) Dispatch of Teams						
- Technical Guidance Team			o	o		
- Consulting Team		o				
- Evaluation Team					o	
3) Training of Counterpart personnel in Japan	-	——	——	——	——	——
4) Provision of Machinery and Equipment	--	--	--	--	--	

Note : * One of the experts will be designated as the Team Leader by JICA.
* An array of short-term experts in the fields mentioned above may be dispatched in place of a long-term expert. (Example:⌈---3---⌋ shows that three short-term experts will cover the long-term assignment.)
* Short-term experts in other related fields will be dispatched, as necessary, for smooth implementation of the Project.

III. Malaysian Contribution

Categories	1990	1991	1992	1993	1994	1995
1) Counterpart personnel in the following fields						
- Enzyme and Fermentation Technology	———	———	———	———	———	———
- Tissue Culture	———	———	———	———	———	———
- Molecular Biology and Genetic Engineering	———	———	———	———	———	———
- Bioprocess Engineering	———	———	———	———	———	———
2) Administrative personnel	———	———	———	———	———	———
3) Land and Buildings	———	———	———	———	———	———
4) Expenses for project implementation	———	———	———	———	———	———

3　技術移転の実績（巡回指導調査時点の詳細活動項目）

技術移転の実績

：継続中の課題

移転技術	技術移転のための研究課題
酵素発酵工学分野	
1．リパーゼ・アミラーゼ及びその他酵素の基礎並びに応用研究	
a.好熱性微生物から高生産菌株のスクリーニング	好熱アミラーゼ生産菌のスクリーニング
	■微生物酵素による澱粉利用の改良■
b.酵素生産のための培養条件の検討	マンノースイソメラーゼ生産微生物のスクリーニングと酵素の分離
c.蛋白質／酵素の精製と性質研究の技術	Ps. aeruginosaからのプロテイナーゼの単離・精製
	精製プロテイナーゼによるペプタイドの合成
	酢酸菌の膜結合酵素の調整
2．有用微生物に関する研究	
a.高生産株のスクリーニング	麹酸及び関連物質生産菌のスクリーニング
	有用有機酸生産微生物のスクリーニングと酸の生産
	■バイオセンサー酵素のスクリーニング■
b.生産のための培養条件の検討	プロテイナーゼ生産条件の検討
	麹酸生産の培養条件及び代謝制御の研究
c.有用単離菌の性質・分類・同定	モリブデン還元微生物の分離及び分類
	■モリブデン還元の生理的役割とその応用■
	■分離菌の環境改善への応用■
	微生物からの色素・フレイバー等二次代謝産物の分離と同定
3．酵素の基礎技術確立と発酵工学	
a.微生物の保存法の修得	上記において分離した微生物の分類と保存
組織培養分野	
1．組織培養システムでの二次代謝と役割	
a.色素や有用二次代謝物を生産する最適熱帯植物の調査	■赤色及び青色色素を生産する植物の選抜■
b.上述の植物のカルス細胞の誘導	色素生産植物のカルス培養
c.色素及び有用二次代謝物高生産性細胞株の選抜	■色素及び二次代謝産物生産カルスの選抜■
d.二次元電気泳動分析技術の修得	二次元電気泳動技術
e.二次代謝物の検出・定量分析・同定技術の修得	二次代謝産物研究の基礎技術
	■植物からの色素・フレイバー等二次代謝産物の分離と同定■

移転技術	技術移転のための研究課題
2．ﾋﾄﾛ 技術を用いての熱帯植物の新系統の開発・育成	
a.ﾌﾟﾛﾄﾌﾟﾗｽﾄ 再生系と馴化栽培技術の確立	メロンその他の植物のプロトプラスト及びカルスの再生 これら技術の遺伝子工学的育種への利用
b.細胞融合技術の修得（PEG 法と電気法）	植物細胞の細胞融合技術
c.Agrobacterium tumefaciens を感染させる技術の修得	アグロバクテリウムによる遺伝子導入技術 この技術による有用植物の育種
d.遺伝子操作技術の修得	植物組織からのDNA 及びRNA の分離
分子生物学・遺伝子工学分野	
1. 一般遺伝子工学の基礎的技術の確立	
a.遺伝子工学における有用ベクターDNA の抽出と精製技術の修得	修得技術：抽出と生成
b.大腸菌や他の有用原核生物のｺﾝﾋﾟﾃﾝﾄ細胞の調製と形質転換技術の修得	修得技術：E. coli への遺伝子クローニング
c.制限酵素／修飾酵素の利用等のDNA 組換え技術の修得	修得技術：制限酵素による遺伝子構造の解析と修飾
d.真核生物からの全RNA 及びmRNAの抽出と精製技術の修得	修得技術：全RNA 及びmRNAの抽出と精製
e.ﾊｲﾌﾞﾘﾀﾞｲｾﾞｲｼｮﾝ 技術の修得(Plaque & colony hybridization, Suthern blot hybridization and Northern blot hybridization)	修得技術：Southern & Northern hybridization による遺伝子の同定
f.DNA 塩基配列決定技術の修得	修得技術：DNA 塩基配列の解析
g.分子生物学におけるPCR の応用技術修得	修得技術：PCR 法による特定遺伝子の増幅
	材料：ｱﾐﾗｰｾﾞ，ﾌﾟﾛﾃｲﾅｰｾﾞ生産微生物 材料：Mo^{+6}ー還元細菌 材料：ﾒﾛﾝ,ﾁﾘ等の熱帯植物 材料：ガン細胞・ﾊｲﾌﾞﾘﾄﾞｰﾏ 細胞等哺乳動物細胞
2．遺伝子工学技術を駆使した有用遺伝子のDNA クローニングと構造解析	
a.原核及び真核生物中の有用遺伝子のスクリーニング	Bacillus種の細菌からの好熱性αーアミラーゼ遺伝子のクローニング 抗体生産及びその技術を利用したハイブリドーマの抗体生産率改良
b.有用遺伝子のDNA クローニングと構造解析	MoO_4^{2-}還元酵素のクローニングと構造解析 バイオレメディエーション環境改善への応用
c.ｸﾛｰﾝ化遺伝子の大腸菌における発現	E. coli 中でのプロテイナーゼの発現
d.ｸﾛｰﾝ化遺伝子産物の構造と機能の解析	Ps. aeruginosaより分離したプロテイナーゼ遺伝子の塩基配列解析とその部位特異的変異

移転技術	技術移転のための研究課題
e. 植物の遺伝育種のための宿主－ベクター系の確立	プロテイナーゼの一次構造と機能解析 メロンにおけるホスト－ベクター・システムの構築と外来遺伝子発現の増幅 この技術の耐病性植物育種への利用
生物反応プロセス分野	
1．固定化細胞及び細胞のバイオリアクター技術	
a. 固定化された酵素及び細胞の調製・製造	微生物細胞の固定化技術の修得
b. ﾊﾞｲｵﾘｱｸﾀｰ設計方法の修得 有用物質生産のための固定化された酵素および細胞の連続操作	固定化細胞を使用する麹酸の連続生産 発酵生産物の分離技術に関する工学的研究
2．有用物質の精製と分離技術	粗パーム油からのα－カロテンの分離とその基礎的研究 上記の実用化

4　遺伝子およびバイオテクノロジー研究センター構想

1. Background:

Universiti Pertanian Malaysia (UPM) has been recognized by the Government as the centre of excellence in the field of genetics and biotechnology under the Sixth Malaysia Plan (RM6). UPM recognized that the development of agriculture and the exploitation of natural resources can be further developed for the benefit of Malaysia's economy. Research in molecular genetics and biotechnology can and have been used to produce disease-resistant and high-yielding varieties of crops and animals. At UPM, similar research activities has been initiated at various Faculties in the university. Furthermore, the Department of Biotechnology in Faculty of Food Science and Biotechnology was established in 1986, with the aim of producing well-trained scientists in the field of biotechnology encompassing genetic engineering, cell and tissue culture, protein and enzyme technology, fermentation technology and bioprocess engineering at undergraduate and post graduate levels. At present the development of the Department for undergraduate teaching and research receiving funding from JICA for five years (1990-1995).

There are many qualified academicians in the field of genetics and biotechnology at various faculties in the university ; however, the interaction between them are very limited and their research approaches narrowed towards their own specialized fields (appendix 1). Realizing the importance of multi-diciplinary research approach in order to give a more significant contribution to the nation, a Centre of Genetics and Biotechnology was proposed under the 6th Malaysia Plan. This centre will coordinate research relating to genetics and biotechnology and also provide centralized facilities for the researchers from within and outside the university to conduct their research in order to promote interaction and maintain the multi-disciplinary approach.

2.*Project Description*

Centre for Genetics and Biotechnology:

A research centre for genetics and biotechnology was proposed by the genetics and biotechnology research groups at UPM for the 6th Malaysia Plan. This project has been approved by the government and will be implemented in 1992. The centre is expected to be completed in 1994. The objective of the Centre is to provide a conducive research environment and post graduate training. This research centre will be the centre of excellence for genetics and biotechnology research in the country. The post graduate training will be conducted on the basis of integrated graduate school concept. It will compliment the existing graduate school, which allows for the interaction of several academicians and diciplines. The Centre will be governed by a Board of Governors, managed by a Director and advised by a Scientific Council (appendix 2). The membership of the Advisory Council will consist of renowned scientists from Malaysia as well as countries in the international scientific communities. The director will be responsible for the establishment of scientific policy, direction of research, coordination of post-graduate training programme and administration of the centre. The director will be assisted by core faculty members and associate members.

Five research laboratories (Units) will be established with several specialized supporting laboratories. Each unit will be headed by a Research Leader and the laboratory will be headed by a Laboratory Manager.

The five component units are as follows:

1.Genetics Unit: This unit will be responsible to coordinate all genetics and breeding research for plants and animals. This unit will work closely with Molecular and Cell Biology Unit for the DNA and chromosomes markers studies. Computer facilities will be provided in this unit for the analysis of quantitative traits of plants, domestic animals and fish.

2. Molecular and Cell Biology Unit: This unit will house the facilities for Polymerase Chain Reaction, DNA sequencing, gene cloning, gene mapping and restriction fragment length polymorphisms of genomic, mitochondria and chrloroplast DNAs of all types of organism. Tissue culture laboratory for plant tissue culture and plant transformation research will be provided under this unit. Furthermore various type of animal cell culture laboratories such as P1 and P2 laboratories for production of monoclonal antibodies and virus vaccines will also be provided.

3. Biochemistry Unit: Analytical equipments such as HPLC, FPLC, GC, NMR and Peptide Sequencer, Amino Acid Analyzer and FT-IR will be kept in this unit. Additionally, it will also be responsible for providing all necessary services for analytical works such as identification of molecular structures of various metabolites and amino acid sequence of peptides. Basic studies of important enzymes for bioconversion will be carried out at this unit. This unit will also embark on biocensor research for various purposes.

4. Bioprocess and Fermentation Unit: This unit will house the scaling-up facilities and recovery processes. Research in this unit is mainly on large scale production of various product from microbes, animal and plant cells, bioreactor design and process control. The facilities will be contracted to the industries for their test-run and also production purposes.

5. Radioisotope Unit: All radioisotope-related experiment in genetics and biotechnology will be carried out in this unit. A complete facilities with storage and proper waste-management system will be provided by this unit. Courses on safety and handling of isotope and its application in genetics and biotechnology studies will be conducted by this unit.

6. Resource and Information Technology unit: This unit will act as a conservation centre and gene bank. A proper cataloging system will be developed by this unit for collection of microbes, vectors and cell lines. This unit will be equipped with computer room, seminar and reading room, as well as administrative offices.

3.Cost Estimates:

The total budget required for the infrastructure is M$14,755,000.00. The breakdown of the budget are as follow:

1. BUILDING (20-30,000 sq. ft.)
   Estimated cost is M$4,905,000.00

2. EQUIPMENT AND FURNITURE
   Estimated cost is M$7,350,000.00

3. TRAINING AND DESPATCH OF EXPERTS
   Estimated cost is M$3,500,000.00

4. Manpower Implications:

1. Academic member:

The academic members of the centre will be divided into core members and associate members. A total of twelve core members will be appointed as joint appointments to the centre and their respective departments for a period of 3-5 years. They will be selected based on their ability to lead research programmes and expertise in their respective fields as identified by the Centre. The core members are responsible for the research and post graduate programmes at the Centre. Associate members are those who are interested to be involved directly or indirectly in research programmes at the Centre. They can be scientists or academicians within or outside the university. The appointment of associate members will be determined by the research leader.

2. Supporting staff

Supporting staffs will be the permanent staffs to the Centre. They are:

a) **Laboratory manager:** 5 laboratory managers with MS or PhD qualifications will be appointed to manage laboratories in the centre.

b) **Research officer:** 12 research officers with MS and PhD qualifications will be appointed to carry out research works in the laboratories.

c) **Laboratory technician:** 5 laboratory technicians with Diploma or BS qualifications will be appointed to handle equipments.

3. Post-doctoral research fellow:

Several posts for post doctoral research fellow will be created by various groups in the Centre based on research grants.

5. Benefit and Justification

The establishment of the Centre of Genetic and Biotechnology will result in more effective utilization of human resources and the facilities. The Centre will provide maximum interaction amongst researchers and minimum duplication of laboratory facilities. The linkage with industry will be developed where the Centre will provide technological supports and expertise. The post graduate training programme and short courses in genetics and biotechnology at UPM will be strengtened. This Centre will become a centre of excellence in this region.

Appendix 1

Genetics and Biotechnology Related Research in UPM

The following research activities are carried out at the various departments in UPM.

1. Enzyme Technology:

a) Biochemistry of fats and oils, fat interesterification, lipase and its immobilization.
b) Development of immobilization matrix for biocatalysts
c) Application of enzymes for food processing
d) Development of biosensor for various applications

(Dept. of Biochemistry and Microbiology-Dr.Abu Bakar Salleh, Dr.Kamaruzaman Ampun, Dr.Che Nyonya Che Razak)

(Dept. of Biotechnology-Dr.Hassanah Mohd Ghazali and Dr.Junainah Abd.Hamid)

(Dept. of Food Technology -Dr.Salmah Yusof, Dr.Che Yaacob Che Man and Dr.Asbi Ali)

2. Genetic Engineering

a) Molecular cloning of xylanase, amylase and cellulase.
b) The application of restriction fragment length polymorpism in plants and animals
c) Transformation of disease resistant plants
d) Protoplast fusion

(Dept. of Biotechnology -Dr.Baharuddin Ghani, Dr.Norihan Saleh, Dr.Suhaimi Napis, Dr.Noraini Abd.Rashid and Dr.Zaleha Christine Alang)

(Dept. of Biochemistry and Microbiology-Dr.Abdullah Sipat and Dr.Khatijah Yusof)

(Dept. of Biology-Dr.Tan Soon Guan and Dr.Ithnin Bujang)

(Dept. of Agronomy and Horticulture- Prof Yap Thoo Chai, Dr.Ghizan Salleh and Mohd Said Saad)

3. Plant Tissue Culture

a) Micropropagation of various crop plants, fruits plants and ornamentals plants
b) Production of secondary metabolites

(Dept. of Biotechnology-Dr.Zaleha Christine Alang, Dr.Hasanah Mohd Ghazali and Dr.Norehan Saleh)

(Dept. of Biochemitry and Microbiology-Dr.Maziah Mahmood and Dr.Razaly Muse)

(Dept. of Agronomy and Horticulture-Dr.Salleh Kazimin)

(Dept. of Forest Production-Dr.Jamaluddin Bashruddin)

4. Fermentation and Bioreactor Design

a) Studies of cocoa fermentation and cocoa enzymes
b) Production of citric acid and other organic acids
c) Bioconversion of agricultural wastes
d) Enzymatic bioconversion of starches to fermentable sugars

(Dept. of Biotechnology-Dr.Baharuddin Ghani, Mohd Ali Hassan, Dr.Mohamed Ismail Abdul karim, Arbakaria Arif)

5. Animal Cell Culture Biotechnology

a) Production of virus vaccines
b) Production of monoclonal antibodies
c) Large scale culture of mammalian cells
d) Development of diagnostic test for various diseases

(Faculty of Veterinar-Prof.Abdul Latif Ibrahim, Dr.Rani Bahaman, Dr.Rehana Abdullah Sani and Dr.Ungku Chulan Ungku Mohsin)

(Dept. of Biotechnology-Dr.Abdul Manaf Ali and Dr.Suhaimi Napis)

(Dept. of Fishery Biology and Aquaculture- Dr.Mohd Shariff Mohd Din)

6. Genetics

a) Molecular study of mitochondria DNA in buffaloes
b) Genetic diversity of buffaloes and goats in Asia.
c) Electrophoretic markers in the tropical stingless bees

(Dept. of Bilogy-Dr.Tan Soon Guan)

(Dept. of Animal Science-Dr.T.Azmi T.Ibrahim, Prof.Mohd Mahyuddin Dahan and Dr.Mohd Hilmi)

Appendix 2

RESEARCH CENTRE FOR GENETIC AND BIOTECHNOLOGY

LABORATORY AND RESEARCH ORGANIZATION