

REPORT  
ON  
IMPLEMENTATION SURVEY  
FOR  
AGRICULTURAL DEVELOPMENT PROJECT  
LAMPUNG PROVINCE  
REPUBLIC OF INDONESIA

August, 1972

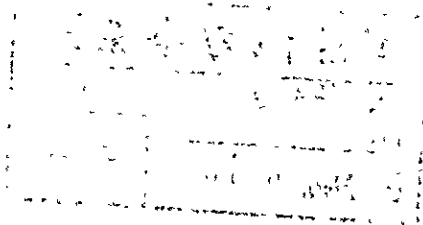
Overseas Technical Cooperation Agency

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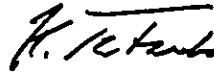
## INTRODUCTION

In compliance with the request of the Indonesian government for cooperation in agricultural development in Lampung province, the Japanese government sent the second survey mission to Indonesia over a period of 40 days from March 7, 1972 to carry out a survey for the project implementation.

This report has been prepared from the mission's findings to present the guiding principles for future agricultural development in the province.

Owing to the limited survey period, however, the mission was not enabled to conduct a thoroughgoing survey, nor was it allowed to cover the whole of project areas. The report may therefore contain certain points which, lacking lucidity, should be clarified by further studies and investigations. It is hoped that these ambiguous points, if any, will be discussed at full length and brought to clear at the Joint Committee on the basis of the results of surveys by Japanese experts who will be dispatched to Indonesia for project implementation.

August, 1972



Keiich Tatsuke  
Director General,  
Overseas Technical Cooperation Agency

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## I. BACKGROUND AND PURPOSE OF THE SURVEY

### 1-1 Background and Purpose

Japan's agricultural cooperation currently extended to Indonesia covers the West Java Food Production Project, Research Cooperation with the Central Research Institute for Agriculture in Bogor, Tadjum Pilot Farm Project in Central Java, and East Java Maize Development Project.

While these cooperation projects are all being implemented in Java island, development of other areas than Java, i. e., the outer territories of the archipelago, has also been one of the major concerns of Indonesia. The Indonesian government has therefore been taking various promotional measures and requested Japan's cooperation in the development of the outer territories.

Acceding to this request, the Japanese Government sent a preliminary survey mission to Indonesia over a period of 40 days beginning in November 1970 to investigate the development potential of the outer territories. As a result of its survey activities in South Sulawesi, Lampung and other areas, the preliminary survey mission reached the conclusion that Lampung province is most favourably conditioned for development of maize cultivation and indicated the outline of the proposed development in a report submitted to the Indonesian government.

To bring solution for the problem of overpopulation and food shortage in Java island, the Indonesian government has been giving a great deal of encouragements to the development of Lampung province. At present, efforts are being made for accelerated resettlement of Javanese farmers and increased agricultural production in Lampung in the hope that the province will be developed into the base of food supply to Java.

As part of the above development efforts, the Indonesian government formulated a plan for comprehensive agricultural development of Lampung, and requested Japan's cooperation for its implementation. Complying with this request, the Japanese government sent the first agricultural survey mission to Lampung over a period of 30 days beginning in August 1971 to study the contents of the plan. The survey results obtained by this mission led to the decision that Japanese Government would cooperate with Indonesia in a comprehensive paddy and upland crops development project which would be implemented chiefly in Central Lampung to elevate the farmers' income level through increased agricultural production, improvement of distribution mechanism and augmented production of export crops. This was ensued by the formal decision conveyed to the Indonesian government by which Japan pledged to the project cooperation based on the policy of developing the provincial experiment station, the so-called "Maize Center", into an Agricultural Extension Center serving as the basis of cooperation activities.

In the meantime, discussions were held in Japan by the parties concerned on the basis of the mission's report, which led to the conclusion that Japan would cooperate in the integrated implementation of the following three sub-projects.

Agricultural Extension Center Sub-project

Lowland (Paddy) Farming Development Sub-project

Upland (Upland Crops) Farming Development Sub-project

The Agricultural Extension Center was planned to cover the following activities for smooth and effective implementation of agricultural development not only in the project area but also in the entire Lampung province.

- (1) Investigation, data collection, provision of guidance and advice and coordination necessary for the planning and implementation of the agricultural development scheme.
- (2) Trials and experiments necessary for the implementation of the agricultural development scheme.
- (3) Training of agricultural technicians, particularly extension workers.
- (4) Multiplication and distribution of seeds and seedlings of improved varieties, and demonstration of advanced farming techniques.
- (5) Other activities necessary for the implementation of the scheme.

The project was planned to be implemented with priority given to the development of the Center in view of the fact that Lampung province is extremely backward in all the above-listed activities.

The Lowland (Paddy) Farming Development Sub-project was planned to be implemented in the paddy field area of Central Lampung in the initial stage to raise the farm productivity in order to increase the farmers' income level and elevate their living standard. Under this sub-project, it was also planned that demonstration farms (hereinafter referred to as demo-farms) of suitable size would be established for demonstration and extension of advanced cultivation techniques and training of farmers in such techniques as well as for spill-out effect of advanced techniques among the neighbouring farmers.

The Upland (Upland Crops) Farming Development Sub-project was planned to be implemented in the upland field area of Central and South Lampung to increase the commercial value and export and to improve the distribution system of maize, cassava, legumes as well as perennial crops and thereby raise the income level and living standard of farmers. It was planned that project areas of suitable size would be selected for demonstration and extension of advanced cultivation techniques and training in such techniques.

The present second survey mission was dispatched to work out a detailed plan necessary for smooth and effective project cooperation and discuss with the Indonesian government on the Master Plan in which the problems pointed out by the mission were presented together with the measures suggested for their solution.

As a result of the mission's survey activities and its discussions with the Indonesian government, agreement was reached on the policy and course of Japan's cooperation in Lampung Agricultural Development Project, and the Record of Discussions between the Indonesian Government and the survey mission was signed by Dr. Yasuo Shun, Head of the Japanese survey mission and Mr. Sadikin, Director General of Agriculture, Indonesian Ministry of Agriculture.



1-2 . The Record of Discussions between the Japanese Agricultural Survey Mission and the Ministry of Agriculture of the Government of the Republic of Indonesia concerning the Lampung Agricultural Development Project

THE RECORD OF DISCUSSIONS BETWEEN THE JAPANESE AGRICULTURAL SURVEY MISSION AND THE MINISTRY OF AGRICULTURE OF THE GOVERNMENT OF THE REPUBLIC OF INDONESIA CONCERNING THE LAMPUNG AGRICULTURAL DEVELOPMENT PROJECT

In pursuance of the investigation carried out by the first Agricultural Survey Mission to Indonesia in September, 1971, the second Japanese Agricultural Survey Mission organized by the Overseas Technical Cooperation Agency and headed by Dr. Shun Yasuo, Director of Extension Department, Ministry of Agriculture and Forestry, visited Indonesia from 7th March to 15th April, 1972 to work out the details of the technical cooperation between the Government of the Republic of Indonesia and the Government of Japan on the Lampung Agricultural Development Project. The Mission conducted surveys in the area to be covered by the proposed programme and also had a series of discussions in Djakarta with the Ministry of Agriculture of the Government of the Republic of Indonesia concerning the above cooperation.

Attached hereto is the Record of Discussions between the Mission and the Ministry of Agriculture of the Government of the Republic of Indonesia.

The contents of the attached Record of Discussions will not be binding legally either on the Government of Japan or on the Government of the Republic of Indonesia, as the formal decision concerning the implementation of the above cooperation is to be made after the two Governments have reviewed the said Record of Discussions. The gist of the present Record of Discussions, however, is understood to serve as the basis of the official agreement to be concluded between the two Governments for the implementation of the said cooperation.

Djakarta, April 11, 1972

For the Japanese Agricultural  
Survey Mission

For the Government of the  
Republic of Indonesia

SHUN YASUO  
Head of the Japanese  
Agricultural Survey Mission  
Overseas Technical Cooperation Agency

SADIKIN SUMINTAWIKARTA  
Director General of Agriculture  
Ministry of Agriculture

1.
  - (1) For the purpose of increasing farmers' income and raising their standard of living, the two Governments will jointly carry out the Agricultural Development Project in Lampung Province to be called the Lampung Tani-Makmur Project (hereinafter referred to as "the Project"). The Project will be implemented comprehensively and systematically with full regard to the development projects for strengthening the infrastructure such as roads and irrigation facilities based on the Agricultural Development Scheme of the Government of the Republic of Indonesia in Lampung Province. The Project consists of three sub-projects and will be implemented through the master plan given in Annex I.
  - (2) The sub-projects may be extended by mutual agreement to any other field necessary for the successful implementation of the Project.
  - (3) The Project will be implemented through annual operational plans approved by the Joint Committee referred to in para. 9 (2).
2.
  - (1) In accordance with laws and regulations in force in Japan, the Government of Japan will take necessary measures to provide at its own expenses the services of Japanese experts as listed in Annex II.
  - (2) In accordance with laws and regulations in force in Japan, the Government of Japan will take necessary measures to dispatch additional experts through normal procedures under the Colombo Plan Technical Cooperation Scheme, as necessity arises.
  - (3) In accordance with laws and regulations in force in Indonesia, the Japanese experts mentioned in para. (1) and (2) above and their families will be granted privileges, exemptions and benefits as listed in Annex III and will be granted privileges, exemptions and benefits no less favourable than those granted to the experts of any third country or of international organizations such as the United Nations stationed in the Republic of Indonesia under similar circumstances.
3.
  - (1) In accordance with laws and regulations in force in Japan, the Government of Japan will also take necessary measures to provide at its expense such equipment, machinery, vehicles, instruments, tools, spare parts and other materials required for the implementation for the Project as listed in Annex IV.
  - (2) The articles referred to above will become the property of the Government of the Republic of Indonesia upon being delivered c. i. f. at the port of disembarkation to the Indonesian authorities concerned.
  - (3) The articles referred to above will be utilized exclusively for the purpose of the implementation of the Project.
4.
  - (1) A part of the articles mentioned in para. 3 (1) may be rented at reasonable rates to the farmers in the Project area, and a part of consumable items such as fertilizers, pesticides, etc., may also be distributed at reasonable prices to the farmers in the Project area through annual operational plans mentioned in para. 1 (3).
  - (2) In accordance with laws and regulations in force in Indonesia, the proceeds

from such rentals or transfers will be used exclusively for the implementation of the Project.

- (3) There will be close consultation between the Japanese Team Leader mentioned in Annex II and Project Director mentioned in Annex V with regard to the application of the para. (1) and (2) above.
5.
    - (1) In accordance with laws and regulations in force in Japan, the Government of Japan will take necessary measures to receive Indonesian officials associated with the Project for technical training in Japan through normal procedures under the Colombo Plan Technical Cooperation Scheme.
    - (2) The Government of the Republic of Indonesia will take necessary measures to ensure that those Indonesian officials trained in Japan under the Colombo Plan Technical Cooperation Scheme for the Project will be reemployed after the training in positions' relevant to the Project.
  6. The Government of the Republic of Indonesia will undertake to bear claims, if any arises, against the Japanese experts resulting from, occurring in the course of, or otherwise connected with the discharge of their official functions in Indonesia covered by the present Record of Discussions, except for those claims arising from the willful misconducts or gross negligence of the Japanese experts.
  7. In accordance with laws and regulations in force in Indonesia, the Government of the Republic of Indonesia will take necessary measures to make at its own expenses:
    - (1) Indonesian counterpart officials, technicians and other personnel as listed in Annex V.
    - (2) Land and building as well as incidental facilities as listed in Annex VI;
    - (3) supply or replacement of equipment, machinery, vehicles, instruments, tools and any other materials necessary for the implementation of the Project other than those provided by the Government of Japan mentioned in para. 3 (1).
  8. In accordance with laws and regulations in force in Indonesia, the Government of the Republic of Indonesia will take necessary measures to meet:
    - (1) Expenses necessary for construction or rearrangement of roads, irrigation facilities etc., in the Agricultural Extension Centre, experimental and demonstration farms (demo-farm), except for such equipment, machinery, vehicles, instruments, tools, spare parts and other materials as listed in Annex IV.
    - (2) customs duties, internal taxes and other similar charges, if any, imposed in the Republic of Indonesia in respect of the articles mentioned in para. 3 (1);
    - (3) expenses necessary for transportation of the articles mentioned in para. 3 (1) within the Republic of Indonesia as well as for installation, operation and maintenance thereof:

- (4) running expenses necessary for the implementation of the Project.
9. (1) The Japanese experts and Indonesian counterpart officials will be responsible for the technical matters pertaining to the implementation of the Project, while the Indonesian officials concerned will be responsible for the administration and managerial matters relative to the implementation of the Project.
- (2) There will be established a Joint-Committee for the successful implementation of the Project. The composition of the Committee is specified in Annex VII. The Committee will meet regularly and may appoint subcommittee to deal with specific problems.
10. The Government of the Republic of Indonesia will take necessary measures to utilize a part of the rupiah counterpart fund accrued from the Japanese assistance to be provided under the Exchange of Letters between the two Governments in connection with the Food Aid Convention of the International Wheat Arrangement 1971, for the implementation of the Project.
11. The Project will be kept in close cooperation with the other projects of Japanese economic and technical cooperation in the field of agricultural in Lampung Province.
12. The two Governments will consult each other on questions relating to the implementation of the Project.
13. The period of the Japanese Cooperation for the Project will be for five (5) years.

## Annex I

### The Master Plan of the Project

#### 1. The Agricultural Extension Centre with Extension Farm

The Agricultural Extension Centre (hereinafter referred to as The Centre) will cover the following activities for smooth and effective implementation of the Agricultural Development Scheme in Lampung Province;

- (1) Data collection, analysis and information services on farmers' income, farm management, farmers' prices etc.
- (2) Technical advice and guidance necessary for the planning and implementation of the Scheme.
- (3) Field experiments and demonstration of new agricultural techniques
  - (a) Trials, experiments and demonstration concerning selection of rice and other crops to be introduced, selection of qualified varieties, fertilizer application, crop rotation and establishment of plant protection techniques.
  - (b) Trials, experiments and demonstration concerning soil conservation, sub-minor irrigation, water management and improvement of agricultural machinery and implements.
- (4) Training of extension workers and key farmers
  - (a) Theoretical and practical training on improved agricultural techniques.
  - (b) Theoretical and practical training on utilization of agricultural machinery and on agricultural mechanization.
- (5) Multiplication and distribution of qualified seeds and seedling until the time the proper distribution system will have been established, within the framework of the Indonesian policy and programme on the development of a sound seed industry.
- (6) Other activities necessary for the promotion of the agriculture in Lampung.

#### 2. Lowland Farming Development Sub-project ("Usaha Tani")

The project will be implemented in the paddy area of 10 Ketjamatans, Cental Lampung as a part of the Project, and a large scale demo-farm (about 100 ha) will be set up in Ketj. Punggur and about 40 small scale demo-farms (about 5 ha) will be set up in 10 Ketjamatans.

The following activities will be conducted integratedly in the demo-farms to improve the farm productivity in order to increase farmers' income and thereby to improve their living standard;

- (1) Introduction of improved rice cultivation and multi-cropping techniques including rearrangement of agricultural infrastructure based on the results of trials and experiments in the Centre, and the demonstration at the demo-farms of improved rice cultivation techniques, such as the use of qualified varieties, fertilizer application, plant protection, water management, harvesting and processing.
  - (2) Extension of improved farming techniques to farmers in the area by round-trip guidance based on the demo-farms.
  - (3) Training of farmers and organization and strengthening of farmers' groups;
    - a. Technical training on improved rice cultivation techniques for farmers at the demo-farms.
    - b. Organization and strengthening of farmers production groups to promote group activities.
  - (4) The promotion of a sound distribution system of agricultural materials and the system for rural credit.
  - (5) Data collection on farmers' income, farm management and farmers' prices in the field.
  - (6) Proper guidance on farm management to the farmers by utilizing the results of analysis in the Centre.
3. Upland Farming Development Sub-project ("Palawidja")

The following activities will be conducted in line with the policy and programme of the Government of Indonesia on upland products, such as maize, legumes, cassava and perennial crops in the upland farming area of Central and South Lampung as part of the Project, concentrating the efforts to the demo-farms in selected Desas.

- (1) Introduction of improved upland farming techniques based on the results of trials and experiments in the Centre, and demonstration, at the demo-farms and trial plots such as the use of qualified varieties, fertilizer application, plant protection, harvesting and processing as well as cropping system.
- (2) Extension of improved farming techniques to farmers by round-trip guidance.
- (3) Training of farmers and organization of farmers' groups;
  - a. Technical training on improved upland farming techniques for farmers.
  - b. Organization of farmers' groups to promote and develop the group activities.
- (4) The promotion of a sound distribution system of agricultural materials and the system for rural credit.
- (5) Data collection on farmers' income, farm management and farmers' prices in the field.

- (6) Proper guidance of farm management to the farmers by utilizing the results of analysis in the Centre.

The programme conceived is as follows;

	1st year	2nd	3rd	4th	5th
Number of Ketjamanatan	2	3	4	5	5
Number of Desa	4	8	16	32	32
Number of trial plot	7	14	28	56	56

- Note:
1. For the first year, Ketj. Gunung Sugih and Natar will be covered.
  2. Finally, Ketj. Terbanggi Bosar, Gedongtataan, Sukadana will be covered in addition to the above.
  3. This program may be changed according to the decision of the Joint Committee, after approval of respective governments.

Annex II

List of the Japanese experts

Team Leader	
The Centre	Extension Lowland cultivation Upland cultivation Farm management Soil and fertilizer Machinery Pest control
Lowland Farming Development Sub-project	Extension Cultivation Irrigation
Upland Farming Development Sub-project	Extension Processing Cultivation
Coordinator	
G. Total	15

Note: (1) 8 experts will be dispatched for the first year, and maximum 15 for successive year.

(2) Specifications of experts maybe changed by the decision of the Joint Committee, if necessary.



### Annex III

#### Privileges, Exemptions and Benefits

- (1) Exemption from income tax and charges of any kind imposed on or in connection with the living allowances remitted from abroad.
- (2) Exemption from import and export duties and any other charges in respect of personal and household effects which may be brought into Indonesia from abroad.
- (3) Free local medical services and facilities to the Japanese experts and their families.

### Annex IV

#### List of the Articles to be provided by the Government of Japan

- (1) Construction equipment, machinery and spare parts.
- (2) Agricultural machinery and implements and their spare parts.
- (3) Pesticides, fertilizers and other materials.
- (4) Machines and tools for repair work.
- (5) Tools and implements for testing work.
- (6) Equipment, instruments, tools, spare parts and other materials for laboratory work.
- (7) Equipment and materials for public utilities.
- (8) Vehicles.
- (9) Teaching materials including audio visual aids.
- (10) Other necessary minor equipment and materials.

Annex V

List of the Indonesian counterpart Officials, Technicians and Personnel

		1st year	2nd year	3rd year	4th year	5th year
Project Director		1	1	1	1	1
-----						
The Centre	Head	1	1	1	1	1
	Extension	1	1	1	1	1
	Lowland cultivation	1	1	1	1	1
	Upland cultivation	1	1	1	1	1
	Farm management	1	1	1	1	1
	Soil and fertilizer	-	1	1	1	1
	Machinery	1	1	1	1	1
	Pest control	-	1	1	1	1
Total		6	8	8	8	8
-----						
Lowland Farming						
Development	Extension					
Sub-project	workers	4	4	10	10	10
-----						
Upland Farming						
Development	Extension					
Sub-project	workers	4	4	4	6	6
-----						
Clerical and service employee						
Clerk typists						
Storekeepers						
Drivers						
Heavy equipment and truck operators						
Janitor-messengers						
Watchmen						
Labourers						

## Annex VI

### List of land, building and incidental facilities

1. The Centre
  - (1) Experimental field
  - (2) Office
  - (3) Shed for machinery and equipment
  - (4) Store-house for farming materials
  - (5) Laboratory
  - (6) Dormitory
  - (7) Workshop and garage
  - (8) Granary and drying floor
2. Lowland Farming Development Sub-project ("Usaha Tani")
  - (1) Store-house for farming materials
  - (2) Granary
3. Upland Farming Development Sub-project ("Palawidja")
  - (1) Store-house for farming materials
  - (2) Granary and drying floor

## Annex VII

### Composition of the Joint Committee

#### Indonesian Side

1. Project leader(Djakarta), 2 assistants and 1 financial officer
2. Head of the Farm Management Section
3. Head of the Soil Productivity Section
4. Head of the Extension Section
5. Chief of Production Bureau of Provincial Government

#### Japanese Side

1. Team Leader and Experts
2. Representatives of the Overseas Technical Cooperation Agency

1-3 Member of the Mission

Dr. Shun YASUO	Leader	Director General of Extension Dept. , Agricultural Administration Bureau, MAF
Dr. Akira MIYASAKA	Rice Cultivation	Chief, Farming Lab. 6, Crop Division, Central Agricultural Experiment Station, MAF
Mr. Seiji SUGIMOTO	Farm Mechanization	Chief, Farm Mechanization Lab. , Upland Farming Division, Central Agricultural Experiment Station, MAF
Mr. Kimio SAKATA	Upland Crop Cultivation	Chief Researcher, Tropical Agriculture Research Center, MAF
Mr. Kazue YASUDA	Marketing	Deputy Head, Inport Administration Division Trade and Development Bureau, MITI
Mr. Yoshio MATSUBARA	Planning	Head, Primary Products Develop- ment Cooperation Office, OTCA
Mr. Chiyoshi OWAKI	Agricultural Economy	Deputy Head, Research and Analysis Division, Minister's Secretariat, MAF
Mr. Shigemasa YOSHIDA	Extension	Deputy Head, Extension and Education Division, Extension Dept. , Agricultural Administrative Bureau, MAF
Mr. Takashi TAUCHI	Irrigation	Irrigation Engineer, Project Operation Division, Agricultural Cooperation Dept. , OTCA
Mr. Ikuo KAMEDA	Coordination	Deputy Head, Primary Products Development Cooperation Office, OTCA
Mr. Noritake KAI	(Official accompany- ing the mission)	The Second Technical Cooperation Division, Economic Cooperation Bureau, Ministry of Foreign Affairs.
Mr. Kazuma NOJIMA	(Participation in the survey at site)	
Mr. Yukio OHHATA	" "	

Remarks: MAF Ministry of Agriculture and Forestry  
MITI Ministry of International Trade and Industry  
OTCA Overseas Technical Cooperation Agency

1-4 List of Counterpart Officials and Technicians

1. IR. NUSJIRWAN ZEN

Chief of Dinas Pertanian, Lampung

2. THAMRIN BASTARI

BSC Secretary of Dinas Pertanian, Lampung

3. IR. DJOEFRI AMIN

Chief of Extension Division  
Dinas Pertanian Propinsi Lampung. -

4. KAMALUDDIN SIPAJUNG

Subject Matter Specialist of Soil Fertility  
Dinas Pertanian Propinsi Lampung.

5. SETIJARSO

Staffing for Direktorat of Agriculture Planning  
djl. Salemba 16 Djakarta. -

6. MURDANI SOEWITO

Subject Matter Specialist of agronomic  
Dinas Pertanian Propinsi Lampung. -

7. JUSFIAN JUSUF

Subject Matter Specialist of plant protection  
Dinas Pertanian Propinsi Lampung. -

8. MUZAKIN MOOR

Subject Matter Specialist of Social Economic. -  
Dinas Pertanian Propinsi Lampung. -

9. AMIRUDDIN INOED

Subject Matter Specialist of Social Economic.  
Dinas Pertanian Propinsi Lampung. -

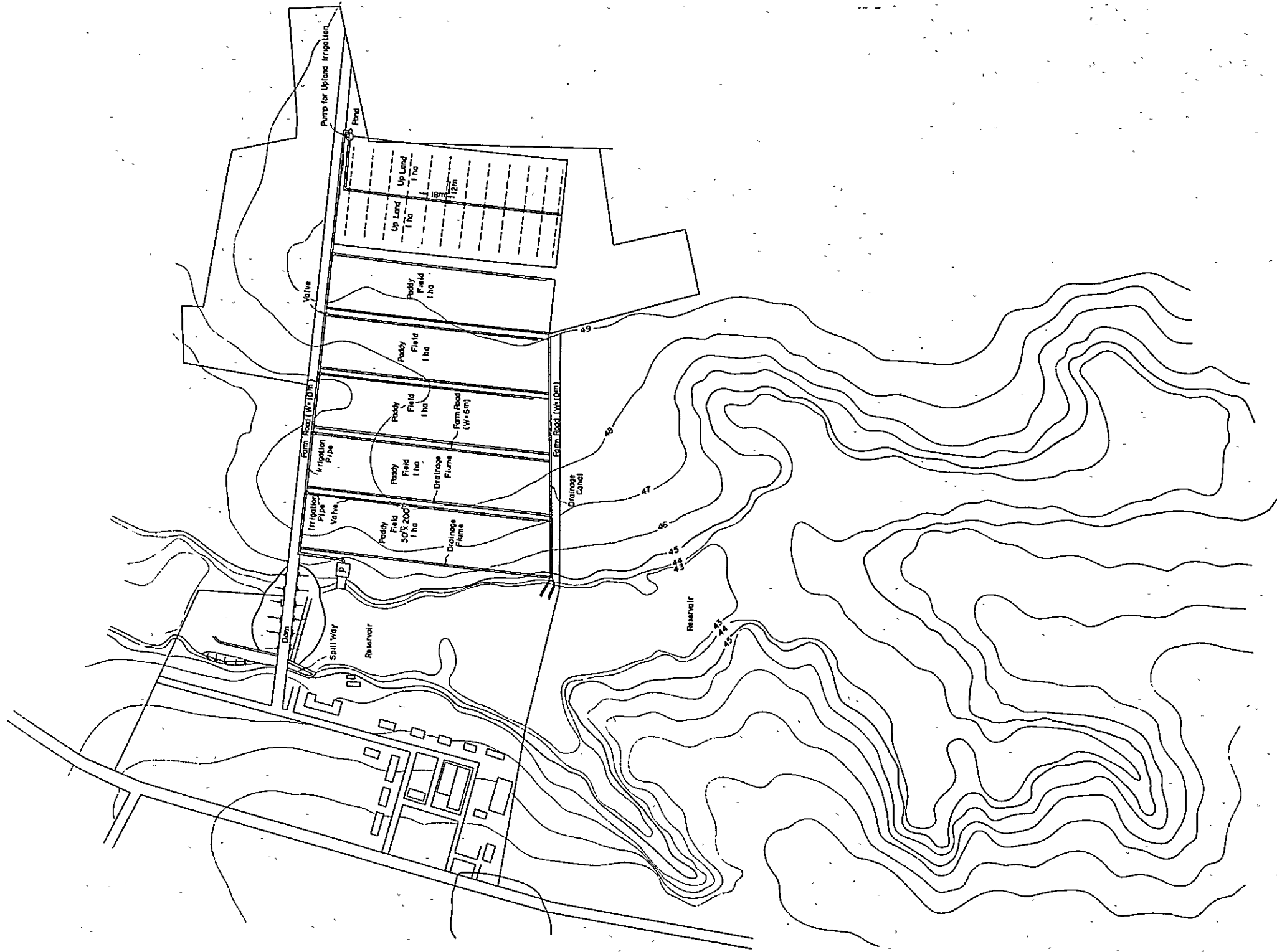


Fig. 2 Tegineng Agricultural Extension Centre

## II. OUTLINE OF THE PROJECT

### 2-1 Agricultural Extension Center Sub-project

The about 2 ha wide paddy field currently available at the Center lies in a depression with a small torrent flowing through it. Due to its small size and absence of irrigation and drainage canals, this field is not suited for various trials and training.

For smooth implementation of the Lowland and Upland Farming Development Sub-projects, the Center is required to perform various trials and experiments and improve extension techniques. Training of extension workers and key farmers is also a task assigned to the Center.

To assure that all these activities will be satisfactorily carried out, the Center should have a minimum of 5 ha of paddy field and 2 ha of upland field both provided with suitable irrigation facilities.

Two alternative plans were studied to secure the water source of these fields. One of the plans was to pump up groundwater and the other was to store the water drawn from the torrent flowing through the existing paddy field and pump it up for irrigation. The study disclosed that the groundwater level is not stabilized in the dry season and does not promise sufficient year-round water supply. Hence, it is planned that the existing paddy field would be turned into a reservoir with a earth dam constructed immediately downstream of the existing road for pump irrigation of the new fields.

The reservoir will be designed to have a capacity ensuring ample water supply to both paddy and upland fields. For the paddy field irrigation, the reservoir is planned to store the irrigation water allowing year-round paddy cultivation, assuming the puddling work will be conducted each month in one day (water duty: 150 mm/day) and water requirement in depth will be 30 mm/day. For the upland field irrigation, the reservoir is planned to have a sufficient capacity for intermittent irrigation conducted at intervals of 5 days, with the daily water consumption assumed to be 10 mm/day.

Effective rainfall is assumed to be 60 - 80% of the average monthly rainfall recorded at Metro over the past 18 years (1951 - 1968).

Discharge was determined in relation to this effective rainfall since an inflow of about  $0.02 \text{ m}^3/\text{sec}$  is recorded at the end (march) of the wet season and the basin is small and shallow.

Assuming that the conveyance loss between the reservoir and the fields is 20% for paddy field and 30% for upland field, the reservoir is required to have a capacity of about  $200,000 \text{ m}^3$ . To store this volume, the dam should have a height of about 5 m because the area of the existing paddy field in the valley is about 8 ha.

After completion of its foundation work, the earth dam (length: 50 m) will be constructed with clayey earth available in the area, with a spillway installed on its right bank side.

From the reservoir thus constructed, water will be supplied 16 hours a day to the paddy field and to the farm pond excavated in the middle of the upland field. Water stored in the farm pond will be conveyed and sprinkled in the upland field by a booster pump connected to sprinkler set.

As shown in Fig. 2, the 5-ha paddy field will be divided into two 3 ha field for trials and experiments and 2 ha field for training, and each will be sub-divided into 1 ha lots. Irrigation water valves will be installed on the upstream side at intervals of 20 m and a U-type drain ditch will be excavated on the downstream end to return drain water from each lot to the reservoir. Irrigation water will be pumped and conveyed to each lot through pipe line. The pumps installed for this purpose will have a capacity of about  $5.4 \text{ m}^3/\text{min}$  ( $2.7 \text{ m}^3/\text{min} \times 2$  units) and a head of about 40m, and will be equipped with diesel engines. Farm road (width 6m) will be constructed between respective lots.

For upland field irrigation to be conducted intermittently at intervals of 5 days (water duty:  $10\text{mm} \times 5 \text{ days} = 50\text{mm}$  per time), 5 valves will be installed at intervals of 18 m. To sprinkle water taken from these valves, risers pipe, sprinkler hose three-legged sprinkler set and other equipment will be also supplied.

#### 2-2 Lowland (Paddy) Farming Development Sub-project

This sub-project will embrace about 20,000 ha of paddy field area in the granary zone of Central Lampung. This project area will comprise the existing paddy field area extending in the neighbourhood of Metro and irrigated with water drawn from Dam Argoguruh the Sekampung on river and the new paddy field area to be reclaimed with irrigation water taken also from Dam Argoguruh.

About 14,500 ha of paddy field has so far been opened up in this granary zone, and this is expected to be expanded and turned into a huge paddy field area of about 60,000 ha when the development work now in Progress is brought to completion.

Operational holding of paddy growing farmers in the project area averages 1.5 to 2.0 ha. Paddy is planted throughout the wet season. In the dry season when water supply is deficient, however, about 60% of paddy field is planted with paddy and the remainder is either fallowed or used for growing vegetables for farmers' own consumption. Hence, manpower is not fully used and farm management is not established on a firm footing. It is therefore advisable that irrigation farming be enhanced to increase the ratio of double or secondary cropping of paddy field so that labour force will be distributed uniformly throughout the year. It is also to be recommended that reclamation of low-lying marshy areas (rawa rawa) and alangalang fields be prompted so as to expand the scale of farm management and thereby stabilize and raise the farmers' income level.

Construction of diversion works, main canals, secondary canals and turnouts is conducted systematically in the area by the Water Resources Department of the Ministry of Public Works. However, construction of tertiary canals leading out from these main facilities and farmland creation are carried out by the resettled farmers under a joint work system (Gotong Rojong). Under this joint work system, priority tends to be given to the construction work which entails less difficulty, so that newly created paddy fields lack uniformity in form or size and have no drain ditches, and plot-to-plot irrigation is in practice. Further, no farm roads are constructed at all, except that maintenance roads are found along the tertiary canals to allow the passage of buffaloes.

The condition of paddy fields in the project area calls, for one thing, for infra-structural improvement such as the construction of irrigation and drainage canals and farm roads which are indispensable for adequate water management and improvement of farm labour efficiency, and demands, on the other, that guiding principles be formulated for adoption in the areas to be newly developed.



Under this sub-project, Japanese Government is to offer her cooperation in "Tani-Makmur Project" which the Indonesian government has formulated to stabilize the farm management in this single paddy cropping area and promote the rural prosperity by elevating the farmers' income level.

For the purpose of extending technical cooperation in this project, demo-farms will be established in the approximately 20,000 ha wide paddy field area which is embraced in 10 Ketjamatans of Central Lampung and irrigated with water drawn from the Dam Argogurah.

The demo-farms will comprise one large-scale farm (hereafter called the "L. demo-farm") and a number of small-scale ones (hereafter called the "S. demo-farms"). To assure that all these demo-farms will fully function as the bases of extension and training activities, they will be established in such central part of each district which presents uniform field conditions and at the same time allows easy access to the neighbouring farmers visiting the farms for observation and training. In selecting the sites of the demo-farms, consideration will also be given to the assurance of maximum demonstration effect.

The demo-farms will be established not just to cover the designated farmland area but also to provide technical cooperation to farmers' production groups in order to improve the management and income level of member farmers. Needless to say, organized activities of the farmers' production groups will be enhanced within the framework of water management and joint purchase and use of farm machinery and equipment and producers' goods.

In addition to the above consideration, due account will also be taken of the locations of rice mills which will be constructed with Japan's financial cooperation in the "Rice Mill Construction Project", so that the activities in the demo-farms will be facilitated by the effective use of rice mills.

The L. Demo-Farm will cover the approximately 120 ha paddy field which is irrigated by the tertiary canals branching off from BPU 10 of the main canal constructed by Punggru Utra Irrigation Project.

Cooperation activities to be conducted in this demo-farm are as follows.

- 1) Application and extension of, and training in, the new cultivation standards established at the Center (e. g., introduction of improved varieties, fertilization management, plant protection, etc.).
- 2) Increase of land productivity by introduction of double cropping, secondary cropping and companion cropping.
- 3) Establishment and application of, and training in, the mechanized farming system to introduce double cropping by planting right crops at the right time.
- 4) Formulation of the standard of infrastructural improvement and its enforcement for introduction of mechanized farming and rationalization of water management.
- 5) Strengthening of farmers' organizations to enhance the joint purchase, use and custody of farm machinery and equipment as well as joint processing and shipment of farm product.

- 6) Reinforcement of farmers' organizations to improve the water management and control of tertiary irrigation facilities between the main irrigation facilities and fields.
- 7) Survey and analysis of commodity price to improve the farmer' income level, and provision of farm management diagnosis and guidance based thereon.
- 8) Establishment of a practical system for provision of rural credit and collection of charges of leased or transferred equipment and materials, and rearing of the organization running such system.

The L. Demo-Farm will cover about 50 farm households and carry out infrastructural improvement works over two dry seasons in due consideration of the intentions of local farmers, required construction period and capacity of construction machinery. Actual implementation of infrastructural improvement will take place after explanations are given to local farmers and discussions held with the Indonesian government on a detailed plan which will be formulated by the survey mission to be dispatched in the 1972 dry season. Other activities of the farm will be conducted systematically in parallel with the infrastructural improvement.

Cooperation in these activities will be extended continuously over the five period as agreed upon by the governments of Indonesia and Japan. To enhance mechanized farming, it is planned that a set of power tiller (8 - 10 HP) and pest control equipment will be leased to each production group in compliance with the desire of local farmers. Further, power threshers and a rice mill (capacity: 0.5 t/hr) will be installed in the farm to produce high quality polished rice at the optimum time and to provide technical cooperation in the entire process from processing to marketing of rice. The production groups to which one set of power tiller and other machines is to be leased will be so guided that they will constitute the smallest units of organized farmers to be integrated later to cover the whole 120 ha area and expanded in future beyond the boundary of the project area.

Activities in the S. Demo-Farms will be carried out in much the same way as in the L. Demo-Farm. Each S. Demo-Farm will cover an area of about 5 ha embracing 5 to 10 farm households. Since the scale of area is thus small, activities in the S. demo-farm are not expected yield much promotional effect on infrastructural improvement or group activities of farmers. It is therefore planned that cooperation will be offered for two years for each farm (i. e. , 2 dry season croppings and 2 rainy season croppings) and shifted thereafter to cover another project area, so that a total of about 40 demo-farms will be established in 10 Ketjamatans within the five year cooperation period.

In the initial year of the cooperation period, 7 demo-farms will be established in Ketjamatan, Trimuldjo, Punggur, with additional demo-farms established consecutively thereafter in Metro, Pekalongan and other Ketjamatans.

Thus, establishment of 1 L. demo-farm and about 40 S. demo-farms in the 20,000 ha paddy field area embracing 10 Ketjamatans of Central Lampung is envisaged by this sub-project. To make the cooperation truly fruitful, it is absolutely necessary that local farmers exhibit willingness to participate in the project. Efforts should therefore be made for enlightening local farmers on the nature and purpose of the project and for creating an incentive atmosphere that will stimulate the volition of all the local farmers for introducing advanced cultivation techniques.

Rearing an strengthening of farmers' organizations is a must for promoting systematic group activities of farmers.

However, what may be called the farmers' organizations at present are the groups of farmers which are formed in each Desa and controlled by Lurah by the tacit mutual understanding of farmers. They are organized by farmers who immigrated to Lampung from the same area in Java island at about the same time for water distribution from tertiary canals under the traditional labour service system (Gotong Rojong) and the mutual aid system (Ani-ani). It will be necessary to base the creation and strengthening of farmers' organizations on these existing farmers' groups, with account also taken of the Unit Desa Plan worked out under Bimas Project.

Considering the capacity of farm machinery and equipment to be leased to farmers, probability is high that the smallest unit of organized farmers will be the production group covering 5 to 10 ha of farmland, and setting up of this smallest unit will provide the basis for introduction of advanced farming techniques. These farmers' production groups will be charged with the custody and maintenance of the rice mill unit to be installed at the L. demo-farm.

Management of irrigation water and facilities between the tertiary canals and fields is not only closely related to farm management but also involves such works as collection of maintenance fees, etc. This task is now left to the care of ili-ili (irrigation manager) elected for each tertiary canal but should be transferred to the newly created farmers' organizations. However, further detailed studies will have to be made on this matter because it falls under the jurisdiction of the Ministry of Public Works.

With respect to the 175 Demo-Plots and 5 Trial Plots planned to be established under BIMAS Project, their relationship with the aforementioned demo-farms should be made clear. Since both demo-plots and trial plots are intended chiefly for demonstration and smaller in scale than the demo-farms, it may as well be suggested to establish the former as sub-plots performing part of the functions of the latter. However, this must be preceded by detailed arrangements for division of terminal functions because the two projects are implemented by different departments of the central government, i. e. , the BIMAS Control Body controlling BIMAS Project and the Directorate General of Agriculture controlling the present project. At any rate, arrangements will have to be made to assure that the farmers involved will be benefited within a minimum of time.

### 2-3 Upland Farming Development Sub-project

The Upland Farming Development Sub-Project should be implemented in close coordination with Bimas Palawidja which is to be executed by the Indonesian government.

Although rice is the main staple food in Lampung province, it cannot be denied that increasingly heavy weight is carried by Palawidja as important foreign exchange earner in the province's agriculture. It leaves little doubt that the production increase, quality control, and rationalization of distribution mechanism will contribute to augmented foreign exchange earnings and elevation of farmers' income level.

Maize production in Lampung is on the steady upward trend, and its export has also been increasing year after year unlike the case in other maize producing areas of the country. However, since maize is cultivated by mixed cropping with upland rice (which is grown for farmers' own consumption) and its yield per unit area is small, production increase of maize entails many problems in the province.

If single cropping is encouraged for increased maize production, then the government should take measures for providing small holders with rice for staple food. If farmers are to sell maize produced by single cropping and purchase rice for their own consumption, the province will run into rice shortage because 50% of all rice production in the province is occupied, as statistics indicate, by upland rice. Considering the future population increase, single cropping of maize could invite acute rice shortage though reclamation of paddy field is in steady progress at present.

If maize production is to be accelerated, therefore, upland paddy production should be decreased according to the progress of paddy field reclamation.

It must also be pointed that a sudden change effected to cropping pattern by total exclusion of cassava from production items will incur economic confusion and disadvantage on the part of farmers because cassava can not only withstand extensive farming but is also the source of relatively large cash income.

Conversely, however, if cassava production is to be encouraged in an extensive scale throughout the province, then construction of tapioca and pellets plants should be prompted and confusion is liable to occur in the distribution system. Further, demand in European market which is the major outlet of cassava product should be taken into consideration in planning its production increase.

Demo-farms will be established to cover individual Desas. At the outset of the project implementation, farmers should be given full explanation and information so that they will willingly participate in the project, and accelerated maize production should be planned on the basis of a rational cropping pattern to be newly established without effecting any major change to the prevailing cropping ratios of maize, upland paddy and cassava.

Unlike the case in the paddy field area, crops grown in upland fields are not fixed and the cropping pattern varies to some extent by the size of holding. From this fact, it is considered that studies will have to be made over a considerably long period before single cropping is employed in the demo-farms. It is therefore planned that the activities in the demo-farms will start with the accelerated maize production programme which will be put in practice in the fields of volunteer farmers on the basis of 3-year continuous cropping in 3 equally divided plots of field.

However, guidance in the maize cultivation techniques by single cropping will be provided if requested by middle-class and larger scale farmers.

Demo-farms will be broadly classified into two types. One of them will cover the existing upland fields. Activities in this type of demo-farms should be preceded by the arrangements with the farmers for selection between the single cropping of maize and the aforementioned system of dividing the field into three equal parts for successive three year cropping of the three crops. The system of technical cooperation should be planned with prudent care for both types of cropping method. What should be done first, however, will be the distribution of improved varieties and fertilizers.

The other type of demo-farms will cover along-alang fields and lands which are fallowed due to labour shortage. In these areas, introduction of farm machinery such as bulldozers and tractors will be taken up before anything else to enhance mechanical plowing. Since no farmers' organizations are established in these areas, introduction of farm machinery will have to be prompted by the Center on the piecework basis for some time to come. Although the farm machinery will be offered by Japan, the Indo-

nesian side should take charge of their management.

In demo-farms covering Desas, farm management is to be carried out by farmers themselves, with the strong government support provided to cover the shortage of techniques and fund required for introduction of advanced cultivation techniques.

Warehouses and drying yards should be installed in each demo-farm to enable farmers' organizations to cover, to the maximum extent, all the activities required after harvesting such as shelling, drying and marketing. While Japan is ready to provide the necessary shellers and dryers, full-fledged support of the Indonesian government is essential in the initial stage when the farmers' organization in the demo-farm is not well developed and is likely to suffer the shortage of technicians, operators and running expenses.

It is naturally desirable that farmers' organizations will soon be integrated and developed into an agricultural cooperation association covering the entire province and undertaking export business as well. For some time to come, however, commodities collected in demo-farms will be delivered to ordinary merchants and dealers at designated time and place. For this reason, studies should be made on the distribution system from the producing farmers to end consumers before implementing the project, and such studies may disclose that subletting shelling and drying work to contractors is justifiable under certain circumstances.

As for rural credit to be advanced to farmers as farm management fund, the system adopted under Bimas Palawidja is considered suitable. However, its actual application will have to be preceded by a close study.

Activities in trial plots are intended for introducing established improved techniques. However, since the adaptability of such techniques will be checked by trials in the plots, they could prove not applicable on the farmers' level. Prior arrangements should therefore be made for paying rent to land owners to cover the possible loss. Budgetary arrangement should also be made to cover the cost of labour, equipment and materials because farmers are not expected to partake in the trials.

Trial plots will cover such activities as fertilizer application for single cropping of maize and tests and experiments on succeeding crops. Plausible succeeding crops of maize are cassava which is planted in September to October period, legumes, and milo as succeeding crop of legumes. Trials on other possible succeeding crops including tobacco should be conducted at the Center.

In the initial year of the cooperation period, activities in the demo-farms will cover the 1973 wet season crops, with stress placed on maize. In parallel with this, possibility of introducing legumes and dry season cropping of milo will be checked in trial plots.

As for upland paddy now being cultivated, no studies will be made along the lines of the policy for paddy field creation. Introduction of cassava will be put in practice after making prudent studies on various aspects including the effect of fertilization.

If November is taken as the standard seeding time of maize, then the Center will have to engage in the seed multiplication of recommended varieties in the May - September season. If 6 kg of seeds is required per ha in the initial year for mixed cropping in the 200 ha demo-farms, a total of 1.2 t of seeds should be made available. Seed multiplication is also required for Bimas Palawidja. In unexploited areas, on the

other hand, reclamation should be carried out in the dry season.

For all these reasons, preparations will be started around January 1972 at the Center to commence its activities with the installation of pumps for dry season irrigation.

There are many works to be undertaken before starting the activities in demo-farms, and these include the rearing of farmers' organizations, training of key farmers and enlightenment of farmers. It is believed that these preliminary works will lead to the success of the activities in demo-farms.

### III. AGRICULTURAL EXTENSION CENTER

The farm planned to be developed into the Agricultural Extension Center is a seed farm located at Tegineneng and engaged chiefly in the multiplication of maize seeds at present.

Development of this farm into the Center was proposed by reason of its excellent site conditions (See Fig. 3) by two Japanese survey missions, i. e., the Preliminary Survey Mission for Maize Development which visited Lampung Province in November 1970 and the First Survey Mission for Agricultural Development of Lampung which was sent to the province in August 1971.

The present survey mission was assigned to the task of planning the Center's establishment on the strength of the proposal of these two missions.

#### 3-1 Objective

The Agricultural Extension Center will be established for smooth and effective implementation of the agricultural development scheme of Lampung and will carry out the following activities to meet this purpose.

##### 1) Trials and experiments

Trials and experiments intended for selection of suitable crops, introduction of improved varieties, establishment of a rational fertilization system, establishment of an adequate cropping pattern, soil conservation rational water management, enhancement of mechanized farming, plant protection, and weed control.

##### 2) Demonstration of advanced cultivation techniques

Demonstration of advanced cultivation techniques for uplifting the technical level of farmers.

##### 3) Provision of technical advice and guidance necessary for smooth implementation of the province's agricultural development scheme.

##### 4) Training

Training of extension workers and key farmers in the theories and fundamentals of advanced cultivation techniques and farm machinery and equipment, and field training of such workers and farmers in the actual application of advanced cultivation techniques and handling of farm machinery and equipment.

##### 5) Multiplication and distribution of seeds

Multiplication and distribution of seeds and seedlings centering on maize, pending the establishment and full-fledged operation of a system which is planned to be created by the Indonesian Government for multiplication and distribution of seeds and seedlings of all improved varieties.

##### 6) Collection and analysis of data on the existing state of farm management

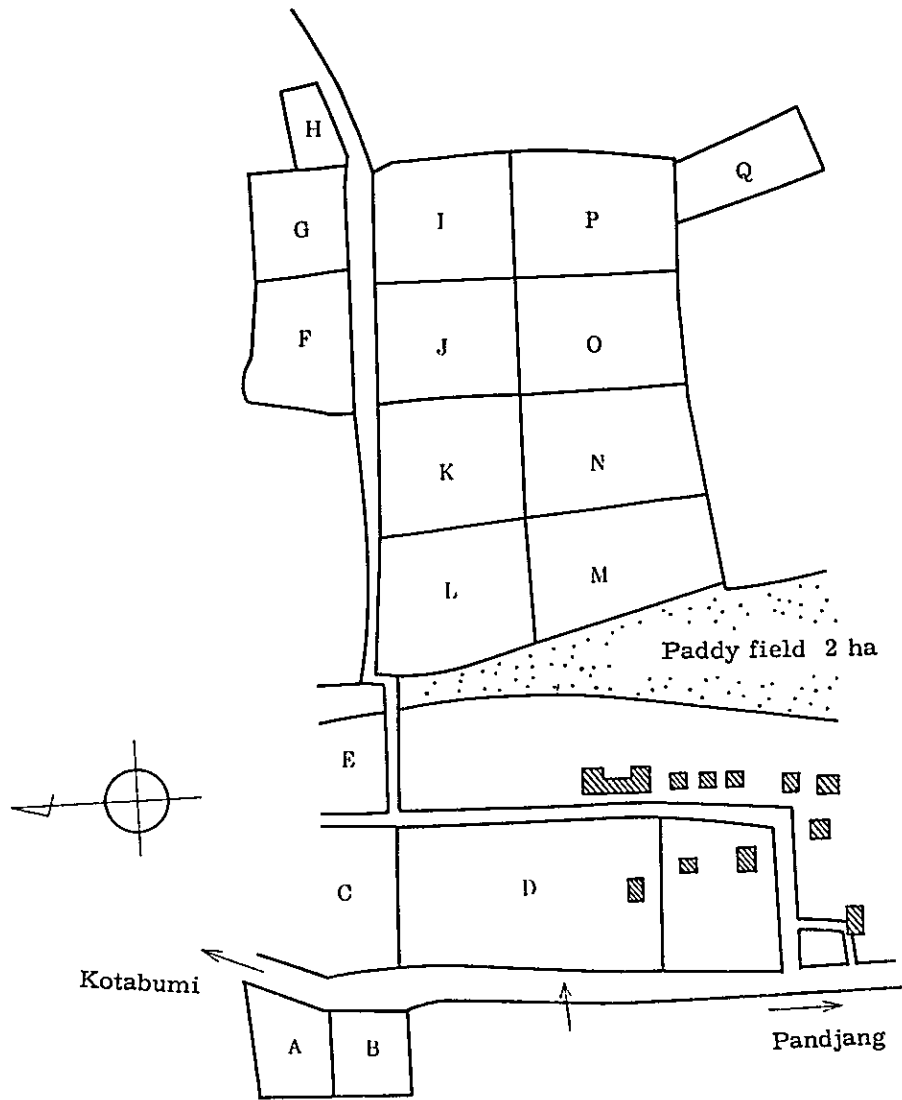


Fig. 3 Tegineneng Maize Center



Collection of data on farm household economy, farm management and ex-farm yard price of agricultural products, and publication of dynamic statics based on the analysis of such data.

7) Others

All other activities necessary for enhancing the agricultural development of Lampung province.

3-2 Details of Activities

(1) Planning Activities

While expressing the hope that the Center's activities listed in Section 3-1 will be carried out on the equal footing and in parallel with the other two sub-projects, i. e., Lowland and Upland Farming Development Sub-projects, the Indonesian Government did not fail to pay due recognition to the importance of close coordination between all the three.

In the course of implementing the agricultural development scheme in Lampung, Japanese experts assigned to the Lowland and Upland Farming Development Sub-projects will be required to maintain constant contact with those stationed at the Center. It is also probable that some of the experts who are specialized in specific fields will be required to offer their service both at the Center and in the sub-project areas.

The Center will therefore be required to play the pivotal function in the planned agricultural development, directing its efforts towards maintaining coordination between the field trial and experiment plans for Lowland and Upland Farming Development Sub-projects besides formulating plans for its own activities. It will also be demanded to take a leading part in planning extension activities and training of extension workers and farmers.

(2) Trials and Experiments

As described in Section 3-1, trials and experiments necessary for smooth implementation of the province's agricultural development scheme will be conducted at the Center. The trials and experiments can be considered under two categories, i. e., paddy and upland crops.

(a) Paddy

The existing 2 ha paddy field is in a depression and has a small torrent flowing through it. It is planned that this paddy field will be turned into a reservoir and the adjoining 5 ha upland field will be transformed into a paddy field. The new paddy field thus created will be divided as follows for various purposes.

- i) 2 ha will be used for training purposes.
- ii) The remaining 3 ha will be used for trials, experiments and demonstration of paddy cultivation techniques covering ecological reaction of improved varieties, fertilization method, water management,

pest and disease control and weed control. These trials and experiments will be conducted to bring solution for the problems described below.

Ecological reaction of improved varieties:

Breeding of paddy varieties is not planned to be conducted at the Center. At present, breeding is carried out at the Central Research Institute for Agriculture in Bogor. Though farmers in Sumatra are encouraged to plant the varieties bred at the said station, there has not been produced any clear evidence that the such new varieties are really suited for cultivation in Lampung, nor is the extension system in the province capable of inducing farmers to plant the new varieties. The Center will therefore be required to clarify the ecological reaction of various varieties for demonstration and extension of such improved varieties which are suited for cultivation in Lampung and also to offer the basic data obtained at the Central Research Institute for Agriculture.

Fertilization method:

Potash fertilizer is not considered to exhibit any appreciable effect in Indonesia. The majority of fertilizers applied in the country therefore consists of nitrogen fertilizer and phosphate fertilizers. Farmers apply urea as nitrogen fertilizer and triple superphosphate as phosphate fertilizer, but their dosage is rather small. Heavy dosage of fertilizer application does not always prove effective in Indonesia because of the low rice price and labour cost. Trials and experiments should therefore be conducted to determine the optimum fertilizer requirement. In Lampung, soils allowing eluviation of fertilizers are considered to be widely distributed. Phosphate deficiency and characteristics of clayey minerals are cited as the factors responsible for eluviation, but this must be made clear by trials and experiments so as to be able to establish adequate preventive measures. Micro element deficiency was not detected during the survey. Considering the vastness of the province, however, this should also be confirmed by a closer survey and experiments.

The fertilization method encouraged by the Agricultural Extension Office of Lampung province is as follows.

Phosphate fertilizer is to be all applied as base fertilizer, while nitrogen fertilizer is to be divided into three equal quantities for application of the first 1/3 as base fertilizer, the second 1/3 as first top dressing to be conducted 14 days after transplanting, and the last 1/3 as second top dressing to be conducted 45 days after transplanting.

Thus, the Extension Office does not provide for any fixed relation between the earling-time and the time for additional fertilization. However, since the lodging time varies to a substantial extent by variety, trials and experiments will have to be conducted to determine the optimum time of top dressing, particularly that of the second top dressing.

At present, upper layer placement is practised in almost all cases. The effect of total layer application and deep placement should therefore be clarified by trials and experiments. Trials and experiments will also have to be made on the application of compound fertilizers in place of single element fertilizer with consideration given to the suppression effect on nitrification and the time when fertilization effect is exhibited.

#### Water Management:

Traditional water management resorts to the plot-to-plot irrigation. This method is considered to be instrumental in replenishing dissolved oxygen, controlling the soil temperature rise, suppressing the decomposition of organic matters in the soil and alleviating the plant rot due to oxygen deficiency. On the other hand, however, it is known to accelerate the run-off of nutrients. In constantly submerged paddy fields which were covered by the present survey, the mission noted that the soil contained lots of gas and bubbles were formed simply by stepping in the field. Surface drainage would be quite effective in such fields but its effect will have to be ascertained by trials and experiments.

The mission also noticed that excessive puddling carried out before transplanting makes the surface soil too soft and impedes rooting. As a countermeasure for this, water is drained for several days after transplanting to solidify the soil, but this in turn retards rooting. Trials and experiments are therefore required to determine the optimum degree of puddling work conducted before transplanting and to confirm the effect of drainage carried out immediately after transplanting.

#### Pest and disease control:

Interviews with farmers disclosed that Tungro, blast and stem borer are the major pests and disease. For control of blast and stem borers, Kitazin P and Sumithion are applied respectively in small quantities. However, no sufficient control measures are taken against plant hoppers which are the vector insects of Tungro.

At present, no detailed information is available on the development, migration and other characters of insect pests or transmission of diseases, nor are the details of pest and disease occurrence known. Further, no system is established yet for occurrence forecasting, and information on the pest and disease occurrence and guidance for its prevention cannot be considered satisfactory. The Center will therefore be required to establish an occurrence forecasting method based on the study of major diseases and insect pests and furnish farmers with the necessary preventive information and guidances.

#### Weed control:

In the paddy field area of Lampung, barnyard millet does not grow and broad leaf grasses occupy the majority of weeds. Weeding is

mostly conducted manually, occasionally using handmade weeding equipment resembling "Hattandori". Trials and experiments on 2,4-D and MCP should be carried out since spraying of these herbicides is expected to exhibit control effect in Lampung.

(b) Upland Crops

Trials and experiments will be conducted on different varieties of each crop and their cultivation techniques.

i) Trials and Experiments on Different Varieties

The maize variety grown by most farmers is white flint, a local variety, though Metro, a new variety selected at Mitugoro Farm, is being cultivated in increasingly wide areas around the farm. However, since these varieties have long been grown by non-fertilized farming, their yield rate is rather small. If any phenomenal increase of yield is desired, high yielding dent varieties which call for heavy fertilizer application should be introduced from the United States or other countries. For this reason, local and foreign varieties should be collected for selection of suitable ones by trials and experiments. Such trials and experiments should also be conducted on other crops than maize.

ii) Trials and Experiments on Farming Method

Trials and experiments of different combinations of planting densities and fertilizer dosages should be conducted on improved varieties.

The prevailing non-fertilized mixed cropping will be given place eventually to fertilized single cropping method. Since the planting density required under fertilized cropping varies from that for non-fertilized cropping, different combinations of fertilizer dosages and planting densities as well as the dosages of top dressing should be checked by trials and experiments.

(3) Training

(a) Purpose

Extension workers and key farmers will be given theoretical as well as practical training in new farming and extension techniques so as to promote their technical level and accelerate the diffusion of advanced techniques among the neighbouring farmers.

(b) Coverage

The training programme will cover not only extension workers and key farmers but also the teachers of agricultural high schools.

Farmers outside the project area will also be given training in mechanized farming and other specific subjects for smooth implementation of the agricultural development scheme.

(c) Period and Frequency of Training

For extension workers, training courses each lasting for about 2 weeks will be offered about 4 times a year.

For key farmers, training courses each lasting for a week or shorter will be offered about 6 times a year.

Since the farmers' training period should not coincide with the busiest farming season, paddy growing farmers will be trained separately from upland crops growing farmers so as to avoid their respective peak labour periods.

(d) Contents of Training

Training will consist of lectures, reviews and practical training, and stress will be placed on practical training.

In addition to the fertilization and plant protection techniques, practical training will cover the plowing and soil preparation using hand tractors for the most part as well as the operation of harvesting and processing equipment.

Lectures will be given to acquaint the trainees with the principles and techniques of fertilization and plant protection at the right time, and will also cover such subjects as the planning of farm household economy, agricultural bookkeeping and farm management diagnosis.

(e) Training System

For the training of extension workers, a number of courses will be offered to cover freshmen, middle-class extension workers, higher level extension officers needing special knowledges, etc.

Training of farmers will not be completed by a single course because repetitive training by 2 to 3 courses is considered to yield better results. In the training in mechanized farming, for example, separate courses will be offered in the operation, mechanical principles and construction, overhauling and repair, etc. so that the trainees will be able to acquire and make mastery of the necessary techniques and skills upon completion of each course.

(f) Training Staff

- i) Subject matter specialists specialized in various fields will be assigned to train extension workers under the guidance of the extension experts stationed at the Center.

Japanese experts stationed at the Center will cooperate actively in the preparation of the training curriculum and in the overall planning of training, and will also give lectures or training in subject matters demanding highly technical knowledges and experience.

- ii) It is planned that farmers will be trained by exclusive extension officers to be stationed at the Center. At the initial stage, however, the above-mentioned subject matter specialists will serve as instructors.

#### (4) Seed Multiplication

At present, Tegineneng Seed Farm takes charge of multiplication and distribution of maize seeds in Lampung province. It is informed that the Indonesian Government has the plan to entrust this multiplication and distribution activity to a private enterprise, but a considerably long time will be required before the plan is set perfectly on foot. The Center will therefore perform the function of seed multiplication pending the full-fledged operation of the planned system.

In addition to this, trials and experiments for selection and demonstration of original paddy seed will be carried out at the Center. The seed farms located at Metro and other places in the province have a total area of a little more than 20 ha, and they will engage in the multiplication of paddy seeds to be distributed chiefly among ordinary farmers.

The Center's seed multiplication plan will also cover such crops as soybeans, green grams, groundnuts, upland paddy, etc. which all carry a heavy weight in the cropping pattern of both upland and paddy fields.

As a provisional plan for this seed multiplication activity, allocation of 52 ha for maize, 3 ha for groundnuts, 2 ha for soybeans, 1 ha for green beans and 1 ha for upland paddy is now under study. Implementation of this plan, however, should be preceded by prudent studies and reviews.

#### (5) Creation and Utilization of New Fields

The existing paddy field and grassland at the Center, for which description has already been given in the foregoing pages, should be rearranged as briefed below for creation of new fields.

##### (a) Creation of New Paddy Field and Reservoir

The Center has a 2 ha wide paddy field at present, but its plot arrangement is not satisfactory. Though a small river flows through this paddy field, irrigation and drainage control is not feasible because there is no distinction between irrigation and drainage canals and further, irrigation is liable to be made totally impossible in the dry season. If experimental paddy cultivation and trials of crop rotation in paddy field are to be carried out at this site, construction of a new reservoir, separation of irrigation canal from drainage canal, and plot rearrangement of paddy field are an imperative. Since the existing paddy field is in a depression, it is possible to construct a dam on the downstream side of the river and turn the paddy field into a reservoir. This should be accompanied by the creation of a new 5 ha paddy field in the upland field (plot name: K. L. M. N. shown Fig. 2) lying adjacent to the existing paddy field on its eastern side. The new paddy field thus created will be divided into 5 plots each covering an area of 1 ha, and a farm road will be provided between respective plots, with an irrigation canal and

drainage canal constructed along each plot. Irrigation water will be pumped up from the reservoir and drain water will be led to the (up side). Each plot will be suitably divided by dykes for various purposes.

3 ha of this newly created paddy field will be used for trials, experiments and demonstration, 2 ha used for training.

(b) Upland Crops

The land lying adjacent to the said 5 ha paddy field is planned to be purchased for use at the Center, and 10 ha of this newly acquired land will be used for trials and experiments on upland crops.

4 ha of this land will be used for trials and experiments on maize, with irrigation facilities provided to cover 2 ha for stabilized experimental activities in the dry season. Of the remaining 6 ha land, 2 ha will be appropriated for cassava, 2 ha for soybeans, 1 ha for groundnuts and 1 ha for trials on cropping pattern.

Irrigation facilities will be provided to cover 2 ha of the 4 ha land allocated for maize.

Daily evaporation : 10 mm

Irrigation interval : 5 days

(6) Farm Machinery and Equipment

At present, the Center's farm machinery and equipment comprise 7 units of 4 wheel tractors (28.5 PS) and attachments (plows, rotary harrows, trailers, etc.). Of these equipment, bottom plows (12" x 2) are used as one bottom because of the large traction resistance caused by the solid soil nature. However, their structural parts are extremely weak and despite the fact that they have been in use for only two years or so, the shares are no longer in working condition due to excessive wear. This points to the need for giving due consideration to the strength and materials of the machines and equipment to be introduced in future.

With the future expansion of farmland area, the Center should be equipped with additional machinery and equipment for field management such as 4 wheel tractors and tilling and levelling equipment. Further, corn shellers and driers will have to be introduced to meet the technical requirements arising in demo-farms, and corn planters, cultivators, ridgers, power threshers should also be installed for trials and experiments in mechanized farming.

In addition, hand tractors and attachments for field management and crawler tractors for reclaiming along-along fields need to be installed at the Center.

(7) Buildings and Structures

Fig. 4 shows the layout of the Center's buildings and facilities. The existing buildings and facilities are as follows. Office room and lecture room (No. 6), tractor shed (No. 10), store house (with concrete floor for solar

drying; No. 12-1), pump room (No. 19-1), generator room (No. 23), director's house (No. 13), house of higher level staff members (one row for 12 families; No. 15), house of general staff members (3 rows; No. 16), and house of farmers (2 rows for 5 families; No. 17). After establishment of the Center, the existing houses will be used for accommodating Indonesian personnel, but the office and lecture rooms (No. 6) will be turned into a demonstration room and a library respectively because they are too small to accommodate the personnel required for the management and clerical work of the Center.

Buildings and facilities to be newly constructed will be as follows.

Office room and laboratory room (No. 4), gasoline stand (No. 1), net house (No. 2), drying yard with a vinyl chloride roof (No. 3), inoculation and insect raising room (No. 5), working yard (No. 9), fertilizer warehouse (No. 11), crop store house (No. 12-2), pump room and generator room (No. 19-2), filtering tower (No. 20), meteorological observatory (No. 21), light trap (No. 22), trainees' dormitory (capacity-40 persons; No. 14), and cow shed (No. 18).

Construction of these new buildings and facilities is to be undertaken by the Indonesian Government.

The plan of the new office and laboratory rooms and the old office rooms which will be turned into a demonstration room and a library is shown in Fig. 5.

For the supply of furnitures and fittings such as desks, laboratory tables, chairs, etc., the Indonesian Government will be requested to make necessary arrangements.



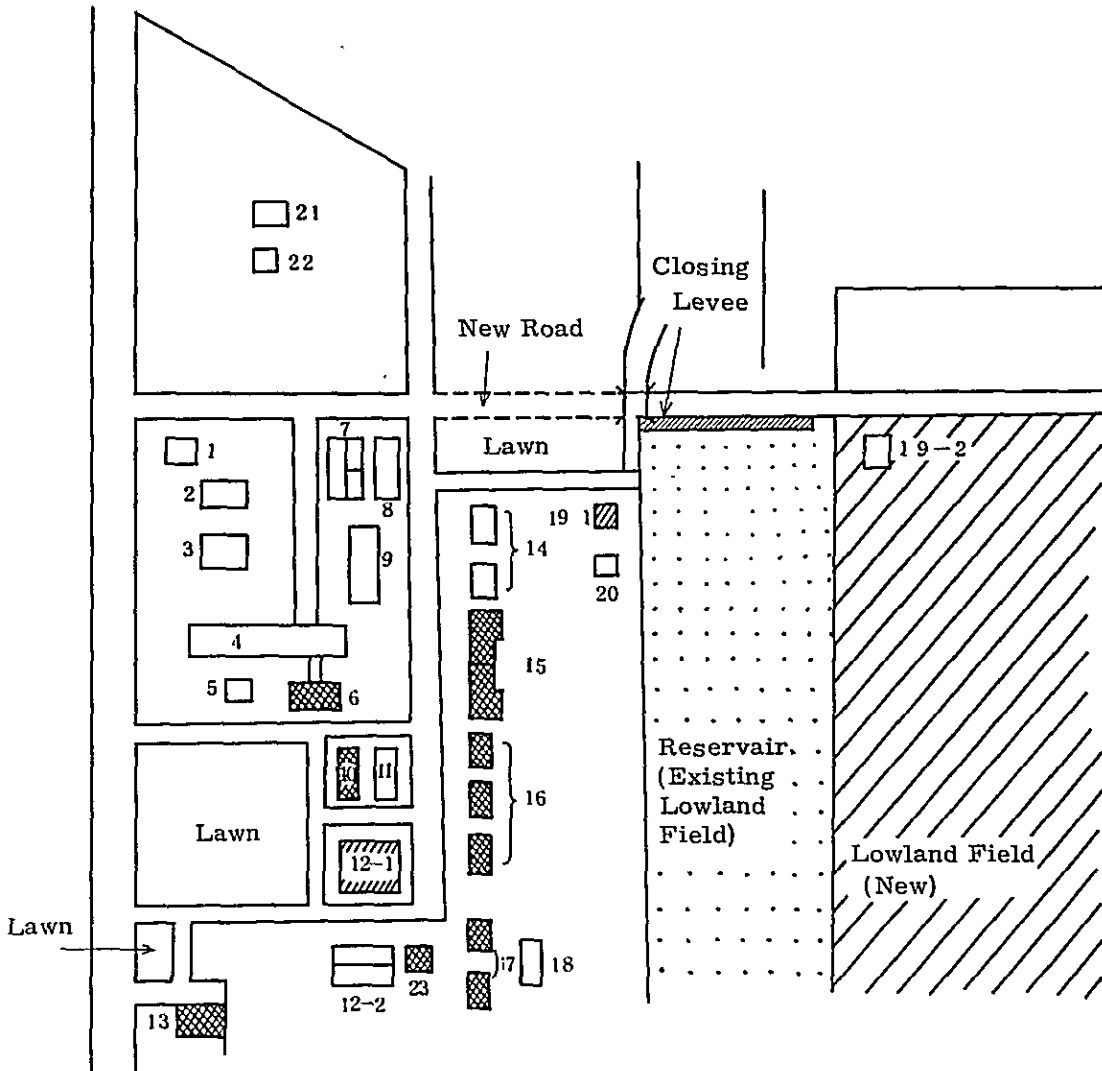


Fig. 4 Layout of Building and Facilities of the Center

Existing building and facilities	New building and facilities
▨	□

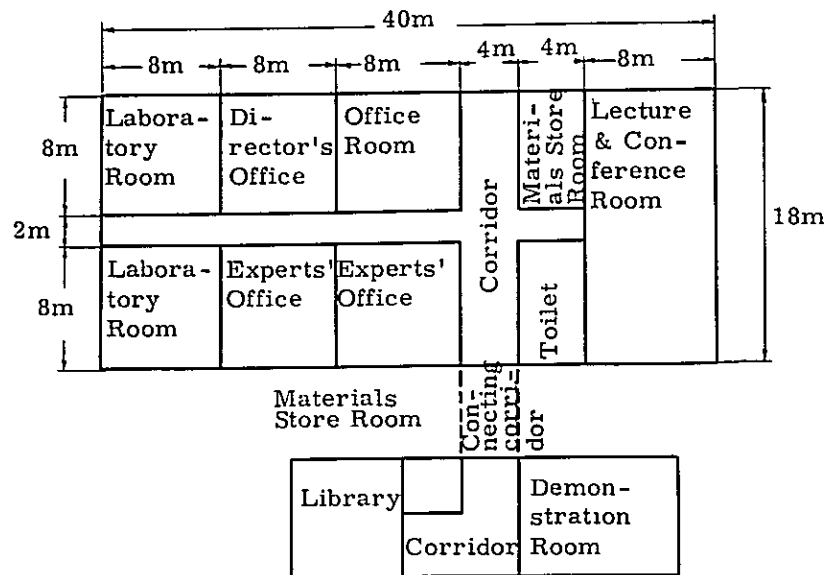


Fig. 5 Layout of Office Room, Laboratory, Demonstration Room and Library

Names and Dimensions of the Centers' Buildings and Facilities

	(Name)	(Existing/New)	(Dimensions)
No. 1	Gasoline stand	New	-
No. 2	Net house	"	12 x 6m x 2
No. 3	Drying yard with a VC roof	"	12 x 6
No. 4	Office room and laboratory room	"	40 x 18
No. 5	Inoculation and insect raising rooms	"	20 x 20
No. 6	Demonstration room and library (Existing office rooms)	Existing	-
No. 7	Tractor shed, repair shop and car washing yard	New	40 x 15
No. 8	Store house of parts and attachments of machinery	"	40 x 10
No. 9	Working yard	"	25 x 6
No. 10	Tractor shed	Existing	-
No. 11	Fertilizer warehouse	New	30 x 10
No. 12-1	Store house with concrete floor for solar drying	Existing	-
No. 12-2	Store house with concrete floor for solar drying	New	Same as 12-1
No. 13	House of Center's Director	Existing	-
No. 14	Trainees' dormitory	New	-
No. 15	House of higher level staff members	Existing	-
No. 16	House of general staff members	"	-
No. 17	House of farmers	"	-
No. 18	Cow shed	New	10 x 4m
No. 19-1	Pump room	Existing	-
No. 19-2	Pump room and generator room	New	-
No. 20	Filtering tower	"	-

No. 21	Meteorological observatory	New	-
No. 22	Light trap	"	-
No. 23	Generator room	Existing	-

Fig. 6 Village Name of Central Lampung



#### IV. LOWLAND (PADDY) FARMING DEVELOPMENT SUB-PROJECT

##### 4-1 Implementation Plan

##### 4-1-1 Purpose of the Sub-project

Central Lampung occupies an important position in the food production in the entire Lampung province, and is expected to be pressed hard for increased production to meet the anticipated population expansion. While paddy cultivation constitutes the nucleus of food production, the soil productivity is poor and farmers' life is not stabilized in this area.

The Lowland Farming Development Sub-project aims at rationalizing the existing paddy cultivation techniques in Central Lampung through introduction of double cropping so as to attain increased production of rice. It also aims at improving land productivity through introduction of intercrops between paddy cropping seasons and cultivation of upland crops in areas subjected to deficient irrigation water supply in the dry season. Further, processing and distribution of farm product, which will be available in stabilized and increased quantities by such promotional measures, is planned to be streamlined, with efforts also directed towards increasing the commercialization ratio and reducing the distribution cost. Thus, the ultimate purpose of the sub-project lies in the gradual improvement of farmers' income and living standard and creation of prosperous rural communities.

To attain this purpose, not only intensive guidance services will be offered to selected groups of farmers but also strenuous efforts will be exerted for infiltration of spill-out effect among neighbouring farmers through the activities in demo-farms (farming work, demonstration of improved cultivation techniques and rearing of farmers' organization) and at the Center (training of extension workers and key farmers).

##### 4-1-2 Contents of the Sub-project

This sub-project will cover a wide range of activities likely to serve for improving farmers' income level, such as demonstration, guidance and extension of improved cultivation techniques of paddy, intercrops and second upland crops in paddy field areas, infrastructural improvement work required for application of such techniques, improvement of storage, processing and distribution of farm product, and rearing of farmers' organizations.

All these activities, itemized below for better understanding, will be carried out in a package deal.

- 1) Demonstration, guidance and extension of cultivation techniques.
- 2) Guidance in water management and maintenance and management of irrigation facilities.
- 3) Guidance and training in mechanized farming, and management and maintenance of farm machinery and equipment.
- 4) Establishment of standards for, and implementation of, infrastructural improvement works necessary for rationalization and mechanization of farming work.

- 5) Training of extension workers and key farmers.
- 6) Rearing of farmers' organizations.
  - a) Guidance for rational and smooth supply of capital goods.
  - b) Guidance in the storage, processing and distribution of products.
  - c) Establishment of rural credit system and guidance for its smooth operation.
- 7) Collection and analysis of data for rationalization of farm management.
- 8) Guidance in the techniques and method of extending improved farming techniques.

For implementation of these activities, 1 L, demo-farm and about 40 S demo-farms will be established in the project area.

The L. demo-farm will be established in Desa Totokaton, Ketjamatan Punggur, and will cover a paddy field area of about 120 ha. Cooperation in the activities in this demo-farm will be offered continuously over the five-year period, with the initial 2 years allocated for infrastructural improvement.

The S. demo-farms will be established in 10 Ketjamatans, and each will embrace 5 to 10 farm households covering 3 to 5 ha of paddy field. Cooperation activities in each S. demo-farm will last for 2 years (i. e. , for 2 dry season croppings and 2 wet season croppings) and then shifted to another.

Implementation of the above-listed activities calls for the organizational and institutional support of the provincial government of Lampung as well as the arrangements by the central government of Indonesia for free use of warehouses and other facilities and preparation of construction cost for infrastructural improvement.

#### 4-1-3 Implementation Plan

In the initial stage of the project, demo-farms will be established mainly in the existing paddy field area for expansion of cooperation activities in new paddy field areas to be successively created in the northern part of Central Lampung.

In the first year of the project period, therefore, demo-farms will be established in Ketjamatan Trimurdjo which is in the existing paddy field area and in Ketjamatan Punggur where the reclamation is in rapid progress by the completion of the main irrigation canal.

The implementation plan over the five year period is as shown in Fig. 7.

Fig. 7 - Annual Implementation Plan

Kecamatan	Paddy field area ha	1972	1973	1974	1975	1976	1977
[ L Demo - Farm ] Punggur		—————					
( S Demo - Farm ) Trimurdjo	3,170	4 demo-farms					
Punggur	3,060	3 demo-farms					
Metro	2,900	5 demo-farms					
Pekalongan	1,240	3 demo-farms					
Batanhari	3,040	5 demo-farms					
Sekampung	1,530	4 demo-farms					
Septih Raman	2,370	4 demo-farms					
Raman Utra	1,810				4 demo-farms		
Purbalingo	2,600				4 demo-farms		
Sukudana	1,100				4 demo-farms		
Total	22,820						

4-2 Large Scale Demo-Farm (L. Demo-Farm)

4-2-1 Selection of Site

Selection of the site of the L. demo-farm was not only based on the administrative division but was also made from the viewpoint of farmers' group activities and establishment of collective farms to ensure improved income of farmers. Further, considering the importance of water management in paddy cultivation, the farm was planned to cover an entire paddy field area irrigated by a tertiary irrigation canal.

In addition, due attention was given to the need for selecting a recently created paddy field area so that farm road construction and other infrastructural improvement works may be executed with ease.

The L. demo-farm is expected to become a model farm from which improved techniques will be diffused among neighbouring farmers. Accordingly, it was planned that the demo-farms will be established in a representative paddy field area which serves, on the one hand, to provide data for future development of other parts of the province, and is favourably conditioned, on the other, for the training of neighbouring farmers and their observation of improved techniques as well as for attaining maximum extension effect.

Discussions were held on the basis of these screening criteria between the Agricultural Extension Bureau of the provincial government of Lampung and the branch office of the Department of Water Resources of the Ministry of Public Works in Metro, which led to the agreement that the site of the L. demo-farm should be sought in the area covered by Punggur Utra Irrigation Project now being implemented by the Water Resources Department.



On the strength of this agreement, the about 120 ha land irrigated by the tertiary canal branching off from B. P. U. 10 of the main canal which was constructed under the said Punggur Utra Irrigation Project was selected. This area extends along the main canal and is embraced in Desa Totokaton, Ketjamatan Punggur. Final selection of this area as the L. demo-farm was made after the pertinent Tjamat and Kepata Desa pledged their support to the project as a result of a number of consultations held with them. As evidenced by the support pledged by their Kapata Desa, local farmers are in favour of the project implementation. It is planned that a long-term surveyers will be sent to this Desa for a detailed follow-up survey on the intentions of local farmers.

#### 4-2-2 Demonstration, Guidance and Extension of Cultivation Techniques

The cultivation techniques and cultural standards to be demonstrated and extended in the L. demo-farm will be as follows.

##### i) Cropping Pattern

Irrigation water becomes short of demand in the dry season in the demo-farm area. Therefore, the entire area will be planted with paddy in the rainy season, but in the dry season, paddy will be grown in about 1/3 of the area and the remaining 2/3 will be used for upland crop cultivation. Accordingly, a three-year rotation cropping illustrated below is planned to be adopted. (See Fig. 8)

As for paddy cultivation, transplanting will be encouraged instead of direct seeding system.

Fig. 8 - Cropping Pattern

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Cropping Pattern I		Paddy			Paddy				Green Grams		Paddy	
Cropping Pattern II		Paddy			Maize				Soybeans of Groundnuts		Paddy	

##### ii) Cultural Standards of Paddy

###### Varieties

It is planned that the varieties encouraged by the Indonesian Government which meet the taste of domestic consumers and therefore have high commercial value will be introduced.

The following are the varieties to be introduced mainly.

C4-64, PB-5, and Perita 1/I and 1/II

### Nursing of Seedlings and Nursery Bed

The following standards will be adopted for nursing of seedlings and will be improved as circumstances call.

- a) Area of nursery bed : 500 m<sup>2</sup> per ha of paddy field.
- b) Type of nursery bed : Semi-irrigated in the former stage and water nursery in the latter stage.
- c) Seeding rate : 25 kg per ha of paddy field.
- d) Seed preparation : Soaking for 24 hrs in clean water followed by 12 hrs of drying in the shade (for accelerating germination).
- e) Seeding density : 50 g/m<sup>2</sup> (in dry seeds).
- f) Water management of nursery : Water to be supplied in small ditch alone for 4 - 6 days after seeding, then in the entire nursery.
- g) Fertilization : Application of 5 g each of urea and triple super-phosphate per square meter in 7 days after complete germination.
- h) Duration of nursery : 20 - 30 days.
- i) Pest and disease control : Preventive measures established for paddy field should be taken.

### Paddy Field

- a) Plowing : Plowing by animal-driven and power plows.
- b) Puddling : To be conducted less frequently and not elaborately as compared with the prevailing practice.
- c) Transplanting :
  - 1. Planting density - 25 x 25 cm, 2 - 3 nurse-plant planting
  - 2. Planting density - Shallow planting, approx. 3 cm.
- d) Fertilization :
  - 1. Base fertilizer - 100 kg/ha each of urea and triple superphosphate.
  - 2. 1st additional fertilizer - Application of 70 kg/ha of urea on the 15th day after transplanting.
  - 3. 2nd additional fertilizer - Application of 30 kg/ha of urea on the 35th day after transplanting.

- e) Water management : Supply of water according to the growth condition, and drainage if necessary.
- f) Weeding : 1. 1st weeding - Intertillage and weeding immediately after application of the 1st additional fertilizer.  
2. 2nd weeding - Intertillage or spraying of 2,4-D in 15 to 20 days after the 1st weeding.
- g) Control of pests, diseases and rodent damage : 1. Pesticide - 30 kg/ha of granular Diazinon for control of stem borers.  
2. Fungicide - 20 kg/ha of Kitazin dust for control of leaf blast.  
3. Rodenticide - 0,4 kg/ha of zinc phosphide for rodent control.
- h) Harvesting, threshing and drying: Harvesting in 30 to 35 days after heading by the Ani-ani system for the present to be improved to the use of sickless. Paddy threshed by threshers to be dried for 3 to 7 days.

#### Target Yield

By the input of the aforementioned techniques, it is planned that a target yield of 5 t of unhusked dry paddy per ha will be attained in the initial year.

The weight decrease caused by drying, winnowing and polishing is estimated as shown below.

Wet Stalk	100%
Dry Stalk	77%
Dry Gabah	59%
Polished Rice	40%

#### Outline of Upland Crop Cultivation

##### 1. Maize

- a) Growing period : 105 days.
- b) Seeding rate : 25 kg/ha.
- c) Fertilizer dosage : 100 kg/ha of urea and 50 kg/ha of triple superphosphate.

## 2. Soybeans

- a) Growing period : 90 days.
- b) Seeding rate : 60 kg/ha.
- c) Fertilizer dosage : 30 kg/ha of urea and 50 kg/ha of triple superphosphate.

## 3. Green Grams

- a) Growing period : 70 days.
- b) Seeding rate : 40 kg/ha.
- c) Fertilizer dosage : 30 kg/ha or urea and 50 kg/ha of triple superphosphate.

### 4-2-3 Infrastructural Improvement

As described already, fundamental facilities such as headworks and main canal were constructed by the Water Resources Department of the Ministry of Public Works. However, construction of tertial canals downstream of diversion works, reclamation of paddy fields and their plot arrangement have not been carried out systematically for satisfactory water management and farm management because these works have been done one after another under Gotong Rojong system and priority was always given to easier works.

If water management and various farm works are to be conducted at the right time and by a certain fixed time for future introduction of double cropping or cultivation of two crops per year, it is desirable that infrastructural rearrangement be made in the area.

Adequate arrangement of irrigation and drainage canals should therefore be made for rational water distribution and drainage. Improvement and construction of farm roads is also an urgent need to ensure smooth transportation of capital goods, agricultural products and farm machinery and equipment.

Outline of the infrastructural improvement plan is as itemized below.

- a) Farmland rearrangement and consolidation will be prompted so that each field will cover an area of about 30 a (100 x 30 m).
- b) An irrigation canal will be excavated along one side of each field and a drainage canal along the other side, with an outlet provided for each field in principle.
- c) One side of each field will adjoin the farm road.
- d) Volume of earth work will be reduced to minimize the cost, and the use of the existing irrigation system will be taken into due consideration.
- e) Irrigation and drainage canals will be so arranged as will make it possible to reuse water flowing into the drainage canal.

- f) Main farm roads will have a width of about 4.5 m so that tractors coming from opposite directions can pass each other, and terminal farm roads will have a width of about 2 m to allow free passage of one tractor.
- g) At the junction of a canal and a road, a closed conduit or underdrain will be provided.

It is planned that a survey mission will be dispatched to this area at an early date to formulate a working plan and design of infrastructural improvement. The findings of this mission will be explained to local farmers, central government and provincial government so that the necessary improvement work will be put in practice with their full understanding. It is expected that a period of about 2 years (2 dry seasons) will be required to complete infrastructural rearrangement in the entire 118 ha area.

#### 4-2-4 Mechanization of Farming

##### 4-2-4-(a) Need for Introducing Farm Machinery and Equipment

Introduction of mechanized farming among ordinary Indonesian farmers is still very limited at present, with only few farmers noted to be employing 2 cattle-driven plows and hoes for plowing and puddling work and shoulder type power sprayers for spraying chemicals. Due to the solid soil nature, plowing and puddling work which is conducted manually in most cases is "the heaviest labour in all the farm work" as one of the farmers interviewed by the mission put it. What is most acutely needed to alleviate this heavy work load is the introduction of power tillers and hand tractors.

Introduction of highly efficient farm machinery and equipment is a must in areas where labour force falls short of demand or the period of plowing and puddling work is limited by the triple cropping system under which upland crops are grown between paddy cropping seasons.

##### 4-2-4-(b) Economic Advantages of Farm Machinery and Equipment

Plowing Work: The table below shows the cost per ha and coverage of plowing work conducted by human power, animal power, power tiller, hand tractor and 4 wheel tractor. (Ref. p. 92 of the First Survey Report for detailed data on plowing work conducted by human power, animal power and power tillers).

Table 1 - Cost per ha and Coverage of Plowing Work

	Human Power	2 Cattle Driven Plow	Power Tiller (5 - 7 PS)	Hand Tractor w/Rotary Hoes (7 - 9 PS)	4 Wheel Tractor w/Plows (40 PS)
Cost per ha (Rp)	18,980	3,371	9,500	7,100	17,040
Coverage (ha)	8	8	24	23	31.4

There is little possibility that the cost of 4 wheel tractor operation will be reduced to the level of animal driven plows. However, the cost of plowing work by power tillers and hand tractors can be reduced considerably if training is given in the

mechanical knowledges, operation and maintenance of the equipment so as to extend their durable years. It can therefore be economically justified that these equipment will be applied on the farmers' level in the near future.

Cost comparison between power tiller and hand tractor indicates that the latter is a little more advantageous. Preference is given to hand tractors since they can be used for transportation purposes in addition to puddling and plowing work.

Calculations disclosed that the cost per ha and coverage of plowing and puddling work conducted by a hand tractor (rotary type) are Rp 26,184 and 11.5 ha, respectively.

Spraying Work: Cost per ha and coverage of a shoulder type power sprayer, as revealed by trial calculation, are Rp 798 and 12 ha, respectively.

Harvesting and Winnowing Work: Paddy harvested by the prevailing "spike cutting method" cannot be processed by threshers. If pedal rotary threshers or power threshers are to be introduced for labour saving purpose, then the existing "spike cutting method" should give place to "stalk cutting method" and improvement should also be effected to the drying method. Threshing of spike paddy calls for higher threshing accuracy and will therefore be introduced in demo-farms after its technical feasibility is established at the Center. The coverage of a power thresher having an effective width of 45 cm is about 0.5 ha/day if the yield is 5 t/ha.

4-2-4-(c) Types and Quantities of Equipment

The L. demo-farm has an area of about 120 ha, while hand tractors and shoulder type power sprayer can cover an area of 11.5 ha and 12 ha respectively. Considering the possible faults and the time required to cover the distance between the shed and fields, the following equipment are planned to be introduced in the L. demo-farm.

Table 2 - Types and Quantities of Equipment

Equipment	Quantity
Hand tractor with attachments	15 units
Shoulder type power sprayer	15 "
Power thresher	15 "
Rice mill	1 set
Other equipment	1 lot

In the initial stage, larger quantities than indicated in the above table will be used because the introduced equipment will not exhibit full capacity due to the lack of skill in handling them.

A set of 4 wheel tractors, binders and other equipment will also be introduced for demonstration of an integrated mechanized farming system.

#### 4-2-5 Farm Household Economy

Farm household economy depends mostly on paddy cultivation in this area. Operational holding of average farmers comprises about 1.0 ha of paddy field, 0.5 ha of upland field, about 0.5 ha of alang-alang field, and about 0.2 ha of dry field within garden compound where coconuts, bananas, etc. are planted. Cash income of such average farmers, as disclosed by trial calculation, is as shown in Table 3 below.

When the cropping patterns shown in Fig. 3 are brought into practice by promotional measures such as application of fertilizers, plant protection, rationalization of water management and introduction of farm machinery and equipment, it can be expected that the farmer's income will be increased as shown in Table 4.

In preparing Table 4, calculations were worked out on the basis of data obtained through interviews. As for the unit price and marketing rate, farmers should be encouraged to keep a detailed balance sheet which will be transferred to the Center for analysis so that the management of respective farm households will be improved on the basis of such analysis. For this purpose, training will be given in the method of management diagnosis involving agricultural bookkeeping, and collection and analysis of data.

Table 3 - Cash Income of Average Farmers

Item	Unit	Dry Field within Garden Compound (Coconut)	Paddy Field			Upland Field				
			Wet Season Paddy	Dry Season Paddy	Maize	Cassava for Food	Upland Paddy	Maize	Cassava	
Planted Area	ha	0.2 (15 trees)	1.0	0.4	0.1	0.1	0.5	0.5	0.5	
Yield per Unit Area	t/ha	60 pcs/tree	2.0	1.5	0.5	5.0 (raw)	0.7	0.5	5.0 (dried)	
Yield	t	900 pcs	2.0	0.6	0.05	0.5	0.35	0.25	2.5	
Marketing Rate	%	100	70	70	60	50	70	60	100	
Sales Volume	t	900 pcs	1.4	0.42	0.03	0.25	0.245	0.15	2.5	
Sales Price	Rp/kg	Rp 10/pcs	20	20	10	3	20	10	8	
Cash Income	Rp	9,000	28,000	8,400	300	750	4,900	1,500	20,000	
Total	Rp	9,000	37,450			26,400				
	Rp		72,850							



Table 4 - Trial Calculation of Farm Household Economy

Item	Unit	Dry Field within Garden Compound (Coconuts)	Cropping Pattern I				Cropping Pattern II						
			Paddy (Wet)	Paddy (Dry)	Green Grams	Total	Paddy	Maize	Soybeans or Peanuts	Total			
Planted Area	ha	0.2 (15 trees)	2.0	2.0	2.0								
Yield per Unit Area	t/ha	60 pcs/tree	5.0	3.0	0.5								
Yield (A)	t	900 pcs	10.0	6.0	1.0								
Sales Volume (B)	t	900	9.5	5.7	1.0								
Marketing Rate (B/A) %	%	100	95	95	100								
Unit Sales Price (C)	Rp/kg	Rp 10/pce	20	20	60								
Cash Income (D = B x C)	Rp	9,000	190,000	114,000	60,000								298,000
Capital Input													
Fertilizers	Rp	-	19,800	19,800	5,560								5,560
Agro-chemicals	Rp	-	6,800	6,800	-								-
Farm Equipment	Rp	-	4,220	4,220	2,800								2,800
Total (E)	Rp	-	20,820	20,820	8,360								8,360
Gross Income (D - E)	Rp	9,000	169,180	93,180	51,640								75,640
													17,300
													256,120

Note: Values of capital goods were calculated as shown below.

1. Fertilizers

a. For paddy	Urea - 200 kg/ha x Rp 31/kg = Rp 6,200 Triple superphosphate - 100 kg/ha x Rp 37/kg = Rp 3,700	) Rp 9,900/ha
b. For maize	Urea - 100 kg/ha x Rp 31/kg = Rp 3,100 Triple superphosphate - 50 kg/ha x Rp 37/kg = Rp 1,850	) Rp 4,950/ha
c. For soybeans and green grams	Urea - 30 kg/ha x Rp 31/kg = Rp 930 Triple superphosphate - 50 kg/ha x Rp 37/kg = Rp 1,850	) Rp 2,780/ha

2. Agro-chemicals for paddy

Pesticide - 3 lit/ha x Rp 800/lit = Rp 2,400 Fungicide - 20 kg/ha x Rp 50/kg = Rp 1,000	) Rp 3,400/ha
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3. Farm equipment

Plowing cost per ha by tractor - Rp 1,400 Spraying cost per ha by duster - Rp 710	) Rp 2,110/ha
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4-2-6 Water Management and Its System

Irrigation can be classified into technical irrigation, semi-technical irrigation and Desa irrigation by how irrigation facilities are constructed and what system is adopted for their management and maintenance.

Technical irrigation is the large scale scheme covering several thousand ha of land. In this type of irrigation, Water Resources Department of the Ministry of Public Works undertakes the construction and maintenance of primary and secondary main canals and diversion works.

Semi-technical irrigation is intended for construction of tertiary canals branching off from these main facilities to distribute water to each field, and is carried out under the Gotong Rojong system.

Desa irrigation is conducted jointly by villagers in a Desa or similar communities with water drawn from rivers, torrents, etc.

A survey on water distribution in a paddy field area covered by technical and semi-technical irrigation systems disclosed that due to the poor diversion from tertiary canals, water is supplied only to about 65% of the design irrigation area and that the supply condition becomes extremely poor towards the downstream end of the design area.

One of the causes of this poor irrigation condition is that the construction of the tertiary canals was carried out under the Gotong Rojong system and therefore lacked systematic planning for satisfactory diversion. Another cause is the absence of an efficient water management and facilities control system. Establishment of such a system is therefore a pressing need in the area.

The 4 areas covered by technical irrigation in the project area are divided into 11 Irrigation Districts for water management without regard to administrative boundaries, and each Irrigation District is further divided into a number of sub-districts. In each of such sub-districts is assigned the water distribution manager (Mandur) who has, under his control, workers (Wakker) and assistants (Pekerdjo) appointed for operation of water gates and management and maintenance of facilities.

While the above system falls under the jurisdiction of the Ministry of Public Works, there is another system controlled by the Ministry of Home Affairs under which the provincial government and Ketjamatan offices provide technical guidance for construction of terminal facilities including tertiary canals. Under the latter system, farmers' organizations like Gotong Rojong are established and one water manager (Ili-ili) responsible for the management of irrigation water and facilities is selected for each tertiary canal. Farmers pay the management fee to this water manager in kind (stalk paddy) according to the acreage of benefited area.

In 1971, Irrigation Committee headed by the Governor of Central Lampung was established, but it is not known that this organization has made any appreciable activities.

As things stand now, therefore, the whole irrigation system in the area is split due to the existence of two different administrative controls. To be more precise, intake facilities, diversion facilities, main canals and turnouts are under the control of the Ministry of Public Works, whereas the management from the turnouts and tertiary canals to fields is left to the hand of water managers (Ili-ili). Remedy should be brought to this state so that an integrated water management system embracing the entire course from the water source to fields will be established.

Water management is closely related to farm management and also involves the problem of collecting the management and maintenance fees. Its inclusion in the activities of farmers' organization therefore deserves consideration and will be studied in the coming years with account taken of the many existing systems and organizations as well as the prevailing water management practices.

#### 4-2-7 Rearing of Farmers' Organizations

For smooth implementation of the present sub-project, a farmers' cooperative association embracing the project area will be established and all the farmers in the project area will be encouraged to join it. Activities of this association for some time to come will be as follows.

##### 4-2-7-(a) Distribution and Leasing of Capital Goods and Collection of Their Charges and Rentals

The system of distributing and leasing capital goods and collecting their charges is still under study by the Indonesian government. Fundamentally, however, the system will be as illustrated below and part of the cost will be charged to the farmers' cooperative association.

The capital goods will be provided by Japan as part of her aids, and will be transferred or leased by the Indonesian government to the farmers in the project area at reasonable price and rate to be determined by consultation with Japanese experts in due consideration of the market price, farmers' financial capability and Bimas Project.

Distribution of the capital goods will be undertaken, for the present, by the Extension Division of the provincial government, but endeavours will be made for early transfer of the distribution activity to the farmers' association.

At present, studies are being made on the application of the collected charges and rentals. It is advisable that further prudent studies be made on adequate appropriation for infrastructural improvement, construction of warehouses, offices of farmers' cooperative association and other facilities, fund for rural credit, etc. so that the collected charges and rentals will be applied for effective and smooth implementation of the project. It is planned that the charges and rentals will be collected in cash or kind.

Distribution and collection activities on the farmers' level will be undertaken by the farmers' organization. However, the system will be run by taking full advantage of the existing organizational functions of the government so as to ensure its smooth operation.

(Farm Machinery and Equipment)

Japanese government → Central government of Indonesia →  
provincial government → Farmers → Farmers' organization  
⇒ Rural banks ⇒ Fund

(Fertilizers)

Japanese government → Central government of Indonesia →  
Fertilizer Corporation → Farmers' organization → Farmers ⇒  
Farmers' organization ⇒ Rural banks ⇒ Fund

(Urea Fertilizer)

Central government of Indonesia → Fertilizer Corporation →  
Farmers' organization → Farmers ⇒ Farmers' organization ⇒  
Fertilizer Corporation

(Agro-chemicals)

Japanese government → Central government of Indonesia →  
Provincial government → Farmers' organization → Farmers ⇒  
Farmers' organization ⇒ Rural banks ⇒ Fund

— Flow of capital goods.

== Flow of collected charges and rentals.

4-2-7-(b) Joint Use of Farm Machinery and Equipment

As described earlier, the smallest unit of farmers' organization will be the group of farmers collectively utilizing tractors, plant protection equipment and threshers for mechanized farming. These farm machinery and equipment will be leased within such groups of farmers for collective farming. Needless to say, collective farming work should be carried out according to the prescribed standard in order to make best use of the leased machinery and equipment and strengthen the solidarity of member farmers. It is therefore desirable that farmers be encouraged to establish and observe uniform and standard farming practices covering planting

time, plant protection, fertilization control, harvesting time, varieties, water management, etc. To these groups of farmers, guidance will also be given in the repair, maintenance and custody so that farm machinery and equipment may be kept in perfect service condition and exhibit their performance fully within each production group of farmers.

#### 4-2-7-(c) Organization of Farmers by Introduction of Rice Mill

A set of rice mill is planned to be introduced in the L. demo-farm for collective processing of paddy produced in the farm area.

How the rice mill is to be actually made use of is a matter that should be determined by the Indonesian government and intentions of local farmers. To assure that the rice mill will serve for the best interests of farmers, however, guidance will be provided for producing uniform quality polished rice at low cost and increasing the marketing rate. At the same time, construction of warehouses will be encouraged so that rice will be marketed at the right time for increasing its commercial value and improving the distribution system as well.

To meet these purposes, it is desirable to rear a farmers' organization which will take charge of the management and operation of the rice mill.

#### 4-2-7-(d) Activities of Farmers' Organizations

Activities of farmers' organizations will be as itemized below.

- a) Collection of fund for joint purchase of capital goods (such as fertilizers, agro-chemicals, seeds and seedlings and daily necessities).
- b) Joint processing, shipment and storage of products.
- c) Management of farm machinery and equipment, supply of their spare parts, and collection of rentals.
- d) Management and maintenance of the rice mill.
- e) Raising of fund for rural credit.
- f) Water management, and control and maintenance of irrigation facilities.

#### 4-3 Small Scale Demo-Farms (S. Demo-Farms)

##### 4-3-1 Selection of Sites

It is planned that an average of 4 S. demo-farms will be established in each Ketjamatan and that cooperation activities in each farm will be offered continuously over a period of 2 years.

Accordingly, decision has already been made by the present survey on the locations of the farms in Ketjamatan Trimurdjo and Ketjaman Punggur which were selected for the initial year cooperation activities. As for other S. demo-farms, cooperation activities will be carried out according to the annual implementation plan shown in Fig. 1 and their locations will be determined by the Joint Committee

in due consideration of the opinions and intensions of the Japanese experts to be deputed at a later date, Directorate General of Agriculture of the Indonesian Ministry of Agriculture, Agricultural Extension Office of the provincial government of Lampung and respective Tjamats.

Desas in which S. demo-farms will be established in the initial year are as follows.

Ketj. Trimurdjo:

Desa Purwo Adi

Desa Tempuran

Desa Purwo Dadi

Desa Liman Benawi

Ketj. Punggur:

Desa Ngestirahayu

Desa Sumberredjo

Desa Astomuljo

In selecting these Desas, the same criteria as applied to L. demo-farm were adopted. In other words, the sites of S. demo-farms were sought in representative paddy field areas which not only serve as model districts but also are located close to clusters, face a road and allow for easy water management. Desas listed above include those in which a rice mill unit will be installed under the proposed "Rice Mill Project." In these specific Desas, guidance will be given for the management and operation of rice mill units and users of the rice mills will be organized so that they will develop into farmers' organizations.

As for the Desas in which S. demo-farms will be established in the second and subsequent years of the cooperation period, selection will be made by the experts sent from Japan after close consultation with the Indonesian government, provincial government of Lampung and local farmers.

#### 4-3-2 Activities in S. Demo-Farms

As in the case of L. demo-farm, S. demo-farms will demonstrate improved techniques and cultural standards developed and established at the Center as a result of trials and experiments so that such techniques and standards will be extended among neighbouring farmers. At the same time, they will also perform the function of a technical center.

Indonesian extension workers will be chiefly responsible for technical guidance offered in the S. demo-farms, and Japanese experts will also provide the guidance if need arises.

Farmers' group embraced in each S. demo-farm will be organized as the smallest unit of farm management organization to be developed into a larger farmers'

organization. Farmers in such smallest unit of group will be given guidance and encouragement to group activities such as joint use of farm machinery and equipment, integrated water management and collective farming. Further, they will be induced to keep the record of the management cost and sales price, which will be transferred to the Center and analyzed to produce the data with which to improve their farm management.

Table 5 shows the outline of S. demo-farms in Ketj. Trimurdjo and Ketj. Punggur. At present, double cropping of paddy is practised in these two Ketjamatans. Ketjamatan Trimurdjo is in the upstream area and located close to the diversion works and can therefore be irrigated even in the dry season. In Ketjamatan Punggur which embraces many undeveloped districts, paddy cultivation in the dry season is also made possible at present by the recent completion of the main canal. Therefore, guidance will be provided for double cropping of paddy in all the S. demo-farms to be established in the initial year. (See Fig. 9)

Table - 5

Ketjatan	Desa	Number of Farm	Acreage of Lowland field	S Demo-Farm	S Demo-Farm	
Trimurdjo	Purwo Adi	305	200 ha	5.3 ha	7	
	Tempuran	535	369	5.3	7	
	Purwo Dadi	482	280	3.4	5	
	Liman Benawi	484	280	4.2	12	
Punggur	Ngestirahayu	224	60	40	5	* about 100 ha • 420 ha • 530 ha
	Sumberredjo	267	41	40	5	
	Astomuljo	435	190	40	8	

\* Upland field transferred to Lowland field.

Fig. 9 Cropping Pattern

Ketjamatan	Desa	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nor	Dec
Trimurdjo	Tempuran				paddy						paddy		
	Purwo Adi				paddy						paddy		
	Purwo Dadi				paddy						paddy		
	Liman Benawi				paddy						paddy		
Punggur	Ngestirahaya				paddy						paddy		
	Sumberredjo		paddy						paddy				
	Astomuljo				paddy						paddy		

To enhance mechanized farming, all the S. demo-farms will be provided with 1 unit each of tractor, plant protection equipment and thresher which will be placed under the management and control of the farmers' production group.

As described already, paddy cultivation is the core of farm management in the selected Desas. Operational holding of average farmers consists of about 1.0 ha of paddy field and about 0.2 ha of upland field and dry field within garden compound. The cash income of average farmers, as disclosed by trial calculation, is as shown in Table 6. By the calculations worked out on the assumption that fertilization and other new techniques will be introduced for cultivation of green grams between two paddy cropping seasons (Cropping Pattern I), it is estimated that the annual production value per ha will be as shown in Table 7. Table 7 also shows the production value per ha calculated on the assumption that soybeans, maize, etc. will be introduced as dry season crops to cope with the possible case where dry season cropping of paddy becomes impossible due to water shortage (Cropping Pattern II).

Table 6 - Cash Income of Average Farmers

	Dry Field within Garden Compound (Coconuts)	Paddy	
		Wet Season Cropping	Dry Season Cropping
Planted Area (ha)	0.2 (15 trees)	1.0	0.6
Yield per ha (t)	60 pcs/tree	2.6	1.8
Yield	900 pcs	2.6	1.1
Marketing Rate (%)	100	73	73
Sales Volume (t)	900 pcs	1.9	0.8
Sales Price (Rp/kg)	10/pce	20	20
Cash Income (Rp)	9,000	38,000	16,000
<b>Total Cash Income</b>	<b>63,000 Rp</b>		

Note: Marketing rate is based on the assumptive domestic rice consumption shown below.  
 $120 \text{ kg (polished rice consumption per person)} \times 5.5 \text{ (Number of family members per household)} = 660 \text{ kg (} = 1.0 \text{ t in unhulled rice)}$



Table 7 - Annual Production Value per ha by Cropping Pattern

	Prevailing Cropping Pattern (Non-fertilizer farming -without application of agro- chemicals and mechanical power)		Cropping Pattern I				Cropping Pattern II		
	Wet Season Paddy	Dry Season Paddy	Wet Season Paddy	Dry Season Paddy	Green Beans	Wet Season Paddy	Dry Season Maize	Soybeans or Groundnuts	
Planted Area	1.0	0.6	1.0	1.0	1.0	1.0	1.0	1.0	
Yield (t)	2.6	1.8	5.0	3.0	0.5	5.0	1.5	0.7	
Unit Price (Rp/kg)	20	20	20	20	60	20	10	60	
Production Value (Rp)	52,000	38,000	100,000	60,000	30,000	100,000	15,000	42,000	
Annual Production Value (Rp) (A)	90,000		190,000				157,000		
Capital Input									
Fertilizers (Rp)	-	-	9,900	9,900	-	9,900	4,950	-	
Tractor (Rp)	-	-	1,400	1,400	-	1,400	1,400	-	
Sprayer Charge (Rp)	-	-	710	710	-	710	-	-	
Agro-chemicals (Rp)	-	-	3,400	3,400	-	3,400	-	-	
Total (Rp) (B)	-	-	30,820		-	21,760		-	
(A) - (B)	90,000		159,180				135,240		

Note: Optimum dosage of fertilizer application and other expense items should be clarified by future studies for indication of accurate capital input. In calculating the figures shown in this table, however, capital input per ha was assumed as follows on the basis of the values actually recorded under Biams Project now in progress.

1. Fertilizers

a. For paddy	Urea	-	200 kg x Rp 31/kg = Rp 6,200	)	Rp 9,900
	Triple super-phosphate	-	100 kg x Rp 37/kg = Rp 3,700	)	
b. For maize	Urea	-	100 kg x Rp 31 = Rp 3,100	)	Rp 4,950
	Triple super-phosphate	-	50 kg x Rp 37 = Rp 1,850	)	
c. For legumes	No fertilizers applied.				

2. Agro-chemicals for paddy

Pesticide	-	3 lit x Rp 800/lit = Rp 2,400	)	Rp 3,400
Fungicide	-	20 kg/ Rp 50/kg = Rp 1,000	)	

3. Cost of farm machinery operation

Plowing cost per ha by tractor	Rp 1,400
Duster charge per ha	Rp 710

#### 4-4 Future Course of Extension Activities

The Agricultural Extension Office of Lampung province shows a forward-looking attitude towards improvement of extension services but its promotional measures cannot be considered to be smoothly implemented. This is assignable, among others, to the debility of the present extension system and poor quality of extension workers. In the coming years, therefore, stress should be placed on the increase and proper distribution of extension workers, with efforts also made for providing adequate training to both extension workers and key farmers.

##### 4-4-1 Reinforcement of Extension System

###### (1) Reinforcement Scheme of Agricultural Extension Office

Noting the difficulty in attaining sufficient extension effect under the existing system, the Agricultural Extension Office of Lampung province has contrived a reinforcement scheme in which it is envisaged that the existing 2 extension centers will be increased to 15 and Tegineneng Seed Farm will be reorganized into a headquarters exercising controlling functions over all the 15 centers. For this purpose, 10 full-time workers are planned to be assigned to Tegineneng Center for training of farmers, particularly key farmers.

The 15 centers will be established at a rate of 1 per 4 Ketjamatans, with 4 extension workers stationed at each center. When this scheme is completed, the number of extension workers will have been increased by about 70, and this will serve for strengthening the system in a great measure. Since this increase is planned to be attained in 4 years, about 15 new extension workers should be available each year. Hence, it is planned that freshmen will be recruited from among the graduates of the agricultural school at Natar.

###### (2) Japan's Technical Cooperation and Reinforcement of Extension Activities

Special attention should be paid to the following in planning the reinforcement of extension activities as part of the Comprehensive Agricultural Development Project in Lampung.

###### a) Reinforcement of Tegineneng Center

Developing Tegineneng Center into an Agricultural Extension Center serving as the base for agricultural development in the province is one of the main objectives of the present project. At this Center, farming techniques will be developed for actual application by farmers and training of extension workers and key farmers will be conducted in a systematic manner. To assure that these activities will be carried out effectively and yield maximum results, it is essential to give due consideration to the existing state of extension service and the course of agricultural development charted by the provincial government.

###### b) Appointment of Extension Specialists

Reinforcement of the extension system and provision of effective extension service are a prerequisite to smooth implementation of the Comprehensive Agricultural Development Project. To satisfy this prerequisite, extension workers stationed in respective service areas should be based base their activities on a plan which will be formulated each year with stress placed on increased production

and synchronous and widespread technical improvement for gradual increase of farmers' income level. Preparation of this plan will be the task of extension specialists who, stationed at the Center, will also provide overall guidance in extension activities and offer advice to individual extension workers.

c) Establishment of Demo-Farms

As the bases of extension service for introducing improved paddy cultivation techniques and modern farm management, a Large Scale Demo-Farm and a number of Small Scale Demo-Farms will be established in the province.

Close coordination should be maintained between these demo-farms and the demonstration plots and farms which are now operated by the provincial government along the lines of its own development policy and programmes.

The number of demonstration plots operated by the provincial Extension Office is considered to suffice for demonstration of paddy cultivation techniques. Improved paddy cultivation techniques developed at the Center will therefore be introduced to these plots for demonstration.

Compared to these plots, the demonstration farms which are intended for rationalizing paddy-based farm management are not sufficient in number or capacity. Establishment of the L. demo-farm and S. demo-farms will serve not only to supplement the activities of the existing provincial demonstration farms but also to enhance the technical and managerial improvement of farmers. The L. demo-farm, in particular, is intended for phenomenal improvement of the traditional farming practices in both scale and water management. Its activities will not therefore be limited to the demonstration of mere cultivation and farm management techniques but will also include complete and lucid demonstration of the method of rearing and running farmers' organization in the process from production to distribution. The S. demo-farms, on the other hand, are intended chiefly for technical improvement required in the production process, and will demonstrate improved farming techniques while maintaining close coordination with the Rice Project to be implemented separately. Since the functions of the S. demo-farms will almost coincide with those of the provincial demonstration farms, coordination efforts will be required in planning their establishment. In the initial year, they will be established to supplement the activities of the existing demonstration farms of the Extension Office, and for additional S. demo-farms to be installed in 1973 and subsequent years, the Indonesian government will be assisted by Japanese experts in mapping out the establishment plan for functional coordination between the two types of demonstration farms.

4-4-2 Promotion of Project and Extension and Guidance Activities

Active extension and guidance activities are one of the imperatives for smooth implementation of the present project. In carrying out these activities, extension workers are required to bear in mind the following points.

- 1) All the farmers in the project area should be enlightened on the nature and purpose of the project. Needless to say, the project is not only aimed at demonstrating improved farming techniques but also intended for improvement of farm management and phenomenal upliftment of farmers' income level. Extension workers are required to organize

meetings and gatherings of farmers to give explanations to farmers and make them convinced that the project promises to elevate the land productivity through introduction of double cropping and other techniques and at the same offers the real hope for raising their income level by the input of scientific methods and resulting yield increase per unit area.

- 2) Efforts should be exerted for creating an incentive climate to induce farmers to willingly adopt and put faith in the new techniques to be introduced under the project.

To win farmers' confidence in the project, slides and other audiovisual aids should be utilized to the maximum extent so that they will have full understanding of the advantages of mechanized farming, fertilization, plant protection as well as the difference between such techniques and the traditional farming practices.

- 3) Extension workers should provide thoroughgoing guidance for farm management improvement. The farm management improvement plan, however, should incorporate the farmers' opinions and hopes so that farmers will not merely follow out the plan prepared by the extension worker but voluntarily endeavour after improved farming.
- 4) Accelerated efforts should be directed towards rearing farmers' organizations. Since farmers in the project area are mostly small holders, organization of farmers' production groups for expanding the scale of farming work is a dire and imperative necessity for increasing agricultural production. What matters most to the creation of such groups is to rear adequate leaders and cultivate the membership of participating farmers. Extension workers are therefore demanded to hold meetings and gatherings in their service area for cultivation of both leadership and membership.
- 5) Close tie should be maintained with key farmers. It is desirable that the extension workers directly provide guidance and advices to the farmers they are serving, but this is not feasible under the existing system. Since guidance for daily farming work and emergency information will be conveyed to farmers through key farmers, close contact should always be maintained with such key farmers.

Besides heeding the points listed above, extension workers are required to note that the fundamental key to successful extension service lies in the close personal contact with farmers. They should make at least one round-trip guidance a month for smoother extension activities.

Since any sizable increase of extension workers cannot be hoped for in the immediate future, each extension worker will be required to cover as wide an area as possible in order to provide farmers with close on-the-spot guidance and advice. For this reason, it is hoped that the extension workers serving in the project area will be provided with a motorcycle.

## V. UPLAND FARMING DEVELOPMENT SUB-PROJECT

### 5-1 Purpose of the Sub-project

The Upland Farming Development Sub-project, to be implemented in the upland field area of Central and South Lampung as part of the comprehensive agricultural development scheme in the province, aims at raising the marketing rate of ordinary upland crops such as maize, legumes, cassava, etc. and perennial crops as well as improving the distribution mechanism and increasing export volume of such crops in order to elevate the farmers' income level and living standard.

To brief the activities to be conducted under this sub-project, which will be described at length in the following pages, farmers in selected demo-farm areas are planned to be organized into groups and cooperation is planned to be extended in each demo-farm in technical guidance, distribution of seeds and seedlings of improved varieties and fertilizers, leasing of farm machinery and equipment, training of farmers, rearing of farmers' organizations, etc., with infrastructural improvement work including road construction effected if need arises.

### 5-2 Selection of Project Areas

In Lampung province, upland crop cultivation is carried out by Javanese and Balinese farmers growing ordinary upland crops for the most part. The farming practices followed by these farmers, who settled themselves in the province not very long ago (less than 20 years), are only a little better than shifting cultivation and intended chiefly for production of upland paddy for food by mixed cropping. The productivity is poor due to the lack of care of fields such as fertilization and plant protection.

If these farmers to be encouraged, through demonstration and extension services, to improved farming practices involving reclamation of alang-alang fields, introduction of improved varieties, application of fertilizers, winnowing and processing of harvested products, and joint operation of all these farming works, the project areas should be sought in the upland field areas facing arterial roads.

To meet this requirement, demo-farms for the initial year activities were determined to be established in Desas in Ketjamatan Gunung-Sugih and Kejtamatan Natar which are both located close to Tegineneng Center and constitute, at the same time, one of the representative upland crops producing areas in Central and South Lampung.

Prior to the selection of these Desas, Tjamats of the two Ketjamatans recommended a number of Desas which they considered suited for establishment of demo-farms. For final selection of the project areas, opinions and desires of the Lurah and farmers of each recommended Desa were taken into consideration and a survey was conducted to study the existing condition of farm households in all the proposed Desas and furthermore, explanations were given to all Lurahs and farmers on the nature and purpose of the project.

As a result, 2 Desas each in Ketjamatan Gunung Sugih and Ketajamtan Natar were selected for demo-farm establishment in view of the enthusiasm evinced by their inhabitants.

Table 8 below shows the existing state of the selected 4 Desas.

Table 8

	Number of Farm House-Holds	Popu-lation	Total Area	Resi-dential Area	Paddy Field Area	Upland Field Area	Perenial Crop Field Area	Waste Land
Rengar	658	2,443	1,094 ha	155 ha	100 ha	339 ha	107 ha	393 ha
Sidocarto	415	2,086	536	127	18	170	189	32
Hadujang	1,129	5,588	549+ $\alpha$	250	50	75	174	-
Bandjarnegeri	334	1,443	234+ $\alpha$	25	15	135	59	-

From the interviews held with the Lurahs of the 4 Desas, it is estimated that the project area in each Desa will be as follows.

	Rengar	Sidocarto	Hadujang	Bandjarnegeri
Project Area	300 ha	10.0	100	250

Selection of project areas to be established in 1973 and subsequent years will be made by the Joint Committee after due consultations and studies.

### 5-3 Contents of Activities

As part of the Upland Farming Development Sub-project, cooperation will be offered in such activities as guidance for farm management improvement, introduction of improved varieties, fertilized farming and mechanized farming, creation of farmers' organizations, improvement of distribution system, etc. These cooperation activities will be carried out in an integrated manner and cover those farmers in the selected Desas who participate in the sub-project. The demo-farms, which are the project areas, will be formed by the groups of these participating farmers.

#### 5-3-1 Coverage of Demo-Farms

In each selected Desa, a suitable Duku or Suku will be selected and the farmers in such Duku or Suku will be embraced in the demo-farm. However, whether the farmers in the selected Duku or Suku will join the demo-farm will be left to their own discretion. Accordingly, the demo-farm will be formed by only those farmers who support the project and voluntarily take part in its implementation.

It is expected that in the initial stage, there will be many farmers who shy away from partaking in the project. Since demo-farms will constitute not only the nucleus of this sub-project but also the smallest unit of farmers' organized activity, all the farmers in the Duku or Suku will be encouraged to join the project on the strength

of the achievements of demo-farms.

The Lurah of Desa will be appointed the leader of each demo-farm, and all the farming and marketing activities will be carried out in an integrated manner under his control.

#### 5-3-2 Details of Activities

##### 5-3-2-(a) Introduction of Improved Techniques

As stated in Section 5-2, upland crops are grown by mixed cropping at present without fertilization.

A fertilization test conducted at Tegineneng Center for single cropping of maize (Metro variety) recorded a yield of 4.5 t by the application of 100 kg of urea and 75 kg of triple superphosphate per ha. To make such a high yield a reality for all farmers, however, a detailed survey of soil texture and properties should be conducted in each district and in addition, breeding of improved varieties, three element test and fertilizer requirement test for winter crops, establishment of optimum dosages of fertilizer application for target production, etc. are required. While these experimental activities are to be undertaken at the Center, situation at present is such that accurate data on upland crop cultivation are completely lacking. Tests and experiments should therefore be conducted at the earliest possible date to find the local characteristics in each project area and at the Center.

For this purpose, it is planned that trial plots each having an area of about 0.3 ha will be established in demo-farms at a rate of 1 per 100 ha of demo-farm area. In these trial plots, various tests and experiments will be conducted for comparison of varieties, fertilization method, establishment of cropping pattern, etc.

Activities for introduction of improved techniques will be carried out in the fields belonging to the participating farmers which will be leased to the Agricultural Extension Office under a contract concluded between the two parties.

In each demo-farm, technical guidance will be provided on the basis of the cropping patterns which will be established with account taken of the following factors.

- a) Average farmers in the project areas own an operational holding of about 2 ha. In 1 ha of this holding, they grow upland paddy and maize by mixed cropping in the wet season and cultivate cassava for tapioca production in the dry season. While 1 ha is thus being cultivated, the other 1 ha is fallowed to restore soil fertility by alang-alang, so that rotation is conducted at intervals of 3 to 4 years. If all the 2 ha is to be plowed on the piecework basis for crop cultivation and increased income, then account must be taken of the need of preventing consecutive planting of upland paddy. In the case of small holders, it is believed that the existing mixed cropping pattern will be maintained for some time to come.
- b) The optimum cropping pattern is to be established at Tegineneng Center after trials and experiments. Insofar as dry season cropping is concerned, however, no better crops than cassava for tapioca production can be conceived of at present.

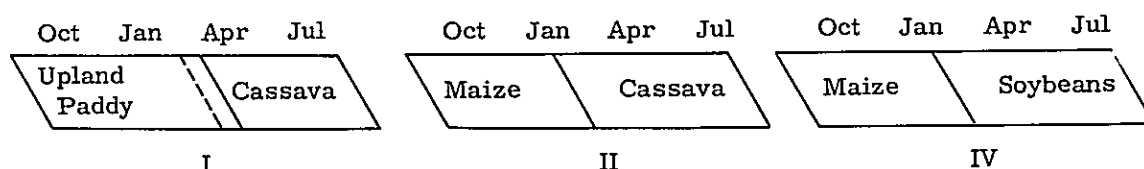


In the conceivable combinations of crops shown below, cultivation will start in October for harvesting of second crops in July - August period.

- I Upland Paddy --- Cassava
- II Maize --- Cassava
- III Maize --- Maize
- IV Maize --- Soybeans
- V Upland Paddy --- Maize

Since farmers naturally wish to secure the supply of paddy for domestic consumption, they will adopt a cropping pattern incorporating I or V of the above combinations. In this case, it is likely that farmers will give preference to I over V because the gross income attainable by the former combination is Rp 100, 100 as indicated by the analysis of farm household economy described later, and this is twice the gross income of Rp 50, 000 deriable from the latter combination.

The gross income attainable by combinations II, III and IV is Rp 100, 000 Rp 50, 100 and Rp 82, 270, respectively. A cropping pattern incorporating these three combinations is conceivable because continuous cropping of upland paddy invites heavy injury which calls for at least 3 to 4 year rotation. From this pattern, combination III will be excluded because it promises a small gross income of Rp 50, 100, but combination IV will be included because soybeans are considered to serve for the maintenance of soil fertility. Hence, the following cropping pattern which incorporates combinations I, II and IV for 3 year rotation can be considered commendable.



The above rotation cropping is desirable since soybeans, like upland paddy, cause heavy injury by continuous cropping.

However, since soybeans have never been grown in the project areas and the Center is not ready to supply seeds of improved soybean varieties, a cropping pattern incorporating combinations I - II - II will be introduced in the demo-farms. To put this pattern in practice, it would be advisable to divide the upland field of each participating farmer into three equal areas so that they will be cultivated by three year rotation cropping based on combinations I - II - II, II - II - I, and II - I - II, respectively.

It is to be added that due consideration should be given to the wet season pattern of "upland paddy -- maize" since it is the traditional cropping pattern practised in the project areas.

For the purpose of introducing the above-mentioned cropping pattern, the following activities will be carried out in the project areas.

(1) Distribution of Seeds of Improved Varieties

Seeds of improved varieties produced at the Center will be distributed to farmers.

In the initial year, maize seeds alone will be supplied. With the progress of the Center's activities, seeds of other crops such as soybeans and groundnuts will also be distributed in the second and subsequent years of the project period.

(2) Distribution of Fertilizers

(3) Technical Guidance

Integrated and overall guidance will be offered for extension of improved cultural standards and introduction of single cropping techniques as well as for efficient shipment and marketing. Results of trials and experiments conducted at the Center and trial plots will be subjected to a close and comprehensive judgement for selection of the techniques to be extended under the extension system.

Cultivation techniques to be applied to single cropping of winter crops should be established by the trials and experiments at the Center and trial plots. The cultivation standards to be observed pending the establishment of such techniques are shown below for respective crops.

° Maize

Plowing and ground making : Field to be plowed to a depth of 25 - 30 cm, levelled with a tooth harrow, and then furrowed.

Fertilizer application : 50 kg/ha of triple superphosphate to be applied as base fertilizer, with 25 kg/ha of urea applied in 10 - 25 days after seeding as first top dressing and then in 25 - 30 days after seeding as second top dressing.

Seeding : Metro (Mitsugoro variety) to be cultivated for the time being. Group seeding to be conducted in mid-October at a rate of 2 seeds per 1.0 m x 0.5 m and 25 kg/ha. Additional seeding to be conducted within 10 days after seeding.

Intertillage and weeding : First weeding to be conducted in 10 - 15 days after seeding, and second weeding and intertillage in 25 - 30 days after seeding (i. e., after second top dressing), which is to be ensued by molding.

Plant protection : If downy mildew develops, infected plants should be removed and buried between rows.

By so doing, the causal bacteria will die out and cause no further transmission because they are biologically active.

- Harvesting : Spikes are to be reaped manually while removing husk and carried to the corn sheller. Stems and leaves are to be plowed in the soil.
- Processing : Harvested spikes are to be dried to reduce water content to less than 20%, then shelled by corn sheller. Shelled maize grains are to be dried by thermal dryer for 4 - 5 hrs and then stored in the grain storage. By this method, a yield of 3 t per ha can be expected.
- ° Upland Paddy
- Plowing, ground making and fertilization : Same as maize.
- Seeding : Drill seeding at a rate of 40 kg per ha, with row interval set at 30 cm.
- Weeding : Weeds are most problematic when upland paddy is cultivated by fertilized farming. Weeding should be conducted at the early stage to attain a large yield.
- ° Soybeans and Groundnuts

After plowing and soil preparation, 30 kg/ha of urea and 50 kg/ha of triple superphosphate should be applied to rows as base fertilizers. 60 kg/ha of seeds are to be sown in group with the spacing in the row set at 20 cm and row width 60 cm. Intertillage and weeding should be conducted once or twice during the growing period. Hills are to be pulled out for harvesting and shelled after drying them for 2 - 3 days in the field. Shelled grains can be dried by the thermal maize grain dryer.

- ° Gassava

Ground making should be carried out after harvesting of maize is completed and remaining hills are all pulled out. Then, cassava cuttings measuring 20 - 30 cm in length should be planted at a planting density of 1 m x 1 m. If upland paddy is the preceding crop, then the cuttings should be planted at the same density between paddy plants towards the end of January, and fertilizers should be applied to the hills after harvesting upland paddy.

Dosage of fertilizer application is 100 kg/ha for urea and 50 kg/ha for triple superphosphate. In case maize is the preceding crop, fertilizers should be applied when the planted cuttings take root and begin to put forth buds (i. e. , 2 - 3 weeks after planting).

In the latter part of September, the hills should be either pulled out or scraped up with a hoe. Harvested cassava should then be cut into pieces by a slicer after removing the stem, dried in the shade, and shipped.

5-3-2-(b) Extension of Improved Farming Techniques

(1) Reinforcement of Extension and Guidance System

The extension and guidance system in Lampung province is in an extremely poor state and its rapid reinforcement and expansion cannot be hoped for owing to financial reasons and shortage of qualified personnel. Since no sizable increase can be expected in the number of extension workers who will be serving under the present sub-project, extension and guidance activities should be so planned as will be carried out in a most systematic and efficient manner. For this reason, the following measures should be enforced.

1) Reinforcement of Mobile Power

What contributes most to effective extension service is the close personal contact maintained between the extension workers and farmers they are serving. Extension workers are therefore demanded to give round-trip guidance as often as possible. At present, however, each extension worker is required to cover the whole area of a Ketjamatan, and this is making it difficult for him to meet even the minimum requirement of round-trip guidance service. To ameliorate this hopeless situation and increase the mobility of extension workers, provision of motorcycles is urgently needed at present.

2) Planning of Systematic Guidance Activities

No matter how close personal contact may be maintained by the extension worker with the farmers he is serving, effect of his guidance service will be largely weakened by the lack of adequate prior planning. To offer guidance according to the need and circumstantial changes of farmers, extension workers are required to keep a field-book to note down all the outstanding problems in their service area so that they may be fully aware, at all times, of the matters demanding their guidance and extension service.

3) Rearing of Key Farmers and Group Guidance

Although extension workers are required to provide farmers with direct extension and guidance services, it is often the case that they are unable to fulfill this basic requirement due to the large number of farmers they are demanded to cover. As an expedient to solve this problem, it is advisable to rear key farmers in each cluster and maintain close contact with them so that improved farming and management techniques will be extended through them. Effect of extension service will also be enhanced if group guidance is provided to farmers' production groups organized with the key farmers as the core. To make such group guidance fruitful, farmers' meetings and gatherings should be made best use of for distribution of pamphlets and materials and audio-visual education.

Under this sub-project, various activities are planned to be carried out in an integrated manner for improvement of upland crop farming techniques, with emphasis placed on the rearing of farmers' organizations. Establishment of demo-farms is intended to provide an arena for such activities.

## (2) Position of Demo-Farms in Extension and Guidance Activities

Demo-farms established under this sub-project are expected to play the role of increasing land productivity through introduction of improved techniques and raising farmers' income level through rationalization of cropping pattern. Hence, they will be the bases of extension and guidance activities and will also contribute to the improvement of upland farming in the entire Lampung province.

## (3) Cautions for Extension and Guidance Service

Extension workers will be required to play the leading part in the establishment and operation of demo-farms. In discharging their duties in respective demo-farms, they should give heed to the following.

### 1) Provision of Thoroughgoing Enlightening Guidance

All the participating farmers should be given thoroughgoing explanations on the purpose and nature of the project so that they will exhibit voluntary aspiration after development.

### 2) Provision of Prior Technical Guidance

For smooth introduction of improved farming techniques and mechanized farming, extension workers should give prior guidance to the participating farmers by means of pamphlets and audio-visual aids so that all of them will join the project with faith in the advantages and safety of new techniques.

### 3) Preparation of Farm Management Plan

The farm management plan should be so prepared as will reflect the opinions and hopes of participating farmers to assure that technical improvement will be prompted by the farmers' own will.

### 4) Organizing of Farmers

It is no exaggeration to say that the success of demo-farm activities hinges on how well the participating farmers are organized. Extension workers should bear this in mind and provide augmented guidance for ideal division of works between farmers.

## 5-3-2-(c) Training of Farmers

Training courses organized by a systematic planning will be offered to farmers each year at the Agricultural Extension Center (Refer to Chapter III for details).

## 5-3-2-(d) Rearing of Farmers' Organizations

Establishment of an adequate extension and guidance system is an indispensable prerequisite of modernized farming based on the application of improved techniques, and the objective of extension and guidance service lies not in the rearing of few advanced farmers but in the overall technical improvement of all the farmers involved. Creation of farmers' groups of suitable size has controlling importance for smooth implementation of the sub-project since it aims at raising the income level of individual farmers.

(1) Rearing of Farmers' Production Groups

Farmers' production groups each embracing about 10 farm households and covering about 10 ha of upland field will be created. In each of the groups thus organized, guidance will be offered for collective production activities based on the unified farming standards in order to improve the productivity and technical level of member farmers.

(2) Enhancement of Collective Processing and Storage

Organizations each covering about 100 ha of land and composed of a number of farmers' production groups mentioned above will be formed to strengthen the solidarity of farmers and improve the quality of products through joint use of dryers, warehouses and other facilities.

(3) Creation of Joint Collecting and Shipment Organizations

Organizations for rational joint collecting and shipment activities will be created by combining a number of collective processing and storage organizations mentioned in Item (2) above for reduction of distribution cost and systematic and stabilized marketing of products.

It is considered appropriate that each of such joint collecting and shipment organizations will cover a Desa and be run under the control of Lurah.

5-3-2-(e) Measures for Rearing and Expanding Farmers' Organizations

Farmers' organizations can be neither reared nor expanded unless their growth is backed up by enough fund.

The following measures may be recommended as possible means of securing the necessary fund.

- 1) Advancement of DIP reserve fund created by the sales of machinery and equipment donated by Japan.
- 2) Provision of long-term low-interest loans from Bank Rakjat Indonesia or other banking institutions under the government del credere (i. e. , advancement of government fund to farmers' organizations through such banks on a long-term low-interest rate).
- 3) Receipt of advance money from expoerts (or, provision of fund by banking institutions against red clause L/Cs received from importers in case export business is undertaken by farmers' organization).

It is to be noted that rearing and strengthening of farmers' organizations is a pressing need of today in the province regardless of whichever means may be adopted.

The Special Fund should be utilized to the maximum extent particularly for infrastrural improvement in the project areas including construction of roads, reclamation of unexploited land, and installation of warehouses provided with drying yard, etc.

### 5-3-2-(f) Survey and Improvement of Farm Household Economy

A survey on farm household economy will be conducted to evaluate the benefit of the project on the basis of analysis of collected data.

#### (1) Survey on Farm Household Economy

A survey of farm household economy will be conducted on a suitable number of samples drawn from all farm households in each demo-farm to clarify (a) income and disbursement of farm management, (b) farmers' family budget, and (c) changes in both. (Studies will also have to be made on the number of farm households, form of survey schedule, method of entering and collecting the schedule, sampling method, design of survey, etc.)

##### 1) Survey on the Cost and Agricultural Products and Capital Goods as well as Labour Cost

For the purpose of obtaining basic data of farm management, a survey will be conducted on the cost of major agricultural products and capital goods at different stages (ex-farmyard, market and port) as well as on the agricultural labour cost.

##### 2) Survey on the Distribution of Agricultural Products and Capital Goods

This survey will be conducted concurrently with the cost survey mentioned in Item 1) above to bring light to the distribution channels of major agricultural products and capital goods (such as fertilizers and farm machinery and equipment) as well as the transaction volume by channel.

##### 3) Survey on Socio-economic Structure of Project Areas

The socio-economic structure of the project areas, particularly the land tenure and class formation (i. e. , relationship between the ruling and the ruled), is not made clear yet. For smooth implementation of the project, a survey should be conducted on this subject concurrently with the progress of the project.

#### (2) Improvement of Upland Farm Management

Two measures are conceivable for improving farm management of farmers growing ordinary upland crops. One is the introduction of farm machinery and equipment for expanding the planted area, and the other is the introduction of improved farming techniques including fertilization for increasing the yield rate and income. The mixed cropping system presently adopted by farmers has its own merits considering the shortage of labour and limited farmland area. If the yield per unit area is to be increased by the introduction of fertilized farming, however, continuous mixed cropping currently practised will become an impossibility because it will invite injury due to continuous cropping of upland paddy, decline of fertilization effect and problem of weeding.

The following table shows the production value per ha attainable by the prevailing non-fertilized mixed cropping system and by the new single cropping system.

Table 9 Production Value by Cropping Pattern

	Prevailing Mixed Cropping (Maize, Cassava and Upland Paddy)		I Upland Paddy - Cassava		II Maize - Cassava		III Maize - Maize		IV Maize - Soybeans		V Upland Paddy - Cassava	
	Yield	Value	Yield	Value	Yield	Value	Yield	Value	Yield	Value	Yield	Value
Maize (wet season)	t 0.3	RP 3,000	t 3.0	RP 30,000	t 3.0	RP 30,000	t 3.0	RP 30,000	t 3.0	RP 30,000	t 3.0	RP 30,000
Maize (dry season)							3.0	30,000			3.0	30,000
Cassava	5.0	40,000	10.0	80,000	10.0	80,000						
Upland paddy	0.7	14,000	1.5	30,000							1.5	30,000
Soybeans									2.0	60,000		
Total Production (A)		57,000		110,000		110,000		60,000		90,000		60,000
Fertilizer Cost (B)				9,900		9,900		9,900		7,730		9,900
(A) - (B)		57,000		100,100		100,100		50,100		82,270		50,100

Note: Breakdown of fertilizer cost is as shown below.

1. Urea 100 kg x Rp 31/kg = Rp 3,100  
(For soybeans) 30 kg x Rp 31/kg = Rp 930
2. Triple superphosphate  
50 kg x Rp 37/kg = Rp 1,850  
Rp 4,950 x 2 = Rp 9,900  
(Soybeans) 2,780 = Rp 7,730



### 5-3-2-(g) Supply of Agricultural Machinery and Materials

Agricultural machinery and materials will be supplied from the Agricultural Extension Office to the farmers' organizations through the Center under the supervision of the Office and Japanese experts.

Fertilizers are planned to be supplied against collection of price. However, since the majority of farmers have no experience in fertilized farming and consequently lack the knowledge of fertilization effect, it is planned that fertilizers will be offered not on the commercial base but on a discount rate which will be reduced each year for supply on the commercial base in the fourth year.

In supplying farm machinery and equipment, emphasis will be placed on arousing farmers' interest in mechanized farming. Even if collection of depreciation expense and running cost from farmers is not feasible at the outset, therefore, introduction of farm machinery and equipment will be prompted with the ultimate purpose of supplying on the commercial basis in the final year of the project period. Further, organizations for introducing farm machinery from P. N. Pusri, etc. will also be established.

Machinery and materials to be supplied will be as follows.

- 1) Fertilizers
- 2) Machinery and equipment

Supply of the following machinery and equipment is planned for the present for mechanized upland farming in the project areas which is to be established according to the results of trials and experiments at Tegeneng Center.

- a) Machinery for reclaiming alang-alang fields

Large type tractors will be supplied for plowing on the piecework basis in the approximately 1 ha alang-alang field which each farm household owns for crop rotation.

- b) Machinery for plowing fields on the piecework basis

Medium type tractors will be supplied for plowing the 1 ha operational holding of each farm household on the piecework basis.

- c) Processing machinery and equipment

Shellers and dryers intended chiefly for maize processing will be supplied so as to enhance the growth of farmers' organizations.

- d) Transport equipment

Attachments of medium type tractor and rear care will be supplied for transportation of harvested crops.

### 5-3-2-(h) Quality and Distribution Improvement

The poor quality of maize is assignable to the absence of drying facilities or equipment at the stage of breakers in Desas and local cities. The best plausible way to improve the maize quality is to construct in each project area at least one warehouse equipped with drying yards and create a farmers' organization which will take charge of the operation of the warehouse as well as dryers, corn shellers, blowers, moisture meter, etc. to be installed there. This will serve for the establishment of a system for joint storage, collection and shipment by the farmers' organization.

To prevent admixture of foreign objects, discoloured grains and broken grains, it is desirable that the government establish a suitable export inspection system. Fumigation and other process are advisable to prevent the quality decline due to insect damage. Fumigation in the producing area, however, should be avoided at the initial stage because it requires skill and involves danger. It may be added that insect damage can be averted to some extent by maintaining the water content at 14 to 15%.

At the outset of the project implementation, materials like seeds and fertilizers will have to be supplied through the existing administrative channel (Propinsi → Kabupaten → Kecamatan → Lurah → Farmers). This channel should be expanded with the growth of farmers' organizations and should give place to the joint purchase system of farmers upon completion of the project.

At present, export maize from Indonesia is carried by regular liners. To cut down the ocean freight currently included in the export price, maize will have to be carried by fully-loaded trampers and loaded in bulk in future (freight of maize shipped from Mitsugoro Farm is reported to have been cut down by US\$9.00 per ton by using 4,000 t class trampers). Cost of jute bags can be saved by loading in bulk. If bulk loading facilities are not available at the shipping port, maize will have to be loaded in bags and stowed in bulk on the carrier, so that the shipping cost will become so much the higher.

For rationalizing the shipment of maize, loading silos should be constructed at the shipping port. This, however, should be planned carefully with account taken of the overall growth of export crops including maize. Construction of silos promises not just the reduction of shipping cost alone but also the cut-down of export price by the rationalization of transport system to the port as well. In other words, it presupposes construction of necessary facilities in producing areas for truck transportation of bulk grains to the loading silos at the port, which in turn calls for the availability of large trucks and improvement of road condition.

Decrease in truck transportation cost depends on the reduction of transport hours from the producing areas to the pier and expansion of loading capacity of trucks. It is expected that the transport hours will be reduced rapidly by the construction of new roads and repair of existing roads (the road running from the eastern part of Central Lampung where Mitsugoro Farm is located to Pandjang port has an extension of 125 km, and this will be reduced to 59 km by the construction of a new road connecting the two places by the shortest route. By the scheduled completion of this road in 1973, the transportation cost between the two places is expected to be cut down to less than one third of the current cost).

Repair of existing roads is to be considered under two categories, i. e., arterial roads and non-arterial roads.

Condition of arterial roads is getting better year after year by the repair work conducted by the Ministry of Public Works. However, the maximum carrying capacity of trucks on arterial roads is limited to 5 t between Pandjang and Telukbetung, 3.5 t between Telukbetung and Metro and between Telukbetung and Kotabumi, and less than 3.5 t in all the other sections, though larger capacity is allowed if special approval is obtained from the governor of province and the Ministry of Public Works. It is hoped that improvement of road condition will be accelerated for early removal of the limits now set on the carrying capacity.

As for non-arterial roads in the province which are mostly unpaved, no particular problems are presented for traffic in the dry season, but the passage is made extremely difficult in the wet season when maize is harvested, incurring a heavy transportation cost. Since the transportation difficulty is conducive to deterioration of quality, it is absolutely necessary that roads in Desas be improved as soon as possible, and input of the project's reserve fund or Japan's financial aid should be considered for this purpose. Further, supply of construction machinery under the technical cooperation agreement and provision of fund from DIP should be planned at an early date.

#### 5-3-2-(i) Special Infrastructural Improvement Work

The operational holding of upland crop growing farmers ranges from 0.5 to 2.0 ha on the average. If the farmers' income level is to be increased, the present level of operational holding should be raised by reclamation of alang-alang fields besides introducing fertilized farming. The alang-alang fields in Lampung, which cover 350,000 ha or 12% of the total area of the province, can be turned into farmland by means of 90 PS class tractors. Since tractors of this class can also be used for extracting roots, field arrangement, soil preparation, etc., it is planned that one set with attachments will be supplied to the Center.

Operation cost of this tractor is approximately Rp 19,800 (plowing) and Rp 19,680 (disc harrow), and 126 ha of land can be covered annually (operating hours: 1,000 hrs).

## VI. IMPLEMENTATION PLAN AND MACHINERY AND EQUIPMENT

(1) Annual fund requirement is as shown in Table 10 (Implementation Plan of Comprehensive Agricultural Development in Lampung).

Since the fund allocation shown in this table is subject to the restraints of budgetary arrangements by the Indonesian and Japanese governments, let alone the change in commodity price, whether the project will be implemented exactly as it is planned is a matter to which no confirmation can be lent at the moment.

Maximum efforts should be exerted, however, for securing budgetary appropriations necessary for implementing the project as scheduled.

(2) Major equipment and materials required for the project implementation are shown in the following tables.

It is to be noted that these tables indicate the total quantities of equipment and materials which will be provided not altogether in 1 or 2 year period but consecutively over the 5 year period of the project. Further, changes will be effected to quantity or kind at the Joint Committee if considered necessary after experts are sent from Japan and the project is started.

Table 10. Implementation Plan of Comprehensive Agricultural Development of Lampung

Unit FC - 1,000 yen  
DC - 1,000 rupiah

	Total		1972		1973		1974		1975		1976		1977	
	FC	DC	FC	DC	FC	DC	FC	DC	FC	DC	FC	DC	FC	DC
<i>1 Personnel Cost</i>														
<i>Japanese experts</i>	384,000		8 28,000		15 48,000		15 75,000		15 90,000		15 84,000		15 39,000	
<i>Counterpart officials     and technicians</i>		21,600		2,160		4,320		4,320		4,320		4,320		2,160
<i>Operators, etc.</i>		28,350		2,220		5,790		5,790		5,790		5,790		2,970
<i>2. Cost of Equipment and Materials</i>	1,002,000	135,270	90,000	12,150	140,000	18,900	265,000	35,725	215,000	29,025	195,000	24,325	97,000	13,095
<i>3 Cost of Facilities</i>														
<i>Buildings</i>		102,000		16,000		93,000		18,000		11,000		13,000		1,000
<i>Construction works</i>		8,280		-		4,500		1,800		660		660		660
<i>4 Management and Operation Cost</i>		50,280		830		9,850		11,000		11,300		11,600		5,700
<b>Total</b>	<b>1,356,000</b>	<b>345,780</b>	<b>118,000</b>	<b>33,310</b>	<b>248,000</b>	<b>34,260</b>	<b>340,000</b>	<b>76,685</b>	<b>305,000</b>	<b>62,095</b>	<b>279,000</b>	<b>61,695</b>	<b>136,000</b>	<b>25,585</b>

Facilities, Equipment and Materials for Project Implementation

	Unit: 1,000 yen
1. Agricultural Extension Center Sub-project	177,000
(1) Facilities	36,000
(2) Construction Machinery	41,000
(3) Farm Machinery and Equipment	47,000
(4) Materials for Agricultural Production	10,000
(5) Testing Equipment and Apparatus	10,000
(6) Vehicles	28,000
(7) Audio-visual Aids and Equipment for Common Use	5,000
2. Lowland Farming Development Sub-project	342,000
(1) Construction Machinery	99,000
(2) Construction Materials	34,000
(3) Farm Machinery and Equipment	82,000
(4) Materials for Agricultural Production	80,000
(5) Equipment for Demo-Farms	47,000
3. Upland Farming Development Sub-project	353,000
(1) Farm Machinery and Equipment	226,000
(2) Materials for Agricultural Production	127,000
 Total	 872,000
Ocean Freight, Marine Insurance, etc. (15% of cost)	130,000
Total Cost	1,002,000

1. Agricultural Extension Center Sub-project

-- (1) Facilities

Unit: 1,000 Yen

Item	Specification	Quantity	Unit Cost	Amount
Warehouse	Prefabricated, 30m x 10m	1	3,000	3,000
Screened House	12m x 6m	2	3,500	7,000
Inoculation and Insect Raising Room	12m x 6m	1	3,500	3,500
Generator	20 - 30 KVA	3	4,000	12,000
Pump	2.7m <sup>3</sup> /min x 2	2	1,500	3,000
Water Purifying Plant	50,000m <sup>3</sup> /day	1	5,000	5,000
Others				2,500
Total				36,000

(2) Construction Machinery

Unit: 1,000 Yen

Item	Specification	Quantity	Unit Cost	Amount
Bulldozer	90HP	2	9,000	18,000
Dozer Shovel with Back Hoe	35HP, 035m <sup>3</sup>	1	7,000	7,000
Belt Conveyor	10m	5	250	1,250
Dump Truck	4 t	3	1,500	4,500
Concrete Mixer	0.09m <sup>3</sup>	1	200	200
Concrete Vibrator		2	150	300
Others				5,650
Spare Parts				4,600
Total				41,000

(3) Farm Machinery and Equipment

Unit: 1,000 Yen

Item	Specification	Quantity	Unit Cost	Amount
4 Wheel Tractor	80 HP	3	3,000	9,000
Tiller		10	300	3,000
Power Sprayer		10	30	300
Thresher	1,000 Kg/hr	10	200	2,000
Rice Mill Unit	0.5 t/hr	2	1,800	3,600
Corn Sheller		5	500	2,500
Corn Picker		5	800	4,000
Grain Dryer	1,500 Kg/hr	10	300	3,000
Binder		1		700
Feed Chopper		15	50	750
Self-feeding Combine		2	800	1,600
Sprinkler		1	400	400
Forklift	5 t	2	3,000	3,000
Others				4,000
Spare Parts				6,150
Total				47,000

## (4) Materials for Agricultural Production

Unit: 1,000 Yen

Item	Specification	Quantity	Unit Cost	Amount
<b>Fertilizers</b>				
Urea		40t	24	960
T. S. P.		20	34	680
Compound				660
Others				700
<b>Agro-chemicals</b>				
Pesticide		5	200	1,000
Fungicide		5	70	210
Herbicide		1	900	900
Rodenticide		2	170	340
Others				4,550
<b>Total</b>				<b>10,000</b>

## (5) Testing Equipment and Apparatus

Unit: 1,000 Yen

Item	Specification	Quantity	Unit Cost	Amount
Self-recording Weather Station		1		2,500
Light-trap		5	200	1,000
Low Temperature Seed Storage		1	3,000	3,000
Self-indicating Weighing Machine		5	100	500
Refrigerator		3	200	600
Distilling Condenser		2	150	300
Microscope		5	100	500
Thermostatic Electric Dryer		2	100	200
Others				1,400
<b>Total</b>				<b>10,000</b>



## (6) Vehicles

Unit: 1,000 Yen

Item	Specification	Quantity	Unit Cost	Amount
Jeep		10	900	9,000
Station Wagon	(Crown)	2	1,000	2,000
Truck	2 t	6	1,200	7,200
"	4 t	2	1,200	2,400
Micro-bus		1	2,000	2,000
Motorcycle		20	100	2,000
Spare Parts				3,400
Total				28,000

## (7) Audio-visual Aids and Equipment for Common Use

Unit: 1,000 Yen

Item	Specification	Quantity	Unit Cost	Amount
16 mm Projector		2	400	800
8 mm Camera		2	200	400
8 mm Projector		2	200	400
Slide Projector		2	50	100
Slide Film		2 sets	50	100
Tape Recorder		2	60	120
Camera		2	50	100
Generator		2	250	500
Screen	16 m/m	2	50	100
"	Slide	2	20	40
Electronic Computer		1	300	300
"		3	150	450
Copying Machine		2	200	400
Others				1,190
Total				5,000

2. Lowland Farming Development Sub-project

(1) Construction Machinery

Unit: 1,000 Yen

Item	Specification	Quantity	Unit Cost	Amount
Bulldozer	90 HP	2	9,000	18,000
Bulldozer	90 HP with wide shoe	1	10,000	10,000
Dozer Shovel	35 HP, 0.35m <sup>3</sup> with back hoe	1	8,800	8,800
Dump Truck	6 t	1	2,000	2,000
Dump Truck	4 t	4	1,500	6,000
Aggregate Production Plant		1	7,000	7,000
Motor Greader		1	4,500	4,500
Drainage Pump	0.5 m <sup>3</sup> /min	4	250	1,000
Truck	6 t	2	1,800	3,600
Sation Wagon	4 Wheel Drive	4	1,200	4,800
Concrete Plant		1	5,000	5,000
Belt Conveyer	10 m	10	250	2,500
Compact Roller	4.0 - 4.5 t	1	3,300	3,300
Tractor	2.6 t - 3.0 t	1	5,000	5,000
Other Machines				3,500
Spare Parts	10 %			9,500
Total				99,000

(2) Construction Materials

Unit: 1,000 Yen

Item	Specification	Quantity	Unit Cost	Amount
Corrugate Pipe	φ 500 m/m	100	20	2,000
Corrugate Pipe	φ 750 m/m	100	25	2,500
Sheet Pile	256m/m x 36m/m x 5m x 5m	100	20	2,000
Prefabricated Bridge		3	800	2,400
Metal Farm		2	1,000	2,000
Other Meterial				15,600
Check Plate		20	500	10,000
Total				34,000

## (3) Farm Machinery and Equipment

Unit: 1,000 Yen

Item	Specification	Quantity	Unit Cost	Amount
Hand Tractor	10 HP with Attachment	80	300	24,000
Tractor (4 wheel)	25 HP with Attachment	5	1,500	7,500
Tractor (4 wheel)	35 HP with Attachment	3	2,300	6,900
Power Sprayer	36 l/min	5	400	2,000
Mist-Dustor	3 HP	80	30	2,400
Auto-Sprayer	10 l	80	10	800
Power Thresher	1,000 kg/hr	40	200	8,000
Rice Mill Unit	0.5 t/hr	1	1,800	1,800
Grain Dryer	1,500 kg	1	300	300
Combine Harvester	20 a/hr	1	800	800
Binder	100 min/10 ares	1	300	300
Other Machinery				20,000
Spare Parts	10%			7,200
Total				82,000

## (4) Materials for Agricultural Production

Unit: 1,000 Yen

Item	Specification	Quantity	Unit Cost	Amount
Fertilizer				
Urea		480 t	24	11,520
T. S. P.		240	34	8,160
Compound				10,000
Agro-Chemicals				
Pesticide		100 t	200	20,000
Fungicide		40	70	2,800
Rodenticide		1.0	900	900
Herbicide		100	170	17,000
Others				9,620
Total				80,000

(5) Equipment for Demo-Farm

Unit: 1,000 Yen

Item	Specification	Quantity	Unit Cost	Amount
Agro-Testing Instrument				8,000
Soil Research Instrument				5,000
Station Wagon	-	3	1,200	3,600
Micro Bus	-	1	2,000	2,000
Auto-Cycle	90 cc	50	100	5,000
Water Measurement Instrument				3,000
Material				10,000
Irrigation Pump	10 m <sup>3</sup> /min	5	400	2,000
Drainage Pump	10 m <sup>3</sup> /min	10	400	4,000
Spare Parts	10%			4,400
Total				47,000

### 3. Upland Farming Development Sub-project

#### (1) Farm Machinery and Equipment

Unit: 1,000 Yen

Item	Specification	Quantity	Unit Cost	Amount
4 Wheel Tractor	35 HP	40	2,300	92,000
Tiller	10 HP	80	300	24,000
Shoulder Type Power Sprayer		120	30	3,600
Corn Sheller		40	500	20,000
Belt Conveyor		40	200	8,000
Grain Dryer	1,500 kg/hr	120	300	36,000
Platform Weighing Machine	200 kg	80	40	3,200
Moisture Meter		160	10	1,600
Winnower	1,000 kg/hr	80	90	7,200
Others				10,000
Spare Parts				20,200
<b>Total</b>				<b>226,000</b>

#### (2) Materials for Agricultural Production

Unit: 1,000 Yen

Item	Specification	Quantity	Unit Cost	Amount
<b>Fertilizers</b>				
Urea		2,500 t	24	60,000
T. S. P.		1,250 t	34	42,500
Compound				14,500
<b>Agro-chemicals</b>				
Pesticide		30 t	200	6,000
Fungicide		10 t	70	700
Herbicide		1 t	900	900
Rodenticide		2 t	170	340
Others				2,060
<b>Total</b>				<b>127,000</b>

