REPUBLIC OF INDONESIA
Ministry of Public Works
Directorate General of Water Resources Development

FEASIBILITY STUDY ON THE KOMERING-I IRRIGATION DEVELOPMENT PROJECT IN THE UPPER KOMERING RIVER BASIN

VOLUME II-2

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VI. AGRO-ECONOMY
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XII. PILOT DEMONSTRATION SCHEME

JUNE 1981

Japan International Cooperation Agency
Tokyo, Japan

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ABBREVIATION AND LOCAL TERMS

Abbreviations and local terms used in this report are listed below:

A. ABBREVIATIONS

1. Length

mm	millimeter
cm	centimeter
m	meter
km	Kilometer

2. Area

cm^2	square centimeter
m^2	square meter
km^2	square kilometer
ha	hectare

3. Volume

lit( )	liter (= 1,000 cm^3)
m^3	cubic meter

4. Weight

mg	milligram
g	gram
kg	kilogram
t	ton (= 1,000 kg)

5. Time

sec	second
min	minute
hr	hour

6. Other measures

%	percent
PS	horse power

pH	scale for acidity
^{o}C	centigrade
m^3/sec	cubic meter per second
lit/sec/ha	liter per second per hectare
cm/sec	centimeter per second
m.e/l	milligram equivalent per liter
$mgcal/cm^2$	milligram calorie per square centimeter
t/ha	ton per hectare
ppm	part per million
EC	electric conductivity
CEC	cation exchange capacity
No. (Nos.)	number(s)

7. Technical terms

EL	elevation above mean sea level
H	height
WL	water level
HWL	heigh water level
LWL	low water level
FWL	flood water level
Q	discharge

8. Money

US$	US Dollar
Rp.	Indonesian Rupiah

(US$ 1.0 = Rp.625.-)

9. Other abbreviations

FAO	Food and Agriculture Organization of United Nations
UNDP	United Nations Development Program
DPU	Departement Pekerjaan Umum (Department of Public Works)
PJSA	Proyek Percencanaan Pengembangan Sumber-Sumber Air
IRRI	International Rice Research Institute

JICA	Japan International Cooperation Agency
WHO	World Health Organization
BRI	Bank Rakyat Indonesia (Indonesian People's Bank)
GDP	Gross Domestic Products
GRP	Gross Regional Products

B. LOCAL TERMS

Kab.	Kabupaten (District)
Prov.	Provinsi (Province)
OKU	Kabupaten Ogan Komering Upper River Basin
OKI	Kabupaten Ogan Komering Lower River Basin
BIMAS	Mass Guidance for Self-sufficiency in Food
INMAS	Mass Intensification for Self-sufficiency in Food
CRIA	Central Research Institute for Agriculture, Bogor
PPS	Extension Specialist
PPM	Extension Supervisor
PPL	Field Extension Worker
BPP	Rural Extension Center
KUD	Village Unit Cooperative Body
DOLOG	Depot Logistic
BULOG	Board of Logistic
KIOSK	Small Shop
ADC	Agricultural Development Center
UPP	Land Development Unit
KIK	Small Investment Credit
Desa	Village
Kecamatan	Sub-district
Kontak-Tani	Key farmer or leading farmer
Ani-Ani	Small Rice Harvesting Knife
Lebak	Swamp behind river levee
Ulu Ulu	Water master

Pelita (Repelita)	Five-year Development Plan
Sawah	Paddy field
Dalam Angka	Statistical data
Polowijo	Second crop, planted after harvest of rainy season paddy
Tegal	Upland field
Ladang	Shifting culture land
Alang-alang	Grass land

ANNEX V

AGRICULTURE

ANNEX - V

AGRICULTURE

1. BACKGROUND

1.1 General

The project area is situated in the Upper Komering river basin extending over the flat alluvial plain between the altitude of about 20 to 80 m. The area belongs to five Kecamatans, namely Martapura, Buay Madang, Belitang, Cempaka in Kabupaten OKU, and Bahuga in Kabupaten North Lampung.

The agricultural survey was carried out in and around the project area to clarify the present agricultural conditions and to assess the potential productivity in the area. The data and information were collected mainly from the Government agricultural offices concerned, such as Kabupaten and Kecamatan agricultural extension offices. Besides, the field interview to farmers was made so as to obtain more detailed information particularly on farming practices, crop production, production cost, labor requirement, etc. Yield of paddy was checked by sampling survey at 12 locations sporadically selected in the project area. In addition, the data on population, family, land use, crop production, livestock, etc. were collected from 65 Desas located in the project area with close cooperation made by Kecamatan agricultural extension offices.

In the study, the physical nature of land, present agricultural conditions, agro-economic background, governmental policy for future agricultural development and farmers' intention are taken into account in addition to the land suitability classification and engineering study on the irrigation and drainage improvement. The main studies made in this report are:

(1) Selection of suitable crops and their varieties considering the marketability, profitability, familiarity to farmers and agronomic characteristics to the soil and climatic conditions.

(2) Formulation of the most suitable cropping pattern and future land use on the basis of the climatic conditions, labor force available in a farm household as well as in the whole project area and plant physiological characteristics of crops as shown in Fig. V-1.

(3) Estimation of the prospective yield and production of crops and farm inputs required referring to the data on present crop production in and around the project area, crop research and soil conditions.

(4) Recommendation of the most applicable farming practices to the project area, taking into account the present farming practices, availability of labor force, future field conditions, characteristics of crop varieties, prevailing pests and diseases in and around the project area and development plan of agriculture.

1.2 National and Regional Agricultural Conditions

Agriculture in Indonesia has played an important role in her economy. The agricultural active population is about 35,300,000/1 or about 66% of the national active population of about 53,400,000/2 in 1978. Average farm family size and farm size excluding estates were about 5.0 persons and 0.99 ha/farm household in 1976/3 respectively.

The following table shows the cultivated land and its production of major crops in Indonesia in 1978, South Sumatra Province in 1978 and Kabupaten OKU in 1979 respectively.

/1 & /2: Source; Central Bureau of Statistic, Indonesia

/3 : Source; Statistic Year Book, 1976

Crops	Area Cultivated (10^3ha)			Production (10^3tons)		
	Indonesia	South Sumatra Province	Kabupaten OKU	Indonesia	South Sumatra Province	Kabupaten OKU
Rice	8,929	378.0	74.7	17,525	424.0	137.0
Maize	3,025	6.4	2.5	4,029	4.8	1.9
Cassava	1,383	20.8	4.0	12,902	204.0	31.7
Peanut	506	5.9	1.3	446	4.7	1.1
Soybean	733	3.4	0.9	617	2.9	0.8
Sweet Potato	301	6.0	1.0	2,083	47.3	4.7
Perennial Crops	3,536	21.8	13.3	3,370	18.4	10.4

Source: Statistical Yearbook of Indonesia, 1977 - 1978
Kabupaten OKU Agricultural Office, 1979
Estate Crop Office in Kabupaten OKU, 1979

Rice is the main staple food in Indonesia. Rice production in Indonesia has increased at an annual rate of 3.2% from 1960 to 1970, and 3.8% from 1970 to 1977. This rapid increase of production is considered to be attributable to the yield increase brought under the Government intensification program mainly in Java and the substantial increase of cultivation area in the outer inlands. However, its total production of rice still can not keep pace with its increasing demand resulting from the rapid population growth and the raising of per capita consumption. (Refer to Annex VI-5.2).

Agriculture in South Sumatra is broadly divided into two types, namely small-holder farming and estate agriculture. According to the statistics[/1] in 1973, the small-holder farming covers about 700,000 ha of farm lands cultivated by about 380,000 farm families, while the estate farming occupies approximately 22,000 ha of lands.

/1: Statistik Indonesia 1977 - 1978

The main crop of the small-holder farming is paddy. It is reported that total cultivated area of paddy in 1978 in the South Sumatra was about 378,000 ha which correspond to about 54% of total farm land. In the Kabupaten OKU total cultivated area of paddy in 1979 was about 75,000 ha which correspond to about 76% of its total cultivated area. According to the statistics of South Sumatra Province, rice production in South Sumatra has increased at about 3% of annual rate from 1969 to 1978. (Refer to Fig. V-3).

About 2% of annual increase rate of paddy production during the past five years was observed in the Kabupaten, while negligible small increase rate of that in the five Kecamatans. (Refer to Fig. V-4 and V-5). The yield of rainy season paddy and the dry season paddy in 1979 in the Kabupaten was about 2.8 t/ha and about 2.7 t/ha respectively.

Indonesia has a long experience in irrigated rice cultivation and understand the practices better than the neighbouring countries. Java has more high proportion of irrigated area than that in the other islands. In Java, the area under irrigation conditions (technical and semi-technical area) occupies about 60% of total cultivation area of paddy even in 1973 as shown in Table V-1. While only 12% in the case of South Sumatra Province and 18% in the case of Kabupaten OKU are observed in 1977 respectively, which are far less than those in the Jave island. (See Table V-1).

Table V-2 shows the difference of paddy yields between irrigated and rain-fed conditions for 5 years. The paddy yield in the rain-fed condition in the rainy year does not differ so much from that in the irrigated condition. While, in the drought year, the paddy yield in the rain-fed condition is approximately half of that in the irrigated condition.

Fig. V-2 shows the yield of food grains and percentage of irrigated area in Asian countries. The figure shows the high correlation between the crop yield and irrigation rate of farm land in these countries, from which it can be said that the irrigation development is inevitable for the increase of crop production.

1.3 Agricultural Development Plan in Repelita III

Following the Second Five-Year Development Plan (Repelita II), the Government of Indonesia has set forth the Third Five-Year Development Plan (Repelita III) for the period from 1979/80 to 1983/84.

Repelita III is a continuation and enhancement of the previous Repelita I and Repelita II and has the following major objectives.

(i) To raise the living standards and levels of knowledge of the Indonesian people.

(ii) To strive for a more equitable distribution of welfare of the whole population.

(iii) To lay a strong foundation for the next stage of development.

For the successful implementation of the Repelita III, the plan will pursue a balance among the three elements of the development strategy, namely, equity of welfare, high economic growth and national stability. In this context, the following economic growth is targetted during the Repelita III period.

(i) Real economic growth rate of about 6.5% per annum.

(ii) Per-capita gross domestic product of about 4.4% per annum.

(iii) Population growth of about 2% per annum.

As for the agricultural development sector, the plan envisages the raise of productivity of agriculture through which the sector will provide more food to the growing population and raw materials to agro-industry as well as employment opportunities. The development of agriculture in Repelita III will contribute directly to improvement of the welfare of the people, promotion of industrial growth and a more balanced development of the regions. Especially, the plan envisages the substantial increase in food production over a wide range of crops. It is projected to increase rice production at an average annual growth rate of 3.3% and polovijo at 5 to 7% per annum, as seen in Table V-3 and V-4.

Following the plan on the national level mentioned above, the development plan for South Sumatra and Kabupaten OKU also puts the stress on the substantial increase in food production not only through extending

cultivation area but also by increasing crop yield.

In order to increase food production in the plan the first priority is given to the water resources development for which the following irrigation developments are contemplated:

		Area (ha)
(i)	Rehabilitation and improvement of existing system	536,000
(ii)	Construction of new system	700,000
(iii)	Tidal swamp irrigation	400,000
(iv)	Expansion and rehabilitation of tertiary system	600,000
(v)	Swamp area reclamation	135,000
	Total	2,371,000

2. PRESENT AGRICULTURAL CONDITIONS

2.1 Present Land Use

The land use survey was carried out in the project area and its surroundings. The present land use in the project area is classified from the aerial photos with 1:20,000 scale which were prepared in August 1979 by Japan International Cooperation Agency (JICA) together with field check survey for present land use situation in the project area, and shows in PLATE No. 6. The Table V-5 shows the present land use in the project area. Out of the total irrigable area of about 51,000 ha, the land under cultivation covers about 23,000 ha and the shifting cultivation land (ladang) cropped with mainly cassava is estimated at about 2,800 ha at present. The remainings are covered by secondary forests, alang-alang, perennial crops, village and others. From the farm hold size and farming practices, the project area is broadly sub-divied into three areas, 1-ha farm development area, 1.5-ha farm development area and Pisang area.

(1) 1-ha farm development area

The area is mostly located in the upper part of the project area, where transmigrants had been settled in the very early stage. Most of the agricultural land comprises flat alluvial plain with the elevation ranging from about 60 to 80 m. Rain-fed paddy cultivation predominates in this area. Out of the total irrigable land of about 11,420 ha, about 7,250 ha or about 63%, are paddy land and about 1,320 ha, or about 11%, are upland field where upland paddy, cassava, maize, peanut, soybean, etc. are mainly planted under rainfed condition. Some perennial crops such as banana, coffee, rubber, etc. are planted in levee land mainly along the Komering rivers and small tributaries commanding about 300 ha. Alang-alang and forest land are very limited in this area.

(2) 1.50-ha farm development area

The area is extended over the northeast of 1.0 ha farm development area mentioned above, sandviching the Belitang proper area. The area is relatively flat, but some undulating lands extensively cover the upper parts of the area. The area has been largely developed for settlement of the transmigrants recently.

Out of about 34,380 ha of irrigable area, about 7,130 ha, or about 20% are cultivated with paddy and about 7,150 ha, or 21%, with upland crops such as upland paddy, maize, cassava, soybean, peanuts etc. Shifting culture and alang-alang lands occupy about 28% of the irrigable land. The forest covers about 23% where secondary forests occupy largely.

(3) Pisang area

The area is located at southern part of the project area, sandwiched by the Pisang river and the Umpu river. The area is rather undulating topography with an elevation ranging from 25 to 60 m. Only less than 1% of savah and about 10% of tegal and ladang are utlized for agricultural land. Rainy season paddy is cultivated on savah, and upland crops such as upland paddy, maize, cassava, soybean, peanut, etc. are planted on tegal and ladang. Perennial crops, coffee, rubber, clove, coconuts, etc. are planted in about 5% of the area. Virtually, the most of the Pisang area is still covered with secondary forests and grasses, corresponding to about 84% of the total area.

2.2 Present Cropping Pattern

Present cropping pattern prevailing in the project area is shown in Fig. V-6, V-7 and V-8, which data were obtained through the Kecamatan agricultural offices concerned and confirmed by the farm economy survey and land use maps.

Paddy is the main crop in the project area except Pisang area. The Pisang area is mainly cultivated with upland crops.

Type I pattern is predominant in the flat lowland area located at southeast of Martapura and the right side of the Upper Komering river. Paddy is planted from the onset of the rainy season, normally middle of October. The planting period of paddy is approximately 2.5 months depending on the rainfall pattern which varies from year to year. The harvesting paddy lasts about 3 months from February to April. The dry season paddy cultivation is practiced after the harvesting of rainy season paddy in very limited area where stream flow for irrigation is made available. Upland paddy is cultivated during the rainy season. Upland crops such as maize, cassava, soybean, peanut, etc. are planted from the beginning of rainy season in general and harvested from June to

August in the case of cassava and from February to May in the case of other cereals depending on the varieties. Farm holding size of farmer is rather small at about 1.0 ha per household on an average.

Type II pattern mostly prevails rather gentle undulated lands and recently transmigrated land, which sandwiches the Belitang Proper Irrigation Project area. Out of 1.75 ha of farm lands provided by the Government, about 1.4 ha are planted with rainy season paddy, upland paddy and upland crops under the rain-fed conditions. The rainy season paddy in sawah is basically cultivated as large as possible if irrigation water is available. Planting and harvesting period of rainy season paddy are almost the same as the cropping pattern Type-I. About 0.1 ha of farm land is planted with perennial crops such as rubber, coffee, clove, coconut, etc. About 0.25 ha on an average for each farmer is still left for ladang, alang-alang and forest.

Type-III pattern is predominant in the newly settled transmigration area under the Government program and partly spontaneous settlement in the Pisang area. The farmer in the area cultivates a few rainy season paddy, upland paddy, upland crops and perennial crops at an about 67% of the total farm land provided by the Government. Substantial part of the land are still covered by alang-alang, etc.

2.3 Present Farming Practices

The present farming practices in the project area are still conventional resulting in rather low yield of crops owing to the lack of effective irrigation facility. Rain-fed cultivation prevails in all over the proposed irrigation development area. (Refer to Table V-6).

As shown in Table V-7, various varieties of paddy in the project area have been introduced in the recent several years. Senggoto, Perbongkar, Kwatik, etc. of paddy varieties are the prevailing traditional varieties throughout the project area at present. IR varieties such as IR-36, IR-38, etc. have been also introduced in the lowland area. According to the village (Desa) survey and farm econory survey, high yield variety introduced in the project area covers only about 10 to 20% of the area planted.

Growing period of traditional variety ranges from about 150 to 240 days and high yeild variety from about 115 to 135 days respectively. Fertilizer application in the project area is relatively low, ranging from 10 to 20 kg per hectare of urea and 5 to 10 kg per hectare of triple super phosphate. A little amount of agro-chemicals is used in the project area, providing 1 to 1.5 liter per hectare in one time as shown in Table V-13.

In recent years the rainy season paddy has suffered serious damages from both insects, Walang Sangit, Beluk/Sundep, etc. and rats in the project area. The area where BIMAS/INMAS programs are introduced in the project area is quite limited as shown in Table V-8 mainly because of newly settled and negligible irrigation facilities provided. Labor intensive farming is predominant for paddy cultivation though animal power such as cattles or buffaloes. Ani-ani system is prevailing for paddy harvesting except for improved high yield varieties.

As seen in Table V-7, Padi Bulu variety of upland paddy is the prevailing variety in the project area. Present upland paddy is mainly cultivated on tegal and some ladang under rain-fed condition. Metro and Kodok varieties of maize, SPP and Mentega varieties of cassava, Gajah and Macan varieties of peanut, Shahiti and Dauros varieties of soybean are predominantly grown in the project area. Weeding is commonly practiced by manual labor. No fertilizer and chemicals are applied usually. Perennial crops such as rubber, coffee, clove, coconut and orchard are mainly planted in some elevated land.

2.4 Crop Yield and Production

2.4.1 Crop Yield

Yield of paddy varies substantially with the variety of paddy, irrigation water available, amount of farm inputs, etc. and ranges from 1.0 to 4.0 t/ha in the project area. Such low-yield is considered to be caused by various factors, i.e. low fertility of soils, less technical irrigation and drainage system provided, conventional farming practices, less application of of fertilizers and chemicals, insufficient agricultural support services, etc. Under the BIMAS/INMAS program, the yields from the improved varieties

range usually from 2.5 to 4.0 tons/ha in the irrigated Belitang Proper Area.

Yields of upland crops vary also substantially with the variety, soil fertility, rainfall condition and density of farm inputs. Particularly in the hilly lands the crops often encounter with severe drought and lack of nutrient and fertility, resulting in the considerable low yield. Based on the various data and information obtained in the project area, the present average crop yields are estimated as shown in Table V-10.

In order to confirm the yield of paddy, twelve (12) paddy fields were actually investigated at the time of maturity for dry season paddy in the Belitang area. The results of the investigation are shown in Table V-9 and Fig. V-9. As seen in the Table V-9, paddy yields in the Belitang area at present are generally low, namely about 2.3 tons/ha as dry paddy on an average ranging from less than 1.0 ton to 4.0 tons per ha, in which the yield *in* BIMAS program averages about 3.0 tons/ha while that in non-BIMAS program averages about 1.7 tons/ha. It can be said that the paddy yield of BIMAS program are higher than that of non-BIMAS program area as seen in this Table V-9. Judging from the correlation coefficients between yield and yield components, paddy yield in this area is considerably governed by the number of panicles per m^2 (R = 0.86), followed by the percentage of ripened grains (R = 0.73). Remaining yield components such as the number of grains per panicle and the weight of 1,000 grains seem to have no effect on yield. Therefore, stress should be laid on increasing the number of panicles per m^2 as well as raising-up the percentage of ripened grains for increasing yield by using the modern paddy cultivation techniques under optimum irrigation conditions.

2.4.2 Present Crop Production

The present crop productions of paddy and upland cropswere estimated by multiplying the crop planted area by the crop yields based on the field survey. Table V-11 and V-12 show the major crops production in the project area at present.

2.5 Farm Inputs and Labor Requirement

2.5.1 Farm Inputs

As seen in Table V-13, a few amount of fertilizer and agro-chemicals, is applied for paddy cultivation but not used for other crops in general. Though seeds are essential for keeping its constant yield, the farmers in the project area commonly use own seeds produced themselves. The fertilizers and chemicals are normally supplied from KIOSK under the BIMAS/INMAS program.

2.5.2 Labor Requirement of Crops

The labor requirements for cultivation of paddy and other crops are summarized in Table V-14. Large part of the works for farming are generally operated by the family labors except for transplanting and harvest of paddy. Seasonal labors required are mainly supplied from small holder farmers in the project area and partly come from the outside. The labor wages by "ani-ani" are usually paid in kind, one-sixth of the harvest stalk paddy in common. The wages for land preparation, transplanting, weeding, etc. is commonly paid in cash in the project area.

2.6 Livestock

Various kinds of livestock are raised in the project area. They are cattle, buffalo, goat, sheep, pig, chicken and duck, as shown in Table V-15. Cattle and buffalo are playing an important role for the land preparation for farming and to some extent for the transportation purpose as well as for meat. The number of cattle and buffalo counts about 13,500 heads in total corresponding to about 0.6 head/ha of the cultivated land (sawah & tegal) in the project area, which is still insufficient to plow the land within the limited period of land preparation. The other livestock such as goat, sheep, pig, chicken and duck raised in the project area are mainly for home consumption and to some extent in local market. Chicken and duck has increased remarkably in the project area.

Table V-16 shows the number of slaughter of livestock and egg production of chicken and duck. The number of slaughter was extremely small particularly in the case of cattle as compared with the present number of cattle. It seems that the certain numbers die of desease and some are sold to other areas.

3. AGRICULTURAL DEVELOPMENT PLAN

3.1 Basic Concept for Agricultural Development

The production of food stuff in Indonesia is still insufficient for the domestic demands, particularly in South Sumatra Province, though the production of rice in Indonesia is expected to catch up with its demand in the near future. The specific objective of the agricultural development is to achieve self-sufficiency in staple foods. Along this line the following basic concept is taken into account for the agricultural development.

(1) Increase in production of staple food crops by introducing the improved irrigation farming as well as high yield varieties.

(2) Stabilization of crop yield and production through improvement of irrigation and drainage facilities and expansion of farm land.

(3) Development of new farm lands for smooth implementation of transmigration program.

(4) Levelling up of living standard and more equitable distribution of welfare of the people.

3.2 Proposed Land Use

The irrigation development area is selected based on the land suitability in the project area of about 51,000 ha of which the net irrigable area would be about 36,700 ha. The net irrigable area will mainly be developed for double cropping of paddy and polowijo. The remaining areas are mainly used for perennial crops, village yard, canal, roads, forest reserves and alang-alang lands. Table V-17 shows the future land use by three farm development types.

3.3 Proposed Cropping Pattern

Paddy is taken up as a main crop in the project area. Cropping patterns in the project area are studied taking into account the climate, soil characteristics, topography, availability of water, drainage, agronomic characteristics on crops, availability of labor forces, farmers' desire and the national policy. Among these, the climate paticularly sunshine duration provides the most important factor for determining

the optimum cropping pattern for increasing of yield of rice. Fig. V-10 and Fig. V-11 show the proposed cropping patterns which are considered to be most beneficial for the farmers, and Fig. V-12 through Fig. V-15 show the alternative proposed cropping patterns in view of crop diversification and water saving.

In order to maximize the potential productivity and profitability of crops of the proposed cropping pattern, high yield and more tasty varieties are to be introduced as much as possible. The following cropping pattern Type I and II are used for calculation of water requirement. Those proposed cropping patterns are mainly introduced into the following respective areas:

(i) Cropping Pattern Type-I: Flat lowland area located at upper reach of the irrigation system proposed where farmers settled in very early stage, more than 20 years and their farm holding size is approximately 1.0 ha on an average.

(ii) Cropping Pattern Type-II: Flat to gently sloping lands located at relatively lower reach of the irrigation system proposed and the south of the Pisang river where the farmers settled recently and their farm holding size within the project area will be about 1.5 ha on an average.

The comparison of periods of transplanting and/or sowing and harvesting of crops in each proposed pattern is tabulated as follows:

Type	Crops	Transplanting period	Harvesting period
I	Rainy season paddy	Early Dec.-Mid. Jan.	Mid. Mar.-Late Apr.
	Dry season paddy	Late Apr.-Early Jun.	Late Jul.-Mid. Sep.
	Polovijo	Mid Aug.-Early Sep.	Mid. Nov.-Early Dec.
II	Rainy season paddy	Early Dec.-End Jan.	Mid. Mar.-Early May
	Dry season paddy	Late Apr.-Early Jun.	Late Jul.-Early Sep.
	Polovijo	Early Jun.-Early Jul.	Mid. Sep.-Mid. Oct.
I-2	Rainy season paddy	Early Dec.-Mid. Jan.	Mid. Mar.-Late Apr.
	Dry season paddy	Late Apr.-Mid. May	Late Jul.-Late Aug.
	Polovijo	Late May -Mid. Jun.	Late Aug.-Late Sep.
	Polovijo	Mid. Aug.-Early Sep.	Mid. Nov.-Early Dec.
I-3	Rainy season paddy	Early Dec.-Mid. Jan.	Mid. Mar.-Late Apr.
	Dry season paddy	Late Apr.-Late May	Late July-Late Aug.
	(Improved local variety)	Late May - Early Jun.	Late Sep.-Mid. Oct.
	Polovijo	Mid. Aug.-Early Sep.	Mid. Nov.-Early Dec.
II-2	Rainy season paddy	Early Dec.-Late Jan.	Mid. Mar.-Early May
	Dry season paddy	Late Apr.-Late May	Late Jul.-Late Aug.
	Polovijo	Late May -Mid. Jun.	Late Aug.-Late Sep.
II-3	Rainy season paddy	Early Dec.-Mid. Jan.	Mid. Mar.-Late Apr.
	(Improved local variety)	Mid. Jan.-Late Jan.	Mid. May -Late May
	Dry season paddy	Late Apr.-Early Jun.	Late Jul.-Early Sep.
	Polovijo	Late Jun.-Mid. Jul.	Late Sep.-Mid. Oct.

Cultivation of polovijo such as peanuts, soybean and maize will also be introduced after harvesting of paddy in each cropping pattern. Especially peanut and soybean are considered to be essential not only for local consumption but also for improvement of soil condition and increase of farm economy.

In case of the cropping patterns Type II, II-2 and II-3, the cultivation of perennial crops such as rubber and coffee will be introduced taking the topography of land and farmers' intention into consideration.

In addition to the above proposed cropping pattern, it is also recommended to cultivate green manure during the fallow period as large as possible for the purpose of soil conservation and of supply of feed for livestock. In order to introduce these proposed cropping patterns into the project area successfully, it is inevitable to provide strong agricultural support services such as agricultural extension, seed multiplication and its distribution, cooperatives, water users' groups, farmers training and good transportation networks.

3.4 Proposed Farming Practices

In order to attain expected higher return from the farming, the improved farming techniques should be introduced into the project area. These are use of high yielding varieties, appropriate fertilizer application, pest and disease control, agro-mechanization, proper management of irrigation water, etc.

Fig. V-17 shows the theoretical formulation of yield-maximizing rice cultivation through ideal plants. The yield of rice can be estimated by multiplying number of grains per unit area by percentage of ripened grains. The results of analysis of sample survey carried out in the project area indicate that the most important factors increasing paddy yield are to increase the number of panicles per unit area and the percentage of ripened grains. The essential points to be take for above two factors are prescribed in Fig. V-16. Fig. V-17 shows the formulation of yield-maximizing rice cultivation through ideal plants.

Referring to the above-mentioned theoretical paddy cultivation techniques, the following farming practices are proposed to be introduced into the project area after completion of the irrigation facilities.

(1) Paddy

Varieties of paddy being cultivated in the project areas at present are IR-5, IR-36, IR-38 as the high yield varieties, Pelita 1/1, Pelita 1/2 as the improved local varieties and Senggoto, Pembongkar, Kwatik as the local varieties, etc. These are cultivated under rain-fed conditions with negligible or without agricultural inputs such as fertilizers and agrochemicals. Thus, yield of paddy in the project area is comparatively lower than the yields in the Belitang Proper Area. The present yields

in the area are about 2.5 tons/ha to 3.0 tons/ha of rainy season paddy. Distribution of good quality as well as high yielding varieties of seeds from the seed center to the farmers is essential. It is recommended to grow the IR series such as IR-36 and IR-38 and the improved varieties like B-series such as Gehar. Adil. Gata, etc. from the viewpoints of plant physiology and productivity. (See Table V-22).

Table V-18 shows the cultivation criteria of irrigated paddy. The amount of seed needed is about 25 kg per hectare of paddy field. The required amount of fertilizers for nursery bed (400 m^2) for 1 ha of paddy field, is about 4.0 kg of urea and 2.0 kg of T.S.P., respectively. Prior to the seeding, the seed should be selected by a solution of 1.13 specific gravity, further be treated by using agro-chemicals such as Benlate-T or Homai to control the diseases.

Land preparation for transplanting will be started about 10 days before the transplanting in general. The recommended number of seedling per hill is to 3 to 4. An optimum planting density is about 20 - 25 hills per m^2.

With regard to the basal fertilizer application for paddy, it is better to apply fertilizers of about 50 kg of urea and 90 kg of T.S.P. per ha respectively at the time of about 5 days before transplanting. Top dressing of fertilizer will be carried out in 2 to 3 times i.e. at about 15 days after transplanting, at the initial young panicle formation stage, and further at the full heading stage if needed. The amount of fertilizer to be applied per ha is about 60 - 70 kg of urea for each dressing time.

As described in the previous section 2-3, paddy has suffered serious damage from both insects and diseases recently, of which virus diseases through vectors are particularly serious in Indonesia as same as South East Asia. (See Table V-19). Insect and disease control for paddy cultivation has to be carried out at the proper time without delay. Recommendable agro-chemicals for insects are Sumithian, Diazinon, etc. and for disease control, Kasumin,Kitazin, etc. The rats damage is very serious. Rodenticides like Zinkphosphate are to be applied at the rate of about 0.2 kg per ha.

Weed control in the paddy field is to be carried out about 2 or 3 times according to the conditions of weed growth. The proposed practice for weeding is to introduce the rotary weeder, which is widely used in Java island. For the weed control in the near future, careful consideration should be given to applying herbicides in the project area.

Proper water management is very essential on paddy cultivation. There are critical periods in the life of the rice plant against the lack of water, i.e. just after sowing time or transplanting time, panicle initiation stage, reduction division stage, flowering stage and most active ripening stage. Proper irrigation management is to be introduced particularly for dry season paddy cultivation.

Although harvesting paddy by sickle has been introduced recently for the high yielding varieties of paddy which are commonly of short straw. Traditional havesting at present, ani-ani system is still predominant in the project area, because of mainly local varieties such as high lodging and shattering, long groving period and uneven maturation of panicles, tall plant height, etc. In view of necessity of harvesting of the short-culmed variety within a short period as well as labor saving to be hired, the havesting by using sickle is suggested to be widely introduced after completion of the project works.

Mechanical threshing is preferable for the improved varieties of paddy rice instead of traditional hand or foot threshing. In this view point, it is proposed to use the treadle thresher being propagated in Java, which is obtainable in the local markets at the initial stage of the development. Engine-driven thresher would be introduced in the future.

(2) Other Major Crops

Standard cultivation methods for other major crops such as peanut and soybeans, are shown in Table V-20 and V-21.

3.5 Anticipated Crop Yield

3.5.1 Crop Yield

Table V-23 shows the potential paddy yield for both the rainy and dry season paddies at various experimental stations in Java. In this

table it is observed that at every station the yield of dry season paddy is higher than rainy season paddy by about 12% on an average ranging from 3% to 28%.

Fig. V-18 shows the correlation between yield and solar radiation. It is clear that the yield of paddy is largely affected by the solar radiation owing to high photosynthesis capacity.

Fig. V-19 shows the relationship between rice grain yields and the nitrogen application (N-level) at 5 different places. This figure indicates that the more applying the quantity of nitrogen, the more yield of rice expected. Table V-24 through V-27 show the paddy yields by varieties and the date of planting experimented at the Belitang Seed Center, the effect of irrigation on paddy field and the results of sample survey on paddy fields in the Belitang Proper Area where irrigation water is available throughout the year. It can be said from these tables that the yield of paddy varies from the variety to variety and the irrigation influences substantially on its yield, particularly in the dry season.

In the farmers' level at present, the paddy yield of BIMAS program in Indonesia has attained to more than 3.6 tons/ha on an average in 1979 according to the statistics/1, and high paddy yield records are reached from 5 tons/ha to 6 tons/ha.

Judging from the above mentioned various data, the yields of 4.0 tons/ha for rainy season paddy and 4.5 tons/ha for dry season paddy can be conservatively expected under the proper irrigated conditions with proper farming practices.

As for the yields of upland crops, the target yields are estimated as shown in Table V-28 based on various data provided by the authorities concerned.

Yields of crops without project condition are considered to increase slightly from the present owing to instable rainfall distribution even in rainy season as shown in Table V-29.

/1: Source: Satuan Pengendadi BIMAS, JAKARTA, 1980
Statistik Pertanian 1976/77

3.5.2 Build-up Period of Target Yield

Discussion is made for the study on build-up period of attaining the final target of the proposed agricultural development. In this study, the following conditions are taking into consideration.

(1) Construction of technical irrigation and drainage facilities under the project.

(2) Improvement of the infrastructures in connection with the project.

(3) Further improvement of agricultural support services such as increase of PPL, equipment of extension activities materials, etc.

(4) Raising-up of farmers' techniques trained under the rural extension center

(5) Stabilization of soil and land conditions in the future after the reclamation of the project area.

Although the farmers in the project area are familiar with paddy cultivation the most of them are not so skilled for improved farming practice on fertilization, plant protection, water management, etc. It would take time to train them in this fields particularly for managing the profitable irrigation farming.

After the implementation of the project, the yield of crops would increase year after year with proper water management, adequate farm inputs supply and sufficient agricultural support services. In the case of 1 ha farm development area where the farmers are rather accustomed to intensive farming, the crop yields would reach the expected yield within five (5) years after commencement of the irrigation water. In the case of 1.5 ha farm development area where the farmers have settled recently, about seven (7) years would be required to reach its expected yeild.

Table V-30 shows the estimated yields of crops during those build-up period. The crop yields in without project are estimated based on data and information on the actual yield increase in Kab. OKU and Kecamatans concerned with the project area, etc. as shown in Table V-31.

3.6 Farm Inputs and Labor Requirement

3.6.1 Farm Inputs

Among the items constituting the crop production cost, direct farm inputs such as seed, fertilizer, agro-chemical and labor force are the foundamental items. Data and information on the farm inputs were mainly collected from the agricultural extension offices and farm economy survey carried out in Desa in the project area.

After implementation of the project, the farm inputs for improved irrigation farming will increase substantially. Table V-32 shows the amount of farm inputs needed in each crop with project condition. These requirements were estimated based on the standard input requirement of BIMAS program. The quantity of fertilizers needed will remarkably increase in both the paddy and the polowijo in order to produce those expected yields. Table V-33 shows the estimated farm inputs under without project condition. It is foreseen that most of the farming will still be operated by the traditional manner, though some dosage of fertilizers is increased gradually.

3.6.2 Labor Requirement

Family labor will be mainly used for farming throughout the year. Some temporary labours will be employed during the period of transplanting and harvesting of the paddy, especially in case of 1.5 ha farm development area. The proposed farming will be practiced basically by manual operation with small farming equipment and tools as shown below. The proposed harvesting method is one of the most practical countermeasure for saving the labor requirements.

Farm implements	Amount
Plow	1
Harrow	1
Winnower	1
Sprayer	1
Rotary weeder	3
Pedal thresher	1
Hoe	3
Sickle	5

Table V-34 shows the labor requirement for the proposed irrigation farming per ha. As the availability of family labor is estimated to be about 62 men-days per month on an average, some hired labors are required to be employed for 1.5 ha farm holding farmers during the peak time of farming as seen in Table V-35. Table V-36 shows the labor requirement under without project estimated based on the field survey in the project area.

3.7 Anticipated Crop Production

The yields and productions for crops in the project area will increase year by year under the proper irrigation and drainage improvement as well as strengthening of the agricultural support services in the project area.

Based on the proposed cropping patterns, irrigable area and target yeilds of the crops, the total crop production in with and without project in each development area is estimated as shown in Table V-37, 38 and 39. The increase of each crop production after the implementation of the project works is estimated as shown in Table V-40. The annual paddy production at the full development stage in the project area would be about 270,000 tons of dry paddy, and the incremental production would be about 218,000 tons.

The annual crop production by alternative proposed cropping patterns is shown in Table V-41, V-42, and V-43. In this table alternative proposed cropping petterns of Type I-3 and Type II-3 are omitted owing to the same patterns of Type I and Type II, respectively as seen in those proposed cropping patterns.

Table V-1 PADDY FIELD WITH IRRIGATION FACILITIES

	1973/1			1977/2			
	Indonesia	Java		South Sumatra Prov.		Kab. OKU	
	(10^3ha)	(10^3ha)	(%)	(10^3ha)	(%)	(10^3ha)	(%)
Technical	1,733	1,446	42.0	17.1	6.0	5.5	9.1
Semi-technical	947	524	15.2	17.1	6.0	5.5	9.1
Non-technical	979	544	15.8	21.0	7.4		
Rain-fed	1,664	859	24.9	76.5	27.0	26.5	43.7
Tidal, etc.	273	73	2.1	152.6	53.6	23.1	38.1
Total	5,596	3,446	100.0	284.4	100.0	60.6	100.0

Source: /1: Direktorat Irrigasi, 1973

/2: Agricultural Office in South Sumatra Province, 1978

Table V-2 DIFFERENCE OF AVERAGE PADDY YIELD BETWEEN IRRIGATED FIELD AND RAIN-FED FIELD FOR 5 YEARS

	Irrigated field (t/ha)	Rain-fed field (t/ha)	Increase rate (%)
Average Paddy yield	1.90	1.27	49
Minimum Paddy yield/1	1.46	0.80	83
Maximum Paddy yield/2	2.22	1.85	20

Source: Ecological Essay for Tropical Paddy, July 1971.

Note: Madras Province in India.

/1 : Drought year.

/2 : Rainy years.

Table V-3 TARGET OF PADDY PRODUCTION IN REPELITA III

		Unit	1979/80	1980/81	1981/82	1982/83	1983/84	Increase rate (%) (1979-1980) (time)
Indonesia.	Harvested area	(10^3ha)	8,885	9,065	9,295	9,600	9,925	1.12
	BIMAS/INMAS	(10^3ha)	5,223	5,541	5,971	6,484	7,220	1.38
	Rice yield	(ton)	2.02	2.03	2.04	2.05	2.07	1.02
	Rice production	(10^3ton)	17,940	18,442	18,995	19,688	20,574	1.15
	Rice production of BIMAS/INMAS program	(10^3ton)	12,405	13,160	14,050	15,108	16,606	1.34
South - Sumatra.	Harvested area	(10^3ha)	404	421	439	458	478	1.18
	Rice yield (ton)		1.27	1.28	1.29	1.30	1.32	1.04
	Rice production	(10^3ton)	514	540	568	597	628	1.22
Kabupaten OKU.	Harvested area	(10^3ha)	76	78	80	83	86	1.13
	Rice yield (ton)		1.80	1.81	1.83	1.84	1.87	1.05
	Rice production	(10^3ton)	136	141	147	153	160	1.18

Source: Repelita III.
South Sumatra Agricultural Office.
Kabupaten OKU Agricultural office.

Table V-4 TARGET OF POLOWIJO PRODUCTION IN REPELITA III

	Polowijo	Unit	1979/80	1983/84	Increase rate (1979-1983) (Time)
Indonesia,	Maize	(10^3ha)	2,630	3,000	1.14
		(10^3ton)	3,200	4,200	1.31
	Cassava	(10^3ha)	1,420	1,700	1.20
		(10^3ton)	13,630	17,340	1.27
	Peanuts	(10^3ha)	560	640	1.14
		(10^3ton)	460	600	1.30
	Soybeans	(10^3ha)	770	910	1.18
		(10^3ton)	630	850	1.35
South Sumatera,	Maize	(10^3ha)	69.5	79.3	1.14
		(10^3ton)	105.2	138.0	1.31
	Cassava	(10^3ha)	70.8	84.7	1.20
		(10^3ton)	863.5	1,098.3	1.27
	Peanuts	(10^3ha)	6.8	22.1	3.25
		(10^3ton)	5.8	21.3	3.67
	Soybeans	(10^3ha)	6.4	25.4	3.97
		(10^3ton)	4.6	16.3	3.54
Kab. OKU,	Maize	(10^3ha)	7.1	10.3	1.45
		(10^3ton)	5.7	9.1	1.60
	Cassava	(10^3ha)	25.7	36.4	1.42
		(10^3ton)	193.5	275.9	1.43
	Peanuts	(10^3ha)	7.6	11.5	1.51
		(10^3ton)	6.6	10.7	1.62
	Soybeans	(10^3ha)	4.3	8.1	1.88
		(10^3ton)	3.6	7.2	2.00

Source : Repelita III.
Agricultural office in South Sumatra Province.
Agricultural office in Kabupaten OKU.

Table V-5 PRESENT LAND USE IN THE SURVEY AREA AND PROJECT AREA

Land Category	1.0 ha area			1.5 ha area			Pisang area			Total area		
	I.L/1	E.L/2	Total	I.L	E.L	Total	I.L	E.L	Total	I.L	EL.	Total
Paddy field (sawah)	7,250	790	8,040	7,130	110	7,240	40	0	40	14,420	900	15,320
Upland field (tegal)	1,320	210	1,530	7,150	1,680	8,830	310	130	440	8,780	2,020	10,800
Shifting Culture (ladang)	0	0	0	2,690	270	2,960	150	40	190	2,840	310	3,150
Forest	190	140	330	7,850	2,160	10,010	3,670	380	4,050	11,710	2,680	14,390
Alang-alang	50	30	80	6,960	1,690	8,650	410	0	410	7,420	1,720	9,140
Perennial crops	300	150	480	300	30	330	230	0	230	860	180	1,040
Village	1,390	70	1,460	1,360	370	1,730	20	0	20	2,770	440	3,210
Others	890	20	910	940	0	940	0	0	0	1,830	20	1,850
Total	11,420	1,410	12,830	34,380	6,310	40,690	4,830	550	5,380	50,630	8,270	58,900

Source: This table is made on the basis of the present land use survey and data on each Desa concerned with the Project.

/1: Irrigable land

/2: Elevated land

Note: Others land includes canal, river, road, swamp, etc.

Out of about 14,420 ha of total sawah in the project area, about 270 ha of sawah is only irrigated as seen in Table V-6.

Table V-6 PADDY FIELD BY IRRIGATION CATEGORY

Category	Kecamatans concerned with the project area		The Project area	
	(ha)	(%)	(ha)	(%)
Technical	4,520	10.6	70	-
Semi - technical	1,650	3.9	200	1.4
Rain - fed	36,360	85.5	14,150	98.1
Total	42,530	100.0	14,420	100.0

Source : Kecamatans offices, 1980

Desas survey, 1980

Table V-7 CROP VARIETY, GROWING PERIOD AND YIELD OF CROPS IN THE PROJECT AREA

Crops	Variety	Growing period (Day or Month)	Yield (t/ha)/2
1) Paddy Sawah			
(High yield variety)	V.U.T.W./1	115	3.4
	IR - 36	124	3.3
	IR - 38	131	3.3
	PB - 5	132	3.0
	IR -32	132	3.4
(Improved variety)	Pelita I/2	135	3.4
	Pelita I/1	137	3.4
(Local variety)	Lampung	150	2.4
	Sri Makmur	150	2.0
	Senggoto*	155	2.1
	Musang	160	2.0
	Masuri	160	2.6
	Kwase	180	2.0
	Gundira	180	1.1
	Pembongkar*	180	2.3
	Kwatik*	184	2.4
	Dandung	200	1.5
	Ketan Tahun	240	1.0

- continued -

Source: Kecamatan Agricultural Offices and Desa Survey in the Project area.

/1: Variety Unggul Tahan Wereng

/2: As dry stalk Paddy

*: Predominant varieties planted

Crops	Variety	Growing period (Day or Month)	Yield (t/ha)
2) Upland Paddy			
	Jalavara	120	0.9
	Gebrot	120	0.9
	Gundil	120	1.8
	PB - 5	140	1.5
	Campung	150	1.5
	Cartuna	150	1.5
	Semeter	150	1.0
	Sikuning	155	1.2
	Sarirendah	150	1.1
	Dayang Rindu	160	1.6
	Seberiti	180	2.0
	Padi Bulu*	180	1.5
	Bujang pandang	180	1.1
	Genjah	180	1.2
	Bringkil	180	2.0
	Serlak	200	1.5
	Moyong rindu	210	1.1
3) Maize			
	Keretek	90	1.4
	Metro*	95	1.0
	Kodok*	105	1.0
	DMR - 5	105	1.2
	Harapan	117	1.5
	Intang	120	1.2

- continued -

Source: Kecamatan Agricultural Offices and Desa Survey in the Project area

*: Predominant varieties planted

Crops	Variety	Growing period (Day or Month)	Yield (t/ha)
4) Cassava			
	Pokarso	6	7.0
	Marini	6	8.0
	Tahun	6	5.0
	Ginjah	6	6.0
	Mantingan	7	10.0
	Marsam	7	4.0
	S.P.P.*	8	7.0
	Martapura	8	7.0
	Mentega*	8	8.0
	Rumbong	9	10.0
	Valenca	9	8.0
	Mangi	9	8.5
	Ambon	10	10.0
	Pundesi	10	10.0
	Lambong	12	7.0
	Tahunung	12	10.0
5) Peanuts			
	Basuky	85	1.0
	Sedeng	90	0.8
	Besar	90	0.8
	Banteng	100	1.1
	Gajah*	100	1.0
	Kidang	105	1.1
	Macan*	105	0.6
6) Soybeans			
	Dauros*	85	0.6
	Orba	85	0.8
	Shahti*	85	0.7
	Habal	100	1.2

Source: Kecamatan Agricultural offices and Desa survey in the project area.
*: Predominant varieties planted

Table V-8 BIMAS AND INMAS PROGRAM AREA IN THE PROJECT AREA

	Total Sawah	BISMAS area (1978/79)		INMAS area (1978/79)		Total Program area		
		R.S.P/2 (ha)	D.S.P/3 (ha)	R.S.P (ha)	D.S.P (ha)	R.S.P (ha)	D.S.P (ha)	(%)/1
1 ha area	7,250	360	20	510	10	870	30	12.4
1.5 ha area	7,130	640	40	1,090	30	1,730	70	25.2
Pisang area	40	5	-	5	-	10		25.0
Total	14,420	1,005	60	1,605	40	2,610	100	18.8

Source: Kecamatan offices, 1980
This table is estimated on the basis of the data from Kecamatan offices concerned with the project.

/1: This means % to the total Sawah in each area

/2: Rainy season paddy

/3: Dry season paddy

Note: According to the farm economy survey, certain rain-fed areas are included under BIMAS/INMAS programs

Table V-9 RESULTS OF SAMPLE SURVEY FOR DRY SEASON PADDY IN THE PROJECT AREA

Desa	Sample Number	Variety	No. of panicles (m^2)	No. of grains per panicle	Percent of ripened grains (%)	Weight of 1,000 grains (g)	Yield /3 (ton/ha)
Trijoso /1	1	IR-36	305	58	56.9	21.6	2.1
"	2	PB-5	208	99	29.4	26.5	1.6
Wonorijo /1	3	PB-5	314	89	54.2	24.8	4.0
" /1	4	IR-36	296	56	64.3	22.7	2.5
"	5	IR-32	315	48	42.3	22.0	1.5
Sukosari /1	6	IR-36	444	59	70.2	18.9	4.0
Sidomulyo	7	IR-32	239	68	54.7	22.7	2.2
Harjo Winangun	8	IR-32	343	129	43.9	20.0	2.5
Rejo Rohaju /1	9	IR-32	283	74	45.4	22.4	2.5
Wonosari	10	Ketan haban	178	52	47.2	21.3	1.0
Sukosari	11	Gropak	207	45	55.4	28.7	1.5
Harjo Winaugun	12	Ketan Tahun	76	117	2.3	16.6	0.03
Average /2			267	75	51.3	22.9	2.3

/1: Paddy of BIMAS program field

/2: Excluding sample number 12

/3: Dry paddy

Table V-10 ESTIMATED CROP YIELD AT PRESENT

Crops	Yield (t/ha)	Remarks
Rainy Season paddy (with BIMAS)	3.0	Dry Paddy
Rainy Season paddy (without BIMAS)	2.5	Dry Paddy
Dry Season paddy (with BIMAS)	3.0	Dry Paddy
Dry Season paddy (without BIMAS)	2.5	Dry Paddy
Upland paddy	1.1	Dry Paddy
Maize	1.0	Grains
Cassava	6.0	Fresh root
Peanuts	0.8	Grains
Soybeans	0.7	Grains

Source:

1) Paddy harvested area and production, Kab. OKU Agricultural offices 1975-1980
2) Crop Yield in Kecamatans Agricultural Extension service offices.
3) Data on Farm Economy Survey in the project area.
4) Data on paddy yield checking survey in/around the project area.
5) Data on Desa Survey in the project area.
6) Data on paddy yield survey by Sub-Seksi in Belitang.

Table V-11 PRESENT CROPPING AREA /1

Unit: ha

Major crops	1.0ha area	1.5ha area	Pisang area	Project area
Rainy season paddy (BIMAS)	870	1,730	10	2,610
Rainy season paddy (non-BIMAS)	6,380	5,400	30	11,810
Dry season paddy (BIMAS)	30	70	-	100
Dry season paddy (non-BIMAS)	40	130	-	170
Upland paddy	460	3,570	90	4,120
Total	7,780	10,900	130	18,810
Maize	230	500	70	800
Cassava	580	3,070	180	3,830
Peanuts	360	960	30	1,350
Soybeans	290	200	15	505

/1: Area is estimated based on land use survey and the data provided by Desa office concerned.

Table V-12 PRESENT CROP PRODUCTION IN THE PROJECT AREA

Unit: ton

Major crops	1.0ha area	1.5ha area	Pisang area	Project area
Rainy season paddy (BIMAS)	2,610	5,190	30	7,830
Rainy season paddy (non-BIMAS)	15,950	13,500	80	29,530
Dry season paddy (BIMAS)	90	210	-	300
Dry season paddy (non-BIMAS)	100	330	-	430
Upland paddy	510	3,930	100	4,540
Total	19,260	23,160	210	42,630
Maize	230	500	70	800
Casava	3,480	18,420	1,080	22,980
Peanuts	290	770	20	1,080
Soybeans	200	140	10	350

Table V-13 AMOUNT OF FARM INPUTS AT PRESENT

	Rainy season paddy		Dry season paddy		Upland paddy	Maize	Cassava	Peanut	Soybean	Rubber	Coffee
	BIMAS	Non-BIMAS	BIMAS	Non-BIMAS							
Seed (kg/ha)	33	33	35	35	40	20	10,000/1	60	20	620/2	1,600/2
Fertilizer (kg/ha)											
Urea	48	10	38	7	10						
TSP	25	5	13	2							
Agro-chemicals (Lit./ha)											
Insecticide											
(Diazinon)	3	1	2	1	1						
Rodenticide (g/ha)											
(Zink-phosphate)	100	100	100	100							

/1: Unit; Stalk

/2: Unit: No. of Seedling

Source: 1) Data from Desa Survey and Farm Economy Survey
2) Kecamatan Agricultural Offices, 1979, 1980
3) Kab. Agricultural Office, 1979
4) South Sumatra Agricultural Office, 1979

Table V-14 PRESENT LABOR REQUIREMENT BY CROPS

Unit : Man - day/ha.

Item	Paddy			Maize	Cassava	Peanut	Soybean	Coffee	Rubber
	Rainy season	Dry season	Upland						
Nursery bed	8	8							
Land preparation	21	21	35						
Transplanting & Sowing	25	25	20	7	10	7	7		
Weeding	55	55	35	20	25	25	20	60	40
Fertilizing	3	3	2						
Protecting	2	2	2						
Harvest	45	45	30	20	30	25	20	60	40
Others	29	29	16	8	10	8	8	30	30
Total	188	188	140	55	75	65	55	150	110

Source:
1) Data from Desa survey and Farm Economy survey, 1980
2) Kecamatan Agricultural offices 1979, 1980
3) Kab. Agricultural office, 1979
4) South Sumatra Agricultural office, 1979

Table V-15 NO. OF LIVESTOCK IN THE PROJECT AREA

	1 ha Area (head)	1.5 ha Area (head)	Piasang Area (head)	Total (head)
Cattle	6,370	6,540	50	12,960
Buffalo	220	340	40	600
Goat	1,700	3,780	180	5,660
Sheep	90	180	0	270
Pig	130	1,880	0	2,010
Chicken	35,620	55,500	2,230	93,350
Duck	4,000	7,380	360	11,740

Source : 1) Data from Desas concerned with the project Area, 1980
2) Farm Economy Survey, 1980

Table V-16 LIVESTOCK PRODUCTION IN THE PROJECT AREA

	No. of Slaughter			
	1 ha Area (head)	1.5 ha Area (head)	Piasang Area (head)	Total (head)
Cattle	350	360	5	715
Buffalo	10	15	5	30
Goat	900	2,000	95	2,995
Sheep	50	90	0	140
Pig	80	1,130	0	1,210
Chicken	10,690	16,650	670	28,010
Duck	1,120	2,070	100	3,290
Egg (Pieces)				
(Chicken)	356,000	556,000	24,000	936,000
(Duck)	24,600	46,200	1,500	72,300

Source : This table is estimated from the survey on each Desa concerned with the project Area, 1980

Table V-17 FUTURE LAND USE IN THE PROJECT AREA

Unit: ha

Land Category	1.0 ha area			1.5 ha area			Pisang area			Total area		
	I.L/1	E.L/2	Total	I.L	E.L	Total	I.L	E.L	Total	I.L	E.L	Total
paddy field	8,400	790	9,190	25,400	110	25,510	2,900	0	2,900	36,700	900	37,600
Upland field	0	120	120	0	730	730	0	130	130	0	980	980
Shifting Culture	0	0	0	0	120	120	0	40	40	0	160	160
Forest	0	100	100	2,820	1,040	3,860	500	380	880	3,320	1,520	4,840
Alang-alang	20	20	40	50	680	730	70	0	70	140	700	840
Perennial Crops	10	100	110	70	0	70	230	0	230	310	100	410
Village	1,520	260	1,780	1,360	3,630	4,990	580	0	580	3,460	3,890	7,350
Others	1,470	20	1,490	4,680	0	4,680	550	0	550	6,700	20	6,720
Total	11,420	1,410	12,830	34,380	6,310	40,690	4,830	550	5,380	50,630	8,270	58,900

/1: Irrigable land

/2: Elevated land

Note: Others land includes canal, river, road, swamp, etc.

Table V-18 CULTIVATION CRITERIA OF IRRIGATED PADDY

Days	Management (Preparation of Nursery)	Amount of Implements
- 3	Seed selection	Salt solution for seed selection 10 liters of water + 2 kg of NaCl.
- 3	Seed disinfection	Benlate - T/1 (200 - 400 times, 6-12 hours) or Homai (200-400 times, 6-12 hours)
- 2	Seed soaking	36 hours
- 2	Hastening of germination	24 hours
- 1	Application of fertilizer	Urea 2.5 kg/400 m2 T.S.P. 1.5 kg/400 m2
0	Sowing	Acreage 400 m2/ha, Seed 25 kg/ 400 m2/ha
15	Control of diseases and insects damage	Diazinon 30-50 cc in 1,000 liters Of water 300-500 lit/400 m2 spraying
	Nursery period: 20-25 days (After transplanting)	
	Preparation of paddy field	
- 5	Basal manuring	Urea 50 kg/ha, TSP 90 kg/ha
0	Transplanting	Spacing 20-25 cm x 20-25 cm 3-4 seedlings per hill, 25-day-aged seedling
10	Weeding (1st)	Hand rotary weeding
13	Control of disease and insect damage (1st)	Diazinon 1 lit/ha, Kasumin 1 lit/ha
15	Application of fertilizer (1st)	Urea 60 kg/ha
30	Weeding (2nd)	Hand rotary weeding
40	Control of disease and insect damage (2nd)	Sumithion 1 lit/ha, Kasumin 1 lit/ha
60	(Panicle initiation period)	
63	Application of fertilizer (2nd)	Urea 70 kg/ha
70	(Booting period)	
73	Control of disease and insect damage	Diazinon 1 lit/ha
80	(Heading period)	
105	Harvesting	Use of sickle

Note: 1) This table compiled on the basis of the published data by Central Research Institute for Agriculture, Bogor.

2) For the introduction of new varieties, much attention should be paid to their resistance power against diseases and insects, As for new varieties, IR-36, -38 and B-series may be recommended.

/1: As to rice seedling diseases, rice blast, rice leaf spot etc.

Table V-19 VIRUS DISEASES OF PADDY AND ITS CHARACTERISTICS IN TROPICAL ASIA

King of diseases	Tungro	Penyakit Merah	Yellow Orange Leaf	Leaf Yellowing	Grassy stunt	Orange leaf	Yellow dwarf	Transitory Yellowing
1) Symptom	Decrease of number of tillers, Dwarfing, Yellowing and browning spot of leaf.	Same with the left	Same with the left	Same with the left	Increase of number of tillers, Extreme dwarfing, Yellowing of leaf, Slender leaf with vertical brown spot	Decrease of number of tillers, No clearling dwarfing, Leaf roll with orange color and blasted up	Increase of number of tillers, Extreme dwarfing, Yellowing, Leaf dropping	Decrease number of tillers, Slight dwarfing, Leaf Yellowing
2) Insect vector	Oriental green leaf hopper	Same with the left	Same with the left	Same with the left	Brown leaf hopper	Zigzag striped leaf hopper	Oriental green rice leaf hopper, Tropical green rice leaf hopper	Tropical green rice leaf hopper Green leaf Plant hopper
3) Distribution	Philippine Indonesia(?)	Malaya Indonesia(?)	Thailand Indonesia(?)	India Indonesia(?)	Ceylon India(?) Philippine Indonesia	Ceylon Philippine Thailand Indonesia(?)	Ceylon India(?) Malaya(?) Philippine Formosa Thailand Indonesia(?)	Formosa

Source: 1) Tropical Agricultural Research Series No.11. Tropical Agricultural Research Center, Japan
2) The IRRI Report 3. No.5 (1967)
3) Ecological Essay for Tropical Paddy, July 1971, Dr. Akira Tanaka, University of Hokkaido
4) (?) means that such diseases have not been identified so far.

Table V-20 CULTIVATION CRITERIA OF PEANUTS

Days	Management	Amount of Implements
	(Preparation of field)	Lime 300 kg/ha
0	Sowing	Seed 60 kg/ha, Spacing 25 x 25 cm
17	Application of fertilizer (1st)	Urea 20 kg/ha, TSP 40 kg/ha
20	Intertillage and weeding	Hoe and hand
35	Control insect damage (1st)	Spraying of Sumithion 1 lit/ha
45	Application of fertilizer (2nd)	Urea 10 kg/ha
47	Intertillage and weeding (2nd)	Hoe and hand
100	Harvesting	
105	Drying	
110	Cleaning	

Note : 1) High yielding varieties: Gajah, Banteng, Gajah Campur, Kidang, Macan.

2) This table is compiled on the basis of the published data by Central Research Institute for Agriculture, Bogor

Table V-2) CULTIVATION CRITERIA OF SOYBEANS

Days	Management	Amount of Implements
	(Preparation of field)	Lime 300 kg/ha
0	Sowing	Seed 40 kg/ha, spacing 30 x 50 cm
15	Application of fertilizer (1st)	Urea 10 kg/ha, TSP 40 kg/ha
17	Intertillage and weeding (1st)	Hoe and hand
30	Control of insect damage (1st)	Spraying of sumithion 1 lit/ha
40	Application of fertilizer (2nd)	Urea 10 kg/ha
45	Intertillage and weeding (2nd)	Hoe and hand
90	Harvesting	
95	Drying	
100	Cleaning	

Note : 1) High yielding varieties: Orba, Kucir, Mas.

2) This table is compiled on the basis of the published data by Central Research Institute for Agriculture, Bogor.

Table V-22 RECOMMENDABLE IMPROVED LOCAL VARIETY

Paddy Varieties	Parent of Cross Breeding	Place of Cross breeding	Growing Period (days)	Possible Yield (t/ha)	Remarks
Pelita I/1	Syntha X PB5	Bogor	135	6.0-7.0	
Pelita I/2	Syntha X PB5	Bogor	135	6.0-7.0	
Syntha	Bengawan X Sigadis	Bogor	145	4.0	
Gehar /1	Jerak X PB8	Bogor	140-150	4.5-5.5	Tolerant Brown Werent, Bacterial Leaf Blight, etc.
Gati /1	Short Sigadis X Basmati	Bogor	110-120	4.0-4.5	Tolerant Brown Werent and Hijan
Adil /2	Pelita I/1 X IR 1108	Bogor	130-140	5.0-6.0	Tolerant Brown Werent, etc.
Gata /1	Short Sigadis and Syntha	Bogor	115-125	5.0-5.5	Tolerant Brown Werent, Bacterial Leaf Blight, Tungro, etc.

Source : Paddy cultivation of East South Asia
Tropical Agricultural Research Center, Japan N. Yamada, Dec. 1978

/1: Taste is good

/2: Taste is not so good

Table V-23 POTENTIAL GRAIN YIELD AT VARIOUS STATIONS IN JAVA IN WET AND DRY SEASON

Location	Longitude	Latitude	Elevation	Yield /1 (ton/ha)	
				Dry Season	Wet Season
Muara	106° 45'E	6° 40'S	260 m	8.00	6.45
Mojosari	112° 30'E	7° 30'S	30	8.85	6.90
Singamerta	106° 15'E	6° 10'S	0	7.00	6.80
Genteng	114° E	8° 20'S	171	7.75	7.20
Ngale	111° 10'E	7° 20'S	55	7.15	6.50
Kuningan	108° 24'E	6° 58'S	599	7.85	7.50
Kendalpayak	112° 20'E	8° 05'S	450	8.05	7.40
Pusakanegara	107° 45'E	6° 18'S	7	7.80	7.20
Average				7.81	6.99

Source : C.R.I.A. Bogor No.30 1977.

/1: Yield in 14 % moisture content.

Table V-24 PADDY YIELD AT SEED CENTER BY VARIETY

Variety	Plot No.	Paddy yield (ton/ha)	Mean (ton/ha)
PB - 5	1	4.13	
	2	4.13	
	3	4.28	
			4.18
Pelita I/1	1	4.13	
	2	4.28	
	3	4.28	
			4.23
C4 - 63	1	3.84	
	2	3.69	
	3	3.54	
			3.69
Devi Ratih	1	4.43	
	2	4.57	
		3.54	
			4.18
T o t a l M e a n			4.27

Source : Belitang seed center, 1972

Note: Fertilizer application

N	:	P_2O_5	:	K_2O
53	:	44	:	0

Urea : 115 kg/ha

T.S.P : 95 kg/ha

Table V-25 VARIETAL TRIAL NO. 1 ON RICE

- Effect of irrigation on the yield of paddy (ton/ha)

	Belitang		
	1972	1973	
Variety	Wet Season	Dry Season	Average
PB - 5	5.7	2.8	4.3
Pelita I/1	5.1	3.2	4.2
Pelita I/2	6.7	3.0	4.9
IR - 20	5.3	3.3	4.3
IR - 22	4.5	1.8	3.2
Katek Jumadi	5.0	1.6	3.3
Putih	5.2	2.1	3.7
Sri Makmur	5.2	1.5	3.4
Pelita I/2*	6.7		6.7

* Belitang PAO

Note: Low yield of dry season paddy caused by lack of irrigation water.

Table V-26 EFFECT OF THE DATE OF PLANTING ON GROWTH AND YIELD OF PADDY AT BELITANG (1973-74)

No.	Date planted	Height (cm)	Tillers	Flowering (days)	Maturity (days)	Yield (ton/ha)	Total damages (%)	Cause of damages		
								Rats	Birds	Insects pests
1.	15.12.1973	65	15	106	138	4.8	15	5	-	10
2.	30.12.1973	58	16	102	133	5.6	5	-	-	5
3.	15. 1.1974	57	11	98	139	5.2	10	-	-	10
4.	30. 1.1974	61	14	101	134	4.4	15	15	-	-
5.	15. 2.1974	61	13	99	137	4.1	20	20	-	-
6.	2. 3.1974	70	8	94	128	2.5	50	50	-	-
7.	17. 3.1974	89	11	105	-	-	100	100	-	-
8.	1. 4.1974	98	12	104	-	-	100	100	-	-
9.	16. 4.1974	70	8	100	-	-	100	100	-	-
10.	30. 4.1974	58	16	100	-	-	100	60	30	5
11.	15. 5.1974	60	13	94	-	-	100	80	10	5
12.	30. 5.1974	68	13	105	147	1.4	80	50	20	-
13.	15. 6.1974	91	17	104	137	3.8	50	-	-	-
14.	30. 6.1974	105	19	96	138	3.6	15	15	-	-
15.	15. 7.1974	103	19	96	137	4.2	-	-	-	-
16.	30. 7.1974	117	17	101	140	4.4	-	-	-	-
17.	15. 8.1974	94	13	107	-	-	100	50	30	20
18.	30. 8.1974	69	18	106	-	-	100	50	40	10
19.	15. 9.1974	85	6	110	-	-	100	55	30	15
20.	30. 9.1974	69	9	107	-	-	100	80	20	-
21.	15.10.1974	71	17	113	-	-	100	65	20	15
22.	30.10.1974	54	20	112	-	-	100	85	-	15
23.	15.11.1974	63	30	112	-	-	100	75	10	15
24.	30.11.1974	60	15	108	-	-	100	80	-	20
Total :		17796	350	2480	1508	44.0	1560	1135	270	10
Mean :		75	15	103	137	4.0	71	60	30	5

Note : Variety = Pelita I/1
Plot size = 12 x 12 m
Fertilizer = 45 kg N + 90 kg P_2O_5 + 10 kg K_2O/ha divided in 2 times
Source : Belitang Seed Center, 1980

Table V-27 YIELD BY VARIETY IN SUFFICIENT IRRIGATION WATER AREA

Kec. Concerned	Variety	Unit yield (ton/ha) Rainy season paddy	Dry season paddy
Buay Madang	PB - 5	4.9	
	IR - 32	4.8	4.7
	Pelita I/1	4.9	
	P.U.T.W.	4.4	
	IR - 36		5.5
	P u t i h		5.3
	Pempunghar		5.8
Belitang	PB - 5	5.3	5.1
	IR - 32	4.7	
	IR - 36	5.1	5.2
	Pempunghar		5.6
	Putih		5.3
A v e r a g e		4.8	5.3

Source : Belitang Sub - Seksi office, 1978, 1979.

Note: Dry paddy.

Table V-28 TARGET YIELD FOR MAJOR CROPS

Crops	Yield	Remarks
	(t/ha)	
Rainy season paddy	4.0	Dry paddy
Dry season paddy	4.5	- ditto -
Peanuts	1.3	
Soybeans	1.3	

Source:

1. Belitang Extension Area Agricultural Development Project Annex FAO / UNDP, 1974.
2. Statistic of Agriculture in Kab. OKU in 1979.
3. Farm Economy Survey in the Project area, 1980.
4. Desas' Survey in the Project area, 1980.
5. Actual yield checking survey in the Belitang proper area and Extension area, 1980.
6. Sub. Seksi office in Belitang, 1976, 1977, 1978.
7. BPP (Agricultural Extension Service) in Kecamatans concerned with the project area, 1980.
8. Annual Report of C.R.I.A. (LP3), Bogor, 1976, 1977.
9. Report of Japan - Indonesia Joint Food Crop Research Program 1975, J.I.C.A.

Table V-29 CROP YIELD IN WITHOUT PROJECT

Crops	Yield (ton/ha)	Remarks
Rainy season paddy (with BIMAS)	3.3	Dry paddy
Rainy season paddy (without BIMAS)	2.8	Dry paddy
Dry season paddy (with BIMAS)	3.3	Dry paddy
Dry season paddy (without BIMAS)	2.8	Dry paddy
Upland paddy	1.2	Dry paddy
Maize	1.1	Grains
Cassava	7.0	Fresh roots
Peanuts	0.9	Grains
Soybeans	0.8	- ditto -

Source:

1. Belitang Extension Area Agricultural Development Project Annex FAO/UNDP, 1974
2. Statistic of Agriculture in Kab. OKU in 1970-1979
3. Farm Economy Survey in the Project Area, 1980
4. Desas' Survey in the Project Area, 1980

Table V-30 BUILD-UP PERIOD OF TARGET YIELD FOR EACH CROP IN WITH PROJECT

1.0 HA AREA

Unit : Ton/ha

Crops	1st Year	2nd Year	3rd Year	4th Year	5th Year	6th Year	7th Year
Rainy season paddy	3.1	3.5	3.7	3.9	4.0		
Dry season paddy	3.3	3.8	4.2	4.4	4.5		
Peanuts	0.9	1.0	1.1	1.2	1.3		

1.5 HA AREA

Rainy season paddy	3.1	3.4	3.5	3.7	3.8	3.9	4.0
Dry season paddy	3.1	3.4	3.7	4.0	4.3	4.4	4.5
Soybeans	0.8	0.9	1.0	1.1	1.2	1.3	1.3
Peanuts	0.9	1.0	1.1	1.2	1.3	1.3	1.3

Table V-31 BUILD-UP PERIOD OF TARGET YIELD FOR EACH CROP IN WITHOUT PROJECT

Unit : Ton/ha

Crops	1st Year	2nd Year	3rd Year	4th Year	5th Year
Rainy season paddy (With BIMAS)	3.1	3.1	3.2	3.2	3.3
Rainy season paddy (Without BIMAS)	2.6	2.6	2.7	2.7	2.8
Dry season paddy (With BIMAS)	3.1	3.1	3.2	3.2	3.3
Dry season paddy (Without BIMAS)	2.6	2.6	2.7	2.7	2.8
Upland paddy	1.1	1.1	1.1	1.1	1.2
Maize	1.0	1.0	1.0	1.0	1.1
Cassava	6.0	6.0	6.0	6.0	7.0
Peanuts	0.8	0.8	0.8	0.8	0.9
Soybeans	0.7	0.7	0.7	0.7	0.8

Table V-32 FARM INPUTS FOR CROPS IN WITH PROJECT

Item		Unit	Paddy		Peanuts	Soybeans
			Rainy Season	Dry Season		
Seeds		kg/ha	25	25	60	40
Fertilizer	(Urea)	"	180	180	20	30
	(TSP)	"	90	90	40	40
	(Lime)	"	-	-	300	300
Agro-chemicals						
Insecticides	(Diazinon)	lit/ha	2	2	-	-
	(Sumithion)	"	1	1	1	1
Fungicides	(Kasumin)	"	2	2	-	-
Rodenticides	(Zink-phosphate)	g/ha	0.2	0.2	0.1	0.1

Source:

1. South Sumatra and Kabupaten Agricultural offices.
2. Kecamatan Agricultural Extension offices.

Table V-33 FARM INPUTS FOR CROPS IN WITHOUT PROJECT

	Rainy season Paddy		Dry season Paddy		Upland Paddy	Maize	Cassava	Peanuts	Soybeans	Rubber	Coffee
	BIMAS	Non-BIMAS	BIMAS	Non-BIMAS							
Seed(kg/ha)	33	33	35	35	40	20	10,000 /1	60	20	620 /2	1,600 /2
Fertilizer(kg/ha)											
Urea	69	11	54	8	15						
TSP	25	5	13	2							
Agro-chemicals(lit/ha)											
Insecticide(Diazinon)	3	1	2	1	1						
Rodenticide(g/ha)											
(Zink-phosphate)	100	100	100	100							

/1 : Unit: Stalk
/2 : Unit: No. of seedling

Source:

1. Data from Desa Survey and Farm Economy Survey.
2. Kecamatan Agricultural Extension offices.
3. South Sumatra and Kabupaten Agricultural offices.

Table V-34 LABOR REQUIREMENT FOR CROPS IN WITH PROJECT

Unit : man-day/ha.

Item	Paddy		Peanuts	Soybeans
	Rainy Season	Dry Season		
Nursery bed	10	10		
Land preparation	40	40		
Transplanting or sowing	35	35	15	15
Weeding	40	40	35	35
Fertilizer	4	4	2	2
Protecting	4	4	1	1
Water management	5	5	2	2
Harvest	40	45	30	25
Threshing	15	15	-	-
Others	7	7	5	5
Total	200	205	90	85

Source:

1. South Sumatra and Kab. OKU Agricultural Offices.
2. Kecamatan Agricultural Extension Offices.

Table V-35 MONTHLY LABOR REQUIREMENT FOR PROPOSED CROPPING PATTERN TYPE I AND II

Unit: Men/days

(Type I Pattern)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
R.S.P/1 (1.0 ha)	44	18	30	29	4	1				3	24	47	200
D.S.P/2 (1.0 ha)			8	28	43	40	27	29	28	2			205
Peanut (0.5 ha)								4	14	10	11	6	45
Total	44	18	38	57	47	41	27	33	42	15	35	53	450
Available family labor force	62	62	62	62	62	62	62	62	62	62	62	62	744

(Type II Pattern)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
R.S.P/1 (1.5 ha)	66	27	52	32	16	3				4	36	64	300
D.S.P/2 (1.0 ha)			8	26	38	42	37	36	15	3			205
Soybean(0.25 ha)						7	7		7	1			22
Peanut (0.25 ha)						2	7	5	6	3			23
Total	66	27	60	58	54	54	51	41	28	11	36	64	550
Available family labor force	62	62	62	62	62	62	62	62	62	62	62	62	744
Shortage of labor force	-4											-2	-6

/1: Rainy season paddy

/2: Dry season paddy

Note: Available farm family labor force;

2.5 mens per household x 25 days per month = 62.5 men per month ≒ 62 men per month

In the Typical Farm Budget, same labor force for perennial crops in 1.5 ha farm holding area will be required.

Table V-36 LABOR REQUIREMENT FOR CROPS IN WITHOUT PROJECT

Unit: man-day/ha.

Item	Paddy			Maize	Cassava	Peanuts	Soybeans	Coffee	Rubber
	Rainy Season	Dry Season	Upland						
Nursery bed	8	8							
Land preparation	21	21	35						
Transplanting or sowing	25	25	20	7	10	7	7		
Weeding	55	55	35	20	25	25	20	60	40
Fertilizer	3	3	2						
Protecting	2	2	2						
Harvest	45	45	30	20	30	25	20	60	40
Others	29	29	16	8	10	8	8	30	30
Total	188	188	140	55	75	65	55	150	110

Source:

1. South Sumatra and Kab. OKU Agricultural Offices.
2. Kecamatan Agricultural Extension Offices.

Table V-37 ANNUAL CROP PRODUCTION AT THE FULL DEVELOPMENT STAGE IN 1.0 HA AREA

Major Crops	Without Project		With Project	
	Cultivated area (ha)	Annual crop production (tons)	Cultivated area (ha)	Annual crop production (tons)
Rainy season paddy (BIMAS)	870	2,870	8,400	33,600
Rainy season paddy (Non-BIMAS)	6,380	17,860		
Dry season paddy (BIMAS)	30	100	8,400	37,800
Dry season paddy (Non-BIMAS)	40	110		
Upland paddy	460	550		
Total paddy	7,780	21,490	16,800	71,400
Maize	230	250		
Cassava	580	4,060		
Peanuts	360	320	4,200	5,460
Soybeans	290	230		

Table V-38 ANNUAL CROP PRODUCTION AT THE FULL DEVELOPMENT STAGE IN 1.5 HA AREA

Major Crops	Without Project		With Project	
	Cultivated area (ha)	Annual crop production (tons)	Cultivated area (ha)	Annual crop production (tons)
Rainy season paddy (BIMAS)	2,000	6,600	25,400	101,600
Rainy season paddy (Non-BIMAS)	6,250	17,500		
Dry season paddy (BIMAS)	70	430	16,940	76,230
Dry season paddy (Non-BIMAS)	130	360		
Upland paddy	4,050	4,860		
Total paddy	12,500	29,750	42,340	177,830
Maize	570	630		
Cassava	3,480	24,360		
Peanuts	1,090	980	4,230	5,500
Soybeans	230	180	4,230	5,500

Table V-39 ANNUAL CROP PRODUCTION AT THE FULL DEVELOPMENT STAGE IN PISANG AREA

Major Crops	Without Project		With Project	
	Cultivated area (ha)	Annual crop production (tons)	Cultivated area (ha)	Annual crop production (tons)
Rainy season paddy (BIMAS)	25	80	2,900	11,600
Rainy season paddy (Non-BIMAS)	75	210		
Dry season paddy (BIMAS)			1,930	8,690
Dry season paddy (Non-BIMAS)				
Upland paddy	170	200		
Total paddy	270	490	4,830	20,290
Maize	120	130		
Cassava	320	2,240		
Peanuts	50	50	485	630
Soybeans	25	20	485	630

Table V-40 ANNUAL CROP PRODUCTION AT THE FULL DEVELOPMENT STAGE IN THE PROJECT AREA

Major Crops	Without Project		With Project	
	Cultivated area (ha)	Annual crop production (tons)	Cultivated area (ha)	Annual crop production (tons)
Rainy season paddy (BIMAS)	2,895	9,550	36,700	146,800
Rainy season paddy (Non-BIMAS)	12,705	35,570		
Dry season paddy (BIMAS)	100	530	27,270	122,720
Dry season paddy (Non-BIMAS)	170	470		
Upland paddy	4,680	5,610		
Total paddy	20,550	51,730	63,970	269,520
Maize	920	1,010		
Cassava	4,380	30,660		
Peanuts	1,500	1,350	8,915	11,590
Soybeans	545	430	4,715	6,130

Table V-41 ANNUAL CROP PRODUCTION AT THE FULL DEVELOPMENT STAGE IN 1.0 HA AREA

(Alternative Pattern Type I-2)

Major Crops	Without Project		With Project	
	Cultivated area (ha)	Annual crop production (tons)	Cultivated area (ha)	Annual crop production (tons)
Rainy season paddy (BIMAS)	870	2,870	8,400	33,600
Rainy season paddy (Non-BIMAS)	6,380	17,860		
Dry season paddy (BIMAS)	30	100	5,600	25,200
Dry season paddy (Non-BIMAS)	40	110		
Upland paddy	460	550		
Total paddy	7,780	21,490	14,000	58,800
Maize	230	250		
Cassava	580	4,060		
Peanuts	360	320	7,000	9,100
Soybeans	290	230		

Table V-42 ANNUAL CROP PRODUCTION AT THE FULL DEVELOPMENT STAGE IN 1.5 HA AREA

(Alternative pattern Type II-2)

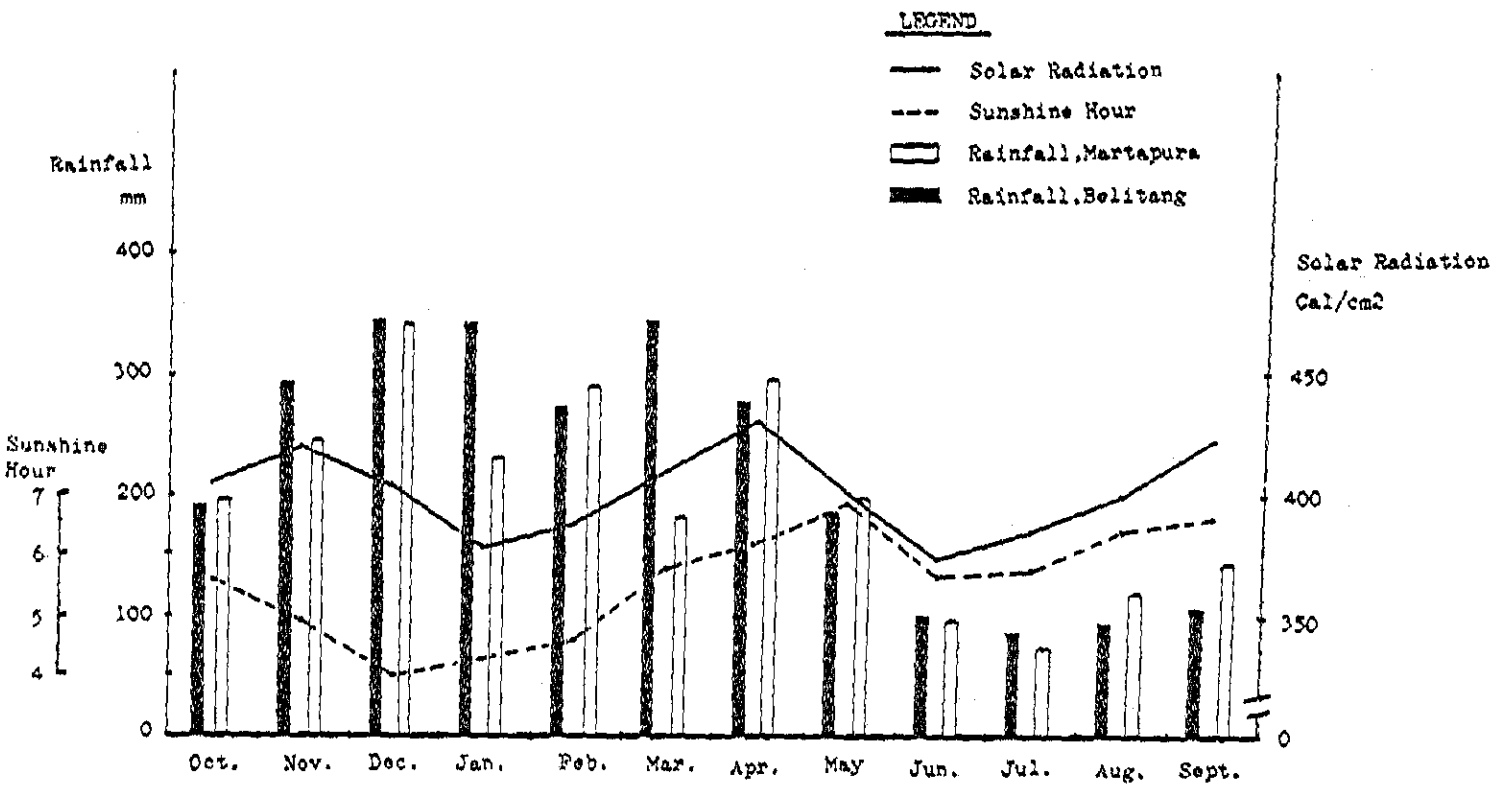
Major Crops	Without Project		With Project	
	Cultivated area (ha)	Annual crop production (tons)	Cultivated area (ha)	Annual crop production (tons)
Rainy season paddy (BIMAS)	2,000	6,600	25,400	101,600
Rainy season paddy (Non-BIMAS)	6,250	17,500		
Dry season paddy (BIMAS)	70	430	12,700	57,170
Dry season paddy (Non-BIMAS)	130	360		
Upland paddy	4,050	4,860		
Total paddy	12,500	29,750	38,100	158,770
Maize	570	630		
Cassava	3,480	24,360		
Peanuts	1,090	980	6,350	8,250
Soybeans	230	180	6,350	8,250

Table V-43 ANNUAL CROP PRODUCTION AT THE FULL DEVELOPMENT STAGE IN PISANG AREA

(Alternative Pattern Type II-2)

Major Crops	Without Project		With Project	
	Cultivated area (ha)	Annual crop production (tons)	Cultivated area (ha)	Annual crop production (tons)
Rainy season paddy (BIMAS)	25	80	2,900	11,600
Rainy season paddy (Non-BIMAS)	75	210		
Dry season paddy (BIMAS)			1,450	6,510
Dry season paddy (Non-BIMAS)				
Upland paddy	170	200		
Total paddy	270	490	4,350	18,110
Maize	120	130		
Cassava	320	2,240		
Peanuts	50	50	725	950
Soybeans	25	20	725	950

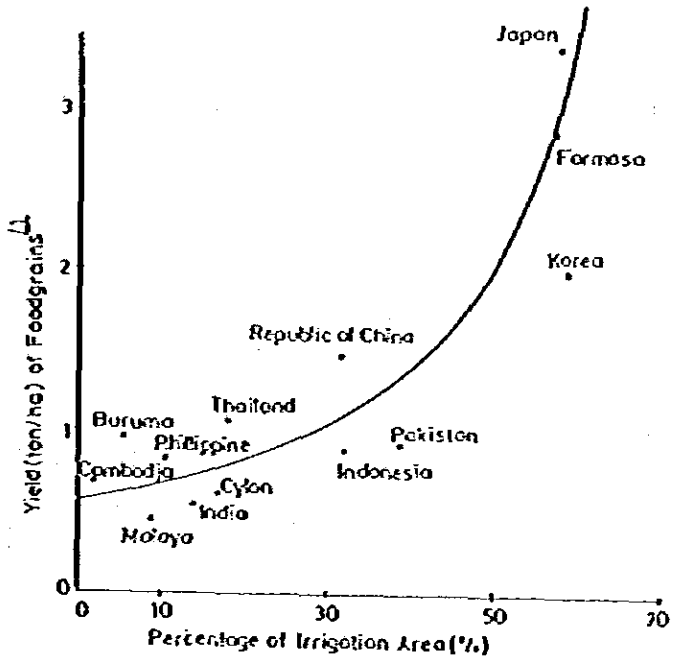
Fig.V-1 CLIMATE CONDITION IN THE PROJECT AREA



Source: P3SA,Sumatera Selatan

Note: Monthly Rainfall,Belitang(1956-1979)
Martapura(1951-1977)
Sunshine Hour,Belitang(1969-1979)
Solar Radiation,Belitang(1971-1979)

Fig.V-2 YIELD OF GRAINS AND PERCENTAGE OF IRRIGATED AREA IN ASIAN COUNTRIES



Source: Source: Ecological Essay for Tropical Paddy, July, 1971
Dr. Akira Tanaka, University of Hokkaido

/1. Paddy, wheat and maize

Fig.V-3 TREND BETWEEN RICE HARVESTED AREA AND PRODUCTION

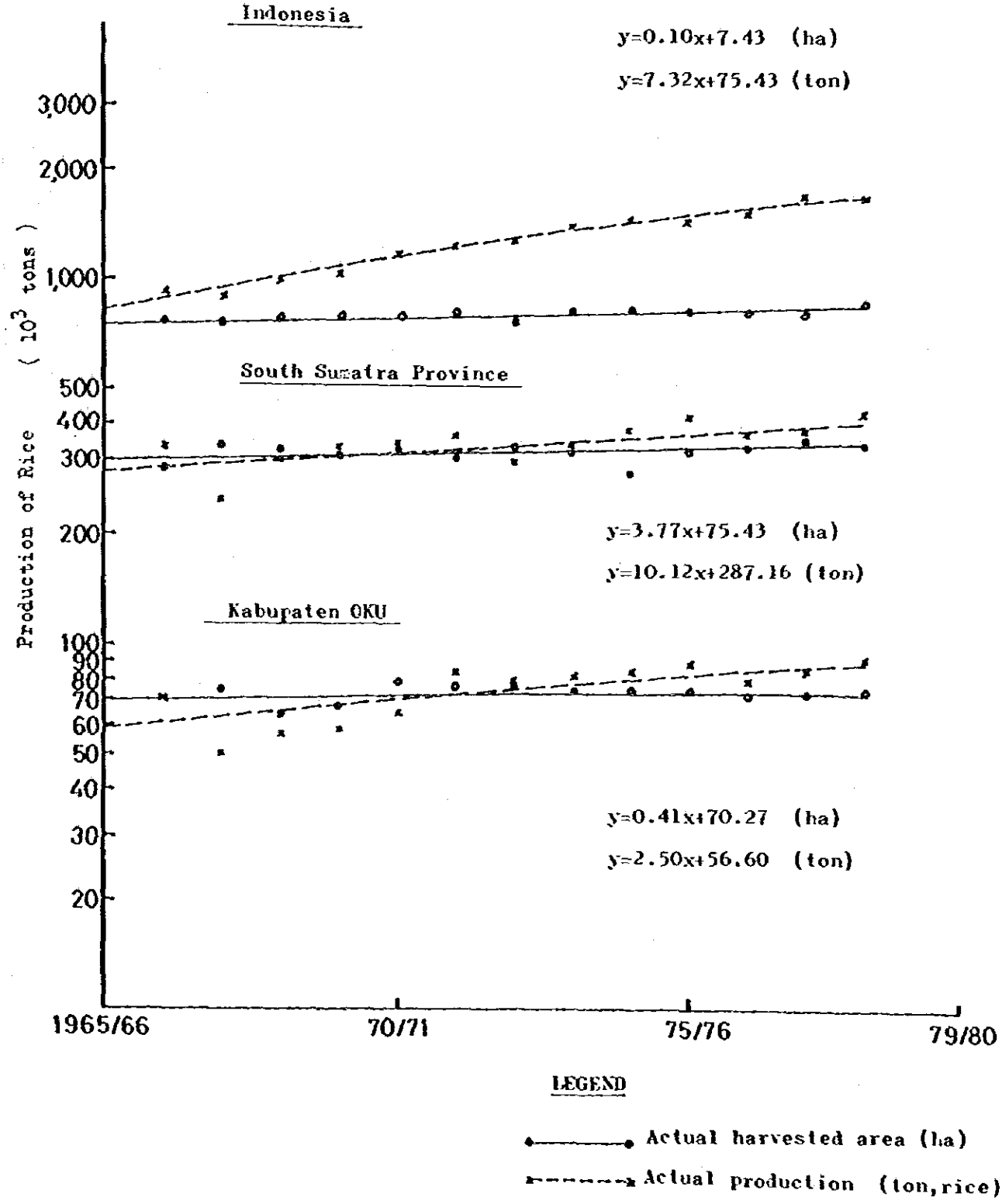
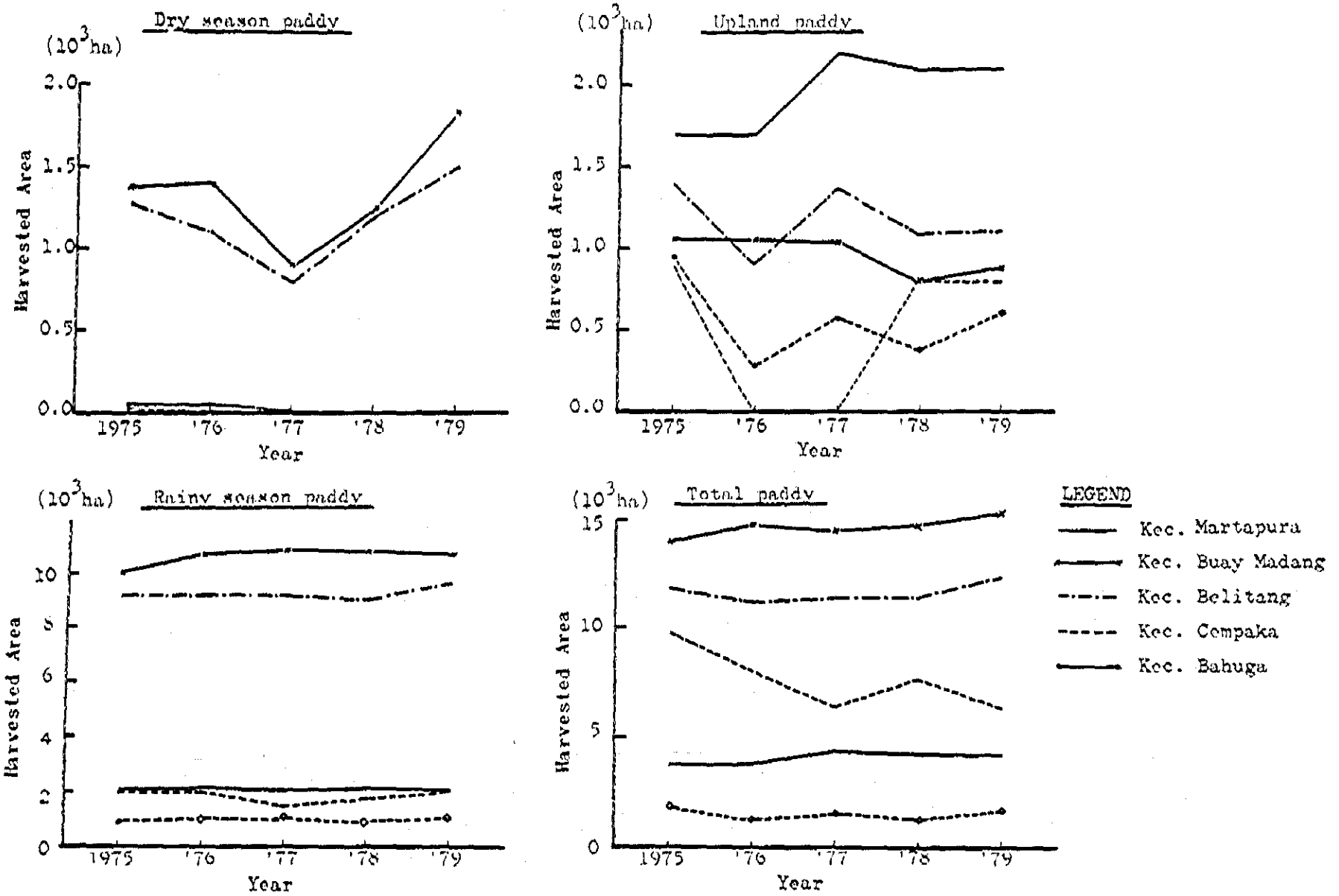
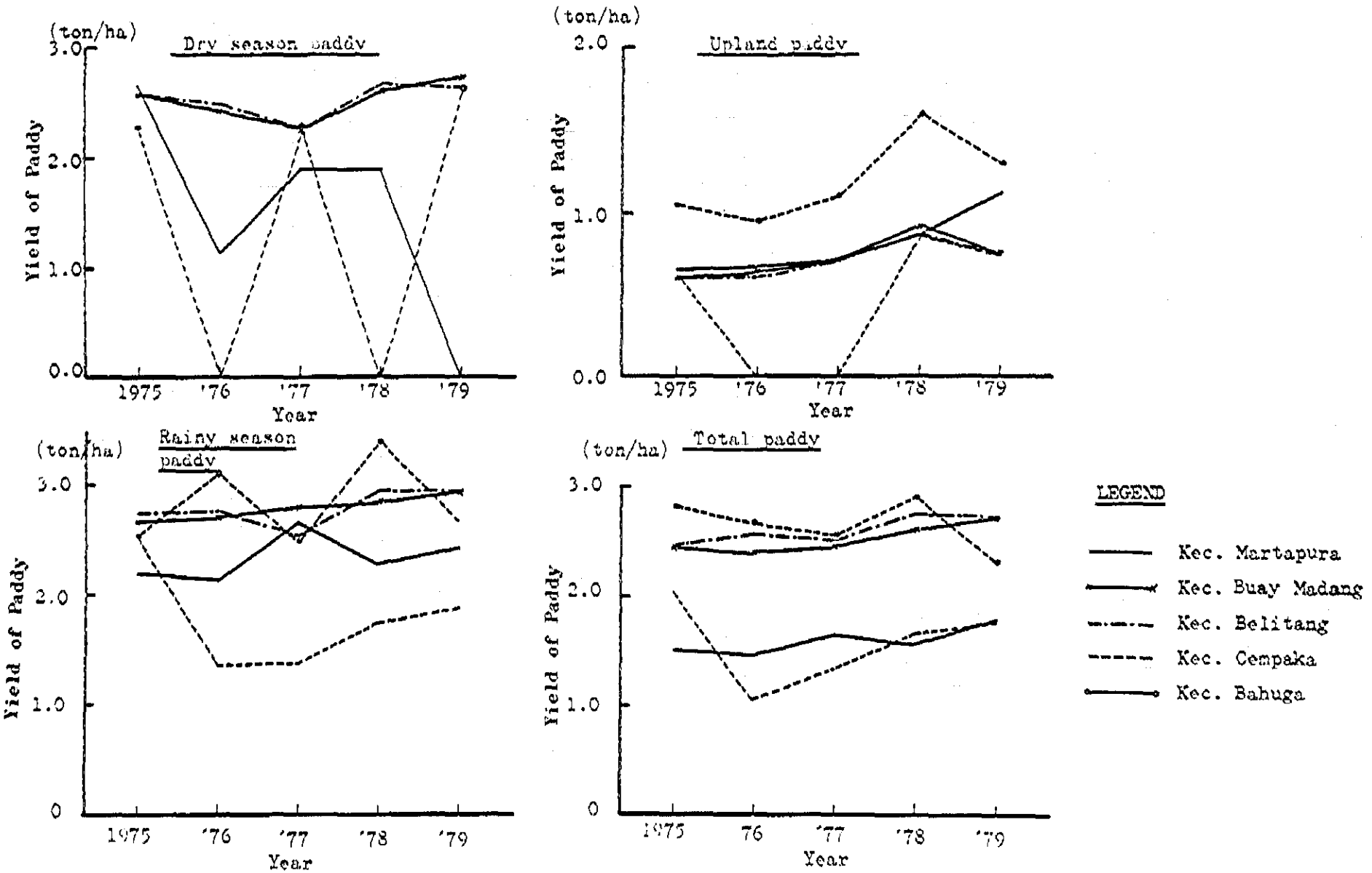


Fig.V-4 PADDY HARVESTED AREA IN EACH KECAMATAN CONCERNED



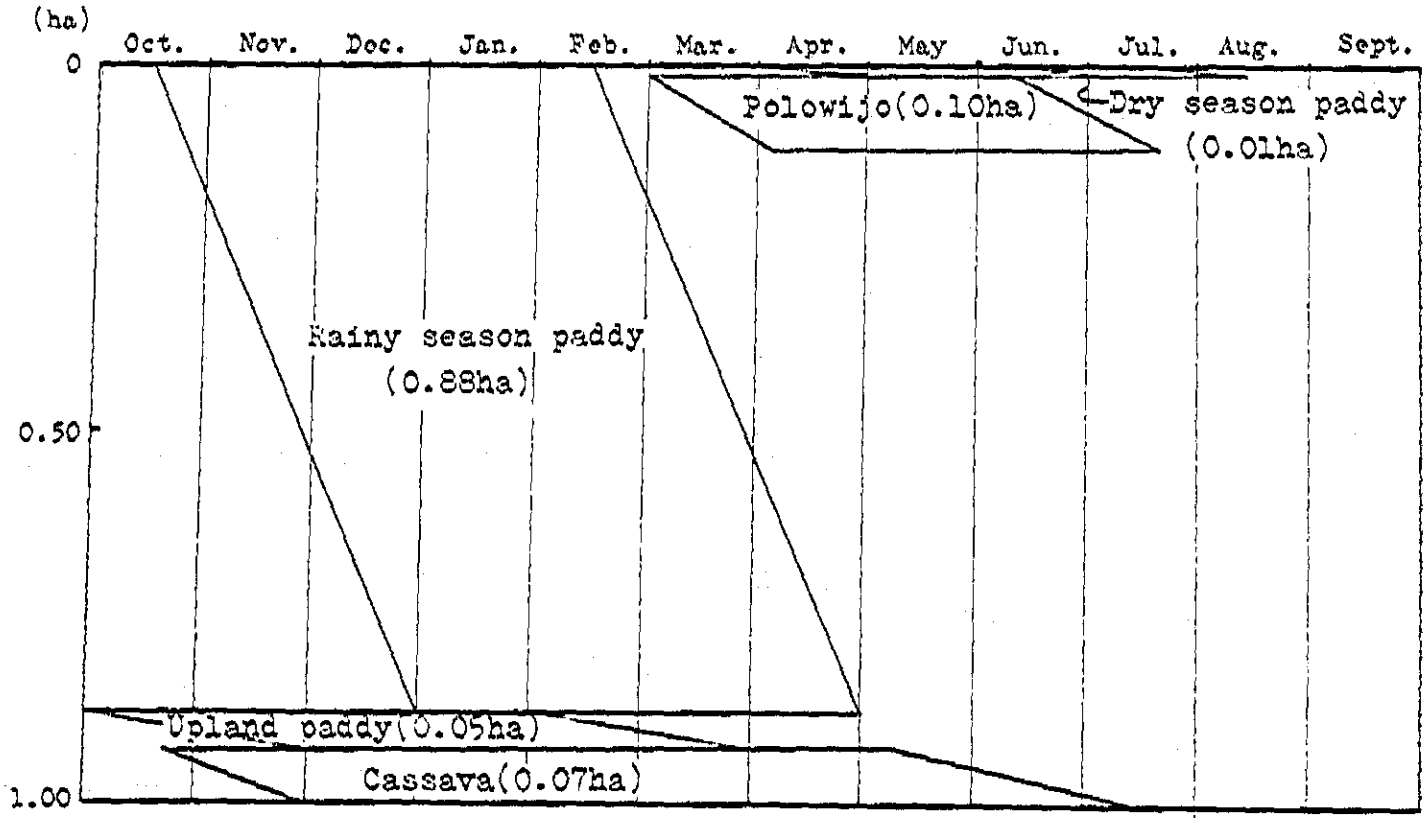
Source: Kab. OKU Agricultural Office, 1981
Each Kecamatan Office, 1980

Fig.V-5 PADDY YIELD IN EACH KECAMATAN CONCERNED



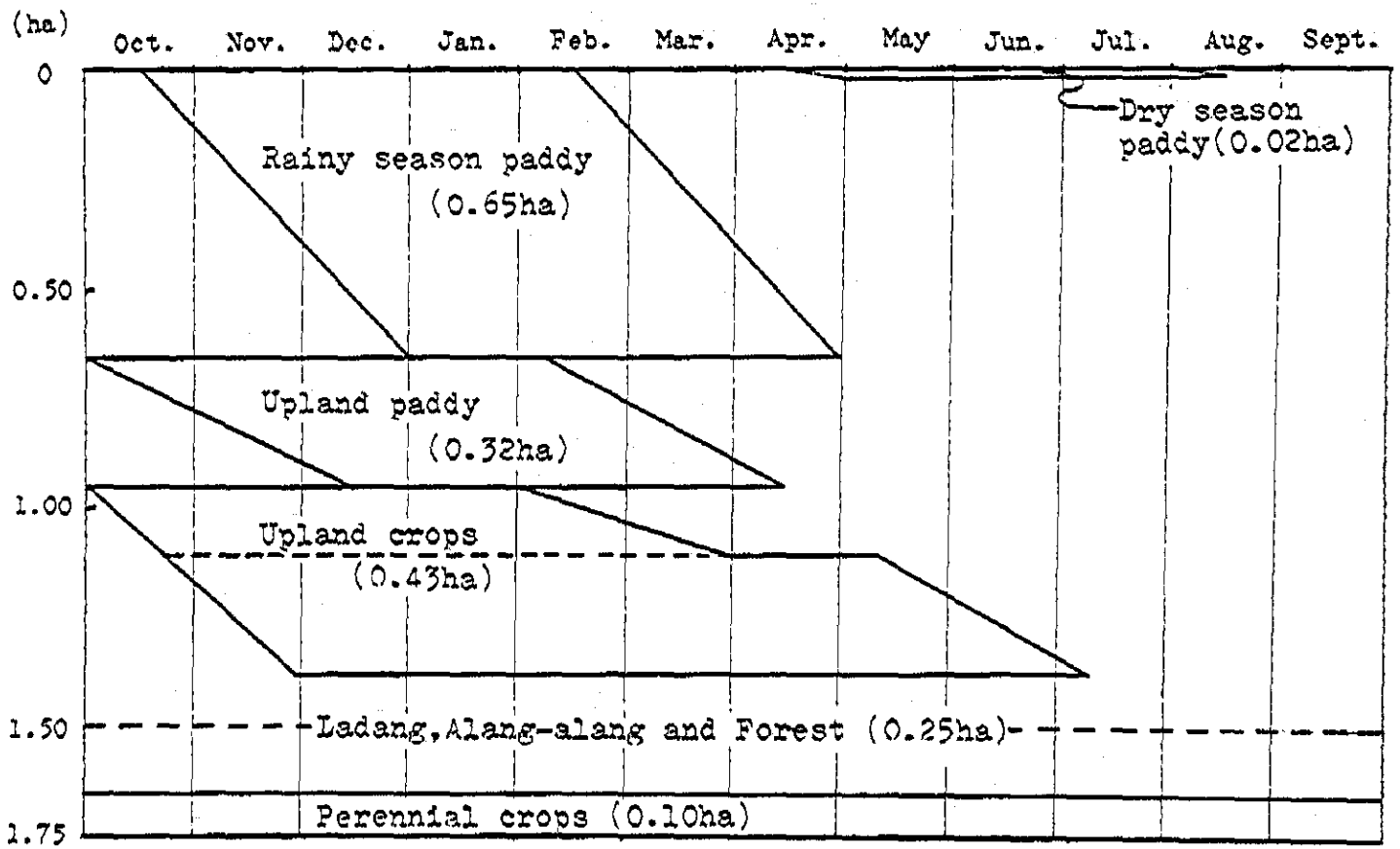
Source: Kab. OKU Agricultural Office,1980
Each Kecamatan Office,1980

Fig. V-6 PRESENT CROPPING PATTERN TYPE I (1.0ha)



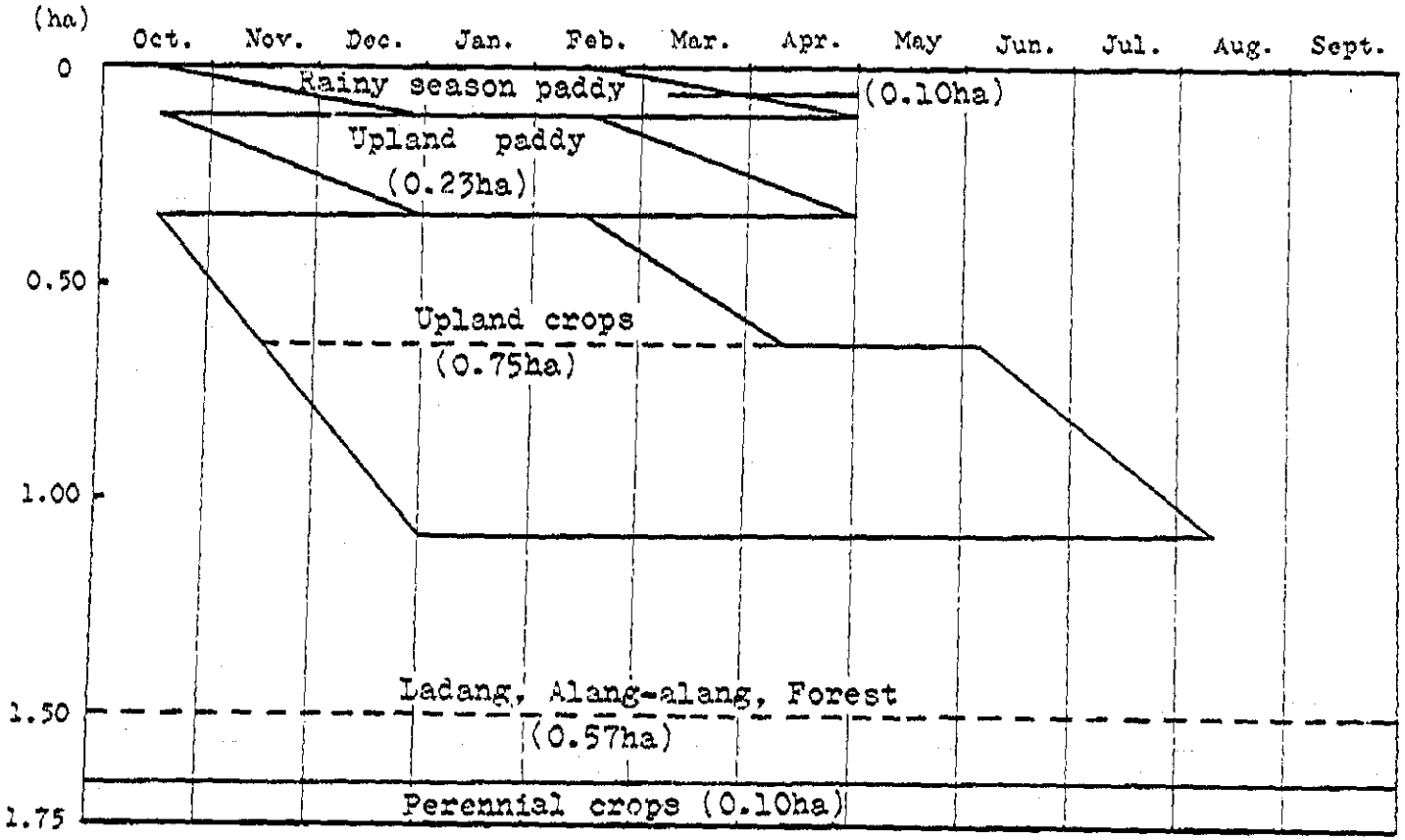
Crop Intensity: 1.11

Fig. V- 7 PRESENT CROPPING PATTERN TYPE II (1.50ha)



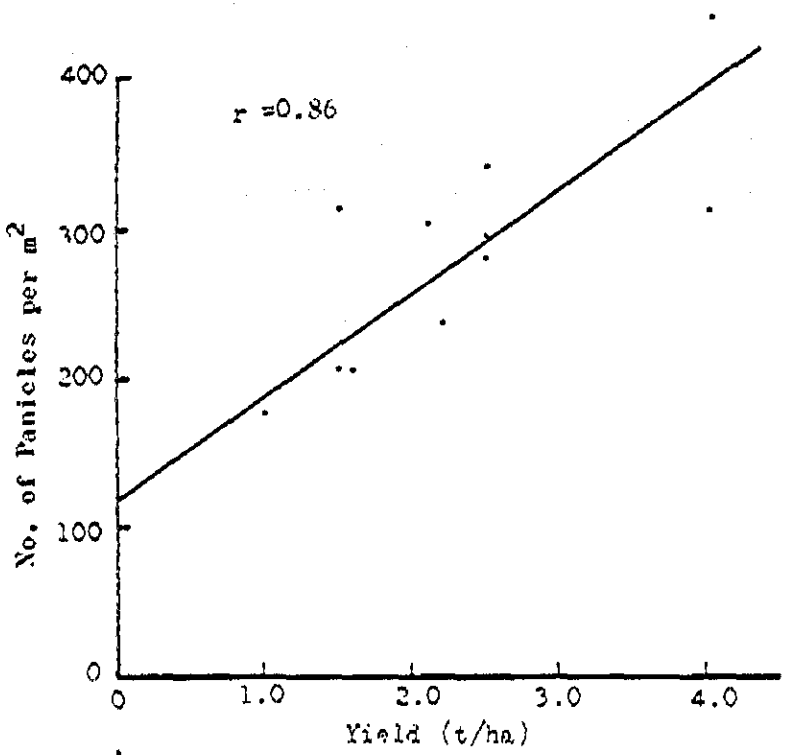
Crop Intensity: 0.95 (Except 0.10ha of Perennial crops)

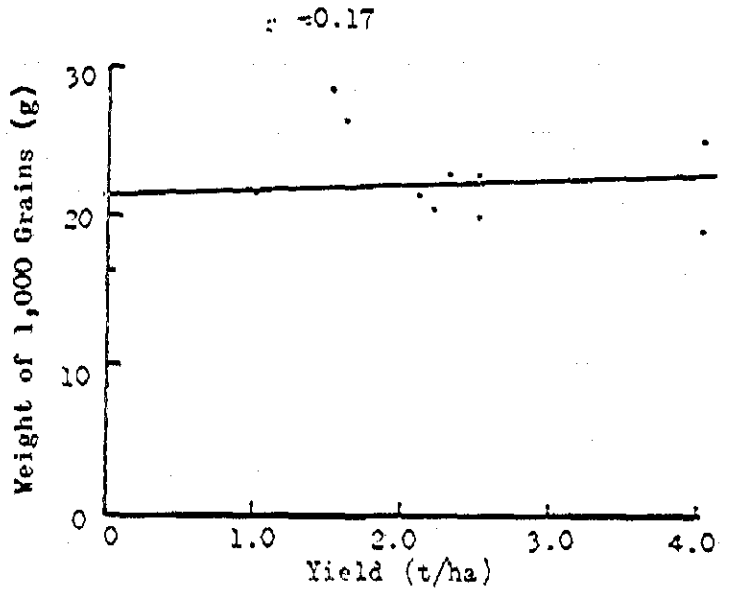
Fig. V- 8 PRESENT CROPPING PATTERN TYPE III (1.50ha)

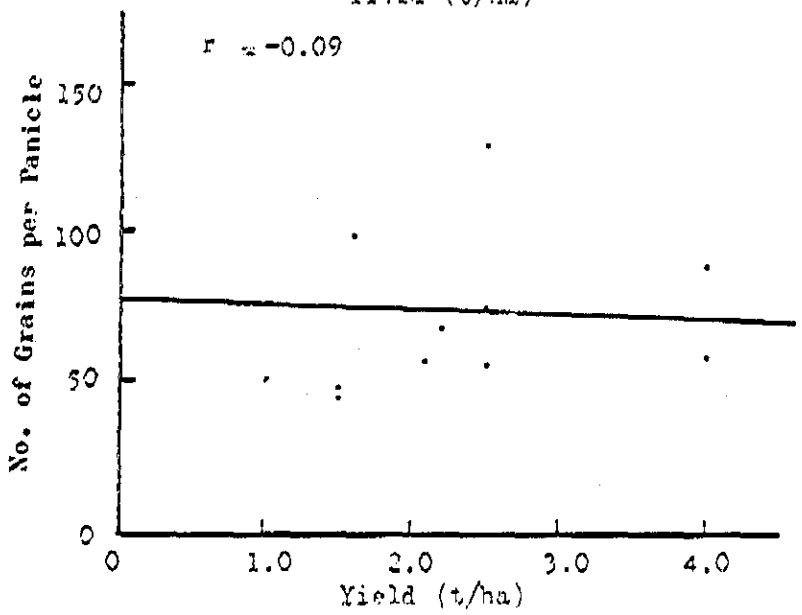


Crop Intensity: 0.72(Except 0.10ha of Perennial crops)

Fig. V-9 CORRELATION BETWEEN YIELDS AND YIELD COMPONENTS







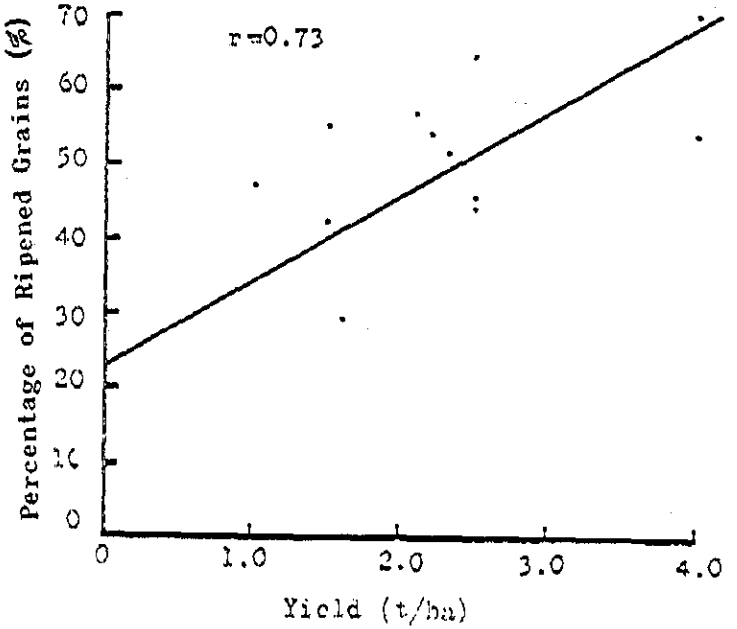
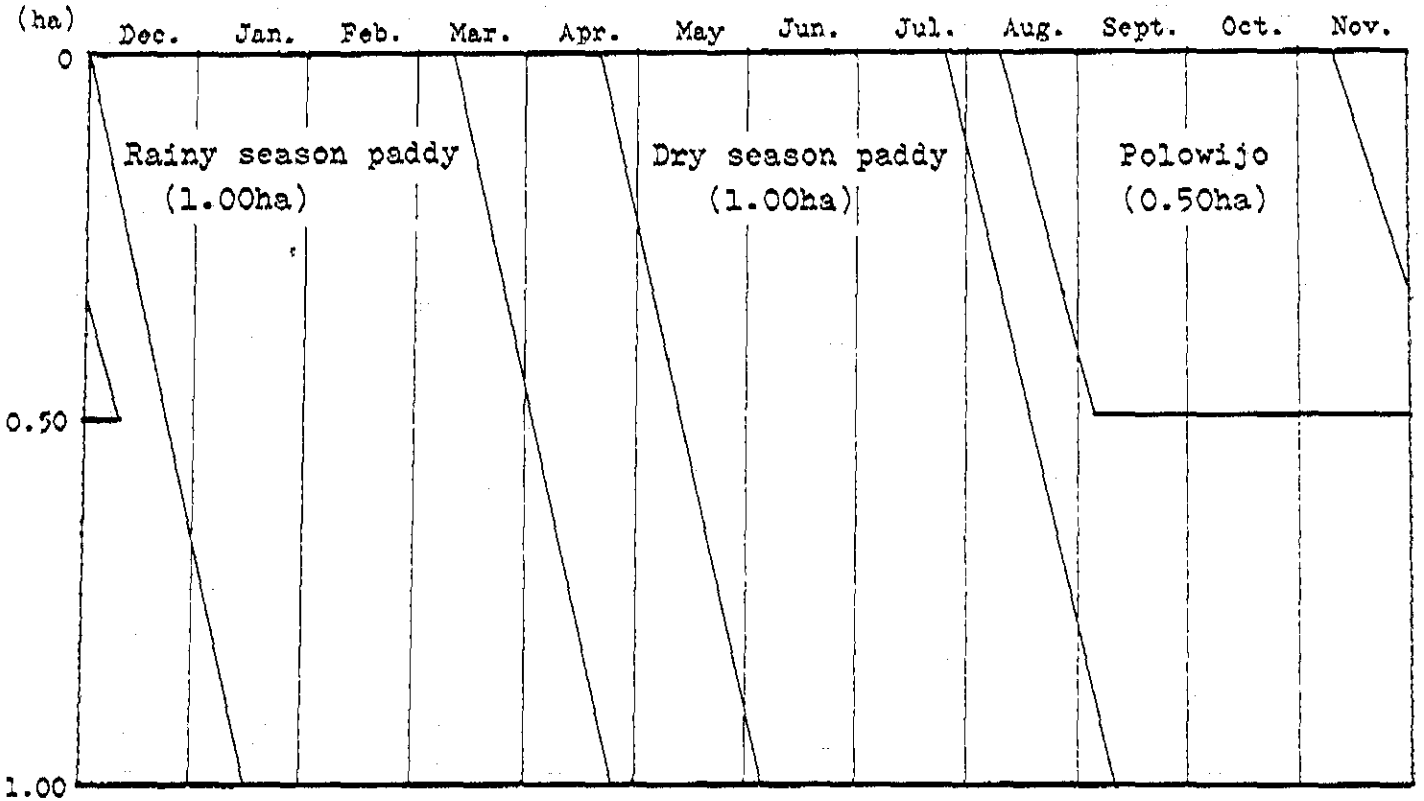
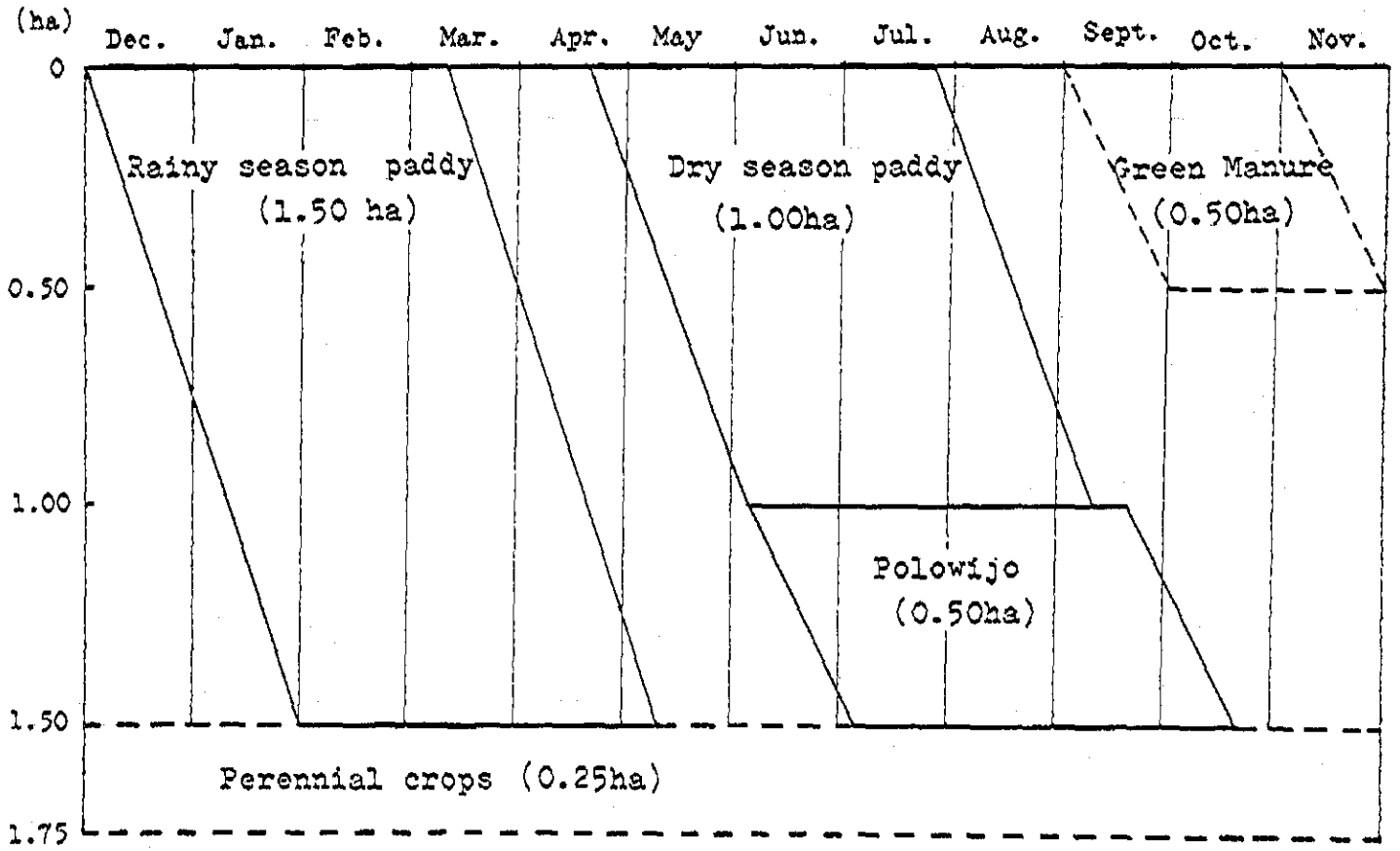


Fig. V- 10 PROPOSED CROPPING PATTERN TYPE I (1.0ha)



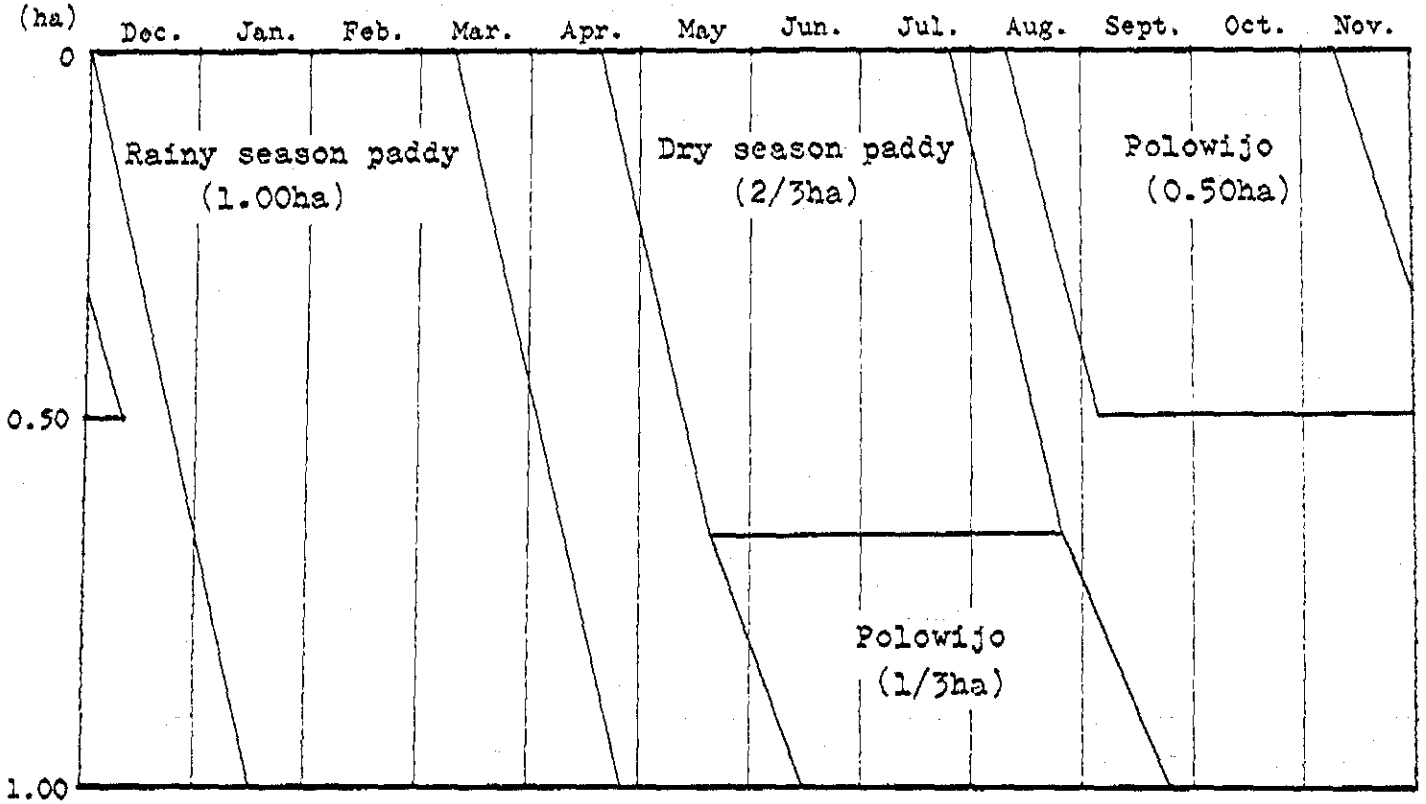
Crop Intensity: 2.50

Fig. V-11 PROPOSED CROPPING PATTERN TYPE II (1.50ha)



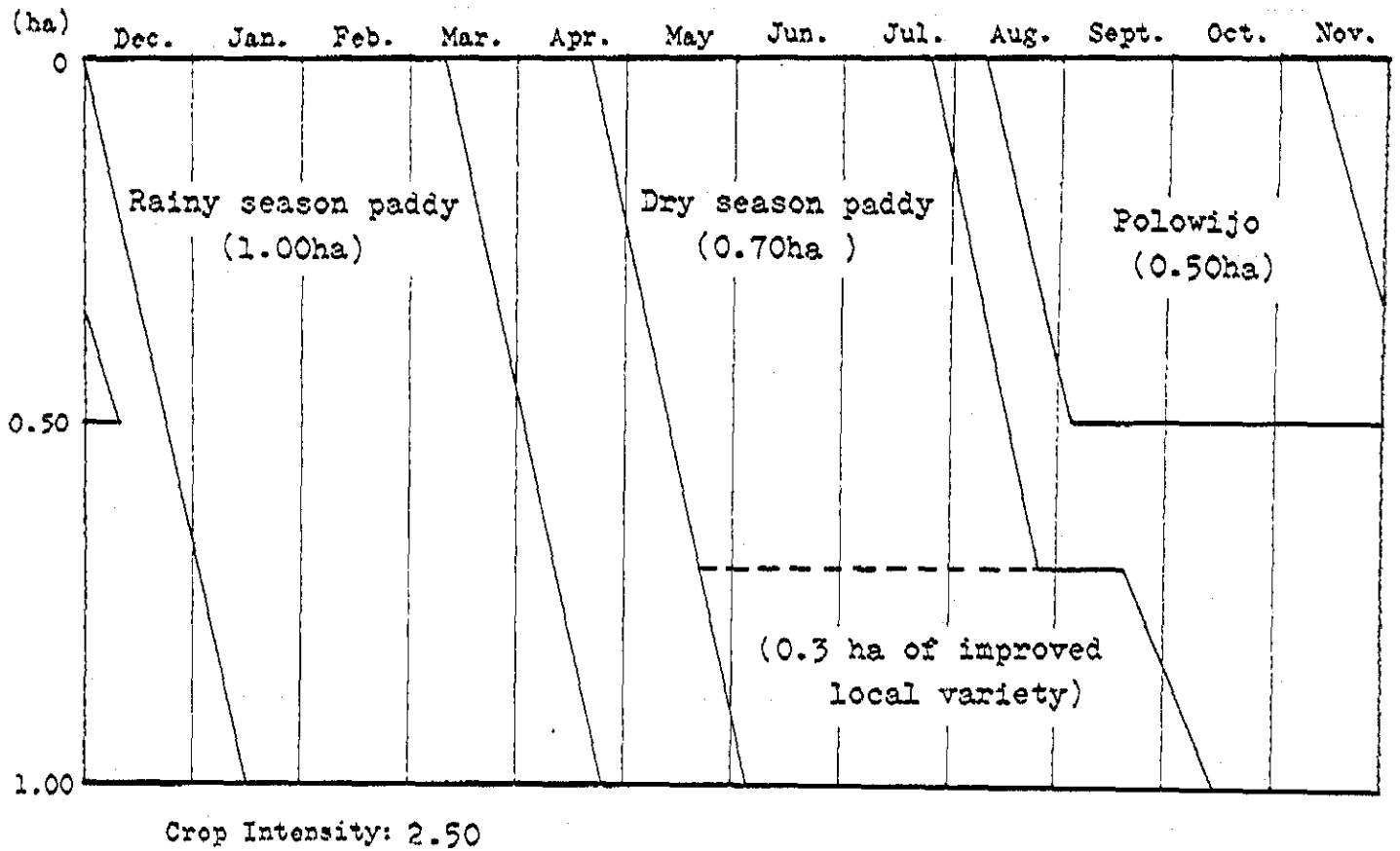
Crop Intensity: 2.00(Except 0.50ha of Green Manure and 0.25ha of Perennial crops Perennial crops are excluded from economic evaluation, because these crops are not benefited by irrigation.

Fig. V-12 PROPOSED CROPPING PATTERN TYPE I-2 (1.0ha)



Crop Intensity: 2.5

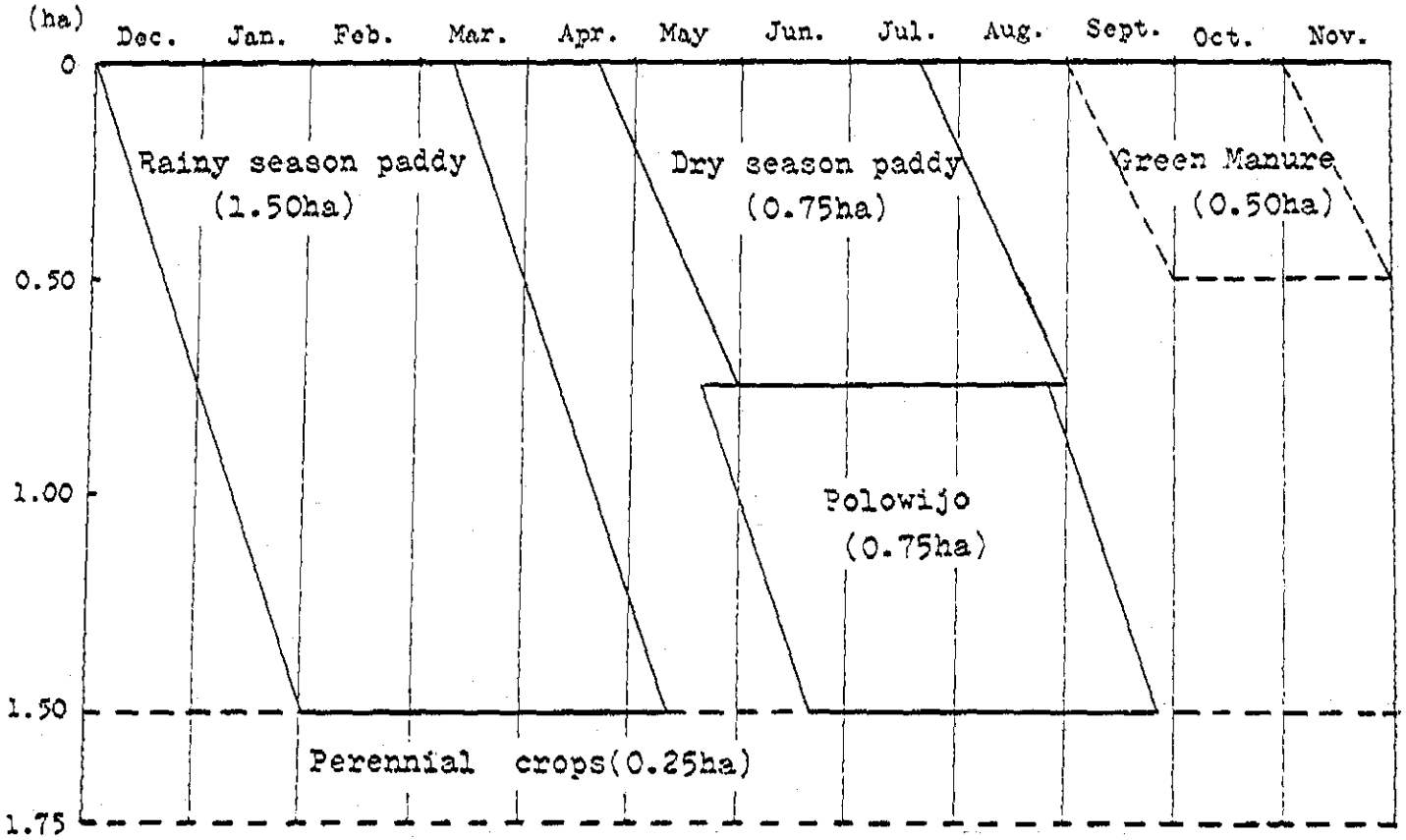
Fig. V-13 PROPOSED CROPPING PATTERN TYPE I-3 (1.0ha)



Crop Intensity: 2.50

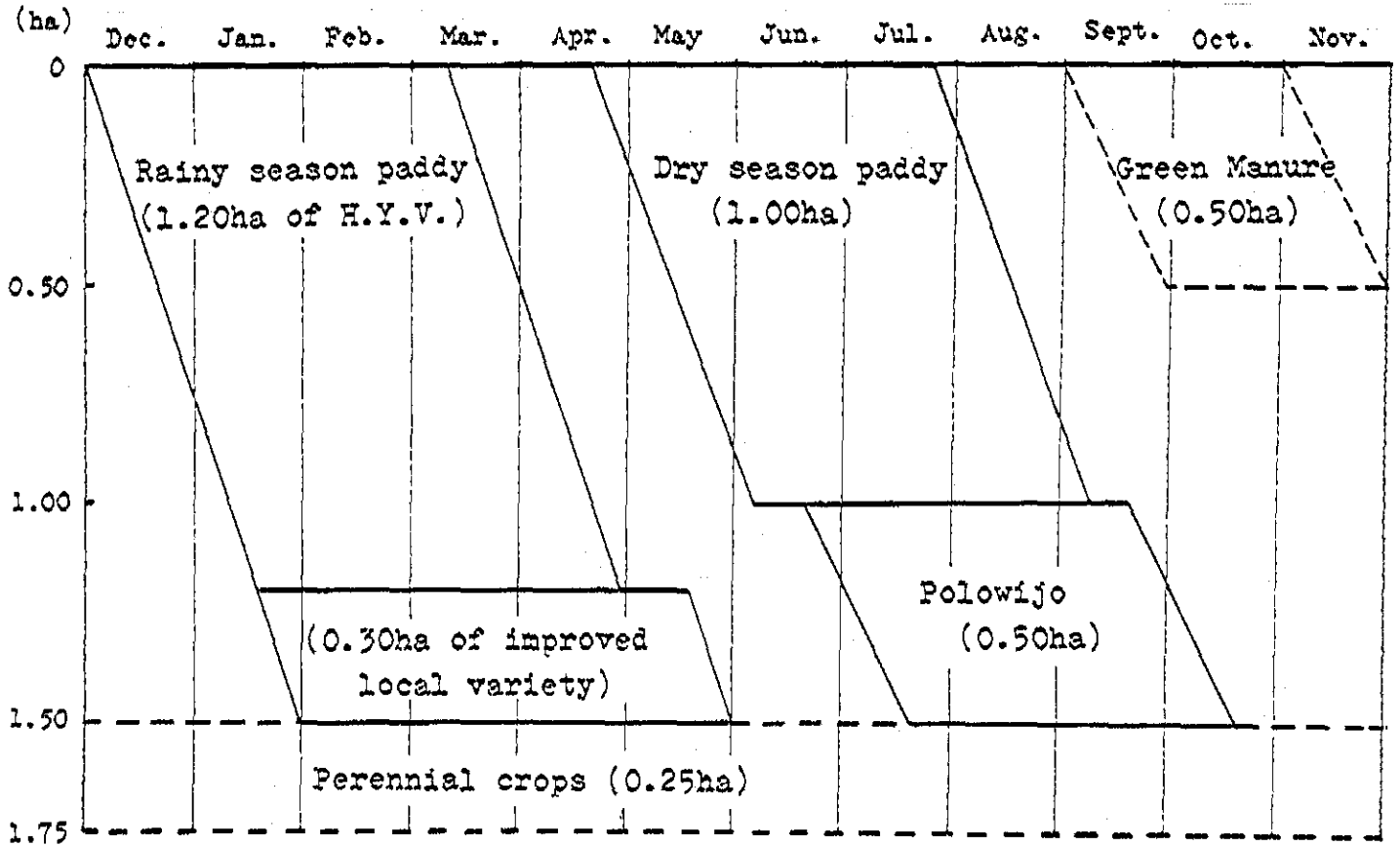
V-73

Fig. V-14 PROPOSED CROPPING PATTERN TYPE II-2 (1.50ha)



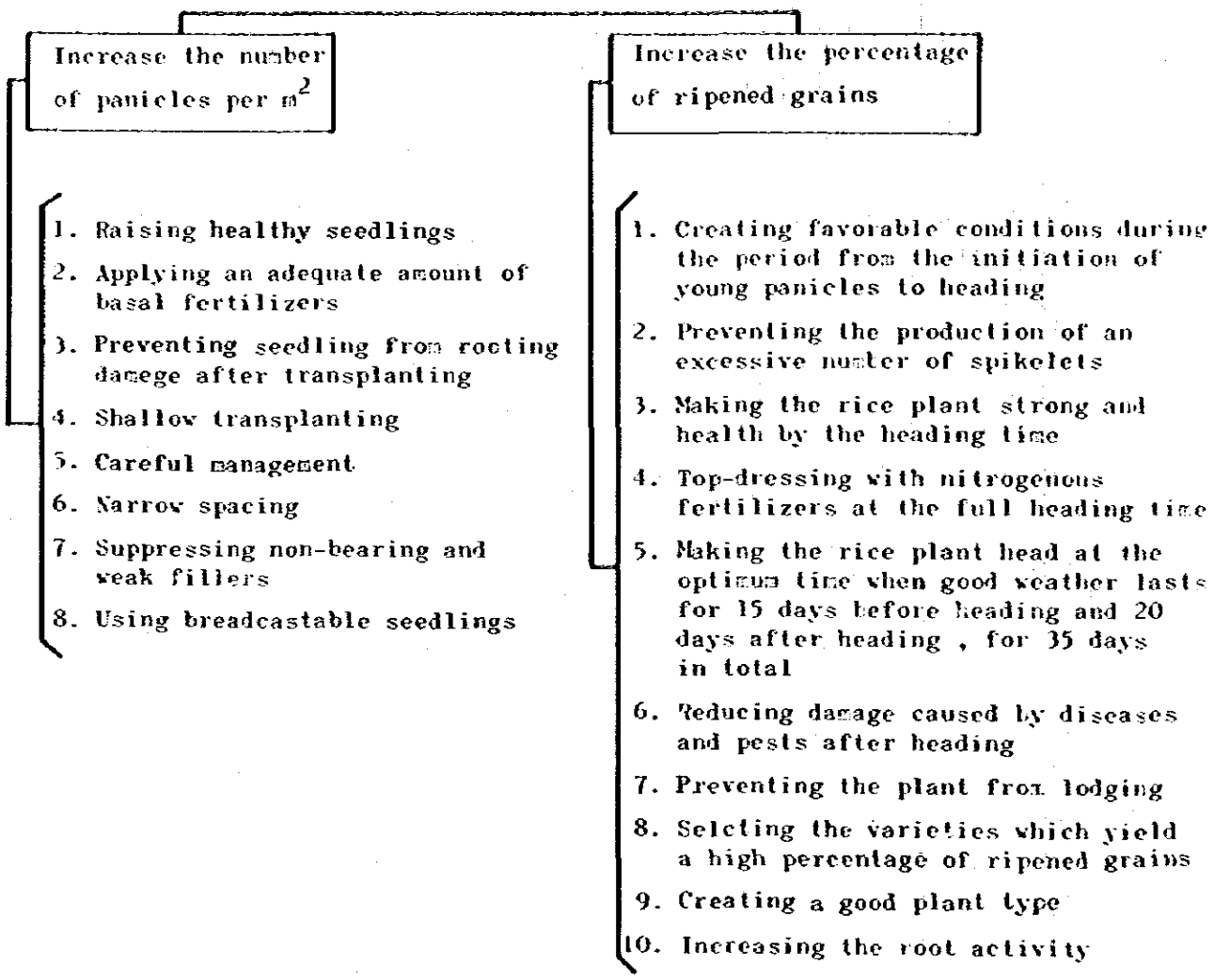
Crop Intensity: 2.00(Except 0.50ha of Green Manure and 0.25ha of Perennial crops)

Fig. V-15 PROPOSED CROPPING PATTERN TYPE II-3 (1.50ha)



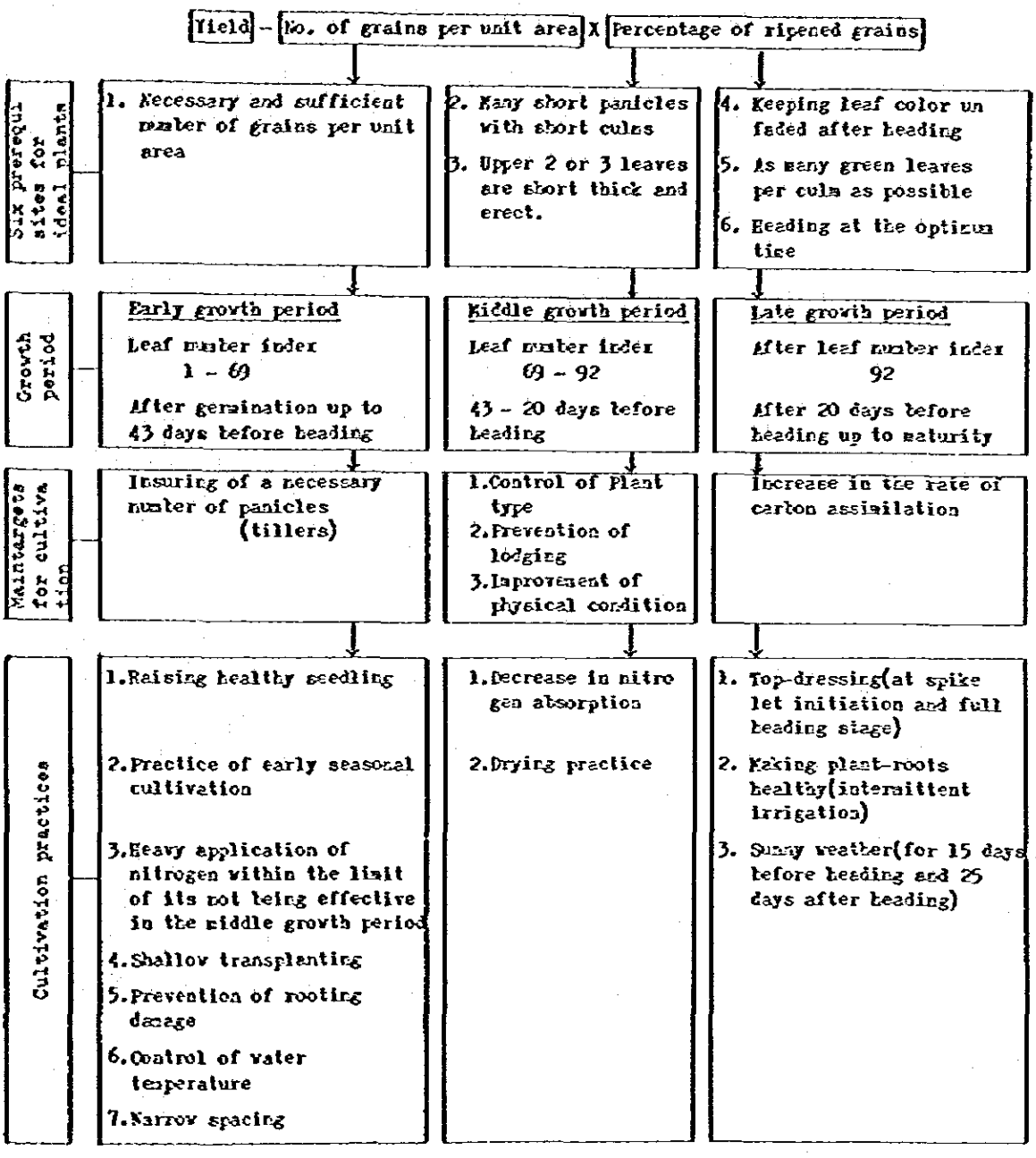
Crop Intensity: 2.00(Except 0.5ha of Green Manure and 0.25ha of Perennial crops)

Fig.V-16 PRESCRIPTION BASED ON YIELD-DIAGNOSIS FOR IMPROVING RICE CULTIVATION



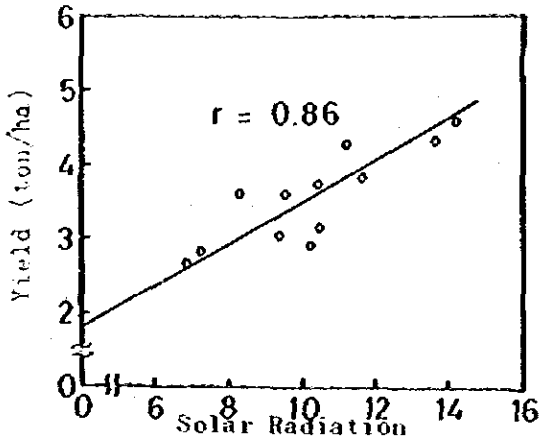
Source : Rice Cultivation for the Million , Dr.Seizo Matsushima
Japan Scientific Societies Press , Tokyo

Fig.V-17 FORMULATION OF YIELD-MAXIMIZING RICE CULTIVATION THROUGH "IDEAL PLANTS"



Source : Rice cultivation for the million, Dr. Seiro Matsushima
Japan Scientific Societies Press, Tokyo

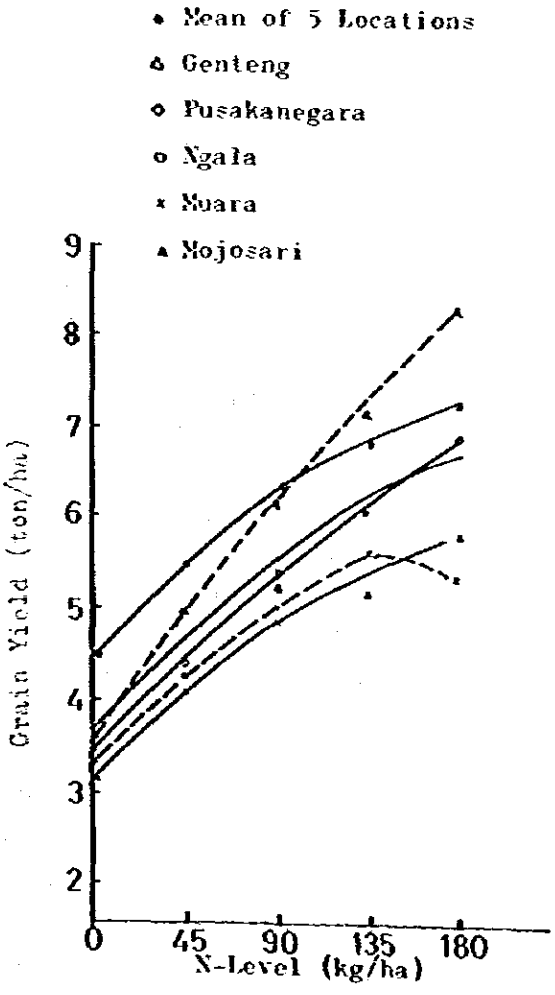
Fig.V-18 CORELATION BETWEEN YIELD AND SOLAR RADIATION



(For the last 40 days of crop cycle)

Source:
- J.C.Moomaw et al, International Rice Commission News Letter, 1967

Fig.V-19 RELATION BETWEEN RICE GRAIN YIELD AND INCREASING RATES OF NITROGEN APPLICATION AT 5 DIFFERENT LOCATION



Source:
- Report on Japan-Indonesia Joint Food Crop Research Program, JICA, 1975

ANNEX VI

AGRO-ECONOMY

ANNEX - VI

AGRO - ECONOMY

1. BACKGROUND

1.1 Land and Population

Indonesia is an agricultural country being blessed with favourable natural conditions. The total land of Indonesia is about 2 million km^2 comprising more than 14,000 islands. The country is comparatively well endowed with land resources, and abundant opportunities particularly in outer islands, exist for more extensive or intensive land use. The greater parts of the lands are, however, still covered by forest. Only about 18.5 million ha or less than 10% of the total lands are presently cultivated. About 8.8 million ha/1 or 48% of the cultivated lands are planted with paddy. The remaining area are cultivated with the upland crops such as maize, cassava, soybeans, peanuts for around 5.9 million ha and with the perennial crops such as rubber, coffee, oil palm, coconut, clove, tea, sugar cane for around 3.8 million ha.

The land of South Sumatra province amounts to about 103×10^3 km^2. About 73% of the land in the South Sumatra province are still covered by forest. The cultivated lands are about 720×10^3 ha/2 in South Sumatra province.

The land of Kabupaten OKU amounts to about $1,153 \times 10^3$ ha/3. Out of the total lands, about 175×10^3 ha, about 15%, are used for agricultural purposes at present. About 888×10^3 ha, 77%, in the Kabupaten OKU are still covered by forest and alang-alang lands.

/1: Source; Statistics of Indonesia, 1978/79

/2: Source; Statistical Yearbook of Indonesia, 1976

/3: Source Kabupaten OKU Agricultural Office, 1978

The population of Indonesia is about 147 million corresponding to about 77 persons/km^2 in 1980 according to the Central Bureau of Statistics, whereas the total population of South Sumatra Province is estimated to be about 4.6 million, 45 persons/km^2 in 1980. Table VI-1 and VI-2 show the population of Indonesia, South Sumatra Province and Kabupaten OKU in the recent 7 years. According to these tables, the population growth rate in South Sumatra Province is much higher than that in the whole Indonesia, mainly because of increasing population of transmigrants from the densely populated islands such as Java, Madura and Bali.

Table VI-3 shows the population by age groups in South Sumatra Province and Kabupaten OKU. About 43% of the total population in Kabupaten OKU is in the age group of 15 to 49, which are expected to be effective agricultural labor force.

Table VI-4 shows the population of economic activity in South Sumatra Province and Kabupaten OKU. The proportion of working population in agriculture sector is as high as about 70% in South Sumatra Province and about 87% in Kabupaten OKU respectively.

1.2 National and Regional Economies

Table VI-5 shows the Gross Domestic Product (GDP) in 1978 in both the whole Indonesia and South Sumatra Province. As seen in the Table, the agricultural output is accounted for about 31% of GDP which still playes a dominant role on the economy in Indonesia. The minings provide also a substantial portion of the products, approximately 18% in the whole Indonesia and 24% in the Province respectively.

The GDP in Indonesia and South Sumatra Province amounts to Rp.21,788 x 10^9 and Rp.840 x 10^9 respectively, which corresponds to Rp.154 x 10^3 and Rp.203 x 10^3 per capita respectively. Such high GDP in South Sumatra Province is distinctly attributable to the products from the mining sector especially for petroleum. The total GDP in South Sumatra Province in 1978 amounted at about 4% of the national GDP.

Table VI-6 shows the Gross Regional Product (GRP) by respective industrial activity at the end of Repelita I and II and that of target at the end of Repelita III.

As seen in the table, the GRPs of mining and manufacturing sectors had remarkably increased in Repelita I and II and would be expected to increase in Repelita III in the same range.

As for the agro-chemical industry, fertilizer production (mainly Urea) in Indonesia has been started by P.T. Pusri with a production capacity of about 100,000 tons of Urea per year since 1963 in Palembang. In 1977/78, about one million tons of Urea and about 110,000 tons of ammonium sulphate were produced by P.T. Pusri and P.T. Petrokimia. Total production of fertilizer in 1982 is expected to be about 3,340,000 tons of Urea, about 150,000 tons of ammonium sulphate, about 330,000 tons of TSP, etc. as seen in Table VI-7. The table also shows that the produced amount of fertilizers has not met with those demands. The "Foreign Trade Statistics" shows that out of about US$27,000,000 paid for the import of total fertilizer in 1977, the most of the amounts were spent for the import of P-fertilizer and K-fertilizer, and less cost was spent for the import of N-fertilizer.

1.3 Export and Import

The amount of export in Indonesia has been increased at a high speed in the past years especially from 1973 to date as seen in Table VI-8. Export structure of Indonesia is characterized by its heavy dependence on the products in the primary sectors such as mineral and agricultural sectors. Particularly, petroleum and petroleum products have become the most important export goods, of which the share in the total exports increased from about 40% in 1970 to 57% in 1979, being reflected by the remarkable price increase of oil. While, the share of agricultural products such as rubber, coffee, palm oil and wood is decreasing from about 42% in 1970 to 23% in 1979, though the total amounts are increasing substantially as shown in Table VI-9.

Meanwhile, imports of Indonesia have been increased in relatively low pace compared with that of exports. Petroleum products, machines for industrial and commerce, rice, etc. are major items of import. The import of rice in 1979 amounted at about 8% of the total import value in Indonesia. The following table shows the quantities of rice imported in the recent 8 years from 1972/73 to 1979/80.

Quantities of Rice Imported/1 Unit: 1,000 tons

Year	1972/73	1973/74	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80
Quantities	1,230	1,225	1,137	670	1,509	2.308	1,800/2	1,922/3

Sources: /1: Source; Lampiran Pidato Kenegaraan, Aug. 16, 1977

/2: Estimation by FAO, 1979

/3: Source; Statistik Perdagangan Luar Negeri, 1979

The balance of the trade in recent 10 years showed rapid increase of surplus from US$107 x 10^6 in 1970 to US$8,388 x 10^6 in 1979. The main factor affecting the favorable balance was the increase of oil price being affected by the world economic situation.

Trade balance in Indonesia including petroleum and its products shows an favourable surplus especially during 1979 amounting to about US$8,388 millions. The balance of trade excluding petroleum and its products showed unfavourable until the period of 1978, but shows a surplus in trade balance amounting US$310 millions in 1979.

Main export commodities of agricultural products in South Sumatra province are estate crops such as coffee, rubber, pepper, etc. but the amount of these exports is not so significant as compared with that of whole Indonesia as seen in Table VI-10 and VI-11.

1.4 The Third Five-Year Development Plan (Repelita III)

Following the successful implementation of the Second Five-Year Development Plan (Repelita II), the Government set forth the Third Five-Year Development Plan (Repelita III) for the period from 1979/80 to 1983/84.

Repelita II placed its main objectives on more employment opportunities, raise of income level, more equitable distribution of income, more even distribution of development opportunity among the various regions, provision of adequate supplies of basic human needs, improvement of nutritional status for the population and enhancement of quality of life.

Repelita III is a continuation and enhancement of the previous plan and has the following major objectives.

i) To raise the living standards and levels of knowledge of the Indonesian people.

ii) To strive for a more equitable distribution of welfare of the whole population.

iii) To lay a strong foundation for the next stage of development.

For the successful implementation of the Repelita III, the plan will pursue a balance among the three elements of the development strategy, i.e., equity of welfare, high economic growth and national stability. In this context, the following economic growth is expected during the Repelita III period.

i) Real economic growth rate of about 6.5% per annum,

ii) Per-capita gross domestic product of about 4.4% per annum, and

iii) Population growth rate of about 2% per annum.

In order to attain the such target by the end of the Repelita III, the Government has set up the development budget and the target of GDP as shown in Table VI-12. Table VI-13 shows the budget allocation in both Repelita II and III. The budget allocation rate to the agricultural sector of the Repelita III is smaller than that in the Repelita II, though the total amount is increased. On the other hand, the rate of allocation to the industry, mining & energy sector is remarkably increased particularly. This may indicate that national strategy for the exploitation of natural resources has gradually been changed in accordance with the needs in the world (see Table VI-16).

As for the agricultural development sector, the plan envisages the raise of agricultural productivity, through which this sector can provide more food to the growing population and raw materials to the industrial sectors, and can increase foreign exchange and employment opportunities. The agricultural program in the Repelita III will also contribute directly to improvement of the welfare of the population, promotion of industrial growth and a more balanced development of the regions.

Table VI-14 shows the investment program for agriculture and irrigation sectors in Repelita III in which an emphasis is placed on raising the productivity of food crops and estate crops resulting from irrigation system improvement and area development. In this context, the following irrigation developments are contemplated by the Government.

		Area (ha)
i)	Rehabilitation and improvement of the existing system	536,000
ii)	Construction of new system	700,000
iii)	Tidal swamp irrigation	400,000
iv)	Expansion and rehabilitation of tertiary system	600,000
v)	Swamp area reclamation	135,000

Table VI-15 shows the target of annual growth rate of agricultural sector in Repelita III and the actual growth rates in both Repelita I and II. It is projected to increase food production at an average annual rate of 4.0% in which about 3.3% for rice and 5 to 7% for secondary crops per annum are envisaged.

Table VI-16 shows the distribution of GDP in the various industrial sectors in Repelita I, II and III periods. From this table, it can be said that a structure of industry is shifting gradually from the primary industry to the secondary or tertiary industries in Indonesia.

1.5 Communication

1.5.1 Transportation

Total length of roads in South Sumatra Province in 1978 was about 10,428 km consisting of 797 km of State road, 3,414 km of Provincial road and 6,217 km of municipal and village roads. The trunk road connecting Palembang to each Kabupaten capital is generally asphalt-paved, and re-alignment and widening of the pavement as well as improvement of bridge load are being undertaken in some extent, while maintenance of secondary roads is restricted to clearing plants growth along the shoulders.

The Trans-Sumatra highway linking Tanjungkarang (*Lampung provincial* capital) to Lubuklinggau, which is under construction, will run through the upper portion of the project area.

In the project area, there exists an asphalt-paved road linking Martapura to Palembang. Along the main canal of the Belitang Proper Irrigation Scheme, well maintained paved road provides an important communication of marketing of agricultural inputs and outputs.

The national railway connecting Tanjungkarang to Palembang runs through the upper part of the project area. The rails are single track of short gauge.

The Komering river has functioned since old time as main navigation route for the transportation of agricultural products such as rice, polovijo crops, banana, etc. from the upper Komering to Palembang using timber and bamboo rafts. According to the field survey at Betung, the amounts of shipping from Betung in 1979 are about 10,000 tons of rice, 6,000 tons of banana, 24,000 tons of rubber, 1,500 tons of coconuts, 4,000 tons of timber, etc.

1.5.2 Telecommunication

Number of telephone holders in Indonesia was approximately 447,000 in 1978, which was about 29% increase from that in the previous year. No constraint and limitation on telephone call is prevailing among the major cities in the country at present. The television broadcasting system is showing rapid increasing tendency in the country wherever electrified, but the number of radio set holders decreased during the period from 1974 to 1978.

As for the telephone holders in the South Sumatra Province, the number was increased from 7,334 in 1974 to 7,702 in 1978, which is still far behind the satisfaction to the users. No telephone service system in the project area exists at present.

2. PRESENT SOCIO-ECONOMIC CONDITIONS

2.1 Rural Organization

South Sumatra Province is administratively divided into 8 Districts (Kabupaten) and 2 Kotamadya. These Districts are further sub-divided into 85 Sub-Districts (Kecamatan). Under the Sub-Districts, there are 1,995 villages (Desa) which are the basic unit of administrative structure in Indonesia. The old traditional local governance structure, so called "Marga", still exists between Sub-District and village, as a leader of several village chiefs in South Sumatra Province. Average number of Sub-Districts in one District is counted for about 9. One Sub-District covers about 23 Villages on an average in the province.

The village chief elected by and among the inhabitants has a responsibility of carrying out the following tasks under the supervision and guidance of respective governmental authority concerned.

a) Agricultural development
b) Public health and sanitation
c) Public education
d) Village welfare and security
e) Encouragement of industries and co-operatives
f) Construction, maintenance and repair of public transportation facilities

The proposed project area belongs to five Kecamatans, i.e. Martapura Buay Madang, Belitang and Cempaka in OKU Kabupaten, and Kecamatan Bahuga in North Lampung Kabupaten of Lampung Province with 187 villages. Since 1973, for an intensive development of the BIMAS/INMAS Program, the Government has initiated to organize a Village Unit (Wilayah Unit Desa) in the rural area as the lovest executive unit of the program. Each Village Unit generally comprises 2,000 farmers in 6 Villages with 600 to 1,000 ha of irrigated paddy field, and the followings are required in each Village Unit;

a) At least one Field Extension Worker (P.P.L.) equipped with extension appliances in order to diffuse the necessary

information to the farmers in the Village Unit concerned. The P.P.L. would be technically responsible to the executive chairman of BIMAS in the Kecamatan.

b) Village Unit "BRI" (Village Unit Branch Office of Indonesian Peoples Bank) having the main function to render banking services including BIMAS credit service within its working area that may consist of more than one Village Unit area.

c) Retail shop/Kiosk of Village Unit assigned to execute the function of distributing farm inputs such as fertilizers, pesticides, seeds and farm machineries and tools.

d) BUUD/KUD (Village Unit Executive Body/Village Unit Co-operative) assigned to execute the function of processing and marketing of agricultural products.
The BUUD is established as an economic instituion in the form of Co-operative which may constitute joint undertaking merger of agricultural co-operative (PRIMER KOPERTA) found in the Village Unit area at its initial stage of growth, and be merged in one Village Unit Co-operative (KUD) under the regulation of Ministry of Manpower, Transmigration and Co-operatives in a certain period of time according to its progress.

Following to the direction of the policy, the Provincial Government has initiated to establish the Village Unit with other related institution covering whole province since 1973. From 1980, the agricultural intensification program is being more integrated with inclusion of not only food crop cultivation but also estate crops cultivation, animal husbandry, inland fishery and forestry. The Village Unit is added the related functions and changed the name as WKPP (Wilayah Kerja Penyuluhan Pertanian) in order to consolidate the extension services concerned. At present, total number of Village Unit (WUD/WKPP) in the province is 547 with 115 Village Unit Co-operatives.

In the five Kecamatans which cover the project area, there are 187 Villages and 65 Village Unit with 14 Village Unit Co-operatives, 24 Kiosks and 13 Village Unit BRI, etc. as shown in Table VI-17.

2.2 Population and Family in the Project Area

Since 1937, the so called Belitang Proper Area has played an important role on the settlement of transmigrants mainly from Java, Madura and Bali islands. As seen in Table VI-18, total population in five Kecamatans concerned with the project area is estimated to be about 410,000 or 60 persons/km^2 in 1979. The average annual population growth in each Kecamatan except for Kecamatan Cempaka showed very high rate during the period from 1971 to 1979 because of substantial transmigration. In particular, Kecamatan Martapura and Bahuga had the highest growth of more than 5%.

Kecamatan Buay Madang and Belitang are the most densely populated with about 130 per km^2, followed by Kecamatan Martapura with 106 per km^2. While, the population density of Kecamatan Bahuga is extremely low, about 7 per km^2 as shown in Table VI-19.

According to the field survey, total population in the project area is estimated at around 114,000 in 1980, of which about 46,000 are living in the western half of the project area (1 ha land holding area), about 65,000 in the eastern half of the area (1.5 ha land holding area) and about 2,800 in the Pisang area. Average family size is estimated to be about 5.4.

Based upon the data from field survey, total number of farm household in the project area in 1980 is estimated at about 19,600 which correspond to about 90% of the total household, of which about 8,200 in 1.0 ha land holding area, about 11,000 in 1.5 ha land holding area and about 400 in the Pisang area are respectively distributed. Average family size in each area is estimated at about 5.1, 5.4 and 6.5 respectively, and generally 2 to3 persons per family are available for farm labor force.

Agriculture is by far the predominant economic activity in the project area. More than 90% of the active population are estimated to be engaged in agriculture and its related activities.

2.3 Education

Tables VI-20 and VI-21 show the number of school children and illiteracy in Kabupaten OKU, and the number of pupils in each grade and percentage

of school attendance in 1978 respectively. As seen in Table VI-20, the number of school illiterates has shown rapid decreasing tendency in Kabupaten OKU recently. The rate of school attendance in elementary school in Kabupaten OKU is higher than that of whole Indonesia and South Sumatra Province, but those of the five Kecamatans concerned with the project area are rather low in each grades as shown in Table VI-21.

Table VI-22 shows the number of school, teacher and pupil on national level, province level and Kecamatan level in 1978, and Table VI-23 shows the number of school, teacher and pupil in the respective Kecamatan concerned with the project area in 1979. In case of elementary school in the five Kecamatans concerned with the project area, one teacher has to take charge of about 50 pupils which are more than those in the cases of Kabupaten OKU, South Sumatra Province and whole Indonesia.

2.4 Health and Sanitation

According to the Statistic Indonesia 1977-1978, Bureau of Statistic, Jakarta, one major health facility, which includes hospital and public health center, has to deal with 18,000 persons in the case of national level and 20,000 persons in the case of South Sumatra Province level on an average. On the other hand, the ratio of population to the number of doctors is 60,000 in the case of national level and 55,000 in the case of the provincial level.

Table VI-24 shows the number of health facilities in Kabupaten OKU and the five Kecamatans concerned with the project area, and Table VI-25 shows the ratio of population to the number of major health facilities. From these tables, it can be said that the numbers of health facility and doctor are extremely short in both Kabupaten OKU and the project area.

3. PRESENT AGRO-ECONOMIC CONDITIONS

3.1 Land Tenure and Land Holding

The South Sumatra Province is still population dispersive region with the population density of about 45 persons per km^2 in 1980[/1]. Out of total area of 103,688 km^2, about 73% are still covered by forest. At present, only about 2% of total area is cultivated with paddy in South Sumatra Province. Although the province has accepted many transmigrants from the dense populated lands such as Java and Bali islands since 1905, there still remain much rooms for agricultural land development. In the Repelita III started from 1979/80, more than 105,000 farm households of transmigrants were programmed to be settled to this province.

As for the land tenure of transmigrant, since the start of transmigration project, the settlers have been given the right for cultivation of 2 ha in total including paddy field, upland field and home yard which should be registered to the Transmigration Office concerned during initial five years. Afterwards, the settlers are given the right of land ownership as far as they cultivate.

As stipulated in the Agrarian Law[/2], the maximum land holding size is decided by the degree of population density in the area. The South Sumatra Province belongs to non-densely populated area except Palembang city. The maximum land holding size per person is allowed to be 15 ha for paddy field and 20 ha for upland field in maximum but not excess 20 ha in total.

In the project area, most of the people are transmigrants. Total number of household is estimated at about 72,000[/3], of which about 90% are farm households. Although all the transmigrants have been given 2 ha

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/1: Kantor Sensus & Statistik, Sumatra Selatan

/2: The Agrarian law on No.56, 1960

/3: Including the Belitang Proper Area.

of lands at the time of transmigration, there are some variations in land ownership at present, especially in the old villages where farmers had been transmigrated more than 20 years ago. According to the field survey, there found actually some tenant farmers and farm labors in the project area. The rate of owner farmer, owner cum tenant farmer and tenant farmer cum labor are estimated to be around 90%, 7% and 3% respectively.

Average farming size in the project area is broadly categorized into two groups; 1 ha farm holding area mainly in the old transmigration area, where farm land have been substantially inherited to the next generations, and 1.5 ha farm holding area mainly in new transmigration area. The Pisang area is tentatively categorized as 1.5 ha farm land holding area in this study, though more than 80% of this area is still covered with forest and alang-alang.

Tenant charge prevailing in the project area is mostly share cropping system with charge of 50% of products in case of paddy.

3.2 Market and Price

3.2.1 Market

Main marketing farm product in the project area is rice. The surplus of paddy produced by the farmers is mainly sold to broker (itinerant grain buyer), rice miller and KUD. The collected paddy by broker and KUD is sold to wholesaler and DOLOG (DEPOT LOGISTIK = Food Procurement Agency) respectively after milling. The amount of marketing rice varies annually according to the variation of the yield of rice produced. However, the price of rice is stabilized by the Government through the operation of DOLOG. In South Sumatra Province, the quantity of rice purchased by KUD/DOLOG is insignicant as present as shown in Table VI-26.

Table VI-27 shows the number of warehouse for cereals in South Sumatra. Total storing capacity is estimated to be about 117,000 tons of which DOLOG handles only 36,000 tons, about 30% of the total. At present these warehouses are mainly used for storing the imported rice.

Fig VI-1 shows the present marketing flow of rice in the project area. The surplus of rice is marketed through four channels, namely DOLOG, wholesaler at Martapura, wholesaler at Betung and local market, of which Betung channel is operated only for 4 months during February to June at the harvesting season of rainy season paddy.

Regarding the upland crops, the farmer sells those products through either itinerant buyers or local markets at present in general.

3.2.2 Prices

DOLOG in South Sumatra Province purchases and sells the rice when the price comes down under the floor price or is raised over the ceiling price at the central market of Palembang in order to stabilize the price of rice in market. In 1979/80, the floor price and ceiling price in South Sumatra Province are set at Rp.156/kg and Rp.195/kg respectively.

The market prices of major crops in Kota Martapura in recent years are shown in Fig. VI-2. The seasonal fluctuation in local market price of farm products is relatively high due to inadequate marketing, poor transportation facilities and limited storage facilities. In fact, the farmers are often compeled to sell those products to the itinerant buyers, particularly paddy immediately after harvesting, resulting in comparatively low selling price. Table VI-28 shows the present farm gate prices of farm products and farm inputs, etc. prevailing in the project area.

3.2.3 Distribution of Agricultural Requisites

Distribution of agricultural requisites such as fertilizers and agricultural chemicals in South Sumatra is handled by P.T. PERTANI and P.T. PUSRI which are the governmental enterprises.

According to the BIMAS/INMAS Program, fertilizers and agricultural chemicals are distributed to the farmers through the distribution networks of P.T. PERTANI and P.T. PUSRI consisting of KIOSKs at the Village Units and BUUD/KUD.

In the project area, number of KIOSK and BUUD/KUD is counted at 24 and 14 respectively in 1980. Out of total distribution amount of about 3,900 tons of fertilizers in the project area, about 88% were distributed by KIOSKs at present.

The distribution price of agricultural requisites for BIMAS/INMAS Program is set by the Government as an unified price in whole Indonesia. The distribution prices of Urea and T.S.P. to farmers are both Rp.70/kg at present.

3.3 Agricultural Support Services

3.3.1 Research and Extension Services

The research works of agriculture, especially for food crops, are centralized and undertaken by the Central Research Institute of Agriculture (CRIA), Bogor in West Java. Under the supervision of the CRIA, six brach research stations, i.e. East Java, West Java, South Sulavesi, South Kalimantan, North Sumatra and West Sumatra, carry out the research works in whole Indonesia.

The branch stations usually undertake the experimental works under the instruction and supervision of the CRIA and also collect the information concerning technical problems on agriculture from farmers through several experimental farms scattered over its command area. In addition to these experimental works, these branch research stations produce the foundation seeds of new recommended varieties of main crops such as paddy, maize, pulses, etc.

Since 1974, Agricultural Extension Service in Indonesia has been strengthened with establishment of the Agency for Agricultural Education, Training and Extension as one of the extraministerial bureaus under the Ministry of Agriculture. At the same time, the Government has intended to establish an Agricultural Development Center (A.D.C.) with an additional function of seed multiplication center in each province and several Rural Extension Centers (B.P.P. or R.E.C.) in rural area.

The main function of ADC is to conduct the adaptability test of new recommended agricultural techniques and in-service training for extension workers at provincial level.

The REC is a kind of base camp for extension education activities with the functions of preparation of extension programs, dissemination of agricultural information and training for leading farmers at the local level.

The primary policy for this development program of Agricultural Extension Service was to promote and accelerate extension education activities on field level by separating extension activities with general agricultural administrative services. Following the basic policy, the South Sumatra Province has promoted the strengthening of Agricultural Extension Service since 1976, about 2 years behind from the commencement of the development program as shown in Table VI-29.

The present organization of Agricultural Extension Service in South Sumatra is formed by two separate lines, namely administrative line and operational line under the supervision of inspector of Provincial Agricultural Extension Service as shown in Fig. VI-3. The Agricultural Development Center (ADC), which provides practical technical information for extension workers, has just commenced the construction works in Lahat District in 1979, but it mainly deals with upland crops. Therefore, it is hardly expected that the Field Extension Workers (PPL) in the project area advise timely to the farmers with the most suitable cultivation method of paddy based on the local natural conditions.

The subject-matter specialists (PPS) are responsible for technical assistance and advice for extension workers. They are stationed in Province and each Kabupaten. In Kabupaten OKU, 2 PPS are appointed and assist 6 to 7 Extension Supervisors (PPM). The qualification of PPM is required at least 5 years experiences as PPL and should be passed in the provincial qualification examination which is at the level of Bachelors of Science. Two to three Extension Supervisors staying at each REC (or BPP) assist and advise about six PPL whose the qualification is graduate of Agricultural High School.

In the project area, total numbers of Rural Extension Center, Extension Supervisor (PPM) and Field Extension Worker (PPL) are 3.3 and 37 respectively. Each PPL covers 1.8 Village Units, 5 Villages (Desa), 1,700 farmers and 1,200 ha of paddy field on an average which ranges from about 7,400 ha to 600 ha of paddy field, as seen in Table VI-30.

In addition, some of the Kontak Tani operate demonstration farms covering 0.1 to 0.2 ha, in their villages for effective transfer of technical knowledge to their member farmers, but the activities of the Kontak Tani are not sufficient at present.

Together with the consideration of the extension system, the extension program has also been strengthened by systematic and periodical farm visit. Every PPL is requested to visit a key farmer (Kontak Tani) in each working area, four days a week and two working area a day. Twice a month, every Saturday of the second and fourth week, the PPLs attend to the training meeting held at the Rural Extension Center. All the problems which they might get from the farm visit, will be discussed in the meeting. Thus, it is expected that a key farmer would contact ten progressive farmers and each progressive farmer would influence twenty neighboring farmers, finally one PPL may be able to affect 3,200 farmers in total.

3.3.2 Seed Multiplication and Distribution

The stock seeds of new recommended varieties of paddy in South Sumatra Province, such as IR 36, IR 38, are produced at the Provincial Seed Center (KEBUN BENIH SENTRAL) located at BK-X in Belitang on the center of the Proper Irrigation Project area. The foundation seeds, necessary for stock seed production in this center, are provided by CRIA at Bogor. The stock seeds of paddy produced at the Center are distributed to Seed Stations (BALAI BENIH) managed by MURA and LIOT District Agricultural Offices, seed growers consisting of mostly farmers and demonstration farmers.

The extension seeds produced by these Seed Stations, seed growers and demonstration farmers are supplied to the farmers through KUD and/or seed distributors according to the BIMAS/INMAS Program and/or requirement of the farmers.

At present, total planted area of paddy seed is estimated to be about 620 ha including Provincial Seed Center, Seed Stations, seed growers and demonstration farmers in whole South Sumatra Province. In Kabupaten OKU, total planted area of paddy seed is estimated at about 150 ha.

In order to keep the high quality of seeds, the seed quality test is conducted in the Provincial Seed Center. The standard of seed quality test is: a) less than 14% of moisture, b) more than 97% of variety purity, c) more than 90% of germination rate, d) less than 3% of broken seeds and e) no insects and diseases. Out of 500 samples of quality test conducted by the Center during 1979/80 fiscal year, 400 samples or 80% are certificated.

At present, required amount of paddy seeds for 83,800 ha of the intensification area of South Sumatra Province is estimated at 2,095 tons in total, of which about one half is supplied by the extension seeds and the rest of a half is provided by farmers themselves.

In future, the improved seeds required for 36,700 ha of rainy-season paddy of the project area at full development stage is estimated at about 300 tons under the seed reneval system of 3 years interval.

3.3.3 Agricultural Credit

The Indonesian People's Bank (BANK RAKYAT INDONESIA - BRI) is the state bank specialized in agricultural credit covering whole country. The Bank is authorized to finance BIMAS (BIMBINGAN MASAL, intensification Program) credit for qualified individual farmers. Besides, using own credit funds, the Bank provides the loan to farmer's group and various agricultural associations.

In order to provide loan services properly, especially BIMAS credit service, the Bank has established a broad network formed by many regional offices, branch offices and sub-branch offices so called BRI. UD (Village Unit BRI) since 1974.

At Palembang, there is a regional office of BRI which covers whole South Sumatra Province. Under the regional office, there are 9 branch offices with 71 Village Unit BRIs in whole South Sumatra Province at present.

There are three kinds of loan for agriculture in the Bank loan, i.e. short term, medium term and long term loans. The BIMAS credit is the short term production loan in category with the loan condition of 7 months in loan term and 1% of monthly interest rate.

The loan amount of BIMAS Package loan is determined by the type of package in every year as shown in Table VI-31. In accordance with the standard of BIMAS Package Credit, the BIMAS Package Credit in each area is adopted under the consideration of various physical conditions such as climate, topography, soil fertility, level of farming practice, target of crop production, etc. Table VI-32 shows the BIMAS Package Credit per ha in the Belitang Area in 1980.

The past records served by the BIMAS program in Kabupaten OKU are given in Table VI-33 and VI-34. The annual average area under the program is about 9,500 ha of Sawah and about 800 ha of upland paddy as seen in Table VI-33. The area under the BIMAS programs covers only about 14% of that of Kabupaten OKU. This figure is very low in comparison with more than 30% of that in the whole Indonesia and more than 50% in Java Island. The reason for this small coverages is mainly due to the fact that there is few technical irrigation facilities in the area.

Table VI-34 shows the records of total amount of credit provided to the farmers and its repayment in Kabupaten OKU. The average amount of credit is about Rp.16,600/ha in Kabupaten OKU. As seen in the table, the repayment of the credit was relatively low, ranging from 39% to 83% in Kabupaten OKU. The repayment time usually comes immediately after the harvest when the price of rice is lowest. Consideration should be given to this fact for improvement of the farmers' credit situation.

Table VI-35 shows the area under the BIMAS and INMAS programs in 1978/79, for which data were obtained from the five Kecamatans concerned with the project area. The area under the programs is about 6,500 ha or about 15% of the total paddy field. In the project area, the area under the BIMAS and INMAS programs is about 2,709 ha or about 19% of the total paddy field, as seen in Table VI-36. This low coverage is mainly attributed to the fact that there is no notable technical irrigation facilities, and this area is under unstable condition for paddy cultivation.

3.3.4 Co-operative

Supplies of agricultural inputs, processing and marketing of farm products were intended to be made through the establishment of co-operatives which has been promoted in the rural area by the Indonesian Government through the District Co-operative Offices since 1945 when the Co-operative Act in Indonesia was enacted. Inspite of the governmental efforts, the movement of co-perative has not been well developed yet, mainly because of weakness in management, shortage of operational fund and inadequate infrastructure such as road net-work in rural area.

In order to improve such stagnant condition of the co-operative movement, the establishment of Village Unit Co-operative (KUD) has been introduced by the Government to the area by adopting the Agricultural Intensification Program since 1973 when the Presidential Decree for Village Unit was enforced.

In the South Sumatra Province, out of 547 village units, 115 village units, 21% of total village units, established BUUD/KUD by the end of 1979/80 fiscal year as described in the previous Table VI-29. In the project area, out of 65 village units, 14 KUDs were already organized, however, membership is only less than 10% of total number of farmers as shown in Table VI-37.

The main processing facilities owned by KUD is rice mill. In the project area, the rice mill owned by the Village Unit Co-operative is counted at 11 with total milling capacity of about 12,500 t/year of rice as shown in Table VI-38. In addition, 184 small rice mills are owned by each village and private business men in the project area as shown in Table VI-17.

3.3.5 Water Management

According to the Indonesian criteria, there are three grades of irrigation classification, i.e. a) technical irrigation, b) semi-technical irrigation and c) non technical irrigation.

a) The technical irrigation works are designed and constructed by the Directorate of Irrigation, Ministry of Public Works (DPU) up to the tertiary canals with facilities for quaternary canals. The construction of quaternary canals and land reclamation for paddy field, is carried out by farmers themselves under the guidances of the irrigation Section of the Provincial Public Works and the land Development Unit (UPP) of the Provincial Agricultural Services respectively.

The operation and maintenance up to the secondary canals are managed by the Irrigation Section of the Provincial Public Works and tertiary canals down to the fields are managed by farmer's organization.

b) The semi-technical irrigation works cover relatively small area which may be limited to one District. In this case, only the head works are constructed by the Director of Irrigation, while the canals and their structures are constructed by farmers themselves. The management and supervision of the head works are generally transferred to the Kecamatan authorities and water distribution below the tertiary canals is managed by the farmer's organization.

c) The non-technical irrigation works are relatively very small works and cover only one to two villages as they have limited water supply generally from a small stream. The execution of construction of the head works and canals is mainly by the farmer's group. The maintenance of the structures and also distribution and management of irrigation water are entirely organized by the rural communities.

In the project area, there is no irrigation facilities, but in the vicinity of the project area; Belitang Proper Area, there exists the technical irrigation system. Total length of canal system including secondary and tertiary canals is about 502 km with commanded area of about 20,600 ha.

Operation and maintenance for these facilities down to the secondary canals are carried out by six resorts of Cabang Belitang under the supervision of the Belitang Irrigation Section as illustrated in Fig. VI-1. Under the chief of resort, several gate operators and maintenance workers (so called PP Airs) carry out daily activities of operation and maintenance of irrigation facilities. At present, 37 PP Airs are working in the Proper Area and each PP Air is dealing with 13.7 km of irrigation canal and 557 ha of irrigation area on an average.

Since 1973, the Water User's Association (P3A: Perkumpulan Petani Pemakai Air) has been established in every village which holds available water source for irrigation, following to the suggestion of the President. In the project area, total number of Water User's association is counted for only 6 having 285 members at present.

3.3.6 Transmigration

Before independence, since early 19th, the transmigration scheme in Indonesia had been carried out under the governance of Netherlands. After independence, the transmigration program was carried out by the Government under the respensibility of Ministry of Manpower, Transmigration and Co-operatives.

There are two kinds of transmigrants in the governmental transmigration, i.e. general transmigration and spontaneous transmigration. The general transmigration means that the transportation cost from original place to transmigration area and foodstuff of initial 12 months are subsidized to each household by the Government as shown in Table VI-39. The spontaneous transmigration has no such subsidy and all the expenses should be prepared by themselves.

In the general transmigration program, the Government delineates the transmigration area and clears the area. Road net-work and village yard are also constructed with necessary office buildings and residences of transmigrants as shown in Table VI-44. Each household of transmigrant is given 2 ha of land including 0.25 ha for home-yard, 0.75 ha for upland field and 1.00 ha for paddy field at the time of transmigration. After

opening the transmigration scheme, the transmigration site office takes care of every administrative aspects such as health, communication, education, village administration and agriculture, for initial 5 years under the supervision and assistance of Kabupaten Transmigration Office and Provincial Department of Transmigration as illustrated in Fig.VI-5.

The selection of transmigrant is done by the following standard:

a) Indonesian nationality,
b) Good character,
c) Healthy,
d) Voluntary,
e) Adequate ability and capability to work,
f) Obeying to the Transmigration Law,
g) Age of head of family is less than 40 years, more than 18 years old, and
h) Wife of transmigrant is in less than three months of pregnancy

The transmigrants settled in South Sumatra during past 30 years mostly came from Java island, followed by Bali as shown in Table VI-40. They are fairly familiar with paddy cultivation and want to make paddy field if water is made available in the allocated land. However, most of the lands allocated as lowland are almost same condition as that of the land allocated as upland. These land are mostly rain-fed conditions without irrigation.

According to the Transmigration Office in South Sumatra, the total number of immigrant during 29 years from 1950 to 1978 was about 54,500 families. Table VI-41 shows the progress of transmigration under the Government program in Kabupaten OKU from 1950 to date. More than 95% of total number of transmigrants in Kabupaten OKU were settled in the Belitang area.

In the Repelita III, the Goverement places also particular emphasis on the transmigration program as shown in Table VI-42, in which 500,000 of families in total are planned to be settled during the five years. Table VI-43 shows the transmigration program for Kabupaten OKU during the Repelita III in which no program is provided in the project area. For the Pisang area, Way Tuba resettlement project is planned by Lampung

Transmigration Office in 1982/83 for about 15,000 ha including a part of the proposed Pisang irrigation project area.

In order to implement the settlement successfully, the Government will provide 1.25 ha of land preparation, certain infrastructures and living accommodations as well as commodities and farm inputs to the immigrants. Table VI-44 shows the facilities to be provided by the Government.

3.3.7 Land Reclamation Service

The large scale irrigation projects in Indonesia were carried out under the responsibility of the Ministry of Public Works (DPU). As for the construction works, the responsibility of DPU was previously limited up to the construction of secondary canal and 50 m of tertiary canal from its turnout structure. On-farm development and/or land reclamation within the tertiary irrigation block such as tertiary canal, quaternary canal, farm ditch, farm road and land reclamation for paddy field were left to the farmer's hand and constructed under the technical guidance of the Provincial Public Works and Agricultural Extension Services as mentioned in the previous Sub-section 3.3.5.

Because of the Lack of fund, inadequate local leaders, insufficient technique for on-farm development, the construction of on-farm development scheme was usually delayed. In order to improve such stagnant condition, Indonesian Government has decided that the construction of tertiary canal with irrigation facilities of quaternary canal is carried out by DPU and land development is promoted under the responsibility of the Ministry of Agriculture, since 1979 when the Repelita III was started.

Following this basic policy, the Land Development Project (LD Project) was introduced by the Ministry of Agriculture to promote and facilitate the construction of on-farm development. The LD Project consists of the establishment of UPP (UNIT PELAKSANA PROYEK), handling the prefinancing loan and the Small Investment Credit (KIK) to the farmers. Other than soft loan, the Government also assists the farmers by free of charge to provide survey and design, guidance and supervision for construction works to be conducted by the UPP.