

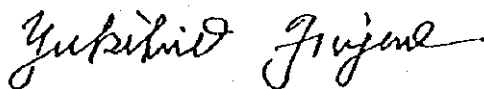
MINUTES OF DISCUSSIONS
ON THE CHIANG MAI UNIVERSITY
PLANT BIOTECHNOLOGY RESEARCH PROJECT
IN THAILAND

The Japanese Advisory Team (hereinafter referred to as "the Team") headed by Prof. Dr. Yukihiro FUJIME visited the Kingdom of Thailand from March 10, 1996 for the purpose of intermediately evaluating the activities of the Chiang Mai University Plant Biotechnology Research Project in Thailand (hereinafter referred to as "the Project").

The Team and the Thai authorities concerned had a series of discussions and exchanged views in order to perceive and assess the activities of the Project, based on the Record of Discussions (hereinafter referred to as "the R/D") signed on February 8, 1993 and on the Tentative Schedule of Implementation (hereinafter referred to as "the TSI") signed on May 22, 1994.

As a result of the discussions, both the Team and the Thai authorities concerned agree to recommend to their respective governments the matters as attached hereto, for the successful implementation of the Project.

Chiang Mai, March 18, 1996



Prof. Dr. Yukihiro FUJIME
Leader,
The Japanese Advisory Team
Japan International Cooperation Agency
Japan



Assoc. Prof. Dr. Luechai Chulasai
Vice President for
Foreign Relations and Research Affairs,
Chiang Mai University
Thailand

The following understandings were reached between the Team and the Thai authorities concerned:

1. Process of the Project

The Project has been implemented according to the TSI, through the guidance by Japanese experts since August 1, 1993 as below:

2. Progress of the Project Activities

2.1 Input

2.1.1 Japanese Input

(1) Dispatch of Experts

The Japanese side has dispatched 7 long-term and 16 short-term experts in the fields of plant tissue culture technology, plant protoplast technology, culture medium, environmental effects, acclimatization technology and others.

(2) Provision of Machinery and Equipment

The Japanese side has provided various machinery and equipment such as an electrofusion equipment, an inverted microscope, a bioreactor for plant cell, a digital slide maker and others.

(3) Acceptance of Counterpart Personnel in Japan

The Japanese side has accepted 9 Thai counterpart personnel in the various fields of plant biotechnology.

(4) Local Cost Bearing

The Japanese side has born a part of the local cost for the activities, operation and management of the Project. For example, the program of Technical Knowledge Exchange with Malaysia was implemented by the Japanese side expenditure in 1994. Besides, in the fiscal year 1995, the Japanese side offered the cost of construction of the greenhouse.

2.1.2 Thai Input

(1) Counterpart Personnel

Since the beginning of the Project, 18 counterpart personnel have been assigned including the Project Manager. In addition, 1 secretary, 1 assistant secretary and 2 drivers have been assigned to the Project at the expense of the Thai side.

J. Fyke

L.C.

(2) Land and Buildings

The Thai side has provided the Japanese Team Office in the Graduate School next to Faculty of Agriculture. Laboratories and study rooms for the Project activities have been obtained in the building of Faculty of Agriculture. At this moment a new faculty building and the Biotechnology Building are under construction. The Japanese Team Office and laboratories for the Project will be located in the new buildings.

(3) Local Cost Bearing

The Thai side has been bearing the expenses for electricity and water of the Japanese Team Office and laboratories as well as a part of accommodation and fuel allowance of long-term experts.

2.2 Project Activities

2.2.1 Establishment of the technology for the practical production systems and acclimatization methods which are applied to selected seedlings for agricultural crops

(1) Plant biotechnology research to establish the technology for the practical production systems to select seedlings for agricultural crops

a) Plant tissue culture technology

The Project has succeeded in producing the virus-free seedlings of potato and strawberry through thermotherapy. Furthermore, the Project has developed *in vitro* treatment to remove pathogens by culturing apical meristem on suitable media. This technique has proved to be superior in the cases of garlic and strawberry varieties. Therefore, now it is commonly used for producing virus-free plants in laboratories.

In connection with the protoplast technology, condition of the morphogenesis and regeneration to whole plants (hormonal ratios and culture condition) were investigated with success on potato and tobacco. However, more data on this topic are still needed for the other crops such as orchids, strawberry and garlic. Moreover, the Project already has some data on the regeneration of the plantlets from the calli derived from the leaf-disc culture of potato, tobacco, garlic and strawberry.

From the idea of culturing the *in vitro* plantlets under CO₂ enriched atmosphere which can promote growth of the plantlets, a certain progress on the rapid propagation of rose, paper mulberry and strawberry has been made. Moreover, the Project has developed a new modified medium which can promote the multiplication rate of strawberry, orchids, *Pelargonium graveolens* and some medicinal plants.

Y. Iyama

L.P.

By the improved techniques for regulation and utilization of somaclonal variation, somaclones have been obtained from leaf-disc culture. The Project has produced strawberry and garlic clones by the above mentioned method. They are now under the field performance test. Moreover, the isozyme pattern analysis has proved to be a very effective technique for identification of the somaclonal variation. Some works on this topic have been in progress for longan, strawberry and orchids.

b) Plant protoplast technology

On this technology, Chiang Mai University (hereinafter referred to as "CMU") has been working for more than 15 years and, as a result, some researchers already have their own basic techniques and established conditions for protoplast research. Suitable isolation conditions and media have been developed for potato and tobacco. Similar works are now in progress for strawberry and orchids.

Regeneration of whole plants from selected cells and characterization of the regenerated plants were successful only in potato and tobacco. Potato leaf-roll virus resistant character has been transferred from *Solanum acaule* to the commercial potato varieties by using a protoplast fusion technique. Attempts to apply this technique to orchids and strawberry are in progress.

Research activities concerning the improvement of conditions of callus culture and related techniques are only in the primary stage due to limited working conditions. Further progresses are expected after the more spaces and convenient conditions are obtained in the new buildings.

(2) Research on culture media and environmental effects to establish the acclimatization method to the field for the cultured seedlings

a) Culture medium

In order to develop practical solid media for tissue culture, some materials including agar, starch from various plants and water absorbing polymers have been tested. Each material tested had advantages and disadvantages for growth of target plantlets and in terms of experimental analyses. Further efforts should be made to test the other materials for these purposes.

b) Environmental effects

Effects of water supply and fertilizer application on growth of transferred plantlets were investigated. Excess of these factors was found to be suppressive for growth of the plantlets. Optimum levels of water and fertilizer supplies should be further examined in comparison with those of the conventional technology.

Y. Fujie

J.C.

c) Acclimatization technology

Transfer trials of plantlets to actual fields raised the importance of control of soil-borne diseases, especially in the rainy season. Isolation and identification of soil-habitant microbes in nurseries and fields are still continued. Effects of the microbes based on these analyses should be examined in parallel with tests on fertilizer and water supply conditions.

2.2.2 Transfer of the technology to academic staff at CMU in the field of plant biotechnology

(1) To produce training manuals on activities

To optimize technical transfer concerning the results of the activities, the Project has made appropriate training manuals and related materials in English or Thai. These manuals were made along the lines of the special lectures, workshops and seminars which had been held with the cooperation of the Japanese long- and short-term experts. So far 40 manuals were completed.

(2) To operate special lectures, workshops and seminars using these training manuals

To transfer the technology and publicize the activities to academic staff at CMU, the special lectures, workshops and seminars on the results of the activities were organized. Twenty-two special lectures were held in cooperation with the Japanese long- and short-term experts. Academic staff and researchers from other universities and institutes were allowed to participate in these activities, and a total of 604 participants attended. The Project also held 20 workshops. Three hundred and thirteen academic staff from CMU and the other institutes participated in these workshops. Two annual plant biotechnology seminars were held under the auspices of the Project with 60 participants each.

3. Recommendation

3.1 Project Ownership

The Project should be implemented by the Thai side as its owner, and accordingly the Thai side will make efforts to achieve the Project purpose. The Japanese side will continue its cooperation as described in the R/D.

3.2 The Amendment of the TSI

It is not necessary to revise the TSI.

Y. Fujii

S.L.

3.3 Project Activities

Main purpose of the Project is to improve and develop the knowledges and techniques of plant biotechnology to the researchers of CMU with a help from Japanese experts. It is expected that the overall goal of the Project will enhance agricultural productivity and contribute to the flourishing of agriculture in the Northern part of Thailand. For this future purpose, the Project should expand its research contributions to actual agriculturists in this part of Thailand as much as possible.

In the activity of acclimatization research, a progress is delayed mostly because of time and labor consuming works in this research field. Dispatch of more short-term experts and completion of the new greenhouse will promote the research activities in this area. The Thai side should encourage counterpart personnel to put more efforts of research activities as well as increase the number of counterpart personnel.

One of the present long-term experts, who is in charge of the acclimatization technology, is going back to Japan in March 1996. In order to compensate for the lack of an expert in the acclimatization technology, the Project team leader who is now in charge of the plant biotechnology field will be responsible for that field.

3.4 The Project Operation

- (1) The Thai side should, through its own efforts, analyze and examine the technological problems to be reflected in the future activities to attain the objective of the Project.
- (2) The expenses incurred for the research by the Thai counterpart personnel are, in principle, to be covered by the Government of Thailand. CMU should, therefore, continue its efforts to secure the necessary research fund by means of requesting budgetary allocation from Ministry of University Affairs and/or utilizing the other available funds.
- (3) For the smooth implementation of the Project, CMU should continue its efforts to secure the budget for the other local costs.
- (4) The equipment and machinery provided are currently situated in separate places and seem to be not effectively utilized. The equipment and machinery should be situated appropriately to improve the access of the experts and counterpart personnel in the new building of Faculty of Agriculture and the Biotechnology Building both of which are now under construction. The allocation and effective use of the equipment and machinery should be

Y. Fujita

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decided in the Technical Meeting. This Meeting was set up on December 3, 1993 to adjust the activity of the Project. (See the attachment 1, the organization and operation of the Project).

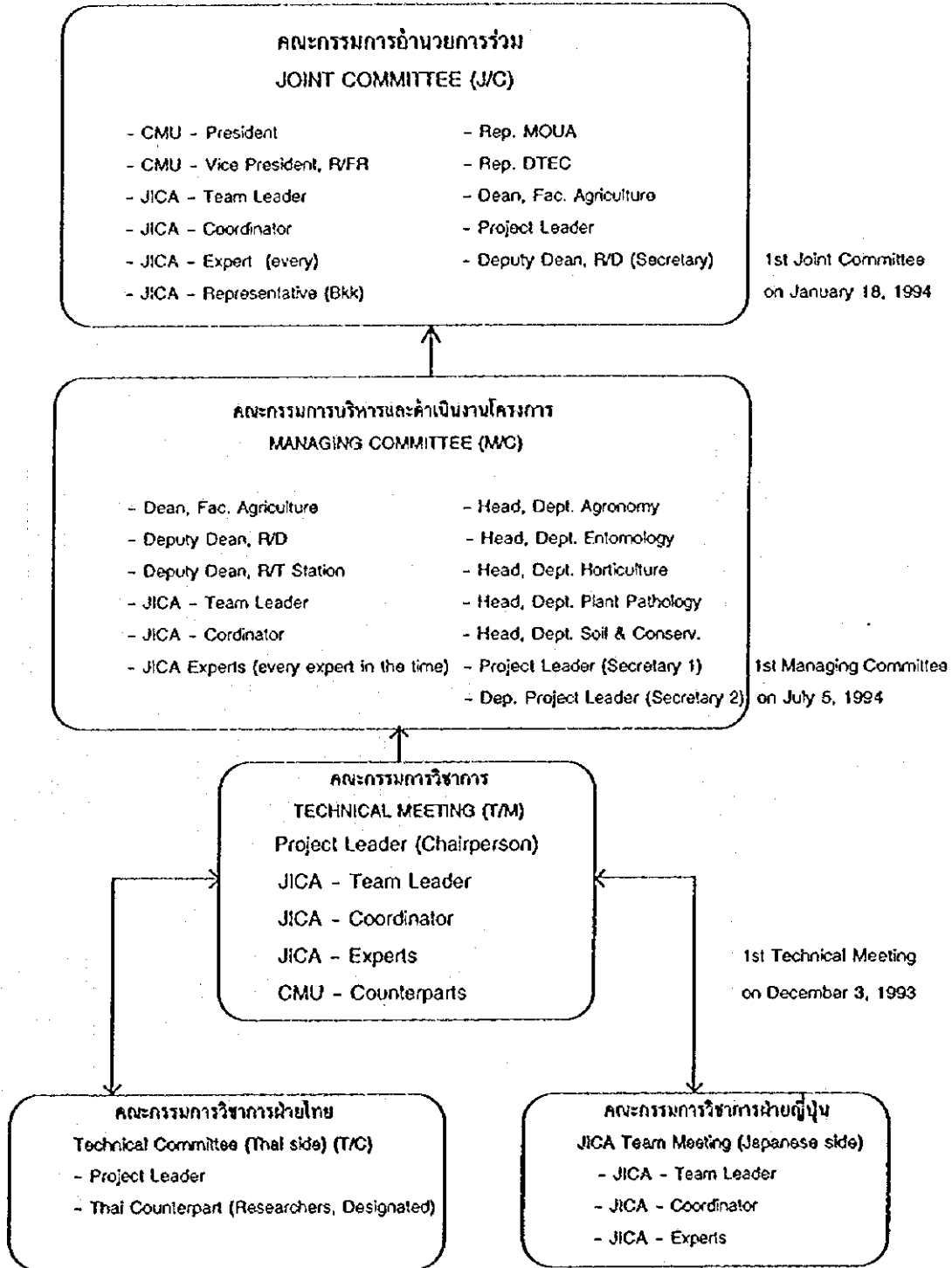
- (5) The Thai side should consider possible measures to utilize the technologies improved and developed through the Project for the sustainability of the research activities in the field of plant biotechnology at CMU, such as establishment of graduate program in Plant Biotechnology and related academic program.
- (6) The results obtained through the Project will be useful for the scientists and researchers who work in the area of plant biotechnology and acclimatization technology as well as for students and extension workers. The number of guidelines and Thai text books in these areas is very limited in Thailand. The Project should, therefore, put its effort in producing these materials.

Y. Fujie

J.C.

**ORGANIZATION & OPERATION CHART
OF
CMU - PLANT BIOTECHNOLOGY RESEARCH PROJECT
IN THAILAND**

Approved by
2nd Managing Committee
on July 13, 1994



Y. Fujie

d.l.

Management Steps
for
Scientific Collaboration, CMUPB

Duty	Steps			Remarks Approved in
	1	2	3	
Expert Dispatch	1. Japan offer 2. Team Meeting 3. Technical Meeting (T/M)	Thai approve Technical Committee (T/C)	Decision Managing Committee (M/C)	Thai Technical Committee (T/C)
Training Counterparts	Thai request (T/C)	Thai-Japan approve Technical Meeting (T/M)	Inform Managing Committee (M/C)	Technical Meeting (T/M)
Equipments	Thai request (T/C)	Thai-Japan approve (T/M)	Inform Managing Committee (M/C)	Technical Meeting (T/M)

Y. Fujii

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