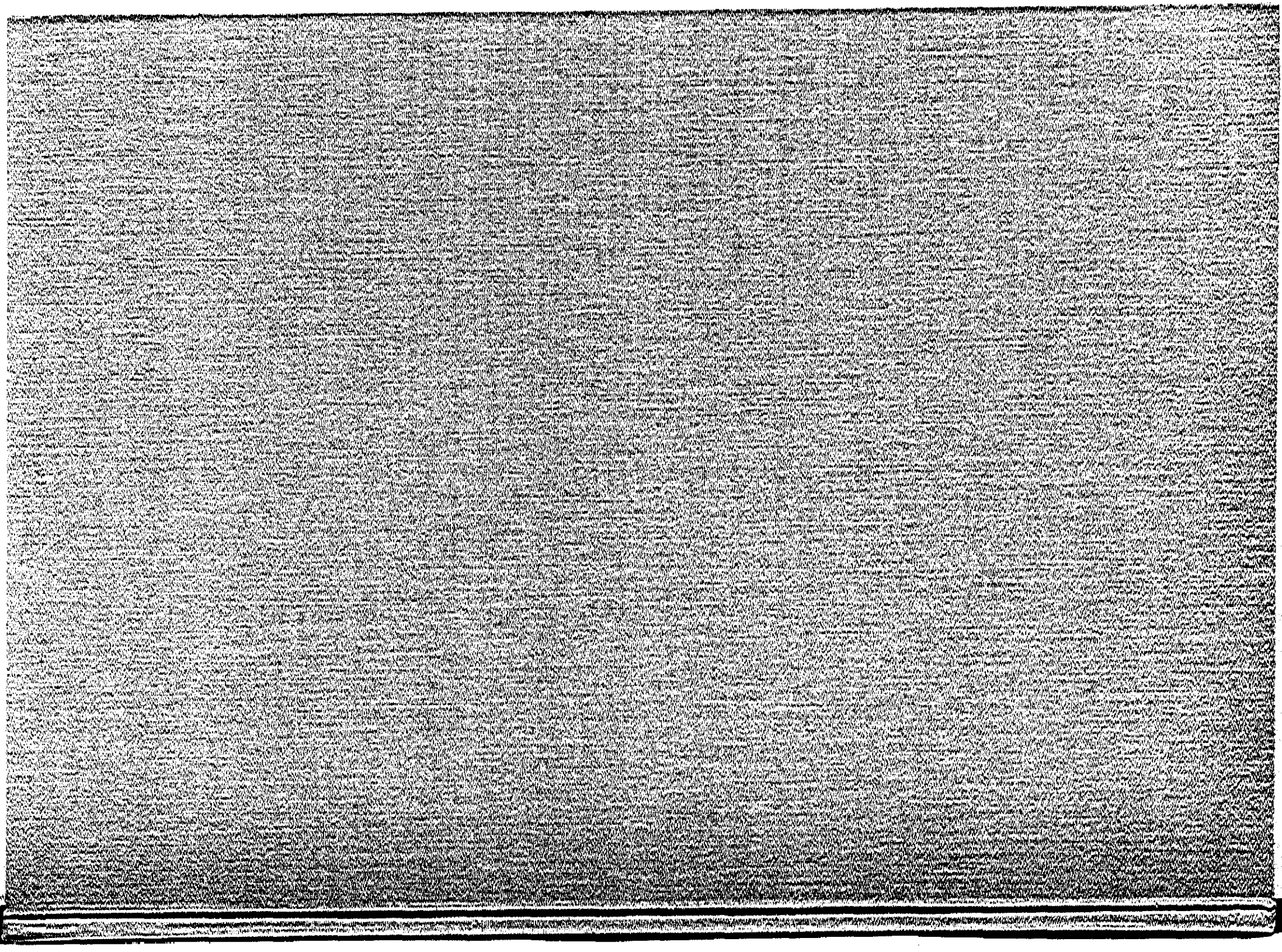

FEASIBILITY STUDY REPORT

ON

THE RICE SEED PRODUCTION AND DISTRIBUTION PROJECT

IN

THE REPUBLIC OF INDONESIA

NOVEMBER 1982

JAPAN INTERNATIONAL COOPERATION AGENCY

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PREFACE

In response to the request of the Government of the Republic of Indonesia, the Government of Japan decided to conduct a study on the Rice Seed Production and Distribution Strengthenning Project and entrusted the study to the Japan International Cooperation Agency. The J.I.C.A. sent to Indonesia a survey team headed by Mr. Yasuo Hasui from January 25 to March 30, 1982.

The team exchanged views with the officials concerned of the Government of the Republic of Indonesia and conducted a field survey in the three provinces of Aceh, South Sumatera, 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 serve for the development of the Project and contribute to the promotion of friendly relations between our two countries.

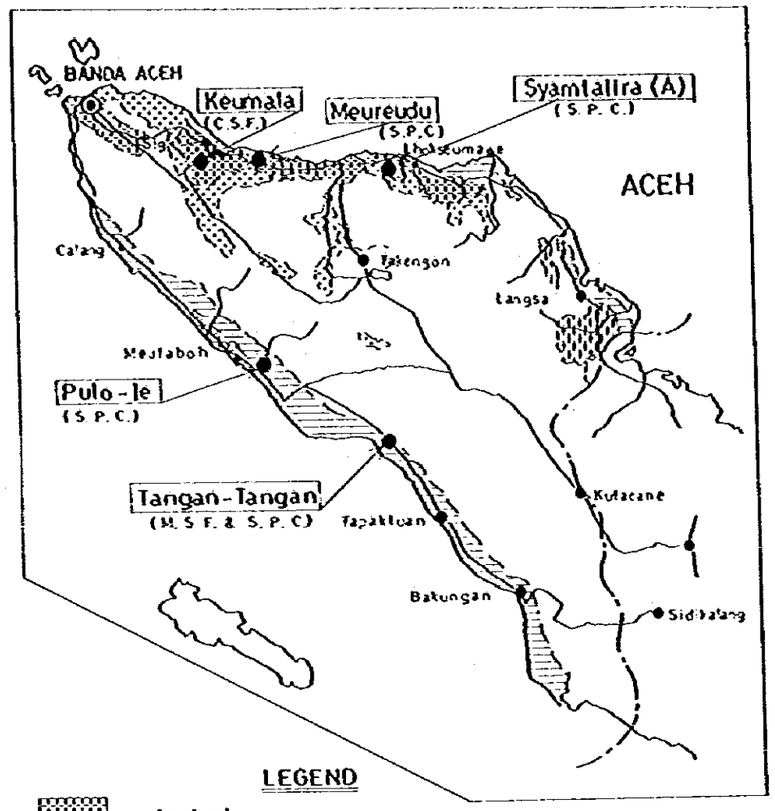
I wish to express my deep appreciation to the officials concerned of the Government of the Republic of Indonesia for their close cooperation extended to the team.

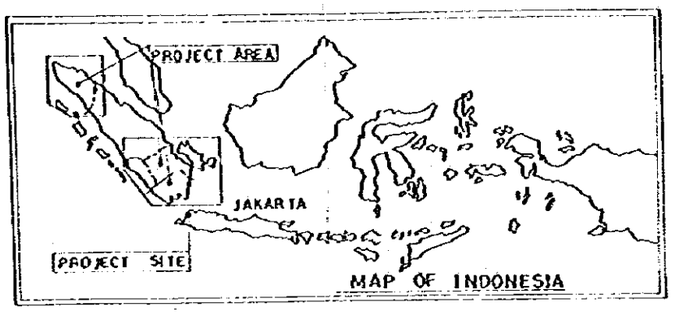
November, 1982

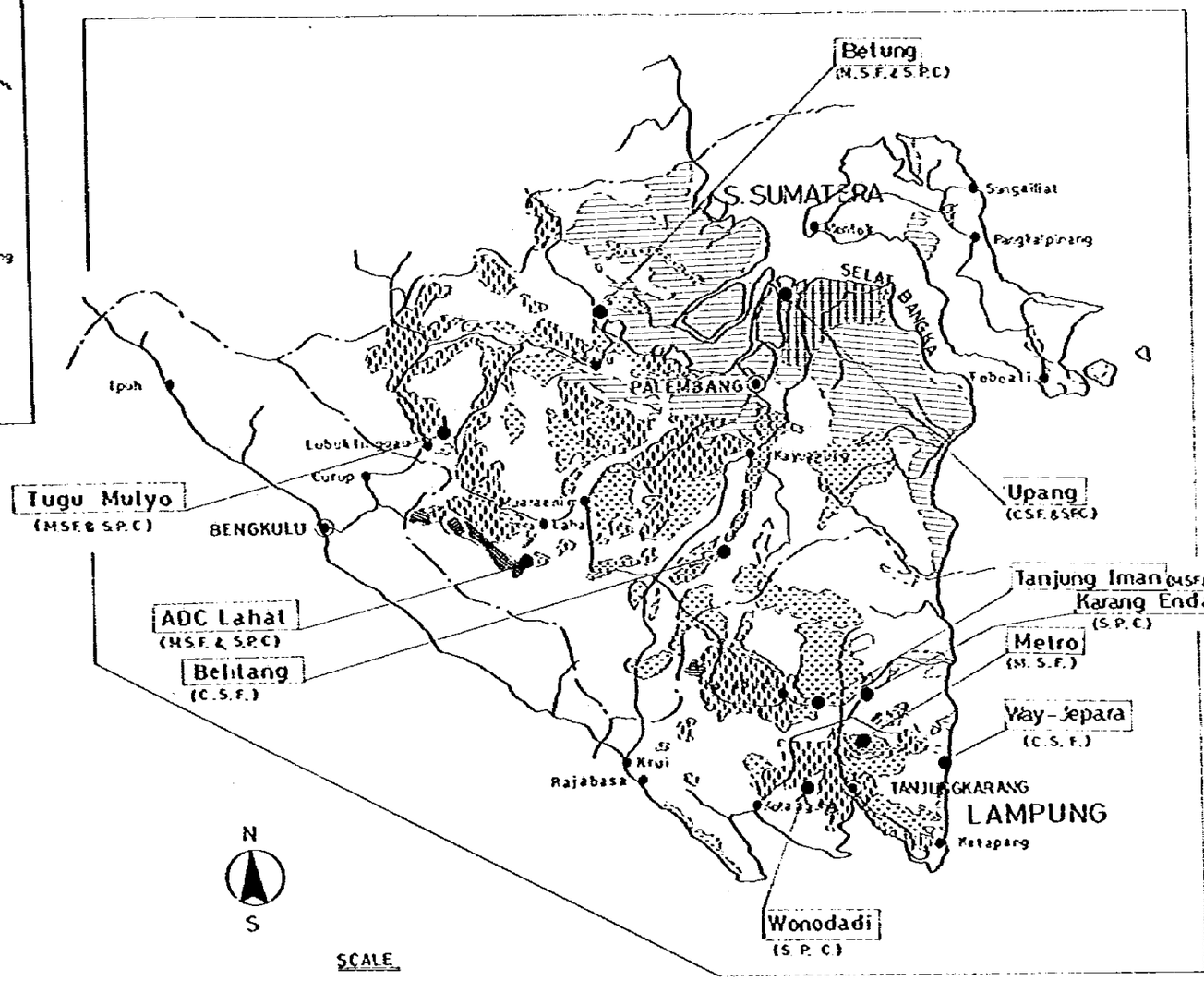
Keisuke Arita

President

Japan International Cooperation Agency

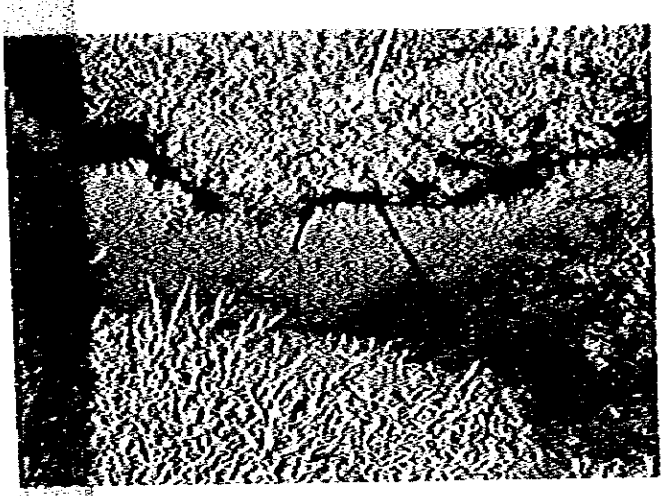




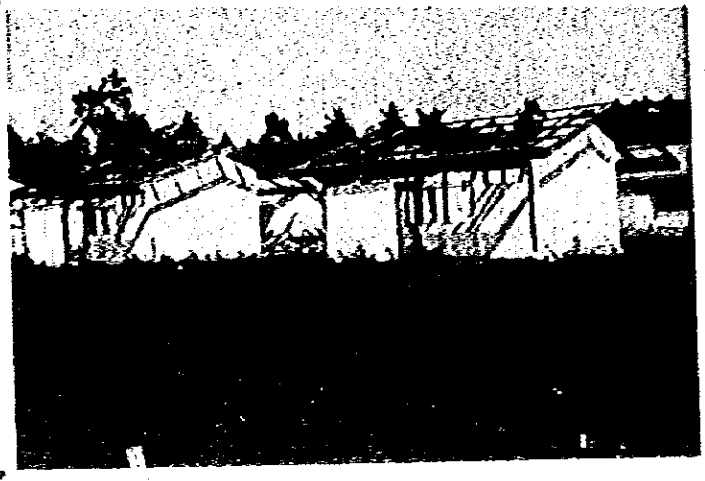


LEGEND

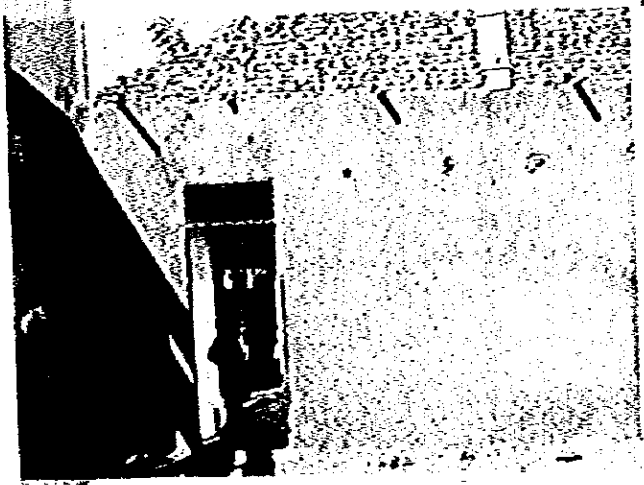
- Lowland
- Tidal
- Upland farming (Food Crop Industrial and estate crop)
- Estate crop mostly rubber
- Swampy area / Flooded
- Grass/alang-alang(Upland paddy)
- Belung — Project site
- Road
- Provincial Boundary Line



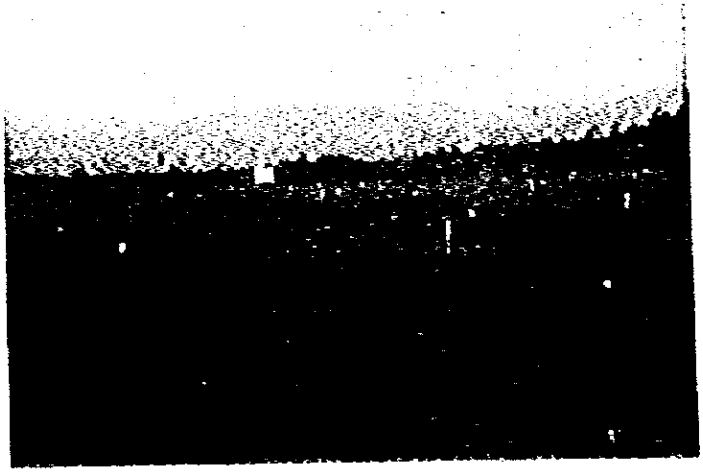
Water channel at Keumala C.S.F.



Keumala C.S.F. staff accommodation is under construction

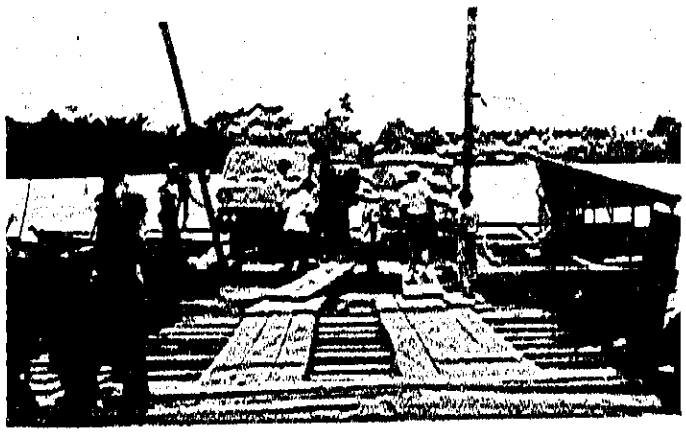


.S.F. storage (brick building) is under onstruction at Keumala



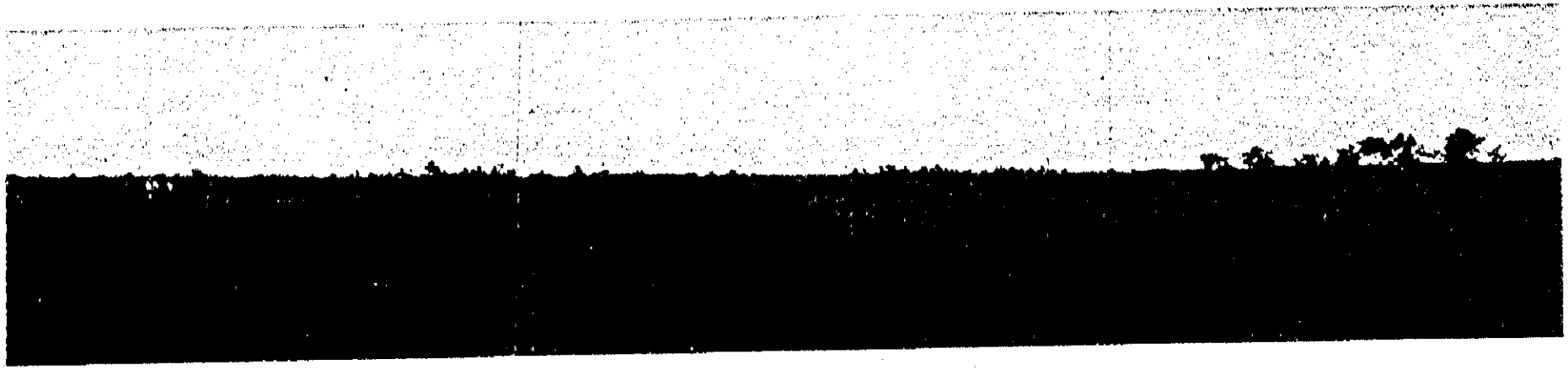
C.S.F. paddy field at Keumala

Jobe site for S.P.C. at Tangan-Tangan



Crossing river by ferry boat (All the crossing river in West Aceh is done by such a ferry boat)

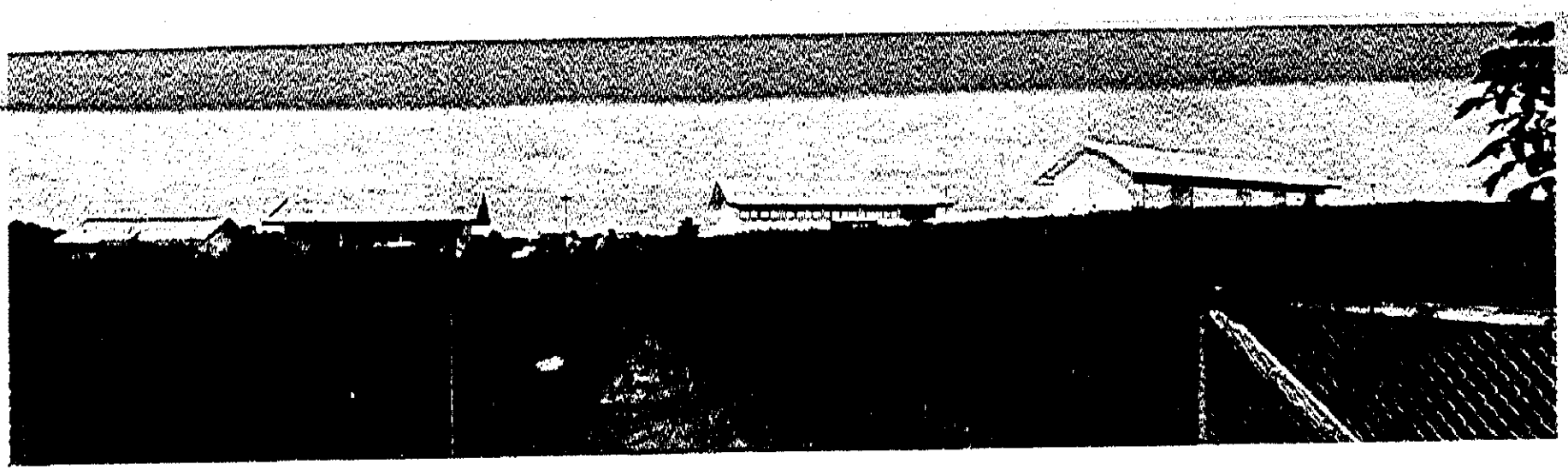
Harvesting scenery in Aceh Province



C.S.F. paddy field at Upang

Water level rise up to
the floor of the building
in rainy season
(Upang C.S.F. office)

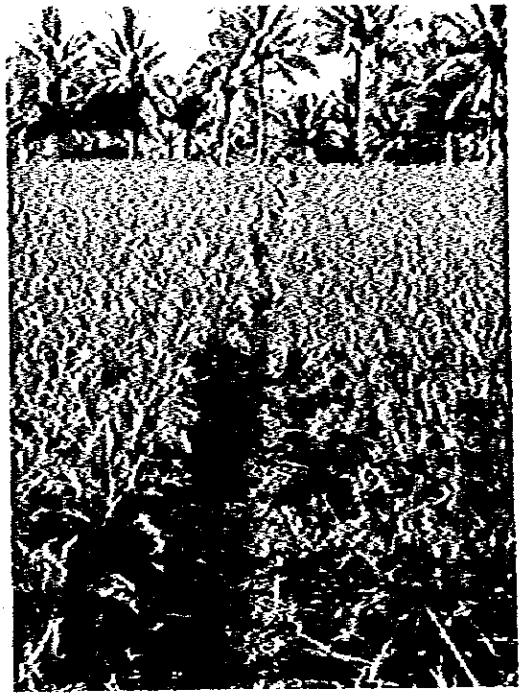
View of C.S.F. facilities at Upang



Betung M.S.F. paddy field and facilities

Tugu-Mulyo M.S.F. scenery
(S.P.C. will be built behind the existing facilities)

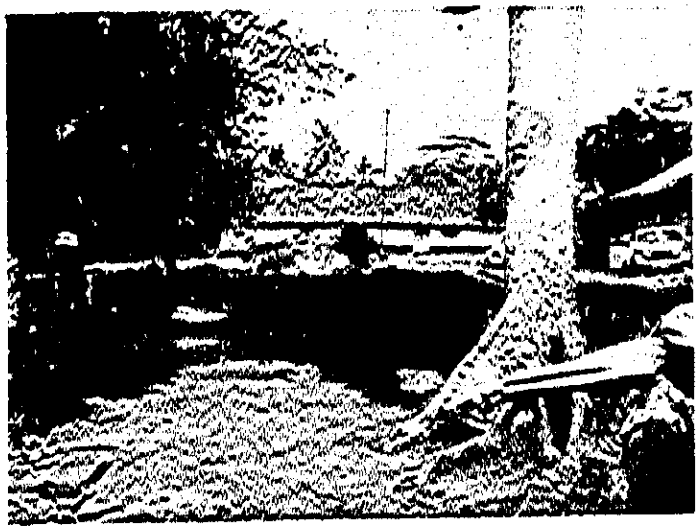
Harvesting scenery at Betung M.S.F.



Footpath of Tugu-Mulyo M.S.F.

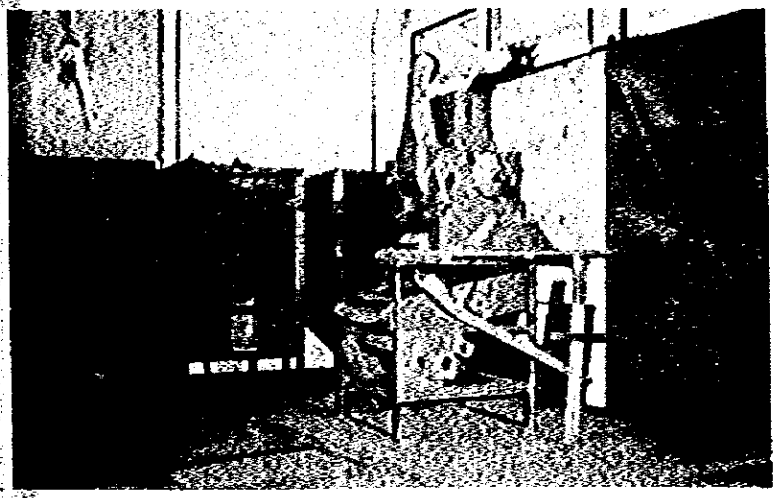
Paddy field at Belitan C.S.F.

Scenery of Way-Jepara C.S.F. facilities



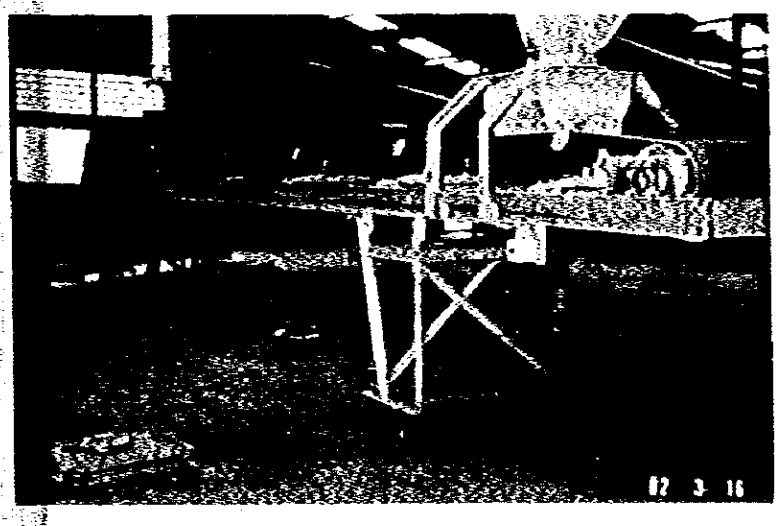
Scenery of M.S.F. at Metro

Scenery of measuring at Karang-Endah



Pre-Cleaner and timber silos at Belitang C.S.F.

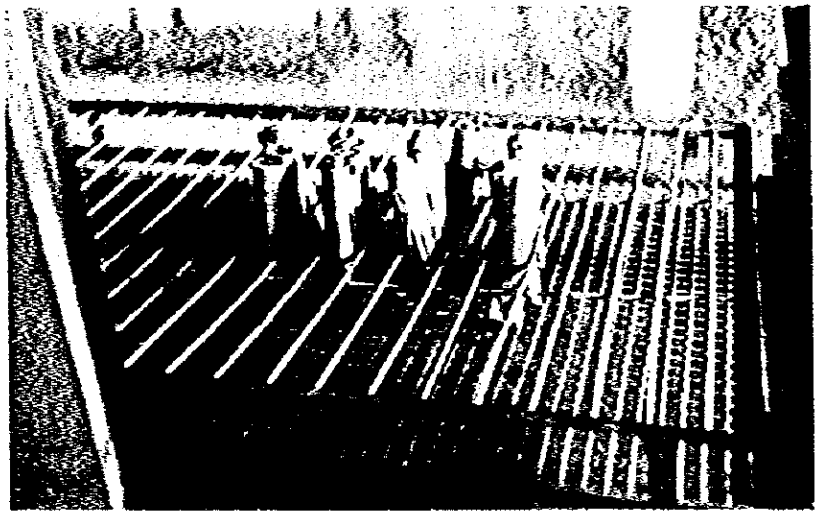
Dryer (Circulation Type)
and timber silos at Belitang
C.S.F.



Movable Belt conveyor system at Sukamandi
(Sang Hyang Seri)

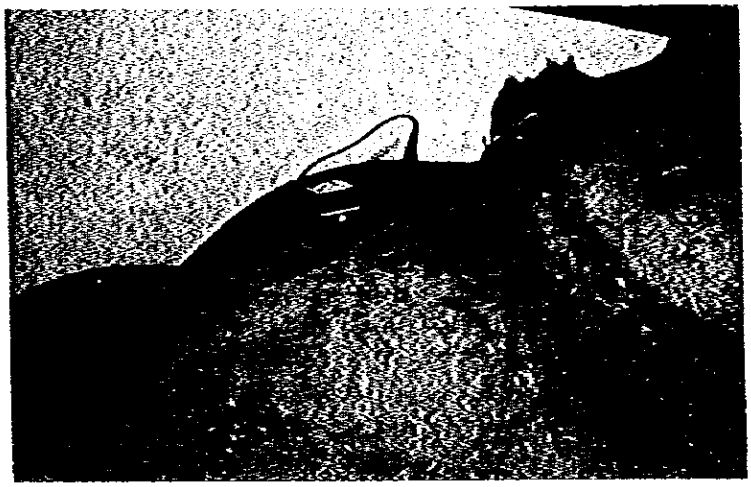
Collecting and weighing of raw paddy at Sukamandi

Germination test with paper towel at Pasar-Minggu Seed Laboratory



Germination test equipment (made in Indonesia)

Structure analysis of paddy at
Pasar-Minggu Seed Laboratory



Measuring of grain temperature at Metro
M.S.F. warehouse

Storage facility located at Pasar Minggu

TABLE OF CONTENTS

ABBREVIATION

AARD	Agency for Agricultural Research and Development
AETE	Agency for Education, Training and Extension
BAPPEDA	Provincial Equivalent of BAPPENAS
BAPPENAS	National Development Planning Agency
BBD	Bank Bumi Daya
BIMAS	Bimbingan Masal-Intensification Program
BORIF	Bogar Research Institute of Food Crops
BRI	Bank Rakyat Indonesia-Rural Bank
B.S.	Breeder seed
BULOG	Badan Urusan Logistik-The National Logistic Agency
CBS	Central Bureau of Statistics
CRIA	Central Research Institute of Agriculture (BOGOR)
CRIF	Central Research Institute of Food Crops
C.S.F.	Central Seed Farm
DGFC	Directorates General of Food Crops
DGT	Directorate General of Transmigration
E.S.	Extension seed
FAO	Food and Agricultural Organization
F.S.	Foundation seed
H.W.L.	High water leval
H.Y.V.	High-yielding varieties

INMAS	Intensifikasi-Informal Intensification Program
INMUM	General Intensification
INSUS	Intensifikasi Spesifik-Intensified Intensification Program
IRRI	International Rice Research Institute
JICA	Japan International Cooperation Agency (JICA)
KUD	(koperasi,Unit Desa)-Village Unit Cooperatives
MMTC	Ministry of Manpower, Transmigration and Cooperatives
MOA	Ministry of Agriculture
MPW	Ministry of Public Works
M.S.F.	Main Seed Farm
NDPA	National-Development Planning Agency (BAPPENS)
NSB	National Seed Board
NSC	National Seeds Cooperation, Perum Sang Hyang, Serie = The "Perum"
PELITA III	Five Year Development Plan III
PPL	Field extension workers
PPM	Middle level extension workers
PPS	Subject Matter Specialists
P.S.F.	Provincial seed farms
SCCS	Seed Certification and Controal Service
S.G.	Seed growers
S.P.C.	Seed processing center
S.S.	Stock seed
S.S.F.	Supplementary seed farm

Unit of Measurements and Glossary

mm, m/m	:	millimeter
cm	:	centimeter
m	:	meter
km	:	kilometer
cm^2	:	square centimeter
m^2	:	square meter
km^2	:	square kilometer
ha	:	hectare
ℓ	:	liter
ℓ/sec	:	liter per second
ℓ/min	:	liter per minute
ℓ/Hr	:	liter per hour
ℓ/sec.ha	:	liter per second per hectare
m^3	:	cubic meter
m^3/sec	:	cubic meter per second
m^3/min	:	cubic meter per minute
m^3/sec. Km^2	:	cubic meter per second per square kilometer
mm Aq	:	millimeter Aqua(pressuare)
mm/day	:	millimeter per day
gr	:	gram
Kg	:	kilogram
Kg/ha	:	kilogram per hectare
Kg/cm^2	:	kilogram per square centimeter
ton, t	:	metric ton

ton/Hr	:	metric ton per hour
ton/day	:	metric ton per day
EL	:	elevation above mean sea level
MSL	:	mean sea level
HWL	:	high water level
G.L	:	ground level
F.L	:	floor level
L.W.L	:	low water level
sec	:	second
min.	:	minute
hr, Hr	:	hour
%	:	per-cent
%/pass	:	per-cent per pass
%/Hr	:	per-cent per hour
°C	:	degree centigrade
Hp, HP	:	horse power
Kcal	:	Kilo calorie
Kcal/Hr	:	" per hour
D.I.	:	dry-up index
pH	:	potential of hydrogen
V	:	volt
A	:	ampere
Kw	:	kilowatt
Kwh	:	kilowatt hour
KVA	:	kilo volt ampere
ET	:	evapotranspiration

Rp	:	Rupiah
¥	:	yen
US$	:	US dollar
IRR	:	internal rate of return
EIRR	:	economic internal rate of return
No.	:	number
Max.	:	maximum
Min.	:	minimum
FOB	:	free on board
CIF	:	cost, insurance and freight
TSP	:	Top super phosphate

SUMMARY AND CONCLUSION

SUMMARY AND CONCLUSION

[Survey and Report]

This report, a compilation of the results of a feasibility study related to the Strengthening Rice-Seed Production and Distribution Project in Indonesia, takes full account of all possible alternative proposals and selects from among them the one considered optimum. The undertaking is economically and technologically suitable since it gives a high degree of precedence to increased rice production and transmigration to outer regions as state policies.

[Background]

In Indonesia, nearly 80% of the total population engages in agriculture, and more than 30% of the gross domestic product is agricultural produce. Rice, the national staple food, is the mainstay of Indonesian agriculture; and Indonesia ranks high among the rice-producing nations of the world. Nonetheless, the per-household area of paddy field is small and its yield is rather low, and heavy yearly loss due to drought and insect pests makes crops unstable. This accounts for the poverty of the people and insufficient food supplies. To make up for shortages, rice must still be imported. And this puts pressure on the national economy and is a burden on the daily lives of the people.

Since the foundation of the modern state of Indonesia, the government has been striving to increase food production mainly by increasing yield and stabilizing crops. Measures adopted have included irrigation; transmigration; the opening of new fields to expand the amount of arable land; and the introduction of high-yielding seed varieties, fertilizers, and methods of insect/pest control. Since the objective of these policies is the introduction of high-yielding seeds, the breeding that give large, steady output; increased production of such seeds; and regulation of the distribution system are matters of the greatest importance.

To carry out the necessary steps, the Indonesian government obtained financing from the World Bank for the First Five-Year Plans, during which National Seed Corporation (Perum Sang Hyang Seri) was established.
At Sukamandi a directly managed seed farm for the production of stock and extension seed was set up.

The seed produced there is distributed mainly on the island of Jawa, where new varieties have been rapidly developed and introduced and where improvements are being made. These new advantages have still had little effect on Sumatera and other outlying districts of the country. Although the government attempted to organize seed production and distribution for these districts and yet results are incomplete.

In compliance with the agreement made between the Government of Indonesia and the Government of Japan in early 1981 on the objective programs of promotion to increase rice production for Indonesia, and as of April 1981, at Jakarta the initial meeting was held between both Governments for "Strengthening Rice Seed Production and Distribution Program" as a part of the above mentioned major programs of promotion to increase rice production in Indonesia.

This was then followed by the 2nd meeting, held at Jakarta in July, 1981 in which, the Government of Japan agreed to proceed with the major objectives which had been duly agreed and signed by the Governments concerned, and that the Government of Indonesia proposed to Japanese Government to assist the programs to be realized within such frame work of the rice production in Indonesia.

In June, 1981, the annual meeting of technical assistance was held between the Governments in which "Strengthening Rice Seed Production" and its technical justification was negotiated.

Accordingly, Japanese Government had carried out the primary field survey in October, 1981 in accordance with the above request of the Government of Indonesia, which was ultimately followed by the feasibility study conducted for about three months from January 25 to end of March, 1982 in Sumatera island, Indonesia.

[Objective Area and Rice Seed]

The Area covered by the project is the three provinces of Aceh, South Sumatera and Lampung, on the island of Sumatera.

In general, rice-cultivating lands in Indonesia are divided into five categories: Lowland fields, rainfed fields, flooded fields, tidal fields and upland fields; but, for the purposes of this report, rainfed fields are included in lowland fields. Flooded fields in South Sumatera province were discussed but, owing to the lack of seed varieties recom-

mendable for use in them and to insufficient control of water for such cultivation, this type was eliminated from the report coverage by consent of the Indonesian government.

[General Contents]

The main project contents may be summarized as follows.

1. Taget Year
   The target year will be 1988 i.e. the end of the Fourth 5 Year Development Plan of Indonesia.

2. Total required amount of project seeds

   (1) Seed Rate and Seed Replacement Frequency

      a. Seed Rate
         According to guidance provided by the Indonesian Government, the following amount of project seed (seed rate) is needed to sow one hectare respectively: lowland fields--25 kilograms, upland fields--40 kilograms, and tidal fields--30 kilograms.

      b. Seed Replacement Frequency
         On the basis of strain type and cultivation method, it is considered suitable for farmers to replace seeds once in every three crop seasons.

   (2) Target Planting Areas of Paddy (except flooded area)

      a. Existing Paddy Areas (Lowland, Upland and Tidal)
         Aceh: 227, S.Sumatera: 265, Lampung: 252, Total: 744 (1,000 ha)

      b. Estimation of Reclamation or Decreased & Transmigration Areas
         Aceh: 37, S.Sumatera: 60, Lampung: 52, Total: 149 (1,000 ha)

      c. Estimation of Double Cropping Areas (Lowland)
         Aceh: 91, S.Sumatera: 63, Lampung: 68, Total: 222 (1,000 ha)

      d. Estimation of Planting Areas of Paddy by 1988
         Aceh: 355, S.Sumatera: 388, Lampung: 372, Total: 1,115 (1,000 ha)
         (Lowland: 794, Upland: 244, Tidal: 77, Total 1,115 (1,000 ha)

   (3) Estimation of Project Seed by 1988
      The estimates are made on the basis of forecast areas of land

under cultivation, seed rate of project seed needed to be sown and renewal rates.

Total required project seed amount for S.S. and F.S. are calculated on the basis of project seed cultivating areas.

Project Seed Amounts

(ton/year)

	E.S.	S.S.	F.S.
Lowland rice	6,619	66.1	0.83
Upland rice	3,247	130.5	3.46
Tidal rice	769	9.2	0.14
Total	10,635	205.8	4.43

Note: In Belitang, South Sumatera, proposed 1,022 tons of lowland E.S. is to be produced by P.T. Patra Tani.

3. Area and scale of production for C.S.F., H.S.F., and S.P.C.

(1) Seed farms

The table below shows suitable areas for C.S.F. and H.S.F. Their scales are measured on estimates of required seed amount. At the vigorous urging of the provincial government, candidate site of the H.S.F. in Lampung was changed from Srimenanti to Tanjung-Iman. They amount for ten in total of which seven set up in lowland fields and three in upland fields.

Location and Field Condition of Seed Farms

Province	NO.	Type of Seed Farm	Location		Field Condition		Farm Site (ha)					Acreage required for Seed Plant (ha)	
			Village	District	Type	Cultivation Times	Arable	Yard	Waste	Non Arable	Total		
ACEH	2	C.S.F.	Keumala	Pidie	Lowland	2	6.9	2.9	15.2	-	25.0	19.0*	F.S. 1.18 S.S. 17.8
		M.S.F.	Tangan-Tangan	A.Selatan	Lowland	1	9.6	1.9	-	-	11.5	8.3	
SOUTH SUMATERA	5	C.S.F.	Upang	Muba	Tidal	1	20.7	1.7	-	-	22.4	4.7	F.S. 0.1 S.S. 4.6
		C.S.F.	Belitang	O.K.U.	Lowland	1	11.4	4.2	-	0.1	15.7	7.9	F.S. 2.8 S.S. 5.1
		M.S.M.	Betung	Muba	Upland	1	28.9	2.1	-	-	31.0	21.0	
		M.S.M.	ADC Lahat	Lahat	Upland	1	20.0	4.0	1.0	-	25.0	18.0	
		M.S.M.	Tugumulyo	Mura	Lowland	1	8.4	1.1	-	-	9.5	3.3	
LAMPUNG	3	C.S.M.	Way Jepara	L.Tengah	Lowland	2	8.1	2.0	-	-	10.1	16.0*	F.S. 2.6 S.S. 13.4
		M.S.M.	Metro	L.Tengah	Lowland	2	11.5	2.5	-	-	14.0	22.3*	
		M.S.M.	Tanjung Iman	L.Utara	Upland	1	11.1	0.4	-	0.6	12.1	11.0	

* Extended cultivation acreage.

(2) Seed-processing Centers

S.P.C. will be set up at the most suitable places in each objective province as stated in the following Table. However, in the case of S. Sumatera one additional S.P.C. should be constructed in A.D.C. Lahat to facilitate seed processing though it was not scheduled initially.

Location and Capacity of S.P.C.

S.P.C.	Site Situation		Land Acquisition	Area (ha)	Civil Works (m^3)		Floor Space for Builds and Facilities (m^2)	Required Amount of Project E.S. (ton/year)
	Land	Owner						
Pulo-Ie	Rice Field	Private	Available	1.5	Fill	15,000	1.787	455
Tangan-Tangan	Rice Field	Private	Available	1.5	Fill	15,000	1.724	323
Meureudu	Rice Field	Private	Available	1.5	Fill	15,000	2.103	745
Syantalira(A)	Rice Field	Private	Available	2.0	Fill	20,000	2.385	1.566
Upang	Tereclaimed land	M.O.A.	Unnecessary	1.5	Fill	30,000	2.031	369
Betung	Up land	M.O.A.	Unnecessary	1.1	Leveling	10,000	2.103	785
ADC Lahat	Up land	M.O.A.	Unnecessary	1.5	Leveling	11,000	2.052	678
Tugumulyo	Rice Field	M.O.A.	Unnecessary	1.6	Fill	17,000	1.655	653
Woodadi	Tereclaimed land	Private	Available	1.5	Fill	2,600	1.850	918
Karang-endah	Yard	Private	Available	1.1	Fill	3,600	1.850	915
Tanjungkran	Up land	Private	Available	2.0	Leveling	8,000	2.385	1.304

Required Number and Capacity of Each Process of S.P.C.

Province	Location	Trucks (5 ton)	Receiving Facilities (ton/hr)	Re-Bin-Dryer (each 10 ton)	silo		Seed Cleaning and Grading Facilities (ton/hr)
					50 ton	25 ton	
Aceh	1 Pulo-Ie	1	5	2	8	4	1
	2 Tangan-Tangan	1	5	2	6	4	1
	3 Meureudu	2	10	3	14	4	3
	4 Syantalira(A)	3	20	5	26	4	3
South Sumatera	5 Upang	by Junk	10	3	14	4	3
	6 Betung	2	10	3	14	4	3
	7 ADC Lahat	2	10	3	10	4	3
	8 Tugumulyo	1	5	1	6	4	1
Lampung	9 Woodadi	1	5	2	10	4	1
	10 Karang-endah	1	5	2	10	4	1
	11 Tanjungkran	3	20	5	26	4	3

4. Construction and Rehabilitation of the Fields Facilities and Equipments for C.S.F. and H.S.F.

The H.S.F produces only S.S. for distribution to the seed growers in its areas. The C.S.F., on the other hand, produces both F.S. and S.S. At each C.S.F. there are a laboratory, training center, guest house, lodgings, and cold storage facilities for F.S. and S.S..

Required land acreage is ensured for seed production and facilities at each C.S.F. and H.S.F. However, some need no more expansion, while others, like the C.S.F. at Keumala, require land reclamation and cultivation.

Some of the seed farms should be used as a double cropping field due to shortage of the area.

(1) Field consolidaition

a. Lowland fields

Areas that will be used as lowland-field seed farms are already being cultivated. Their natural environments are good in conditions, and there are no problems involved in connection with land area or water utilization and soil conditions.

However to outfit them as seed farms, agricultural machinery must be introduced; and drainage systems must be improved. This will entail improving the farms in general and their facilities. Because their water utilization and conditions are good enough to permit it, at three farms--the Keumala C.S.F., in Aceh Province and the Way Japara C.S.F. and Metro H.S.F., in Lampung Province--it is planned to produce double crops a year.

b. Upland fields

All of the sites for farms of this kind are located in the hills, and some of them are currently in use for upland-field cultivation. Water utilization and conditions,and the layout of the land do not permit the use of these sites for lowland-field cultivation.

Improvements are planned in connection with grading, adjustment of plot configurations, construction of new

roads, installation of new drainage systems, the construction of needed buildings, and installation of sprinkler irrigation facilities in some areas.

(2) Farm facilities

General facilities for all seed farms include offices, machinery-maintenance plant, electrical generators, seed storage space, seed-processing room, warehouses, garages, staff housing, guard housing, guard sheds, conference rooms, laboratory, and working-staff housing. In addition to these facilities, each C.S.F. requires a guest house, training rooms, dormitory and cold-storage.

On the basis of this survey, consideration was made of all instances in which new construction or rehabilitation of existing buildings is essential. In addition, consideration was given to the kinds of agricultural machinery that will be required, means of transportation, farm staffs, and vehicles for training use at the C.S.F.

5. S.P.C. Facilities

For the implementation of the S.P.C. Facilities, adequate land reclamation is required for the relevant job site whereas new buildings and relevant facilities are constructed at the project locations.

Those facilities include; main building, generator house, house, staffs' house, drying facilities storage warehouse and others.

As for the drying facilities are concerned, In-Bin-type Dryer with equilibrium moisture content system shall be employed.

For greater management efficiency, silos having mainly 50 tons/bin in capacity will be installed for storage at each S.P.C.

In the S.P.C., also main building will be facilitated with sufficient storage space only enough for controlling minimum amount of dispatching cargo.

Berthing facilities will be provided for Upang.

Provisions are made for staff vehicles, and number of trucks are required for collection and delivery of the cargo.

6. Cold-storage

It was decided to build one cold-storage in each of the three provinces covered by the report. Ultimately, to allow the building of two storage at C.S.F. in South Sumatera.

A central Cold Storage is to be built at Pasar Minggu outskirt of Jakarta.

7. Seed control and Certification Services (SCCS)

Laboratory equipment and vehicles to be supplied for the Seed Control and Certification Services (SCCS) in each of the provinces covered by this report.

8. Training and research

Domestic training for the seed growers and staff members of C.S.F. M.S.F., and S.P.C s' officials have been scheduled. Detail of the training also have been established according to the woking Position

[Executing Organizations]

Major responsibility for the implementation of this project rests with the Directorate General of Food Crop Agriculture. The director of food crops production, empowered by the director general to accept actual responsibility for its implementation, issues orders to the Head of Province Agriculture Office in each of the three provinces covered by the report.

[Total Project Costs]

Total project costs, for the objective three provinces including price escalation have been estimated at 45,896 million Rp with 20,921 million Rp (US$ 31,627,000 or Yen 7,472 million) of foreign currency, comprising 45% for foreign currency and 55% for local currency.

In addition, 81 million Rp is required for the preparation of the Central Seed Cold Storage Center of which 74 million Rp (91%) is estimated in foreign currency. Moreover, 1,753 million Rp is estimated for necessary working capital required for S.P.C.s' E.S. collection.

[Economic Benefits and EIRR]

The most direct economic benefit to be derived from this program are increase of rice crops resulting from the production and distribution of improved seed and the consequent increase in farmers' income. In the areas studied, remarkable rice cultivation is conducted with local varieties; and the introduction of improved seeds will have great economic effect. It is estimated that the implementation of this project would bring an increase of rice production of 549 thousand tons annually in the three provinces. This figure represents 28% of the total product of paddy in the objective areas for 1980. Furthermore, increase of rice production will mean an increase in farmers' income of 36.797 billion Rp a year (56.26 million U.S. dollars at an exchange rate of 654 Rp to the dollar).

The economic internal rate of return (EIRR) from this project would be 36.5% provided the program continues for 20 years, a percentage that is higher than the interest rate of the Indonesian Bank of Commerce (31.87%), that of the governmental banking interest rate (22.25%), and that of BIMAS credit (15%).

The economic sensitivity of the project when the fixed investment value is raised by 30%, the EIRR is 31%, and the returns are diminished by 20%, is a stable 30%. In other words, the results of sensitivity tests show that the Project is feasible.

According to S.P.C. financial analyses, excepting the amounts of depreciation, E.S. processing costs are 51,600 Rp per ton for lowland-field rice and 51,600 Rp per ton for upland-field rice. Adding to this the cost of acquiring the E.S. from the seed growers gives these seeds a price higher than the general market price at present. Consequently, E.S. processing costs should be minimized by means of a thoroughly rationalized and efficient system of management.

[Socio-economical Impacts]

Implementation of this program would contribute to the achievement of the government's goal of food self-sufficiency, solve the national rice shortage, and make possible considerable reduction of food imports. It would therefore make a great contribution to the stabilization of the daily lives of the people and of the national economy.

The use of the project seed that are pest-resistant and ensure hig

yields will inspire confidence in rice growers and in the long run will stimulate increase of agricultural production raise levels of farmer's income, and rural development in the area. The implementation and management of this project will open new fields of employment opportunity to agricultural technicians, create a new kind of labor demand, and thereby stimulate the labor market.

[Recommendation]

In connection with this project, it is recommended that the following measures shall be taken.

1. According to the study of our survey team, it is concluded that this project is feasible in general in the project areas. However, in Upang, that is in the tidal area, some problem exsist with relation to socio-economic and daily-life environments and infrastructure for transportation and communication.

   Therefore, for the sake of implementing the proposed plan, the Government of Indonesia should draw up overall future plan considering the transmigration, labor problems and the infrastructure in the tidal area.

2. Due to implementation of irrigation and drainage facilities suitable for the double cropping at C.S.F., Keumala in Aceh Province, the cost of construction increased for which special attention should be paid by the parties concerned.

3. In connection with construction preparations of S.P.C., in instances in which future expansion is foreseen, consideration should be given to seed distribution and transportation ploblems and to regional management scales; and maximum dispersal should be employed in placements of S.P.C.

4. Since training of competent seed growers will determine the success or failure of this project, the staffs of related farms and seed-processing centers as well as the staffs of pertinent government organization should and undergo training to enable them to guide seed growers. Adequate budget program should be made to ensure the continuation of needed education and training even after the conclusion of the term of this project.

It is also necessary to obtain cooperation from members of Rural Extension Center

5. Selection of E.S. growers should be made on the basis of thorough consideration of such factors as distances from seed-processing centers and road conditions along the way as well as of soil conditions, water supply, sunlight, and environmental conditions to prevent disasters.
It is also necessary to give proper guidance to seed growers to enable them to take these some conditions into consideration when selecting their own farm site for seed production.

6. In order to encourage E.S. growers to produce E.S. enthusiastically, it is necessary to organize farmers into groups in terms of effective operation. It is important to simplify the contract to produce E.S.

7. Each year adequate funds should be provided for farms to make possible smooth production of F.S. and S.S.

8. To facilitate seed processing favorable working capital should be provided for P.T. Pertani, Perum Sang Hyang Seri, to obtain E.S. Collection funds.

9. Needless to say, for the implementation of the project, appropriate education and training as stated above are essential. Therefore, to develop and accelerate the domestic education and training activities, together with introduction of technology regarding seed production and distribution now in action in the advanced rice producing countries; invitation of experts from these countries, and overseas training in the relevant countries are recommended.

CHAPTER I INTRODUCTION

CHAPTER I INTRODUCTION

1-1 General

The government of Indonesia has proposed to Japanese government the assistance in "Strengthening Rice Seed Production and Distribution Program".

The program aims at a promotion to increase rice production for Indonesian food self-sufficiency with systematical intensification of the production and distribution of the improved seeds in main paddy production areas of Sumatera island, specially, in Aceh, South Sumatera and Lampung.

The objectives of the project, therefore, might be summarized as follows; (1) To purify and produce Foundation and Stock seeds of regional, suitable cultivators for specific environmental condition (Refer to ANNEX Table 1-1); (2) To increase and improve the supply of Foundation and Stock seed of high yielding varieties which have been released by the Ministry of Agriculture; (3) To increase and improve the production, processing, storage and distribution of Extension seed of them; (4) To establish and develop qualified private seed growers and seed industries; (5) To establish aggressive and efficient seed marketing system.

Japanese government has carried out the primary field survey in October of 1981 based on Indonesian proposal, and made an agreement to assist the "rice seed production and distribution project".

This report includes the results of the studies on technical and economical feasibilities of the project and some recommendations, basing on feasibility study survey in Sumatera island for three months from 25th of January to end of March, 1982.

1-2 Itinerary

S/No.	Date	Particulars	Lodging
1.	Jan. 25 (Mon)	Departure of the Team (10 experts) Tokyo-Jakarta	Jakarta
2.	Jan. 26 (Tue)	Courtesy Visit to Japanese Embassy and JICA Discussion with Indonesian Government	Jakarta
3.	Jan. 27 (Wen)	Discussion with the Covernment and JICA, plan of Operation submitted	Jakarta
4.	Jan. 28 (Thu)	Courtesy Visit to the Covernment, Discussion on Plan of Operation	Jakarta
5.	Jan. 29 (Fri)	Discussion with the Covernment	Jakarta
6.	Jan. 30 (Sat)	- do -, Especially on Production & Distribution	Jakarta
7.	Jan. 31 (Sun)	Data Collection and Preparation for F.S. in Aceh	Jakarta
8.	Feb. 1 (Mon)	Departure of the Team, Jakarta - Aceh	Banda Aceh
9.	Feb. 2 (Tue)	Discussion with the Provincial Covernment	Banda Aceh
10.	Feb. 3 (Wen)	Field observation in Keumala Area	Banda Aceh
11.	Feb. 4 (Thu)	Field observation in Heuredu Area	Banda Aceh
12.	Feb. 5 (Fri)	Reporting and Discussion with the Provincial Covernment	Banda Aceh
13.	Feb. 6 (Sat)	Departure of the Team, Aceh Tangan-Tangan	Heulaboh Tapak I
14.	Feb. 7 (Sun)	Courtesy Visit to the Provincial Covernment	Tangan-Tangan Blan Pidie
15.	Feb. 8 (Mon)	Field observation in Tangan-Tangan	" Tapak Tuan
16.	Feb. 9 (Tue)	- do -	"
17.	Feb. 10 (Wen)	- do -, Departure of the Team, Tangan-Tangan	Banda Aceh
18.	Feb. 11 (Thu)	Reporting and Discussion with the Provincial Coverament	Banda Aceh
19.	Feb. 12 (Fri)	- do -	Banda Aceh
20.	Feb. 13 (Sat)	Departure of the Team, Banda Aceh - Palembang	Palembang
21.	Feb. 14 (Sun)	Courtesy Visit to the Provincial Covernment and Discusstion	Palembang
22.	Feb. 15 (Mon)	Discusstion on the plan of operation	Palembang

No.	Date	Particulars	Lodging
23.	Feb. 16 (Tue)	Field Observation in Upang Area	Palembang
24.	Feb. 17 (Wen)	Reporting and Discussion with the Provincial Government	Palembang
25.	Feb. 18 (Thu)	Field observation in Betung Area	Palembang
26.	Feb. 19 (Fri)	Reporting and Discussion with the Provincial Government	Palembang
27.	Feb. 20 (Sat)	Departure of the Team, Palembang-Lubuk Linggau	Lubuk Linggau
28.	Feb. 21 (Sun)	Field observation in Tugu Mulyo	"
29.	Feb. 22 (Mon)	Field observation in Tugu Mulyo, Departure of the Team, Lubuk Linggau - Lahat	Lahat
30	Feb. 23 (Tue)	Field Observation in Lahat Area	Lahat
31.	Feb. 24 (Wen)	- do -	
32.	Feb. 25 (Thu)	Departure of the Team, Lahat - Belitang	Belitang
33.	Feb. 26 (Fri)	Field observation in Belitang Area	Belitang
34.	Feb. 27 (Sat)	Departure of the Team, Belitang - Palembang	Palembang
35.	Feb. 28 (Sun)	Reporting and Discussion with the Provincial Government Departure of the three (3) Team Members to Jakarta	Palembang Jakarta
36.	Mar. 1 (Mon)	Reporting to JICA, Departure of the Team to Jakarta Arrival of (1) member of the Team	Jakarta
37.	Mar. 2 (Tue)	Departure of the Team, Jakarta - Tanjung Karang, Discussion with the Provincial Government	Tanjung Karang
38	Mar. 3 (Wen)	Courtesy visit to the Provincial Government and Discussion with Authority	"
39.	Mar. 4 (Thu)	Field observation in Way Jepara Area	"
40.	Mar. 5 (Fri)	Field observation in Metro Area	"
41.	Mar. 6 (Sat)	Field observation in Karang Endah Area	"
42.	Mar. 7 (Sun)	Data collection and Discussion	"
43.	Mar. 8 (Mon)	Field observation in Tanjung Iman Area	"
44.	Mar. 9 (Tue)	Data collection and Discussion	"
45.	Mar. 10 (Wen)	Reporting and Discussion with the Provincial Government and Authority	"

S/No.	Date	Particulars	Lodging
46.	Mar. 11 (Thu)	Departure of the Team, Tanjung Karang - Jakarta	Jakarta
47.	Mar. 12 (Fri)	Reporting to JICA and Discussion	Jakarta
48.	Mar. 13 (Sat)	Discussion with the Government, Pasar Minggu	Jakarta
49.	Mar. 14 (Sun)	Data collection	Jakarta
50.	Mar. 15 (Mon)	Reporting to JICA and Discussion among the Team	Jakarta
51.	Mar. 16 (Tue)	Field observation and Survey at Sukamandi, Report Preparation	Jakarta
52.	Mar. 17 (Wen)	Field observation and Survey at Bogor, Discussion with JICA and Supervisory Group	Jakarta
53.	Mar. 18 (Thu)	Report Preparation and Discussion with JICA	Jakarta
54.	Mar. 19 (Fri)	- do -, and Discussion with the Supervisory Group	Jakarta
55.	Mar. 20 (Sat)	- do -, Departure of two (2) members of the Team	Jakarta
56.	Mar. 21 (Sun)	- do -, Departure of three (3) members of the Supervisory Group and one (1) member of the Team	Jakarta
57.	Mar. 22 (Mon)	- do -	Jakarta
58.	Mar. 23 (Tue)	- do -	Jakarta
59.	Mar. 24 (Wen)	- do -	Jakarta
60.	Mar. 25 (Thu)	- do -	Jakarta
61.	Mar. 26 (Fri)	- do -	Jakarta
62.	Mar. 27 (Sat)	- do -	Jakarta
63.	Mar. 28 (Sun)	- do -	Jakarta
64.	Mar. 29 (Mon)	Progress Report Submitted to the Government	Jakarta
65.	Mar. 30 (Tue)	Departure of eight (8) members of the Team	Tokyo

1-3 Person Concerned

1-3-1 Supervisory Group Assigned to the Project

1. Chief Advisor (Mr. Kunio TAKEMASA)	Director, Agricultural Production Project Office. Agricultural Production Bureau, Ministry of Agriculture, Forestry and Fisheries (MAFF)
2. Advisor (Farm Management and Training) (Mr. Takeshi SASAKI)	Director, Iwateken Agricultural Experiment Station Ken-hoku Branch
3. Advisor (Farm Consolidation) (Mr. Kazuo GOCHO)	Deputy Director, Design Division, Construction Department Hokuriku Regional Agricultural Administration Office, MAFF
4. Advisor (Cultivation) (Mr. Toshiaki HOSODA)	Deputy Director, Crop Production Division, Agricultural Production Bureau, MAFF
5. Advisor (Machinery and Equipment) (Mr. Akinori GOZAWA)	Deputy Director, Crop Production Division, Agricultural Production Bureau, MAFF
6. Advisor (Economic Evaluation) (Mr. Yoshiyuki BAN)	Deputy Manager, 2nd Technical Appraisal Division, Economic Research and Technical Apprais Department, The Overseas Economic Cooperation Fund (Japan)

1-3-2 Them Member Assigned to the Project

1.	Team Leader (Mr. Yasuo MASUI)	25 January - 30 March
2.	Seed Technology (Mr. Takane MATUO)	1 March - 21 March
3.	Economic Analysis (Mr. Masanobu YAMASHITA)	25 January - 30 March
4.	Seed Production and Distribution (Mr. Yoshihiro HAYAMICHI)	25 January - 30 March
5.	Storage (Mr. Koji FUKUCHI)	25 January - 30 March
6.	Seed Processing Machinery and Equipments (Mr. Osamu TOKUMOTO)	25 January - 30 March
7.	Structure (Mr. Kenichiro FUKUSHIMA)	25 January - 30 March
8.	Irrigation and Drainage (Mr. Toshio SUMITOMO)	25 January - 30 March
9.	Farm Consolidation (Mr. Yasuyuki KUWAHATA)	25 January - 30 March
10.	Design and Surveying (Mr. Tadashi KIDO)	25 January - 20 March
11.	Design and Surveying (Mr. Masanori NAKAO)	25 January - 20 March

1-3-3 Counterpart Personnel Assigned to the Project

1. Mr. A. Chatib	Agronomist, Staff of Directrate of Food Crop Production, Ministry of Agriculture
2. Mr. Bani Suyar	Agronomist, Staff of Directrate of Food Crop Production, Ministry of Agriculture
3. Mr. Usman Bakar	Staff of Production Division, Agriculture Service, Aceh
4. Dr. Ir. Zainal Abiddin Pian	Agronomist, Lecturer of Syiah Kuala University, Aceh
5. Mr. M. Simorangkir	Economist, Senior Extension Specialist, Agriculture Service, Aceh
6. Mr. Yacob Sirait	Extension Specialist, Staff of Subdivision of Agricultural Extension Service, Agriculture Service, Aceh
7. Mr. Dahlan Wiyoho	Machinery Specialist, Staff of Subdivision of Machinery and Equipment, Agriculture Service, Aceh
8. Mr. Nasir Arlan Lubis	Agronomist, Head of Subdivision of Food Crop Production, Agriculture Service, South Sumatera
9. Mr. Dawami	Economist, Head of Subdivision of Agriculture Economic. Agriculture Service, South Sumatera
10. Mr. Arsyah Mardjani	Machinery Specialist, Head of Subdivision of Machinery and Equipment, Agriculture Service, South Sumatera

11.	Mr. Saidi Harun	Extension Specialist, Staff of Subdivision of Agricultural Extension Service, Agriculture Service, South Sumatera
12.	Mr. Basarah	Extension Specialist, Staff of Subdivision of Agricultural Extension Service, Agriculture Service, South Sumatera
13.	Mr. Amiruddin Inoed	Economist, Staff of Subdivision of Agriculture Economic, Agriculture Service, Lampung
14.	Mr. Muslim Nurdin	Agronomist, Staff of Subdivision of Food Crop Production, Agriculture Service, Lampung
15.	Mr. Wathoni MZ	Agronomist, Staff of Subdivision of Food Crop Production, Agriculture Service, Lampung
16.	Mr. Wahyu Subandrio	Machinery Specialist, Staff of Subdivision of Good Crop Production, Agriculture Service, Lampung
17.	Mr. Masdulhaq	Extension Specialist, Staff of Subdivision of Agricultural Extension Service, Agriculture Service, Lampung

CHAPTER II BACKGROUND AND PROJECT OVERVIEW

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2-1 Background

2-1-1 General

The total land area of Indonesia is around 1,919 thousand km^2, about 5 times that of Japan, consisting of some 13 thousand islands scattered between Lat. ±10° and Long. 100° - 145°E. Total population amounted to 147 million in 1980. 63% of the population live in Jawa, Madra and Bali islands which constitute only 7.2% of the whole territories.

Sumatera island, where the project provinces are included, is the second largest island in size and the first in population density among the outer possession of Indonesia. The growth rate of the population on Sumatera island had been 3.2% during the 1960's and 3.8% from 1971 to 1980 annually, while its rate in relation to the whole of Indonesia was 2.0% and 2.8% respectively. However, in those last two years, the rate increased to 4% annually.

2-1-2 Position of agriculture in the economy

Even though the share of the agricultural sector, which includes forestry and fisheries, in Gross Domestic Products has been declining since 1965, Indonesian agriculture still has kept a significant position in the economy, and has been growing at an annual rate of 3 - 4%.

The number of agricultural households make up a large share of the total households in Indonesia. It was 57.7% of the total in the census of 1980. And 75% of the population depend upon the agricultural sector directly for their livelihood.

Sumatera, an outer possession of Indonesia, has a rather larger amount of agricultural households, than the other islands due to the inclusion of Lampung province where many farmers have transmigrated from Jawa.

Most Indonesian farms are characterized by small holders. Only 22% of agricultural households have more than 2 ha. of cultivated land in the outer possessions, and 5% on Jawa island. This special feature is one of the significant constraints to the development of food crops in Indonesia.

Although the number of agricultural workers has tended to decline

at an increasing rate, the percentage of those workers as a whole was still 59% in 1980.

On the national trade of Indonesia, the role of the agricultural sector decreased slightly, due to the unexpected emergency of the petroleum export industry. However the amount of exports of Agricultural products and timber are still responsible for earning foreign currency.

2-1-3 Food crops and food problems in Indonesia

In Indonesia, especially, its outer possession, estate crops are cultivated in a similar fashion to neighboring countries. However they have only a small share in the cultivated areas. The major part of crops in the agricultural sector is food crops which are supplied with food to the Indonesian people. General growth of the food crops seems to have been stagnant recently, due to palawija's failure, and the food supply is not enough for food demand which has been increasing rapidly in relation to the growth of both population and national income. As a result, the Indonesian government is forced to cover the deficiency of food supply with the importation of rice.

Consequently, Indonesia appears unable to become self-sufficient through its own efforts, despite the changes that could have occurred. And the following two factors have aggravated the food problem further: the concentration of the population in special areas, especially in Java & Madra and Bali island, and an extreme rate of increase in the population on the outer possession such as Sumatera.

2-1-4 Five year's plan for economic development and rice production increase

In the first 5 year's plan for economic development (PELITA I), initiated in 1969, the Indonesian government provided the first priority to BIMAS and INMAS program, and 22% of the government's financial budget was outlaid for the agricultural sector and irrigation fields. A 2.8% annual rate increase in paddy production was planned, and 15,420 thousand tons of rice was expected by the target year. Nevertheless, their realization was only 87% of the target amount. In addition, maize production was unable to achieve its target. Consequently, 860,000 tons of rice was imported annually for the period of PELITA I.

The second 5 year's plan made it a main objective to carry out the

employment policy and income distribution policy. In this period, the government made 1,002 billion Rps. of investment in the agricultural and irrigation sectors. Although the percentage of the investment rather decreased compared to that of the former 5 year's plan, its real amount was three times higher than that of the former investment. However, rice production still could not achieve the target amount.

On the other hand, the growth rate of the population expanded from 2.0% to 2.8%. As a result, the imported amount of rice in this period was 1.5 million tons on average per year.

In the third five year's agricultural development plan, 1979-1983 (PELITA III), 7 major objectives (see ANNEX Reference 2-1) are stated. The policy for the increase of food production is given with the first priority for its self sufficiency in Indonesia.

To achieve the above policy, the Indonesian government began to undertake INSUS program, (Special intensification program) from 1979. In addition, the government decided to promote the extension of improved seed resistant to disease and pest.

Rice production began to regain its vigor as of 1978, and in 1980, harvested rice amounted to 20 million tons which exceeded in volume the rice for the target year. This was mostly due to the introduction of INSUS and new improved seeds under appropriate climatic conditions.

In PELITA III 3.5% of annual growth rate is employed for agricultural development with an expected 4.3% rate of paddy production. However, the paddy production increase seems to have become stagnant in the Jawa area because of the limitation of cultivated land and zero ceiling of the intensification program. Consequently, a new agricultural development plan including extensification through transmigration program, special intensification program and introduction of new improved varieties program would be more significant to support food self-sufficiency in Indonesia.

The fourth 5 year's economic development plan will start from 1984. It is natural that Indonesian government will maintain its policy for food self-sufficiency, along with the population increase and rise in income.

2-1-5 Economic and technical cooperation needed

The many problems for a stable growth of food crop production, especially of paddy production, in Indonesia could be disposed of with

good cooperation from more advanced friendly nations. Indonesia needs technical cooperation in the following items:

1) Research and field trials, on fertilizer, and plant protection technology, agricultural machineries and equipment for small farmers, harvesting and milling technology, water management.
2) Training and extension.
3) Agricultural insurance.
4) Preparation of basic data.
5) Rehabilitation and construction of tertiary and quarterly canals.
6) Water management associations.
7) Agricultural roads.
8) Mechanization for rice field formation.
9) Seed Production and distribution.
10) Plant protection.
11) Rice harvesting, milling storage, transportation and marketing.

Now, it is clear that "rice seed production and distribution project" is one of eleven cooperative items pointed out above. Technical cooperation has been required to develop and supplement the Indonesian economy in order to exploit its national resources effectively and efficiently and to achive food self-sufficiency.

In Indonesia "the seed production and distribution project" has been in operation since the early stages of the 1970's under the cooperation of the world Bank and F.A.O. The seed I project, implemented since early stage of 1971 to 1978, initiated a modern HYV rice industry in Jawa by establishing: (1) National Seed Corporation, to own and operate a 2,450 ha of rice seed farm and a seed processing plant at Sukamandi, (2) the Seed Control and Certification Service to administer seed purity and quality standard, (3) Sukamandi Food Crop Research Institute, for research primarily on low land rice, and (4) Establishing the facilities for training staff engaging in the seed project.

Preliminary Survey of Seed II project was executed in 1979 with the following objectives: (1) establishing seed centers for the production of stock seed, and its multiplication into larger quantities of extension seed, (2) providing additional facilities to dry, process, store and package and effectively distribute and market the commercial seed produced, and (3) providing staff training in seed production, processing and testing.

Seed II project comprises: The establishment of 18 seed centers in

the 12 project provinces [1] for the production of 1,120 tons of Stock Seed; production of Extension seed (35,000 tons) through a network of contract seed growers in the different crops zones in the provinces; support for the improvement and expansion of seed quality control services through provision of 8 additional new laboratories as well as supplementary equipment for the existing ones at different SCCS' branches, and Provision of ex-patriate technical assistance for the project.

1) 12 provinces are West Jawa, Central Jawa, Jogjakarta, East Jawa, Bali, NTB, South Kalimantan, South Sulawesi, North Sulawesi, West Sumatera, Riau & Jambi.

The Indonesian government proposed several kinds of cooperation to the Japanese government to achieve the rice self-sufficiency program. This project is one of them and is intended to assist in the strengthening of rice seed production and distribution program in 3 provinces of Sumatera. The proposed project will have the following components :

(1) Project areas: Aceh, South Sumatera and Lampung province.
(2) Strengthening and establishment of main seed farm and central seed farm for production F.S. and S.S.
(3) Establishment of seed processing center.
(4) Establishment of central cold storage for F.S. and B.S.
(5) Strengthening of staff's training and seed control.
(6) Provision of technical experts to support the project and training through fellowship to transfer high technology.

2-2 Project Description

(1) In order to increase and improve the production, processing and storage capacity of high quality seed, to establish and equip provincial seed farm, Seed processing Centers and Central seed storage.

(2) To establish and develop private seed growers and assist in the procurement processing storage and marketing of the seed produced.

(3) To train agricultural staffs and selected seed growers in the production, processing, storage and marketing of seed.

(4) To select, purify, and produce high quality seed of local cultivars.

(5) To maintain the purity and quality of seed high yielding variety.

(6) To study formers response toward the quality seed distribution/marketing system.

III PROJECT AREA

CHAPTER III PROJECT AREA

3-1 Natural Condition and Locality

3-1-1 General

The equator passes roughly through the center of the island of Sumatera, which stretches from 5 degrees 52 minutes north latitude to 5 degrees 52 minutes south latitude. With an area of 1,919 thousand square kilometers, Sumatera accounts for 24.7 percent, or roughly one quarter, of the area of all of Indonesia, including more than 13,600 large and small islands. Though located at the equator, Sumatera has a mild climate. Its population is 19 percent of that of the whole nation and, while smaller than that of nearby Jawa, is nonetheless large for Indonesia's outer possession. Furthermore, Sumatera occupies the important place in the nation's social and economic life (Refer to ANNEX Table 3-1).

3-1-2 Geographical Features

The Bukit Barisan range of mountains, which runs from the north-west to the South-east of Sumatera and which ranges in altitude from 1,000 to 1,500 meters, includes 12 volcanoes: Leuser, Bandahara, Kerintji, Dempo, and so on. Deep reaches of the Indian Ocean are on the west side of the island, along which runs a long, narrow, continuous plain. There are hilly zones among the mountains. In contrast with the more mountainous west side, the east side of the island, which faces the shallow Strait of Malacca and the South China Sea, is broad lowlands in all parts except the north. The farther south, the broader and lower the land till it terminates in vast swampy regions subject to seasonal flooding.

This project deals with the province of Aceh in the north end of the island and with the two provinces of South Sumatera and Lampung in the south.

(1) Aceh

Divided into east and west zones by mountains running down

its center, Aceh consists of a narrow plain along the east from Aceh Besar in the north to Aceh Utara, plus a westcoast plain running from Lamno to Aceh Selatan, and mountainous zones at Aceh Tengah and Aceh Tenggara. Marshes and swamps are prevalent in the flatlands of the west coast.

(2) South Sumatera

This region is characterized by vast swamps and areas subjected to seasonal flooding on the east coast. Palembang is located at an altitude of only eight meters. Rivers and streams snake through the hilly regions and plains running from north to south; and at Mura and Oki, which may be conveniently irrigated, land is used for paddy field rice. Land with an elevation of more than 350 meters, represented by the zone at Lahat, constitutes 16 percent of the area of South Sumatera. Such hilly regions, including the provinces of Oku, Kiot, and Lahat, are used for the cultivation of upland rice and other crops. The zone between the mountains and the swamps has great arability potential.

(3) Lampung

Adjacent to South Sumatera, Lampung is the southern-most region on the island. In its south-west zone are such volcanoes as Tanggamus (2,102 meters), Sekentjau (1,718 meters), Seminung (2,235 meters), and Tebak (2,115 meters). In the southesast extremity is the volcano Radjabasa (1,281 meters). Farther eastward, the hilly region gives way to marshes extending to the coast of the Strait of Bangka. Most of the rivers in this region rise from the intermountainous zone in the west and flow into the Strait of Bangka. Some of the most important rivers are the Sekampung, Pejadung, Seputek, and the Tutanglawang. Well supplied with water even during the dry season, these rivers flood the surrounding plains during the wet season.

3-1-3 Climate

Lying within five degrees north and south of the equator, Indonesia has a hot, humid, rainy and maritime climate. The average annual temperature is approximately 27°C in lowlying ground regions and remains largely stable throughout the year, though it may vary greatly in diarnal range. For instance, the following are the differences in temperature between days and nights in some regions: Jakarta -- 8.1°C, Pelembang --8.1°C, Padang -- 10°C, and Medan -- 10.2°C. The average maximum

temperature is 30°C, the average minimum temperature is 23°C, and the day and nights average difference is 10°C.

Sumatera, which is located directly on the equator, has a general rainfall of more than 20,000 millimeters annually, with more than 4,000 millimeters in the mountainous zones on the west coast. Twice yearly, the island falls under the influence of western and south-eastern monsoons; the interchange periods of the seasonal winds are in April and October.

Strong west winds blowing across the mountains in the west part of northern Sumatera give rise to the foehn phenomenon in the areas they affect, causing considerable drought damage. On the other hand, it is known that the south-southeast winds blowing across the western mountains in the south part of the island also give rise to the foehn phenomenon; but, in this region--South Sumatera and Lampung almost totally unobstructed north-north-northwest and south-southeast seasonal winds bring abundant rain.

(1) Temperatures

ANNEX Table 3-2 shows temperatures for five zones in South Sumatera. These regions have greater temperature variation between flatland and mountainous regions than any other in the zone covered by this project. The maximum temperature for the lowlands of South Sumatera is 31.6°C, the minimum is 22.4°C, and average is 26.6°C. At Lahat, which has an elevation of 350 meters, however, the maximum is 30.2°C, the minimum 20.0°C, and the average 24.6°C. In other words, the Lahat temperatures are all 2°C lower than those for the lowlands. In July and August, the coolest months of the year at Belitang; the average temperature is 21.5°C compared with a lower 19.1°C for the same months at Lahat, where the elevation is greater. It is important to bear in mind relations between temperature and elevation in tropical areas where an increase of 100 meters in height means a drop of from 0.5 to 0.6°C in temperature.

(2) Rainfall

On Sumatera, regional difference in rainfall are much greater than regional differences in temperature. In spite of the equatorial location, because of the mountain ranges in the west, the island is

affected by the monsoons, which make surprisingly clear distinctions between dry and wet seasons. In general, the rainy season starts with the seasonal winds of October; the dry season begins in April. clear distinctions between dry and wet seasons. In general, the rainy season starts with the seasonal winds of October; the dry season begins in April.

Aceh. As has been said, Aceh is divided by mountains into east and west zones. The east side is subject to both the west and the southeast monsoons and has heavy rainfall. Amounts of percipitation for individual rainstorms are greater in the wet season and smaller in the dry season. (Refer to ANNEX Table 3-3)

South Sumatera and Lampung. The dry season in the flat lands of South Sumatera and Lampung is shorter than it is in the north, though in some years no rain at all falls in July and August. Because of the influences of north-northwest and south-southeast seasonal winds, rainfall in the southern part of Sumatera is comparatively heavy. Occasionally, however, when the south-southeast monsoon are blocked by the mountains in the west, the foehn phenomenon causes droughts in both South Sumatera and Lampung. (Refer to ANNEX Table 3-4 and 3-5)

To determine the extent of desiccation during the dry season in all three project provinces, dryness indices were estimated. An index value of more than twenty represents a humid condition; one of less than twenty indicates a dry condition, and one of less than ten indicates desert conditions. As the values shown in Fig. 3-1, the project regions are subject to severe dryness.

3-1-4 Soil

The soil is weathered secondary rock. Obviously soil and its ability to support crops are of the greatest importance. The following is a simple outline of information pertaining to the soil in the three project provinces and areas suggested for seed production.

Aceh has more mountainous than flat land, and geologically it is of the Paleozoic layer. The wet-paddy fields on the east and west sides are Tertiary; and the swampy lowlands, which are Quartenary, are put to little agricultural use.

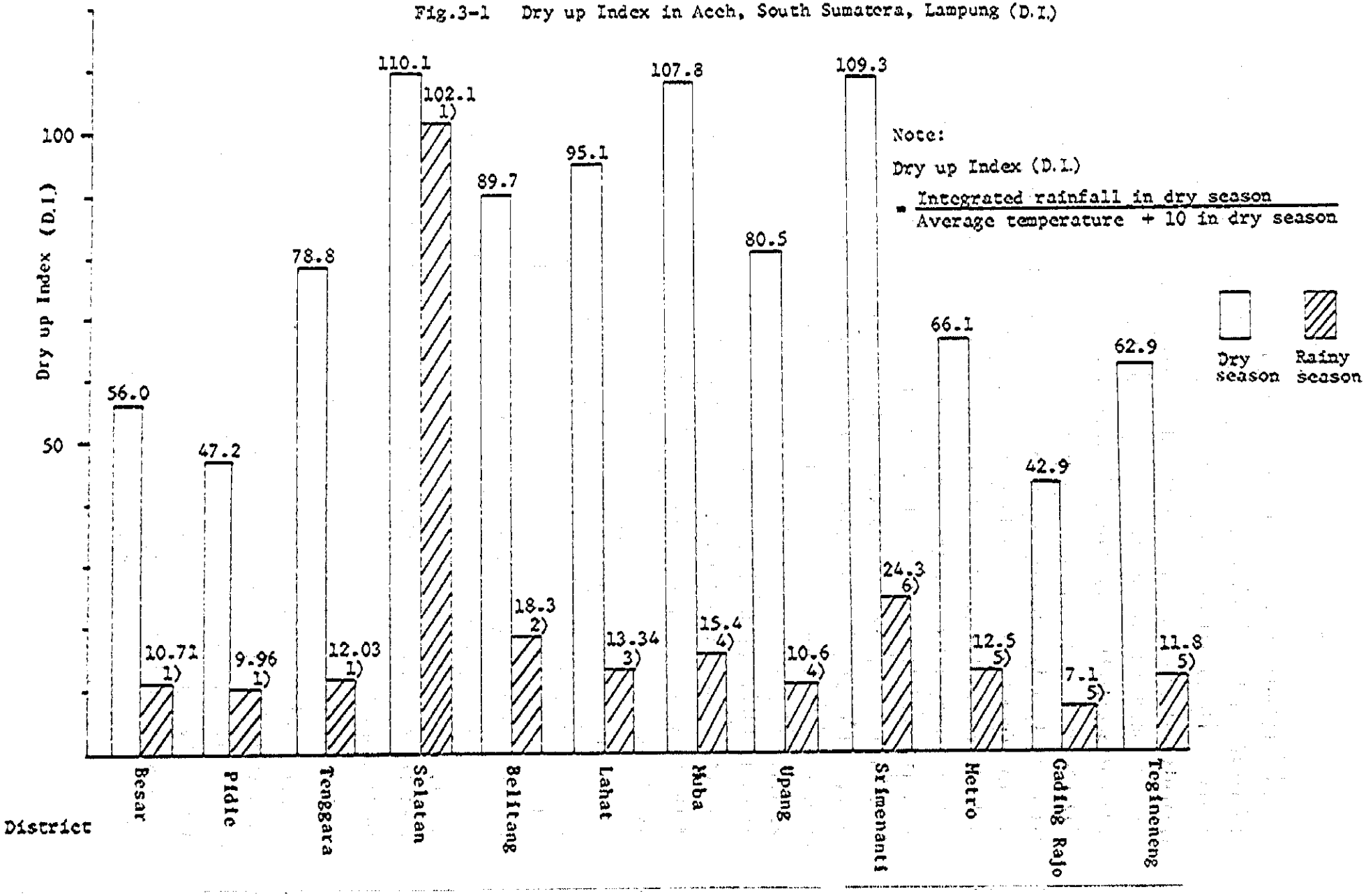
The old soil of the Keumala and Meuldeu regions, included within the limits of this project, has the high organic content characteristic of alluvial soil and therefore is fertile enough to support high agricultural productivity. Its pH values are estimated to be between pH5 and pH6. The soil of the Tangan Tangan area in the west is undergoing podzolization through weathering and leaching. Still, the soil of the many wet-paddy fields at the foot of the Aceh mountain system is largely alluvial and fertile. On the basis of observation of weeds from those paddy fields, the soil's pH values are estimated as low: from pH 4.5 to pH 5. The soil of South Sumatera--especially that of Lahat--which is either Quartenary or neovolcanic accumulations, is of the very fertile kind called Andosol. The soil of both Tugumulyo and Belitang is Quartenary alluvial. That of Belitang has less organic matter and is claylike and drains poorly. Silt and clay in the soil of Betung, which has been largely leached and is sandy, and soil fertility is poor, and may be classified as red yellow podzol. Though alluvial, highly organic, and black, the soil of the Upang delta is extremely moist and mudlike. In the dry season, when the water level of the Musi River drops, sea water backs up into this area, causing salt damage.

Neovolcanic accumulations have formed the soil in Lampung, where general conversion into latosol has occurred and where in places the soil has undergone podzolization and is therefore an alluvial formation of latosol and red yellow podzol. Especially in Wayjepara, where leaching has been serious, the soil has low productivity, lacks organic matter, and is dense and claylike. In short, to increase soil productivity in South Sumatra, the application of organic matter is extremely important.

3-1-5 Hydrologic Condition

Hydrologic Condition varys strongly between mountainous Aceh and the broad flatlands of South Sumatera and Lampung. As has been mentioned, the mountainous parts of Sumatera enjoy abundant rainfall. Since the distance between the feet of the mountains and the seacoasts in Aceh is not great, only small rivers traverse this area. Furthermore, the Indonesian government has set up no irrigation facilities of any kind there. As there are no dams, the wet fields must be watered with simple

Fig.3-1 Dry up Index in Aceh, South Sumatera, Lampung (D.I.)



devices the farmers themselves create (Refer to ANNEX Table 3-6). Consequently, experience has taught them that, lacking water reservoirs, it is best to plant nothing during the dry season. Since the farmers' primitive arrangements do not include secondary and tertiary canals, almost all irrigation must be done by the flood-and-overflow method.

In South Sumatera and Lampung, where there is little elevation variation throughout stretches of flat land, level adjustments and the construction of such things as drainage ditches are essential. Without them, in the wet season, the land floods and becomes swamp. Although full irrigation facilities are available in both South Sumatera and Lampung, additional development in this field is desirable.

3-2 Rice Production

According to statistics, in 1980, Indonesia raised 29.5 million tons of paddy or 20 million milled rice (Refer to ANNEX Table 3-7). Five-year economic plans were instituted in 1969, and the third such plan is currently in progress. But an annual population-increase rate of 2.8 percent consumes increases in food production of 20 million tons would represent and insecure level if disaster of any kind were to strike. In 1979, Indonesia imported 1.92 million tons of rice. As is shown in ANNEX Table 3-8, import of foodstuffs is a serious drain on the nation's precious reserves of foreign currency and has a grave effect on the national economy. In the light of these considerations, policies to increase food production are of the greatest significance.

3-2-1 Production Amounts

Agriculture, forestry, and marine products account for about 40 percent of the Indonesian gross national products. And rice which is the national staple food, accounts for 60 percent of net agrucultural products. To compensate for insufficiencies in absolute quantities of rice produced, the cultivation of such secondary crops (palawija) as the following is encouraged in all provinces: (1) maize; (2) peanuts; (3) cassava; (4) soybeans; (5) green beans, pulse, and other legumes, (6) sorghum and (7) sweet patatoes. ANNEXT Table 3-9 & 3-10 gives

further detailed information on the production of these crops. ANNEX Table 3-11 & 3-12 contains information of the production amounts rice and secondary crops as well as plans in connection with their production in South Sumatera. The per-capita annual consumption of paddy in South Sumatera is given as 160 kilograms (150 kilograms is the figure for all of Indonesia). But South Sumatera is albe to supply only 130 kilograms of paddy per person. In Lampung, the figure is a still lower 100 kilograms.

In addition to natural increase, Lampung's population grows because of overflow from Jawa. This means that both Lampung and South Sumatera, which has a population-growth rate of 3 percent over, must plan to increase production of rice and maize.

Until 1978, the increase in production has been almost entirely dependent on Extension Program. But, in the 1980s, agricultural production is being pushed up by technical measures in intensification.

3-2-2 Paddy Varieties

Announcement of the varieties of rice cultivated in Indonesia began with Bengawan, in 1943. ANNEX Table 3-13 shows a year-by-year breakdown of the improved varieties by year that have been recommended and introduced until the present.

In the early stage of development (before the 1960s), efforts were concentrated on trying to improve local varieties of rice. But it proved impossible to alter such characteristics as long growing period and long broad leaves with the result that these varieties failed to give the hoped-for yield. In the 1960s, IR strains developed by the International Rice Research Institute were introduced because of their high yield.

But the strains also failed to meet expectations since, in spite of their yield, they have less taste than other kinds of rice and are sensitive to Rice bacterial leaf blight (Xanthomonas origne). (IR-5 is still raised by Indonesian famers.) with the seed which is produced themselves. In the 1970s, in the hope of developing improved variety that would suit the Indonesian cultivation environment, a cross was made between high-yielding IR-5

and an dominant local variety called Syntha to produce what is called Pelita 1/1 and Pelita 1/2. Although these strains of variety require 135 days to grow--from 10 to 15 days longer than the IR strains--great hope was put in them because they are straingt-standing, send out abundant tillers, and produce a high yield of tasty grain. But, in 1974, it was ravaged by biotype 2 of Brown plant hopper; and its ability to resist the Tungro virus became a serious issue.

As a result of these difficulties, throughout the 1970s, the IR strains were introduced to a large extent; and emphasis was on the yield increase rather than on the taste of the rice.

Originally developed from one of parent strains, the local Indonesian Peta, the IR strains are subjected to intensive cultivation and had spreaded throughout the nation under PB numbers for the Indonesian words Peta baru, which mean new Peta.

Improved varieties of rice raised in the three objective provinces are given in ANNEX Table 3-14, 3-15 & 3-16. About fifteen improved varieties are listed, but of which main varieties are PB 32, PB 36 and PB 38 and they have been mainly grown in project areas. PB 50, PB 52 and PB 54 have already been put into cultivation in Lampung and are scheduled for planting in Aceh in 1982.

In the 1980s, the Indonesians have been announcing independent development of improved variety that suit both local environment and local food preferences. The most popular of these are such Bogar varieties as Semeru, Cisadane and Cimandari. Astounding innovations are being made in varieties and this tendency seems likely to continue.

Preliminary investigation showed that new, more locally compatible strains of exclusively upland rice (Refer to ANNEX Table 3-17) and of rice for cultivation in tidal paddy fields (Refer to ANNEX Table 3-18) are being developed. Although for upland cultivation in Aceh Gata, Gati, in South Sumatera C22 and Hl00, and in Lampung Seratus Malam are being grown, so far varieties that can be called optimum for the prevailing conditions are few in number. Hope is put in Gata, Gati, and IR 32 for upland cultivation since they lend themselves to growth in dry fields. Although at present not many varieties are being developed for use in tidal wet-paddy fields, IR-42 and the Bogar variety called Brantas offer promise. Still the local varieties seem to be most hopeful for

the unstable cultivation environment of rainfed fields, upland rice cultivation in upland, and flooded fields. The following table shows varieties of rice cultivated by general farmers in the three provinces covered by this project.

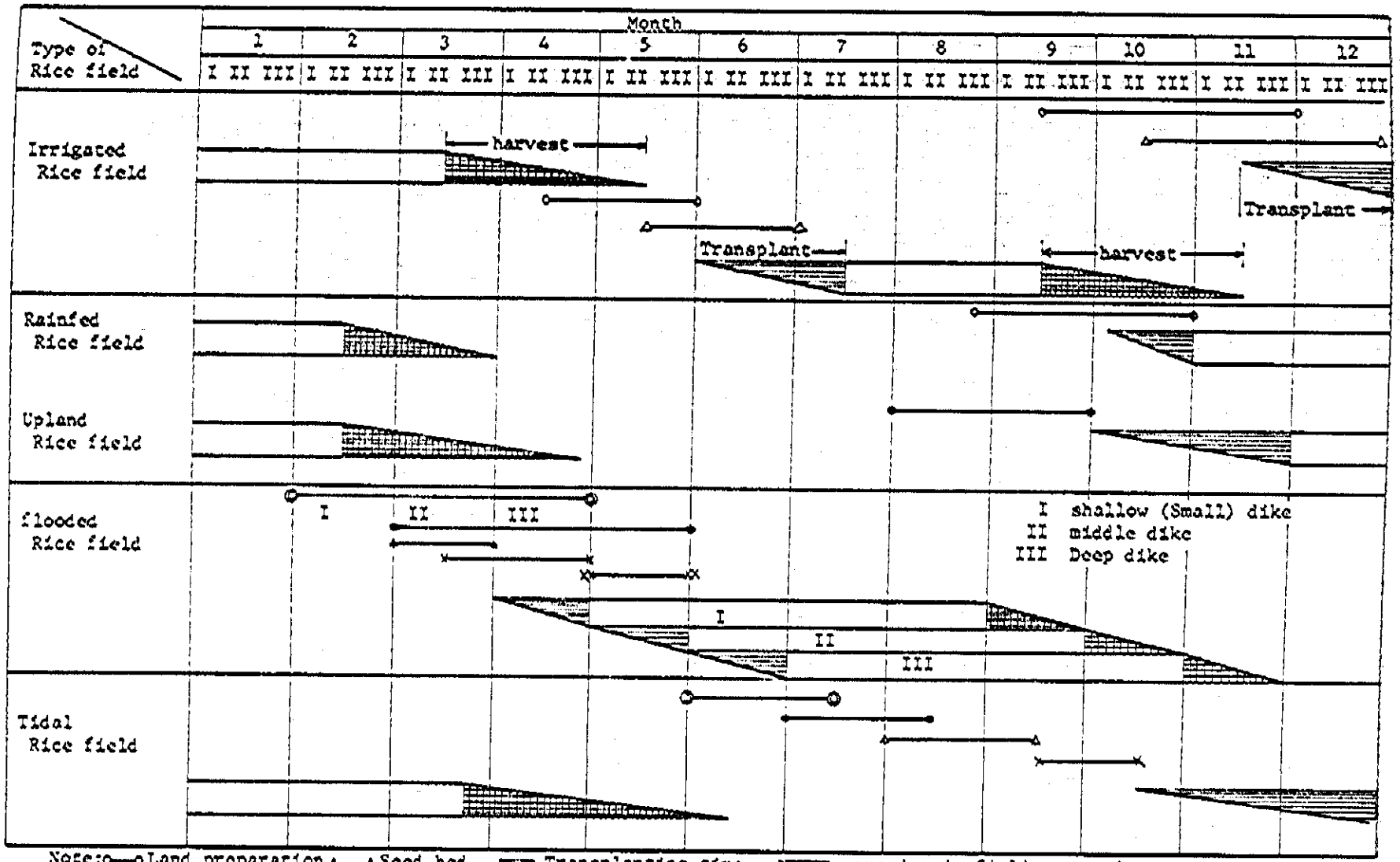
Table 3-1 Varieties of rice cultivated by general farmers in the objective provinces

D.I. Aceh	South Sumatera	Lampung
Lowland rice	Lowland rice	Lowland rice
Rasi Kuning (yellow)	Dawi Ratik	Asahan 2)
Si Repdeh (Short)	Sri Makmur	Citarum 2)
Padi Cina	Tidal rice	Upland rice
" Sarah	Kwatic	Sirendah
" Mandang	Ketek	Seratus Malam 1)
" Pang Raman	Padi Putch	Ganjah Lampung
Sunting	Pembongkar putih	Samariti
Sigadis 1)		Cempoturi
Sigupai	Upland rice	Lampung putch
Sipule	Seratus Malam 1)	
Sikuring	Kartuna 1)	
Upland rice	Flooded rice	
Gata 2)	Pelita 1/2 1)	
Gati 2)		

Source: From our survey and quoted from the report of presurvey team of Rice Seed Production and Distibution Project.

Note: 1) Bred by CRIF 2) H.Y.V. and released by the ministry of Agriculture
3) Others: Local varieties

Fig. 3-2 Time Schedule of the Rice Cultivation in S. Sumatera



Note: Land preparation — Seed bed — Transplanting time — growing in field — harvesting time
Cutting Bushes and grass — Burring grass-Cleaning — first Transplanting — Second Transplanting

Source: DEPERTMENT of AGRICULTURE of South Sumatera Province

3-2-3 The types of Rice Cultivation and their Productivity Indonesian rice cultivation may be divided into five types, which depend on the nature of the available water supply. The first, irrigated paddy fields, is used when one or another kind of irrigation is employed to supply water to the fields and then to control the water. The second is rainfed rice fields, in which rainfall is the source of the water in which the paddy are cultivated. The third is flooded field. In the flooded regions, fields are continually under flooded water during the wet season and the rice crop is done from the end of wet season to the dry season which flood water is receding. In the forth, tidal rice fields are those in tidal areas where the rising and falling of sea tides can cause salt damage. Fifth is the upland field method in which rice seed are sown directly into the field wetted with rain water. The rice grown in these five types of fields is called lowland irrigated rice, rainfed rice, flooded rice, tidal rice, and upland rice. Total cultivation areas subject to these cultivation types in the three project provinces were shown in ANNEX Table 3-19, 3-20 & 3-21.

In Aceh, 65.8 percent of land cultivated for rice is irrigated, though most of the irrigation is of the sinple kind. The amount of irrigated rice-cultivation land in South Sumatera is 14 percent; that in Lampung is 31 percent. But in these two provinces irrigation is of the full kind and relies on government-built dams. For this reason, rice crops can be raised the year round. In Aceh, also, rice may be planted all year (Refer to ANNEX Table 3-22), but, because of simple irrigation systems, water is insufficient during the dry season; and the planting ratio is low. Fig. 3-2 shows cultivation according to cultivation method in South Sumatera.

Preparations for wet-field planting in South Sumatera begin in September, and harvesting starts in March of the following year. During the dry season, because the days are short, the growing period also is somewhat brief. The Tugu Muly region and Belitang in South Sumatra both enjoy full irrigation facilities. For this reason, the following time schedule for five crops in two years has been worked out for that part of Sumatera.

The Schedule of 2 year 5 crops at Lubuk Linggau (Idea)

I	April 1	August 8, 1981
II	August 25	January 1, 1982
III	January 18	May 28, 1982
IV	June 13	October 21, 1982
V	November 6	March 16, 1983

The above schedule is for fully irrigated land at Lubuk Linggau. Allowance of no more than two weeks between one harvest and the planting of the next crop puts too heavy a burden on the farmer. And in this respect, the plan is impractical.
With irrigation equipment, year-round rice planting is possible; two-crop regions are still limited. During the low amount of rice planting the rice planting time must be intentionally staggered to avoid from the concerted depredations of field mice and birds.

Obviously, rainfed rice must be raised during the rainy season. The amount of rice-cultivation land subjected to this growing method in Aceh is about 27 percent, that in South Sumatera is about 8 percent, and that in Lampung is about 13.7 percent. Flooded rice is raised in the shallow waters left when lowland waters from river overflow in the rainy season begin to withdraw. Flooded areas may be classified into grades from I to III according to the depth of water flooding them and the way the water recedes during the dry season. There is a difference of about three months between grades I and III in South Sumatera, where more flooded rice is grown than in any other part of the island.

Although produced in small amounts in Lampung, tidal rice is grown to a much greater extent in South Sumatera. This kind of rice is grown in river-mouth deltas where the influence of ebb and flood tides is felt or in low swampy land. In Indonesia the former type is prevalent. Tidal rice is widely distributed throughout Kalimantan, Irian and Sumatera; and there are said to be about 300,000 hectares of land devoted to its cultivation in South Sumatera. Raised largely in the rainy season, tidal-rice crops are possible in the dry season also if irrigation facilities are available. But at this time salt damage

is high because low river water permits sea water to back up farther inland.

All upland rice must be cultivated during the rainly season. Although the area suitable to upland-rice cultivation is fixed, over the past ten years the amount of this land used for the purpose has tended to zigzag in the three provinces covered by this project. (Refer to ANNEX Table 3-23 & 3-24). Domestic migration takes place to a greater extent in areas where dry-field agriculture is practiced. Although such migration causes temporary increases in upland-rice production, after a few years have passed this staple crop gives way to long-term crops that will bring in cash income with the result that no real increase in upland-rice cultivation occurs.

3-2-4. Current conditions in relation to rice crops

(1) Crop seasons

In Aceh, 80 percent of the rice is raised during the wet season; in Lampung, 70 percent; and in South Sumatera 60 percent.
The necessity of relying on the rainy season for 100 percent of all upland-rice crops indicates the severity of the Sumatera dry season. But there is no definite relation between irrigation ratio and crops during the two seasons, largely because of great discrepancies among kinds of irrigation facilities available. For instance, in Aceh, water supply is good and can be readily controlled during the rainy season; but lack of reservoir and facilities means that crops are small in the dry season. (Refer to Table 3-2)

(2) Intensification program

As stated in Chapter IV, 4-1-1,(2) data on cultivation of improved varieties in the three provinces covered by this project. Dissemination of improved varieties is highest (73.4 percent) in Lampung and lowest (39.6 percent) in South Sumatera. All tidal rice in these three provinces is of local varieties that are the same as the varieties used for wet-field cultivation, as is only to be expected the cultivation environment of tidal rice is unstable howerver,

local varieties are more compatible with prevailing conditions; and the rate of introduction of improved varieties is low.

Table 3-2 Cultivation time of Rice in the Water Condition in Project Area

1000 ha, (%)

		Aceh	South Sumatra	Lampung	Whole Indonesia
Irrigated	Single	100 (65)	34 (63)	35 (50)	1573 (39)
	Double	54 (35)	20 (37)	36 (50)	2357 (61)
	Total	154(100)	54(100)	71(100)	3880(100)
Rainfed	Single	115 (95)	48 (98)	26 (87)	2054 (92)
	Double	6 (5)	1 (2)	4 (13)	173 (8)
	Total	121(100)	49(100)	30(100)	2227(100)
Other	Single	2(100)	198 (99)	10 (63)	566 (93)
	Double	0 (0)	1 (1)	6 (27)	43 (7)
	Total	2(100)	199(100)	16(100)	609(100)
Total	Single	218 (78)	282 (92)	74 (61)	4142 (62)
	Double	60 (22)	23 (8)	48 (39)	2576 (38)
	Total	278(100)	305(100)	122(100)	6718(100)

Source: Department of Agriculture

Reference: Report of Presurvey of Seed project mission.

The paddy yield under the intensive cultivation of rice plant is extremely high in D.I. Aceh, and is about 5.3 tons per hector. Also it is about 2.0 tons higher than that of traditional rice cultivation.

In Lampung, paddy yield under the intensification program and of that non-intensification in the lowland are 3.97 tons and 2.06 tons, and are 2.28 tons and 1.95 tons in the upland respectively. The intensive farming in the lowland is higher in yield than the traditional farming in Lampung. However, differences in upland/lowland, intensification/ non-intensification are very small.

As a whole, paddy yield in the lowland of Lampung is lower than in Aceh and S. Sumatra. It is considered that in Lampung low yield is due to the frequent occurences of Rhizactonia SPP.

The effects of intensification in rice cultivation are sufficiently manifested in improved varieties use. Therefore, the seed production of improved varieties has high merits for the intensification program.

Upland rice cultivation is done only in the wet season. Based on the teams observation in all three provinces, the yield of lowland rice is higher than that of upland rice.

This is owing to the water supply of irrigated lowland being sufficient.

As result, the lowland rice is more easily grown and is more stable compared with upland rice.

In 1980, yield of lowland and upland in D.I. Aceh was 4.72 tons and 1.9 tons respectively. In S. Sumatera, there were 3.9 tons of lowland rice, 2.8 tons of flooded rice, 2.3 tons of tidal rice and upland rice was only 1.5 tons. In respect of Lampung, the yields of lowland and upland rice were 3.02 tons and 2.22 tons. In all objective provinces, the yield of lowland rice is higher than that of upland rice.

3-3 Marketing

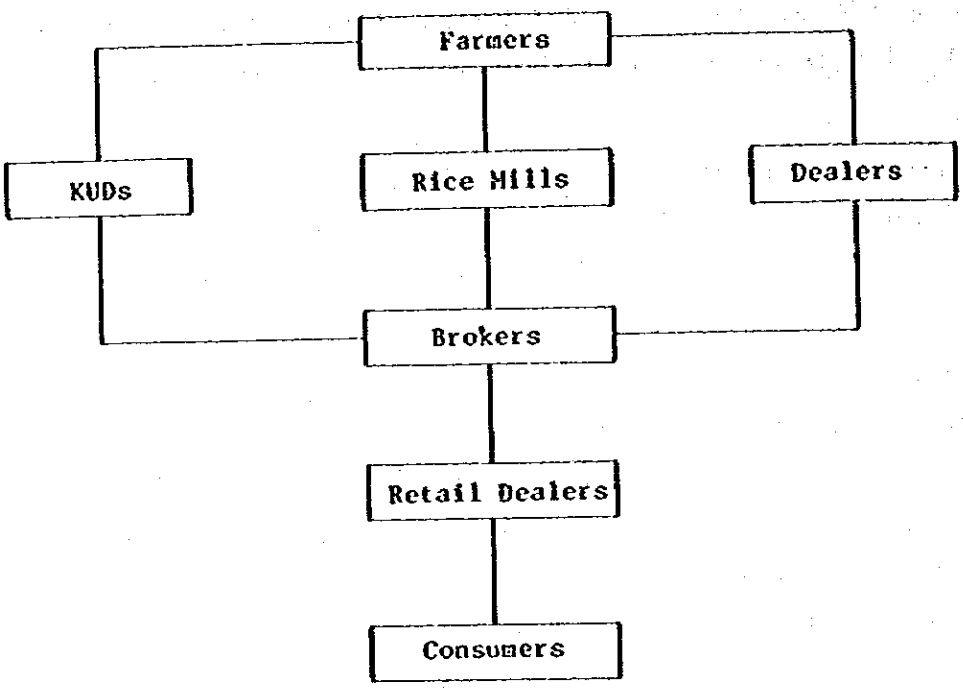
The marketing of agricultural products in Sumatera is not substantially different from that of Java and other districts.

Nationwide rice marketing is as follows; About 70% of produced

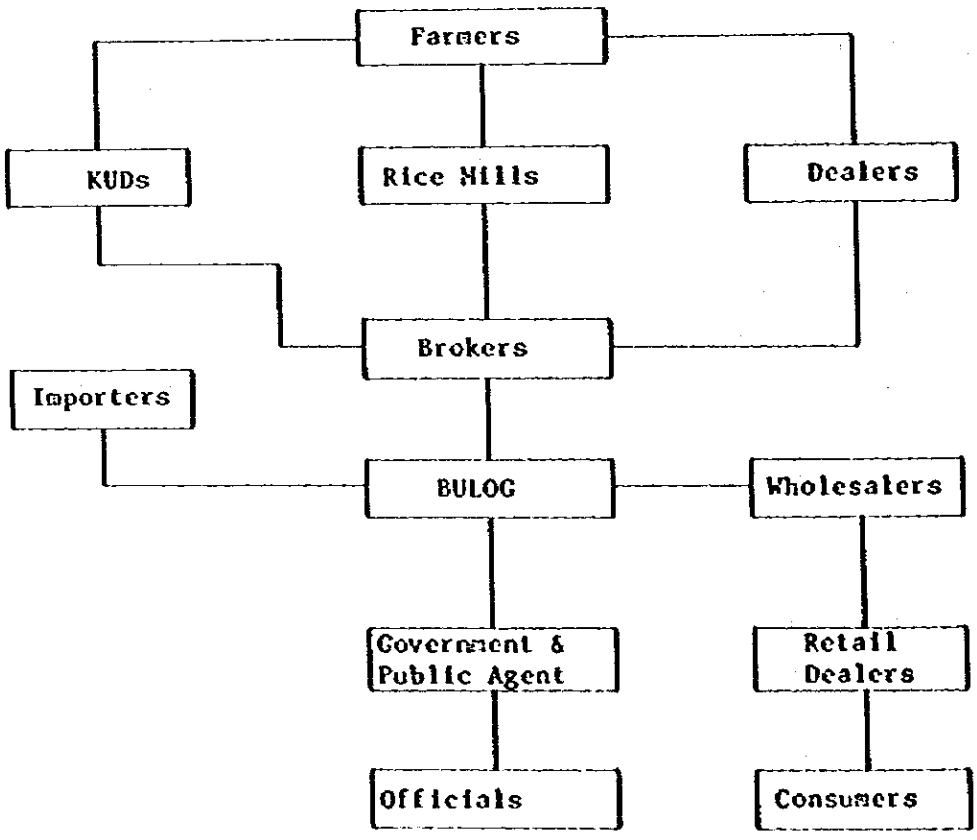
rice is consumed by rice producers and only the remainder of about 30% is marketed. About 80% of it is marketed by private merchants, mainly Chinese-Indonesian, and the remaining 20% is marketed through the National Logistic Agency of the Government namely BULOG.

Fig.3-3 Rice Marketing

GENERAL



THROUGH BULOG



As for the managing size of rice cultivating farmers of the 3 provinces selected for survey, 1.3 ha for Aceh Province and 1.0 Ha for South Sumatera Province which are considerably large, (with the exception of 0.7 ha for Lampung Province), compared to about 0.6 ha for Java, and the percentage of the marketing rice volume is deemed to be larger than 30% of the whole production.

It seems that the activity of KUDs (Agricultural Cooperatives) is comparatively lively, therefore, a large percentage of rice is marketed through KUDs. Especially, since the farmers in Aceh are very active in competition with Chinese-Indonesian Merchants, the activity of KUDs is lively as compared with that of other provinces.

BULOG is an organization which procures rice for storage in order to stabilize the rice price in domestic markets.

It deals in imported rice, and in addition procures and purchases domestic paddy and milled rice from merchants and cooperatives and preserves it in storages at the provinces and Kabupaten.

Rice is released to general markets at floor prices when price controls are necessary, futhermore it is distributed to armies, public officials and staff members of national enterprises. (Refer to ANNEX Table 3-28 & 3-29) The marketing structure is roughly shown in the following chart.

Out of the objective 3 provinces, only in Aceh can the balance of rice in the province be clearly stated.

As shown clearly in ANNEX Table 3-27, demand for paddy in the province for 1980 was 11,600 tons for seeds, 626,700 tons for food and 31,300 tons for buffer stock, making a total of 669,600 tons. On the other hand, from the supply of 812,200 tons, 142,600 tons of surplus was estimated to be released to the other provinces of Sumatera and was Jawa. The surplus rice accounts for 17.6% of production. The balance between demand and supply of rice for the other two provinces is not clear, but it is estimated that production cannot meet the demand in each province and the surplus rice and the imported rice may flow through BULOG.

The marketing condition of rice seeds is not clear due to the shortage of data but its outline estimated by consolidating the results of the actual survey is as follows.

Out of the rice seeds produced in provincial or national fields responsible for producing seeds, S.S. are sold to farmers directly or sold through groups of seed producing farmers and representatives of cooperatives, and apparently merchants seldom participate in the dealings. It is said that E.S. (Extension seeds) are sold to farmers through the routes of extension centers and the BIAMS Programs, but it is uncertain.

E.S. produced by seed producing farmers are mainly sold to farmers directly, but it is delivered to distant farmers through ordinary merchants or KUDs.

The Agricultural Material Supplying Cooperation (P.T. Pertani) is transacting small quantities of seeds only in Belitang district in South Sumatera and Metro district in Lampung but not in any other districts. However, the Central Seed Cooperation opened a branch office in Metro in Lampung in 1980 and seed producing farmers purchase E.S. from seed growers and sell to ordinary farmers after processing and packing through the Agricultural Material Supplying Cooperation (P.T. Pertani). The transacted seed quantity up to now has been 29.0 tons in the wet season of 1980-1981 and 234 tons in the dry season of 1981.

E.S. which are obtained by the Agricultural Material Supplying Cooperation (P.T. Pertani) from seed growers and the Central Seed Cooperation, is marketed through extension centers, BIMAS routes or merchants in villages. The transaction of rice seeds is not carried out systematically and no systematic organization or marketing structure has been established. The rice prices are explained hereunder. The movement of retail prices of milled rice published by the Indonesian Central Statistics Bureau as of October 1981 is as follows.

The price is 202 Rp per kg, which exceeds the floor price of 175/kg, even in the capital of Aceh Province in north edge of Sumatera which is one of the summer resorts in Indonesia.

Table 3 - 3 Milled Rice Price

City	Milled rice per ℓ	Milled rice per kg
	RP	RP
Banda Aceh	162	202
Palembang	202	252
Tanjungkarang	263	329
Jakaruta	274	343

Lampung is outstandingly the highest of the objective 3 provinces, followed by South Sumatera and Aceh Provinces, and the regional differences among the 3 provinces are great in the extreme. The comparison of paddy price obtained from the results of the actual survey is as follows.

Table 3 - 4 Paddy Price

	Lowland rice per kg		Upland rice per kg
	Local variety	Improved variety	
	RP	RP	RP
Aceh	145	135	145
South Sumatera	150	130	150
Lampung	-	120 - 140	-

Contrary to the price of milled rice, paddy is lowest in Aceh Province, higher in South Sumatera Province, and the highest in Lampung Province.

The price of paday of the transacted local variety is higher than the improved variety by 12% in Aceh Province and 15% in South Sumatera

Province respectively, and the paddy price in up-land rice cultivation areas is the same as that of the local variety of low-land rice cultivation areas.

As for the marketing price of rice seeds, it is different from state to state and from region to region and the price is not as well stabilized as ordinary paddy, because the marketing of rice seeds is not established yet and the marketing it self is very conservative.

	S.S. selling price	Seed growers' selling price	Ordinary farmers' purchasing price
	Rp	Rp	Rp
Aceh	200 - 250	175 - 225	175 -
South Sumatera	200	195	200 - 250
Lampung	175 -	225	200 - 225

It is reported that the structure of seed prices at the branch office of the National Seed Corporation in Lampung Province is as follows.

The seeds are bought from seed growers at 123 Rp per kg and sold after processing and quality assurance to the Agricultural Material Cooporation at 185 Rp per kg and the cooperation sells then to farmers at 225 Rp per kg.

3-4 Infrastructure

The delay of development, especially in infrastructure, is conspicuous in outer possession of Indonesia. This phenomenon is also observed without exception in the objective Aceh, South Sumatera and Lampung Provinces.

The present conditions of the most important points such as road traffic, land facility, irrigation facility, electric facilities and tele-communication in the above three provinces are as follows.

3-4-1 Road traffic conditions

(1) Aceh Province

The main highway around Banda Aceh, the capital of Aceh Province, are paved or semi-paved, but Batas Kabupaten and Batas Kecamatan are narrow and seldom paved.
Especially, the roads in mountainous areas are narrow with many ups and downs and only just permit jeeps and lorries to pass.
The east coast area is flat and the number of roads crossing rivers are few, while the west coast area is mountainous to the seashore and many rivers flow into the sea. Since some rivers have few bridges, travel is very inconvenient in those areas.
At present, main highways are under construction as a part of highway construction plan connecting Lampung and Aceh by cooperation of West Germany, Canada, Korea and other countries.
The mountainous Central Aceh Kabupatan and South East Aceh Kabupatan have no highways which pass the Province or entrance locations on the side of North Sumatera Province.
There was a railway service connecting Medan and Banda Aceh but only the track is left, and is now out of use.

(2) South Sumatera

Canals and rivers are playing an important roles in transportation as well as railways and roads. They are especially indispensable in tidal and swampy areas in the eastern district of Palembang. There is a network of natural canals and artificial canals in the province, but travel is very inconvenient because of the great differnce between the rise and fall of the tide in the Malacca Strait. A railway is running between east and west in the central district of the inland area, but Batas Province, Batas Kabupatan and Batas Kecamatan are playing important roles and only Batas Province connecting Palembang and Lahat and the other one passing Baturaja to Lampung have paved roads, but other roads are not paved yet, moreover tney are very narrow and travel is not easy. Only Batas Kabupaten and Batas Kecamatan surrounding the capital of Kabupaten are temporarily paved and greatly restrict the transportation of people and goods.
The road starting from Baturaja and passing Lahat and Bengkulu belongs to the Sumatera Highway and basis construction work is being carried out now.

(3) Lampung

The paved roads constructed along the canals in the low land, when the Dutch were in Indonecia, have been comparatively developed and transportation seems to be convenient as compared with that of the above two provinces. But, the construction of roads in North Lampung Kabupaten, or in highland grasslands and upland fields in Middle and South Lampung Kabupatan is remarkably slow.
The paved roads in low lands are flooded on the rainy days and traffic is stopped frequently due to submersion.
Travel in the deforested arèa is difficult because of the collapse of roads or heavy muddling, due to the lack of protection afforded by trees.
The condition of roads used for agriculture in the objective area is as follows.
As shown in the ANNEX Table 3-31, according to the results of our survey on farm-roads which need construction and restoration, the length of roads which need repair in Aceh Province is 51 Km, and 934 Km for repair and 210 Km for constuction are necessary in South Sumatra Province, and 184 Km for repair and 234 Km for construction are necessary in Lampung.
The total length of farm-roads which need repair and construction accounts for 20% of all farm-roads and it is 10% of all farm roads in the objective three provinces.

3-4-2 Foundamental readjustment of land and irrigation

Foundamental readjustment problems in the objective districts are explained through the actual conditions of land-use and are as follows.

The land use in the objective three provinces made clear by the preparatory survey for the project shall be mentioned under.

The extent of forestry in Aceh Province is greater, as compared with that of the other two provinces, but no problems occur because the arable land there is very large.

Land Use in Objective District

(%)

	Whole land	Cultivated land	Pasture	Forestry land	Others
Aceh	100.0	34	3	52	11
South Sumatera	100.0	15	2	23	60
Lampung	100.0	27	1	46	26
Average of Indonesia	100.0	25	3	50	22

Remarks: "Others" includes swamps and alang-alang area.

The percentage of "Others" for South Sumatera and Lampung is large. South Sumatera province has a large tidal area, on the other hand Lampung has a alang-alang area. Both the tidal area and alang-alang area are scheduled to be used as a transmigration area in the future, and development for upland fields and lowland field is necessary, making an infrastructural project in agriculture urgent. The percentage of "Others" for Aceh is small now, but "Forestry" accounting for 52% offers a high possible for change into alang-alang area as well as South Sumatera Province and Lampung Province.

Therefore, it is necessary to prepare an infrastructural project for development of fields in future. The actual status of the irrigation equipment for paddy rice cultivation in the objective three provinces is as follows.

The networks of irrigation facilities for cultivation of paddy rice are varied from the well developed to the poorly developed and from primary canal to tertiary canal.

The irrigation projects are divided into two groups, projects which are controlled by the Public Enterprise Bureau and others which are not managed by the Bureau.

The irrigated low-land fields are divided into 3, namely, perfectly irrigated areas, rouhgly irrigated areas and simply irrigated areas. This classification seems to be equivalent to the primary canal, secondary canal and tertiary canal, and quarterly canal, and the irrigation network which is not controlled by the said Bureau is regarded as belonging to the category of simple irrigation.

The irrigation percentage which is made by dividing the total area from perfectly irrigated field to simply irrigated field, by whole area of low-land paddy field in three provinces shows the highest 71% for Aceh, 60% for Lampung and only 19% for South Sumatera. (Refer to ANNEX Table 3-6) The reason for the smallest percentage in South Sumatera Province is that there is a lot of flooded or tidal low-land paddy fields which are very hard to irrigate and great investment is necessary for irrigation facilities in this area, consequently it is impossible to expect efficiency.

The total area of perfectly irrigated fields and roughly irrigated field is small as compared with simply irrigated fields in every province, but it is desired that the tertiary canal is developed to cultivate two season crops and three season crops in the future.

3-4-3 Electricity and Telecommunications

(1) Electricity

All of the Indonesian Electric Companies were nationalized by ident- Presidential Decree and they are now under the control of P.L.N. (Perushaan Listrik Negara).

The supply condition of electric power is insufficient today, therefore manufactures have to rely on their private power stations to get eletric power. But, people in the countryside don't have their own generator, therefore, petroleum lamps are still prevalent among them.

(2) Telecommunications

As for telecommunication facilities, there are telephones in Indonesia, however, the number of telephones is only 3.3 per 1,000 people (1978) for all the country.

CHAPTER IV THE PROJECT

CHAPTER IV THE PROJECT

4-1 Estimation of the Project Seeds Required

4-1-1 Present Utilization of Rice Seed and Farmers' Responses to Improved Varieties,

Rice seed is one of the important inputs for Indonesian farmers, who are cultivating paddy. And its cost amounts to more than 10% of the whole material inputs in general. Rice farm inputs and their credits have been provided by Indonesian government under an intensification program which was introduced in 1963.

The initial intensification program consisted of two parts: BIMAS and INMAS. In the BIMAS program, groups of farmers in selected areas can be offered a package of farm inputs on credit under mutual guarantee arrangements. Since 1970 under the new improved program, BIMAS national, the farmers could obtain credit from the Bank Rakjat Indonesia to purchase inputs packages in which improved seeds from distributors are included.

On the other hand the INMAS program is a follow up of the BIMAS with a similar package but without credits to support rather economically advanced farmers.

Since 1979, the starting year of Pelita III, the Indonesian government has undertaken a new special intensification program. This program (called INSUS) aims to promote and encourage the outstanding farmers, by intensive methods of development of their technology.

As a result, all kinds of intensification programs have a deep relation with the improved seed utilization of the farmers.

(1) Intensification areas in the project provinces

Existing intensification areas in the 3 provinces are shown in the following table.

Table 4-1 Intensification Areas (1980)

(ha)

	BIMAS	INMAS	Total	Non-intensification	G. Total	Intensification Ratio
Aceh	9,792	74,320	84,113	141,362	225,475	37.3%
South Sumatera	35,076	61,245	96,321	315,768	412,089	23.4
Lampung	38,479	74,171	112,650	161,824	274,474	41.0

Source: Agricultural Services of each Provincial Government

Lampung province has been intensified most and it had 41% of the total harvested areas under the BIMAS and INMAS program in 1980, while South Sumatera province fell substantially behind in the program due to having large flooded and tidal areas.

Comparing their intensification ratio with that of Java's where the BIMAS and INMAS program is in operation, the project areas are still less advanced in the intensification program.

(2) Diffusion of improved varieties of paddy

Although the intensification program is a significant measures to promote improved paddy seed utilization by farmers, not all BIMAS and INMAS farmers use the seeds. And not all non intensification farmers do not use the improved seeds.

According to our field surveys, some intensification farmers refuse to accept the improved seeds in the package bacause they prefer to select their own seeds by themselves. On the other hand some non intensification farmers are using the improved varieties willingly. Accordingly, the real utilization of improved varieties will be illustrated by the diffusion of them in the project areas. There are three kinds of improved seed categories throughout in the project areas: VUTW, VUB and VUL. VUTW is the abbreviation for "Varietas Unggul Tahan Wereng" - literally "dominant varieties for resistance to pest" and include PB32, PB36, PB38 etc. VUB is the abbreviation for "Valletas

Unggul Baru" and it means new dominant varieties including PT-1, PT-2, C4 62 etc. And VUL is the abbreviation for "Varietas Unggul Lama" and it means old dominant varieties.

The following table indicates the spread of improved varieties of paddy in the project areas in 1980.

Table 4-2 Diffusion areas of improved varieties (1980)

(ha)

	VUIW	VUB	VUL	Total	Local	G. Total	Diffusion ratio (%)
Aceh	103,630	2,783	587	107,000	118,475	225,475	47.5
South Sumatera	37,217	50,566	9,670	97,453	314,637	412,090	23.6
Lampung	93,899	19,161	5,968	119,028	155,446	274,474	43.4
Total	234,746	72,510	16,225	323,481	588,558	912,039	35.5

Source: Agricultural services of each provincial government
Note: South Sumatera includes islands and flooded area.

(3) Farmer's response to improved varieties

The seeds utilized by farmers come via three channels in the project areas: (1) the seeds self-supplied or exchanged seeds among farmers, (2) the seeds provided through the intensification program, BIMAS or INMAS, and (3) the seeds provided from seed markets. There are many sources from which the seeds come and the transactions are also very complicated and not systematic.

The main sources of commercial seeds are NSC, PSP and private seed growers. They sell the seeds to the farmers directly or through a marketing channel or intensification program system. The seeds through the marketing channel are treated by KUDs, P.T. Pertani, NSC, and private dealers.

However, most of the rice farmers utilize their own self-supplied seeds in the project areas, according to our field survey. Of course, there are some farmers near by PSP or extension

unit where ES are cultivated and they are used to getting seeds from the station, but most farmers far from the station find it difficult to get seeds due to no well-organized seed market is available in the project areas.

In spite of the lack of marketing for dominant seeds, farmers still want to get these good seeds. It is certified from the ratio of diffusion is rather larger than the ratio of intensification. On the other hand, farmer's response to new improved varieties is delicate and complicated. This may be illustrated by the fact that there are a great number of improved varieties in the project areas; 24 kinds in Aceh, 16 kinds in South Sumatera and 17 kinds in Lampung. Futhermore the farmers in the areas always wish to change to newly improved seeds.

Recently, most of the farmers in the project areas have wished to use such kinds of improved varieties i.e. those having good results from tests on resistance to disease or pest, but they did not wish to use the seeds having only high yielding characteristics.

The following table indicates the most popularly improved varieties in the project area.

Table 4-3 Main Varieties of VUTW spreaded

(%)

	Aceh	South Sumatera	Lampung
Total of VUTW	100	100	100
PB 36	36	44	75
PB 32	31	36	25
PB 38	25	9	-

Variety IR 36 which is the most widely spread in the area is named PB 36 in Indonesia. Its growing period is very short - totally 110 - 120 days - , and has a resistance to brown plant hopper, in addition, it is rather flavourous.

Conversely, it shouldn't be forgotten that the farmers do have an affection for the traditional local varieties. Local varieties have still several merits: (1) their market price is higher than the improved varieties; (2) they have a stable yield, owing to plant protection from natural damage, pest and diseases;

(3) cheaper production cost and (4) easy farming practices. A successful implementation of the seed project, depends on whether or not the seeds one more adaptable and suitable for not only the local climate, soil, and water conditions, but also the food customs and people's taste.

* When making the survey,no sampling method was employed. But it was done hearing survey from several farmers in each district of three provinces.

4-1-2 Seed rate and seed replacement frequency

(1) Seed rate

Although it is very varied, the seed rate of paddy field in project areas, in general, was 40-45 kg/ha. in local varieties, while 30-35 kg/ha in dominant varieties in lowland, according to our field surveys. And the seed rate of upland rice was 40-45 kg/ha in the Betung areas in South Sumatera province.

Seed I project, recommended that the farmers in the Jawa areas sow 25 kg/ha of improved paddy seeds in 1976, despite the the seed rate of non improved rice usually being 35-40 kg/ha., at that time. And 40 kg/ha of seed rate for upland rice and 30 kg/ha for tidal rice were also recommended at the same time.

BIMAS and INMAS farmers in the project areas have kept the recommended standard rate. In this project the following seed rate on project seed is recommended: 25 kg/ha. for lowland rice, 40 kg/ha for upland rice, and 30 kg/ha. for tidal rice.

However, owing to the fact that the seed rate depends on probably seed quality, especially its germination rate, it is necessary to take good seed processing, quality control and the purity of varieties into consideration. In addition, a seed certification program and cold storage for FS, SS are required.

(2) Seed replacement frequency

It is said that BIMAS and INMAS farmers in the Jawa areas prior to 1969, purchased the rice seeds every 3.5 years (or every 7 seasons), and non-intensification farmers purchased the seed every seven years.

At that time, obtaining suitable improved seeds was difficult, because there was no seed industry, and breeding research

was in a weak stage of development in Indonesia.

In Seed I project, the World Bank/FAO recommended that the seed replacement frequency should increase to once every 2.5 years (or once every 5 seasons) in lowlands and once every 7 years in upland areas.

In Seed II project, it was recommended that in 35% of the rice cultivation areas in the target year, the seeds should be replaced and the farmers in double cropping areas should replace the seeds once every 1.5 years (or once every 3 seasons).

As is mentioned above, the farmers near seed farms or private seed growers are used to purchasing the improved seeds while other farmers in the project area have no purchased seeds. Some farmers in intensification areas purchase the seeds every season.

The Indonesian government has recognized that seed replacement frequency should be increased to 35% for lowland areas and 25% for upland and tidal areas in this project. However, it is difficult for the seeds in the upland or tidal areas to keep their purity due to the soil and natural environmental conditions being unsuitable for rice cultivation. Furthermore, most of farmers in the upland and tidal areas have transmigrated from Jawa and Bali. They are grouped into the BIMAS program and get the seeds in BIMAS packages.

Because of the above two reasons, the frequency rate of seed replacement in upland and tidal areas should not be lower than that of the lowlands.

In this project, adoption of a once every 1.5 years (or once every 3 seasons) of seed replacement program in all areas is advisable.

4-1-3 The improved seeds required for this project

The amounts of required seeds for the project - hereby called the "project seed" - can be calculated from farmers' demand for the seeds by the target year. The target year is defined as 1988 i.e. the end of the fourth 5 year development plan of Indonesia.

However, it is very difficult to estimate the seed demand.

In Seed I and Seed II project, the target areas of intensification program were accepted as a significant element to determine the project seeds required. In addition, new transmigration areas in the target year were also employed to estimate the seeds demand.

However, the diffusion areas of improved varieties are larger than the intensification areas, and the realized intensification areas were much longer than the target areas of the intensification areas. Therefore, the target areas of intensification program are not suitable for estimating the project seeds requirement.

In this project, the following methods are taken to estimate the amounts of project seed required in the target year: the first, to estimate total planting areas of paddy in the target year in the project areas; the second, to multiply the areas by seed rate and seed replacement ratio.

Not all farmers who produce paddy, of course, will purchase the project seeds, but there is no means to estimate how many farmers will purchase the seeds by the target year.

In a sense, the estimated amounts of the seeds will express expected demand for the project seeds.

The total planting areas of paddy are estimated based on the following data; (1) existing paddy areas; (2) target areas of transmigration; (3) reclaimed and lost areas of lowland and upland for paddy; and (4) estimated double cropping areas in the target year.

The existing paddy areas in the project provinces are shown in the following table.

Table 4-4 Existing Paddy Areas in the Project Provinces (ha)

	Land for wet paddy	Land for upland paddy	Land for tidal paddy	Total
Aceh	210,767	15,970	-	226,737
South Sumatera	99,048*	100,805	65,667	265,520
Lampung	129,343	122,246	-	251,589
Total	439,158	239,021	65,667	743,846

* except flooded area

Source: Agriculture Service, in each provincial government.

Agricultural services of each provincial government in the project areas have plans for the reclaimed, lost and transmigration areas in target year of the project.

The following table indicates the areas.

Table 4-5 Estimation of Reclamation or Decreased and Transmigration Areas

(ha)

		Reclamation of decreased areas		Target areas of transmigration		Total
	Lowland	Upland	Tidal	Upland	Tidal	
Aceh	17,368	-	-	20,000	-	37,368
South Sumatera	39,524	(-) 16,482	(-) 26,615	25,415	37,836	59,678
Lampung	76,730	(-) 24,446	-	-	-	52,284
Total	133,622	(-) 40,928	(-) 26,615	45,415	37,836	149,330

Source: Agriculture Service in each Provincial Government

Aceh: Provincial government has a plan to have 17,368 ha. of reclamation areas for low land paddy, 64% of which will be developed in South Aceh and the West Aceh district. Development of the upland paddy areas is now dependent on the central government's transmigration policy. By 1988, 20,000 ha. of upland paddy fields will be opened by transmigration farmers from Java and Bali island.

South Sumatera: About 40,000 ha. of lowland is to be scheduled for reclamation. However, the lost areas (due to the areas having converted to perennial crop areas and because of a transmigration problem) of the existing upland rice and tidal areas, will be estimated.

On the other hand, 25,415 ha. of upland rice areas and 37,863 ha. of tidal rice areas are scheduled for development in the new transmigration program. Ultimately, 9,000 ha. of upland rice areas and 11,000 ha. of tidal rice areas will be added to existing areas respectively, by 1988.

Lampung: In accordance with the on-going irrigation program (Refer to ANNEX Table 4-2), approximately 76,700 ha. of lowland rice area is expected to be increased with new reclamation and diversion of upland rice areas into lowland rice areas.

However, by contrast, some upland rice areas would become waste areas due to retransmigration. Finally, there has been a decrease of 24,000 ha. of upland rice areas, because Lampung province has been declining to schedule a new transmigration program for the last few years and is still continuing to do so.

In order to obtain the total areas of planted paddy in the Target year 1988, the net expanded areas from reclamation and transmigration will be added to the existing paddy areas, and they should be modified with the double cropping areas expected by 1988.

Although it is difficult to find a good measure to estimate the double cropping areas in the target year, the following assumption could be accepted: all existing "Teknis" and "Semi teknis" irrigation areas and half of the "Sedahana" irrigation areas will become double cropping areas, by 1988.

As the paddy in double cropping areas can be cultivated twice a year, the areas are counted as double the actual areas. Ultimately, the total planting areas of paddy in the target year are measured as follows.

Table 4-6 The planting areas of paddy by 1988 (estimated)

(ha)

	Lowland paddy	Upland paddy	Tidal paddy	Total
Aceh	319,079	35,970	-	355,049
South Sumatera	200,956	109,738	76,888	387,582
Lampung	274,177	97,800	-	371,977
Total	794,212	243,508	76,888	1,114,608

The above table indicates that the incremental paddy areas are estimated at 10,800 ha. in Aceh province, 111,600 ha. in South Sumatera province, and 97,500 ha. in Lampung province.

The project seeds to be prepared are estimated by using seed rates, seed replacement frequency and above estimated areas as follows:

Table 4-7 Project seeds to be prepared by 1988

(ton)

	Lowland rice	Upland paddy	Tidal rice	Total
Aceh	2,659	480	-	3,139
South Sumatera	1,675	1,463	769	3,907
Lampung	2,285	1,304	-	3,589
Total	6,619	3,247	769	10,635

Note: In Belitang, South Sumatera, proposed 1,022 tons of lowland E.S. is to be produced by P.T. Patra Tani.

Comparing the above amounts of the seeds with the seed amounts proposed by each provincial government (Refer to ANNEX Table 4-3, 4, 5), the latter is larger than the former because the latter is estimated using a bigger ratio of seed replacement frequency.

The project seeds mentioned above come from extension seeds which are produced by private seed growers under contract with provincial agricultural services.

The extension seeds produced by seeds growers would be collected and processed, certified and packed. After that, the seeds will be distributed to the seed growers through the intensification program or the distributors - KUDs, P.T. Pertani, merchants and other agents - .

From collection to distribution some losses should be taken into consideration. In this case, it is estimated at around 20% in lowland rice and tidal rice, and at 30% in upland rice, depending on the data of seed processing.

The extension seeds are reproduced by S.S. and F.S. As far as the required quantity of Stock seed and Foundation seed is concerned, these can be estimated on the basis of the required cultivation areas for seed production and each seed rate. The seed cultivation areas is dependent on field productivity*, and farming practices including farm technology. Consequently,

suitable, adaptable high technologies for seed production are most necessary.

Note: *	Lowland ton/ha	Upland ton/ha	Tidal ton/ha
E.S.	3	1.3	3
S.S.	2	1.5	2
F.S.	1	0.6	1

Table 4-8 Estimated demand amount of S.S. and F.S. is shown in the following table.

(ton)

	Lowland rice		Upland rice		Tidal rice		Total	
	SS	FS	SS	FS	SS	FS	SS	FS
Aceh	26.6	0.33	19.8	0.51	-	-	46.4	0.84
South Sumatera	16.7	0.21	58.5	1.56	9.2	0.14	84.4	1.91
Lampung	22.8	0.29	52.2	1.39	-	-	75.0	1.68
Total	66.1	0.83	130.5	3.46	9.2	0.14	205.8	4.43