

1. RECORD OF DISCUSSIONS

ON THE RECORD OF DISCUSSIONS BETWEEN THE JAPANESE AGRICULTURAL SURVEY TEAM AND THE AUTHORITIES CONCERNED OF THE GOVERNMENT OF THAILAND CONCERNING TECHNICAL CO-OPERATION PROJECT ON MAIZE DEVELOPMENT IN THAILAND

The Japanese Agricultural Survey Team, organized by the Japan International Cooperation Agency and headed by Mr. Motonaga Ohto visited Thailand from August 31 to September 17, 1976, for the purpose of formulating concrete co-operation plans for the Technical Co-operation Project on Maize Development which will be carried out with the Co-operative Demonstration Center as its core.

During its stay in Thailand, the Team exchanged views with the authorities concerned of the Government of Thailand on the necessary measures to be taken by both Governments to successfully implement the Technical Co-operation Project on Maize Development. The Team also conducted necessary survey for the implementation of the project.

As a result of the exchange of views and survey, both parties agreed to recommend to their respective Governments to carry out the matters referred to in the attached Record of Discussions.

Bangkok, September 17, 1976

Motonaga Ohto  
Head of the Japanese Agricultural  
Survey Team  
Japan International Cooperation  
Agency

Surin Cholpraserd  
Director-General  
Cooperatives Promotion  
Department

in the presence of

Wanchai Sirirattna  
Deputy Director-General  
Department of Technical  
and Economic Cooperation

## RECORD OF DISCUSSIONS

- I. (1) Both Governments will co-operate with each other in implementing the Technical Co-operation Project on Maize Development (hereinafter referred to as the "Project") with the Co-operative Demonstration Center as its core for the purpose of promoting the enhancement of the productivity of maize, and contributing to the development and strengthening of the agricultural co-operatives and the modernization of agriculture through the quality improvement of maize and its production technology.
- (2) The Project will be implemented in accordance with the Master Plan as stipulated in Annex I and in close contact with the maize development project between Thai and Japanese agricultural co-operatives.
- (3) The Project will be implemented in accordance with the annual operational work plan to be formulated annually by the Joint Committee referred to in VI. The annual operational work plan will be submitted to the authorities concerned of both Governments for their approval.
- II. (1) In accordance with laws and regulations in force in Japan, the Japanese authorities concerned will take necessary measures to provide at their own expense the services of the Japanese experts as listed in Annex II through the normal procedures under the Colombo Plan Technical Co-operation Scheme.
- (2) The Japanese experts referred to in (1) above and their families will be granted in Thailand the privileges, exemptions and benefits no less favourable than those accorded to experts of third countries working in Thailand under the Colombo Plan Technical Co-operation Scheme.
- III. (1) In accordance with laws and regulations in force in Japan, the Japanese authorities concerned will take necessary measures to provide at their own expense such equipment, machinery, implements, vehicles, tools, spare parts and other materials required for the implementation of the Project as listed in Annex III through the normal procedures under the Colombo Plan Technical Co-operation Scheme.

(2) The articles referred to in (1) above will become the property of the Government of Thailand upon being delivered c.i.f. to the Thai authorities concerned at the ports of disembarkation, and will be utilized exclusively for the implementation of the Project in consultation with the Japanese team leader referred to in Annex II.

IV. (1) In accordance with laws and regulations in force in Japan, the Japanese authorities concerned will take necessary measures to receive the Thai personnel engaged in the Project for technical training or study tour in Japan through the normal procedures under the Colombo Plan Technical Co-operation Scheme.

(2) The Government of Thailand will take necessary measures to ensure that the knowledge and experience acquired by the Thai personnel mentioned in (1) above through technical training and study tour in Japan may be utilized effectively for the implementation of the Project.

V. The Government of Thailand will take necessary measures to provide at its own expense:

(1) the services of the Thai counterparts and other personnel as listed in Annex IV;

(2) land and buildings as listed in Annex V. as well as incidental facilities;

(3) foundation seeds of good varieties needed for the extension purposes;

(4) supply or replacement of equipment, machinery, implements, vehicles, tools, spare parts and any other materials necessary for the implementation of the Project other than those provided by the Japanese authorities concerned under III (1);

(5) suitably furnished housing accommodations for the Japanese experts and their families;

(6) transportation facilities and the grant of the travel allowance for the Japanese experts for the official travel within Thailand.

Annex I

Master Plan for the Project

A. Composition of the Project

1. The Co-operative Demonstration Center (hereinafter referred to as the "Center") which will include fields for trials, training, seed production and demonstration, will be established in Chaibadan, LOP BURI Province.

Trials, training and extension services, demonstration and other related activities in respect of technology for the improvement of maize production will be conducted at the Center.

2. For the purpose of effective extension of technical co-operation to the following five provinces, key extension bases will be established within these provinces.

Lop Buri Province  
Sara Buri Province  
Petchaboon Province  
Pisanuloke Province  
Sukhothai Province

(1) The following six agricultural co-operatives and five farmer's groups to be designated from each of the provinces mentioned in A2 above by the Joint Committee will be the key extension bases.

Chaibadan Agr. Co-op.  
Prabuthabad Reclamation Agr. Co-op.  
Petchaboon Agr. Co-op.  
Prompiram Agr. Co-op.  
Nongtom Agr. Co-op.  
Sawankaloke Land Settlement Co-op.

(2) Demonstration fields of about 13 ha. will be set up at each of the eight key extension bases, excluding the Petchaboon Agricultural Co-operative, Nongtom Agricultural Co-operative and Sawankaloke Land Settlement Co-operative.

3. To ensure the smooth supply of extension seeds, seed production fields will be set up within the Center and at appropriate places in its vicinity.

The area required for the seed production fields will be approximately 100 ha in the first year, 140 ha in the second year and 160 ha in the third year of the Project.

## B. Activities under the Project

### 1. Applied Experiments for Production Techniques

The following experiments will be conducted at the Center for the purpose of identification, utilization, confirmation of local adaptability and other items of specific techniques developed by agricultural experiment and research institutions.

- Applied experiments for production techniques
- Varieties adaptability tests
- Fertilizer tests
- Water management tests
- Disease and insect control experiments
- Cropping system experiments

### 2. Seed Multiplication

In collaboration with the Department of Agricultural Extension, the foundation seeds which are to be supplied by the Department of Agriculture will be multiplied to produce extension seeds at the seed production fields.

The extension seeds thus produced will be distributed to maize producing farmers in the five provinces mentioned in A2, through agricultural co-operatives and farmer's groups.

### 3. Disease and Insect Control

Co-operation activities of the Center will be extended to the projects on the control of maize disease and insect, which will be carried out by the Department of Agricultural Extension in the provinces mentioned in A2.

### 4. Extension and Demonstration

Improved cultivation techniques developed by the Center will be demonstrated at the demonstration fields mentioned in A2, and experts will conduct round trip guidance activities to promote their effective extension to the key extension bases.

5. Technical Training in Seed Production and Improved Cultivation Techniques

Technical training in seed production and Improved cultivation techniques) will be provided at the Center for the farmers associated with the seed production fields mentioned in A3 and also for the maize producing farmers.

6. Agricultural Mechanization System

To establish a system for the mechanization of maize cultivation and to promote its extension, applied experiments for the systematization of agricultural mechanization as well as training activities for agricultural machinery operation and repair will be conducted at the Center. At the same time, the agricultural mechanization system will be demonstrated at the Center and at the demonstration field mentioned in A2.

7. Guidance on the Management of Agricultural Co-operatives

To develop and strengthen agricultural co-operatives and farmer's groups, staff officials of agricultural co-operatives and other personnel will be trained and educated at the Center, and experts will conduct round trip guidance activities to the key extension bases.

Annex II

List of Japanese Experts

Category	Field
1. Team Leader	
2. Experts	Seed production Cultivation Farm machinery Agricultural co-operatives and extension
3. Coordinator	

Notes: Short-term experts may be dispatched, when necessity arises.

Annex III

List of the articles to be provided  
by the Government of Japan

1. Equipment, machinery, implements, spare parts and fertilizer for crop production.
2. Equipment, machinery, implements and spare parts for seed processing and storage.
3. Equipment, machinery, and chemicals for insect and disease control.
4. Machinery and tools for repair work at the Centre.
5. Equipment, instruments, spare parts and other materials for laboratory work.
6. Vehicles.
7. Teaching materials including audio-visual aids.
8. Other necessary equipment, tools and materials to be mutually agreed upon.



Annex IV

List of Thai Counterpart Officials  
and Other Personnel

Category	Field
1. Project Manager	
2. Counterpart Officials	Seed production Cultivation Soil and fertilizer Pathology and insects Farm machinery Irrigation Extension Agricultural co-operatives Farm management
3. Clerical and service employees	
4. Labourers	

Annex V

List of Land and Buildings

1. Land
  - (1) Land for the Center about 16 ha
  - (2) Seed production fields about 160 ha  
(in the third year)
  - (3) Demonstration fields about 104 ha  
(total area for the eight  
key extension bases)
  
2. Buildings in the Center
  - (1) Office
  - (2) Garage
  - (3) Guest house
  - (4) Classrooms
  - (5) Laboratory
  - (6) Fuel storage
  - (7) Storage for farming materials
  - (8) Shed for agricultural machinery
  - (9) Workshop
  - (10) Seed drying station
  - (11) Seed processing station
  - (12) Seed storage
  - (13) Dormitor

Annex VI

Composition of the Joint Committee

Chairman Under-Secretary of State, MOAC

Japanese Side	Thai Side
1. Team Leader	1. Director-Generals of CPD, DA and DAE
2. Expert(s) designated by the team leader	2. Project Manager
3. Coordinator	3. Coordinator from Foreign Relations Div, MOAC.
4. Representative of JICA	4. Representatives of DTEC, Budget Bureau and NESDB.

Notes:

- (1) An official of the Embassy of Japan may attend the meeting of the Joint Committee as an observer.
- (2) MOAC : Ministry of Agriculture and Cooperatives
- (3) CPD : Cooperatives Promotion Department
- (4) DA : Department of Agriculture
- (5) DAE : Department of the Agricultural Extension
- (6) DTEC : Department of Technical and Economic Cooperation
- (7) NESDB: National Economic and Social Development Board
- (8) JICA : Japan International Co-operation Agency



D) EXTENSION NOTE FOR THE RECORD OF DISCUSSIONS  
REGARDING THE TECHNICAL COOPERATION PROJECT  
ON MAIZE DEVELOPMENT IN THAILAND

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The Japanese Technical Advisory Team (hereinafter referred to as "the Team") organized by the Japan International Cooperation Agency and headed by Mr. Motonaga Ohto, visited Thailand on August 1st, 1979.

The Team had a series of talks with the authorities concerned of the Government of Thailand on the extension of the period of technical cooperation based on the Record of Discussions, signed in Bangkok on September 17th, 1976, concerning the technical cooperation project on maize development in Thailand.

As a result of talks, both sides agreed to recommend to their respective governments that the period of the technical cooperation mentioned in the Record of Discussions be extended until September 16th, 1982.

Bangkok, August 16th, 1979.

Mr. Motonaga Ohto

Head of the Japanese  
Technical Advisory Team,  
Japan International  
Cooperation Agency

Mr. Adul Chyaviphat

Director-General,  
Cooperatives Promotion Department

in the presence of

Mr. Sujati Iramoolpol

Director-General  
Department of Technical  
and Economic Cooperation

Project title : Maize Development

Requesting agencies : Cooperative Promotion Department (CPD)  
in cooperation with the Department of  
Agriculture (DA) and the Department of  
Agricultural Extension (D.A.E), Ministry  
of Agriculture and Cooperatives

Source of assistance : The Government of Japan

1. Proposed period of project extension (2 years) from  
17th September, 1982 to 16th September, 1984
2. Detailed description of present project accomplishment and  
work in progress:

The report on "development and present situation" of  
the project is attached as Supplement 1 to this request.

3. Major problems and obstacles experienced during project  
implementation period:

3.1 The increase of production cost and the decrease  
in market price of maize in 1981, and also enlargement of  
irrigation system into cultivated area of Non, tom and  
Pompiram Agricultural Cooperatives cause the reduction of  
cultivated area of maize.

3.2 Guidance on management of agricultural cooperatives  
in the project area are still slowly progress because lack of  
managerial skills, operational fund, and marketing facilities  
in cooperatives that the services provided by the cooperatives  
can not achieve the members' needs.

3.3 The capacity of seed processing plant is only  
500 tons per year. To produce 1,000 tons of seed by the year  
of 1981/82 is essential to enlarge the capacity of the plant.

3.4 The limitation of revolving fund for purchase  
seed of corn caused the project being unable to produce corn  
seed as it was planned.

3.5 Most of farmers still lack of knowledge on plant  
protection, the infestation of pests could outbreak seriously  
anytime. It is essential that the control of insects

and insects should be carried out intensively in the project area in time, and member education on plant protection should be conducted extensively.

4. Justification for an extension of the project:

4.1 According to the statement in the implementation of activities in the early period due to the certain problems confronting at that time, the targets had been delayed. After the removal of these obstacles, the progress has been made. Therefore, during the first phase (1976 - 79) it was the establishment period of the Cooperative Demonstration Centre.

In the second phase, the activities have been conducted on applied experiment, seed production and multiplication, demonstration on farm techniques and mechanization system, disease and insect control, and guidance on the management of agricultural cooperatives. However, the focus has been done on seed production and multiplication, and applied experiment, the other activities which related to strengthening of agricultural cooperatives in the project area has still lagged behind by the problem mentioned above in item 3.2

In order to achieve the desired objectives as cited in the R/D, especially on strengthening of the six agricultural cooperatives in the project area, it is essential that the activities of cooperatives to improve production technology of cooperative members and widen marketing business of cooperatives should be emphasized as follows:

4.2 Setting up cooperative repairing workshops at agricultural cooperatives in the project area as automotive service centre in order to provide members on farm machinery services and repairing of farm machine such as farm tractor, pumpin machine, spraying machine, corn miller etc. This activities will not only increase members' experience on operating and repairing of farm machinery but also modern farm techniques will be operated throughout the project area.

4.3 Total supply of corn seed produced by the D.E is still unenough for farmers' demand. In order to remedy this situation and relieve the burden of the Government, the cooperative societies in the project area should be promoted to produce certified seed themselves under the technical

assistance of the D. and D'E to supply their members as well as the other cooperatives nearby. This activities will creat high advantage on both stren,thening of agricultural cooperatives and also raising of farmers' income.

4.4 Rev lving fund should be set up to be lended to the agricultural cooperatives in the project area for running their activities and improving the marketing of cooperative products. This revolving fund is very essential for developing and stren,thening agricultural cooper tives and farmer's groups in the project area.

4.5 As foundation seed is a crucial source for the extension seed,the development of other good varieties and hybrids of foundation seed, is essential importance.

Hence, a proper foundation seed processing plant is highly required for more accurate and objective development in the third phase.

4.6 In the third phase, corn breeding should be conducted on both yield and quality improvement because high nutrition value in protein and oil is essential to consumers, factories and a good premium to farmers. It is, therefore, necessary to cooperate both in field and laboratory of the researchers for yeild and quality improvement in the third phase.

4.7 After the harvesting of maize, other crops such as soybean or mungbean should be cultivated as minor crops in order that cultivated land is fully utilized and farmers can earn more income. Therefore, in the third phase other seeds are required to produce in seed processing plant in order to provide good varieties seed of minor crops to farmers.

4.8 In the third phase, the project area should be enlarged to cover the other main production areas of maize in four cooperatives as follows:-

Takhli Agricultural Cooperative, Nakhon Sawan Province,  
Nak-Pa Agricultural Cooperative, Nakhon Sawan Province,  
Vichien Suri Agricultural Cooperative, Petchaboon  
Province,

Yang-Inang Agricultural Cooperative, Udon R. Province,

This will substitute the maize production area which have been reduced in Nakhon and Petchaboon District, Petchaboon Province

as mentioned in item 3.1. Moreover, large amount of corn seed is highly needed by maize producing farmers in these areas.

As the period of technical cooperation of this project is being terminated in September, 1982. It is very essential that the period of Japanese technical cooperation should be extended for the other 2 years, in order that the achieved results will be utilized successfully to improve productivity of maize and contributing to the development and strengthening of agricultural cooperatives.

5. Detailed description of the proposed project extension:

5.1 Project objective : Same as cited in the R/D, dated September 17, 1976

5.2 Condition expected at completion of extended project. The results of extended project is planned annually as follows:

Activity	1982/83	1983/84	Remarks
Applied Experiment (ha)	3	3	- Experiment will be done on cropping pattern, fertilizer test, weed control, varietal test in yield and quality, disease and insect control, mechanized cultivation and irrigation.
Varietal Improvement (ha)	5	5	- Varietal improvement will be done on yield trial, crossing block, and seed increasing.
Seed Multiplication:			- 1,000 tons of certified seed corn, and 500 tons of certified seed of mungbean and soybean will be produced each year.
Maize (ha)	1,100	1,100	
Mungbean and Soybean(ha)	1,100	1,100	
Insect and disease control (ha)	64,000	64,000	- It will be extended to farmers in the project area.
Training (persons)	1,000	1,000	- Training will be conducted both at the Centre and Mobile Unit on modern farm techniques and mechanization system.
Improvement and Strengthening of Cooperatives by:			



Activity	1982/83	1983/84	Remarks
- Guidance in operating farm machinery workshops	2	4	- Four agricultural cooperatives will provide services on farm machinery and repairing to members of about 5,000 families.
- Guidance on seed farm production and seed processing techniques(ha)	600	600	- Two agricultural cooperative will be promoted to process seed of corn themselves, 300 tons per year each

5.3 Recommended sources of data for project verification:

- 5.3.1 Department of Agriculture
- 5.3.2 Department of Agricultural Extension
- 5.3.3 Cooperatives Promotion Department
- 5.3.4 Japanese Experts

5.4 Project site : Cooperatives Demonstration Center  
Koktoom, Huang District of  
Lopburi Province

5.5 Project work plan and activities

5.5.1 Detailed work plan : Detailed work plan of the project will comply with item 3 of the Master plan as stipulated in annex 1 of the R/D, dated September 17, 1976.

5.5.2 Time schedule of project activities is attached as Supplement 2 to this request

5.6 Personnel support for the extension of the project:

Personnel support from the three Departments concerned will be as follows:

Item	Number
<u>Cooperatives Promotion Department</u>	
Project manager	1
Technician	6
Mechanical repair	4

Item	Number
<u>Department of Agriculture</u>	
Technician	19
Officer	5
Office personnel	6
Workers	12
Sub-total	42
<u>Department of Agricultural Extension</u>	
<u>(a) Seed Multiplication</u>	
Technician	10
Officer	11
Mechanical engineer (seed processing plant)	7
Electrical Engineer	1
Office personnel	1
Workers	11
<u>(b) Plant Protection</u>	
Technician	4
Officer	8
Sub-total	53
Total	129

6. Assistance requested for the project extension

6.1 Experts

Field of Operation/ Activity	Total		1982/83		1983/84	
	No.	M/M	No.	M/M	No.	M/M
- Team Leader(Agronomy)	(1)	(24)	1	16	1	8
- Seed Production	(1)	(24)	1	16	1	8
- Cultivation	(1)	(24)	1	16	1	8
- Farm Machinery	(1)	(24)	1	16	1	8
- Agr.Cooperatives and Extension	(1)	(24)	1	16	1	8
- Plant Breeder	(1)	(24)	1	16	1	8
- Co-ordinator	(1)	(24)	1	16	1	8
- Plant Protection	(1)	(24)	1	16	1	8

### 6.1.1 Justification for requesting experts :

The project is intended to contribute to the improvement of technological levels in the area of maize production and to strengthen the management of agricultural cooperatives. Accordingly a major part of this request is for experts to assist in project execution in the various fields mentioned. A total of 9 experts would be required over the extended period. In addition, a number of short-term experts would be also needed to provide assistance at critical stage of the project period.

### 6.2 Fellowships :

Field of Training	Total		1982/83		1983/84	
	No.	M/M	No.	M/M	No.	M/M
Agricultural Marketing	2	6	1	3	1	3
Agricultural Cooperative- Management	2	6	1	3	1	3
Farm Machinery	2	6	1	3	1	3
Cooperative Training	2	6	1	3	1	3
Seed Technology and Production	4	12	2	6	2	6
Cultivation	4	12	2	6	2	6
Plant Protection (insect, disease, weed, vertebrate and mite)	6	18	3	9	3	9
Irrigation on field crop	2	6	1	3	1	3
Seed Processing	2	6	1	3	1	3
Seed Production	4	12	2	6	2	6
<b>Total</b>	<b>30</b>	<b>90</b>	<b>15</b>	<b>45</b>	<b>15</b>	<b>45</b>

#### 6.2.1 Justification for requesting fellowships:

In order to carry out the project successfully, local staff must be equipped with broad knowledge and experience in their jobs. Therefore, training of participants in Japan which is successful in agricultural and cooperative development is also included as a major element of this project. A total of 30 fellowships would be needed with a combined duration of 90 man-months. These are required to provide training in various fields for project

6.3 Equipment

To be attached as Supplement 3 to this request

6.3.1 Justification for requesting equipment:

The main activities of this project are: applied experiments for production techniques, seed multiplication, quality and varietal improvement, disease and insect control, extension and demonstration, training, agricultural mechanization system, guidance on the management of agricultural cooperatives, guidance on farm machinery workshops and extension seed processing of agricultural cooperatives. Therefore, items of equipment in Supplement 3 are highly needed for the activities under the project to be carried out.

7. Thai Government Counterpart Contribution to the Proposed Project extension.

Item of counterpart contribution	Total Contribution		1983	1984
	Already available in 1977-82	To be requested in 1983 - 84		
1. Salaries and wages	6,260,210	6,000,000	2,700,000	3,300,000
2. Operation and maintenance	5,865,000	7,000,000	3,000,000	4,000,000
3. Materials and equipment	12,294,350	9,000,000	4,500,000	4,500,000
4. Buildings and construction	21,280,850	12,000,000	7,000,000	5,000,000
5. Revolving fund for seed collecting	2,340,000	5,000,000	2,500,000	2,500,000
Total	48,040,910	39,000,000	19,700,000	19,300,000

8. Future work plan

During the period of Japanese technical cooperation it is expected that the project results will accumulate and that these will be utilized to stimulate developing of maize and agricultural cooperatives in the project area. After the completion of technical cooperation, the project is intended to continue to provide for the proper growth of inter-rate activities relating to maize and agricultural cooperatives in the project area.

cooperatives not only limited to six agricultural cooperatives as cited but also to a large extent of agricultural cooperatives which operate in the maize producing provinces. Meanwhile, marketing business of cooperatives will also be promoted so as to be able to raise income of the cooperative members. Within a reasonable period of development, an attempt to improve production and marketing of the other upland crops of cooperatives would also be included. It is expected that the results derived from this project would be a major factor in the development of agriculture and agricultural cooperatives in this region.

参考資料 4. SUMMARY REPORT AND RECOMMENDATION OF THE JAPANESE EVALUATION TEAM


To: Mr. Yookti Sarikaphuti,  
Chairman of the Joint Committee for Technical Cooperation  
Project on Maize Development.

From: Motonaga Ohto,  
Leader of the Japanese Evaluation Team for Technical  
Cooperation Project on Maize Development in Thailand.

Subject: Submission of Summary Report.

Date: 22 July, 1982.

I am submitting herewith the record of my summary report of the evaluation which I presented orally at the Fifth Meeting of the Joint Committee held on 21 July 1982, for distribution to the agencies concerned and for inclusion in the minute of the meeting.

  
(Motonaga Ohto)

### Summary Report and Recommendation

The Project has been carried out in accordance with the Master Plan which was attached to the original Record of Discussion of 17 September, 1976. The actual implementation of the Project, however, delayed due to the change of the location of the Center from the originally planned site in Chaibadan to the present site which locates in Muang District of Lopburi Province, adjacent to the Experiment Station of the Agriculture Department.

Although the change of the location caused delay in starting the project activities, the present site of the Center seems to be much better in all aspects. The progress of the activities after the completion of the Center was fast and caught up the delay.

The costs of the project were met by the government of Thailand and Japan. The Thai portion consisted mainly of the costs for land and buildings, salaries, wages and other operational expenses and Japanese portion covered mostly the costs of equipment, farm machines, vehicles and other materials, and the expenses for experts services. The disbursement of Thai portion amounted to Bht. 44,291,810, and Japanese portion ¥ 624,360,000 (approximately Bht. 63 million).

The activities of the project were carried out under the 7 categories as specified in the original Master Plan.

## I. Evaluation on activities under the Project.

### 1. Applied Experiments for Production Techniques:

Applied experiments on 8 items have been carried out in the experiment plots in the Center.

Some of them, already have produced definite results, such as those on time of seeding, and seed preservation method, but some other experiments such as the cropping pattern experiment requires longer period until useful result is obtained. Such long-term experiment needs continuation for some years. The experiments which have been started recently such as the experiment on post-harvest quality control should also be continued.

### 2. Seed Multiplication:

The production and processing of certified seeds progressed rapidly. Last year's production was about 800 tons and the production for this year is estimated at 1,000 tons. As the quantity increases and the processing plant operates in full capacity, the proper operation, maintenance and repair of the plant become increasingly important. The technical staff of the plant should be strengthened both in number and quality and transfer of technology in this aspect to the technical staff, which is not yet satisfactory, should be continued.



### 3. Disease and Insect Control:

Before this project started in 1976, locust and downy mildew were major damages on maize, but since the inception of the project the damages almost disappeared, owing to the active DAE's plant protection and perhaps the change of natural environment in case of locust and the development of resistant varieties in case of downy mildew.

The Team noted with great concern the damage on maize of rodent. The production of maize seed in dry season under the Project at Sawankaloke in 1978/79 completely failed by the rodent damage. Since rodent damage is not only on maize but also on other major crops in various parts of Thailand, effective control measures have to be developed as a national project.

### 4. Extension and Demonstration:

In order to extend the techniques confirmed by the applied experiment in the Center, field demonstrations were conducted. The cumulative number of places where demonstrations have been done in 121 fields totaling 687 rai in acreage. This activity attained the planned target as far as number of places and acreage are concerned, but the actual effect of the demonstration is difficult to evaluate. It seems, however, that, due to the poor transportation system in rural areas, the visitors to the fields were very few. The extension activity of the Project might better be

concentrated on a smaller number of demonstration fields not far from the Center and utilize the demonstration combined with the training program in the Center.

5. Technical Training in Seed Production and Improved Cultivation Techniques:

Training courses on cultivation techniques were conducted at the Center. The number of courses and the participants were 6 and 250 respectively.

The effectiveness of the technical training is clearly proved by the fact that all of the prize winners and the farmers who showed very high yield at the yield competition, as referred to later, were the graduates of the training courses.

6. Agricultural Mechanization System:

Training courses for the operation, maintenance and repair were conducted in the Center. The cumulative number of courses was 7 with 320 participants in total.

In addition to the special courses for mechanisation, mechanical training was included in curriculum of the various courses for cultivation techniques mentioned above.

Training on mechanization was also conducted at various places in the Project area by the "Mobile-Unit". The number of farmers participated in the mobile-unit training amounted to 210.

As the use of tractors and other machines for maize cultivation is widely spread and still increasing, the need for training seems to be large. The task of the machine workshop in the Center, at the same time, will increase its importance.

7. Guidance on the Management of Agricultural Cooperatives:

The main activity in this field was the training of Cooperative personnel and member farmers on the theory and practice of the management of Cooperatives. Five training courses on this subject were conducted in the Center with participation of about 200 trainees in total. Beside these specialised courses, cooperative management was included in the curriculum of many other training courses.

The round-trip guidance by the Center's staff was conducted frequently at the Phraphutthabat Reclamation Cooperatives and Chaibadan Agricultural Cooperatives. The guidance was focused on specific activities of the Cooperatives rather than general guidance.

The general meetings and monthly Committee Meetings of each of the six "designated cooperatives" were always attended by the staff-members of the Center.

As a new activity of agricultural cooperative, tractor services were provided on trial basis by three cooperatives, e.g. Sawankaloke, Chaibadan and Phraphutthabat. Tractors were made available to these cooperatives from the Center for this activity.

It appears that cooperative tractor service is an attractive activity to member farmers. However, more study is necessary to establish economic feasibility of tractor service as the cooperative business. The data concerning the fuel consumption, operation hour, labor requirement, etc., recorded in the course of this trial activities will be useful for such study.

Another new activity performed by the cooperatives under the guidance of the Center's staff is yield competition. In 1980, the Phraphutthabat Reclamation Agricultural Cooperative held the competition with participation of 22 member farmers. The yield of the first prize winner was as high as 6.6 tons per hectare, the farmers who yielded more than 5 tons were 5 in number. In 1981, the competitions were held again by the Phraphutthabat Co-op and by Chaibadan Co-op. In addition to these two Co-ops, Petchaboon Agr. Co-op and a farmers group in Lopburi are now carrying out the competition this season.

This activity was very effective not only in motivating farmers to improve their cultivation techniques, but also in promoting interests of farmers to the cooperative activities. The cultivation records (planting time, spacing, amount of fertilizer applied, varieties, etc.) submitted by the participants provided very useful data for analysis of high yield elements.

In connection with the cooperative promotion activities under the project, we noted with concern the fact that only a small portion of the certified seed were sold to farmers through cooperatives, despite the effort of the Center's staff to encourage the cooperatives to deal with more seeds. And, we understand that there are various difficulties which are beyond the scope of this project, such as the lack of funds on the part of the cooperatives.

We consider that this problem might better be considered from the viewpoint of overall and integrated cooperative development. More specifically, the cooperative distribution of seeds under this project might well be linked with, or incorporated in, the "Total System Cooperative Development Model Project", which is now being formulated by CPD, basing upon the result of the "Thai-Japan Joint Feasibility Study for the Cooperative Development Project in Thailand", conducted in 1980-81.

## II. Conclusion and Recommendation

There are differences among the activities under the project in the degree of progress, but the project as a whole made a good progress as planned in the original Master Plan.

Moreover, some activities, such as the mobile unit training and yield competition, which were not envisaged in the original Master Plan were carried out with success.

Various factors may be attributable to this success of the project, but we consider that the most important factor was human relation: among the Thai officials participated in this project from three different Departments and between the Thai staff and Japanese experts. And in the later aspect, we highly evaluate the value of "Counter-part training" in Japan.

Prior to and during the Project period about 20 Thai officials came to Japan in connection with the project. The counter-part training was valuable not only in raising their knowledge and technique, but also contributed greatly to the good understanding among Japanese experts and the counterparts.

From these observations, the team considers that the project should be continued basically on the same organization, i.e., the joint undertaking of the three Departments. On that assumption, the team recommends that following activities should be continued as priority activities for Japanese Cooperation.

参考資料 5. INFORMATION FOR EXTENDING THE PROJECT FROM THE EMBASSY OF JAPAN

1. The applied experiments which are unfinished and some experiments started recently due to the new needs, such as post-harvest quality control.
2. Technology transfer on operation, maintenance and repair of seed processing plant in the Center.
3. Yield Competition.
4. Mobile unit training on mechanisation and the technology transfer in operation of workshop in the Center.

The Embassy of Japan presents its compliments to the Department of Technical and Economic Cooperation and, with reference to the Embassy's Note No. 754/57 dated June 22, 1982, has the honour to inform the latter that the Government of Japan has decided to extend the another two years Cooperation on Maize Development Project in Thailand from September 17, 1982 till September 16, 1984 as the follow-up type cooperation. The subjects covered by the follow-up are as follows:-

1. Applied Experiment for Techniques Production, such as Cropping Pattern Experiment, Post Harvest Quality Control Experiment and Irrigation so forth.
2. Seed Multiplication, such as Technology Transfer on Operation, Maintenance and Repair of Seed Processing Plant in the Center.
3. Extension and Demonstration, such as Yield Competition.
4. Agricultural Mechanization, such as Mobile Unit Training on Mechanization and the Technology Transfer in Operation of Workshop in the Center.

The Embassy has further the honour to inform that the term of service of three Japanese experts in this project will be extended as follows:-

- |                          |  |
|--------------------------|--|
| 1. Mr. Tetsuji YAMAKI    | From September 17, 1982<br>To March 16, 1983     |
| 2. Mr. Tatsuji MURAI     | From September 17, 1982<br>To September 16, 1984 |
| 3. Mr. Haruhiko SAKAMOTO | -do-   |

It would be greatly appreciated if the Department would be kind enough to convey the above information to the authorities concerned and submit A1 Forms to the Embassy as soon as possible.

The Embassy of Japan avails itself of this opportunity to renew to the Department of Technical and Economic Cooperation the assurances of its highest consideration.



August 19, 1982



## TECHNICAL COOPERATION PROJECT ON MAIZE DEVELOPMENT IN THAILAND

by  
Tetsuji Yamaki<sup>1</sup>

### 1. Introduction:

The project has been initiated under the Record of Discussion (R/D) between the Thai and Japanese Authorities which was signed on September 17, 1976. The R/D agreed upon a 3-year mutual cooperation for the purpose of promoting the productivities of maize, and contributing to the development and strengthening of the agricultural cooperatives and modernization of agriculture through the quality improvement of maize and its production technology.

The project was decided to extend the period of the technical cooperation until September 16th, 1982 based on the Extension Note of the R/D signed on August 16th, 1979.

The project is composed of the main elements as follows:

- 1) The establishment of a Cooperative Demonstration Center in Lopburi Province, for the purpose of conducting experiments, training and extension services, demonstration and other related activities in respect of technology for the improvement of maize production.
- 2) Establishment of the key extension bases at six agricultural cooperatives and five farmers' groups in the project area, which consist of five maize producing provinces, for setting up the demonstration fields.
- 3) The setting up of seed production fields at the Center and appropriate places in the project area to ensure the smooth supply of extension seed to the farmers.

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Paper presented at the "Thirteenth Thai National Corn and Sorghum Reporting Session", organized by the Department of Agriculture at the Bangsaen Beach Hotel, Chonburi, March 19-23, 1982.

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The project area covers five major producing provinces: Lopburi, Saraburi, Petchaboon, Phisanulok and Sukhothai. Nearly 50% of the total production of maize in the country has been produced in the project area. In order to attain the purpose of the project, the Cooperatives Demonstration Center was set up in Koktoom, Muang District, Lopburi Province, 150 kms north of Bangkok. The buildings and facilities, such as an administrative office, a seed processing plant, a laboratory, a dormitory, an auditorium, a workshop, housing, a prefabricated cold storage, etc., were constructed at the Center.

The opening ceremony of the Center was held in August 1978.

## 2. Result of activities of the project

The real activities of the project were carried out in 1979 during the third year of it, in accordance with the schedule of construction work, allocation of the staff members and of necessary equipment at the Center. Field work on a small scale, however, was conducted at the Center in 1978 and it was extended to the real activities at the Center and the farmers' fields in the project area since 1979.

In this report, however, priority is given to the experimental activities over others.

### 1) Applied experiments:

Applied experiments should be conducted for the purpose of identification, utilization, confirmation of local adaptability and other items of specific techniques developed by agricultural research work. Experiments were carried out to confirm the effect of individual cultivation techniques, such as variety, plant population, planting time, fertilizer application, etc., at the Center since 1978.

The results showed that the variety Suwa 1 was highest in yield and response for increasing yield by the application of fertilizer compared with other promising ones and Guatemala. The favorable popu-

lation of plants for yield increase was 50,000 and 75,000/ha with few differences among the number of plants in a hill. The effect of fertilizer application was about 200% on yield increase of Suwan 1 and the highest yield was more than 5 tons/ha in the dry season under irrigation in 1978/1979. Other varietal tests were conducted in 1981 and 1981/1982. Suwan 2 which was released in 1981 was compared with Suwan 1. The new variety was about 10 days earlier in maturity and there were no significant differences in yield with Suwan 1. however, favorable planting density of Suwan 2 for getting high yield was much higher than that of Suwan 1. That was 80,000- 90,000/ha. Hybrid varieties Pioneer 193 and Hycorn 9, which were introduced in Thailand by private sectors, were also examined under conditions with and without fertilizer in 1980/1981. Both of them seemed to be higher yielding varieties than Suwan 1 especially in case of applying fertilizer, but no significant differences could be observed.

An experiment with regard to the irrigation techniques with special reference to the frequency and amount of water, was conducted at the Center in the dry season 1978/1979 for the purpose of getting high yield of maize. In this experiment, furrow irrigation was applied. The effect of irrigation on yield increase was more than 150% and supply of water at silking stage about 50 days after germination was most effective. The same kind of experiments was conducted more precisely by pot culture during the dry season 1981/1982. In these experiments, <sup>the</sup> amount of water for irrigation was set from 0 to 150% of the amount of evaporation and water was given at 7 day intervals. The effect of irrigation on yield increase was very clear when water was given for the period of 20 days before and after the stage of tasseling and silking. The rate of yield increase was from 30 to 55% following increase of <sup>the</sup> amount of water.

Another way of saving water in the soil is the mulching method. The effect of mulching on maize fields was examined in Saraburi Province in the dry season 1979/1980 and at the Center in the rainy season 1980. The yield of maize mulched with rice straw increased 34% in the dry season while no effects were observed in the rainy season.

An experiment regarding the cropping pattern has been carried out from the rainy season in 1978 as a long term practice in the cultivation of maize. Soybean, mung bean, sorghum were utilized as rotation crops for maize. The effect of rotation by leguminous crops on yield increase of maize was observed clearly in the rainy season of 1979 during the second year of the experiment. After leguminous crops were planted in the dry season the maize showed the highest yield of 3.9 tons ha as compared with about 2.4 tons ha for maize planted after maize or sorghum in the dry season. The mean yield for 3 years in the rainy season from 1979 to 1981 showed almost the same results in 1979.

Germinative ability tests between maize seeds stored in air-conditioned rooms and those stored under natural conditions were conducted from 1979 to 1981 at the Center. It was observed that there were no differences in germinative abilities between seeds under the two conditions provided that they were used not later than 8 months after harvest. The result showed that the seeds harvested during the last rainy season could be used for the next rainy season if they were kept dry and protected from damage by insects and mould.

The improvement of the quality of maize grains has been one of the main purposes of the project. The investigations were conducted at the Center in 1981/1982 for the purpose of making clear the varieties of fungi parasitized on maize after harvest and to measure the amount of Aflatoxin produced by *Aspergillus flavus*.

Many fungi were isolated from the maize grains in Thailand. It was indicated that the storage fungi such as *Aspergillus* and *Penicillium* increased and the field fungi such as *Botryodiplodia* and *Fusarium* decreased as the period after harvest went by. Among the field fungi, *Fusarium moniliforme* and *Botryodiplodia* sp. were frequently detected. It was reported that many *Fusarium* species produced mycotoxins. It will be necessary to examine the ability of mycotoxin

production of *Fusarium moniliforme*. *Botryodiplodia* sp. was usually isolated from the embryos of maize grains which turned into black. However, the life history and ecology of this fungus was yet unknown. Among the storage fungi, *Aspergillus flavus*, *Aspergillus niger*, *Aspergillus glaucus*, *Penicillium citrinum*, *Penicillium islandicum* were dominantly obtained. In the samples from the godowns of silo companies, 43 % of the grains were infested with *Aspergillus flavus* which is known as aflatoxin-producing fungi. It was also reported that *Penicillium citrinum* and *Penicillium islandicum* produced mycotoxins.

It is well known that *Aspergillus flavus* which produces Aflatoxin exists in the air, and it could be observed in 1981-1982 that the fungus grew on maize grains of farmers' fields in Lopburi Province. Many cases of the first infestation of the fungus on maize grains, therefore, would begin in fields at harvesting time.

However, in the investigations on grains collected from farmers' fields, it was observed that the Aflatoxin contamination is negligible. On the samples from farmers' warehouses, the detection rate of it increased to 43 %, but the amount of the contamination was not as large as from 0 to 82 ppb and the mean value of 16 ppb. The contamination of Aflatoxin in samples from middlemen's warehouses increased clearly both in the detection rate of 83 % and the amount of it from 0 to 520 ppb and the mean value of 122 ppb. In the warehouses of silo companies, almost the same level of Aflatoxin content as in middlemen's warehouses was observed. As a result of the investigations it was suggested that the high level of Aflatoxin contamination will be detected more than one month after infestation of the fungi on grains under the conditions of high humidity and temperature. This will be just the storing period of grains in middlemen's warehouses. The contamination value of grains in middlemen's level would be transferred directly to the silo companies, where there are better conditions for keeping them.

It is suggested that the most important counter-measures for checking the Aflatoxin contamination in grains are to dry them enough as quickly as possible after harvest by introducing effective faci-

lities to both farmers and middlemen's levels. Furthermore, the harvesting time of maize, which is now too early to escape the rainy season, should be shifted by introduction of a new planting system.

Investigations have been conducted on the reasons for getting high yield of maize in the competition fields in 1980 with the help of Thai officials in the Department of Agriculture and the staff members of the Tropical Agricultural Research Center. There were no relationships between productivity of soil and chemical property. Further investigations are under weigh on soils including pot culture and incubation tests. There were some relationships between productivity of soil and soil types. Between productivity of soil and physical characteristics of soils there were no clear correlations. However, the fields which have a layer of soil low in hardness extending deeply seemed to be considerably high in productivity.

## 2) Seed multiplication:

In collaboration with the Department of Agricultural Extension, the foundation seeds, which are to be supplied by the Department of Agriculture, will be multiplied to produce extension seeds at the seed production fields. The extension seeds produced will be distributed to farmers in the project area through Agricultural Cooperatives and farmers' groups. Seed multiplication was conducted on 15 ha for the first time under contract with farmers in Puraphuttabat area during the rainy season in 1978. In the rainy season of 1979, seed multiplication was carried out on 230 ha under contract with the farmers in the area of the Puraphuttabat Cooperative. At first it was expected to produce 400 tons of extension seed in total, but, as the result of severe damage by drought, only 260 tons of ear-corns were purchased from the area. The ear-corns were produced by the plant completed in August 1979 at the Center. After the processing, about 200 tons ( 12.5 % in moisture content ) of seeds were stored in an air-conditioned storage completed in December 1979. More than 90 tons or about 50 % of the extension seeds produced in the project were distributed to the project area.

/ In 1980, 440 tons of seed were produced at the project and more than 400 tons, which are equal to about 90 % of the total production, were distributed to the farmers in the project area, and 40 % of them were delivered directly to the primary cooperatives in the project area. They will be distributed to the farmers in the project area the same as last year. The seed production of the project was about 500 tons for the first plan. However, production attained in 1982 will be double that of the first plan.

### 3) Extension and Demonstration:

Improved cultivation techniques developed by the Center are to be demonstrated at the demonstration fields in the project area. The demonstration fields at the Center and eight farmers' fields in the project area were established for the first time during the rainy season in 1979. The recommended variety suwan 1 was compared with the local varieties stocked by each farmer under cultivation both with fertilizer and without it.

The demonstration fields seemed effective for introducing new techniques to farmers when the location of the fields was good. However, the plant density in farmers' fields was very small in general and this might be the main cause of low yields. This small population of planting would be caused by the traditional way of sowing which makes the distance between hills too large.

Demonstrations were conducted in more than 20 fields in the rainy season of 1980. Their results were almost the same as those in 1979. Briefly, the conclusion is that the variety Suwan 1 was very efficient in increasing yield by the application of fertilizer. However, it could be said that, in order to get more profit than the cost of fertilizer the yield of Suwan 1 should be increased more than 20 % over that of the fields without fertilizer.

In 1981, 29 demonstration fields were established in the project area ( 6 in Prompirum, 7 in Chaibadan and others in Phraputtabad). A new variety, Suwan 2, was introduced from this year as a earlier variety than Suwan 1. According to the results of the demonstration work in 1981, the variety of Suwan 2 yielded almost the same as Suwan 1 in spite of earlier maturity, about 10 days earlier than Suwan 1.

Another demonstration field was established at the Center during the rainy season in 1979 and 1980. In the fields, the cultivation of maize by machinery (tractor and hand tractor) was compared with that of the traditional way from the economic viewpoint. The result showed that the introduction of machinery induced lower yields and less labour, but the production cost was almost the same. Further investigations would be necessary for introduction of machinery into the farmers' fields.

As a step to provide sufficient motivation to farmers in maize cultivation, a yield competition was carried out in the area of puraphuttabad Cooperative during the rainy season in 1980. The result was very remarkable. The highest yield of maize was 6.6 tons/ha and average yield of 10 farmers following the highest one was 5.5 tons/ha. From this trial it was realized that the potentiality for yield increase of maize in Thailand would be very high. The yield competition was carried out again in the Cooperative area of the Puraphuttabat and Chaibadan in 1981. The results were almost the same as those of the previous year.

Now we are trying to investigate the main factor for getting high yields from several view points as mentioned already. We have not arrived at any definite conclusion yet, however we can presume that the high yield would be based on high fertility of soil in the fields as well as appropriate rainfall conditions in that year. The



high fertility of soil might come from fertilizer application or other kinds of techniques for making soils fertile for long periods. One of the most efficient fertilizers would be organic matter like green manure or chicken droppings. In most of the fields which produced high yields, according to the testimony of the farmers, vegetables were cultivated under high application of fertilizer for long periods before joining the yield competition on maize.

#### 4) Training:

Training courses as one of the most important activities of the project were given to the cooperative members for the first time at the Center in 1979. The activities developed year by year. Six training courses will be planned at the Center this year. Training courses during this year will be planned at the Center but also at the extension bases. The mobile car with equipment for repairing completed last year would be very important for training activities in techniques of handling and repairing agricultural machinery at the extension base in the project area.

A new kind of training course is being given now instructing members of cooperatives in keeping individual farmers accounts in the Puraphuttabat area.

#### 5) Guidance on the management of Agricultural Cooperative:

There are many problems in the Agricultural Cooperatives in Thailand. The main problems concluded by the Cooperatives Promotion Department are as follows:-

- a. Insufficient management capability
- b. Shortage of capital
- c. Incomplete range of business activity
- d. Lack of good coordination

According to the R D, in order to develop and strengthen Agricultural Cooperatives and farmers' groups training and education by the staff officers and other personnel at the Center and guidance activities by the experts at the key extension bases were requested. However, as to the guidance at the key extension bases for the management of Agricultural Cooperative, it is very difficult to expect a substantial effect on account of the limited number of staff members and budget, because there are many big problems in each cooperative as mentioned above, and the extension bases are distributed in a wide area.

Therefore, in conducting activities priority should be given to one or two Cooperatives located near the Center. For strengthening the cooperatives, it would be very necessary to pick up the key members who are keen on improving Cooperative activities. The selected members should have special relation with the staff members of the project, and should be given intensive training courses in many fields. They have played a very important role in organizing the yield competition of maize in the Cooperatives area concerned.

Many other trials, introducing tractors and bulldozer to the Cooperatives areas concerned for land preparation services in the field of member farmers and introducing new crops like "Shiitake" (a kind of mushroom), castor bean and a new variety of cucumber to the member farmers' fields, in order to contribute towards improving the economic conditions of both the Cooperatives and their member farmers are under weigh.



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