BASIC DESIGN STUDY REPORT
ON
THE RICE PEST AND DISEASE FORECASTING AND CONTROL PROJECT
IN
THE REPUBLIC OF INDONESIA

JANUARY 1986

JAPAN INTERNATIONAL COOPERATION AGENCY

BASIC DESIGN STUDY REPORT
ON
THE RICE PEST AND DISEASE FORECASTING AND CONTROL PROJECT
IN
THE REPUBLIC OF INDONESIA

JANUARY 1986

JAPAN INTERNATIONAL COOPERATION AGENCY

PREFACE

In response to the request of the Government of the Republic of Indonesia, the Government of Japan decided to conduct a basic design study on the Rice Pest and Disease Forecasting and Control Project and entrusted the study to the Japan International Cooperation Agency (JICA). JICA sent to Indonesia a study team headed by Mr. Kanji TAMAGAWA, Deputy Director, Plant Protection Division, Ministry of Agriculture Forestry and Fisheries, from August 6 to September 12, 1986.

The team had discussions with the officials concerned of the Government of Indonesia and conducted a field survey in Java and Bali areas in Indonesia. After the team returned to Japan, further studies were made and the present report has been prepared.

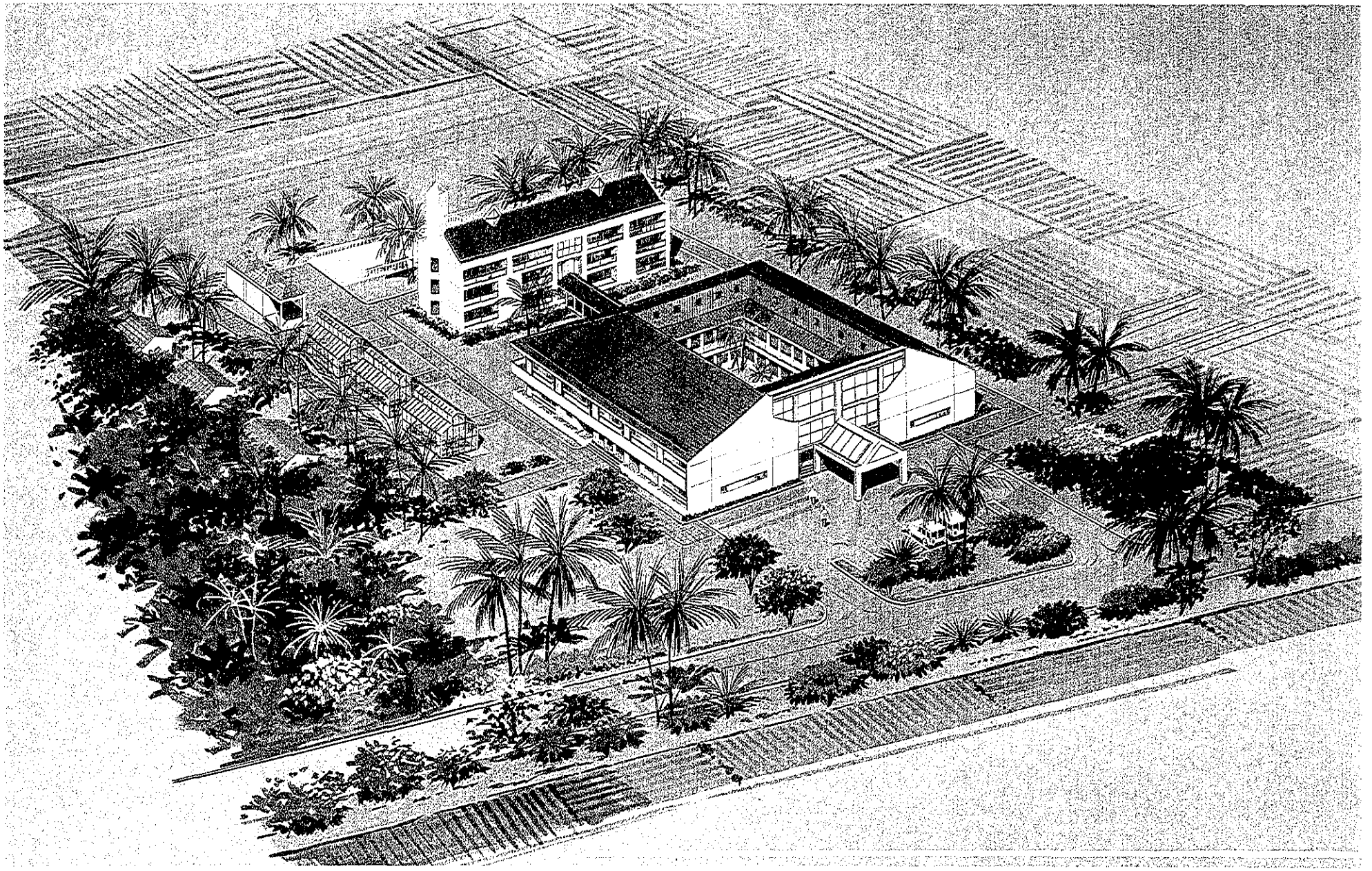
I hope that this report will serve for the development of the project and contribute to the promotion of friendly relations between our two countries.

I wish to express my deep appreciation to the officials concerned of the Government of the Republic of Indonesia for their close cooperation extended to the team.

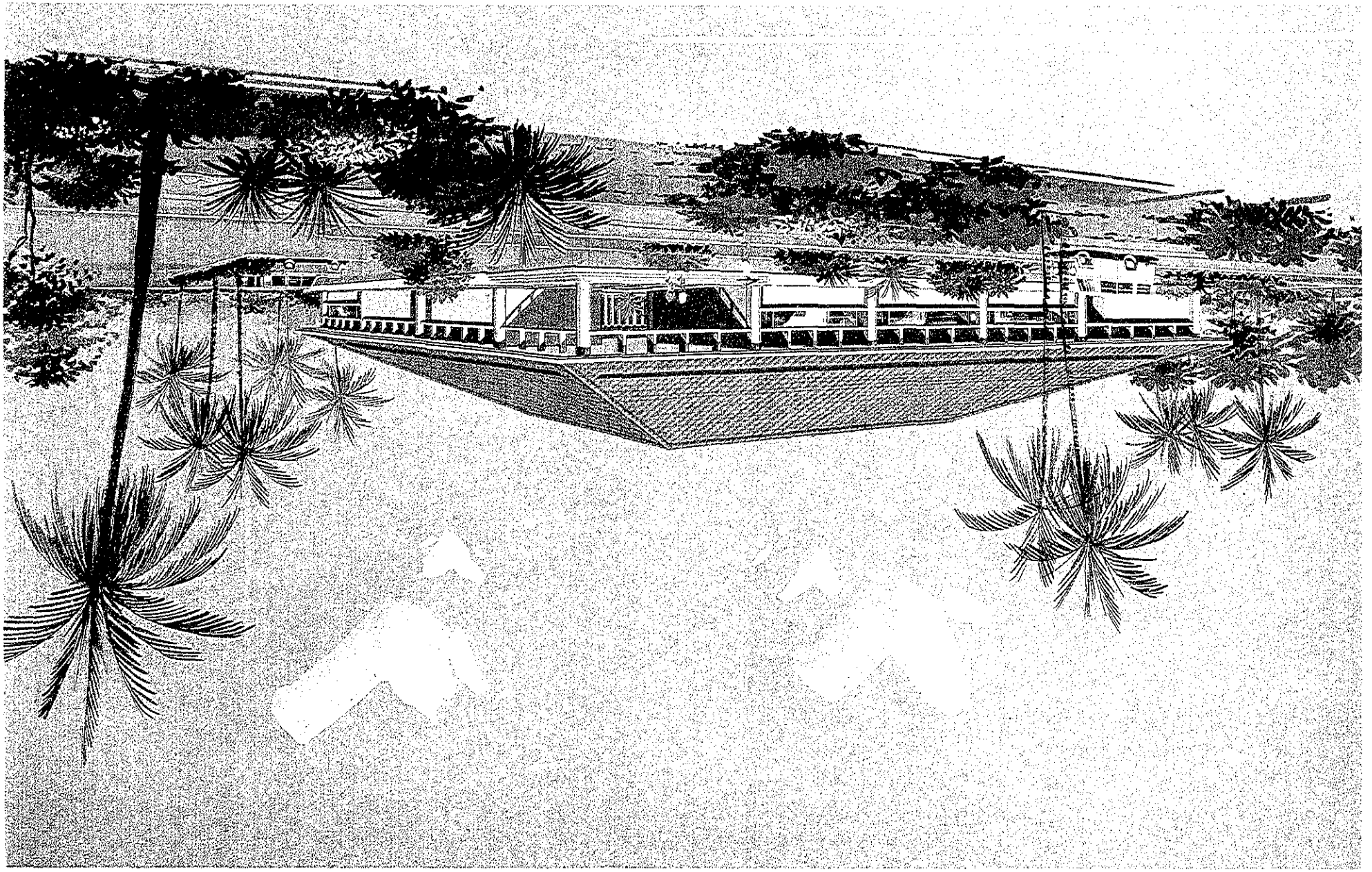
January, 1986

Keisuke Arita

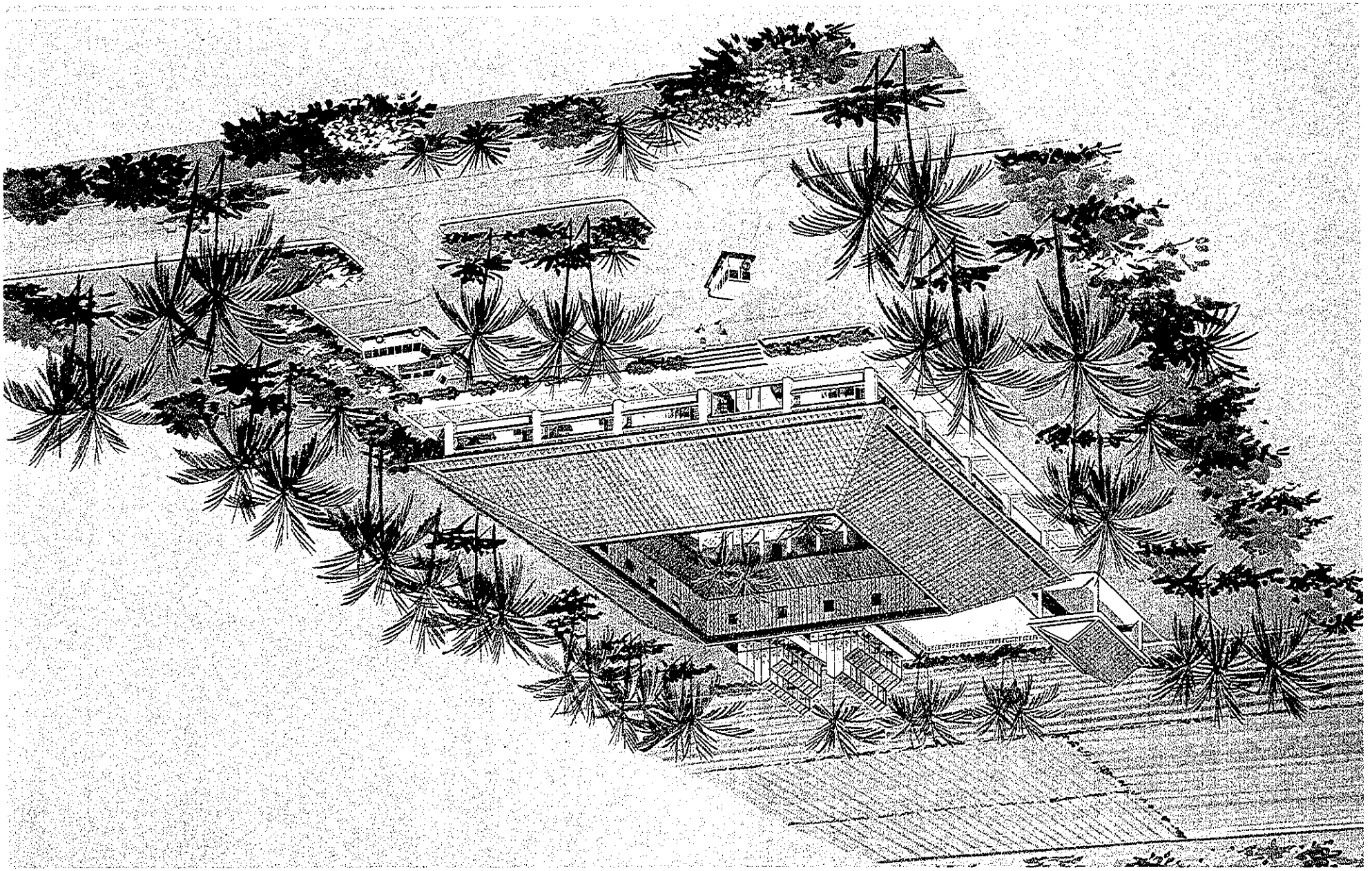
Keisuke Arita
President
Japan Internation Cooperation Agency



Food Crop Protection Center



Field Laboratory



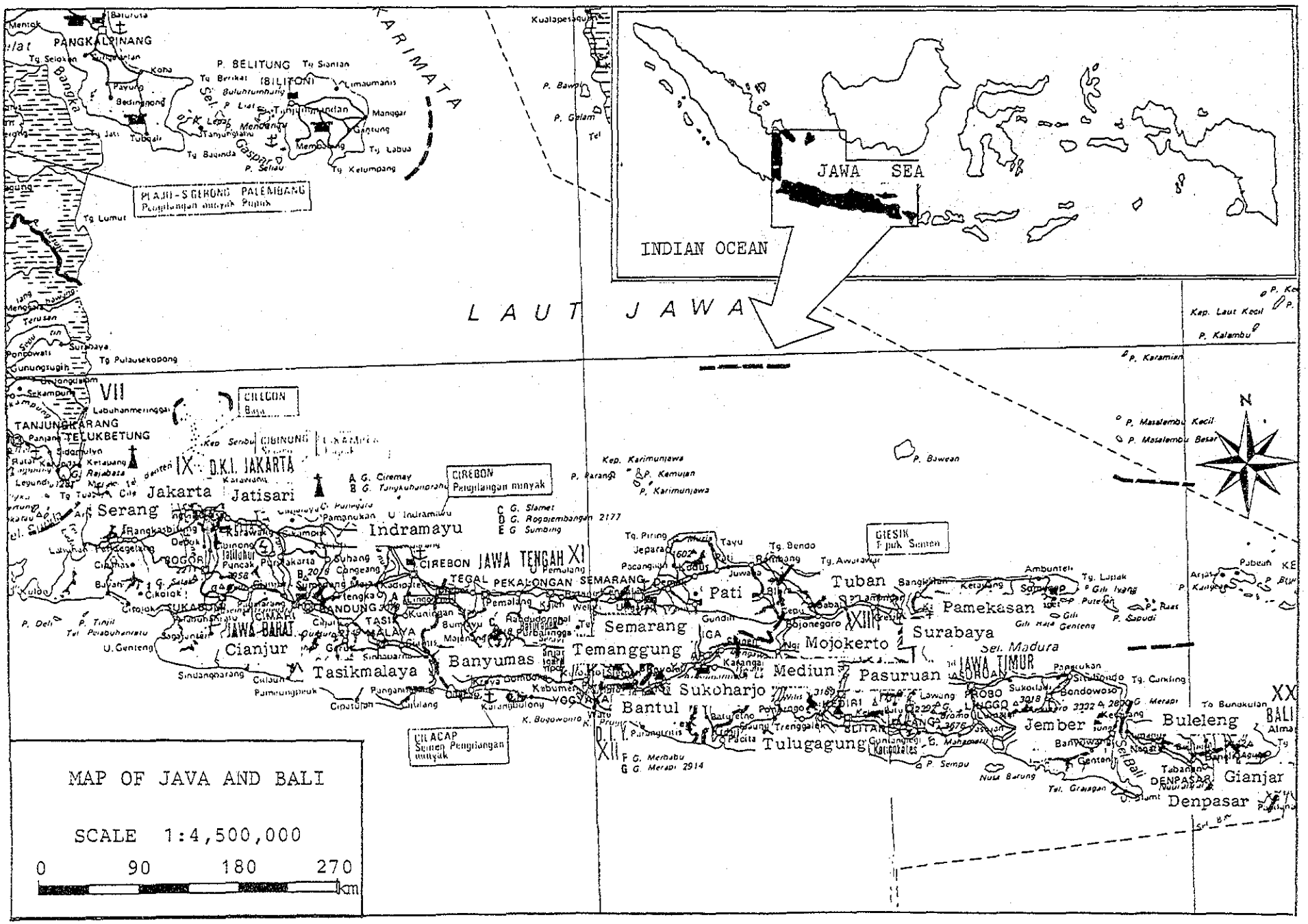

MAP OF JAVA AND BALI
SCALE 1:4,500,000
0 90 180 270 km
JAWA SEA
INDIAN OCEAN
L A U T J A W A
KARIMATA
PANGKALPINANG
P. BELITUNG
PLAJU-SEBERANG PALEMBANG
TANJUNGKARANG
TELUKBETUNG
CIREBON
CILACAP
GRESIK
D.K.I. JAKARTA
Jakarta
Jatisari
Serang
Indramayu
JAWA BARAT
Cianjur
Tasikmalaya
CIREBON JAWA TENGAH
TEGAL PEKALONGAN SEMARANG
Pati
Semarang
Temanggung
Banyumas
Bantul
Tulugagung
JAWA TIMUR
Tuban
Pamekasan
Surabaya
Mojokerto
Mediun
Pasuruan
Sukoharjo
Jember
Buleleng
Gianjar
Denpasar
BALI
Sel. Madura
Kep. Karimunjawa
P. Bawean
P. Masalembu Kecil
P. Masalembu Besar
Kep. Laut Kecil
P. Kalambu
P. Karamian
Nusa Barung
P. Sempu

TABLE OF CONTENTS

ABBREVIATIONS

ADB	Asian Development Bank
ATA	Aid for Technical Assistance
BIMAS	Bimoingan Masal (Mass Guidance Scheme for Self-sufficiency in Food)
BIP	Agricultural Information Center
BLPP	Agricultural Officials Training Center
BPH	Brown Plant Hopper
BPP	Balai Penyuluhan Pertanian (Rural Extension Center)
CPC	Crop Protection Center
DFCP	Directorate of Food Crop Protection
DGFCA	Directorate General of Food Crop Agriculture
E/N	Exchange of Note
FAO	UN Food and Agriculture Organization
F/L	Field Laboratory
F/S	Feasibility Study
FCPC	Food Crop Protection Center
INMAS	Intensificasi Massal (Mass Intensification)
INSUS	Intensificasi Khsus (Special or Group Intensification)
IRRI	International Rice Research Institute
JICA	Japan International Cooperation Agency
Kab.	Kabupaten (District or Regency)
KUD	Farmers' Cooperatives
MOA	Ministry of Agriculture
NCPP	National Crop Protection Project
O/U	Observatory Unit
PFC	Pest Forecasting Center
P/L	Pesticide Laboratory
PO	Pest Observer
PPL	Penyuluan Pertanian Lapangan (Junior Agricultural Extension Worker)
PPM	Senior Agricultural Extension Worker
RPFP	The Rice Pest and Disease Forecasting and Control Project
2KR	Second Kennedy Round Aid
ha	Hectare = 100 ares = 10,000 m^2
kg	Kilo gram = 1,000 grams
km	Kilo meter = 1,000 meters
ℓ	Litter = 1,000 cm^3
m	Meter
t	Metric ton = 1,000 kg
Rp.	Rupiah
¥	Yen
$	US dollar
cif	Cost, insurance and freight
fob	Free on board

CURRENCY EQUIVALENTS

Present rate (At the end of Nov. 1985)
US$1.00 = Rp. 1,124 = ¥ 202

SUMMARY

SUMMARY

Indonesia has a population of 147 million according to the August 1980 Census with an annual growth rate of 2.32 percent (1971-1980). To moderate the pressures of population growth, the Government of the Republic of Indonesia (hereinafter referred to as the Government of Indonesia) began implementing the National Program for Food Crop Protection under the Five Year Development Plan II (1974-1978). Rice yield in the first year of the Program was 15.4 million tons, and attainment of the target yield of 18 million tons by the final year seemed possible. Unfortunately however, a rice brown planthopper (BPH) infestation occurred in the second year of the Program, and the infestation spread from an area of 540,000 ha to 1.54 million hectares in the following years. Yield loss due to this infestation increased from 19.4 percent to 24.1 percent and the Government of Indonesia was compelled to import 2.5 million tons of rice in the fall of 1977.

To remedy this situation, the Government has placed high priority on self-sufficient rice production and increased production of food crops, launching the National Crop Protection Project (NCPP) under the Five Year Development Plan III (1979-1983) implementation of which continues under the Five Year Development Plan IV (1984-1988). The Directorate General of Food Crop Agriculture (DGFCA), Ministry of Agriculture, is the implementing agency for this project.

As part of the national project, DGFCA aimed to establish a network of coordinated rice pest forecasting and control activities with the Directorates of Food Crop Protection - DFCP, as the central implementing agencies. To this end, the Government formulated the Food Crop Protection Project (ATA-162), and the Government of Japan, through JICA, has been providing technical cooperation for this project since 1980. In 1982, JICA completed the Feasibility Study Report on the Rice Pest Forecasting and Control Project (ATA-259) in eight major rice growing provinces of Indonesia.

The Government of Indonesia subsequently requested the Government of Japan to provide grant aid for facilities, equipment and materials required for the Rice Pest and Disease Forecasting and Control Project-RPFP (ATA-389), hereinafter called the Project. The objectives of the Project are 1) improvement of pest outbreak forecasting technology and establishment of an integrated pest management and information system; and, 2) strengthening of existing food crop protection organizations and functions to avoid pre-and/or post harvest yield loss of food crops.

Project components include provision of facilities and/or equipment of Food Crop Protection Center (FCPC), Field Laboratory (F/L) and Pest Observatory Unit (O/U), and also provision of equipment to the Directorate of Food Crop Protection and other existing facilities. The implementation period for the Project is three years and the request from the Government of Indonesia concerns the overall plan for the RPFP (ATA-389).

In response to this request, the Government of Japan decided to undertake a Basic Design Study for construction of FCPCs and F/Ls including arrangement of equipment and materials in three provinces of Java and on Bali Island and for the Pest Forecasting Center (PFC) in Jatisari. A JICA Study Team was accordingly dispatched to Indonesia in August 1985. Discussions were held between the Team and concerned officials of the Government of Indonesia regarding the background and content of the request, site study, etc., and the Team completed the survey works.

Upon their return to Japan, the Team studied the appropriateness of the plan, suitable scale, operation and maintenance systems, and effectiveness of grant aid on the basis of data collected in the field work and discussions with people concerned. A basic design was thereby formulated with particular emphasis on necessary facilities, equipment and materials.

Facilities for which provision of grant aid will be required as well as main equipment and materials are listed below.

(1) Facilities

1) Pest Forecasting Center - PFC

Construction Site: Jatisari, about 80 km east of Jakarta

Building and Facilities:
- main building (reinforced concrete 2-story building)
- dormitory (reinforced concrete 3-story building)
- storage, concrete yard

Total Area: 2,370 m^2 (excluding storage, concrete yard, and net-house)

2) Crop Protection Center - FCPC

Construction Sites: Bandung, Semarang, Surabaya, Denpasar

Building and Facilities

- main building (reinforced concrete one-story building; 1 building/site)
- storage, workshop

Area of each building: about 522 m^2 to 661 m^2 (excluding storage, concrete yard, and net-house)

3) Field Laboratory (F/L)

Construction sites:	4 in West Java Province
	5 in Central Java Province
	4 in East Java Province
	2 in Bali Island
Total:	15 sites

Buildings and Facilities: main building (reinforced concrete 1-story; 1 building/site).
- storage and concrete yard

Area per site: 340 m^2 to 412 m^2 (excluding storage, concrete yard, and net-house)

(2) Equipment and Materials

Equipment and materials are required for the followings:

1) Laboratory Equipment
   - entomology lab
   - phytopathology lab
   - weed control lab
   - vertebrate lab
   - biological control lab
2) Meteorological Equipment
3) Training and Extensional Equipment
4) Data Consolidation Equipment
5) Vehicles
6) Communication Equipment
7) Farm Equipment

Power supply to each of the proposed sites is feasible while water will be supplied by wells. Rain water and drainage water will be discharged into nearby waterways while sewage will pass through a septic tank to a drainage tank. Installation of dial phones in the DFCP Jakarta, PFC Jatisari and each FCPC is possible; however, installation in F/L and O/U will not be possible for the next few years. Permission for wireless communication (SSB) and other communication methods must therefore be considered.

Scheduled completion of the Project after Exchange of Notes is 13.5 months including Detail Design and Construction Work.

With project completion, a rice pest forecasting and control network will be established. At the same time, the rice pest (including field rat) management system will be strengthened, and the rate of self-sufficiency in rice production will be improved by increased yields through technical cooperation from Japan and the efforts of trained Indonesian counterparts. The Project will thus contribute to signifi-

cant economic development in Indonesia. Provision of grant aid for the Project by the Government of Japan is urgently required and the envisioned effectiveness of the same is substantial.

The knowledge, experience and technology of the Indonesian counterparts already gained through previous technical cooperation should be effectively utilized in administration of the DGFCA and DFCP through project implementation. Continuous constructive efforts by the Government of Indonesia will be required even after implementation in strengthening the management system and in budget allocation for facility operation and maintenance of a sufficient number of qualified and experienced staff.

CHAPTER 1. INTRODUCTION

CHAPTER 1. INTRODUCTION

The primary objectives of Indonesia's agricultural policy are increased production of food crops and attainment of self-sufficiency in food production, increased farmers' income, expansion of foreign currency income and creation of job opportunities. To combat the problems of population increase, the Government of Indonesia has placed high priority on increased rice production and self-sufficient food supply. It has also been implementing the National Crop Protection Project-NCPP since 1979.

As one part of the NCPP, the Government aims to establish systematic pest forecasting and control activities throughout Indonesia. To this end, it has requested the Government of Japan to provide grant aid for the establishment of a network of activities and arrangement of facilities, equipment and materials required for implementation of the Rice Pest and Disease Forecasting and Control Project- RPFP. In response to this request the Government of Japan through JICA sent a preliminary survey team to the country for one month. The team confirmed the project components of the Indonesian Government's request and conducted surveys required to ascertain various conditions in the country.

Based on the results of the preliminary survey, JICA dispatched the Rice Pest and Disease Forecasting and Control Project Basic Design Study Team under Team Leader Kenji Tamagawa, Assistant Division Chief, Plant Protection Division, Ministry of Agriculture, Forestry and fisheries from 6 August 1985 for 38 days to conduct necessary surveys required for basic design of the Project. Members of the Study Mission and the Study schedule are as presented in APPENDIX 1 and 3. Discussions on the basic design were held with concerned officials of the Government of Indonesia as listed in APPENDIX 2, and 6 on September the minutes were exchanged between the Mission Leader and the Director General of Food Crop Protection-DFCP, Dr. Sadji Partoatmodjo. Content of the Minutes is presented in APPENDIX 4.

The Basic Design Explanatory Study Team was subsequently dispatched from 10 Dec. 1985 for 8 days to confirm the basic design with officials of the Government of Indonesia. Team members and study schedule are as presented in APPENDIX 5 and 7. This report incorporates Basic Design formulation based on data collected in the field work and discussions with concerned officials of the Government of Indonesia, the proposed design, and evaluation of the same.

CHAPTER 2. PROJECT BACKGROUND

CHAPTER 2. PROJECT BACKGROUND

2-1 FOOD CROP PRODUCTION

Of the total arable land area in Indonesia devoted to food crops, paddy accounts for 7 million hectares and field crops for 2.5 million hectares. Annual harvested area for paddy rice, including irrigated paddy, is 9.16 million hectares, with a unit yield of 3.85t, producing 35.3 million tons of dried paddy as of 1983. The majority of rice is grown in the densely populated islands of Java and Bali which comprise 54 percent (4.95 million ha) of national harvested area, and 63 percent (22.4 million tons) of total yield with a high unit yield of 4.5t.

Supplement TABLE 3 presents production, harvested area and unit yield for rice, corn, cassava, sweet potato, groundnuts, soybeans, etc. Java and Bali account for 73 percent of national corn production, 72 percent of national cassava production, 72 percent of national groundnut production and 76 percent of national soybean production.

Unit yield for rice production increased from 2.89t/ha in 1978 to 3.85t/ha in 1983 with an annual growth rate of 5.9 percent. Harvested area, however, remained almost unchanged at approximately 9 million hectares indicating that these increases were due to increased unit yield through extension of intensive cultivation techniques.

Unit yield for corn increased from 1.33t/ha to 1.69t/ha during the same period at an annual rate of 5 percent, next to that for rice. Harvested area however, did not increase and production is unstable. No remarkable fluctuation occurred in the unit yield or harvested area of groundnuts and production volume was approximately 500,000t.

Other food crops (cassava, sweet potato, soybeans, etc.) registered no increase in unit yield and production actually decreased due to a trend towards reduction of harvested area. This decrease in planted area corresponds to an increase in intensive cultivation of high-profit vege-

table crops. Vegetable crop cultivation has high potential for further development to meet the demands for diversified diet arising from improved standards of living. In addition, the intensive heavy manuring cultivation techniques are suitable for small landholders.

2-2 INCREASED FOOD PRODUCTION PROGRAM

Government of Indonesia has experienced three times of Five-Year Economic Development Plans since 1969, and presently executing the Fourth Five-year Plan (1984-88).

Recently, the agricultural sector comprises less than 30 percent of the Gross Domestic Product due to development of industries, commercial enterprises, and construction enterprises. Agriculture, particularly self-sufficient food supply, however, is still given high priority in the IV Five-Year Development Plan(1984-88). The growth rate of the agricultural sector is projected at only 3 percent while the annual growth rate of national rice demand is estimated at 4 percent, increasing in correspondence with improved standards of living, particularly in areas other than Java. Annual rice consumption per capita is 130kg as of 1983. Rice production is targetted to increase at an annual rate of 4.01 percent under the IV Five-Year Development Plan with an annual 2 percent increase in per capita rice consumption. (See Supplement TABLE 2)

2-3 FOOD CROP PROTECTION

2-3-1 Present Conditions

On the average in 1980-83, the area damaged by rice pests was reported at 619,000ha and by field rats at 198,000ha, while 77,000ha were reportedly contaminated by diseases (Supplement TABLE 4). A trend towards reduction of pest infested areas began from the early 1980s with the introduction of resistant varieties and extension of chemical control, etc.; however, on the whole, no marked change has occurred in damage by diseases and, in fact, Tungro virus disease increased lately while an increasing trend was also evident in field rat damage (1983-84).

Rice brown planthoppers (BPH), Tungro and field rats cause the greatest damage to rice harvest. Brown planthoppers are common in Ache, North Sumatra, West Java, South Sumatra and Central Java provinces while Tungro is common in Bali, South Sumatra, Central Java and South Sulawesi provinces. Field rats are prevalent throughout the area but particularly in West Java, Central Java and South Sulawesi where open rice fields abound.

Crop protection is headed by the Directorate of Food Crop Protection of the Ministry of Agriculture, with 10 Food Crop Protection Centers (FCPC), 9 Field Laboratories (F/L) and 1,061 Observation Units (O/U). Crop Protection at the local level is also managed by the Crop Protection Section of the Provincial Agricultural Extension Office, and consists mainly of operation of a Pest Brigade during an outbreak, prevention activities and instruction of farmers. Rural Extension Center (BPP) also includes O/U, and in the field, Extension Workers and Pest Observers cooperate at the farm level.

Introduction of resistant varieties (Supplement TABLE 6) is the primary means for pest control. IR strains have been adopted as resistant to rice brown planthoppers; however due to their inferior flavor, susceptibility to bacterial disease and lower market price, the extension rate

of the same is only about 50 percent. At present the most widely adopted resistant strain is Cisadane which is resistant to bacterial disease and has superior flavor and market price. The growing period however, is rather long.

The area designated for application of BIMAS (INMAS, INSUS), an agricultural chemical, was suddenly increased in the early 1980s and supply of chemicals also increased markedly (Supplement TABLE 7). Calendared application of pesticides in which the same are applied 4 or 5 times every two weeks during rice growing can lead to over application and in some areas chemicals are applied to vegetable crops as well.

Present measures for protection of rice crops against pests and disease consist of extension of resistant rice varieties and application of agricultural chemicals, as mentioned above. In consideration of such factors as economic effectiveness and environmental safety, the Government of Indonesia is also working for establishment of integrated pest management including combined use of cropping patterns, cultivation methods and natural control agents. Technological developments for achievement of this aim is expected from the DFCP.

2-3-2 Constraints

(1) Pest Surveillance and Monitoring Techniques

A surveillance system by Pest Observers and monitoring techniques have been established to some extent; however, the technology employed in this system requires some modification and improvement. At present, the Pest Observer submits a report on outbreaks of disease or numerical population of pest infestations and contaminated area every two weeks. At the same time, the Bureau of Statistics in cooperation with the Crop Protection Section of the District Agricultural Extension Office compiles statistics on areas damaged by pests and disease for each province. Data on damaged area is also submitted by the Pest Observers. Unfortunately, the Observers concentrate upon estimation of damaged area as if it were their main job, rather than upon forecasting outbreaks by means of calculations of the numerical population, etc. This situation

arises from lack of local institutions to directly supervise and instruct the Pest Observers, the extensive area covered by one Observer (1 person /10,000ha) and management of almost 200 Observers by the provincial FCPC. Moreover, the FCPC mainly functions as an administrative organization, giving little technical instruction.

Not only are forecasting techniques deficient for crop protection, but the difficulties involved in and the inaccuracy of estimations of yeild loss in percentage for the entire area are a pressing problem. Yield reduction rate reportedly dropped from over 20 percent in the late 1970s to about 10 percent in 1983; however, according to farmers and Extension Workers in many areas, yield reduction due to field rat damage alone averages around 10 percent. In the case of Japan when rice protection administrative agencies were first established, rice yield reduction due to pests and disease amounted to as much as 10 percent, not including field rat damage.

Methods for compilation of observation data represent a further problem with regards to monitoring techniques. Even in the four provinces of Bali and Java, various methods are employed. In East Java for example, monthly statistics on damage due to pests and disease are used whereas in reports from other provinces such statistics cannot be found. Moreover, data concerning individual numbers corresponding to rice plant growing stages or dynamic changes in rainfall are not employed in any of the provinces.

For accurate forecasting, a compilation of statistics on crops cultivated in the previous cropping season, rice variety, growing stage, fertilizer usage, period and amount of chemical application, and rainfall is essential. These data should be collected not only on a national level but on a local level, focussing on specific characteristics of each locality in order to establish appropriate surveillance and monitoring techniques.

(2) Pest Forecasting and Control Techniques

The value of a crop protection system is in forecasting of pest or disease outbreaks and, while the individual numbers are still few, warning of a major outbreak in time for implementation of control and protection measures before numerical increase of the pest population. Ideally, provincial level FCPC should be responsible for issuance of such a warning. Unfortunately, although the FCPC are functioning administratively, they are unable to respond appropriately after a large outbreak has occurred due to lack of technology, equipment and qualified staff. In the case of the Crop Protection Section of the Provincial Agricultural Extension Office, capable Extension Workers from the district office report on existing farming conditions and investigate the causes of outbreaks. The FCPC, however, lack sufficient F/L facilities for appropriate response to this information and staff are sometimes unable to identify the pest species even when presented with an actual specimen.

If 50,000ha of paddy is designated as an appropriate unit area for forecasting, forecast reports should be submitted for each district. Excluding Bali Province, Java's three provinces consist of 20 to 30 districts. The FCPC alone, even with substantial improvements, therefore, would be insufficient in number for establishment of a forecast network.

At present the ATA 162 Jakarta DFCP in cooperation with FCPC in Bali and North Sumatra, plans to collect sample data from qualified O/U staff through training of these staff in Tungro and BPH forecasting. Collection of sample data by O/U staff, as well as construction of F/L and training of staff at the Jatisari PFC in the Project area, are essential for improvement of pest control technology and it is envisioned that the F/L which manage the O/U will provide the basic technical support required by the FCPC.

The technical experience of the existing F/L however, is at present insufficient for support of FCPC. The F/L are fully occupied with collection of data from O/U, graphing, etc. and lack materials, manpower

and training for further activities. None of the F/L surveyed were conducting experiments for protection or forecasting at their experimental paddy fields. This clearly reflects a lack of technical guidance from the FCPC or the Central DFCP.

2-4 DFCP AND FACILITIES AT PRESENT

2-4-1 DFCP and Management System

The administrative organization which will be used in project implementation has already been established (see FIG 2-1); however, the Jatisari Pest Forecasting Center presently functions out of the F/L with the cooperation of specialists from Technical Cooperation Project ATA 162. Moreover, although FCPC are established in each province, they are not performing forecasting activities. A total of 5 F/L have been established; 1 in West Java, 1 in Central Java, and 3 in East Java; however, due to lack of manpower and equipment, they are not utilizing their full potential. O/U use the same facility as the BPP. In August 1984 the jurisdiction over Pest Observers was transferred from the Provincial Agricultural Extension Office to the FCPC. Due to lack of F/L facilities however, O/U activities are not completely independent of the district offices.

DFCP, the central organization for food crop protection is divided into four sections and the Pesticide Lab (P/L) and PFC are part of the Pesticide Section and Pest-forecasting Section of DFCP, respectively. The P/L already operates on a national level while the PFC is envisioned to become the core forecasting laboratory in a national network system. Internal organization of the DFCP is as presented in FIG 2-2. At present the number of employees, including parttime workers, totals 152.

The Forecasting Section, located in the Jatisari PFC, is responsible for development of forecasting technology with technical cooperation on Project ATA 162. The Pesticide Section through the P/L undertakes registration of pesticides, quality control and routine tests. Other two sections are also responsible for extension of pest control technology but as yet the level of technical development within the organization as a whole is still immature and the level of activity is therefore low.

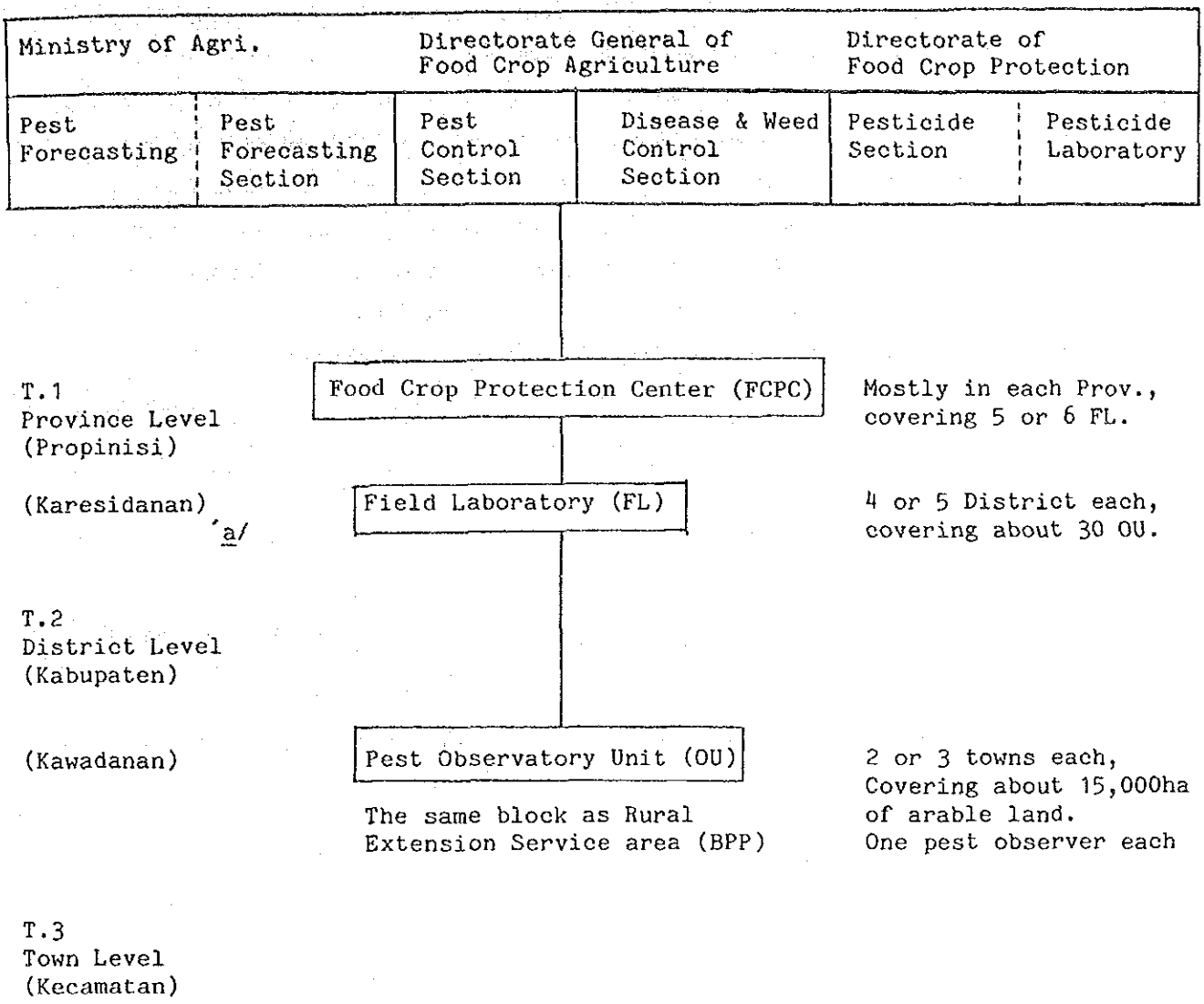


FIG. 2-1 Network of DFCP

---

a/ Each Karesidanan has a Pest Control Brigade under the Provincial Extension Office. Requests for agro-chemicals for outbreak areas are sent by BPP through District Extension Office to the Provincial Extension Office.

Communication with FCPC is conducted by phone and particularly through documents. The administrative office coordinates the four technology sections through use of the archives section.

There are two national committeess over which the DFCP presides; the National Pesticide Committee and the National Plant Protection Commission. These review crop protection and pesticide policies of the Ministry of Agriculture and are composed of university professors, ministry officials and others. In addition, international exchange takes place through attendance at the said FAO Integrated Rice Pest Control Program conference and through on the job training programs of IRRI as well as participation in ATA 162.

2-4-2 Staff Training Program at Present

The BLPP is presently conducting a staff training program for FCPC, O/U, etc. Staff from these facilities attend one month training courses at the provincial BLPP while personnel in charge of pesticide control undergo training at the national BLPP in Bogor. In addition, 3 month training courses are held at the BLPP and one year diploma courses are held at the national university for O/U Pest Observers. The curriculum of these programs however, concentrates predominantly on classroom lectures and practical training in the field is inadequate.

2-4-3 Existing Facilities

Existing facilities and their locations are as follows:

		(m^2)
West Java		
Directorate of Food Crop Protection (DFCP)	Pasarminggu, Jakarta	-
Pesticide laboratory	DFCP Pesticide section, Pasarminggu, Jakarta	-
FCPC	Bandung	348
F/L	Jatisari	363
Central Java		
FCPC	Ungarang	214
Crop Protection Sub-Center	Yogyakarta	-
F/L	Petarkan (Kab. Pemalang)	168
East Java		
FCPC	Surabaya	342
Pesticide laboratory	Affixed to FCPC	-
F/L	3 sites; Senori (Kab. Tuban)	156
	Tulungagung	-
	Tanggul (Kab. Jember)	48
Bali		
FCPC	Denpasar	204

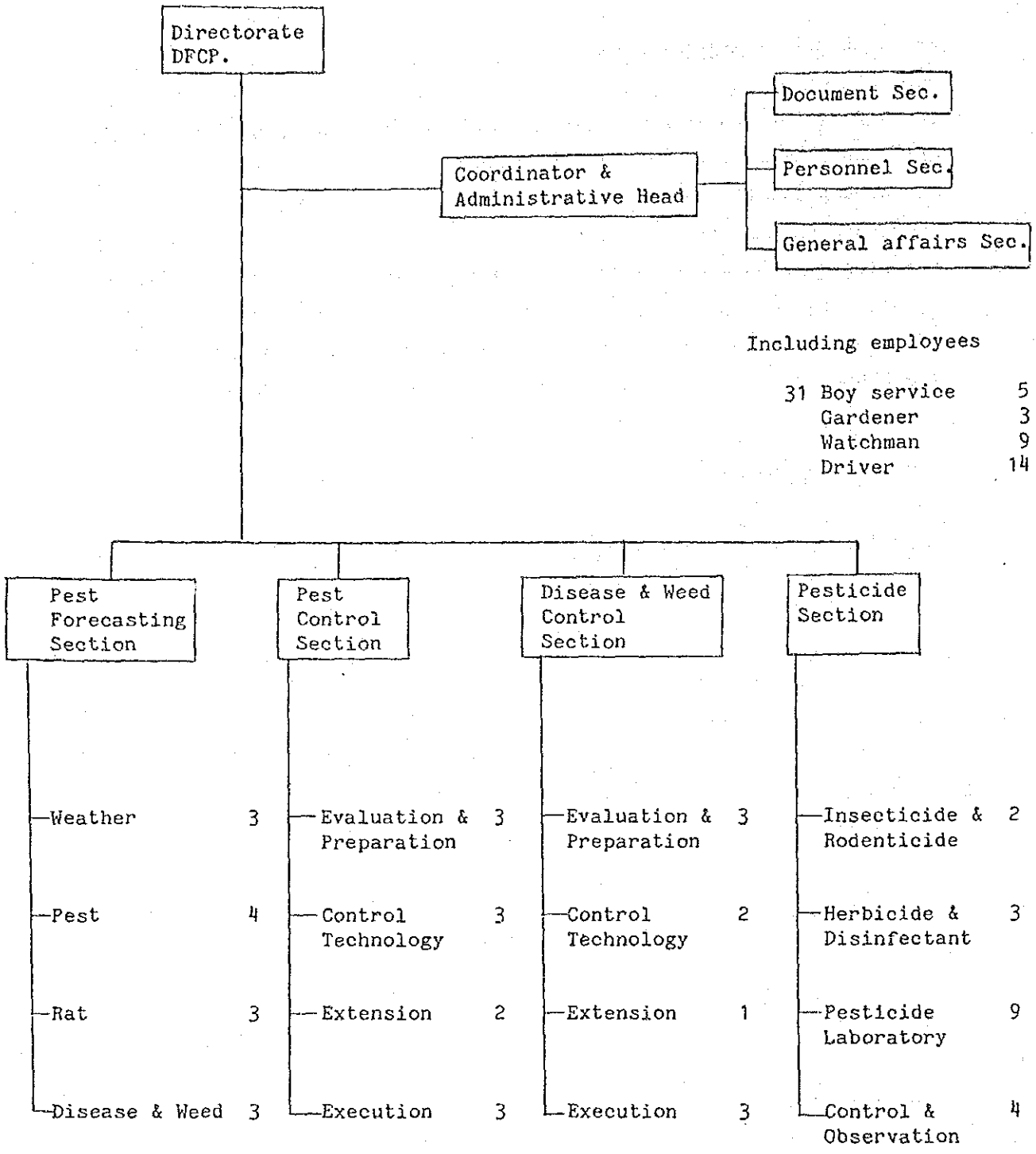


FIG. 2-2 DFCP Organization

2-4-4 Existing Equipment

(1) Existing Equipment

Main equipment for each of the above existing facilities is as follows:

DFCP

Vehicles	:1 sedan, 9 jeeps, 4 micro-buses, 1 truck, 25 motorcyoles
Copy machine	:4
Typewriter	:26
Mimeograph	:5 printers, 1 stencil machine,
Computer	:1 office computer, 1 personal computer
Other	

Pesticide Laboratory (West Java)

Microscope	:7 of each type
Precision balance	:5 of each type
Gas chromatograph	:2
Infra-red spectro-photometer	:2
Other	

Bandung FCPC(West Java)

Mimeograph	:1
Typewriter	:3
Platform scale	:1
Electronic calculator	:1
Jeep	:1
Pickup truck	:1
Motorcycles	:8
Mist blower	:about 617
Other	

Jatisari F/L

Vehicles	:1 pickup truck; 14 motorcycles
Experimental equipment	:3 microscopes, 3 culture incubator sterilizers, 1 mimeograph, 5 dessicators, 1 ripening grain counter, 2 experimental threshers, other
Agricultural machinery	:2 power tillers, other

Ungaran FCPC (Central Java)

Vehicles	:1 jeep
Incidental equipment	:1 mimeograph, 1 typewriter, 1 calculator
Mist blower	:about 1,000

Pemalang F/L

Vehicles	:1 minibus, 1 motorcycles
Training equipment	:1 mimeograph, 1 slide projector, 1 overhead projector, other
Experimental equipment	:2 automatic insect collectors, 1 light trap, 2 balances, other
Outdoor equipment	:10 knapsack sprayers, 2 dusters, 1 generator, sweep nets, sample jars, etc.

Surabaya FCPC (East Java)

Vehicles	:3 jeeps, 3 motorcycles
Incidental equipment	:5 typewriters, calculators, 1 mimeograph, 1 dial phone

Pesticide Laboratory (East Java)

To be equipped under 1984 grant aid

Jember F/L

Vehicles	:1 pickup truck
Meteorological equipment	:1 instrument shelter, atmometer, heliographs, other
Experimental equipment	:stereoscopic microscopes, glassware
Training equipment	:1 slide projector, 1 overhead projector, 2 typewriters, 1 electromagnetic telephone, other

(2) Materials and Equipment Provided under 1984 Grant Aid

The DFCP requested grant aid for materials and equipment in 1984 and is presently proceeding with preparations for procurement. A portion of equipment and materials required for present Project facilities are already included within this tender. Equipment for FCPC in each province excluding Bali, as well as for the Pesticide Laboratory in Jakarta and Surabaya and equipment for existing F/L which will be covered under the said grant aid, are as outlined below.

1) Equipment for FCPC

Disposition of equipment and materials is the same for each FCPC facility and main items are listed below according to category of use.

Training and Extensional Equipment

Camera, slide projeotor (w/sound track), overhead projector, movie projector, movie camera, copy machine, mimeograph, automatic mimeograph

Laboratory Equipment

Binocular microscope, stereoscopic microscope, microscope accessories, micro-syringe, drying cabinet, dessicator, ripening grain counter, drying oven, magnifier lense, numbering, specimen cabinet, plant growth measuring apparatus, culture plate

Sampling Equipment

Grain sample collector, grain balance, grain cutter, grain measuring micrometer, miniature thresher

2) Equipment for the Pesticide Laboratory

Infra-red Spectrophotometer Complete
Thin Layer Chromatograph, Complete with Scanner
Balance
Contrifuge
Shaking Water Bath
Polarrograph
Gas Cylinder Carriage
Water Demineralizer
Water Sampler
Gas Mask
Portable pH-meter
Tap-bulk Densitometer
TLC-kit
Protective Goggles
Adjustable Oven
Hot Plate, Temperature Regulator
Destillation Apparatus
Tool Kit
Toxic Gas Incinerator
Electric Presision Balance
Binocular Stereo Microscope
Biological Binoculer Microscope
Daylight Screen
Grain Moisture Meter
Micro Syringe
Atomic Absorption Spectrophotometer, Complete
Complete Water Test Kit
Glass Blowing Equipment, Complete
Laboratory Glass Ware Washing
Balance Table
Electrinic Delutor and Dispenser
Stabilizer
Hydraulic Laboratory Press
Bottom Sampler
Halide Detector
Overhead Projector
Viscometer
Emulsion Stability Test Kit
Hydrometer
Portable Balance
Heating Mantles
Extraction Apparatus
Primary Pesticide Standard
Laboratory Waste Incinerator
Copying Machine
Universal Biological Microsope
Microscope Lighting Apparatus
Slide Projector
Reflect Microscope
Electriphoresis Apparatus
Constant Temperature Inoculator

Ripening Rate Measuring Apparatus	Miniature Thresher
Fish Toxicity Test Chamber	Momentum Measuring Apparatus
Auto Sterillizer	Rice Yield Analyzer
Soluvents	Chemical Regents
Glass Wares	Grinder
Mass Rearing Cabinet	Seedling Case Set
Desiccator	Laboratory Dish
Sample Jar	Killing Jar
Tweezer	Analytical Electric Precision
Ultra Violet Light Detection Lamp	High Purity auto-still
Recording Data Processor	High Performance Liquid
Liquid Chromatograph packed Colum Set	Chromatography Set
Shaker Set	Ultrasonic Pipette Washer
Cacilloscope	Burner for Glass Working
Compressor for Glass Working	Glass Cutter Set
Physical Properties Measuring Apparatus	Standard Sieve Set
Electric Sieve Set	Auto Cube-ice Machine
Ultrasonic Cleaner	Automatic Motor
High Speed Automatic Cutter	Gas Chromatograph Set
Gas Chromatograph Packed Column Set	Hydrogen Leak Detector
Constant Temperature Oven	Experimental Supply
Insect Sweeping Net Set	Magnifier Lense
Hand Numbering Apparatus	

3) Equipment for F/L

Light Trap	Spore Trap
Sticky Trap	Blower
Dissection Set	Deep Freezer
Precision Blance	Syringe
Calliper Gauge	Automatic Sprayer
Hand Counter	Biological Microscope
Binoculer Microscope	Moisture Tester
Balance	Max & Min Thermometer

Hygrometer/Psychometer
Preparat Needle
Loupe
Psychrometer
Sunshine Duration Recorder
Recorder Rain Gauge Hilman
Soil Thermometer
Evaporimeter class A
Grain Crack Inspector
Chalky Grain Tester
Testing Huster

Glasswater
Aspirator
Rain Gauge
Max - Min Thermometer
Cup Counter Anemometer
Piche Evaporimeter Casella
Precision of Open Pen
Thermohygrograph J. Ricard
Sample Divider
Testing Miller

2-5 NCPP AND RELATED PROGRAMS

2-5-1 NCPP-Crop Protection Master Plan

The Master Plan for food crop protection was formulated in 1978 by the DFCP with cooperation of various international agencies and countries aiming for completion of an administrative system in the provinces which produce the nation's staple food crops. The facilities proposed in the Master Plan are FCPC, F/L, O/U and P/L. At this stage, the Jatisari PFC was not yet planned.

The Master Plan was modified and added to through project cooperation after 1980 (ATA 162) and the JICA Feasibility Study on Rice Pest Forecasting and Control Project (ATA 259) which was undertaken from 1982-'83 in eight rice growing provinces. ATA 162 recommended establishment of the Jatisari PFC as a national center for technological development while ATA 259 (F/S) proposed an arrangement plan for materials and facilities for each organization such as the FCPC, F/L, O/U and P/L and a training plan for development of the required manpower.

Subsequently, the DFCP studied the contents of the plan during formulation of the original proposal for the IV Five Year Development Plan (1984-1988) and the 15-year long term plan concept (1986-2000). They now wish to complete the technological aspects, particularly strengthening the functional organization of F/L and developing forecasting and control technology.

2-5-2 Japanese Cooperation

With regards to strengthening of crop protection, the Technical Cooperation Program (ATA 162) aims to develop pest and disease control technology. Originally planned to cover a five year period from June 1980, the program has been extended for an extra two years to March 1987. Cooperation includes dispatch of experts to the field (long-term: 4 persons; short-term: 5-6 persons), training of Indonesian staff in Japan (3-4 persons/year), and provision of equipment and materials. Technology is being transferred to Indonesian counterpart staff with particular

focus on systemized pest forecasting techniques for major rice pests such as the rice brown planthopper, Tungro and green rice leafhopper. With extension of ATA-162, technical cooperation for not only rice cultivation but also for research on field rats and pests and diseases which affect secondary crops such as soybeans and corn, has been discussed and confirmed.

In addition to the above, the Feasibility Study on Rice Pest Forecasting and Control Project was implemented by JICA in 1982, covering the eight major rice producing provinces; namely, Ache, South Sumatra, Lampung, West Java, Central Java, East Java, South Kalimantan and South Sulawesi. A Master Plan for pest forecasting and control was formulated. Grant aid in 1984 in the form of equipment is also being provided for the Rice Pest Forecasting and Control Project and this forms one part of the present Project (ATA 389).

Equipment and materials were also provided for the Rice Pest Brigade under a 2KR grant in 1984 and '85. Mist blowers and other equipment from this grant are stored in the FCPC warehouses.

2-5-3 ADB Program

The ADB program, on the other hand, deals with protection of plantation and industrial crops rather than food crops, and is being promoted in cooperation with the Directorate of Estate Crops, Ministry of Agriculture. The concept of the program is based on the National Crop Protection Program and proposed similar facilities such as CPC, F/L, O/U and Pest Brigades.

The study area covers eight provinces (N. Sumantra, W. Sumantra, Riau, Bali, E. Nusa Tenggara, W. Kalimantan, N. Seulawaih, Malik) which are the main producers of industrial and plantation crops, and therefore overlaps very little with the present Project area. Number of sites for this program are as listed below and the construction period is 5 years. Total cost of construction, equipment and materials is Rp 61.6 billion (US$51.33 million or ¥12.3 billion).

Type of Facility	Number of Sites
FCPC	8
Pesticide Laboratory	1
Vertebrate Control Laboratory	1
Biological Control Laboratory	39
F/L	30
O/U	564
Pest Brigade	40

2-5-4 Other International Programs

Other programs related to the present Project include several internationally funded programs such as the FAO Development and Implementation of Integrated Rice Pest Control, the IRRI Training Program for Integrated Rice Pest Control, etc.

The FAO project consists of conferences on rice pests and diseases in seven Southeast Asian countries. One conference is held per year and the host country rotates annually. The most recent conference was held in August, 1985 in Thailand.

The IRRI program involves training of personnel for integrated rice pest control as well as discussions on specific problems and support activities.

2-6 BACKGROUND AND CONTENT OF THE REQUEST

2-6-1 Background

The Government of Indonesia drafted the National Crop Protection Project (NCPP) in 1978 as a basic approach to pest control for increased rice production, a prerequisite for self-sufficient food supply. The program commenced with the cooperation of other countries, to establish systemized pest forecasting and control activities.

The Government of Japan has provided project-type technical cooperation for ATA 162 since its commencement in 1980.

JICA conducted a Feasibility Study for the Rice Pest Forecasting and Control Project (ATA 259) in 1982; however, although the Government of Indonesia requested an OECF loan in 1983 and '84, the project was not implemented at that time seemingly due to such factors as the high cost of the local portion.

For increased rice production, the Government of Japan accepted requests for construction of the Jatisari Pest Forecasting Center (1984) and provision of materials as a form of grant aid for the Rice Pest Forecasting and Control Project. Recently the Government of Indonesia made an additional request for economic cooperation for the present Project including arrangement of facilities, materials and equipment for FCPC, F/L, etc. in nine major rice producing provinces (Bali included).

2-6-2 Content of the Request

The request for grant aid cooperation concerns the overall plan for the Project (ATA 389) and includes arrangement of materials, equipment and facilities for FCPC, Pesticide Laboratories (P/L), F/L, and O/U in the nine provinces as well as construction of the Jatisari PFC. Project

implementation period is three years with construction of the PFC, FCPC, F/L and O/U from the first to the third year, and materials and equipment will be arranged in the second and the third year as in the following TABLE 2-1 and 2-2.

In Java and Bali, one PFC, 4 FCPC, 16 F/L and 603 O/U will be established while in the other five provinces (Ache, South Sumatra, Jampong, South Kalimantan and South Sulawesi) 3 FCPC, 18 F/L and 389 O/U will be established. Of these, the Jatisari PFC in Jakarta and the facilities (FCPC, F/L, O/U) in Bali and the three provinces of Java will be constructed in the first year.

TABLE 2-1 The Schedule of Activities within Three Years
1- Breakdown by Field

No	Activities	1st year	2nd year	3rd year
I	Building Component			
1.	Pest Forecasting Center	O	–	–
2.	Food Crop Protection Center	O	O	O
3.	Sub Crop Protection Center	–	O	O
4.	Field Laboratory	O	O	O
5.	Pest Observatory Unit	O	O	O
6.	Vertebrate Pest Laboratory	O	O	O
7.	Biological Laboratory	O	O	O
8.	Pesticide Analysis Laboratory	O	O	–
II	Equipment Component			
1.	Pest Forecasting Center	–	O	–
2.	Food Crop Protection Center	–	O	–
3.	Sub Crop Protection Center	–	–	O
4.	Field Laboratory	–	O	O
5.	Pest Observatory Unit	–	O	O
6.	Vertebrate Pest Laboratory	–	O	O
7.	Biological Laboratory	–	O	O
8.	Pesticide Analysis Laboratory	–	O	–

TABLE 2-2 2-Breakdown by Province

No	Provinces	1st year	2nd year	3rd year
I	Building Construction			
1.	Jakarta(Jatisari)	○	—	—
2.	West Java	○	—	—
3.	Central Java	○	—	—
4.	East Java	○	—	—
5.	Bali	○	—	—
6.	D.I.Aceh	—	○	—
7.	South Sumatera	—	○	—
8.	South Sulawesi	—	○	—
9.	South Kalimantan	—	—	○
10.	Lampung	—	—	○
II	Equipment Supplies			
1.	Jakarta(Jatisari)	—	○	—
2.	West Java	—	○	—
3.	Central Java	—	○	—
4.	East Java	—	○	—
5.	Bali	—	○	—
6.	D.I.Aceh	—	—	○
7.	South Sumatera	—	—	○
8.	South Sulawesi	—	—	○
9.	South Kalimantan	—	—	○
10.	Lampung	—	—	○

CHAPTER 3. THE PROJECT

CHAPTER 3. THE PROJECT

3-1 OBJECTIVES

3-1-1 Long-Term Objectives

The long-term objectives of the Project include integrated pest management measures which are economically, ecologically and socially sound, and establishment of various technological and administrative systems and organizations required for crop protection in order to achieve self-sufficient food supply and production increase. In addition, training and experimental activities in pest surveillance, monitoring and outbreak forecasting will be improved and strengthened to promote technological development.

3-1-2 Short-Term Objectives

Short-term objectives comprise forecasting and analysis of individual pest populations and pest damage as well as the grant aid arrangement of those facilities, materials and equipment required for training qualified personnel and for reorganization of a functional system for development of forecasting technology.

3-2 STUDY OF THE REQUEST

3-2-1 Outlook for Java and Bali

The following items have been requested under the grant aid program:

a) Construction of a PFC in Jatisari,
b) Expansion of FCPC in Bandung, Semarang, Surabaya and Denpasar,
c) Construction of F/L in 16 locations; 4 in West Java, 6 in Central Java, 4 in East Java and 2 in Bali,
d) Provision of 622 O/U (577 existing sites), and,
e) Equipment in those facilities (PFC, FCPC, F/L and O/U).

3-2-2 Scope of the Project

Facilities required for Bali and the 3 provinces of Java comprise about half of the total number of facilities requested. These two densely populated regions occupy 54 percent of the total paddy area and 63 percent of the total rice production. Of the total area damaged by pests, 14 percent of Brown plant hopper damage occurs here, 62 percent of Tungro and 61 percent of field rat. Pest forecasting and control in Bali and Java are directly linked to the problems of attaining self-sufficient food supply, and the importance of the Project to this area is evident in the occurrence of chronic food shortages arising from dense population.

Construction of the PFC will form the core of nationwide development of forecasting and control technology while training of skilled staff for FCPC and F/L is given highest priority in the Project.

An important factor in Project implementation is continued functional crop protection activities and training of all staff who will become leaders in technological development. For this reason the role of the PFC is vital to project success, forming the main support of the Project's organizational system as conceived by the Technical Cooperation Project Team (ATA 162).

The F/L and O/U are the major weak points in the present system and therefore establishment of pest surveillance and monitoring techniques appropriate for the F/L and O/U levels is urgent. Construction of new F/L is expected to provide an incentive to O/U in the area and, as the F/L form the basis of FCPC activities, they are envisioned to become the center of activity in the crop protection system when staffed with qualified technical personnel.

Through development of the technical capacity of the above, FCPC functions will be expanded from solely administrative to more technical work, thereby fulfilling its role as a center for crop protection. Although several years may be required for staff training and other factors, inclusion of additional facilities at the FCPC such as a labo-

ratory or net house for experimental purposes is also planned in consideration of the necessity for development of technology at the provincial level. Joint field experiments and other activities can also be conducted with nearby F/L.

Two areas in which the existing organization requires strengthening are mobilization of staff and exchange of information among the individual institutions. About 23 percent of O/U have not been provided with motorcycles and Pest Observers presently borrow those of the Extension Workers or perform their observation duties by bicycle. With project implementation, it is envisioned that traffic between O/U and F/L will be vital to realization of Project objectives and, as the area of each Pest Observer has a radius of about 7km, provision of motorcycles is essential for mobilization of O/U staff. Moreover, regular patrols should be made by superiors for instruction and supervision.

Installation of a telephone system is the optimum method to improve information exchange among the various institutions. Dial phones and facsimille are recommended for communication between the DFCP and Jatisari PFC, and between the DFCP and the FCPC in each province, while SSB communication could be considered for communication between FCPC and F/L.

The crop protection system above with coordinated integration of PFC, FCPC, F/L and O/U activities will ensure overall effectiveness of project implementation.

3-2-3 Facilities Requested

Due to the need for experimental facilities and an experimental field for forecasting and control activities, the Jatisari F/L facilities are being used for the PFC under ATA 162. This site is considered optimum for various experiments, studies and training because of its proximity

to Jakarta (about 80km), and its location in the center of Krawang-Subang plain (340,000 ha) in Java where double paddy cropping is practiced.

PFC facilities are required to accommodate the laboratories, net houses, offices for instructors of FCPC and F/L technical staff, offices for technical staff, classrooms, a dormitory and other facilities. This proposed scale is considered appropriate in view of the facility's function as a national training center for 200 to 300 people, as well as for its technical research and experimental activities.

Four FCPC in Java and Bali provinces have been requested under the Project. The type of pests and diseases and their distribution, etc., varies with each province. As each province is comprised of 20 to 30 districts and as the necessary cooperative system and independent agricultural support systems have already been established, the present location of the FCPC in the capitals (Bandung, Semarang, Surabaya, Denpasar) of each province is judged appropriate.

The DFCP presides over the National Pesticide Commission, the National Crop Protection Committee and other national agencies for crop protection. This type of council system is also required at provincial and district levels over which the FCPC and F/L, respectively, would preside. In particular, the FCPC and F/L should have close, regular contact with the provincial and district extension offices concerning equipment maintenance, inspection and other activities to ensure efficient operation of provincial and district Rice Pest Brigades.

In addition, a cooperative system is required between the FCPC and each type of agricultural agency at the provincial level including the following:

Agency	Objectives of Cooperation
Provincial Office, Ministry of Agriculture	: coordination or requests among each agency

Agency	Objectives of Cooperation
Provincial Research Station, Agency for Agricultural Research and Development	: technical cooperation and information exchange
Agricultural Faculty, National University	: "
Agricultural Personnel Training Center, Agency for Agricultural Education, Training and Extension	: training and technical instruction
Agricultural Information Center	: publication of pamphlets for Extension Workers
Provincial Office, Central Bureau of Statistics	: provision and discussion of damage statistics
Provincial Office, Seed Certification Center	: coordination or seed production for improved varieties within the province
Provincial Office, Department of Cooperatives	: data collection related to circulation of agricultural products and farm production inputs

The agencies recommended for inclusion within an F/L cooperative system at the regional and district levels include:
Regional Extension Office, District Extension Offices, meteorological stations, agricultural faculty of universities, officers in charge of district BIMAS projects and agricultural cooperatives (KUD).

The O/U, on the other hand, should cooperate with officers in charge of agricultural production in the Kechamatan (town) office, Extension Workers from BPP and key farmers.

The existing FCPC presently concentrate on administrative functions. In order to include technical functions therefore, expansion of facilities has been requested including laboratories, net houses, library, equipment workshop and storage. As the FCPC are responsible for instruction and supervision of F/L within their province, and for establishment of technology at the provincial level, the proposed expansion is considered appropriate.

According to administrative division in the Government of Indonesia, the Bali FCPC has jurisdiction over not only Bali Island but also the archipalego's four provinces (Bali, East and West Nusa Tenggara, and East Timor).

3-2-4 Location of the Site

(1) Conditions in F/L Areas

Agricultural and pest infestation conditions are as tabulated in TABLE 3-3, 3-4, and 3-5 for each area (Karesidanan) in Java and Bali determined on the basis of topographical characteristics, including F/L sites. In addition, data concerning such factors as population, area, paddy area, rice production, and pest damage are tabulated for each province in TABLE 3-1 and 3-2.

(2) F/L Facilities Requested

The Government of Indonesia requested 16 F/L, one for each area (Karesidanan) covering 4-5 districts; however, based on study results, concerning topography, paddy conditions, geographical boundaries, etc., the Grobogan F/L site in Central Java, identified as a lower priority by the Government of Indonesia, was eliminated. Grobogan F/L site is too close to Pati FL site locating within 50km. F/L's distance is planned to be approximately apparted 100km from the nearest F/L site in general. Each F/L is to be located at the central part of the alloted area, as well. Of the remaining proposed 15 F/L, 7 are designated for construction of additional facilities such as Biological Laboratories or Vertebrate Laboratories. Moreover, 4 of the 7 F/L will be associate laboratories adjacent to FCPC. The scale of the remaining 8 F/L will accordingly be smaller without construction of additional laboratories. Personnel distribution will remain about the same as that for presently existing F/L.

TABLE 3-1 Conditions in 3 Java Provinces and Bali

Item	Major Rivers District	Local Subdivisions	Agriculture Conditions	Pest & Disease Conditions
West Java	Ciujung (Serang) Citarum (Karawang) Cisadane (Bogor) Citande (Tasikmalaya) Cimanuk (Indramayu)	Dry farming area in the southern high land and Paddy cultivation area in the northern plain. Five subdivisions in total.	360,000ha of plantation; coffee; rubber, copra, tea, etc. Fruit and vegetable crops also important.	Highest incidence of field rat and BPH in Indonesia. Field rat damage over 20% in northern plain. BPH most prevalent in eastern area
Central Java	Komaru (Pemalang) Progo (Temanggung, Magelang, Yogya Pro.) Tuntang (Demak) Lusi (Blora, Grobogan)	The eastern parts are divided into two sub-divisions; North & South. The western parts are divided into four; two Sub divisions each in North & South.	Few plantations. Extensive cassava cultivation vegetable crops grown near West Java and Yogyakarta	Third highest rate of Tungro next to Bali and S. Sumatra. BPH damage about 1/2 that of West Java. Field rat almost same acreage as West Java (65,000ha). Highest rate of rice blast.
East Java	Bungawan Solo (Bojonegoro) Madiun (Mediun) Brantas (Kediri, Mojokerto)	Two subdivisions by the river basins of Madiun & Bungawan Solo. Bratas River basin is divided into two parts; middle & lower basin. Three volcanic skirts in the eastern parts are divided into two.	Due to little rainfall, field crops and Palawija (field crops in paddy field) are popular. Produces 40% of corn and sweet potato, and 50% of soy beans in Indonesia. Platation area of 17,000ha.	Fewer pests and field rats than other areas. Rice blast area same as West Java (about 1,000ha). Field rat damaged area about 17,000ha.
Bali	-	Divided into two parts; North & South.	Fertile volcanic soil and abundant rainfall of 3,000mm; extensive cultivation. Migration policy due to over population. Decrease in livestock and coffee plantation.	Large, concentrate outbreak of Tungro. BPH damage rate similar to Central Java. Field rat damage less but rice blast extensive.

TABLE 3-2 Conditions in 3 Java Provinces and Bali

Item \ Province	West Java	Central Java	East Java	Bali
Population (Annual growth rate)	27,500,000 (2.66%)	28,200,000 (1.65%)	29,200,000 (1.50%)	2,470,000 (1.71%)
Labor Force	10,680,000	10,100,000	11,560,000	N.D.
Farm Labor Force	5,130,000 (48%)	5,450,000 (54%)	6,470,000 (56%)	N.D. N.D.
Area (ha)	4,460,000	3,480,000	4,790,000	560,000
Population Density (person/ha)	617	810	610	441
Farmland Area (ha)	2,800,000	2,000,000	4,000,000	400,000
Paddy Area (ha)	1,200,000	1,080,000	1,190,000	100,000
Irrigable Area (%)	75	67		N.D.
Harvested Area (ha)	1,830,000	1,450,000	1,480,000	170,000
Total Paddy Production (t)	7,770,000	6,680,000	7,150,000	740,000
Unit Yield (t/ha)	4.24	4.61	4.83	4.35
Pest Damage Area (1984) 1)				
Rice Brown Planthopper	2,566ha	1,395ha	102ha	147ha
Tungro	0	2,837ha	227ha	16,330ha
Rice Gall Midge	0.619ha	8,741ha	359ha	186ha
Rice Blast	704ha	4,847ha	869ha	1,680ha
Field Rat	65,757ha	64,967ha	17,110ha	N.D.

Note: 1) Where pest damage exceeds 25% the area is considered havily damaged according to the DFCP standards.
2) Population figures are for 1980; all others are for 1983
Source: IV Five Year Developemtn Plan and DFCP

(3) Conditions in F/L Areas

A total of 20 F/L are to be established in Java and Bali under the Project. Five of these are existing facilities while 15 will be newly constructed. Site conditions, pest damage, rice production, area conditions, number of O/U, etc. are summarized for each district in the following TABLE 3-3, 3-4 and 3-5. The district names and boundaries for the 15 F/L sites are shown in FIG. 3-1, 3-2 and 3-3.

Those F/L situated closest to the FCPC are designated as associate laboratories as follows:

F/L Site	Associate Lab Designation	Distance from Closest FCPC (km)
Cianjur	West Java FCPC	55
Temanggung	Central Java FCPC	50
Mojokerto	East Java FCPC	55
Gianyar	Bali FCPC	11

At present, Pest Observers utilize the office facilities of the BPP for observation activities as there are few existing O/U facilities. As BPP facilities and administrative capacity are well developed, establishment of separate O/U facilities at this time does not appear to be necessary. Accordingly establishment of the same is considered to be under the jurisdiction of the Government of Indonesia rather than grant aid.

TABLE 3-3 Conditions in West Java FL Area

No.	Location	District	No. of OU	Conditions	Harvested Area (ha)	Paddy Production Production (t)	Yield (t/ha)	Pest Damage	Situation of FL	FL Comments
1.	Karawang	Bekasi Karawang Subang Purwakarta	12 12 11 5 40	- Main area: Karawang plain irrigated by Jatiluhur Dam - Cisadane, IR36 varieties - Much use of fertilizers and agro-chemicals - Collective pest control easy; but, danger of outbreak	460,000	2,110,000	4.6	- Extensive damage in urbanized Bukasi - Rat 20% - BPH 19% Tropical Rice Bug 17%	- Jatisari/Karawang FL is situated on the east end of Karawang District. Karawan plain (190,000ha of paddy) and Subang plain (150,000ha of paddy)	- Existing
2.	Serang	Pandegelang Serang Lebak Tanggerang	13 10 11 11 45	- Incomplete irrigation on the Ciujung river-basin - Low level of farming technology - Flood and drought damage - Mostly single cropping in rainfed paddy field	260,000	990,000	3.8	- Highest rate of damaged area in West Java - BPH 32% Rat 19% Army Worm 24% -	- Serang FL site has such facilities as schools, mosque, etc., including 100ha of District paddy farm - District Extension Office and Agr. Univ. within 10km	- Planning
3.	Cianjur	Bogor Sukabumi Cianjur	11 17 12 40	- Advanced farming practices - Famous for Cianjur rice - Vegetable crops also famous - Round-year rice cropping about 10% of total	270,000	1,070,000	4.0	- Heavy damage in Sakubumi - BPH 18% Rat 17% Rice Gall Midge 16%	- Cianjur FL site is situated on Cihea farm. - Cihea is Agr. Dep. Complex with BLPP, Machinery Center, BPP, etc.	- Planning - Biological laboratory to be included - FCPC associated FL
4.	Tasikmalaya	Bandung Grant Tasikmalaya Ciamis Sumedung	12 11 10 16 8 57	- Covering five mountainous districts situated south-east of Bandung - Dry field rice of 50,000ha - Livestock and vegetable crops common	440,000	1,700,000	3.9	- High rate of damage in Tasikmalaya and Grant - BPH 23% - Rat 17% - Army Worm 18%	- Tasikmalaya FL site is situated in the center the five Districts - Next to BPP & Seed center - Proposed FL field is 50m from the district road	- Planning
5.	Indramayu	Indramayu Majalengka Kuningan Cirebon	13 10 6 8 37	- Covering lowland plain in the north-east part of West Java, - Indramayu District accounts for 50% of paddy field area and rice production, but with low yield because of field rat damage	400,000	1,790,000	4.5	- Extensive damage in Cirebon plain - Rat 22% - BPH 23% - Army Worm 14%	- Indramayu FL site is at the end of the Univ. Campas 12km from the District Extension Office - The Univ. can also utilize FL facilities	- Planning - Vertebrate laboratory to be included

No.	Location	District	No. of OU	
1.	Karawang	Bekasi	12	
		Karawang	12	
		Subang	11	
		Purwakarta	5	
				40
2.	Serang	Pandegelang	13	
		Serang	10	
		Lebak	11	
		Tanggerang	11	
				45
3.	Cianjur	Bogor	11	
		Sukabumi	17	
		Cianjur	12	
				40
4.	Tasikmalaya	Bandung	12	
		Grant	11	
		Tasikmalaya	10	
		Ciamis	16	
		Sumedung	8	
				57
5.	Indramayu	Indramayu	13	
		Majalengka	10	
		Kuningan	6	
		Cirebon	8	
				37

★ PFC

■ FCPC

● PLANNING FL

○ EXISTING FL

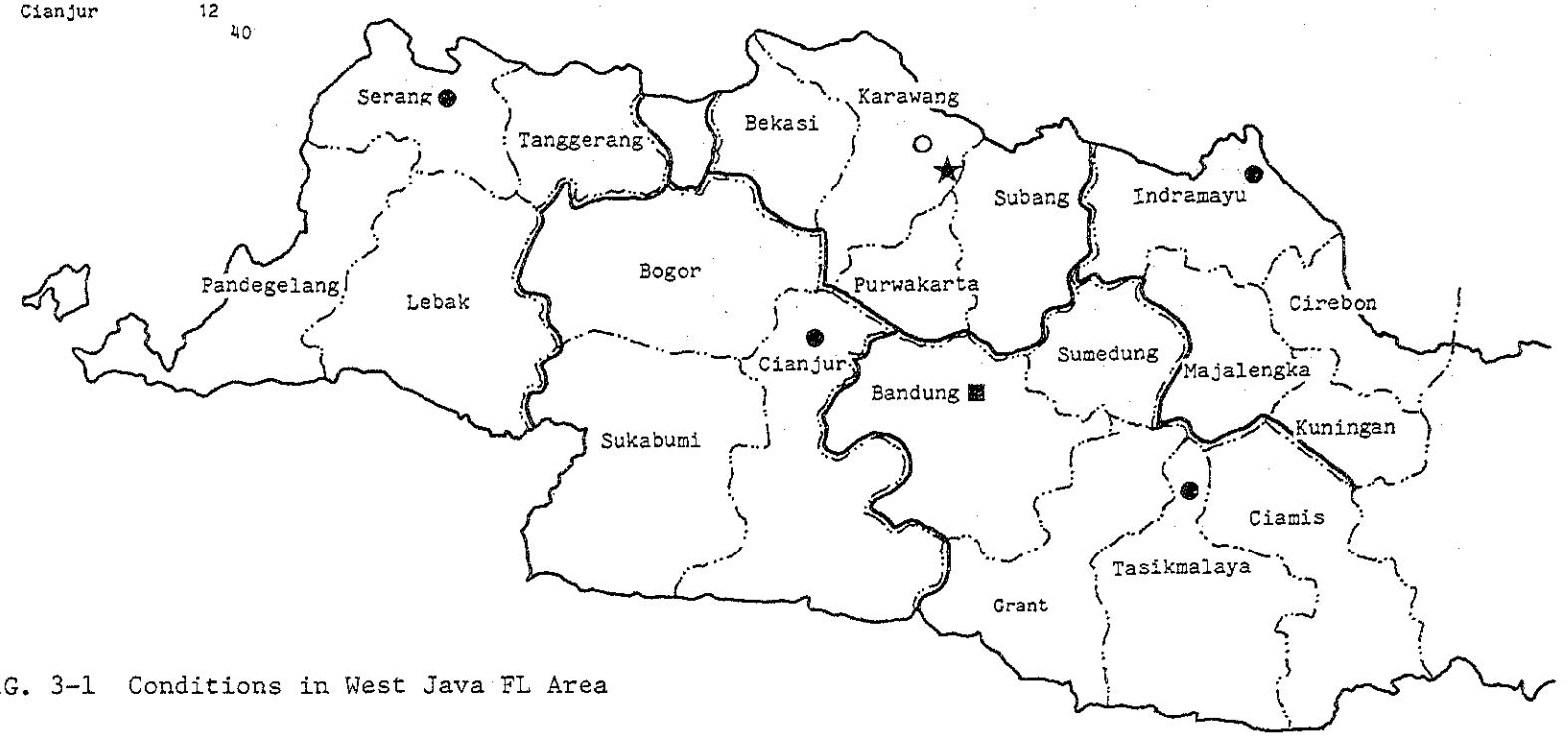


FIG. 3-1 Conditions in West Java FL Area

TABLE 3-4 Conditions in Central Java FL Area

No.	Location	District	No. of OU	Conditions	Harvested Area (ha)	Paddy Production Production (t)	Yield (t/ha)	Pest Damage	Situation of FL	FL Comments
1.	Pemalang	Brebes Tegal Pamalang Pekalongan Batang	6 6 5 4 4 25	- Vegetable crops are popular in the area near West Java; Brebes and Tegal. - Pekalongan and Batang are included in Semarang marketing area, situated east of Komaru River	240,000	1,080,000	4.5	- Pemalang: extensive Army Worm, Stemborer and field rat damage - Brebes: BPH (37,000ha) - Batang: Tungro	- FL site in center of the area - Pest occurence in Pemalan is the highest throughout the Province	- Existing
2.	Pati	Jepara Kudus Pati Rembang Blora Demak Grobogan	3 3 5 4 4 4 5 28	- East side of Semarang, plain along Lusi an Juono Rivers. - Yield is low due to bad soil, but largest paddy area in Central Java. - Cassava is popular	360,000	1,310,000	3.6	- Grobogan & Pati: Stemborer (5,000ha) and field rat (3,000ha) - Little damage in other district - Pati: Tungro - Rice Blast in all districts	- Pati has the most extensive-Tungro, Stemborer, rat, Army Worm and Rice Blast damage.	- Planned
3.	Sukoharjo	Klaten Boyolali Wanogiri Karanganyar Sragen Sukoharjo	5 5 6 5 5 4 30	- Inland marketing area centered in Srakarta (Solo) city, Bungawan Solo. - Another cultural center is Yogyakarta - Paddy yield is the best of all	290,000	1,360,000	4.7	- Sukoharjo, Boyalali & Klaten: Stemborer (6,000ha) - Klaten: Tungro - Sukoharjo: Rice Blast - Wonogiri & Sragen: light damage	- The suburb of Srakarta city - Located the center of the area - Sukoharjo is much damaged by rat, Army Worm, Rice Blast, etc.	- Planned
4.	Temanggung	Wonosobo Temanggung Magelang Kendal Semarang	5 4 4 5 3 21	- Upper basin of Progo River - Kendal and Semalan are near - Mostly volcanic skirts - Smallest paddy area in Central Java	180,000	740,000	4.1	- Temanggung, Semarang & Wonosobo: field rat (2,000-4,000ha each) - Kendal & Magelang: Stemborer (1,000ha each)	- Located in the area between the plain of Kendal & Smarang & the hillside of Megelang - Heavily damaged by rats	- Planned - Vertebrate laboratory included - FCPC associated FL
5.	Banyumas	Cilacap Banyumas Purbalingga Banjarnegara Kebumen	5 7 4 5 6 27	- Southwest part of Central Java - Inland hillside area in Banyumas, Purbalingga and Banjarnegara - Cilacap and Kebumen are situated on the coastal plain	260,000	1,190,000	4.6	- Cilacap: Stemborer (6,500ha) - Other districts: 1,000ha-2,000ha of Stemborer - Purbalingga: field rat (6,000ha) - Kebumen: light damage	- Located in the center - Damage of rat and Army Worm in the inland area is heavier than that of Stemborer in the coastal plain	- Planned - Biological laboratory included
6.	Bantul	Purwarejo Progo Sleman Bantul Kidul	4 3 4 4 4 19	- Four districts, except for Purwarejo, belong to Yogyakarta Special Province - Bantul is in the lower basin of Progo River - Mostly small landholders with low yield	140,000	550,000	3.9	- BHP 200ha - Tungro 600ha - Field rat 2,000ha	- Located in the center - The most concentrated paddy field area	- Planned

existing 148
planning 150

No.	Location	District	No. of OU
1.	Pemalang	Brebes	6
		Tegal	6
		Pamalang	5
		Pekalongan	4
		Batang	4
			25
2.	Pati	Jepara	3
		Kudus	3
		Pati	5
		Rembang	4
		Blora	4
		Demak	4
		Grobogan	5
			28
3.	Sukoharjo	Klaten	5
		Boyolali	5
		Wanogiri	6
		Karanganyar	5
		Sragen	5
		Sukoharjo	4
			30
4.	Temanggung	Wanosobo	5
		Temanggung	4
		Magelang	4
		Kendal	5
		Semarang	3
			21
5.	Banyumas	Cilacap	5
		Banyumas	7
		Purbalingga	4
		Banjarnegara	5
		Kebumen	6
			27
6.	Bantul	Purwarejo	4
		Progo	3
		Sleman	4
		Bantul	4
		Kidul	4
			19

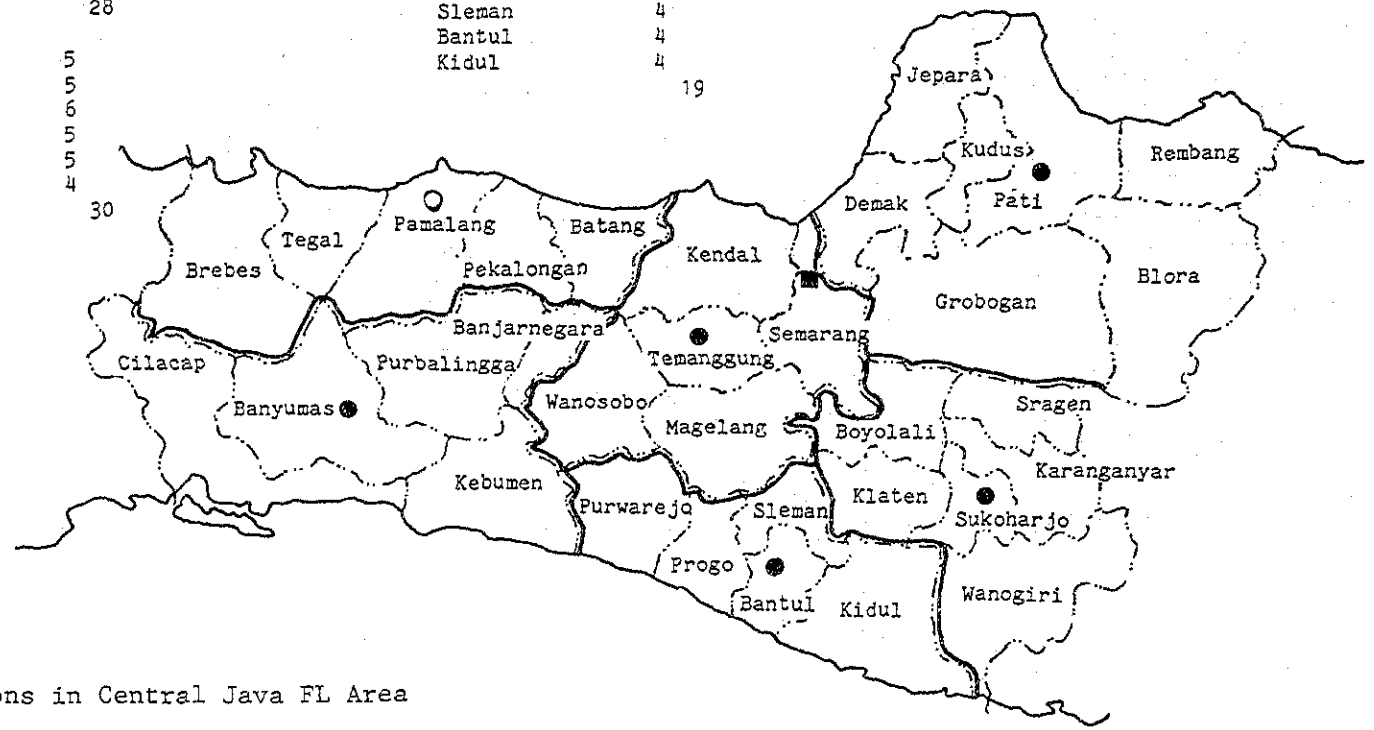


FIG. 3-2 Conditions in Central Java FL Area

TABLE 3-5 Conditions in East Java and Bali FL Area

No.	Location	District	No. of OU	Conditions	Harvested Area (ha)	Paddy Production Production (t)	Yield (t/ha)	Pest Damage	Situation of FL	FL Comments
1.	Jember	Jember Bondoweso Situbondo Banyuwangi	10 6 5 15 36	- Two volcanic skirts in the east end of Java island Southern plain is large. - Largest area and paddy Production	310,000	1,580,000	5.1	- Situbondo: Plenty of Stemborer, grass leaf roller and Rice Blast Jember; Rice Blast and leaf spot	- Located in the center of the area - Situated inland	- Existing
2.	Pasuruan	Malang Lumajang Probolinggo Pasuruan	8 6 6 7 27	- Paddy field - Rather low temperature	240,000	1,210,000	5.0	- Lumajang: Extensive damage of Rice Blast, leaf spot and field rat	- Extensive damage near Lumajen district	- Planned - Biological laboratory
3.	Tuban	Tuban Bojonegoro Lamongan	8 9 8 25	- Gentle hillside area in general - Many coppices - Low paddy yield due to minimal rainfall	230,000	960,000	4.2	- Lamongan: Extensive damage particularly of field rat	- Near Bojonero - Situated at Senori, inland hillside town	- Existing
4.	Meduin	Nagawi Magetan Mediun Pacitan Ponorogo	5 4 5 7 6 27	- Medium river basin, upper basin of Bungawan Solo, and coastal plain in the south. - Self-supporting farms in each valley	230,000	1,180,000	5.1	- Panorogo & Ngawi: Plenty of Stemborer - Generally minimal rat	- Medium is the center of transportation culture in the area	- Planned
5.	Tulungagung	Trengalek Tulungagung Kediri Nganjuk Blitar	5 5 9 6 7 32	- Fertile soil in the central basic of the Brantas River - Palawija such as Kediri beans (Soy beans) is populer - Paddy yield is the best in the province	200,000	1,080,000	5.4	- Blitar & Tulungagun: Stemborer - Tulungagun: leaf spot - Nganjuk & Treggalek: grass leaf roller	- In center of the area - Tulungagung is more heavily damaged than any other district	- Existing
6.	Mojokerto	Jambang Mojokerto Sidoarjo Gresik	9 6 4 5 24	- Lower basin of the Brantas - Sidoarjo & Gresik are lowland areas - Mojokerto, an ancient Hindu city, shows high level culture and dense roadways	180,000	930,000	5.2	- Sidoarjo: Stemborer and field rat Gresik: BPH	- Mojokert is located in the area between the lowland plain and hillside valley Mojokerto has many kinds of pest and disease	- Planned - Vertebrate laboratory - FCPC asso. Fl.
7.	Pamekasan	Bankalan Sampang Pamekasan Sumenep	5 5 5 6 21	- Lettle rainfall, lettle irrigation and bad soil conditions - Lowest paddy yield - Plenty of dry field	100,000	310,000	3.1	- Bangkalan: The most extensive damaged area in Madura - Sampang: the second highest rate of damage	- Pamekasan is the capital district in Madure island - Easy to hold meetings as transportation convenient.	- Planned
1.	Cianjang	Klungkung Jembrana Tabanan Bandung Cianjang	2 2 5 4 3 16	- Four volcanoes of around 2,000m in the center of the island - Most rivers runs north or south	170,000	740,000	4.4	- Tungro damage: 1,600ha - Rice Blast: 1,680ha - BPH: 147ha	- Larger Tungro damage	- Planned - Biological laboratory - FCPC asso. Fl.
2.	Bulelengi	Buleleng Bangli Karangasen	5 3 3 11	- Three roads running from south to north - Dense roadways in southern area					- Situated in the suburbs of Singaraja, the largest town in the northern area of Bali Island	- Planned

■ FCPC

● PLANNED FL

○ EXISTING FL

No.	Location	District	No. of OU
1.	Jember	Jember	10
		Bondoweso	6
		Situbondo	5
		Banyuwangi	15
			36
2.	Pasuruan	Malang	8
		Lumajang	6
		Probolinggo	6
		Pasuruan	7
			27
3.	Tuban	Tuban	8
		Bojonegoro	9
		Lamongan	8
			25
4.	Mediun	Nagawi	5
		Magetan	4
		Mediun	5
		Pacitan	7
		Ponorogo	6
			27
5.	Tulungagung	Trengalek	5
		Tulungagung	5
		Kediri	9
		Nganjuk	6
		Blitar	7
			32
6.	Mojokerto	Jambang	9
		Mojokerto	6
		Sidoarjo	4
		Gresik	5
			24
7.	Pamekasan	Bankalan	5
		Sampang	5
		Pamekasan	5
		Sumenep	6
			21

No.	Location	District	No. of OU
1.	Gianyar	Klungkung	2
		Jembrana	2
		Tabanan	5
		Ba dung	4
		Gianyar	3
			16
2.	Buleleng	Buleleng	5
		Bangli	3
		Karangasen	3
			11

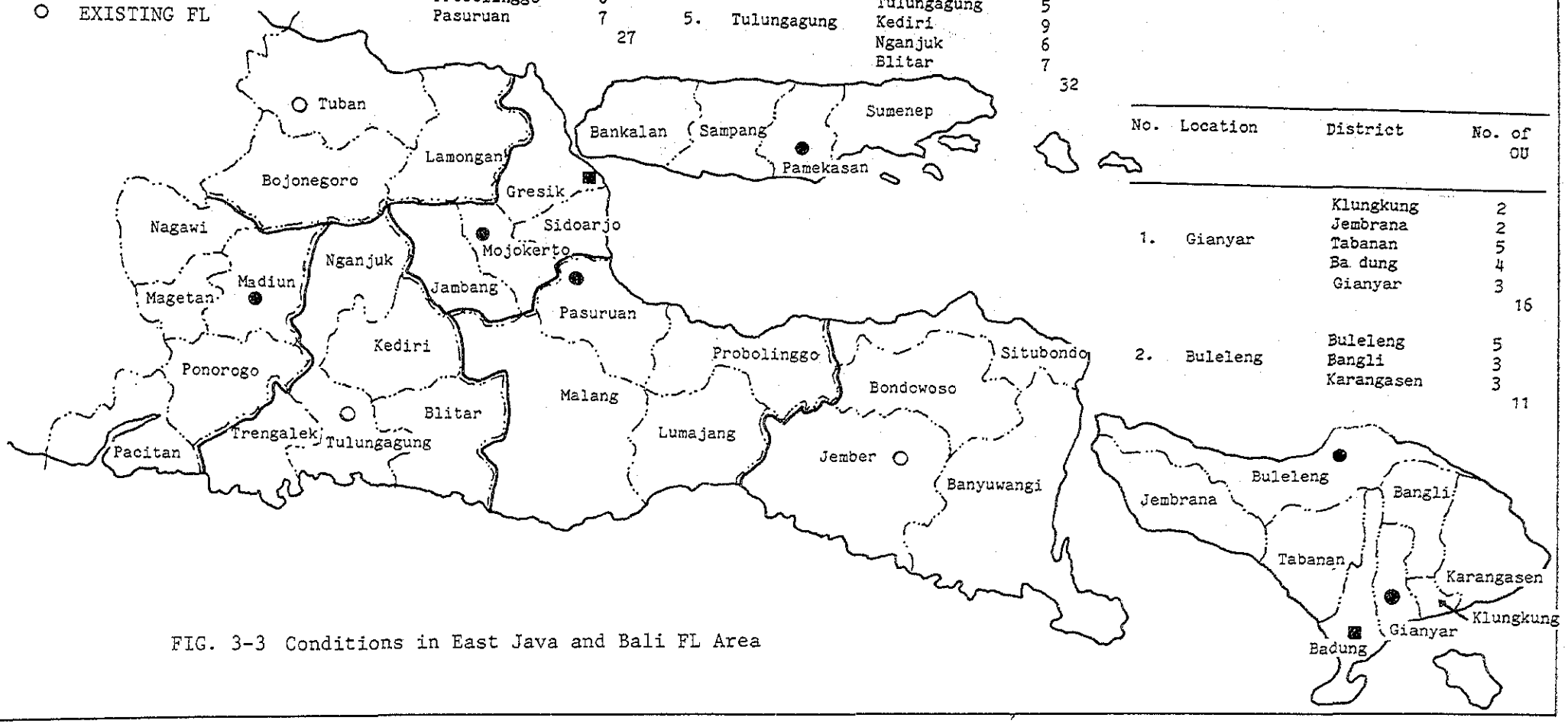


FIG. 3-3 Conditions in East Java and Bali FL Area

3-2-5 Facilities for Education and Training

DFCP and PFC will undertake training and education of technical staff for the FCPC, F/L etc.

Total proposed number of FCPC technical staff in Indonesia is approximately 230 while that of F/L staff is 510; however, if training is limited to the directors and section chiefs of each institution, the total number of trainees amounts to 220 (80 FCPC staff and 140 F/L staff). In order to finish staff training within a five year period, 40 staff must be trained each year; and, if each training period is designated as 6 months, capacity of training and dormitory facilities should be designed for 20 people.

The trainees in this program will in turn instruct the staff of their respective institutions, conducting regular supervisory patrols and holding periodic meetings.

The present training system for O/U Pest Observers will be continued, however, the level of training will be improved through the education of FCPC technical staff who become instructors at the BLPP.

3-2-6 Materials and Equipment Requested

1) Items Deleted from the Request

The majority of materials requested were considered necessary and acceptable for provision under grant aid. Those items which fell into the following criteria however, were considered inappropriate for provision and therefore deleted:

a) items for which existing equipment has sufficient quantity
b) items of inappropriate technical level
c) items which have already been provided under ATA-162 and 1984 grant aid assistance
d) items which should be provided by the Government of Indonesia

The list of requested items was reviewed in accordance with the above criteria and items which were judged inappropriate for each facility are listed below.

PFC

a) Plowing tractor (4 wheels), motorcycle

b) Transplanter, harvester, office computer, compound microscope

c) Vehicles

d) Lab. coats, traps, small bore rifle, portable typewriter, small calculator, fans interphone set, office desk and chair, library desk and chair, cash box, white boad, etc.

FCPC

a) Existing office equipment such as manual typewriter, small calculator, fans, etc., jeep

b) High grade monocular microscope

c) Microscopes, microsyringe, Ripening measure, miniature thresher, inoculator, desicator, numbering, insect specimen cabinet, photo copy, stencil machine, rex rotary machine, OHP, projectors, camera,

d) Small bore rifle, office equipment such as cash box, fans, etc., boards, sweep nets, insect boxes, spring balance (100k), insect pins, etc.

FL

a) -

b) Personal computer, jeep, telephone, small bore rifle, compound microscope, freezer, oven, blender, laminar flow hood,

c) -

d) Office equipment such as cash box, fan, boads, kitchen equipment, etc., laboratory furniture such as side benches, stools, cabinets, shelves, etc., glass house table & chairs,

cages, pots, aspirator, roupe, pins, sweep nets, balance (10k, 100k, chemical), corks, lab. coat, gloves, rats traps, small calculator, insect storage box, etc.

2) Additional Items or Alterations

Materials or equipment which were not listed in the request but, in consideration of facility functions and study results, were judged to be required or in need of alteration, are listed in the following table along with the reason for inclusion.

No. Equipment	Reason for Addition or Alteration	Proposed Facility
1. Facsimille	For rapid communication with each FCPC in emergency; essential for establishment of centrally organized national information network.	DFCP & PFC
2. Microscope	For training of FCPC, F/L and other technical staff. To be placed in seminar room.	PFC
3. Specimen making tools set	- do. - (for preparation of actual specimens)	PFC
4. Dissection set	- do. - (for experiments on rats, etc.)	PFC
5. Wireless telephone SSBR	Required for emergency response to sudden pest outbreak; between FCPC and FL.	FCPC & FL

3) Quantity of Each Item

The number requested for each item is considered appropriate in most cases; however, the number of consumable materials, etc. which is judged to be excessive will be reduced and the appropriate number estimated to be required in the first stage will be provided. The number of vehicles and personal computers, which were considered excessive, is reviewed hereunder.

Vehicles

PFC	Mobile labo.	Micro-bus	Pick-up	Jeep	Motorcycle
Requested	1	1	0	2	4
Existing	0	0	1 (FL)	0	14 (FL)
ATA-162	1	3	0	9	30

Vehicles requested for the PFC will be provided from the vehicles of the existing DFCP and Jatisari F/L supplied under ATA-162 and therefore the same will be deleted from the present request.

FCPC	Mobile labo.	Pick-up	Jeep	Motorcycle
Requested	1	1	2	4
Existing				
- Bandung	0	1	1	8
- Semarang	0	0	1	0
- Surabaya	0	0	3	3
- Denpasar	0	0	1	0

As jeeps have already been distributed to the FCPC, they will be deleted from the request. One mobile laboratory and pickup truck and about 3 motorcycles are considered necessary in view of the FCPC's experimental function. As a result of the above review, one mobile laboratory per FCPC, one pickup truck each for Semarang, Surabaya and Denpasar FCPC, and 3 motorcycles each for Semarang and Denpasar FCPC are considered the maximum number of vehicles to be provided to FCPC under the Project.

FL	Jeep	Mobile labo.	Motorcycle
Requested	1	1	2

One mobile labo. was judged to be provided for F/L, as it is considered to be used for transport of fertilizer, agrochemicals and other inputs as well as of produce from the F/L experimental paddy field. In the case of motorcycles, as there are 3 sections of the F/L and each section is independently functioned, one motorcycle will be allotted to each section for a total of 3 motorcycles.

Although one motorcycle was requested for each O/U, 428 of the existing 557 O/U already own motorcycles and therefore the number to be provided under grant aid for the present Project was reduced to 129.

Personal Computer

One personal computer was requested for the PFC, five for the FCPC and one for the FL; the latter however, was deleted as aforementioned.

As for the PFC, two computers were considered necessary; one for statistical management for the pest laboratory and one for training and research. The extra computer was allotted in place of the requested office computer which was deleted. Although the DFCP computer room will be the center of training in computer activities, it is preferable to install an additional computer for training purpose in the PFC adjacent to the FCPC researchers dormitory.

Although 5 computers were requested for FCPC, one is considered sufficient in view of the fact that even in West Java, which has the heaviest statistical data output, only about 200 observation data tables are produced requiring only one or two days for input. As floppy discs will be provided at the PFC/DFCP, typists will also be able to input data. Analysis of statistical data and supervision of input however, will be undertaken by technical staff from the statistical department who have been trained at the PFC.

3-3 PROJECT OUTLINE

3-3-1 Basic Concept of Facility Functions

The two priorities in development of an organizational system which will promote the technical and administrative functions of each type of facility are:

1) strengthening of pest monitoring technology; and,
2) development of forecasting and control technology.

(1) Strengthening of Pest Monitoring Technology

The smallest but most important functional unit of the forecasting system is the Pest Observer. The F/L and FCPC must strengthen the surveillance and monitoring system through instruction in observation techniques in addition to study of observation items, methods and period. In the case of heavily contaminated areas, sampling reports on specific field data concerning specific pests and/or diseases should be collected and close monitoring should be carried out by farmers and Extension Workers.

At present there is no standard system in use for observation, surveillance methods or monitoring techniques. Major pests and diseases at each level - regional, provincial and national - should be clearly identified and monitoring and surveillance should be restricted to these designated species in order to develop the level of specific technology. These designated species should be reviewed annually at each level and adjusted when necessary. In this way, geographical analysis of yield loss conditions and damaged areas on the basis of annual changes in distribution patterns of designated species would be facilitated.

The present emphasis on damaged area should also be shifted to practically useful reports on numerical populations of pests in relation to cultural practices and growing stages, as well as to monitoring and estimation of yield loss in the harvest season. For effective use, forecasting techniques must include projections of both possible pest outbreaks and of

yield loss. The DFCP or FCPC should estimate yield loss, undertake an integrated study of the same with monitoring data collected from farmers and Extension Workers through the F/L and O/U, and establish standards for estimation.

(2) Development of Forecasting and Control Technology

The PFC should thoroughly train FCPC and F/L staff in the theory and practice of pest forecasting and control technology. Study of the designated species at the national and provincial levels, as well as a special study at lower levels from the district level down is considered the most effective basis for forecasting and control.

In development of technology, the first step is establishment of a forecasting unit. Forecasting activities should ideally be conducted in every observation area; however, in the case of guidance and instruction on agricultural production, the District Extension Office is the most effective implementing agency. Accordingly, the district level is considered the most effective forecasting unit for the Project including Pest Brigade activities, collection of forecast information and forecast map formulation. Forecast information will be compiled by a representative (presently known as coordinator) of Pest Observers at the district level, in cooperation with the F/L and in association with the Crop Protection Section of the District Extension Office.

The next step in technology development is identification of major pest species. In some areas, paddy is cultivated year-round and often several seed varieties are used in the same location. Accordingly, observation must be clearly limited to varieties which are susceptible to specific pests or diseases and to the date of rice transplanting in order to ensure accurate data for forecasting. Furthermore, collection of data from the district or nearest meteorological station concerning weather conditions, particularly rainfall, is another prerequisite for accurate forecasting. The PFC should prepare a manual which will provide a standard defining the relationship between weather conditions and the prevalence of a specific pest or disease.

Information and observation data on common rice varieties and cultivation practices for each district in relation to a specific disease will mainly be obtained by the F/L along with results of tests in the experimental field. The FCPC will compile this data and issue information or warnings to the District Extension Office. They should also take measures for timely distribution of pesticides and equipment required for pest control. Accurate yield loss forecasting and evaluation of forecasting techniques can be achieved through successive surveys and collection of data.

To ensure the success of the forecasting and control system with the above functions, basic forecasting and control techniques (including statistical methods) must be studied at the PFC. Once practical forecasting measures have been established, the FCPC in each district should establish methods based on these measures using locally applicable data and at the same time field experiments should be conducted at the F/L to demonstrate the same. Forecasting technology should then be reconfirmed at the FCPC. It is important that this process become a routine for repeated implementation. The basic concept of the above functions is presented in TABLE 3-6.

TABLE 3-6 Basic Concept of Facility Functions

Strengthening of Technology	System	Items to be Identified	Items to be strengthened in F/L, O/U	Functional Role of PFC-DFCP, FCPC
(1) Pest Surveillance and Monitoring Technology	Surveillance System O/U → F/L → FCPC Weekly Report Instructed by DFCP-PFC Basic technology studied by PFC	Designated Pest Nation/Provicen/FL area/ District Yield Loss Ratio FCPC review (Provincial Ag. Ex. Service) Pest forecasting and control techniques	Restricted Surveillance O/U (Rice variety, Cropping technology) O/U → F/L Monitoring Practical Experiment F/L Practical data on yield loss Experiments on chemical dosage and integrated pest control	Establishment of Special Surveillance Tech. For designated pest DFCP/PFC FCPC Establishment of Standards for Estimation of yield loss ratio DFCP/PFC FCPC Training & Instruction PFC → FCPC, F/L
(2) Pest Forecasting and Control Technology	PFC: Technical Training FCPC: Application of PFC techniques at the provincial level Instruction of F/L Designation of Restricted F/L area and/or districts F/L: Technological Development Tests Demonstrative field experiments	Forecasting Unit District level (To be started from districts with F/L) F/L: Regional Map. Pest prevalence map Rice varieties Cropping calendar other technical items Forecasting of designated pest by restricted rice variety and month of harvest Forecasting Conditions Related to rainfall	F/L: Cooperation with District Agricultural Office Monitoring from PPL (Agr. Extension Worker) O/U District Coordinator Data from—District Agr. office Date from—Meteorological station	FCPC: Cooperation with Provincial Agricultural Service Preparation of Pesticide and Equipment for pest control. Estimation of Yield Loss Yield Loss Monitoring (O/U, F/L) PFC: Establishement of basic thery and techniques in Forecasting Technology FCPC: Planning of F/L experiments and collection of Data. Confirming experiments in CPC