THE REPUBLIC OF INDONESIA

MINISTRY OF AGRICULTURE

THE STUDY ON IMPROVEMENT OF RICE POST HARVEST AND MARKETING IN FARMER GROUPS

MAIN REPORT

OCTOBER, 1989

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

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PREFACE

In response to a request from the Government of the Republic of Indonesia, the Japanese Government decided to conduct a survey on Improvement of Rice Post Harvest and Marketing in Farmer Groups Project and has entrusted the survey to Japan International Cooperation Agency (JICA).

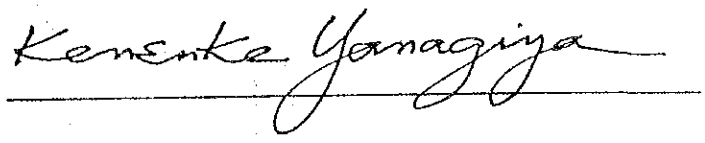
JICA sent to the Republic of Indonesia a survey team headed by Mr. Masashi Shono from November 29, 1988 to September 14, 1989.

The team held discussions with the officials concerned of the Government of the Republic of Indonesia and conducted a field survey in East Java, West Java, South Sulawesi and Lampung. After the team returned to Japan, further studies were made and the present report has been prepared.

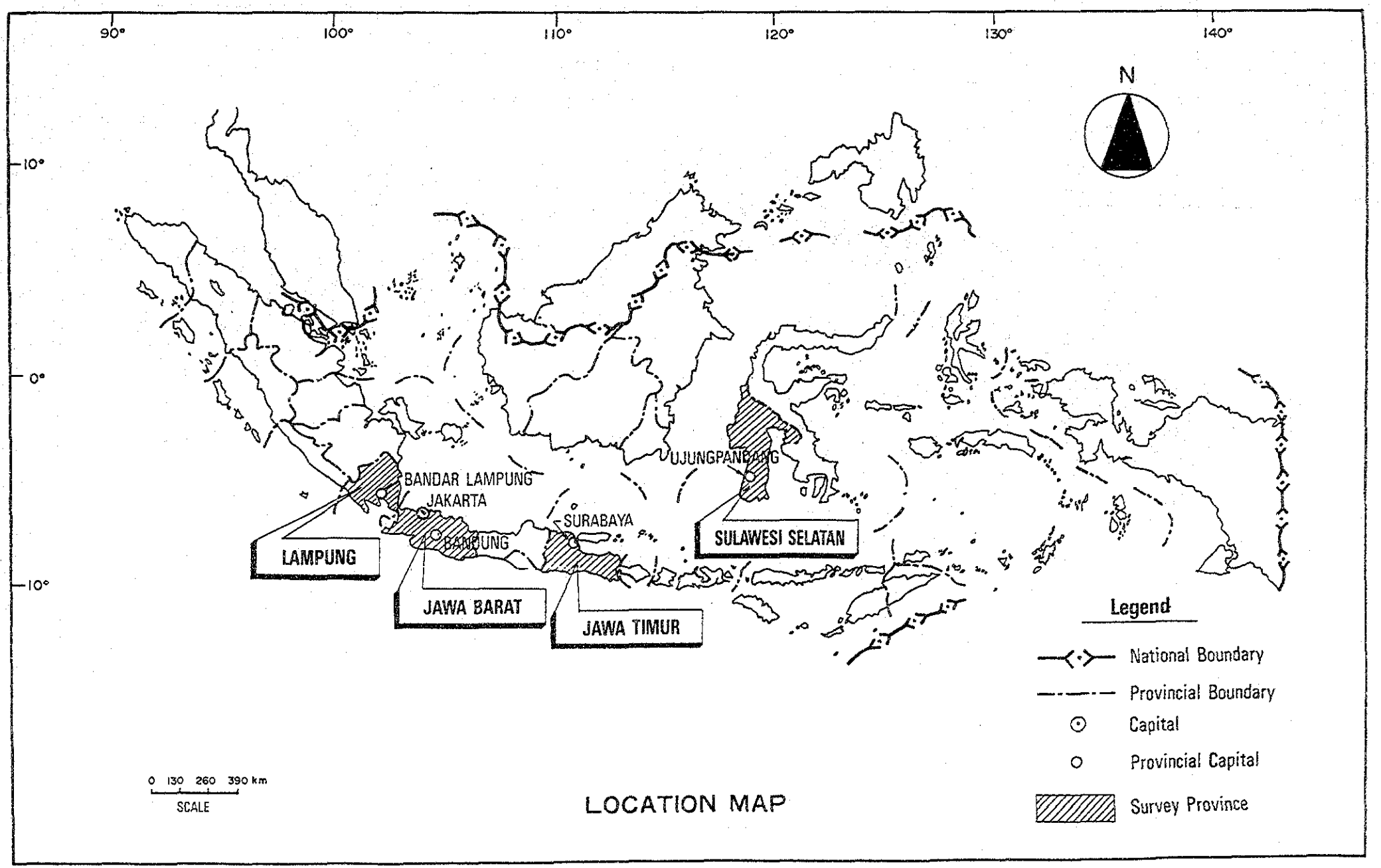
I hope that this report will contribute to the development of the Project and to the promotion of friendly relations between our two countries.

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.

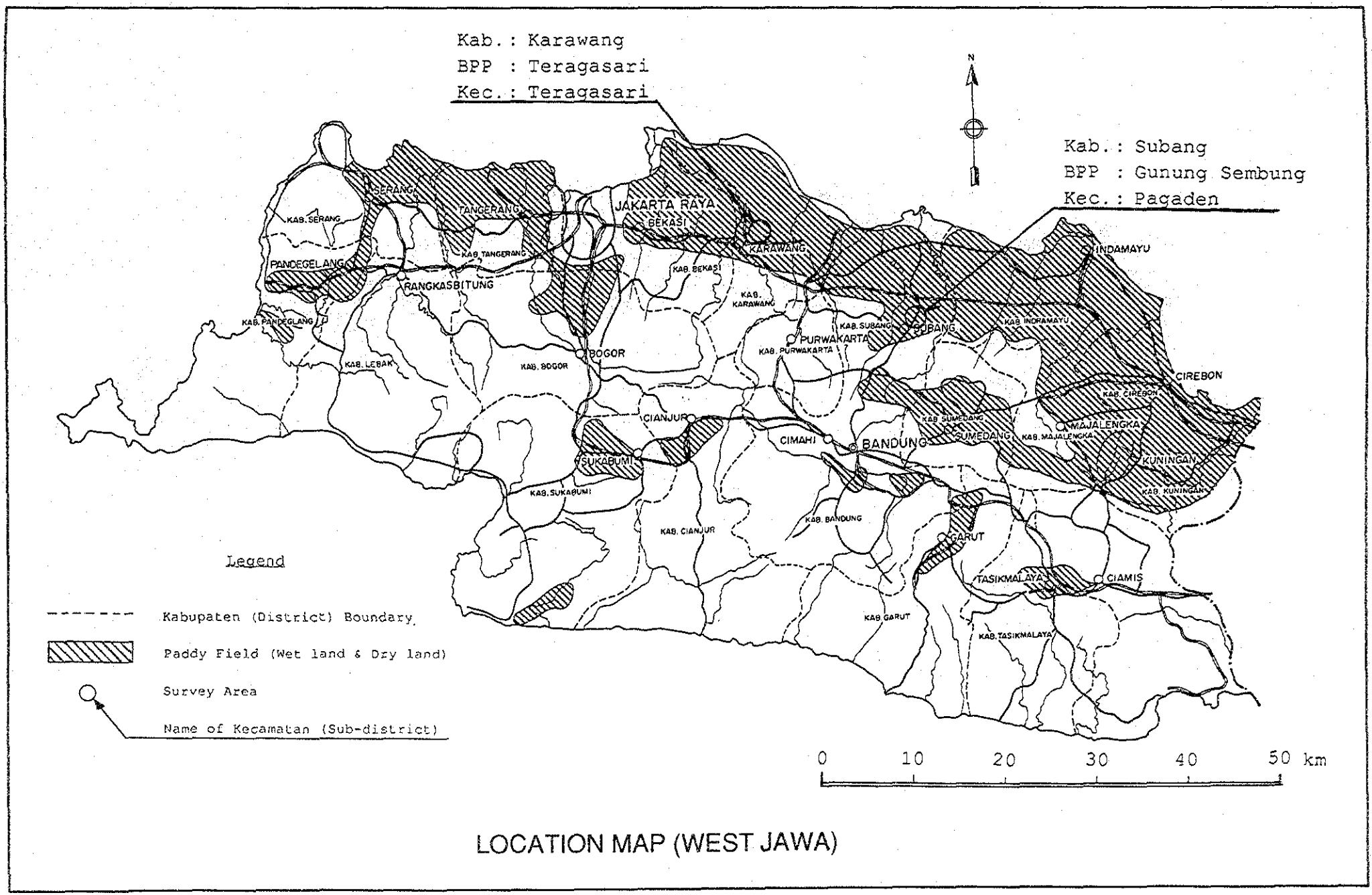
October, 1989



Kensuke Yanagiya
President
Japan International Cooperation Agency

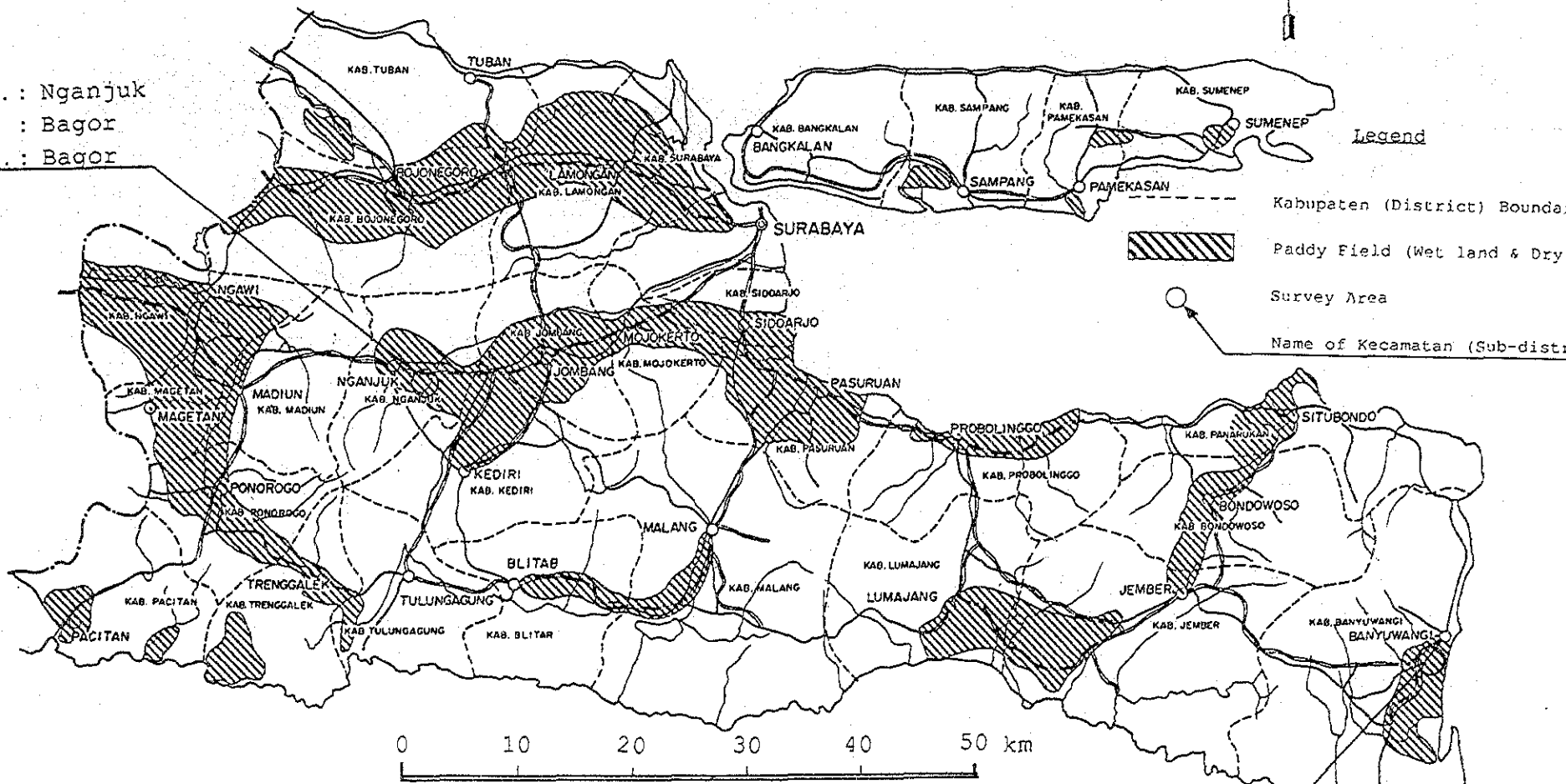


LOCATION MAP



LOCATION MAP (WEST JAWA)

Kab. : Nganjuk
BPP : Bagor
Kec. : Bagor



Legend

Kabupaten (District) Boundary

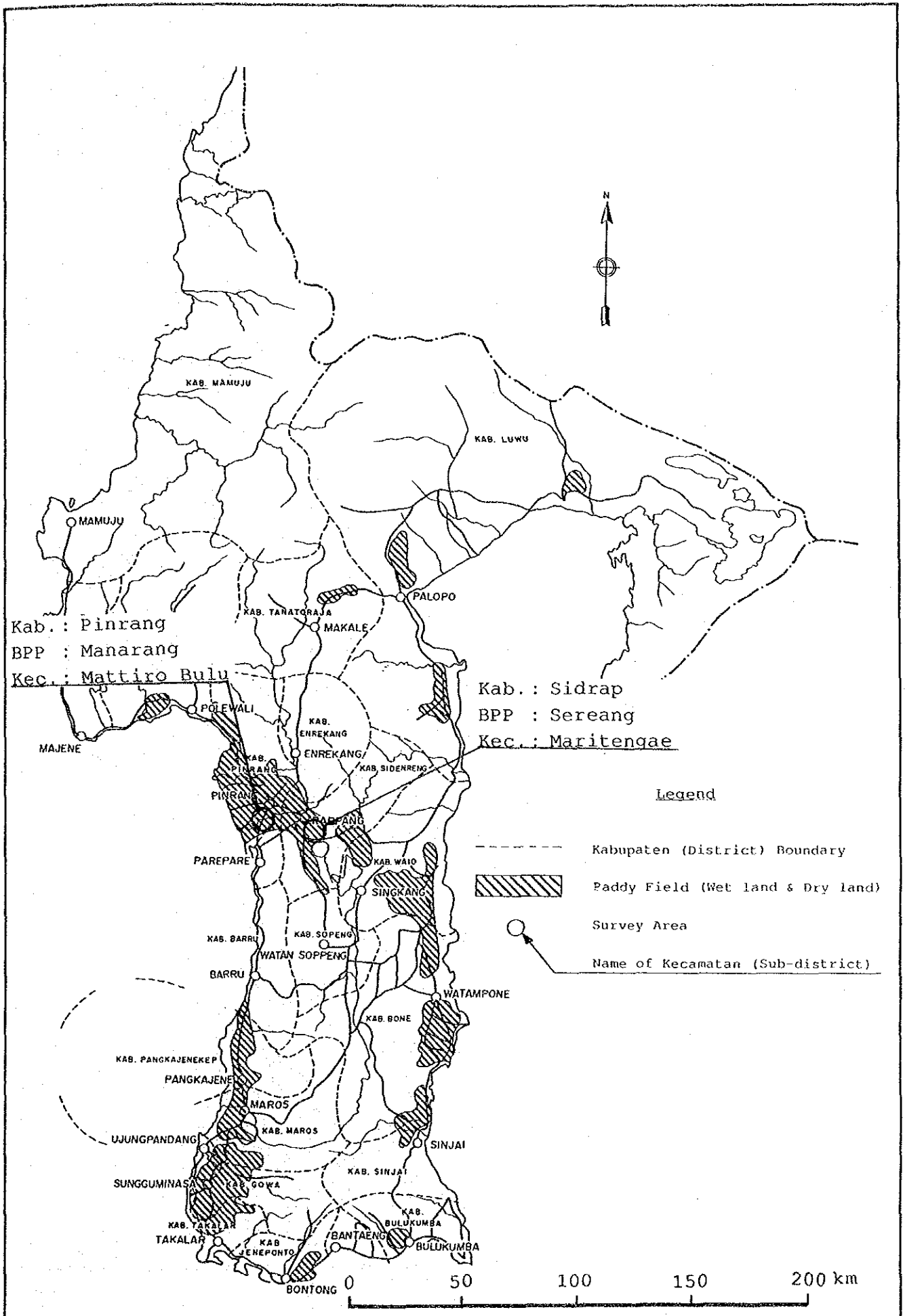
Paddy Field (Wet land & Dry land)

Survey Area

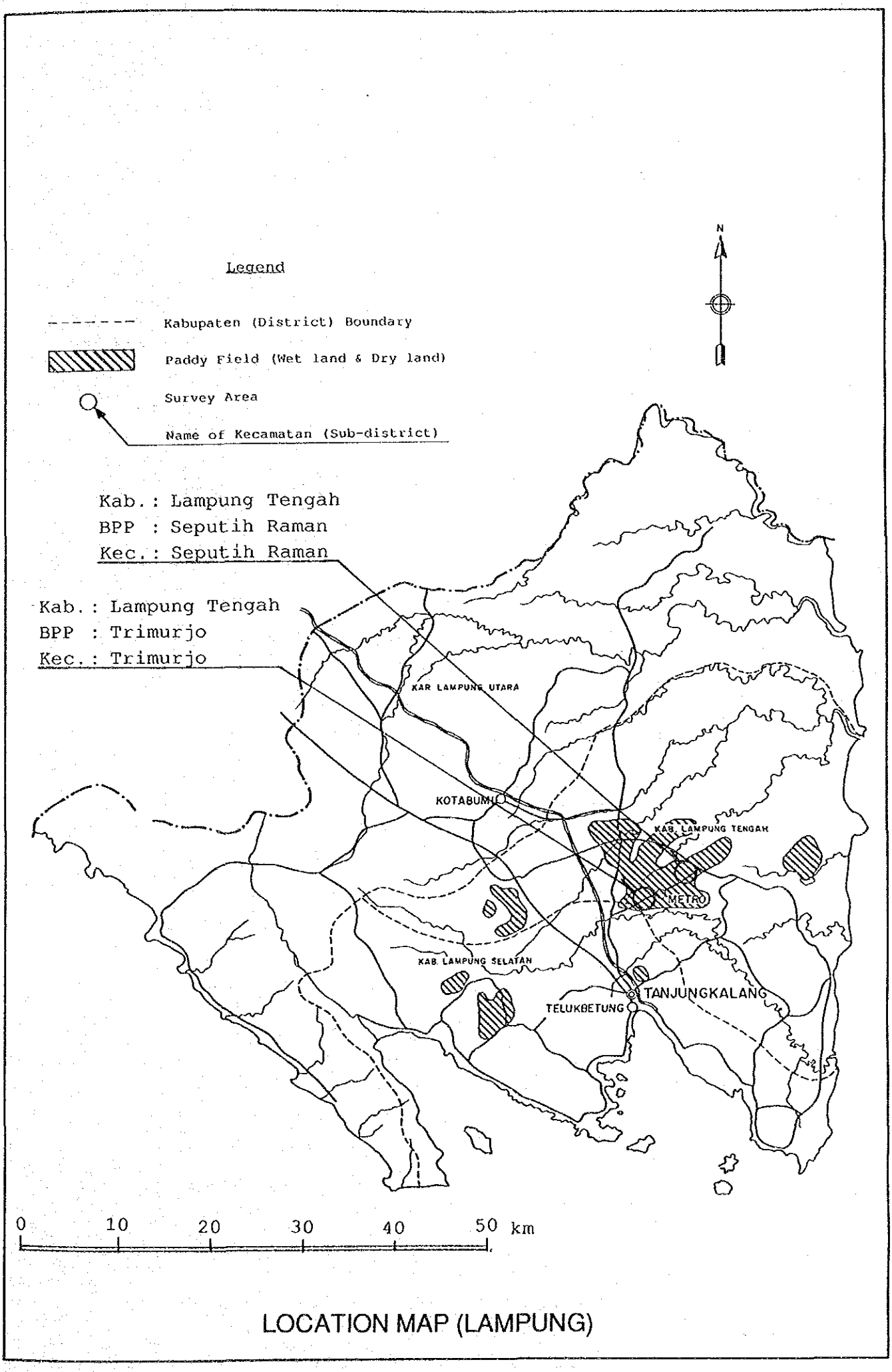
Name of Kecamatan (Sub-district)

Kab. : Banyuwangi
BPP : Rogojampi
Kec. : Rogojampi

LOCATION MAP (EAST JAWA)



LOCATION MAP (SOUTH SULAWESI)



LOCATION MAP (LAMPUNG)

SUMMARY

INTRODUCTION

1. This is the Final Report prepared in accordance with the Scope of Work for "the Study on Improvement of Rice Post Harvest and Marketing in Farmer Groups" (hereinafter referred to as the Study) agreed upon between the Government of the Republic of Indonesia through the Ministry of Agriculture (MOA) and the Japan International Cooperation Agency (JICA) in June, 1988. The objectives of the Study are to study the possibility of improvement of rice post harvest and marketing activities in farmer groups, to suggest improved rice post harvest and marketing packages for farmers/farmer groups, and to formulate pilot plans for improved post harvest and marketing packages for selected farmers groups.

The areas subjected to Study are West Java, East Java, South Sulawesi and Lampung Provinces.

The Study was commenced in November 1988 and finalized in October 1989. The following reports had been prepared and submitted to MOA.

1) Inception Report, November 1988
2) Progress Report, March 1989
3) Interim Report, April 1989
4) Draft Final Report, August 1989

2. The Government of Indonesia has been placing the highest priority on achievement of self-sufficiency in the staple food crop, i.e. rice, in the agricultural policy under past Repelita (Five-Year Development Plan) I through IV (1969/88). In line with this policy, the Government has been implementing rice production projects under the cooperation of other countries and international institutions. With her abundant experiences in rice cultivation, the Government of Japan has been extending technical and financial assistance to Indonesia to enhance the rice productivity of Indonesia under the framework of "Cooperation for Promotion of Rice Production (1981-1985)". With the guidance of the government, rice production in Indonesia has been steadily increasing and achieved to its

self-sufficiency. However, the further efforts are still required for increasing rice production as well as improving rice quality so as to maintain the self-sufficiency of rice under the current population increase. Under the limitation of available arable land and stagnant increase in unit yield of rice, it is essential and crucial to reduce the post harvest losses which was estimated at around 20% to total production, through improvement of the post harvest activities and those related facilities.

NATIONAL ECONOMIC BACKGROUND

3. Gross Domestic Product (GDP) of the Indonesia in 1986 is estimated at Rp 96,489 billion ($58.3 billion), and per capita GDP is Rp 574 thousand ($348). During the 1985-1986 period, the annual growth rate of GDP was estimated at 3.2%. Shares of GDP by industry in 1986 was 25.8% for agriculture, 14.4% for manufacturing and 16.7% for commerce. During the 1983-1986 period, annual growth rate of the agricultural sector was 3.6%. About 75% of the agricultural GDP was produced in food crops sub-section of which major crops are paddy, cassava, sweet potatoes, maize, and beans. Indonesia was one of the biggest rice-importers importing as much as 2 million tons of rice per annum in the last period of 1970s. Self-sufficiency in rice was, however, achieved in 1985 and Indonesia exported 270 thousand tons of rice in the same year. Since there has been no remarkable increases in rice production recently, rice had to be imported in 1988 again. The rice self-sufficiency will not be able to be kept if effective means are not taken, properly. Because the present increase rate of rice production is less than that of population, i.e. 2.0%/yr. The profitability of paddy cultivation was substantially decreased because of little increase in unit yields, substantial decline of farm gate prices as against the current increase of labor wages and farm inputs.

5. The paddy produced by farmers is supplied to consumers through brokers, rice millers, DOLOG, KUDs, wholesalers, and retailers.

In case of the private marketing channel, harvested paddy is sold directly to brokers or rice millers at fields or farm gates. BULOG play

an important role in stabilization of the rice prices through discharge control of the marketing rice using the stockage and/or imported rice. DOLOG dealt with 4.6% of rice produced in whole Indonesia in 1987/88.

6. In the Repelita V (1989-1993), up-keeping and continuation of rice self-sufficiency is the most important objective of the agriculture sector. In connection to this objective, the following technical measures are taken up in Repelita V for improvement of the rice post harvest and marketing activities particularly at the on-farm level:

1) Test and demonstration of post harvest technologies and equipment through:

   - enhancement of farmers' concerns on loss saving,
   - improvement of post harvest handling system and facilities to reduce both qualitative and quantitative losses,
   - improvement of knowledge and skillfulness of farmers/farmer groups in applying post harvest technologies,
   - Establishment of the post harvest service center as the basal core for promotion of the post harvest and marketing improvement at on-farm level, and
   - guidance for farmer groups and private sector to encourage post harvest and processing business including rice milling.

2) Development of flexible credit and incentive system for farmers to apply more progressive post harvest technologies.

3) Improvement of the existing price information system through same day broadcasting, increase in number of commodities and expansion of area covered.

4) Formulation of floor price and monitoring of actual prices.

SURVEY AREAS

7. The survey areas belong to the following 4 Sub-districts (Kecamatans).

Kecamatan (Survey Area)/Province
1. Telagasari/West Java
2. Bagor/East Java
3. Mattiro Bulu/South Sulawesi
4. Trimurjo/Lampung

The average holding size of paddy field by tenure system is as follows:

(Unit: ha/household)

Survey area	Average Land Holding Size (Owner)	Average Farming Size (Owner/Tenant)
1. Telagasari	1.0	0.7
2. Bagor	0.8	0.2
3. Mattiro Bulu	1.7	1.0
4. Trimurjo	0.8	0.6

Main trunk roads connecting between the survey area and the center towns in each respective Kabupatens are fully paved in every survey area. The paddy fields in each survey areas are under the year-round irrigation system. Drainage conditions are not satisfactory in all the survey areas except Bagor. As for Bagor, drainage canals are partly constructed by farmers themselves, and the drainage water is well controlled.

8. The double cropping of paddy is dominantly practiced under irrigated conditions in all the areas, though cropping intensity particularly in the dry season decreases due to the limitation of irrigation water in some areas. Harvesting work, including reaping and threshing practices is done mainly by agricultural laborers under the traditional employment system in Telagasari and Bagor. In contrast, it is done by the family owned force with the assistance of other families in the same community in case of Mattiro Bulu and Trimurjo. The remuneration of harvesting is usually paid in kind by applying the

production sharing of 1:5 - 1:7. Paddy is reaped by common sickles in most cases. Serrated sickles are so far not popular in all the areas. Rice plants are cut at the lower parts of the plants in Bagor. Since paddy fields in Telagasari, Trimurjo and lowlying area of Mattiro Bulu have a poor drainage system at on-farm level and hence water stands even after maturing of wet season paddy, the plants are obliged to be cut at the middle parts of the stems. Manual threshing by beating is predominant in Telagasari, Mattiro Bulu and Trimurjo. Pedal threshers is predominant in Bagor. The threshed paddy is packed in vinyl bags and transported to farmers' houses by agricultural laborers in most cases. A part of the packed paddy is directly, sold to rice broker on field.

Cleaning and drying of paddy are not commonly practiced by farmers except paddy for home-consumption. Only large impurities are removed before sacking when the paddy is sold. The quality improvement of paddy by drying and cleaning is not reasonably reflected in prices given by rice brokers or rice millers.

9. Estimated post harvest losses are given in the following table.

(Unit: %)

	Telagasari	Bagor	Mattiro Bulu	Trimurjo	Average
Reaping	2.4	3.2	4.2	4.2	3.5
Threshing	6.2	3.4	4.4	4.4	4.6
Transportation	0.7	0.7	0.7	0.7	0.7
Drying	2.0	2.0	2.0	2.0	2.0
Storage	0.3	0.3	0.3	0.3	0.3
Milling	3.5	3.5	3.5	3.5	3.5
Total losses to product before harvest	14.3	12.6	14.2	14.2	13.8

With the improvement in farming practices as well as the modernization of farming implement and equipment, the post harvest losses can be reduced by a significant extent, i.e. about 8.8% on an average, as estimated below:

Practice	Improved Practice	Loss (%)
Reaping	- Cash payment system, serrated sickle, optimum chance in reaping	1.3
Threshing	- Pedal or power thresher, cash payment system	1.6
Transportation	- Transportation by sacks without holes	trace
Drying	- Drying on sheets without holes, careful bird control	trace
Storage	- Cleanliness of storage place, strict insect/rodent/bird control, strict quality control	trace
Milling	- Modernized mill, strict paddy quality control	2.2
Total losses to product before harvest		5.0

10. The unit yields in the survey areas are relatively high as tabulated below:

(GKG)

Survey Area	Yield (t/ha)	
	Wet Season	Dry Season
Telagasari	6.8	6.5
Bagor	6.5	6.3
Mattiro Bulu	5.8	5.8
Trimurjo	5.7	5.2

Source: District Agricultural Office
Central Bureau of Statistics

Under the present socio-economic situation of the survey areas, the hired labors occupy a large share of the total requirement of labor force in Telagasari and Bagor, and in contrast, the family labors are predominant in Mattiro Bulu and Trimurjo.

11. The joint selling of rice product by farmers' groups is not common in the survey areas. In the limited cases, the milled rice is sold by individual farmers after the custom milling in the rice mills in the villages. The drying of paddy is, so far, practised to a limited extent at on-farm level. Most farmers mainly use the local sheets and/or small vinyl sheets for drying. In general, majority of paddy is dried at rice

mill as one of the practices of rice milling process. Large scale concrete floors and/or dryers are used for this practice.

The existing rice mills in the survey areas are grouped into three categories by working capacity, i.e. large scale mill having a capacity of more than 0.7 t/hr, small scale mill ranged 0.3 - 0.7 t/hr capacity and Engelberg huller having a capacity of less than 0.3 t/hr. Most of these mills are not well managed resulting in low operation efficiency and producing significant amount of broken rice. Paddy for home consumption and stockage is sacked into vinyl bags after drying and cleaning, and then stored in sheds or conventional warehouses (Lumbung). Since these facilities are not so well maintained, paddy is susceptible to be damaged by rats, insects and high humidity in general. The farm gate price of paddy is fluctuated seasonally, i.e. the lowest in April to May, and the highest in December or January. Most of farmers sell surplus paddy production having the moisture content of more than 20% and impurities such as 1) empty grain and foreign materials, 2) green/chalky grains and 3) yellow damaged grain, and 4) red grain, all together 16-23% in all survey areas.

12. There are three farmer organizations in the survey areas, i.e. KUD (Unit Villages Co-operative), Water Users Association and KT (Farmer Group). Generally one KUD covers 4 to 5 villages or total about 500 farm households. In the respective areas, participation of farmers to KUD is still limited to 30-40% of total farm households. A main activity of KUD is the arrangement of farm inputs under farm credit scheme (KUT).

Water User's Association were organized in Telagasari and Mattiro Bulu under the guidance of Rural Extension Center (BPP). Traditional irrigation groups headed by irrigation inspectors such as Hippa and Ili-ili exist in Bagor and Trimurjo under administration of Kecamatan/Desa. These associations were organized at each tertiary irrigation block under the control of irrigation inspector.

The irrigation facilities in Telagasari is not sufficiently maintained mainly because of weak group activities, while well maintained by the farmers groups in other three areas. In Trimurjo, a part of

quarterly canals and drainage canals were made by farmer groups themselves.

Under the guidance of Rural Extension Center, the participant farmers in SUPRA INSUS program have been organized into the farmer groups (Kelompok tani) in the survey areas. The numbers of membership in each farmers group vary rather wide from 90 to 370 in the survey areas. The farmer group is generally managed by one group leader (key farmer), and some 5 - 10 progressive farmers. Farmer groups usually consist of several sub-groups, but joint activities and coordination in and between sub-groups are limited to specific work like maintenance of tertiary canals and control of rats.

Farmer group activities in the survey areas are summarized as below:

	Group Activities	Telagasari	Bagor	Mattiro Bulu	Trimurjo
a.	Maintenance work of tertiary canal	Δ	Δ	Δ	Δ
b.	Farm road construction by group	X	O	X	Δ
c.	Land preparation by family labor				
	- using hand tractor	X	X	Δ	Δ
	- using animal power	X	X	Δ	Δ
d.	Land preparation by contract laborers				
	- using hand tractor	O	O	X	X
e.	Transplanting and harvesting by				
	- contract agricultural laborers	O	O	Δ	Δ
	- family labor with labor exchange	X	X	Δ	Δ
f.	Joint ownership/utilization of hand tractor	X	Δ	X	X
g.	Communal seedling preparation	X	Δ	X	X
h.	Joint utilization of warehouse	X	Δ	X	Δ
i.	Joint operation of drying and milling	X	X	X	X
j.	Joint marketing	X	X	X	X

Note: mostly done : O
partly done : Δ
no case : X

13. The rural extension center (BPP) is responsible for agricultural extension services for farmers at field level. The daily extension services are carried out according to the training and visiting system

(T&V system) by field extension workers (PPLs). The main problems of extension services in the study area are insufficient technical guidance to the farmers due to the other administrative activities such as meeting with chief of Kecamatan, chief of Desa, KUD, shortage of extension equipment for PPL, such as a motor-cycle, a photo camera, stationery, and insufficient knowledge of extension workers on post harvest technology, agricultural mechanization, budgeting management and farmer group promotion methods.

For implementation of SUPRA INSUS program, POSKOs (Supra Insus Coordination Committee) were organized at the respective levels of Province, Kabupaten, Kecamatan and Desa. Main POSKO activities are planning, monitoring of the program, identification of problems, suggestion to lower level of POSKO, and supervision of POSKO for farmer groups. The regular meeting of POSKO is once in two weeks and the attendance are from Agricultural Office, BIMAS, KUD, BRI, etc. in Kabupaten level. In this meeting, main discussion concerned with post harvest and marketing are labor shortage in harvesting season, and recommendable post harvest activities by farmers

Farm credit scheme (KUT) is available for farmers to buy farm inputs such as certified seeds, fertilizers, agro-chemicals, and growth hormone. This credit is characterized by a group (mass) credit and distributed in kind to farmer groups. The interest rate is 1% per month or 12% per year and the repayment period is set at 7 months taking crop season and selling time of product into consideration. Revolving fund credit for hand tractors and water pumps has been applied to farmer groups and this credit items were expanded to post harvest machinery such as power threshers recently.

BASIC CONCEPT OF THE IMPROVEMENT

14. Major problems and constraints related to post harvest in survey areas are summarized as follows:

(1) Major Problems in Post Harvest Activities

a. large harvesting losses on fields caused by

- improper farming implements such as common sickles and small ground sheets.
- improper harvesting practices such as cutting at the higher parts of the plants, delayed reaping from optimum reaping period, traditional beating method, and delayed threshing after reaping.
- inadequate field conditions such as poor drainage system at on-farm level and shortage of foot-paths in the fields
- traditional labor employment system as well as poor management of labour work on harvesting

b. large milling losses in quantity and quality

- improper milling machines and equipment in small rice mills
- shortage of facilities such as drying yard, paddy collection depots in the fields, transportation facilities in fields and storing facilities.
- improper handling practices such as imperfect or none pre-drying on fields before and/or immediately after threshing and insufficient field cleaning

(2) Major Problems in Marketing Activities

a. Small quantity for marketing by individual farm,

b. Poor quality of paddy product due to shortage of quality control facilities

c. Luck of farmer's marketing organization and facilities e.g. no joint marketing activities, shortage of milling facilities for joint usage and luck of group self-help credit system

d. Insufficient competition in marketing such as in milling and wholesaling.

(3) Major Problems in support services

a. shortage of technical guidance on post harvest improvement activities

b. shortage of guidance on management of marketing system and activities

c. shortage of market information services

15. For implementing the post harvest and marketing activities, the following schedules are set up as the essential approach to the improvement plan:

a. to save the present post-harvest losses through improvement and modernization of the respective activities, particularly harvesting and milling,

b. to improve the economy of paddy cultivation through modification of the present labor employment system and/or payment system on labor wages, e.g. sharing of production,

c. to ensure fair prices for farmers through intensifying competition in marketing and regularization of joint processing and joint selling of rice product by farmer groups,

d. to develop the appropriate marketing facilities such as rice mills, warehouses and transportation facilities for farmer groups, and

e. to ensure economically optimum scale of post harvest and marketing activities by farmer groups.

Basic approach to fill the above-mentioned objectives is as follows:

a. Implementation of pilot plans for the improvement in post harvest and marketing activities.

b. Trial of the following improved tools, machinery, facilities, practices and employment system of laborers

1) Tools, machinery and facilities

- serrated sickles
- large threshing sheets

- pedal or power threshers
- rice mills
- drying sheets for pre-drying
- concrete drying floors
- warehouses
- trucks

2) Practices
   - reaping paddy stalks near the ground
   - improvement of drainage system in paddy fields by farmers

3) Employment system
   - cash transaction instead of sharing system in harvesting

c. Trial of joint usage of large equipment or facilities such as threshers, rice mills, drying floors, warehouses and trucks by farmers' groups in the pilot areas.

d. Trial of group marketing of milled rice by farmers' groups, in the pilot areas.

e. Establishment of a service center for each pilot area to initiate pilot plan, to investigate the adaptability of advanced technologies and to carry out monitoring, evaluation and modification of technology packages. The service center also provide supporting services to farmers/farmers' groups, such as display and demonstration of agricultural machinery and facilities, paddy/rice quality tests and paddy/rice market information services.

PILOT PLANS

16. The following area which is under the same tertiary irrigation block was selected as the pilot area in each survey area:

Pilot Area	Telagasari	Bagor	Mattiro Bulu	Trimurjo
a. Location (desa) :	Cadas Kertajaya	Selorejo	Marannu	Purwodadi
b. Paddy field (ha) :	119	109	105	157
c. No. of farmers :	172	363	87	254
d. Cropping intensity:				
Wet season paddy	100 %	90 %	100 %	100 %
Dry season paddy	100 %	80 %	70 %	100 %

The unit yield of paddy at 1996 is anticipated as follows applying 0.29% of annual increase rate estimated in SUPRA INSUS program:

(GKP)

Pilot Area	Telagasari	Bagor	Mattiro Bulu	Trimurjo
a. Wet season paddy :				
- Unit Yield (t/ha)	8.5	8.4	7.5	6.9
- Production (tons)	1,011	823	787	1,083
b. Dry season paddy :				
- Unit Yield (t/ha)	8.3	7.7	6.8	6.2
- Production (tons)	987	669	571	973
c. Annual Production : (tons)	1,998	1,492	1,358	2,056

Cropping pattern herein proposed is the rice cultivation twice a year under irrigated condition. Post harvest activities such as reaping, threshing, drying and cleaning will be respectively scheduled with 15 working days in each season. Main feature of proposed working schedule in each pilot area is summarized as shown in following table.

Pilot Area		Telagasari	Bagor	Mattiro Bulu	Trimurjo
A. Reaping work					
a.Equipment	:	Serrated sickles	Serrated sickle	Serrated sickles	Serrated sickles
b.Work force	:	Casual laborers	Casual laborers	Family laborers	Family laborers
c.Operation	:	Individual farm	Individual farm	Individual farm	Individual farm
B. Threshing Work					
a.Pre-drying	:	On ground sheet	On ground sheet	On ground sheet	On ground sheet
b.Equipment	:	Pedal thresher	Power thresher	Pedal thresher	Power thresher
c.Work force	:	Casual laborers	Casual laborers	Family laborers	Family laborers
d.Operation	:	- Joint use by working unit of farmers -			
e.Repayment	:	- O/M cost and repayment are paid based on amount of threshed paddy by farmers			
C. Initial Drying/ Cleaning Works					
a.Material	:	Ground sheet	Ground sheet	Ground sheet	Ground sheet home yard
b.Work force	:	Casual laborers	Casual laborers	Family laborers	Family laborers
c.Operation	:	Individual	Individual	Individual	Individual
D. Rice Milling and Marketing					
a.Final drying	:	Concrete	Concrete	Concrete	Concrete
b.Storage of paddy:		Warehouse	Warehouse	Warehouse	Warehouse
c.Cleaning	:	Power winnower	Power winnower	Power winnower	Power winnower
d.Milling	:	Rice mill	Rice mill	Rice mill	Rice mill
e.Work force	:	Casual laborers	Casual laborers	Casual laborers	Casual laborers
f.Operation	:	- Joint operation/management by farmer group			
g.Repayment	:	- Joint marketing of milled rice by farmer group			

The equipment required for harvesting is estimated as follows:

(Unit : Nos.)

	Telagasari	Bagor	Mattiro Bulu	Trimurjo
a. Serrated sickle :	183	151	162	241
b. Pedal thresher :	41	-	28	-
c. Power thresher :	-	12	-	17

Requirements of machinery and facilities are summarized below:

Pilot Area	Telagasari	Bagor	Mattiro Bulu	Trimurjo
a. Rice mill unit (Nos.) (500 kg/hr) :	3	2	2	3
b. Power winnower (Nos.) (750 kg/hr) :	2	1	1	2
c. Concrete floor (m^2) :	2,100	1,500	1,600	2,300
d. Warehouse (m^2)				
- Rice mill unit :	180	120	120	180
- Paddy storage :	200	140	140	200
- Office/others :	40	40	40	40

17. The farmer group herein envisaged to be organized is the executive body of the objective post harvest and marketing activities including farm production and processing. The proposed farmer groups will be organized in each pilot area which is under the same irrigation tertiary block. Number of branches, working units and members in respective farmer groups are as follows:

Farmer Group	No. of Branch	No. of Working Unit	No. of Member
Telagasari	3	13	172
Bagor	4	11	363
Mattiro Bulu	2	14	87
Trimurjo	4	14	254

As an executive body of each farmer group, a Pilot Leader (key farmer), a sub-leader, 2 secretaries and a treasurer will be selected from members. In order to facilitate group activities, the following sections will be established and managed by above mentioned executive staffs namely Farm Input, Labor Arrangement, Processing and Marketing, and Accountant.

18. For the execution of the pilot plans, the Director General of Food Crops Agriculture (DGFAC) in Ministry of Agriculture will be the management administration and will establish the administrative channel, namely the Project Manager at national level and the Regional Project Leaders in provinces. The Director General of Food Crops Agriculture will have the responsibility for overall implementation of the rice post

harvest and marketing improvement program. The Project Manager will be responsible for the pilot plan implementation. The Regional Project Leader will be in charge of implementation of the said program, and chair the Post Harvest Committee Board in the province and arrange the financial budget for the objective activities. Under the supervision of Regional Project Leader, the Service Center will play daily services for promotion of the pilot plan and implement the integrated technical services on post harvest and marketing activities under the coordination with related agricultural service institutions. Proposed Service Center will consist of a Chief of Center and Specialists or experts on the following technical fields:

- Farm machinery
- Rice processing
- Marketing business
- Extension method
- Farm management
- Rice farming

As an integrated technical services on post harvest and marketing in farmer group, the Service Centers will assist and advise the farmers/farmer groups in and around the pilot areas within respective rural extension centers, mainly for the successful operation and management of the group activities envisaged as the pilot plan. The essential activities of the Service Center will be as follows:

1) Promotion of the pilot plan under coordination with Rural Extension Center (BPP),

2) Technical support on post harvest and marketing for farmers/farmer groups,

3) Monitoring and evaluation of performances of the improvement plans by farmer groups,

4) Formulation of appropriate technology packages for post harvest improvement,

5) Trials and demonstration of farm machinery to be promoted,

6) Rice quality inspection services for farmers,

7) Trials in the pilot areas of improvement plans made by related agricultural institutions,

8) Market information services for the farmers in the pilot areas, and

9) Preparation of manuals on promotion methods.

An extension worker covering the pilot plan area is in charge of the area which is about 4-5 times larger than the pilot area under the present working pattern, and it is hardly expected to concentrate his service only to the pilot area. Therefore it is proposed to adopt intensive service pattern instead of present equal service pattern. In the intensive service pattern, the whole working area of extension worker will be divided into intensive service areas and general service areas. The intensive service areas will be shifted under rotation system by several years. In the long term plan, whole working area of extension worker will be covered by intensive services. The pilot areas will be given the intensive services by respective rural extension centers.

IMPLEMENTATION PLAN AND COST ESTIMATE

19. The implementation of the pilot plan is scheduled for seven years consisting of 1) preparatory stage for two years and 2) pilot plan period for five years. There are two stage for the development, i.e. preparatory stage and pilot plan period.

20. The project costs in the pilot plan areas are as follows:

(Unit: Rp '000)

Item	Telagasari	Bagor	Mattiro Bulu	Trimurjo	Total
1. Machinery	30,014	33,351	19,707	49,183	132,255
2. Construction for facilities					
- Drying floor	10,668	7,620	8,128	11,684	38,100
- Warehouse and milling house.	59,920	43,680	45,360	63,840	212,800
Sub-total	70,588	51,300	53,488	75,524	250,900
3. Total (1 + 2)	100,602	84,651	73,195	124,707	383,155

Financial costs of operation and maintenance for the pilot plans were estimated as follows:

(Unit: Rp '000)

Cost Item	Telagasari	Bagor	Mattiro Bulu	Trimurjo	Total
I. Operation and Maintenance Cost /1					
1. Machinery	7,012	7,593	4,663	10,981	30,249
2. Facilities /2	5,289	3,647	3,750	5,583	18,269
Sub-total	12,301	11,240	8,413	16,564	48,518
II. Labor Cost					
1. Machinery	15,013	6,063	8,610	7,888	37,574
2. Facilities	5,488	3,645	3,054	4,710	16,897
Sub-total	20,501	9,708	11,664	12,598	54,471
III. Transportation Cost	1,972	1,304	1,322	2,056	6,654
Total (I + II + III)	34,774	22,252	21,399	31,218	109,643

Note: /1: Cost for fuel, oil, spare parts and repayment excluding labor cost.
/2: Including cost for bagging.

The preliminary cost estimate of the Service Center is as follows:

(Unit: Rp '000)

Cost Item	Amount
1. Building/ facilities	132,500
2. Equipment/ implement for laboratory	68,480
3. Farm machinery for demonstration	86,200
4. Equipment/ furniture for office (truck, jeep others)	137,700
Total	424,880

PROJECT EVALUATION

21. After the implementation of the pilot plan, harvesting and processing losses will be reduced considerably through improvement of the post harvest activities. Harvesting cost will also be reduced in significant extent by the introduction of improved harvesting system i.e. reaping by organized laborers under cash payment system and effective threshing work by pedal and power threshers through farmer groups' custom services. The improvement of profitability will be brought about by decrease in losses and reduction of harvesting cost. The increase in gross income is also expected due to joint sales of rice under the

condition with project. The increase in net reserve under the condition with project is fairly large being Rp 400-1,400 thousand in case of owner, while that is limited to Rp 30-150 thousand in case of tenant. The economic useful life of the pilot plan is considered to be 20 years on the basis of the useful life for building and drying floors of 20 years.

Groups' activities are managed through the collection of charges for operation and maintenance of machinery and facilities from group members. The farmer groups can manage their activities financially even during the repayment periods for machinery until the fifth year. The groups' accounts will be improved after the repayment of the loan for machinery when farmer groups could have possibilities for the other investments, i.e. introduction mechanical dryers, a truck for transportation, etc. The groups' accounts in the fifth year are summarized as follows:

(Unit: Rp '000)

Item	Telagasari	Bagor	Mattiro Bulu	Trimurjo
Annual Balance in the Fifth Year	13,872	13,064	9,687	15,413
Cumulative until the Fifth year	64,440	65,080	118,268	201,431

The economic internal rate of return (EIRR) was calculated from the economic cost and benefit flows for each pilot area. The EIRRs are as follows:

	Telagasari	Bagor	Mattiro Bulu	Trimurjo
EIRR (%)	25	18	24	19

The operation of rice mills by farmer groups will create the employment opportunities of laborers and operators for drying, cleaning and milling. Initial rice milling activities by farmer groups would promote the other processing industries for palawija crops.

RECOMMENDATIONS

22. (1) Early Implementation of the Plans

The plans are verified herewith to be technically sound, and economically and financially feasible. It is highly recommended that the necessary arrangement for early implementation of the plans be taken as soon as possible.

(2) Financial Support by the Government for the Pilot Plans

It is very important to realize improvement in post harvest and marketing in farmer groups in the pilot plans as one of the progressive examples for future implementation of the national post harvest improvement program. For early and steady realization of proposed pilot plans, it is recommended to support financial arrangement of farmer group's initial investment costs by the Government. In order to facilitate introduction of advanced machinery by farmer groups, it is recommended to provide some subsidized credit or lease services of advanced machinery to farmer groups with technical guidance and training through the Service Centers.

(3) Intensive Investment in Farm Roads and Drainage Canals

The poor drainage and road system is one of the major causes of the harvesting losses and low efficiency in the field work of the paddy cultivation and its improvement is the prerequisite for the improvement in harvesting and transportation activities. But the improvement of drainage and road system is thought to be too heavy for farmers. It is recommended to implement drainage and road improvement work in the pilot areas by the Government.

STUDY ON
IMPROVEMENT OF RICE POST HARVEST
AND MARKETING IN FARMER GROUPS

FINAL REPORT

MAIN REPORT

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ABBREVIATION

BIMAS	:	Ordinary Intensification Program (Bimbingan Massal Biasa)
BPP	:	Rural Extension Center (Balai Penyuluh Pertanian)
BULOG	:	Food Agency (Badan Urusan Logistik)
CBS	:	Central Bureau Statistics
DGFCA	:	Directorate General of Food Crops Agriculture
GKP	:	Wet Paddy at Field (Gabah Kering Panen)
GKS	:	Dry Paddy for Storage (Gabah Kering Simpan)
GKG	:	Dry Paddy for Milling (Gabah Kering Giling)
DOLOG	:	Sub-Office of Food Agency (Depot Logistik)
GDP	:	Gross Domestic Product
GNP	:	Gross National Product
GRDP	:	Gross Regional Domestic Product
JICA	:	Japan International Cooperation Agency
KUD	:	Village Unit Cooperative (Koperasi Unit Desa)
KUT	:	Farm Credit Scheme (Kredit Usaha Tani)
MOA	:	Ministry of Agriculture
PPL	:	Field Extension Worker (Penyuluh Pertanian Lapangan)
P3A	:	Water User's Association (Persatuan Petani Pemakai Air)

ABBREVIATIONS OF MEASUREMENTS

Length

mm = millimeter
cm = centimeter
= 0.39 in.
m = meter = 1.09 yd.
= 3.28 ft.
km = kilometer = 0.62 ml.
in. = inch = 2.54 cm
ft. = foot = 30.48 cm
yd. = yard = 91.44 cm
ml. = mile = 1.61 km

Area

cm^2 = square centimetre
m^2 = square meter
km^2 = square kilometre
= 100 ha
ha = hectare = 0.01 km^2
= 2.5 ac
ac = acre = 0.41 ha
= 4,050 m^2
ft^2 = square feet
= 0.03 m^2
$mile^2$ = square mile = 2.59 km^2

Volume

lit. = liter
cm^3 = cubic centimeter
m^3 = cubic meter
= 1,000 lit.
MCM = million m^3
= $1x10^3$ m^3
ft^3 = cubic feet = 0.028 m^3
= 28.32 lit.
ac-in. = acre inch = 88.05 m^3
ac-ft. = acre feet = 1,234 m^3

Weight

g = gram
kg = kilogram
t = metric ton = 1,000 kg
lb = pound = 375 g

Time

sec = second
min = minute = 60 seconds
hr = hour = 60 minuits
= 3,600 seconds
day = 24 hrs = 1,440 minutes
= 86,400 seconds
yr = year

Electrical Measures

kW = kilowatt = 1,000 watt
MW = megawatt = 1,000 KW
GW = gigawatt = 1,000 MW
kV = kilovolt = 1,000 volt

Other Measures

% = percent
° = degree
' = minute
" = second
°C = degree in centigrade

Derived Measures

m^3/sec = cubic meter per second (Cumec)
ft^3/sec = cubic foot per second (Cusec)

Monetary

US$ = US dollar
¥ = Japanese yen
Rp = Indonesian rupiah

1. INTRODUCTION

1.1 Authority

This is the Final Report prepared in accordance with the Scope of Work for "the Study on Improvement of Rice Post Harvest and Marketing in Farmer Groups" (hereinafter referred to as the Study) agreed upon between the Government of the Republic of Indonesia through the Ministry of Agriculture (MOA) and the Japan International Cooperation Agency (JICA) in June, 1988 (Attachment-1).

The Study was commenced in November 1988 and was finalized in October 1989. The following reports were prepared and submitted to MOA as the intermediary information on the objective study and for the approval of MOA on the basic idea for approaching to the project.

1) Inception Report, November 1988
2) Progress Report, March 1989
3) Interim Report, April 1989
4) Draft Final Report, August 1989

1.2 Project History

The Government of Indonesia has been placing the highest priority on achievement of self-sufficiency in the staple food crop, i.e. rice, in the agricultural policy under past Repelita I through IV (1969/88). In line with this policy, the Government has been implementing rice production projects under the cooperation of other countries and international institutions. With her abundant experiences in rice cultivation, the Government of Japan has been extending technical and financial assistance to Indonesia to enhance the rice productivity of Indonesia under the framework of "Cooperation for Promotion of Rice Production (1981-1985)".

With the guidance of the government, rice production in Indonesia has been steadily increasing and achieved to its self-sufficiency. However, the further efforts are still required for increasing rice production as well as improving rice quality so as to maintain the self-

sufficiency of rice under the current population increase. Under the limitation of available arable land and stagnant increase in unit yield of rice, it is essential and crucial to reduce the post harvest losses which was estimated at around 20% to total production, through improvement of the post harvest activities and those related facilities.

To implement the improvement plan of post harvest and marketing work the Japanese Government has been extended assistance as one of five priority fields in "Cooperation for Promotion of Rice Production". First the Government of Japan carried out the study on the post harvest losses on rice product during the period of September 1981 to December 1982. She also granted the rice milling units to KUDs and large milling plants to P.T. Pertani, respectively through KR II program, and besides, dispatched the post harvest experts for technical cooperation since 1986 through JICA. The frame work of "Cooperation for Promotion of Major Food Crops Production (1986-1990)" was agreed upon between both the Governments of Indonesia and Japan in July 1986 and several cooperations are continuously undertaking up to present.

The post harvest loss surveys revealed that the reaping and threshing losses are the most dominant in the post harvest activities. Besides, the quality losses of rice product also arise during the post harvest activities at on-farm level. To realize saving of losses and quality improvement successfully the technical as well as financial assistance to farmers are essential and crucial.

Government of Indonesia intends to increase farmers' income through post harvest and marketing improvement at on-farm level. To this end, the Government of Indonesia requested the Government of Japan to extend technical cooperation for the Study on improvement of rice post harvest and marketing in farmer groups. In response of the request, the Government of Japan decided to conduct the Study.

1.3 Scope of Work for the Study

The "Scope of Work" agreed upon between MOA and JICA on June 23, 1988 is as summarized below:

(1) Objectives of the Study

The objectives of the Study are to study the possibility of improvement of rice post harvest and marketing activities in farmer groups, to suggest improved rice post harvest and marketing packages for farmers/farmer groups, and to formulate pilot plans for improved post harvest and marketing packages for selected farmers groups.

(2) The Study Area

The areas subjected to Study are West Java, East Java, South Sulawesi and Lampung Provinces.

(3) Scope of Pilot Plan

Pilot plans for improvement of post harvest and marketing packages for selected farmers/farmers groups comprise the following improvements.

1) Tools, equipment and machinery
2) Facilities
3) Institutions and organizations
4) Supporting systems

(4) Work Schedule

The Study was scheduled by two phases, namely: a) Phase I: Setting up of the basic plan for improvement and selection of the target areas and farmer groups for formulation of the pilot plan, 2) Phase II: Formulation of the pilot plan. The study was made within eleven months from November 1988 to October 1989.

1.4 Activities of JICA Study Team

1.4.1 Phase I Study

The Phase I study was initiated on November 22, 1988. The inception Report was prepared prior to commence this Phase I study.

The field work was carried out during the period from November 29, 1988 to February 1, 1989. Making reference to the Inception Report, the meeting among the Sub-working Group, JICA Study Team and the Advisory Committee Members was held on December 1, 1988 for the mutual understanding on the plan of operation. Through the discussion with Directorate of Food Crops Economic and Processing and Provincial Agricultural Offices, two preliminary survey areas were selected in each objective province. The study team carried out the field surveys and data collections at the respective levels of national, provinces and the survey areas and farmer groups preliminarily selected.

The home office work was carried out in February 1989. Based on the result of both field surveys and home office work, the study team identified the constraints of present post harvest and marketing activities at on-farm level and formulated the basic plan for the objective improvement. One survey area was selected among two preliminary survey areas in each study area as the subjected area to the pilot planning as shown in the next table. All the results were incorporated in the progress report and submitted to MOA for the reference.

Province	Kabupaten	Kecamatan (Survey Area)	Farmer Group
West Java	Karawang	Telagasari	Karya Tani Banyu Asih Sri Mulya Marga Mulya
East Java	Nganjuk	Bagor	Boga Sembada Ringin Tunggal
South Sulawesi	Pinrang	Mattiro Bulu	Resopammase I Resopammase II Resopammase III
Lampung	Central Lampung	Trimurjo	Krida Kismana Panti Boga Yoso Makmur

1.4.2 Phase II Study

The field work at Phase II stage was carried out during the period from March 2 to May 1, 1989. The technical meeting on the progress report was held on March 6. The basic plan and selection of the survey areas/farmer groups were accepted in the said meeting.

The following survey and study were carried out during the field work of Phase II. All the results were compiled in the interim report and submitted to MOA for his review and comments.

1) Survey on harvesting and threshing losses and post harvest activities in the survey areas in the 4 provinces.

2) Survey on farmer group activities in the survey areas.

3) Survey on existing condition of operation of post harvest facilities.

4) Identification of problems in post harvest activities and marketing (supplemental survey).

5) Collection of necessary information for the economic evaluation.

6) Formulation of technology packages for improvement of post harvest and marketing activities.

7) Formulation of outline of pilot plan for the survey areas and groups.

The study team made further study at the home office during the period from May to July 1989. Major work was to formulate the pilot plans and implementation schedule, to estimate the cost and benefit and to evaluate the feasibility of project. All the study results and pilot plans formulated were incorporated in this Final Report.

2. BACKGROUND

2.1 National Economy

The Republic of Indonesia is the archipelago country consisting of about 13 thousand islands. Total population in 1989 was estimated at about 178 million and the annual population growth rate during 1980 to 1985 was 2.15%. Total labor force was 68 million of which agriculture occupies 55.1% and industry 8.2% respectively in 1986.

Gross Domestic Product (GDP) in 1986 was estimated Rp 96,489 billion ($58.3 billion), and per capita GDP is Rp 574 thousand ($348). During the 1985-1986 period, the annual growth rate of GDP was estimated at 3.2%. Shares of GDP by industry in 1986 was 25.8% for agriculture, 14.4% for manufacturing and 16.7% for commerce. During the 1983-1986 period, annual growth rate of agricultural sector was 3.6%. About 75% of the agricultural GDP was produced in food crops sub-section of which major crops are paddy, cassava, sweet potatoes, maize, and beans.

Indonesian economy has been suffering from severe setback since the early 1980's due to the decline in the petroleum prices which dropped to US$ 13.6/Barrel in 1986 from US$ 26.7/Barrel in 1985. Annual growth rate of GDP dropped to 3.2% in 1986 from 7.9% in 1980. Under such circumstances, the current account deficit of the Government increased to Rp 5,750 billion in 1986/87, which was equivalent to 6% of GDP in 1986. To cope with these critical situations, the Government of Indonesia has been executing the following decisive measures. As a result, the annual growth rate of GNP was increased to 5.0% in 1988 from 3.6% in 1987.

1) Reduction of Government Expenditure
2) Increase of non-oil tax collection
3) Devaluation of Rupiah by 31% in September 1986
4) Deregulation on economic activities

2.2 Rice Production and Marketing

2.2.1 Rice Production

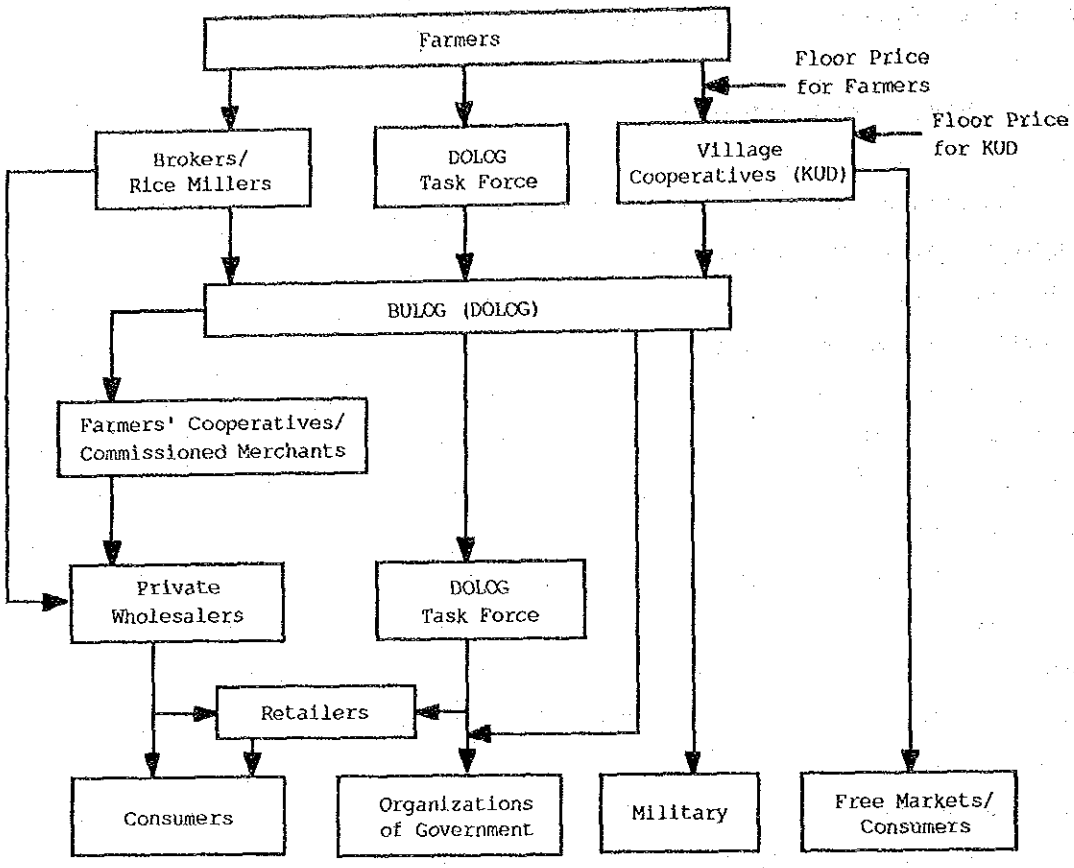
Indonesia was one of the biggest rice-importers before importing as much as 2 million tons of rice per annum in the last period of 1970s. Self-sufficiency in rice was, however, achieved in 1985 and Indonesia exported 270 thousand tons of rice in the same year. Since there has been no remarkable increases in rice production recently, rice had to be imported in 1988 again. The rice production increased significantly at the annual growth rate of 6.6% during the period from 1970 to 1984, while the growth rate declined to 1.9% during the period between 1984 and 1986.

The rice self-sufficiency will not be able to be kept if effective means are not taken, properly. Because the present increase rate of rice production is less than that of population, i.e. 2.0%.

The profitability of paddy cultivation was substantially decreased because of little increase in unit yields, substantial decline of farm gate prices as against the current increase of labor wages and farm inputs. It is forecasted that the profitability will be further lowered in the future due to abolishment of the price subsidy for agro-chemicals and reduction of subsidy rate for fertilizers. The national budget for the said subsidy has been recently curtailed under the current set backs of the national economy. The subsidy was decreased from Rp 600 million in 1985 to Rp 200 million in 1988, and will be ceased up to the end of Repelita V.

2.2.2 Marketing

The paddy produced by farmers are supplied to consumers through brokers, rice millers, DOLOG, KUDs, wholesalers, and retailers as shown in the following figure:



In case of the private marketing channel, harvested paddy is sold directly to brokers or rice millers at fields or farm gate.

In the public channel, there are two essential streams in rice marketing, namely KUD channel and DOLOG channel. Paddy purchased by KUD is milled by KUD owned mills and sold to local market and/or a part to DOLOG. DOLOG has only a limited capacity in rice market. Purchased paddy by DOLOG is consigned for milling in the private rice mills. The milled rice is then supplied to Government organization through DOLOG channel or partly stored as buffer stock for stabilization of rice prices.

BULOG plays an important role in stabilization of the rice prices through discharge control of the marketing rice using the stockage and/or imported rice. DULOG dealt with 4.6% of rice produced in whole Indonesia in 1987/88.

The KUDs' buying prices of paddy from farmers are declared according to the quality.

2.3 Policy on Rice Production

Self-sufficiency of rice has been the top priority objective in agricultural policy given in Repelita I and IV (1969/88). In the Repelita V (1989-1993), up-keeping and continuation of rice self-sufficiency is the most important objective of agriculture sector. The annual increase of rice production targeted in Repelita V is 3.2% of which it is anticipated to increase of 1.0% in harvesting area and 2.2% in unit yield. Other than the above, the following achievement are also envisaged in the framework of the agriculture development in Repelita V.

1) To improve the quality of food and to strengthen food self-sufficiency,
2) To increase the agriculture production for export,
3) To raise the farmers' productivity and added value of agriculture production,
4) To improve farm income, and
5) To improve regional development while conserving natural resources to upgrade the quality of life.

In connection to the objective achievement of item 1), the following technical measures were taken up in Repelita V for improvement of the rice post harvest and marketing activities particularly at the on-farm level:

1) Test and demonstration of post harvest technologies and equipments through:
   - enhancement of farmers' concerns on loss saving,
   - improvement of post harvest handling system and facilities to reduce both qualitative and quantitative losses,
   - improvement of knowledges and skillfulness of farmers/farmer groups in applying post harvest technologies,

- Establishment of the post harvest service center as the basal core for promotion of the post harvest and marketing improvement at on-farm level, and
- guidance for farmer groups and private sector to encourage post harvest and processing business including rice mill.

2) Development of flexible credit and incentive system for farmers to apply more progressive post harvest technologies.

3) Improvement of the existing price information system through same day broadcasting, increase in number of commodities and expansion of area covered.

4) Formulation of floor prices and monitoring of actual prices prevailing in field.

The SUPRA INSUS program has been launched since the dry season in 1981 as the most powerful supporting activities for successful execution of the objective achievement stated above.

SUPRA INSUS program aims at successful attainment of pest control, water management and supply of excellent seeds. It is characterized by coordinated activities among the farmers' groups each other. The service unit of SUPRA INSUS program (Unit SUPRA INSUS; USI) is 600-1,000 ha in which the farmers has been organized themselves into some 10-16 groups. Under administration of the rural extension center, one field extension worker is appointed on this unit area and extend his/her services as the full-time WKPP. USI/WKPP areas are integrated to a unit SUPRA INSUS program (Unit Himpunan SUPRA INSUS; UHSI), which is totaled about 15,000 to 35,000 ha for facilitating the field operation as scheduled below:

1) Unit SUPRA INSUS (USI)
   - implementation of optimum cropping pattern,
   - rotation of paddy varieties for pests control and
   - harvesting within 15 days to get enough fallow periods of more than one month per year so as to prevent insect, pests and rodents.

2) Unit Himpunan SUPRA INSUS (UHSI)
   - integrated pest control,
   - effective irrigation water management and
   - self-supply of certified seed.

Organization for SUPRA INSUS program was formulated on the basis of BIMAS executing structures. There are coordination committees (POSKO) and working groups (POKJA) at Desa, Kecamatan, Kabupaten, Province and National levels, respectively. The coordination committee comprises the government administration from Desa to the national level and the farmer groups organization from one farmer group level to the national level. The working groups consisting of the government support agencies coordinate to execute the programs effectively.

The technology package pursued under the SUPRA INSUS program includes ten elements as mentioned in ANNEX II.

2.4 Rice Post Harvest and Marketing Program

The post harvest program has been launched since 1979 by establishing the National Committee on Food Crops Post Harvest under the Ministry of Agriculture. Under Administration of the National Committee, the post harvest campaign has been taken place at the end of 1986, it has been accomplished 46 campaign units in 23 provinces.

Under the promotion of the objective post harvest program, various equipment and facilities related to the post harvest activities have been provided to the village unit cooperatives through technical and financial assistance of the advanced countries. These are:

1) Diffusion of power dryers, such as
   - 320 sets of Lister dryers
   - 63 sets of simple flat-bed dryers
   - 357 sets of Satake intend dryers
   - 500 units of Surya phala dryers (husk burner)

2) Diffusion of corn shellers
   - 5,000 units of manual corn shellers

3) Installation of rice mills

- 1,051 units of rice mill plant having more than 1.0 ton/hr capacity

Other than the above, the BULOG has also built 1,349 units of godown facilities with the total capacity of about 3,114,500 tons for the national food stock.

To accelerate the pace of the post harvest work, the President has issued the Presidential Decrease No. 47/1986 in which all the agricultural commodities have been taken up as the matter to be subject to reinforcement of the post harvest activities. It is also defined that the post harvest activities should cover from the harvesting action until the handling and/or processing stage just ready to marketing.

To fulfill reinforcement of the post harvest activities in conformity with the Presidential Decree, the Coordination Forum for Improvement of Post Harvest Activities has been organized by the Minister of Agriculture. The members of the Forum are the representatives of all the institutions in respect to the post harvest program and the Secretary General of the Department of Agriculture has appointed as the chairman of this administration.

The essential function of the Forum herein envisaged are to play an integrated approach to such application of research findings, transfer of technology to farmers, performance of public campaign and liaison with the supporting institutions.

Under the said function, the Working Group chaired by the Director General of Food Crop Agriculture has been organized. The working group has prepared the matrix on the Post harvest Activities of both Inter Department and Directorates aiming to reduce/preclude a duplication of the respective post harvest work.

The Forum has also set up the new policy for activating the post harvest program. In this policy, it is envisaged that the improvement of post harvest and marketing activities on rice production is, in

principle, implemented by farmers themselves at on-farm level through reinforcement of the function of existing farmers groups which have been organized under implementation of the SUPRA INSUS program.

3. PRESENT CONDITION AND PROBLEMS IN SURVEY AREAS

3.1 General Condition

3.1.1 Administration and Population

The four survey areas belong to the following 4 Kecamatans. The physiographical extent of each area is as shown below:

Kecamatan (Survey Area)/ Province	Area (km^2)
1. Telagasari/West Java	50
2. Bagor/East Java	51
3. Mattiro Bulu/South Sulawesi	161
4. Trimurjo/Lampung	58

The locations of each area are as shown in Fig. 3.1-1. Each area is in most part, gentle slope with generally flat topography and is recognized as the representative rice producing area in the respective provinces.

Demographic conditions in the survey areas are shown in Table 3.1-1 and summarized as follows:

(1988)

Survey Area	Population (10^3)	No. of Household (10^3)	Farm Household No. (10^3)	Farm Household Share to Total (%)
1. Telagasari	49.6	12.9	10.2	79
2. Bagor	50.6	11.9	10.9	92
3. Mattiro Bulu	23.2	4.8	4.1	87
4. Trimurjo	42.7	8.2	6.7	81

The farm households in each area share 79 to 92% of the total household. The total labor force is estimated about 32,000 in both Telagasari and Bagor, while rather small as 11,000 and 24,000 in Mattiro

Bulu and Trimurjo, respectively. The agricultural labor force shares 80-90% of the total labor force.

Survey Area	Total Labor Force (10^3)	Agricultural Labor Force No. (10^3)	Agricultural Labor Force Share to (1) (%)
	(1)		
1. Telagasari	32	25	79
2. Bagor	32	30	92
3. Mattiro Bulu	11	10	87
4. Trimurjo	24	20	81

3.1.2 Land Tenure System and Holding size

Number of farm household by tenure system, i.e. owner farmer, tenant farmer and agricultural laborer in each survey area is as shown below:

Survey Area	Farm Households							
	Owner Farmer		Tenant Farmer		Agricultural Laborer		Total	
	(10^3)	(%)	(10^3)	(%)	(10^3)	(%)	(10^3)	(%)
1. Telagasari	3.9	38	2.1	27	4.2	35	10.2	100
2. Bagor	2.5	23	5.7	52	2.7	25	10.9	100
3. Mattiro Bulu	2.3	56	1.8	44	-	-	4.1	100
4. Trimurjo	5.0	74	1.1	17	0.6	9	6.7	100

The average holding sizes of paddy field by tenure system are as follows:

(Unit: ha/household)

Survey area	Average Land Holding Size (Owner)	Average Farming Size (Owner/Tenant)
1. Telagasari	1.0	0.7
2. Bagor	0.8	0.2
3. Mattiro Bulu	1.7	1.0
4. Trimurjo	0.8	0.6

3.1.3 Infrastructure

Main trunk roads connecting between the survey area and the center towns in each respective Kabupatens are fully paved in every survey area. All the connection roads from village to main roads are unpaved. In small exception, a part of the connection roads in Teragasari area has been paved recently. A part of the unpaved roads become muddy in wet season, and abstract passage of vehicles. Farm roads in Bagor and a part of Trimurjo are well networked. Hand tractors and carts having a capacity of about 500 kg are passable in these roads. In Telagasari and Mattiro Bulu, no farm roads were constructed so far. Thus, the farmers use the ridges of farm plots as the footpass. Transportation of farm inputs and outputs is very much obstructed and being time consuming work in these two areas.

The paddy fields in each survey areas are developed under implementation of the following irrigation systems. Thus, all the paddy fields are recognized as the technical irrigation class.

Survey Area	Irrigation System	Water Source	Location of Survey Area
1. Telagasari	Jatiluhur	Jatiluhur Dam	lower
2. Bagor	Brantas	Widas Dam	middle
3. Mattiro Bulu	Sadan	Sadan Reservoir	lower
4. Trimurjo	Way Sekampung	Sekampung River	upper

Drainage conditions are not satisfactory in all the survey areas except Bagor. As for Bagor, drainage canals are partly constructed by farmers themselves, and the drainage water is well controlled.

Mode of communication in the survey areas are radio and postal services. About 10% of farm households has recently owned television sets in each survey area. Telephone system is not established yet in all of the survey areas. The electric supply services cover most of households in each area.

3.2 Farming Activities

3.2.1 Cropping Patterns

The double cropping of paddy is dominantly practiced under irrigated conditions in all the areas, though cropping intensity particularly in the dry season decreases due to the limitation of irrigation water in some areas. The major cropping patterns and cropping intensity of each area are shown in Figs. 3.2-1. Present condition of agriculture in survey areas are mentioned in Table 3.2-1.

3.2.2 Pre Harvest Activities

There are much differences in pre harvest activities among the four survey areas. In Telagasari and Bagor, the soil preparation such as plowing, harrowing and puddling has been mechanized in significant extent, while in Trimurjo, use of animal power for the said practices is dominant. In Mattiro Bulu, mechanization and use of animal power co-exist equally. As for transplantation of seedlings the contract based work by agricultural laborers is prevalent in Telagasari and Bagor. In other areas, transplantation of seedlings is performed mainly by own family labors partly helped by other families under Gotongroyong system.

Regular transplanting is applied extensively in most areas, while random transplantation is predominant in Mattiro Bulu. Planting density at 200,000 - 250,000 hills/ha has been standardized in all the survey areas under SUPRA INSUS program.

Herbicides are commonly used in Mattiro Bulu and Trimurjo. The utilization of herbicides is prohibited by the local regulation in the areas of Java. Insecticides are used only for emergency means in all the area. Fungicides are not applied in general. The average of actual fertilizer dosage is as shown below:

(Unit : kg/ha)

	Telagasari	Bagor	Mattiro Bulu	Trimurjo
N	92	125	69	90
K_2O	60	45	36	69
P_2O_5	46	46	46	60

Source : BPPs

3.2.3 Post Harvest Activities

(1) Reaping/threshing

Harvesting work, including reaping and threshing practices is done mainly by agricultural laborers under the traditional employment system in Telagasari and Bagor. In contrast, it is done by the family owned force with the assistance of other families in the same community in case of Mattiro Bulu and Trimurjo. There are basically two labor employment systems in the survey areas. They are Gropyokan and Ceblokan. The Gropyokan predominates in Bagor, Mattiro Bulu and Trimurjo and the Ceblokan in Telagasari. In any cases the remuneration of harvesting is usually paid in kind by applying the production sharing at 1:5 - 1:7. Payment in cash has been increasingly introduced in Bagor and Mattiro Bulu recently. About 20 Rp/kg of paddy and 15 Rp/kg are the unit wages currently paid to the harvesters in Bagor and Mattiro Bulu, respectively.

Paddy is reaped by common sickles in most cases. Serrated sickles are so far not popular in all the areas. Rice plants are cut at the lower parts of the plants in Bagor. Since paddy fields in Telagasari, Trimurjo and lowlying area of Mattiro Bulu have a poor drainage system at on-farm level and hence water stands even after maturing of wet season paddy, the plants are obliged to cut at the middle parts of the stems, e.g. 20-30 cm high from the bottom. The plants after reaping are put on the stubbles by 2-3 hills in order to protect the panicles from standing water and mud. Work efficiency for reaping of wet season paddy in the above three areas is lower and paddy qualities tend to deteriorate. The stubbles remained at fields disturb the land preparation for next cropping. In fact, the clearance of those remaining stalks induce

additional cost of about Rp 10,000/ha for long stalks and also bring about labor shortage.

The reaped paddy plants are gathered in the several places in the paddy field for threshing. Paddy is threshed within 24 hours after reaping in general. The gathered paddy sometimes deteriorates by heat or germination, when threshing work is delayed.

Manual threshing by beating is predominant in Telagasari and Mattiro Bulu. Pedal threshers have been introduced in Bagor extensively and almost 80% of paddy is threshed by the pedal threshers. In Trimurjo, the pedal threshers have been recently introducing but still limited use to only 10% of the reaped paddy. The remaining paddy is still threshed manually. Pedal threshers are prepared by farmers themselves using the structural parts of bicycles and other local materials such as bamboo, wooden plate. It costs about Rp 15,000 to 30,000. The retailing price of manufacturing pedal thresher is from Rp 40,000 to 50,000 in the local market. An efficiency of the package work of reaping, threshing by pedal thresher and sacking of threshed grain is estimated to be 1.0 to 1.5 t/day in case where 5 laborers work for 10 hours a day.

The vinyl ground sheet is widely used for paddy threshing. The different size of sheet diffuses in each area, namely 5 m x 5 m in Bagor and Trimurjo, while around 2.5 m x 3.6 m in Telagasari and about 2.8 m x 2.1 m in Mattiro Bulu. It is generally recognized that the small ground sheet causes much scattering loss of paddy grains.

(2) Transportation

The threshed paddy is packed in vinyl bags and transported to farmers' houses by agricultural laborers in most cases in Telagasari, Bagor and Trimurjo. A part of the packed paddy is directly, sold to rice broker on field. In case of Mattiro Bulu, the packed paddy is transported on the backs of horses to selling depot which has been established along the main road by the farmers group. Transportation cost by horse is 1.3 - 2.5 Rp/kg/km.

(3) Cleaning and drying

Cleaning and drying of paddy are not commonly practiced by farmers except paddy for home-consumption. Only large impurities are removed before sacking when the paddy is sold. The Ministry of Agriculture reported that the quality improvement of paddy by the practices such as drying, and cleaning, is not reasonably appreciated by rice brokers so far. In fact, the benefit brought by the quality improvement does not compensate enough for the cost paid for cleaning/drying works. The present marketing prices of paddy are as summarized below:

(Unit: Rp/kg)

Cleaning/Drying	Cost	Benefit*		Net Return	
	Java	West Java	East Java	West Java	East Java
Sun-Drying and Wind-cleaning	2.4	3.3	1.0	0.9	-1.4
Traditional Cleaning ("Tampi")	2.0	0.2	0.1	-1.8	-1.9
Mechanical Drying (Lister-type)	7.5	4.8	-0.7	-2.7	-8.2

Note : * = Benefit by rise of price due to paddy quality improvement after taking account of weight loss

Source : Price and Quality of Foodcrops Agriculture in Indonesia, Ministry of Agriculture, 1988.

3.2.4 Post Harvest Losses

(1) Post Harvest Loss Surveys

The survey on post harvest losses in the respective 4 provinces was conducted 3 times by different organizations before. The present study team also carried out the survey during the study period.

a. Past Surveys

CBS survey in 1986/87

This survey was conducted by Central Bureau of Statistics (CBS) in 1986/87 wet season under interdepartmental collaboration.

The survey covered 94 Kabupatens in 15 provinces, of which 4 Kabupatens were taken up in the respective 4 provinces.

Reaping loss defined in CBS survey is practically the subtracted production which has been obtained as the minus balance between the actual production in treated plot and the total production without losses in the controlled plots. The threshing loss is also estimated by applying the same method stated above.

Transportation losses were calculated by measuring the weight losses before and after transportation from the fields to farmers' houses/warehouses/markets/KUDs. Drying losses were calculated by weighing of dry materials lost during drying. Processing losses were estimated as the minus balance of the recoveries obtained from the experimental milling and the treated milling. Losses during storage were calculated by based on the paddy weight measured before and after storage.

JICA survey in 1981/1982

The post harvest loss surveys reported by the 1981/82 JICA survey team on post harvest losses cover the total 14 districts selected in 4 provinces i.e. Aceh, West Java, South Sulawesi and South Kalimantan. Out of these survey areas, the districts of West Java and South Sulawesi Provinces are subjected hereto the pilot planning on improvement of post harvest and marketing activities.

The losses during reaping work were studied directly by counting the lost grains from the treated plot. Threshing and cleaning losses were also estimated based on the direct measurement made on scattered losses from the treated samples. The observation methods for other items were practically the same as CBS.

Provincial agricultural office (PAO) surveys in 1983-88

With particular attention to large losses of the post harvest activities, Provincial Agricultural Offices (PAO) have been conducting the surveys on post harvest losses since early 1980s. These PAO surveys covered Lampung, West Java and East Java provinces. In Lampung, the JICA method was applied, while in West Java and East Java, the CBS method was adopted.

b. Study by the Present Study Team

The present study team conducted the sample surveys on the reaping and threshing losses, which are considered to be the most serious losses in the post harvest activities. This survey was performed basically according to procedure applied to the 1981/82 JICA survey.

(2) Estimated Post Harvest Losses

Post harvest field losses are made by compounding effects of so many factors such as tools/machines, reaping position of stalks, maturing period of reaped paddy, variety of paddy, planting density, field conditions especially drainage condition, weather condition, and laborer's conditions. The losses estimated in the past surveys varied to a large extent caused by difference in survey method, survey area, season and year, and so on. All the survey results showed that reaping and threshing losses covered considerably larger portion of total post harvesting losses than any other losses.

There are some differences in losses between CBS and JICA '81/82 results. The results of the loss survey by the present study team in the survey areas were mostly similar to those of JICA '81/82. CBS surveys were the largest in scale and the most systematic, however, the estimated losses are for large area (Kabupaten level) covering less developed areas in rice cultivation. On the other hand, the study areas are Kecamantans covering comparatively advanced areas in rice cultivation.

Taking the above mentioned conditions into consideration, losses of CBS and JICA '81/82 survey results were used for estimation of harvesting losses in respective study areas in this study.

As for the transportation, drying, storage and milling losses, the average losses of CBS data are taken up and applied to the survey areas since there are no significant difference among the previous survey results and the CBS data cover all the survey areas. As the Karawang had the same harvesting conditions as Nganjuk, i.e. Gropyokan system and sickle reaping, the harvesting loss estimated as the average in Karawang is hereby applied to Nganjuk. The harvesting loss estimated in Pinrang is

also applied to Central Lampung by the same idea. Estimated post harvest losses are given in the following table.

(Unit: %)

	Telagasari	Bagor	Mattiro Bulu	Trimurjo	Average
Reaping	2.4	3.2	4.2	4.2	3.5
Threshing	6.2	3.4	4.4	4.4	4.6
Transportation	0.7	0.7	0.7	0.7	0.7
Drying	2.0	2.0	2.0	2.0	2.0
Storage	0.3	0.3	0.3	0.3	0.3
Milling	3.5	3.5	3.5	3.5	3.5
Total losses to product before harvest	14.2	12.6	14.2	14.2	13.8

3.2.5 Paddy Yield

The unit yield is 6 to 7 t/ha in Telagasari and Bagor of Java, and 5 to 6 t/ha in Mattiro Bulu and Trimurjo. Yield of wet season paddy is relatively higher than that of dry season paddy in each area. The unit yield is tabulated below:

Survey Area	Yield (t/ha)	
	Wet Season	Dry Season
Telagasari	6.8	6.5
Bagor	6.5	6.3
Mattiro Bulu	5.8	5.8
Trimurjo	5.7	5.2

Source: District Agricultural Office
Central Bureau of Statistics

3.2.6 Farm Economy

(1) Crop Budget

The requirement of labor force for paddy cultivation is as summarized below:

(Unit: man-day)

	Telagasari			Bagor			Mattiro Bulu			Trimurjo		
	F	H	T	F	H	T	F	H	T	F	H	T
Wet Season paddy	6	99	105	15	91	106	78	22	100	81	19	100
Dry Season paddy	6	93	99	15	86	101	73	22	95	76	19	95

F: Family Labor H: Hired Labor T: Total

Under the present socio-economic situation of the survey areas, the hired labors occupy a large share of the total requirement of labor force in Telagasari and Bagor, and in contrast, the family labors are predominant in Mattiro Bulu and Trimurjo.

The crop budget on paddy cultivation is analysed based on the price/cost in 1988 as summarized below:

(Unit: '000 Rp/ha)

	Telagasari		Bagor		Mattiro Bulu		Trimurjo	
	W.S.	D.S.	W.S.	D.S.	W.S.	D.S.	W.S.	D.S.
A. Gross income	1,360	1,632	1,216	1,455	1,009	1,125	1,003	1,269
B. Production cost								
1) Farm inputs	120	120	148	148	109	109	125	125
2) Hired labor	389	377	304	336	45	50	65	82
3) Animal and machinery	55	55	50	50	70	70	24	24
4) Total	564	552	502	534	224	229	214	231
C. Net return	796	1,080	714	921	785	896	789	1,038
	(68%)	(66%)	(58%)	(63%)	78%)	(80%)	(79%)	(82%)

Although the value of gross income varies from Rp 1.3 million/ha to Rp 1.6 million/ha among 4 survey areas, the dry season paddy is always higher than that of the rainy season paddy in every areas. This is mainly due to the fact that the price of dry season paddy lies at higher position in the seasonal fluctuation. Rather big difference of income level between Java island and outer islands is also directly attributed to the price gap appeared in the local rice market, region by region.

As for the net return, no significant difference is observed among 4 survey area, as far as the comparison is made among the amount of net return in each area namely Rp 714,000 to Rp 796,000/ha in rainy season paddy and Rp 896,000 to Rp 1,080,000/ha in dry season paddy, respectively. In reality, however, the sharing of net return to gross income varies

widely from 58% to 81%. Low sharing of net return as seen in Telagasari and Bagor is mainly due to high production cost because of large labor cost for hired worker.

As much as 7 to 8% of the paddy production is lost at field during the harvesting. The next table shows the amount lost in the field as harvesting loss.

(Unit: Rp '000/ha/year)

	Telagasari	Bagor	Mattiro Bulu	Trimurjo
Wet season	126	85	92	92
Dry season	152	101	103	116

These harvesting losses are corresponding to about 10 to 15% of the annual net return.

(2) *Farm Economy*

The farm economy in the respective survey areas is assessed according to the tenurial status of owner farmer and tenant farmer. The farm budget for owner and tenant farmers is prepared by average farming size in each survey area as below:

(Unit: '000 Rp)

	Telagasari		Bagor		Mattiro Bulu		Trimurjo	
	Owner	Tenant	Owner	Tenant	Owner	Tenant	Owner	Tenant
Farm size (ha)	1.04	0.67	0.78	0.24	1.72	0.95	0.79	0.65
1. Farm income	1,766 (81%)	366 (47%)	1,137 (72%)	221 (31%)	2,466 (99%)	940 (97%)	1,307 (98%)	528 (79%)
2. Non-farm income	419 (19%)	412 (53%)	451 (28%)	489 (69%)	18 (1%)	30 (3%)	24 (2%)	162 (21%)
3. Total income (1+2)	2,185 (100%)	778 (100%)	1,588 (100%)	710 (100%)	2,484 (100%)	970 (100%)	1,331 (100%)	670 (100%)
4. Living expense	2,065	749	1,480	667	2,145	925	1,184	662
5. Net reserve (3-4)	120	29	108	43	339	45	147	28

3.3 Marketing of Rice Product

3.3.1 Marketing of Rice Product

Most of the farmers directly sell the fresh paddy to middlemen immediately after harvesting so as to get the cash early.

The joint selling of rice product by farmers' groups is not common in the survey areas. In the limited case, the milled rice is sold by individual farmers after the custom milling in the private rice mills in the villages.

Since the total capacity of rice mills is short to process the total paddy in the respective survey area, some marketable surplus of paddy is sold outside of the areas.

3.3.2 Rice Processing and Storage Facilities

(1) Drying Facilities

The drying of paddy is, so far, practised in limited extent at on-farm level. In fact about 10% of farmers have the concrete floors in the home yard in case of Bagor, a half of farmers in Trimurjo, while very limited concrete floors in both Telagasari and Mattiro Bulu. Most farmers mainly use the local sheets and/or small vinyl sheets for drying.

In general, majority of paddy is dried at rice mill as one of the practices of rice milling process. Large scale concrete floors and/or dryers are used for this practice. The drying floors of around 500 m^2 to 2,000 m^2, is prepared according to the capacity of each rice mill. The power dryers, in many cases batch-in-bin type, are operating for 1-2 months a year mainly for the wet season paddy. The total capacities of drying facilities available in the survey areas are estimated as follows:

Item	Telagasari	Bagor	Mattiro Bulu	Trimurjo
1. Drying Floor				
- Total area (10^3 m^2)	37.6	0.6	28.6	117.6
- Area per ha of paddy field (m^2/ha)	9.5	0.5	5.4	28.6
2. Dryer				
- Number (No.)	3	1	1	3
- Holding Capacity (ton)	15	7	8	9

(2) Rice Mill

The existing rice mills in the survey areas are presumably grouped into three categories by working capacity, i.e. large scale mill having a capacity of more than 0.7 t/hr, small scale mill ranged 0.3 - 0.7 t/hr capacity and Engelberg huller having a capacity of less than 0.3 t/hr. Large scale mills are owned by KUDs or rice wholesalers in general. Numbers of large rice mills in the survey areas and those milling capacities are as summarized below.

Item	Telagasari	Bagor	Mattiro Bulu	Trimurjo
1. Number of Mill				
- KUD owned	0	-	0	4
- Private miller owned	2	1	2	3
2. Capacity of Mill (t/hr)				
- KUD owned	-	-	-	0.8 (3) 1.0 (1)
- Private miller owned	0.7 (2)	2.0 (1)	2.2 (2)	2.0 (2) 1.7 (1)

New rice mills have been recently introduced in KUD. These mills are of the complete unit comprising paddy cleaner, husker, paddy separator, rice whitener and rotary-shifter. However, the milling operation hours of these rice mills are still limited so far because of shortage of operation fund and man-power, etc.

Small rice mills having 0.3 - 0.7 t/hr capacity are located within the village yard in each survey area. Most of these mills are owned by rich farmers. Some of rice mills are established and managed under joint ownership of farmers. These mills are mainly operated for the custom milling of rice for home consumption. The machinery unit of these mills have the husking and whitening functions. Most of these mills are not well maintained, and hence the operation efficiency is always low and significant amount of broken rice is generated. These small mills are usually operated for 4 - 5 hours a day during the harvesting season and/or for about 400 - 500 hours a year. Custom milling is charged at about Rp 20/kg of rice. Numbers of rice mills in the survey areas and those capacities are as summarized below:

Item		Telagasari	Bagor	Mattiro Bulu	Trimurjo
1. Number of Unit by scale					
- Large scale	(> 0.7 t/hr)	2	1	2	7
- Small scale	(0.3-0.7 t/hr)	50	15	-	66
- Engelberg huller	(<0.3 t/hr)	-	-	79	-
2. Total Capacity (10^3 t)		11.0	9.5	13.9	25.8 (11.0) *

*: Excluding large scale rice millers collecting paddy from the other Kecamatans.

(3) Storage Facilities

Paddy for home consumption and stockage is sacked into vinyl bags after drying and cleaning, and then stored in sheds or conventional warehouses (Lumbung). Since these facilities are so rough in the structural functions, paddy is susceptible to be damaged by rats, insects and high humidity in general. The storage period is less than 5 months.

Large size of the warehouses are attached to rice mills of KUDs and rice wholesalers. Most of these warehouses have been built with wooden materials and slated roofs. Modern warehouses have also been built by use of prefabricated steel structures and concrete floors recently by KUD. The storage capacity of these warehouses is 300 - 1,000 t. KUD's warehouses are used not only for rice product but also for farm inputs such as fertilizers and agro-chemicals.

Numbers of warehouses in the survey areas and those capacities are as summarized below:

Item		Telagasari	Bagor	Mattiro Bulu	Trimurjo
1. Capacity					
- Total Capacity	(t)	5,600	13,500	13,000	19,700
- Total Capacity to total paddy production	(%)	11	56	33	46
2. Distribution Share	(%)				
- KUD		6	2	39	7
- Sub-DOLOG		-	34	5	-
- Private Miller		6	56	53	51
- Farmer/Village		88	8	3	42
3. Capacity per Farmer	(t)	0.5	0.1	0.1	1.2

3.3.3 Price and Quality

(1) Price

The farm gate price of paddy is fluctuated seasonally, i.e. the lowest in April to May, and the highest in December or January. The wholesale price of milled rice is also fluctuated seasonally tracing the same trend as farm gate price of paddy. The current farm gate price of paddy and wholesale price of rice is as follows:

(Unit: Rp/kg)

Season	Karawang (Telagasari)	Nganjuk (Bagor)	Pinrang (Mattiro Bulu)	C. Lampung (Trimurjo)
Farm Gate Price (Paddy)				
Wet Season	200	187	174	176
Harvesting	(Mar-Apr)	(Mar-Apr)	(Mar-Apr)	(Apr-May)
Dry Season	251	231	194	244
Harvesting	(Jul-Aug)	(Jul-Aug)	(Aug-Sep)	(Aug-Sep)
Off Season	282	282	206	279
Wholesale Price (Rice)				
Lowest Price	358	357	328	373
Highest Price	520	460	404	560
	(Dec)	(Nov)	(Jan)	(Dec)

(2) Quality

The paddy quality is classified into 3 grades according to the degree of grain moisture content and impurities specified by the Government.

Most of farmers sell surplus paddy production having the moisture content of more than 20% which is graded as "wet paddy at field (GKP)" immediately after harvesting. Paddy sold in the off harvesting season is dried up imperfectly at the grain moisture content of 15-18% which is graded as "dry paddy for storage (GKS)". The dried paddy having less than 14% of moisture content which has been prepared as "dry paddy for milling (GKG)" is very rare in farmers' level at present. The content of impurities such as 1) empty grain and foreign materials, 2) green/chalky grains and 3) yellow damaged grain, and 4) red grain ranges all together 16-23% in all survey areas. The total quantities of these impurities are still within the permissible limit of GKG according to the quality standard decided by the government.

3.4 Farmers' Organization

3.4.1 General

There are three farmer organizations in the survey areas, i.e. KUD (Unit Villages Co-operative), P3A (Water Users Association) and KT (Farmer Group). The structure is shown in Fig. 3.4-1.

KUD provides the SUPRA INSUS based services such as farm input supply, marketing service and credit service. P3A provides irrigation service and maintenance of irrigation facilities. KT is organized for the promotion of SUPRA INSUS technologies mainly on the pre harvesting activities.

3.4.2 KUD

Generally one KUD covers 4 to 5 villages or total about 500 farm households. In the respective area, participation of farmers to KUD is

still limited to 30-40% of total farm households. The payment of Rp 1,000 - 2,500 of admission fee and Rp 100 - 500 of monthly membership fee is supposed to be heavy for farmers. The farmers of the survey areas cover about 80% of the total membership of KUD.

Each KUD has facilities such as rice mill, warehouse and drying facility. Five KUDs out of ten KUDs have rice mills, while they are operated mainly for custom milling of paddy brought by farmers or middlemen. No paddy procurement by KUDs from farmers is done except one KUD in Bagor. KUDs procure rice from private rice millers and distribute mainly to Sub-DOLOG. The warehouses are mainly used for keeping of farm inputs or machinery garages. Facilities of KUD are not fully utilized up to their holding capacities, at present.

Main activity of KUD is the arrangements of farm inputs under farm credit scheme (KUT). Most of KUDs have saving accounts collected from members.

3.4.3 Water User's Association

Water User's Association (P3A) were organized in Telagasari and Mattiro Bulu under the guidance of Rural Extension Center (BPP). Traditional irrigation groups headed by irrigation inspector such as Hippa and Ili-ili exist in Bagor and Trimurjo under administration of Kecamatan/Desa. These association are organized at each tertiary irrigation block under the control of irrigation inspector. The associations are sub-divided into the unit groups at quarterly block covering about 10 ha. All the farmers who cultivate paddy field within the tertiary irrigation block are subjected to join the Water User's Association. If some farmers cultivate the farm plots in different tertiary irrigation blocks, these farmers should be the member of each Water User's Association organized in the respective irrigation blocks.

The member farmers should pay the irrigation fee in kind at the rate of 15 - 20 kg/ha of paddy for each season. The irrigation fee is smoothly collected by the chief of P3A or the irrigation inspector. The collected paddy are used for the salary to irrigation inspector, laborer wages, and regain maintenance costs of irrigation facilities.

The irrigation facilities in Telagasari is not properly maintained mainly because of weak group activities, while well maintained by the farmers groups in other three areas. In Trimurjo, a part of quarterly canals and drainage canals were made by farmer groups themselves.

3.4.4 Farmer Group

(1) Organization

Under the guidance of Rural Extension Center, the participant farmers in SUPRA INSUS program have been organized into the farmer groups (Kelompok tani) in the survey areas. The numbers of membership in each farmers group vary rather wide from 90 to 370 in the survey areas. There are some farmers who belong to two or more different farmer groups similarly as in case of P3A.

The farmer group is generally managed by one group leader (key farmer), and some 5 - 10 progressive farmers. The key farmers and progressive farmers are selected from the advanced farmers. In most case, the tenant farmers can not join into as permanent member of farmer groups due to unstable farming activities because of short term tenancy contract.

Farmer groups usually consist of several sub-groups, but joint activities and coordination in and between sub-groups are limited to specific works like maintenance of tertiary canals and control of rats.

Generally admission fee and annual membership fee are not collected at present.

(2) Activities

There are no cases of group marketing activities, but most of selected farmer groups have interest in joint utilization of facilities for drying, milling and transportation.

More than 50% of farmer groups in the survey areas are classified to Advance Group which is characterized that:

1) Nucleus members are contacting other members, while activities are limited,

2) Working plan is prepared,

3) Key farmer is active, and

4) Key farmer can manage cooperate activities in the group.

Farmer group activities in the survey areas are summarized as below:

	Group Activities	Telagasari	Bagor	Mattiro Bulu	Trimurjo
a.	Maintenance work of tertiary canal	Δ	Δ	Δ	Δ
b.	Farm road construction by group	X	O	X	Δ
c.	Land preparation by family labor				
	- using hand tractor	X	X	Δ	Δ
	- using animal power	X	X	Δ	Δ
d.	Land preparation by contract laborers				
	- using hand tractor	O	O	X	X
e.	Transplanting and harvesting by				
	- contract agricultural laborers	O	O	Δ	Δ
	- family labor with labor exchange	X	X	Δ	Δ
f.	Joint ownership/utilization of hand tractor	X	Δ	X	X
g.	Communal seedling preparation	X	Δ	X	X
h.	Joint utilization of warehouse	X	Δ	X	Δ
i.	Joint operation of drying and milling	X	X	X	X
j.	Joint marketing	X	X	X	X

Note: mostly done : O
partly done : Δ
no case : X

3.5 Agricultural Support Services

3.5.1 Rural Extension Center (BPP)

(1) General Condition

The rural extension center (BPP) is responsible for agricultural extension services for farmers at field level. The daily extension services are carried out according to the training and visiting system

(T&V system) by field extension workers (PPLs). Working areas per one PPL in the BPP area are as follows:

Survey Area	BPP	Work Load per PPL	
		BPP Average (ha)	No. of Farmer Group in Survey Area
1. Telagasari	Telagasari	660	16
2. Bagor	Bagor	800	16
3. Mattiro Bulu	Manarang	990	32
4. Trimurjo	Trimurjo	670	13

One PPL covers 13 - 32 farmer groups in the survey areas and the work loads per PPL vary by the area.

(2) PPL Activity

PPL activity consists of three (3) items, namely extension service at field level, regular meeting and preparation of working report. The main activities of extension workers for agricultural technical guidance are the extension service at field level.

The scope of extension services in the field undertaken by PPL is defined as follows:

- to transfer information and technology on farming practices to farmers,
- to assist farmers to use recommended farm inputs,
- to assist farmer groups to prepare list of members and request list of farm inputs,
- to conduct farmer group evaluation,
- to assist agricultural research trials at field level,
- to conduct demonstrations of proper farming and introduction of new technologies, and
- to strengthen farmer groups' organization and communication.

The scope of services is covered whole area of farmers guidance, however degree of each scope is quite different by each PPL and area.

In addition every PPL have an obligation to attend the regular meetings of SUPRA INSUS Coordination Committee to offer field information obtained through visitings.

The main problems of extension services in the study area are insufficient technical guidance to the farmers due to the other administrative activities such as meeting with chief of Kecamatan, chief of Desa, KUD, etc. shortage of extension equipment for PPL, such as a motor-cycle, a photo camera, stationeries, etc., and insufficient knowledges of extension workers on post harvest technology, agricultural mechanization, budgeting management and farmer group promotion methods.

3.5.2 SUPRA INSUS Coordination Committee (POSKO)

For implementation of SUPRA INSUS program, POSKO is organized at the level of Province, Kabupaten, Kecamatan and Desa. Main POSKO activities are monitoring of the program, identification of problems, suggestion to lower level of POSKO, and supervision of POSKO for farmer groups.

The regular meeting of POSKO is once in two weeks and the attendance are from Agricultural Office, BIMAS, KUD, BRI, etc. in Kabupaten. In this meeting, main discussion concerned post harvest and marketing are labor shortage in harvesting season, and recommendable post harvest activities by farmers, in addition to following topics of SUPRA INSUS Program:

- list of members (RDK) and request list of farm inputs (RDKK),
- SUPRA INSUS credit distribution,
- linkage between KUD and farmer groups,
- irrigation water distribution,
- activities of KUD, and
- seed distribution and pest control.

3.5.3 Agricultural Credit

(1) Farm Credit Scheme (KUT)

Farm credit scheme (KUT) is available for farmers to buy farm inputs such as certified seeds, fertilizers, agro-chemicals, and growth hormone. This credit is characterized by a group (mass) credit and distributed in kind to farmer groups. The interest rate is 1% per month or 12% per year and the repayment period is set at 7 months taking crop season and selling time of product into consideration.

Farmer groups without repayment of the credit are excluded from SUPRA INSUS program in the next season. Key farmers or landowners are obliged to repay for group members or tenants, when some of the group members fail to repay.

(2) Other Credits

Other credits on rice production shown limit credit debtors due to bureaucratic procedures and strict screening. Most of these credits are utilized by applicants on agro-industry.

Revolving fund credit for hand tractor and water pump has been applied to farmer groups and this credit items are expanded to post harvest machinery such as power thresher recently.

4. BASIC CONCEPT OF THE IMPROVEMENT IN POST HARVEST AND MARKETING ACTIVITIES

4.1 Problems and Constraints in Survey Area

Major problems and constraints related to post harvest in survey areas are summarized as follows:

(1) Major Problems in Post Harvest Activities

a. large harvesting losses on fields caused by

- improper farming implements such as common sickles and inadequate size of ground sheets.
- improper harvesting practices such as cutting at the higher parts of the plants, delayed reaping from optimum reaping period, traditional beating method, and delayed threshing after reaping.
- inadequate field conditions such as poor drainage system at on-farm level and shortage of foot-paths in the fields
- traditional labor employment system as well as poor management of labour work on harvesting

b. large milling losses in quantity and quality

- improper milling machines and equipment in small rice mills
- shortage of facilities such as drying yard, paddy collection depot in the fields, transportation facilities in fields and storing facilities.
- improper handling practices such as imperfect or none pre-drying on fields before and/or immediately after threshing and insufficient field cleaning

(2) Major Problems in Marketing Activities

a. Small quantity for marketing by individual farm,

b. Poor quality of paddy product due to shortage of quality control facilities

c. Luck of farmer's marketing organization and facilities e.g. no joint marketing activities, shortage of milling facilities for joint usage and luck of group self-help credit system

d. Insufficient competition in marketing such as in milling and wholesaling.

(3) Major Problems on support services

a. shortage of technical guidance on post harvest improvement activities

b. shortage of guidance on management of marketing system and activities

c. shortage of market information services

4.2 Approach to Improvement of Post Harvest and Marketing Activities

(1) Objectives of the Improvement

For implementing the post harvest and marketing activities, the following schedules are set up as the essential approach to the improvement plan:

a. to save the present post-harvest losses through improvement and modernization of the respective activities, particularly harvesting and milling,

b. to improve the economy of paddy cultivation through modification of the present labor employment system and/or payment system on labor wages, e.g. sharing of production,

c. to ensure fair price for farmers through intensifying competition in marketing and regularization of joint processing and joint selling of rice product by farmer group,

d. to develop the appropriate marketing facilities such as rice mills, warehouses and transportation facilities for farmer groups, and

e. to ensure economically optimum scale of post harvest and marketing improvement by farmer groups.

(2) Basic Approach to the Improvement Plan

Basic approach to fill the above-mentioned objectives are as follows:

a. Implementation of pilot plans for the improvement in post harvest and marketing activities.

b. Trial of the following improved tools, machinery, facilities, practices and employment system of laborers

i) Tools, machinery and facilities
- serrated sickles
- large threshing sheets
- pedal or power threshers
- rice mills
- drying sheets for pre-drying
- concrete drying floors
- power winnower
- warehouses

ii) Practices
- reaping paddy stalks near the ground
- improvement of drainage system in paddy fields by farmers

iii) Employment system
- cash transaction instead of sharing system in harvesting

c. Trial of joint usage of large equipment or facilities such as threshers, rice mills, drying floors, power winnowers, warehouses and trucks by farmers' groups in the pilot areas.

d. Trial of group marketing of milled rice by farmers' groups, in the pilot areas.

e. Establishment of a pilot service center for each pilot area to institute pilot plan, to investigate the adaptability of advanced technologies and to carry out monitoring, evaluation and modification of technology package. The service center also provides supporting services to farmers/farmers' groups, such as display and demonstration of agricultural machinery and facilities, paddy/rice quality tests and paddy/rice market information services.

4.3 Post Harvest Activity Improvement Plans

(1) Harvesting (reaping, threshing)

The post harvest losses are most seriously appeared in harvesting activities on field. Thus improvement of the harvesting method and then saving those field losses are essential to maintain the paddy productivities as well as to increase the farmers economy.

a. Use of serrated sickles

The reaping work by use of common sickle brings big losses of 2.4% to 4.2% of the total paddy production. In case of the reaping by use of serrated sickles, the operation losses are small of 1.3%.

b. Termination of Crowded Gropyokan System

The Gropyokan system such as in East Java produces 0.8% more reaping losses than Ceblokan system and cash payment system according to the investigation made by the present study team. Introduction of cash payment system can reduce the reaping loss by around 0.8%.

c. Reaping near the ground

The JICA 1981/82 survey of post harvest losses showed that reaping of the stalks near the ground made 1.8% less reaping losses than reaping at about 15 cm above the ground. This is thought to be that reaping at higher parts provide stronger shocks to panicles causing more shattering losses. Reaping near the ground should be practiced to reduce reaping losses.

d. Drainage improvement

The poor drainage in the paddy fields restricts harvesting work and make more harvesting losses. Reaping at higher parts are carried out in paddy fields with poor drainage to keep reaped paddy stalks above standing water. Drainage improvement of the paddy fields should be made.

e. Use of large threshing sheets

Utilization of large ground sheets should be promoted for reduction of the scattering loss in threshing. According to the field observation made by the present study team, the loss saving by a large ground sheet is at 3.5% of the production.

f. Use of threshers

Pedal and power threshers are very effective in loss and cost saving. The investigation made by the present study team showed that the use of pedal thresher reduced threshing losses by 2.8% compared with the beating method. Where manual threshing is predominant pedal thresher should be introduced. Pedal thresher can easily be assembled by farmers themselves with technical assistance of agricultural extension workers. Where pedal threshers are popular among farmers powered threshers should be introduced based on the principle of the phased development.

(2) Cleaning and Drying

Farmers' paddy of poor quality with much impurities and moisture lessens milling capacity and produces much broken rice resulting in lower recovery rates and prices. Dirty and wet paddy is not suitable for safe storage of paddy. Such paddy is too susceptible to insect, rodent and fungi attack.

To control the grain moisture, two-step drying named pre-drying before and just after threshing and final drying after threshing will be practiced.

a. Pre-drying work

The reaped paddy will be pre-dried on field until the grain moisture content reduce to around 20%. After threshing, paddy will continuously be dried till 18% grain moisture level by use of ground sheet on field so as to facilitate cleaning/purification and transportation work as well as safety storing in short time.

b. Final Drying work

The final drying of paddy will be practised at rice mill yard after collection of the pre-dryed paddy from the member farmers. The final drying will be made until the grain moisture content reduces to around 14%.

The powered winnower will be introduced as a part of the rice mill facilities and control the impurities adequately before commencement of rice milling process.

(3) Milling

A rice mill unit of smaller milling capacity will be better than larger capacity because a small lot of individual farmers for custom milling, i.e. 30 to 40 kg of paddy, will be the major parts of paddy to be milled. A rice mill with a bigger capacity is not suitable to

a small lot because a milling recovery rate become lower when a small lot is milled by a rice mill with a larger capacity. A half ton per hour is the typical milling capacity of modern milling machines in Indonesia with keen price competition, which produces economic prices of the machines. Accordingly, a rice mill with a capacity of a half ton per hour will be introduced as an unit of rice mill.

(4) Transportation and Others

Present transportation of paddy/rice are made by manpower, and/or bicycle, house backs, trucks, etc. The harvested paddy is carried in the vinyl bag. Transportation losses are then limited to only less than 1% according to the CBS survey. To facilitate the transportation of paddy from fields rehabilitation and/or consolidation of farm roads is essential in this improvement plan.

4.4 Marketing Improvement Plans

As stated in the preceding chapter, unfair producer prices of paddy caused by the incomplete competition in marketing are the fundamental problems in paddy/rice marketing in the country. To fulfill the objectives such as to provide marketing facilities and to intensify competition in marketing, the following strategies will be promoted.

a. Development of marketing facilities for smallholders, such as warehouses, mills, telephones and trucks

b. Development of group marketing of white rice by farmers' groups

c. Development of marketing support systems for small farmers such as official market information services, standardization, quality control and marketing credit services.

The group marketing gives benefits of economics of scale in the use of transport, milling and storage facilities through increasing the volume of paddy/rice handled at one time and raises their bargaining power of the producers against wholesalers and retailers.

4.5 Other Improvement to be Required

The proposal on the technical improvement package to be required for successful implementation of the objective pilot plan is prepared hereinafter.

(1) Consolidation of On-farm Facilities

a. Irrigation and Drainage Canals

Tertiary and quarterly canals are in most case silted seriously due to inadequate maintenance by water users' associations and farmers. Drainage conditions in Telagasari and Mattiro Bulu survey areas are poor and then obstruct an adequate post harvest activities, especially in harvesting of wet season paddy.

Rehabilitation work of existing tertiary and quarterly canals as well as the field drains should also be scheduled on as the cooperative work of farmer group. To the above end, the irrigation office in each area should provide the technical assistance and advice to farmers through the technical coordination channel which has been established in the water users association.

b. Farm Roads

The farm roads in Teragasari and Mattiro Bulu survey areas are developed very scarcely, and therefore, the farmers mainly use the farm ridges as the foot-pass.

Development of the farm road network is essential and urgently needed in Teragasari and Mattiro Bulu areas for efficient farm work. It is recommended that the existing road along tertiary canal, should be expanded to 2 m wide. The new roads having 1 m wide should be constructed along each quarterly canals. The above work should be undertaken by the farmers through regularization of the cooperative work of farmers group.

c. Community House and Others

The construction of a community house is proposed for smooth communication among farmers and officials only in the Trimurjo area which has no community house.

Other than the above recommendation, it is also suggested that the land consolidation such as final land levelling, reformation of paddy field, etc. shall be on scheduled as much as possible, so that the modernization of rice cultivation and it farming activities can be made, smoothly and efficiently.

(2) Intensification and Standardization of Farming Activities

The farming activities of some farmers are still extensive and have deep gap among the farmers according to the financial conditions under current farmers' economy. Thus, to implement/activate the post harvest and marketing activity, successfully, the technology package which is specified in SUPRA INSUS Program, as well as those field activities should be the subject to intensification and standardization with particular attention to the following:

a. Unification of rice varieties by use of the high yielding varieties, such as IR64, IR48, IR42, IR36, etc. recommended under SUPRA INSUS Program,

b. Paddy cultivation according to the premeditated cropping schedule,

c. Establishment/operation of the communal nursery, and

d. Group operation of the plant protection work.

The recommendable technology package is shown in Fig. 4.5-1.

4.6 Reduction of Post Harvest Loss

With the improvement in farming practices as well as the modernization of farming implement and equipment, the post harvest losses will be reduced by significant extent, i.e. about 8.8% on an average, as estimated below: The post harvest losses are foreseen making reference to the field losses observed under improved/modernized conditions.

Practice	Improved Practice	Loss (%)
Reaping	- Cash payment system, serrated sickle, optimum chance in reaping	1.3
Threshing	- Pedal or power thresher, cash payment system	1.6
Transportation	- Transportation by sacks without holes	trace
Drying	- Drying on sheets without holes, careful bird control	trace
Storage	- Cleanliness of storage place, strict insect/rodent/bird control, strict quality control	trace
Milling	- Modernized mill, strict paddy quality control	2.2
Total losses to product before harvest		5.0

5. PILOT PLANS

5.1 General

One tertiary irrigation block was selected as the pilot area in each survey area. To this selection/demarcation of the pilot areas, the following conditions were taken into account. A pilot area must have

1) the most active rice cultivation within the province under irrigated conditions,

2) principle problems on post harvest and marketing activities,

3) progressive institutional supporting activities, and

4) location suitable for efficient implementation and effective demonstration of the pilot plan.

Present condition of 4 pilot areas are summarized as follows ;

Pilot Area	Telagasari	Bagor	Mattiro Bulu	Trimurjo
a. Location (desa) :	Cadas Kertajaya	Selorejo	Marannu	Purwodadi
b. Paddy field (ha) :	119	109	105	157
c. No. of farmer :	172	363	87	254
d. Cropping intensity:				
Wet season paddy	100 %	90 %	100 %	100 %
Dry season paddy	100 %	80 %	70 %	100 %

General maps in the 4 pilot areas are shown in Fig. 5.1-1.

5.2 Paddy Production

The paddy production will be stabilized and increased through apply of technical package of SUPRA INSUS program. The unit yield of paddy at 1996 is anticipated as follows applying 0.29% of annual increase rate estimated in SUPRA INSUS program:

Pilot Area	Telagasari	Bagor	Mattiro Bulu	Trimurjo
a. Wet season paddy :				
- Unit Yield (t/ha)	8.5	8.4	7.5	6.9
- Production (tons)	1,011	823	787	1,083
b. Dry season paddy :				
- Unit Yield (t/ha)	8.3	7.7	6.8	6.2
- Production (tons)	987	669	571	973
c. Annual Production : (tons)	1,998	1,492	1,358	2,056

The harvested paddy will be brought to the rice mill by farmer and performed drying and cleaning, properly. Quantity of paddy to be milled is estimated at dried and cleaned condition, and shown in Table 5.2-1. Paddy to be milled and marketing period are mentioned as follows :

Pilot Area	Telagasari	Bagor	Mattiro Bulu	Trimurjo
a. Paddy to be Milled (GKG, tons) :				
- Wet season paddy	855	659	622	950
- Dry season paddy	818	559	489	870
- Total	1,673	1,218	1,111	1,820
b. Milling and Marketing Period :				
- Wet season paddy	Mar.-Jun.	Mar.-Jun.	Feb.-Aug.	Apr.-Jun.
- Dry season paddy	Jul.-Dec.	Jul.-Dec.	Aug.-Dec.	Aug.-Dec.

5.3 Post Harvest Working Schedule

Cropping pattern herein proposed is the rice cultivation twice a year under irrigated condition. Working period of both harvesting of wet season paddy and transplanting of dry season paddy is limited to only one month and fully over-lapped each other due to irrigation schedule. Post harvest activities such as reaping, threshing, drying and cleaning will be respectively scheduled with 15 working days in each season. The proposed cropping patterns and working schedule in each pilot area is shown in Fig. 5.3-1.

The reaping work will be carried out using the serrated sickles by the casual labors to be employed under the contract with farmer. The reaping of paddy will be practised by cutting at lower stem portion, and timely reaping at normal maturation stage. The reaped paddy will be gathered to the ground sheet set on the dried field or threshing yard.

The reaped paddy will be threshed using pedal or power threshers. Initial drying work of threshed paddy will be carried out to reduce the paddy moisture from 22 - 25% to 18% using of ground sheets or existing small concrete floors. The cleaning of paddy will be made after drying successfully. The payment of labor wages in the harvesting work will be made in cash instead of the present system of payment in kind. The threshed paddy will be packed in vinyl bags for transportation. The paddy for food consumption is carried into the home-shed, while marketable surplus directly into the rice mill of farmers group.

The final drying work will be made on concrete floor which will be constructed in rice mill yard, to dry the paddy to 14 - 15% moisture level. The dried paddy will be cleaned using power winnower in rice mill as the essential practice in line of rice processing. After completion of drying and cleaning works, paddy will be milled according to the marketing schedule. The milled paddy will directly be sold to the respective market without storing.

The rice mill facilities will be operated and managed by the farmer group. The operators and laborers for rice milling work will be employed by the farmer group. Technical training and guidance to these operators and labors will be provided by the Service Center.

The post harvest activities mentioned above are summarized as follows:

Pilot Area		Telagasari	Bagor	Mattiro Bulu	Trimurjo
A. Reaping work					
a.Equipment	:	Serrated sickles	Serrated sickle	Serrated sickles	Serrated sickles
b.Work force	:	Casual laborers	Casual laborers	Family laborers	Family laborers
c.Operation	:	Individual farm	Individual farm	Individual farm	Individual farm
B. Threshing Work					
a.Pre-drying	:	On ground sheet	On ground sheet	On ground sheet	On ground sheet
b.Equipment	:	Pedal thresher	Power thresher	Pedal thresher	Power thresher
c.Work force	:	Casual laborers	Casual laborers	Family laborers	Family laborers
d.Operation	:	- Joint use by working unit of farmers -			
e.Repayment	:	- O/M cost and repayment are paid based on amount of threshed paddy by farmers			
C. Initial Drying/ Cleaning Works					
a.Material	:	Ground sheet	Ground sheet	Ground sheet	Ground sheet home yard
b.Work force	:	Casual laborers	Casual laborers	Family laborers	Family laborers
c.Operation	:	Individual	Individual	Individual	Individual
D. Rice Milling and Marketing					
a.Final drying	:	Concrete	Concrete	Concrete	Concrete
b.Storage of paddy	:	Warehouse	Warehouse	Warehouse	Warehouse
c.Cleaning	:	Power winnower	Power winnower	Power winnower	Power winnower
d.Milling	:	Rice mill	Rice mill	Rice mill	Rice mill
e.Work force	:	Casual laborers	Casual laborers	Casual laborers	Casual laborers
f.Operation	:	- Joint operation/management by farmer group			
g.Repayment	:	- Joint marketing of milled rice by farmer group			

5.4 Machinery and Facilities Development Plans

As stated in the preceding sections, it is required to introduce various implements, machinery and equipment so as to improve the post harvest and marketing activities.

The equipment required for harvesting is estimated as follows:

(Unit : Nos.)

	Telagasari	Bagor	Mattiro Bulu	Trimurjo
a. Serrated sickle :	183	151	162	241
b. Pedal thresher :	41	-	28	-
c. Power thresher :	-	12	-	17

Rice mill unit to be introduced into the pilot plan will have two structural functions, namely husking and rice whitening. Milling machine will be of one pass type with capacity of 500 kg/hr which has already been manufactured in Indonesia, and extensively installed/operated entire countries. These machine could be easily maintained since steady supply of spare parts is expected in the local market. Power winnower having 750 kg/hr capacity will be introduced as a part of rice mill facilities.

Warehouse will be built in the rice mill yard. This warehouse practically have the multi-function, namely for setting the rice mill unit, storage of paddy, joint-owned farm machinery, office for farming group, etc.

Requirement of machinery and facilities are mentioned in Table 5.4-1 and is summarized below:

Pilot Area	Telagasari	Bagor	Mattiro Bulu	Trimurjo
a. Rice mill unit (Nos.) (500 kg/hr) :	3	2	2	3
b. Power winnower (Nos.) (750 kg/hr) :	2	1	1	2
c. Concrete floor (m^2) :	2,100	1,500	1,600	2,300
d. Warehouse (m^2)				
- Rice mill unit :	180	120	120	180
- Paddy storage :	850	620	650	920
- Office/others :	40	40	40	40

Typical layout of rice mill facilities, warehouse, etc. are shown in Fig. 5.4-1.

5.5 Proposed Organization of Farmer Groups

5.5.1 General

The farmer group herein envisaged to be organized is the executive body of the objective post harvest and marketing activities including farm production and processing.

Although improvement and/or reinforcement of the structural function is required, the present farmers groups will be the most desirable farmers' organization to achieve the objective improvement of post harvest and marketing activities.

Technical package to be applied to each pilot area will include several type of group activities which are broadly classified as follows:

1) rice cultivation according to the mutual agreement on such conditions as utilization of cropping schedule of each season, etc.

2) cooperative operation, i.e. transplanting, harvesting by group farmers,

3) joint utilization/management of farm machinery,

4) joint ownership of processing facilities/equipment,

5) joint marketing of rice products.

5.5.2 Proposed Organization

The proposed farmer groups will be organized in each pilot area which is selected in one irrigation tertiary block. The existing farmer groups in each pilot area will be integrated in the proposed farmer group as its branches. In order to perform all the respective activities smoothly, the branch will be sub-divided into several working units on the basis of the quarterly irrigation service block covering around 10 ha. This could preclude the discrepancy between both organizational activities of farmer group and water user's association at on-farm level, as referred to Fig. 5.5-1.

Number of branches, working units and members in respective farmer groups are as follows:

Farmer Group	No. of Branch	No. of Working Unit	No. of Member
Telagasari	3	13	172
Bagor	4	11	363
Mattiro Bulu	2	14	87
Trimurjo	4	14	254

As an executive body of each farmer group, a Pilot Leader (key farmer), a sub-leader, 2 secretaries and a treasurer will be selected from members. In order to facilitate group activities, the following sections will be established and managed by above mentioned executive staffs, as referred to Table 5.5-1 and Fig. 5.5-2 namely Farm Input, Labor Arrangement, Processing and Marketing, and Accountant. The sections of labor arrangement, processing and marketing, and accountant are the new function for effective operation of proposed improvement activities in post harvest and marketing.

The farm input section will carry out preparation, procurement and distribution of farm input under the SUPRA INSUS Program, as it is carried out by the existing farmer groups.

The processing and marketing section will take care of drying, cleaning and milling operation by farmer group. This section will also be in charge of storing and sales business.

The accountant section will keep the accounts of farmer group including balance sheets of rice mill operation, custom service of machinery, joint investment account and group fund saving account, etc.

The labor arrangement section will undertake arrangement of labor contract for harvesting and other operations and will make contracts for employment of the technician and casual labors, etc.

For smooth operation of management, two competent office workers, one for accountant section and one for processing and marketing section, will be employed. During the operation of rice milling work, several daily workers will be employed.

The selected members of executive body will be given some honorarium based on the amount of benefit born by group activities.

5.5.3 Group Activities

According to the pilot plan, required group activities of farmer groups are summarized as follows:

(1) Joint Marketing

Proposed implementation of joint marketing will be scheduled as follows:

a. A rice mill unit including a concrete drying floor, a power winnower and a warehouse, etc. is set as one package for joint marketing activities of farmer group.

b. These facilities are group properties by joint investment of each farmer group under the financial assistance to be functioning in the national post harvest improvement program.

c. Joint marketing management is limited only to the marketable surplus paddy of member farmers.

d. Milled rice in each crop season paddy products is continuously sold to KUD, DOLOG and wholesalers.

e. Operation and Maintenance cost of these facilities and repayment of credit for joint investment are deducted firstly from the gross income of rice sales business.

f. Necessary number of laborers and operators are employed by farmer group.

g. Gross net benefit of rice sales business is shared to member farmers based on the presented paddy amount of each member.

(2) Joint Activities on Post Harvest

a. As for serrated sickle introduction, farmer group will purchase total amount of serrated sickles and distribute to each member farmer based on the farming size. Each member pays for distributed amount of sickles and lends to laborers or use for own operation.

b. Joint investment of thresher including pedal thresher or power thresher and ground sheet as one package.

c. These facilities are group properties by joint purchase and joint ownership of each farmer group under the institutional credit services or financial assistance of the pilot plan.

d. Utilization/operation and maintenance are carried out by joint operation and joint management of working unit group.

e. Working unit pay lental charge based on the repayment amount to the farmer group.

f. Working unit manage operation and maintenance by re-lease thresher with employed laborers and operators, if necessary, to member farmers according to the harvesting schedule.

g. Member farmer pays operation and maintenance cost and loan amount in proportion to the threshed amount of paddy of member.

5.6 Reinforcement Plan of Agricultural Support System

5.6.1 Post Harvest and Marketing Service Center

(1) Proposed Organization and Staffing

For the execution of the pilot plans, the Director General of Food Crops Agriculture (DGFAC) in Ministry of Agriculture will be the management administration and will establish the administrative channel, namely the Project Manager at national level and the Regional Project Leaders in provinces.

The Director General of Food Crops Agriculture will have the responsibility for overall implementation of the rice post harvest and marketing improvement program. The Project Manager will be responsible for the pilot plan implementation. The Regional Project Leader will be in charge of implementation of the said program, and chair the Post Harvest Committee Board in the province and arrange the financial budget for the objective activities. Under the supervision of Regional Project Leader, the Service Center will play daily services for farmers/farmers' groups in and around the pilot area within the respective rural extension centers mainly for promotion of the pilot plan and implement the integrated technical services on post harvest and marketing activities under the coordination with related agricultural service institutions. Proposed organizational structure is presented in Fig. 5.6-1.

Proposed Service Center will consist of a Chief of Center and Specialists or experts on the following technical fields:

- Farm machinery
- Rice processing
- Marketing business
- Extension method
- Farm management
- Rice farming

Specialists and/or experts of the above mentioned subjects are the regular staffs of the Service Center.

Such on-farm development as land consolidation, drainage improvement, etc. will be assisted by irrigation office.

(2) Functions and Responsibilities

a. Director General of Food Crops Agriculture (DGFCA):

1) to be responsible for overall implementation of the pilot plan and give guide line to lower level officers concerned in either technical or administrative commanded link, and

2) to determine either general or special policy related to pilot plan implementation.

b. Project Manager:

1) to act as a project implementor and to be responsible for the pilot plan implementation,

2) to arrange and determine pilot plan activities either technical or administrative to accelerate the implementation under witnessing of Director General of Food Crops Agriculture,

3) to arrange for dispatching a monitoring team regularly to the pilot plan area, and organize a working group in the final year of plan period so as to prepare appropriate technology packages and manuals on promotion methods of the technology packages, in whole pilot areas, and

4) to be a middle level technical officer dealing with post harvest guidance and located in DGFCA in Jakarta.

c. Regional Project Leader:

1) to act as an assistant of project manager and located in Agriculture Services for Food Crops in the Province concerned. He will be technical officer responsible for Food Crop Economics and processing development in a province,

2) to be in charge of pilot plan implementation which has been determined by the project leader, and

3) to be responsible to project manager on the implementation in a province.

d. Chief of Service Center:

1) to promote the pilot plan in coordination with related organizations such as BUPATI Office, Rural Extension Center (BPP), Irrigation Office, KUD and DOLOGS,

2) to implement integrated technical services to the farmers/farmer groups,

3) to monitor and evaluate performance of the improved technologies adopted by farmer groups,

4) to formulate appropriate technology packages for post harvest improvement, and

5) to prepare manuals of promotion methods of technology packages and establishment of farmer group organization.

(3) Location of Service Centers

The proposed location for establishing the Service Centers is selected with particular attention to the followings:

1) Easy coordination to BPP and other institutional agencies
2) Administrative center
3) Future expansion of the objective program

The selected locations of Service Centers are as follows:

Province	Kabupaten	Kecamatan
1. West Java	Karawang	Telagasari
2. East Java	Nganjuk	Bagor
3. South Sulawesi	Pinrang	Mattiro Bulu
4. Lampung	Central Lampung	Trimurjo

Proposed locations of Service Centers are shown on Fig. 3.1-1.

(4) Major Activities of Service Center

As an integrated technical services on post harvest and marketing in farmer group, the Service Centers will assist and advice the farmers/farmer group for the successful operation and management of the group activities envisaged as the pilot plan.

The essential activities of the Service Center are as follows:

1) Promotion of the pilot plan under coordination with Rural Extension Center (BPP),

2) Technical support on post harvest and marketing for farmers/farmer groups,

3) Monitoring and evaluation of performances of the improvement plans by farmer groups,

4) Formulation of appropriate technology packages for post harvest improvement,

5) Trials and demonstration of farm machinery to be promoted,

6) Rice quality inspection services for farmers,

7) Trials in the pilot areas of improvement plans made by related agricultural institutions,

8) Market information services for the farmers in the pilot areas, and

9) Preparation of manuals of promotion methods.

(5) Layout and Facilities

To undertake the activities mentioned above, the following facilities will be set in the Service Centers.

1) Office and meeting room,

2) Price information processing unit (small computers) with necessary stationeries,

3) Garage for farm machinery

4) Farm equipment and machinery i.e. reaper, dryer, truck, etc.

5) Laboratory for quality test and inspection, and

6) Telecommunication facilities.

The reapers and power dryers will be introduced for experiment on those adaptability as well as for demonstration purposes. The reapers and dryers have remarkable effects on loss saving and on time work of post harvest activities. However, introduction of these machinery and equipment still remains risky due to high selling prices and narrow adaptabilities to the present field conditions. The service center will make trial operation of these machinery and equipment and study both technical and financial feasibilities.

The typical layout of the Service Center is prepared in Fig. 5.6-2.

5.6.2 Reinforcement of Rural Extension Center

Target farmer groups in the pilot areas will play the objective joint activities under the services of Rural Extension Centers (BPPs) concerned. RECs are in charge of extension programs as well as the activities of extension workers (PPLs) which are extended to develop/improve farmers/farmer groups in the respective agricultural field. Therefore BPPs would be the important working partners of Service Center for implementing the proposed technology package for pilot plan.

An extension worker covering the pilot plan area is in charge of the area which is about 4-5 times larger than the pilot area under the present working pattern, and it is hardly expected to concentrate his service only to the pilot area. Therefore it is proposed to adopt intensive service pattern instead of present equal service pattern, taking account of the objectives and characteristics of the pilot plan.

In the intensive service pattern, the whole working area of extension worker will be divided into intensive service area and general service area. Intensive service area will be shifted under rotation system by several years. In the long term plan, whole working area of extension worker will be covered by intensive services.

It may be more preferable that the pilot area will be covered as the intensive service area not by a specific extension worker but by the BPP as a whole so that all extension workers in the BPP concerned could participate to the pilot plan and obtained technology and experience in the pilot plan under the guidance of the Service Center.

6. IMPLEMENTATION PLAN AND COST ESTIMATE

6.1 Implementation Plan

The implementation of the pilot plan is scheduled for seven years consisting of 1) preparatory stage for two years and 2) pilot plan period for five years as shown in Fig. 6.1-1. There are two stage for the development, i.e. preparatory stage and pilot plan period.

6.1.1 Preparatory Stage

The following four(4) items will be implemented during the preparatory stage for two years :

(1) Preparatory Works

a) Detailed study and survey for the pilot plan implementation
- site selection and design of the facilities in Service Centers and pilot areas
- assessment of required number of machinery
- organization plan for the pilot plan and the farmer groups selected.
- cost estimate of the detailed pilot plan

b) Service Center organization set-up
- organization at the national, provincial, Kabupaten and Service Center level
- staffing at each level

c) Orientation for farmer groups set-up
- instruction and discussion with the selected farmer groups
- meeting for organization set-up

(2) Construction of Service Center

- buildings for office and machinery

(3) Procurement of Machinery

- farm machinery, mechanical dryer, rice mill, etc.

(4) Development of Pilot Area

a) Pilot farmer groups set-up
- selection of key staffs
- selection or employment of operators
- grouping of pilot farmer groups
- arrangement of loan

- assessment of charges for joint utilization of machinery and facilities

b) Construction of facilities
- warehouse, milling house and drying floor

c) Procurement of machinery
- pedal threshers (Telagasari, Mattiro Bulu)
- power threshers (Bagor, Trimurjo)
- power winnowers and rice mill units

6.1.2 Pilot Plan Period

During the pilot plan period of 5 years, the following activities will be executed by the pilot farmer groups to be organized and the Service Centers to be established :

(1) Pilot Farmer Groups' Activities

a) Training for machinery and facilities' operation
- thresher, winnower, rice mill
- drying floor and warehouse

b) Improved harvesting activities
- scheduled harvesting
- serrated sickles
- wide ground sheet and pedal or power thresher
- pre drying at field using sheet

c) Joint processing and marketing activities
- joint management of processing and marketing facilities
- joint marketing of rice based on the price information

(2) Service Center Activities

a) Guidance for farmer groups set-up (initiated in the preparatory stage)

b) Training and demonstration of machinery operation

c) Guidance, assistance and monitoring on farmer group activities

d) Demonstration of reaper and mechanical dryer

e) Market information service

f) Preparation of monitoring and evaluation report

g) Preparation of appropriative technology packages

h) Preparation of manual on promotion methods of the pilot plan

6.2 Financial Cost Estimate for the Pilot Plan

6.2.1 Project Cost

The project cost for the pilot plan comprises of the machinery and equipment procurement cost and construction cost for facilities. The machinery and equipment consists of ground sheet, pedal or power thresher, power winnower and rice mill. The facilities are drying floor, warehouse and milling house. The project costs in the pilot plan areas are as follows (See Table 6.2-1):

(Unit: Rp '000)

Item	Telagasari	Bagor	Mattiro Bulu	Trimurjo
1. Machinery	30,014	33,351	19,707	49,183
2. Construction for facilities				
- Drying floor	10,668	7,620	8,128	11,684
- Warehouse and milling house	59,920	43,680	45,360	63,840
Sub-total	70,588	51,300	53,488	75,524
3. Total (1 + 2)	100,602	84,651	73,195	124,707

6.2.2 Annual Operation and Maintenance Cost

The unit cost of annual operation and maintenance for machinery were estimated on the basis of the annual requirements for fuel and oil cost, repair cost, labor cost, and others, taking the annual operating hours of the respective machinery into consideration. The unit costs of O&M for drying floor, warehouse and milling house were estimated taking the labor requirement for drying and handling of paddy and maintenance cost for these facilities into consideration.

Financial costs of operation and maintenance for the pilot plans were estimated as follows :

(Unit: Rp '000)

Cost Item	Telagasari	Bagor	Mattiro Bulu	Trimurjo
1. Operation and Maintenance Cost/1				
a. Machinery	7,012	7,593	4,663	10,981
b. Facilities/2	5,289	3,647	3,750	5,583
Sub-total	12,301	11,240	8,413	16,564
2. Labor Cost				
a. Machinery	15,013	6,063	8,610	7,888
b. Facilities	5,488	3,645	3,054	4,710
Sub-total	20,501	9,708	11,664	12,598
3. Transportation Cost	1,972	1,304	1,322	2,056
Total (1 + 2 + 3)	34,774	22,252	21,399	31,218

Note: /1: Cost for fuel, oil, spare parts and repayment excluding labor cost.
/2: Including cost for bagging.

6.2.3 Replacement Cost

The useful life of facilities and machinery is assumed to be three years for threshing sheet and pedal thresher, five years for power thresher, power winnower and rice mill unit, and twenty years for drying floor, warehouse and milling house. Financial replacement costs in the respective pilot areas were estimated as shown in Table 6.2-2.

6.2.4 Repayment of Loan

Condition of the loan for procurement and construction of machinery and facilities are set as follows :

- Machinery
  - Repayment period ; 5 years
  - Interest ; 18% /year
- Facilities (drying floor, warehouse, milling house)
  - Repayment period ; 10 years
  - Interest ; 6% /year

The repayment covers principal and interest. The annual repayment in the pilot plans were estimated as follows:

(Unit: Rp '000)

Cost Item	Telagasari	Bagor	Mattiro Bulu	Trimurjo
1. Machinery	9,597	10,665	6,302	15,728
2. Construction of facilities				
- Drying floor	1,450	1,035	1,104	1,588
- Warehouse/milling house	8,141	5,935	6,163	8,673
Sub-total	9,591	6,970	7,267	10,261

6.2.5 Estimation of Operation Expenses

Operation expenses for machinery and facilities in the respective pilot areas covers the operation and maintenance costs, depreciation cost and repayment cost for the loan. The following unit operation expenses will be collected from the member farmers so as to compensate the several costs for the activities :

Item	Telagasari		Bagor		Mattiro Bulu		Trimurjo	
	1st-5th Year	After 6th Year	1st-5th Year	After 6th Year	1st-5th Year	After 6th Year	1st-5th Year	After 6th Year
1. Custom Threshing (Rp/kg of paddy)								
- Pedal Thresher	8	6	-	-	7	5	-	-
- Power Thresher	-	-	10	6	-	-	9	6
2. Processing and marketing (Rp/kg of rice)								
- Drying (Drying floor)	6	6	7	7	6	6	6	6
- Storage (Warehouse, milling house)	17	17	19	19	19	19	17	17
- Cleaning (Power winnower)	5	4	5	4	4	4	4	4
- Milling (Rice mill)	20	13	20	13	20	13	20	13
- Transportation	2	2	2	2	2	2	2	2
Sub-total	50	42	53	45	51	44	49	42

6.3 Preliminary Cost Estimate

The cost of the Service Center comprises the construction cost of building and facilities, equipment and machinery for demonstration, equipment and implement of laboratory for paddy/rice inspection, equipment and furniture and others.

The preliminary cost estimate of the Service Center are mentioned in Table 6.3-1 and is summarized below:

The preliminary cost estimate of the Service Center are mentioned in Table 6.3-1 and is summarized below:

(Unit: Rp '000)

Cost Item	Amount
1. Building/ facilities	132,500
2. Equipment/ implement for laboratory	68,480
3. Farm machinery for demonstration	86,200
4. Equipment/ furniture for office (truck, jeep others)	137,700
Total	424,880

7. PROJECT EVALUATION

7.1 Price Forecast

(1) Financial Price Forecast

The financial prices to be applied for assessment of both conditions with and without project are referred to the current prices in 1988 and no increase of prices owing to inflation is foreseen in this study.

In case of the condition without project, no drastic change will be appeared on the paddy and/or rice marketing, namely selling of rice product will be scheduled by fresh/wet paddy immediately after harvesting in each season. Hence the price of paddy under the condition without project are assumed to be the same as the present low price. In case of the condition with project, it is assumed that all the rice product will be sold in terms of the milled rice which is processed in rice mill to be owned by the respective farmer groups. The financial prices of rice product under the conditions without and with project are estimated as follows:

1) Financial prices are estimated at the farm gate bases for paddy and the wholesale bases for rice.

2) Paddy prices both for wet and dry seasons are taken average prices during both harvesting seasons.

3) Rice price in wet season is taken an average price during wet harvesting season. On the other hand, rice price in dry season is taken an average price between dry harvesting season and off season of December because of increase in rice price.

4) Price differences on rice quality classes are estimated at Rp 20/kg between the common prices of class C and class B and Rp 30/kg between B and A classes. Outlets of rice are DOLOG for B class and the local wholesale markets for both A and B

classes. DOLOG buying price of B class rice from KUDs or task force is applied Rp 405/kg which is set since January, 1989.

Item	Telagasari	Bagor	Mattiro Bulu	Trimurjo
I. Without-Project Condition (Present Farm Gate Price of Paddy)				
1) Wet Season				
Price (Rp/kg)	200	187	174	176
2) Dry Season				
Price (Rp/kg)	251	231	194	244
II. With-Project Condition (Wholesale Price of Rice)				
1) Wet Season				
- Class B Rice for DOLOG/Market				
Price (Rp/kg)	405/378	405/377	405/348	405/393
2) Dry Season				
- Class B Rice for DOLOG/Market				
Price (Rp/kg)	405/458	405/449	405/414	405/446
- Class A Rice for Market				
Price (Rp/kg)	488	479	444	476

Financial prices of farming tools, equipment and machinery are directly referred to the retail prices in 1988 in Indonesia. The expenses for machinery, rice milling, etc. under the condition with project are estimated on the basis of the operation and maintenance costs including the costs for depreciation and repayment. Financial prices and costs of farm inputs in the respective pilot areas are estimated as shown in Table 7.1-1.

(2) Economic Price Forecast

The economic prices used for the economic evaluation of pilot plans are studied on both farm inputs and outputs as follows:

1) Economic prices for rice production are estimated on each quality classes, i.e. class A, B and C on the basis of the projected world market prices in the long term range for the period of 1987 to 1995 by the World Bank.

2) Seasonal financial price increase through shipment control of rice product is excluded from economic price forecast.

Economic prices of paddy and rice are forecasted taking quality increase into consideration.

3) Economic labor charges are estimated by applying shadow wage rates of 60% for Java and 70% for outer Java.

4) The economic prices for others are converted from the respective financial prices by applying the standard conversion factor of 0.9.

Economic prices of farm inputs and outputs are estimated as follows:

Item	Unit	Economic Price (1995)
Outputs		
1) Paddy (Farm gate price)	(Rp/kg)	
a) For Class C rice		
- 60% milling rate(Without Condition)		159
b) For Class B rice		
- 65% milling rate(With Condition)		242
2) Rice (Wholesale price)	(Rp/kg)	
a) Class A rice		439
b) Class B rice		393
c) Class C rice		350
Inputs		
1) Labor charges	(Rp/day)	1,450
2) Hired animal power	(Rp/day)	10,800
3) Custom charges for hand tractor		
- Telagasari		27,500
- Bagor		25,000
- Outer Java		32,500

7.2 Financial Evaluation

7.2.1 Farmers' Economy

After the implementation of the pilot plan, harvesting and processing losses will be reduced considerably through improvement of the post harvest activities.

Harvesting cost will also be reduced in significant extent by the introduction of improved harvesting system i.e. reaping by organized laborers under cash payment system and effective threshing works by pedal and power threshers through farmer groups' custom service. The threshing expenses will be reduced after the sixth year from the commencement of

the pilot plan because of completion of the loan repayment for the threshers. The harvesting costs in the pilot areas are estimated as follows:

(Unit: Rp '000/ha/year)

Item	Telagasari			Bagor			Mattiro Bulu			Trimurjo		
	w/o	w-1	w-6	w/o	w-1	w-6	w/o	w-1	w-6	w/o	w-1	w-6
1. Labor charge	428	130	130	412	115	115	145	38	38	155	40	40
2. Custom threshing charge	-	120	98	-	157	94	-	92	72	-	124	72
3. Others	-	12	12	-	12	12	-	12	12	-	12	12
4. Total	428	262	240	412	284	221	145	142	122	155	176	124

Note: w/o = without project condition
w-1 = with project condition (1st-5th year)
w-6 = with project condition (after 6th year)

The improvement of profitability will be brought by decrease in losses and reduction of harvesting cost. The increase in gross income is also expected due to joint sales of rice under the condition with project. The crop budget is made for paddy sales under the condition without project and for rice sales under the condition with project as shown in Table 7.2-1. The net return under the condition with project will be increased even though additional processing and marketing costs are required. The net return will be moreover enlarged from the 6th year as follows:

(Unit: Rp '000/ha)

	Telagasari		Bagor		Mattiro Bulu		Trimurjo	
	W.S.	D.S.	W.S.	D.S.	W.S.	D.S.	W.S.	D.S.
Without-Project Condition (Paddy)								
1. Gross income	1,400	1,682	1,253	1,478	1,027	1,145	1,021	1,293
2. Production cost	568	606	578	576	267	287	239	268
3. Net return (1-2)	832	1,076	675	902	759	858	782	1,025
With-Project Condition (1st-5th year) (Rice)								
1. Gross income	1,829	2,098	1,710	1,971	1,416	1,664	1,576	1,647
2. Production cost	749	729	754	745	478	481	458	449
3. Net return (1-2)	1,080	1,369	956	1,227	938	1,184	1,118	1,198
With-Project Condition (After 6th year) (Rice)								
1. Gross income	1,829	2,098	1,710	1,971	1,416	1,664	1,576	1,647
2. Production cost	699	681	686	677	440	443	404	397
3. Net return (1-2)	1,130	1,416	1,024	1,294	976	1,222	1,172	1,250

Note: W.S.; Wet season D.S.; Dry season

Farm budget is prepared the average size farmers in both without and with project conditions on the basis of the above crop budget analysis as shown in Table 7.2-2. The budget conditions in the following

table are different among the pilot areas because of the difference of farm size and rice productivity. The increase in net reserve under the condition with project is fairly large being Rp 400-1,400 thousand in case of owner, while that is limited to Rp 30-150 thousand in case of tenant. This is mainly due to the land rent as high as 50% to the total paddy product.

(Unit: Rp '000)

	Telagasari		Bagor		Mattiro Bulu		Trimurjo	
	Owner	Tenant	Owner	Tenant	Owner	Tenant	Owner	Tenant
Farm size (ha)	0.98	0.69	1.30	0.30	2.56	1.21	0.76	0.62
Without-Project Condition								
1. Farm income	1,722	383	1,822	268	3,481	1,148	1,264	502
2. Non-farm income	419	412	451	489	18	30	24	162
3. Total income	2,141	795	2,273	756	3,499	1,178	1,288	664
4. Living expense	2,065	749	1,480	667	2,145	925	1,184	662
5. Net reserve (3-4)	76	46	793	89	1,354	253	104	2
With-Project Condition (1st - 5th year)								
1. Farm income	2,259	465	2,609	301	4,776	1,191	1,662	538
2. Non-farm income	419	412	451	489	18	30	24	162
3. Total income	2,678	877	3,060	789	4,794	1,220	1,685	700
4. Living expense	2,065	749	1,480	667	2,145	925	1,184	662
5. Net reserve (3-4)	613	128	1,580	122	2,649	295	501	38
With-Project Condition (after 6th year)								
1. Farm income	2,326	532	2,644	335	4,859	1,273	1,728	603
2. Non-farm income	419	412	451	489	18	30	24	162
3. Total income	2,746	944	3,095	824	4,877	1,303	1,751	765
4. Living expense	2,065	749	1,480	667	2,145	925	1,184	662
5. Net reserve (3-4)	681	195	1,615	157	2,732	378	567	103

7.2.2 Farmer Groups' Economy

Farmer groups' economy is assessed for ten years from the commencement of the pilot plan taking the groups' incomes and expenditures into consideration. The machinery and the facilities will be jointly procured or constructed respectively by the utilization of loan.

The cash inflow of the groups' activities consists of custom threshing charges, processing and marketing charges, rice sales income and loan. The charges for joint use of machinery and facilities are calculated so as to compensate the expenses for operation, maintenance, depreciation and repayment for loan detailed in the Chapter 6. The unit charges collecting from group members are decided as follows:

Item	Telagasari	Bagor	Mattiro Bulu	Trimurjo
I. Custom Threshing Charges (Rp/kg of paddy)				
1. 1st to 5th year	8	10	7	9
2. After 6th year	6	6	5	6
II. Processing/Marketing Charges (Rp/kg of rice)				
1. 1st to 5th year	50	53	51	49
2. After 6th year	42	45	44	42

Annual incomes from the charges are estimated on the basis of the threshing, processing and marketing quantities of rice product and the above unit charges. Milled rice is jointly sold to the local wholesale markets or DOLOG. The amount of sold rice is shared with the members on the basis of the members' deliveries of paddy. Loan incomes are expended for the procurement of machinery and construction of facilities.

The cash outflow for the management of groups' activities comprise 1) investment cost for procurement of machinery and construction of facilities i.e. drying concrete floor, warehouse and milling house, 2) operating cost for machinery, facilities, paddy procurement from farmers and transportation cost to DOLOG or the wholesale markets, 3) replacement cost for machinery, 4) repayment for the loan.

Cash flow statements in the respective pilot areas are prepared on the basis of the above conditions and implementation schedule of the pilot plan as shown in Table 7.2-3. It is concluded that the pilot farmer groups can manage their activities economically even during the repayment periods for machinery until the fifth year. The groups' accounts will be improved after the repayment of the loan for machinery when the farmer groups could have possibilities for the other investments i.e. expansion of capacities for storage, introduction of mechanical dryers, a truck for transportation, etc. The groups' accounts in the fifth and tenth years are summarized as follows: