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

PRE-FEASIBILITY STUDY ON THE UPPER KOMERING RIVER BASIN DEVELOPMENT PROJECT

VOLUME II-2

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MARCH 1982

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 (ℓ)	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
kW	kilowatt
kVA	kilovoltampere
kWh	kilowatthour
MW	megawatt
MWh	megawatthour
GW	gigawatt
GWh	gigawatthour
pH	scale for acidity
^{o}C	centigrade
cm/sec	centimeter per second
m/sec	meter per second
m^3/sec	cubic meter per second
lit/sec/ha	liter per second per hectare
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 term

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

8. Currency

US$	US Dollar
Rp.	Indonesian Rupiah

9. Other abbreviations

FAO	Food and Agriculture Organization of United Nations
UNDP	United Nations Development Program
IRRI	International Rice Research Institute
JICA	Japan International Cooperation Agency
WHO	World Health Organization
GDP	Gross Domestic Products
GRP	Gross Regional Products
DPU	Department of Public Works
P3SA	Sub-directorate of Planning and Programming for Water Resources

B. LOCAL TERMS

Kab.	District (Kabupaten)
Prov.	Province (Provinsi)
OKU	District for Ogan Komering Upper River Basin
OKI	District for Ogan Komering Lower River Basin
BIMAS	Mass Guidance for Self-sufficiency in Food
INMAS	Mass Intensification for Self-sufficiency in Food
BRI	Indonesian People's Bank
CRIA	Central Research Institute for Agriculture, Bogor
PPS	Extension Specialist
PPM	Field Extension Worker
BPP	Rural Extension Center
KUD	Village Unit Cooperative Body
DOLOG	Depot of Logistic
BULOG	Board of Logistic
KIOS	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
Ulu-Ulu	Water master
WILUD	Wilayah Unit Desa
Pelita (Repelita)	Five-year Development Plan
Dalam Angka	Statistical data
BUUD/KUD	Village farmers' co-operative
BAPPEDA	Regional Planning and Development Agency
BALAI BENIH	Seed Center
PTPT	One of the new organization established under the Ministry of Public Works
Sawah	Paddy field
Polowijo	Second crop, planted after harvest of rainy season paddy
Tegal	Upland field
Ladang	Intermittent cultivation land
Alang-alang	Grass land

ANNEX V

SOCIO-ECONOMY, AGRO-ECONOMY AND AGRICULTURE

ANNEX - V

SOCIO-ECONOMY, AGRO-ECONOMY AND AGRICULTURE

1. NATIONAL AND REGIONAL SOCIO- AND AGRO-ECONOMIC 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 total population of Indonesia is estimated at about 148 million corresponding to 77 persons/km^2 in 1980 according to the Central Bureau of Statistics. The Table V-1 and V-2 show the population of Indonesia, South Sumatra and Lampung provinces as well as Kabupaten (Kab.) OKU, OKI and North Lampung in past eight years. According to these tables, the population growth rate in South Sumatra and Lampung provinces are much higher than that of the whole Indonesia, especially in Lampung provinces. One of the main reasons of such high population growth rate is considered to be the increase of transmigrants from the densely populated islands such as Java, Madura and Bali.

Table V-3 shows the population by age groups in Indonesia, South Sumatra and Lampung provinces, Kab. OKU, OKI and North Lampung respectively. About 40% of total population in each Kabupaten is in the age group of 15 to 44, which is deemed to be effective agricultural labor force. One of the particular of population distribution by age group in this table is that the rate of population less than 14 years old in each province and Kabupaten is higher than that in the whole Indonesia owing to the transmigrants of younger generation.

Table V-4 shows the economically active population in while Indonesia, South Sumatra and Lampung provinces, Kab. OKU, OKI and North Lampung. The proportion of working population in agricultural sector is about 66% in South Sumatra province, 76% in Lampung province, 86% in Kab. OKU, 82% in Kab. OKI and about 76% in Kab. North Lampung respectively. From the above proportions, it can be said that agriculture is the most important industrial activity in both provinces, particularly in rural Kabupatens.

1.2 National and Regional Economies

Table V-5 shows the Gross Domestic Products (GDP) in whole Indonesia and in both South Sumatra and Lampung provinces in 1979. As seen in this table, the agricultural output is accounted for about 30% of GDP which still play a dominant role in the economy of Indonesia. The GDPs in South Sumatra and Lampung provinces amount to Rp.841,000 million and Rp.627,000 million respectively, which correspond to 2.7% and 2.0% of the national GDP respectively. The high GDP in South Sumatra province is obviously attributable to the products in the mining sector especially for petroleum. From the above GDPs, the GDPs per capita are calculated to be US$ 307 in South Sumatra province and US$ 251 in Lampung province respectively.

1.3 National and Regional Agricultural Conditions

1.3.1 Agriculture

Table V-6 and V-7 show the harvested area and production of major crops in both provinces and Kabupaten concerned with the project in 1980. Further, the following table shows the harvested area and production of major food crops in Indonesia and both South Sumatra and Lampung provinces.

Crops	Area Harvested (10^3 ha)			Production (10^3 tons)		
	Indonesia /1	South Sumatra /2	Lampung /2	Indonesia /1	South Sumatra /2	Lampung /2
Rice	8,850	402	242	17,918	502	337
Maize	2,575	9.3	54.2	3,305	6.9	72.9
Cassava	1,418	19.4	98.4	13,330	175	1,007.6
Peanut	490	15.6	5.5	418	12.2	5.4
Soybean	764	5.7	6.2	674	4.2	15.4
Sweet Potato	278	8.3	16.8	2,044	39.6	1,020

Source: Statistical Year Book of Indonesia, 1979
Agricultural Office in South Sumatra and Lampung Provinces, 1981
Estate Crop Office in South Sumatra and Lampung Provinces, 1981

Note: /1 1979
/2 1980

As seen in the above-mentioned tables, rice is main staple food in Indonesia. Its production has rapidly increased at an annual rate of 4.4%/1 in the period from 1970 to 1979.

This rapid increase of production is considered to be attributable to the yield increase brought under the Government's intensification program mainly in Java and the substantial increase of cultivation area in the outer islands. However, total production of rice still can not meet the increasing demand resulting from the rapid population growth and the raising of per capita consumption. The rice productions in South Sumatra and Lampung provinces have increased at an annual rate of about 4% and 5.1% respectively in the period from 1970 to 1979. The reasons for such rapid increase of rice production in both provinces are also considered to be the Government's intensification programs and increase of rice cultivation area. As for the Kabupaten level, the total paddy-harvested area is 76,000 ha in Kab. OKU, 95,000 ha in Kab. OKI and 66,000 ha in Kab. North Lampung, which correspond to 80%, 89% and 71% of the total cultivated area, which excludes the perennial crops area, in the respective Kabupaten.

Table V-8 shows the area extents of paddy fields by irrigation category in 1973, 1977 and 1978. According to this table, the technical and semi-technical areas, where BIMAS/INMAS programs have been introduced, occupy only 12% of the total paddy fields in South Sumatra province and 42% in Lampung province, whereas in Java around 57% of the paddy fields belong to the technical or semi-technical area. No technical and semi-technical area exists in Kab. OKI and North Lampung but about 13% in Kab. OKU.

1.3.2 Agricultural Support Services

(1) Research works

The research works on agriculture are conducted through centralized network under the direction of the Central Research Institute of Agriculture, Ministry of Agriculture, located at Bogor, West Java. There are six branch research stations, i.e. East Java, West Java, South Sulawesi, South Kalimantan and West Sumatra, conducting various agronomic research activities throughout the whole Indonesia.

/1: Statistical Year Book, Indonesia, 1972/73, 1975/76, 1979.

The agricultural research works at the branch stations are carried out within the centralized network activities under the direction of the Central Research Institute of Agriculture, Bogor (C.R.I.A.). In addition to the research works, these branch stations produce the foundation seeds of newly recommended varieties of main crop such as paddy, maize, pulses, etc.

(2) Seed multiplication and distribution

One of the most important factors of the agricultural inputs for the increase of production is introduction of improved seeds of crops. The Government has placed a particular emphasis on the improvement of paddy since the beginning of BIMAS program in 1964. In order to maintain the purity of high yield seeds of paddy, the Government has established seven seed centers in whole Indonesia; two in Sumatra, four in Java and one in Sulawesi. Out of two seed centers in Sumatra, one seed center is located at Belitang, within the project area, in South Sumatra province. They are under the supervision of the Agriculture Extension Service Office.

(3) Agricultural extension services

Agricultural extension services are being conducted by the Provincial Agricultural Extension Service Office under the guidance of the Ministry of Agriculture. In order to strengthen the extension service activities, the Government has established the Training Institute of Agricultural Extension Services in 1974. The main activity of the Institute is to train the extension workers as well as the leading farmers selected from the whole Indonesia.

(4) BIMAS/INMAS Programs

One of the important policies for the increase of food crop production in Indonesia is the BIMAS/INMAS Programs. The yearly variations of total area under the BIMAS/INMAS Programs in South Sumatra and Lampung provinces are shown in the following table.

	South Sumatra			Lampung		
	BIMAS (ha)	INMAS (ha)	TOTAL (ha)	BIMAS (ha)	INMAS (ha)	TOTAL (ha)
1976	78,400	20,400	98,800	44,000	32,000	76,000
1977	75,600	10,500	86,100	37,600	39,000	76,600
1978	59,800	19,000	78,800	29,800	55,400	85,200
1979	60,000	28,000	88,000	31,600	67,700	99,300
1980	60,900	61,200	122,100	7,200	22,000	29,200
Average	67,000	27,800	94,800	30,100	43,200	73,300

Source: Agricultural Offices in South Sumatra and Lampung Provinces, 1981

As shown in the above table, the total areas under the BIMAS/INMAS programs in South Sumatra and Lampung provinces are 95,000 ha and 73,000 ha respectively, which correspond to 33% and 54% of the total cultivation area of low-land paddy. While, in whole Indonesia around 4.4 million or 50% of the total cultivation area of low-land paddy is covered by the BIMAS/INMAS programs in 1979.

(5) Co-operatives

Supplies of agricultural inputs and processing and marketing of farm products were intended to be made through the establishment of co-operatives. Table V-9 and V-10 show the number of agricultural support services and the number of staffs in both South Sumatra and Lampung provinces. Inspite of the governmental efforts, the movement of co-operatives in both provinces has not been well developed yet as compared with that in Java.

The BUUD/KUD is one of the most important farmers' organizations as the village level organization. This organization purchases products directly from farmers and re-sells those to DOLOG. The other activity of BUUD/KUD is supply of necessary farm inputs such as improved seeds, fertilizer, agro-chemicals and some farming instruments.

1.4 Export and Import

The amount of export in Indonesia has increased at a high speed in the past years particularly from 1973 to date as seen in Table V-11. Out of the export goods, crude petroleum and petroleum products have become the most important export goods, of which share in the total exports increased from about 40% in 1970 to 64% in 1978, being reflected by the remarkable price increase of oil. Main export commodities of agricultural products in Indonesia are estate crops such as coffee, rubber and pepper. The total values of these exports in South Sumatra and Lampung provinces are about US$143 x 10^6/1 and US$236 x 10^6/2 in 1979, which correspond to 8% and 13% of the total value of whole Indonesia respectively.

On the other hand, the import of Indonesia has increased at relatively high speed, but the speed of import is still low as compared with that of export in recent years.

The balance of the trade in recent ten years from 1970 to 1979 showed rapid increase of surplus from US$106 x 10^6 in 1970 to US$8,388 x 10^6 in 1976 as seen in Table V-12. The main factor affecting the favourable balance was the increase of oil price being affected by the world economy situation. The balance of trade excluding petroleum and its products was unfavourable until the period of 1978, but showed a surplus in trade balance amounting US$310 million in 1979.

The following table shows the production of rice and its quantity imported in past nine years from 1972/73 to 1980/81.

Production of Rice and its Quantity Imported

(Unit: 10^3/tons)

	'72/73	'73/74	'74/75	'75/76	'76/77	'77/78	'78/79	'79/80	'80/81
Rice Production	13,182	14,607	15,276	15,185	15,845	15,876	17,502	17,918	-
Rice Imported	1,230	1,225	1,137	670	1,509	2,308	1,800	1,922	1,213

Source: 1) Lampiran pidato kenegaraan, Aug. 16, 1977
2) Estimation by FAO, 1979
3) Statistik Perdagangan Luar Negari, 1979
4) BULOG, 1981, Jakarta

/1: Export, 1979.
/2: Lampung dalam angka, 1979.

1.5 The Third Five Year Development Plan (Repelita III)

Following the successful implementation of 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;

(a) to raise the living standards and levels of knowledge of the Indonesian people,

(b) to strive for a more equiptable distribution of welfare of the whole population, and

(c) to lay a strong foundation for the next stage of development.

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

(a) real economic growth rate of about 6.5% per annum,

(b) per-capita gross domestic product of about 4.4% per annum, and

(c) population growth rate at about 2% per annum.

As for the agricultural development sector, the plan envisages the raise of agricultural productivity, through which this sector will provide more food to the growing population, raw material to agro-industry and perennial cash crops to export 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 substational increase of food production over a wide range of crops. It is projected to increase rice production of about 2,630,000 tons from 17,940,000 tons in 1979 to 20,570,000 tons in 1983 during the Repelita III period as seen in Table V-13. In order to attain this target,

paddy-cultivation area is planned to be extended up to about 1,000,000 ha mainly in the outer islands, and an average annual growth rate of 3.3% for paddy and about 5 to 7% for polowijo are estimated in the period of Repelita III.

Following the national level plan mentioned above, the development plans for South Sumatra and Lampung provinces also put the stress on the substantial increase of food production not only through extending cultivation area but also by increasing crop yields. (Refer to the Table V-58)

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

		Area (ha)
(a)	Rehabilitation and improvement of existing system	536,000
(b)	Construction of new system	700,000
(c)	Tidal swamp irrigation	400,000
(d)	Expansion and rehabilitation of tertiary systems	600,000
(e)	Swamp area reclamation	135,000
	Total	2,371,000

1.6 Communication

1.6.1 Transportation

Total length of roads in South Sumatra province in 1979 was about 8,318 km consisting of 663 km of state roads, 7,320 km of provincial and regional roads and 335 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 are being undertaken, while, maintenance of secondary roads is restricted to clearing plant growth along the shoulders.

In the Lampung province, there existed about 2,473 km of roads in total length in 1979, consisting of 247 km of state roads, 2,105 km of provincial and regional roads and 121 km of municipal and village roads. The trunk road connecting Tanjung Karang to each Kabupaten capital is

almost asphalt-paved, but secondary roads such as municipal and village roads are being asphalt-paved to some extents. The Trans-Sumatra Highway linking Tanjung Karang to Banda Aceh will run through 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 Area, a well maintained road provides the transportation to the Lempuing area. The roads from BK-X in the Belitang Proper Area to Rasuwan and from BK-XVI to Betung are significant for the local transportation. Other than these roads, there is no notable road in the project area.

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

The Komering river and the Tulangbawang river have functioned in the project area since old time as main navigation routes for the transportation of agricultural products such as rice, polowijo crops, banana and subsistence commodities.

1.6.2 Telecommunication

The number of telephone holders in Indonesia was approximately 44,000 in 1978, which was about 29% increase as compared with 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, but the number of radio set holders decreased during the period from 1974 to 1979.

With regard to the telephone holders in South Sumatra province, the number was increased from 7,334 in 1974 to 7,702 in 1978, and in Lampung province the number of telephone holders was increased from 2,868 in 1973 to 5,593 in 1978, which are still far behind the satisfaction to the users in comparison with population in both provinces. At present, no telephone service system exists in the development areas of the project.

1.7 Education

Table V-14 shows the number of school, teacher and pupil on the national, provincial and Kabupaten levels concerned with the project area in 1980. In the elementary school, one teacher in Kab. OKU has to take charge of about 42 pupils which are more than those in the case of Kab. OKI and North Lampung. In the previous study of the Komering-1 Irrigation Development Project, one teacher had to take charge of about 60 pupils in the Bahuga. In the case of junior high school and senior high school, the number of pupils per teacher is far less than that of the elementary school in both provinces and Kabupatens. One teacher has to take charge of less than 20 pupils in national, provincial and Kabupaten levels except the junior high school in Lampung province, as seen in Table V-14.

Judging from the above mentioned various data, consideration for eduction in the project area should be given to up-grading of the knowledge and techniques for next generation for successful implementation of the project.

1.8 Health and Sanitation

Table V-15 shows the number of health facilities and number of doctors, etc. According to the table, one major health facility; hospital or public health center, has to deal with about 12,300 persons on an average in the case of national level, about 6,000 persons in South Sumatra province and about 10,700 persons in Lampung province. On the other hand, the rate of population to the number of doctor is about 14,000 persons in national level, about 15,000 persons in South Sumatra province and about 34,000 persons in Lampung province.

In the Kab. OKU, OKI and Kab. North Lampung concerned with the project area, the number of health facilities is higher than that of Indonesia and Lampung province against the total population, but the number of doctor is low. From this table, it can also be said that the number of doctors is comparatively short in each Kabupaten.

Table V-16 and V-17 show the number of patient and death by major diseases in South Sumatra and Lampung provinces and Kab. OKU, OKI and North Lampung in 1980.

In the South Sumatra province, Genetalia, Cholera and Lepra are major diseases, but death rate for these diseases are comparatively low. One of major diseases in Lampung province is G.E. Tampa Dehydrasi disease (Venereal disease) which is occupied about a half number of patients among the total petients. Particularly, Rabies causes high death rate of about 60% against the total number of patients.
Judging from the above mentioned data, it is necessary to carry out a plan for consolidation of health facilities, etc. not only hospital, health center and bed but also doctor, nurse and midwife, together with extension of sanitation knowledge and circumstances improvement.

2. PRESENT CONDITION IN THE PROJECT AREA

2.1 Rural Organization/1

South Sumatra province is administratively divided into eight Kabupatens (districts) and two Kotamadyas. These Kabupatens are further sub-divided into 85 Kecamatans (sub-districts). Under the Kecamatans, there are 2,347 villages (Desa) which are the basic unit of administrative structure in Indonesia. The old traditional local governance structure so called "Marga" still exists between Kecamatan and village. Average number of Kecamatan in one Kabupaten is counted for about nine. One Kecamatan covers about 27 villages on an average in the province.

Lampung province is administratively divided into three Kabupatens and one Kotamadya. These Kabupatens consist of 71 Kecamatans. Under the Kecamatans, there are 2,000 villages which are also basic units of administrative structure in the Lampung province. No traditional local governance structure "Marga" exists in this province. Average number of Kecamatan in one Kabupaten is counted for about 17. One Kecamatan has about 28 villages on an average in the province.

The proposed project area belongs to seven Kecamatans, i.e. Buay Madang and Cempaka in Kab. OKU, Kayuagung in Kab. OKI, and Bahuga, Menggala, Pakuan Ratu and Tulangbawang Tengah in Kab. North Lampung with 207 villages in total in the Kecamatans concerned with the project area.

2.2 Population and Family

Table V-18 shows the population in the seven Kecamatans concerned with the project area. The total population in the Kecamatans is estimated to be about 460,000 or 55 persons/km^2 in 1980. The average annual population growth rate in each Kecamatan was very high during the period from 1971 to 1980 because of substantial increase of transmigration. In particular, Kec. Menggala had the highest growth rate of more than 25% owing to intensive transmigration program during the period from 1977 to 1980.

/1: Statistical Year Book, Indonesia 1977-1978
Statistical Year Book, Indonesia 1979
Lampung Dalam Angka 1979

Kec. Buay Madang is the most densely populated with about 142 persons/km^2, followed by Kec. Cempaka with 103 persons/km^2. While, the population density of the Kec. Pakuan Ratu is extremely low, about 14 persons/km^2 as seen in Table V-18.

According to the field survey, total population in the project area is estimated at about 76,000 in 1980, of which about 18,500 are living in Muncak Kabau area, about 27,000 in Lempuing area and about 30,000 in Tulangbawang area respectively. Average family size is estimated to be about 5.2.

Based upon the data from field survey, the total number of farm household in the project area in 1981 is estimated at about 14,100 which correspond to about 96% of the total households, of which about 3,200 are in Muncak Kabau area, about 5,100 in Lempuing area and about 5,800 in Tulangbawang area. Average family size in each area is estimated at about 5.7, 5.1 and 5.2 respectively, and generally 2 to 3 persons per farm family are available for farm labor force.

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

2.3 Land Tenure and Land Holding

South Sumatra province is still population dispersive region with the population density of about 45 persons/km^2, whereas, Lampung province has a population density of 140 persons/km^2 in 1980. Although both provinces have accepted many transmigrants from the densely populated lands such as Java and Bali islands since 1905, there still remain much rooms for agricultural land development particularly in South Sumatra province. In the Repelita III started from 1979/80, more than 90,000 farm households in South Sumatra province and about 13,000 farm households of transmigrants in Lampung province were programmed to be settled to these provinces.

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 homeyard which should be registered to the Transmigration Office concerned during initial five years, and afterwards, the settlers are given the right of land ownership as far as they cultivate.

As stipulated in the Agrarian Law/1, the maximum land holding size is decided by the degree of population density in the area. The South Sumatra and Lampung provinces belong to non-densely populated area except Palembang and Tanjung Karang cities. The maximum land holding size per person is allowed to be 15 ha for paddy field and 20 ha for upland field in the maximum, but not exceed 20 ha in total.

In the project area, most of the people are transmigrants. Total number of household is estimated at about 14,700, of which about 96% are farm households. Although all the transmigrants except in a part of Kec. Menggala have been given 2 ha of lands as standard 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.

Statistics on the land holding size is not obtained so far. According to the field survey and door to door interviews to typical farmers in the project area, the average farming size is broadly categorized into two groups; 2.0 ha farm holding mainly in Muncak Kabau and Lempuing areas and 5.0 ha farm holding in the eastern half of Tulangbawang area (the Tulangbawang east sub-area). The western half of Tulangbawang area (the Tulangbawang west sub-area) can be categorized as 2.0 ha farm holding area in this study, where a resettlement program is going on.

The rate of owner farmer, owner cum tenant farmer and tenant farmer cum laborer are estimated to be around 95%, 4% and 1% respectively according to the farm economy survey in the project area.

/1: The Agrarian Law on No.56, 1960.

2.4 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 using the aerial photos with 1:20,000 scale prepared by JICA in August 1979, 1:50,000 scale prepared by FAO in 1971 and satellite image with 1:250,000 scale together with field check survey in the project area, and shown in PLATE No. V-1, -2 and -3. The Table V-19 shows the area extent of respective category of present land use in the project area.

Out of the total gross irrigable area of about 116,600 ha, the land under cultivation covers about 15,300 ha, and the shifting cultivation land (ladang) cropped with mainly cassava and upland paddy is estimated at about 14,100 ha at present. The remainings are covered with secondary forests, alang alang, perennial crops, village and others. In addition, some shifting cultivations for upland crops are practiced in the alang alang and secondary forest land. The present land use in each development area is further explained as follows.

(1) Muncak Kabau Area

The Muncak Kabau area, around 16,900 ha in gross, is located along the right bank of Komering river. This area is comparatively developed for agriculture, and had been settled by indigenious or spontaneous transmigrants since old time. Recently the transmigrants from Java island have settled in this area under the Government's transmigration program. The area is relatively flat, but some undulating lands extensively cover the project area. Total paddy land cultivated in the area is about 2,900 ha; 17% of total land of the area, and all of the paddy lands are still under rainfed conditions at present.

About 2,100 ha are planted with upland paddy, cassava, maize, peanut, soybean, etc. under rain-fed condition. Some perennial crops such as banana, coffee, coconuts, etc. are planted in levee land mainly along the Komering river and small tributaries commanding about 300 ha.

The grass land (alang alang); one of the potential cultivable lands, occupies about 800 ha, and are still non-productive. Forest lands are mainly covered by secondary forests, which occupy about 7,700 ha of lands. Some shifting cultivations are commonly practiced in the forest area.

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 homeyard which should be registered to the Transmigration Office concerned during initial five years, and afterwards, the settlers are given the right of land ownership as far as they cultivate.

As stipulated in the Agrarian Law/1, the maximum land holding size is decided by the degree of population density in the area. The South Sumatra and Lampung provinces belong to non-densely populated area except Palembang and Tanjung Karang cities. The maximum land holding size per person is allowed to be 15 ha for paddy field and 20 ha for upland field in the maximum, but not exceed 20 ha in total.

In the project area, most of the people are transmigrants. Total number of household is estimated at about 14,700, of which about 96% are farm households. Although all the transmigrants except in a part of Kec. Menggala have been given 2 ha of lands as standard 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.

Statistics on the land holding size is not obtained so far. According to the field survey and door to door interviews to typical farmers in the project area, the average farming size is broadly categorized into two groups; 2.0 ha farm holding mainly in Muncak Kabau and Lempuing areas and 5.0 ha farm holding in the eastern half of Tulangbawang area (the Tulangbawang east sub-area). The western half of Tulangbawang area (the Tulangbawang west sub-area) can be categorized as 2.0 ha farm holding area in this study, where a resettlement program is going on.

The rate of owner farmer, owner cum tenant farmer and tenant farmer cum laborer are estimated to be around 95%, 4% and 1% respectively according to the farm economy survey in the project area.

/1: The Agrarian Law on No.56, 1960.

2.4 Present Land Use

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(1) Muncak Kabau Area

The Muncak Kabau area, around 16,900 ha in gross, is located along the right bank of Komering river. This area is comparatively developed for agriculture, and had been settled by indigenious or spontaneous transmigrants since old time. Recently the transmigrants from Java island have settled in this area under the Government's transmigration program. The area is relatively flat, but some undulating lands extensively cover the project area. Total paddy land cultivated in the area is about 2,900 ha; 17% of total land of the area, and all of the paddy lands are still under rainfed conditions at present.

About 2,100 ha are planted with upland paddy, cassava, maize, peanut, soybean, etc. under rain-fed condition. Some perennial crops such as banana, coffee, coconuts, etc. are planted in levee land mainly along the Komering river and small tributaries commanding about 300 ha.

The grass land (alang alang); one of the potential cultivable lands, occupies about 800 ha, and are still non-productive. Forest lands are mainly covered by secondary forests, which occupy about 7,700 ha of lands. Some shifting cultivations are commonly practiced in the forest area.

(2) Lempuing Area

The area extends over 19,400 ha (gross) along the left bank of the Macak and the Lempuing rivers. Topographically this area is deemed to be the extension of the Belitang Proper Area, and has a fairly flat topography. This area has rapidly been developed for the settlement of transmigrants from the densely populated islands since 1972.

The low-elevated lands, around 4,900 ha, are cultivated with paddy under the rain-fed condition. Around 2,600 ha of lands are cultivated with upland crops such as upland paddy, maize, cassava, peanuts and soybeans. Some perennial crops such as banana, coconut, coffee and rubber are planted in about 500 ha. Some shifting culture and alang alang occupy about 2,900 ha of lands, and the secondary forest still covers about 5,600 ha.

(3) Tulangbawang Area

This area covers gross area of about 80,300 ha extending along the left bank of the Kanan and the Tulangbawang rivers between the confluence of the Umpu river with the Pisang river and Menggala. The land settlement by transmigrants was firstly commenced in the northern area of Menggala in 1977, and around 4,500 families have settled by the end of 1979/80.

Virtually, negligible lands of around 300 ha are cultivated with paddy, and around 16,700 ha are cultivated with various upland crops such as maize, cassava, soybeans and peanuts. Estate crops such as coffee, rubber, pepper and fruits are mostly planted in the levee lands. About 47,600 ha or 60% of the total area are still covered with primary or secondary forests. The alang alang area still occupies about 11,800 ha. Some shifting cultivation for upland crops are being practiced in the alang alang and secondary forest lands.

2.5 Present Cropping Pattern

Present cropping pattern prevailing in the project area are shown in Fig. V-1, V-2, V-3 and V-4, of which data were obtained through Kecamatan Agricultural Extension Offices concerned, and confirmed by the farm economy survey and land use maps.

Paddy is the main crop in the project area except Tulangbawang Area, where the upland crops are mainly cultivated.

Type-I cropping pattern is predominant in the Muncak Kabau area. Mainly rain-fed paddy is planted from the onset of the rainy season, normally from the middle of October. The planting period of paddy is approximately three months depending on the rainfall pattern which varies from year to year. The harvesting period of paddy lasts for about four months from mid-February to mid-May. No dry season paddy is cultivated in this area. Upland crops such as maize, cassava, soybeans and peanuts are mainly planted from the beginning of rainy season in general and harvested from May to July in the case of cassava, and from February to April in the case of other cereals depending on the varieties. Crop cultivation area per farmer is rather small, about 1.36 ha except perennial crops per household on an average.

Type-II cropping pattern mostly prevails in the Lempuing area. Out of 1.75 ha of total farm land provided by the Government, about 0.96 ha is planted with rainy season paddy, and 0.44 ha is planted with upland paddy and upland crops under rain-fed condition. The planting period of paddy is about three months, and its harvesting period lasts for about four months from mid-February to mid-May. The planted area of dry season paddy is not seen throughout the project area. About 0.10 ha of farm land is planted with perennial cash crops such as banana, coconut, coffee, rubber, clove and pepper.

Type-III cropping pattern is predominant in the Tulangbawang west sub-area where spontaneous and governmental transmigrants have been settled. About 0.19 ha of rainy season paddy and about 0.61 ha of upland paddy and upland crops per farm household are planted on an average.

The farmers in this area mainly cultivate upland crops and some perennial crops. A few rainy season paddy is also cultivated in low lands mainly along the Kanan river. A large part of the area is still covered with forest and alang-alang.

Type-IV cropping pattern is observed in the Tulangbawang east sub-area. The transmigrants in this area have been provided with about 5 ha of lands including 0.25 ha of home yard. Each farmer cultivates about 0.65 ha of upland paddy and 0.63 ha of upland crops. Some perennial crops such as rubber, coffee, coconut, clove and fruits are cultivated for about 0.2 ha on an average.

2.6 Present Farming Practices

2.6.1 Variety of Crops

All the works for present farming in the project area are operated manually and by using animal power, and it can be said that the present farming practices are still conventional resulting in rather low yields of crops. Rain-fed cultivation prevails all over the proposed irrigation development area.

Table V-20 shows the various varities of paddy being cultivated in the project area. These data were collected from the Kecamatan Agricultural Extension Offices and village offices, and through farm economy survey. Senggoto, Pembongkar, Kwatik, etc. of paddy varieties are the prevailing traditional varieties throughout the project area at present. IR varieties such as PB-5, IR-32, IR-36 and IR-38 have been also introduced to the low land area. According to the field survey and farm economy survey, high yield varieties introduced to the project area cover only about 10 to 20% of the area planted. Growing period varies from about 150 to 240 days for traditional varieties and from 115 to 135 days for high yield varieties. Fertilizer application in the project area is relatively low, ranging from 10 to 30 kg per hectare of urea and 5 to 15 kg per hectare of triple super phosphate (T.S.P.). A little amount of agro-chemicals is used in the project area, averaging 1 to 2 liters per hectare at one time as seen in Table V-21.

In recent years the rainy season paddy has suffered from serious damages by insects such as Walang Sangit and Beluk/Sundap and rats. The area in which BIMAS/INMAS programs are introduced is quite limited as seen in Table V-22 mainly because of newly settled area and no irrigation facilities provided. Labor intensive farming is predominant for rice cultivation. Ani-ani system is still prevailing for rice harvesting except for the improved high yield varieties.

As seen in Table V-20, Padi Bulu variety of upland paddy is the prevailing variety in the project area. Present upland paddy is mainly cultivated in upland field (Tegal) and some shifting cultural lands (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 cash crops such as banana, coconut, rubber, coffee, clove, pepper and orchard are mainly planted in either river levee land or some elevated land where natural soil characteristics and its drainability are favorable for the crop growing. No fertilizer and chemicals are commonly used for the perennial crop plantation. The weeding for these crops is carried out manually.

2.6.2 Area under BIMAS/INMAS Programs

Table V-22 shows the area under the BIMAS/INMAS Programs in the project area in 1979/80, which is estimated on the basis of the field survey and farm economy survey. The area under BIMAS/INMAS programs covers only 8% of the total paddy fields in the project area because of no irrigation facilities at present. The area covered by the BIMAS/INMAS programs is about 14% of the total paddy fields in Muncak Kabau area, about 5% in Lempuing area and about 10% in the Tulangbawang west sub-area, all of which are cultivated under rain-fed condition in the rainy season only.

According to the field survey, the amount of credit provided to the farmers in the project area is about Rp.21,000 per hectare on an average.

2.6.3 Farm Inputs and Labor Requirements

As seen in Table V-21, a few amounts of fertilizers and agro-chemicals are applied for paddy cultivation, but not used for other crops in general. Although extension seeds are essential to keep yield high, the farmers in the project area commonly use their own seeds produced in their fields. The fertilizers and agro-chemicals are normally supplied from KIOS to only the farmers whose lands are included in BIMAS/INMAS programs.

The labor requirements for cultivation of paddy and other crops are summarized in Table V-23. A large part of the works for farming is generally operated by family labors except for land preparation, transplanting and harvesting of paddy at present throughout the project area.

2.7 Crop Yeild and Production

Yield of paddy varies substantially with variety, availability of irrigation water, amount of farm inputs, etc. ranging from 1.2 to 2.8 t/ha in the project area. Such low-yields are considered to be caused by such various factors as lov fertility of soils, no provision of technical irrigation and drainage systems, conventional farming practices, less application of fertilizers and chemicals, insufficient agricultural support services, etc. Under the BIMAS/INMAS programs, the yields of improved varieties range from 3.0 to 4.0 t/ha in the irrigated Belitang Proper Area.

Yields of upland crops vary also substantially with variety, soil fertility, rainfall condition and quantity of farm inputs used. Particularly in the hilly lands the crops often encounter severe drought and lack of nutrient and fertility, resulting in low yields. Based upon the various data and information obtained in the project area, the average crop yields are estimated as shown in Table V-24.

In order to confirm the yield of paddy, the sample surveys were conducted for the dry season paddy at 12 plots selected in the Belitang area during the Feasibility Study period in 1980. The results of the surveys are summarized in Table V-25 and Fig. V-5. As seen in Table V-25, paddy yields in the Belitang area are generally low, about 2.3 t/ha as

dry paddy on an average ranging from less than 1.0 t/ha to 4.0 t/ha, of which the yield in BIMAS area averages about 3.0 t/ha, while that in non-BIMAS program area averages about 1.7 t/ha. From the survey result, it can be said that the paddy yields in the BIMAS program area are higher than those of non-BIMAS program area as seen in Table V-25. Judging from the correlation coefficients between yield and yield components, obtained on the basis of the field survey during the feasibility study time in 1980, the paddy yield in the surveyed area is considered to be governed by the number of panicles per m^2 (R = 0.86) and the percentage of ripened grains (R = 0.73). The other 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 the optimum irrigation conditions.

The present total crop production of paddy and upland crops was estimated based on the crop-harvested area given in Table V-26 and the yields given in Table V-24. Total crop production thus estimated is as shown in Table V-27. Table V-28 and V-29 show the present crop-harvested area and production for past three years in each Kecamatan concerned with the project area.

2.8 Livestock

Various kinds of livestock are raised in the project area. They are cattle, buffalo, goat, sheep, pig, chicken and duck. Table V-30 and V-31 show the number of livestock and slaughter of livestock in Kab. OKU, OKI and North Lampung in past three years, and Table V-32 and V-33 show the number of livestock and slaughter of livestock in the Kecamatans concerned with the each development area.

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. As seen in Table V-32, the number of large animal per farmer is insufficient to plow the lands within the limited period of land preparation, especially in the Tulangbawang area; about 0.18 head/per farmer.

The number of slaughter in the Kabupatens and the Kecamatans concerned with the project area has been increased gradually in recent years, but the number of slaughter is still less particularly for large animals as compared with the present number of large animals. It seems that the certain numbers die of disease and some are sold to others.

Table V-34 shows the number of livestock in the project area. The number of cattle and buffalo is about 2,730 heads in total corresponding to about 0.18 head per hectare of the cultivated land (Sawah + Tegal) in the project area, which is insufficient for land preparation of paddy cultivation. The other livestock such as goat, sheep, pig, chicken and duck raised in the project area are mainly for home consumption and sold in local market to some extent.

Table V-35 shows the number of slaughter of livestock and egg production of chicken and duck in the project area. The number of slaughter was extremely small particularly in the case of large animals as compared with the present number of large animals such as cattle and buffalo.

2.9 Market and Price

2.9.1 Market

Main farm product for marketing in the project area is rice. The surplus of paddy produced in the area is mainly sold to broker, rice miller and BUUD/KUD. The collected paddy by broker and BUUD/KUD is sold to wholesaler and DOLOG (Depot Ligistik) respectively after milling. The amount of rice for marketing varies annually according to the variation of the amount of paddy produced. However, the price of rice is stabilized by the Government through the operation of DOLOG. In South Sumatra and Lampung provinces, the quantity of rice purchased by KUD/DOLOG is insignificant at present as shown in Table V-36 and V-37.

Table V-38 shows the number of warehouse for cereals in South Sumatra and Lampung provinces. Total storing capacity is estimated to be about 117,000 tons of which DOLOG handles only 36,000 tons, about 30% of the total in South Sumatra province. In Lampung province, total storing capacity is estimated to be about 43,000 tons, of which DOLOG handles

only 15,000 tons, about 35% of the total capacity. At present these warehouses are mainly used for storing the imported rice.

Fig. V-6 shows the present marketing flow of rice in the project area. The surplus of rice is marketed through three channels, namely, DOLOG through BUUD/KUD, wholesaler through broker and private rice mill and local market.

Regarding the upland crops, the farmer sells those products through either itinerant buyers or local markets in general. Market flow of major farm inputs such as fertilizers and agro-chemicals is broadly divided into two flows; free market flow and controlled market flow. The former is for private estates, and the latter is for BIMAS/INMAS programs which is controlled by the Government.

For the farmers under BIMAS/INMAS programs, distribution of urea is mainly handled by P.T. Pusri (Urea Production Co., Ltd. which was established in 1964 by the governmental fund), and all other fertilizers, chemicals and some farm implements are dealt by P.N. Pertani (Fertilizer Supply State Enterprise).

The farmers under BIMAS/INMAS programs can purchase necessary fertilizers with price partly subsidized by the Government.

2.9.2 Farm Gate Price

The seasonal fluctuations in farm gate prices of the farm products such as rice, polowijo crops and coconuts are relatively large due to the inadequate marketing and transportation systems, shortage of storage facilities and the lack of market information in general (see Fig. V-7). The farmers usually sell their farm products to local market in the neighbourhood, the millers, the millers agents, or to itinerant buyers immediately after the harvest.

In an attempt to stabilize the price of rice, governmental agency (Badan Urusan Logistik = BULOG) functions in the marketing with DOLOG in the provincial level. DOLOGs in South Sumatra and Lampung provinces purchase and sell the rice, when the price comes down under the floor price

or the price is raised over the ceiling price at the central market in Palembang and Tanjung Karang in order to stabilize the price of rice in market. The floor price and ceiling price are set at Rp.156/kg and Rp.195/kg in South Sumatra province in 1979/80, and Rp.120/kg and Rp.195/kg in Lampung province in 1980/81 respectively. The floor price and ceiling price of rice in Jakarta are set at Rp.195/kg and Rp.237/kg in 1981/82 (Refer to Fig. V-8).

The farm gate prices of the products and the prices of the farm inputs in the project area are estimated based on the data obtained from the village offices and farm economy survey in the project area as shown in Table V-39.

2.10 Agricultural Support Services

2.10.1 General

Agricultural support services are one of the most important sectors for the agricultural development, in particular, for increase of crop production and subsequent increase of farm income as well as improvement of farmers' living standard.

2.10.2 Research and Extension Services

The research works of agriculture, especially for food crops, are centralized and undertaken by the Central Research Institure of Agriculture (CRIA), Bogor in West Java. As described in the previous section 1.3, six branch research stations carry out the research works under the supervision of the CRIA in whole Indonesia.

The branch stations usually undertake the experimental works and collect the information concerning technical problems on agricultural matters from farmers through several experimental farms scattered over their commanding areas. These branch stations also produce the foundation seeds of newly recommended varieties of main crops.

Tegineneng Center in Lampung province, located near Tanjung Karang, has played one of the most important role on improvement of agriculture

since 1972. The major works of this center are selection tests of suitable varieties for paddy and upland crops, application tests of fertilizers, control tests of pests and diseases, seed multiplication of paddy and upland crops, training for PPL and farmers, farm economy survey etc.

In South Sumatra province, the main research works carried out by the provincial government are field tests on the trial plots. The main items of the tests carried out in the past few years were;

(a) variety tests on paddy and upland paddy,
(b) fertilizer tests for paddy,
(c) protection tests for plant insects and diseases, and
(d) second crop variety tests and fertilizer tests, etc.

The test works under the detailed farming and measuring plan directed by CRIA are carried out mostly by the students of the Agricultural Faculty, Srivijaya University in Palembang, and these data are analysed by CRIA.

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 intends to establish an Agricultural Development Center (ADC) with an additional function of seed multiplication center in each province and several Rural Extension Center (BPP or REC) in rural area.

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

The BPP is a kind of base camp for extension education activities with the function of preparation of extension programs, dissemination on agricultural information and technical training for leading farmers at the local level. One PPM (Chief of BPP) commands around ten PPL (Field Extension Worker) and covers about ten WILUD (Wilayah Unit Desa) commanding 3 to 4 villages on an average.

In the project area, the total number of PPM and PPL are 6 and 51 respectively, as seen in Table V-40. Each PPL covers four villages; about 1,400 farmers and about 1,600 ha of farm lands on an average.

One PPL has to provide his service to the farmers as large as about 1,600 ha of farm lands on an average, and gives the guidance on improved farming techniques and knowledge to the farmers either directly or through the Kontak-tani who is selected from each village. One Kontak-tani covers approximately 170 farmers or 190 ha of paddy fields.

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

In view of limited number of PPLs, it is desired to equip them with better extension facilities such as jeeps and motorcycles so as to enlarge his activities as large as possible. Furthermore, the number of PPLs should be increased and strengthened so as to give more intensive guidance to the farmers.

For reference, Fig. V-9 shows the extension organization in South Sumatra province at present.

2.10.3 Seed Multiplication and Distribution

One of the most important factors of the agricultural inputs for production increase is introduction of improved seeds for crops. The Government of Indonesia has placed particular emphasis on the improvement of paddy since the beginning of BIMAS program in 1964.

The stock seeds of new recommended varieties of paddy in South Sumatra province, such as IR-36 and IR-38, are produced at the Provincial Seed Center located at BX-X in Kec. Belitang in the center of the Belitang Proper Irrigation Project Area. The foundation seeds necessary for stock seed production in this center are provided by CRIA, 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/BUUD and seed distributors according to the BIMAS/INMAS programs and at the request from farmers.

At present, total planted area for paddy seed production is estimated to be about 620 ha including Provincial Seed Center, Seed Stations, seed growers and demonstration farmers in whole South Sumatra province. The total planted area for paddy seed production is estimated to be about 150 ha in Kab. OKU and about 50 ha in Kab. OKI.

On the other hand, planted area for paddy seed production in Lampung province is estimated to be about 100 ha including Tegineneng Center, Provincial Seed Center, Seed Stations, seed growers and demonstration farmers. In Kabupaten North Lampung, total planted area for paddy seed production is estimated to be about 30 ha (Refer to the Table V-41).

At present, required amount of paddy seeds for 90,000 ha of the BIMAS/INMAS programs area of South Sumatra province is estimated at about 2,200 tons in total, of which about one half is supplied with the extension seeds and the rest of a half is provided by farmers themselves. The required amount of paddy seeds for 70,000 ha of the BIMAS/INMAS programs area in Lampung province is estimated at about 1,700 tons in total.

In future, the quantity of improved seeds to be required for the cultivation of rainy season paddy in 68,300 ha of the project area is estimated at about 560 tons, provided that the seeds are renewed in every 3 years.

2.10.4 Agricultural Credit

The Indonesia People Bank (BANK RAKYAT INDONESIA-BRI), which was established in 1971, is the state bank and specialized in agricultural credits covering whole country. The Bank is authorized to finance BIMAS/INMAS credit to qualified individual farmers. Besides, using its own credit funds, the Bank provides the loan to farmers' groups 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.

There are three kinds of loan for agriculture in the bank loan, i.e. short term, medium term and long term loans. The BIMAS/INMAS credit is the short term loan with the loan condition of 7-month loan term and 1% monthly interest rate.

The past records served by the BIMAS/INMAS programs in Kab. OKU, OKI and North Lampung are given in Table V-42. The annual average areas under the programs are about 14,500 ha of lowland paddy in Kab. OKU, about 4,200 ha in Kab. OKI and about 9,700 ha in Kab. North Lampung respectively. The areas under the BIMAS/INMAS programs cover about 30% in Kab. OKU, about 5% in Kab. OKI and about 46% in Kab. North Lampung. These figures are comparatively low in comparison with about 50% of that in whole Indonesia in 1979/80. The reason for this small coverage is mainly due to the fact that there are few technical and semi-technical irrigation facilities in the area.

Table V-43 shows the records on total amount of the BIMAS credit provided for the farmers and its repayment in each Kabupaten concerned with the project area. As seen in the Table, the repayment of the credit is relatively low; 49% in Kab. OKU, 40% in Kab. OKI and 43% in Kab. North Lampung. This is mainly due to the fact that the repayment time usually comes immediately after the harvest, when the price of rice is the lowest. Consideration should be given to this fact for the improvement of farmers' credit situation.

The area under the BIMAS/INMAS programs in the project area is only about 670 ha of rainy season paddy or about 8% of the total paddy fields in the project area as seen in the previous Table V-22. This low coverage in the project area is mainly attributed to the fact that there are no notable technical and semi-technical irrigation facilities and insufficient agricultural supporting services.

2.10.5 Cooperatives

The existing farmers' cooperatives in each Kecamatan concerned with the project area are listed in Table V-44. BUUD/KUD (Badan Usaha Unit Desa/Koperasi Unit Desa) plays an important role in providing various services for the farmers to achieve leveling-up of their living standard.

The main activities of this organization are to purchase the farm products directly from farmers and to re-sell those to DOLOG. The other activities of BUUD/KUD are the supply of necessary farm inputs such as improved seeds, fertilizers, agro-chemicals, some farming instrument marketing of farm products. The number of the village units which have BUUD/KUD corresponds to about 12% of the total village units in Kab. OKU, 6% in Kab. OKI and 2% in Kab. North Lampung respectively at the Kabupaten level, and 11% in the Muncak Kabau area 7% in the Lempuing area and 3% in the Tulangbawang area at the level of the development area.

The main processing facility owned by BUUD/KUD is rice mill. In the project area, the number of rice mill is counted for 177 as seen in Table V-44. Most of the rice mills have small capacities ranging from 1 to 2 t/day.

BRI unit village is mainly dealing with farmers' credit in each village. The number of unit BRI is extremely low throughout the development area, about 8% in the Muncak Kabau area, about 5% in the Lempuing area and about 3% in the Tulangbawang area of the total number of village respectively.

Table V-44 also shows the number of KIOS established in each Kabupaten and development area. The main function of KIOS is to supply farm inputs and small farming equipment under the control of BUUD/KUD. The number of the village unit which has KIOS is only 14, corresponding to 7% of the total village units in the project area, especially no KIOS in the Tulangbawang Area.

2.10.6 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 their related structures. The construction of quaternary canals and reclamation for paddy fields are carried out by farmers themselves under the guidance of the Irrigation Section of the Provincial Public Works and Land Development Unit (UPP) of the Provincial Agricultural Extension 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 farmers' organization.

b) The semi-technical irrigation works cover relatively small area which may be limited to one District. In this case, only the headworks are constructed by the Directorate of Irrigation, while the canals and their related structures are constructed by farmers themselves. The management and supervision of the headworks are generally transferred to the Kecamatan authorities, and water distribution below the tertiary canals is managed by the farmers' 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 carried out by the farmers' group. The maintenance of the structures and also distribution and management of irrigation water are entirely conducted 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 a commanded area of about 20,600 ha (see Fig. V-10).

The Government has a plan to establish a water users' association (P3A) in every village which holds available water source for irrigation, but it has not been established so far in the project area.

2.10.7 Land Reclamation Service

The large scale irrigation projects in Indonesia are implemented under the responsibility of DPU. As for the construction works, the responsibility of DPU was previously limited 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, quarternary canals, farm ditches, farm roads 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.

Because of the lack of fund, inadequate local leaders and insufficient technique for on-farm development, the construction works of on-farm development scheme are usually delayed in its commencements. In order to improve such stagnant condition, Indonesian Government has decided that the construction of tertiary canal with irrigation facilities of quaternary canal be carried out by DPU, and land development be promoted under the responsibility of the Ministry of Agriculture.

Following this basic policy, the Land Development Project (LD Project) was introduced in 1979 by the Ministry of Agriculture to promote and facilitate the construction of on-farm development (Fig. V-8). 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 in providing the survey and design, guidance and supervision for the construction works to be conducted by the UPP.

The LD Project is carried out under the responsibility of Director General of Food Crop Agriculture. Under the supervision of Director General of Food Crop Agriculture, a project leader is appointed at the central office, and at the same time, a project leader in each province is also appointed. The Project Leader at the provincial level decides the operational area of UPP which covers about 1,000 ha of land reclamation, and 2,000 ha of "investigation" of the land to be developed within two years (Refer to Fig. V-10).

Main tasks of UPP are: (1) to disseminate information concerning the Land Development Project, (2) to assist the farmers in obtaining prefinancing loan, (3) to investigate the candidate area, (4) to supervise and control the survey, design and construction of land reclamation to be done by contractor and/or farmer's group, (5) to assist the Agrarian Service to issue land certificate, (6) to release prefinancing loan from the Branch Office of Bank Indonesia as handling agent, (7) to transform prefinancing loan into Small Investment Credit (KIK) and (8) to monitor all activities and make reports to Director General of Food Crop Agriculture.

The LD Projects included in the Repelita III for South Sumatra and Lampung provinces are listed in Table V-45 and V-46 respectively. The amount of loan by the type of works in the LD Projects is shown in Table V-47 and V-48 for South Sumatra and North Lampung provinces respectively.

PTPT (or PLPT) is one of the new organizations established under the Ministry of Public Works and operated under the direct control of the Provincial Public Works. The main purposes of the establishment of PTPT are to strengthen the coordination among Transmigration Office, UPP Office and Agricultural Office and to prepare settlement areas for the governmental transmigration and resettlement program.

The main tasks of PTPT are: (1) to survey and plan the proposed areas for the transmigration or resettlement, (2) to execute land clearing and (3) to construct roads and public facilities. The areas thus prepared will be handed over to Kabupaten Transmigration Office 5 years after the completion of reclamation.

Table V-57 shows the schedule of resettlement program in Kab. North Lampung for the period from 1980/81 to 1983/84. For the execution of this program, the Provincial Office made a plan to reclaim the following areas:

(1)	Sungkai Utara	5,000 ha
(2)	Sungkai Selatan	5,000 ha
(3)	Blambangan Umpu	15,000 ha
(4)	Pakuan Ratu	36,000 ha
(5)	Mesuji	30,000 ha
(6)	Way Tuba	15,000 ha
(7)	Tulangbawang	4,500 ha

Among these areas, the around 80% of the Pakuan Ratu area is included in the Tulangbawang Development Area of the project.

2.11 Present Farm Budget

The study on the present farm budget is made based upon the data and information obtained mainly from the field survey and farm economy survey. The analysis of the present farm budget is made by taking a typical farm with a land holding of 1.75 ha in the Muncak Kabau area, the Lempuing area and the Tulangbawang west sub-area and 4.75 ha in the Tulangbawang east sub-area respectively.

Table V-49 shows the roughly estimated farm budget for typical farmer in the project area under the present condition. For the Type-I and Type-II cropping patterns, the main source of farm income mainly depends on paddy, while in the Type-III and Type IV cropping patterns, paddy is not so predominant. Income from the livestock is still insignificant throughout the project area. The farmers raise mainly chicken and ducks including eggs for the home consumption. Incomes from miscellaneous activities such as selling of firewood and engagement as temporary labor are rather high as compared with livestock income. The average annual farm income is still low in the project area as compared with that in whole Indonesia. Recently, the living expenses of farm family have increased substantially due to up-grading of living standard. Surplus of their budget is accordingly rather small as seen in Table V-49.

2.12 Transmigration and Resettlement

Transmigration from the densely populated islands such as Java and Bali to the Sumatra island was initiated in 1905 under the Governance of Netherlands. After independence, the transmigration program was carried out by the Government under the responsibility of Ministry of Manpower, Transmigration and Co-operatives.

According to the Transmigration Office in South Sumatra province, the total number of migrant during 31 years from 1950 to 1980 was about 57,000 families. Table V-50 shows the progress of transmigration under

the Government program in Kab. OKU and OKI from 1950 to date. Out of the total number of migrant in South Sumatra province, about 26,500 families or 46% and about 9,000 families or 16% of the migrants were settled in Kab. OKU and OKI respectively. For reference, Fig. V-12 shows the organization of Provincial Transmigration Service Office in South Sumatra province.

In the Lampung province, the total number of migrant during 31 years from 1950 to 1980 was about 74,000 families according to the Transmigration Office in Tanjung Karang - Telukbetung. Out of the total number of migrant in Lampung province, about 27,000 families or 36% of migrants were settled in Kab. North Lampung from 1959 to 1980 as seen in Table V-51.

In the Tulangbawang area about 4,500 families of governmental transmigrants and about 200 families of spontaneous migrants were settled in the northern part of Menggala from 1976/77 to 1979/80.

Following the transmigration policy in Repelita I and II, the Repelita III also places particular emphasis on the transmigration program as shown in Table V-52, in which 500,000 families in total are planned to be settled during the five years of Repelita III period in whole Indonesia. Table V-53 and V-54 show the transmigration programs for Kab. OKU, OKI and North Lampung during the Repelita III period.

In order to implement the settlement successfully, the Government will provide infrastructures with certain quality and living accommodation to the transmigrants as well as commodities such as food, clothes, cooking utensils and farm inputs needed, such as seeds, seedling, fertilizers, etc. Table V-55 and V-56 show the facilities to be provided and the materials as well as goods to be supplied by the Government to the transmigrants. As seen in Table V-56, each farm household of transmigrant is given 2 ha of land including 0.25 ha for home yard, 0.75 ha for upland field and 1.0 ha for paddy field at the time of transmigration except the Tulangbawang east sub-area, where each household of transmigrants is provided with 5 ha of land as the special transmigration area.

As mentioned in the Section 1.1 hereof, the population increase in Lampung province is quite high, 5.8% per annum for the past ten years, mainly due to the increase of population of transmigrants from the densely populated islands like Jave and Bali. These transmigrants, particularly the spontaneous ones, settled in forest areas and deteriorated the forest lands to great extent, because of their agricultural activities. Taking these facts seriously, the Lampung Provincial Government has recently decided not to receive any transmigrants, and instead, to promote the resettlement program for the spontaneous transmigrants who have settled in the forest areas.

According to the resettlement program, about 35,000 families are scheduled to be resettled in the Kab. North Lampung as seen in Table V-57 in four years from 1980/81 to 1983/84. For the successful execution of resettlement, the Government will provide to the resettlers almost the same public facilities and subsidies as those for general transmigrants.

2.13 Present Constraints

2.13.1 Socio- and Agro-Economic Constraints

From the socio- and agro-economic viewpoints, the present major constraints are pointed out as follows:

(1) insufficient and ineffective coordination between respective administrative organizations concerned,

(2) inefficiency of marketing system for smooth flow of farm products and farm inputs including the DOLOG activities,

(3) insufficient agricultural support services such as agricultural extension services, seed multiplication system and agricultural credits: especially, increase of field extension worker (PPL) and arrangement of extension equipment, etc. are essential, and

(4) lack of farmers' organization and/or associations, especially village unit cooperatives (KUD), water users' associations and farmers group for high crop production increase.

2.13.2 Agricultural Constraints

The present constraints against the agricultural development are summarized as follows:

(1) high shortage of irrigation water throughout the whole project area due to no irrigation facilities,

(2) inferior climatic conditions; uneven distribution of rainfall,

(3) shifting culture,

(4) insufficient and less proper control of diseases, insects and rats in fields,

(5) insufficient transportation facilities for agricultural inputs and outputs,

(6) lack of effective water management,

(7) lack of modern crop cultivation knowledge and techniques, and

(8) less interest of local farmers to intensified agriculture.

3. AGRICULTURAL DEVELOPMENT PLAN

3.1 Basic Concept for Agricultural Development

The production of food-stuff in Indonesia is still insufficient for the domestic demand which is increasing in proportion to the population growth and the increase of per-capita income. The same thing can be said for the South Sumatra province and Lampung province. The specific objective of the agricultural development is to achieve self-sufficiency in staple food. Based upon this basic agricultural policy of the Indonesian Government, both South Sumatra province and Lampung province have also laid the agricultural targets in Repelita III as shown in Table V-58. Along this line, the following basic concepts are considered for agricultural development:

(1) Increase and stabilization of crop yield and production through the provision of proper irrigation and drainage facilities.

(2) Increase in production of staple food by introducing the improved irrigation farming as well as high yield varieties under double cropping of paddy.

(3) Development of new farm land for smooth implementation of transmigration and resettlement program.

(4) Leveling up of living standard and more equitable distribution of income of the people.

3.2 Proposed Land Use

The irrigation development area is selected based upon the land suitability in the project area of about 116,600 ha of which the net irrigable area would be about 68,300 ha in total, consisting of about 10,700 ha of the Muncak Kabau area, about 13,100 ha of the Lempuing area, about 13,200 ha of the Tulangbawang area in its eastern part (Tulangbawang east sub-area) and about 31,300 ha of the Tulangbawang area in its western part (Tulangbawang west sub-area).

The net irrigable area thus selected will mainly be developed for double cropping of paddy and polowijo. The remaining area of 48,300 ha is mainly used for perennial crops, village yards, canals, roads, forest reserves, etc. as shown in Table V-59.

3.3 Proposed Cropping Pattern

Paddy is selected as a main crop in the project area. Cropping patterns in the project area are studied taking into account the climate (see Fig. V-13), 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 particularly sunshine duration provides the most important factor for determining the optimum cropping pattern for increasing paddy yield.

Fig. V-14 and Fig. V-15 show the proposed cropping patterns which are considered to be the most beneficial to the farmers, and Fig. V-16 through Fig. V-19 show the alternatives of the proposed cropping patterns in view of crop diversification and water saving.

In order to maximize the potential productivity and profitability of the project, high yield and more tasty varieties of paddy are to be introduced as much as possible.

Cultivation of polowijo crops such as peanuts, soybeans, maize and green bean will also be introduced into the area after harvesting paddy. Especially peanuts and soybeans are considered to be essential not only for local consumption but also for improvement of soil condition and increase of farm income.

The cultivation of perennial crops such as rubber and coffee will be introduced taking into account the topography of land, farmers' intention and export of cash crops.

In addition to the above-mentioned crops, it is also recommended that green manure be cultivated during the fallow period as large as possible for the purpose of soil concervation and as the feed crops for livestock. In order to introduce these proposed cropping patterns into the project

area successfully, it is inevitable to reinforce the present agricultural support services such as agricultural extension services, seed multiplication and its distribution system, cooperatives and water users' groups as well as improvement of transportation networks.

The following cropping pattern Type-I and Type-II are used for the estimate of agricultural benefit and the calculation of water requirements. These proposed cropping patterns are mainly introduced into the following respective areas:

(1) Cropping pattern Type - I: This cropping pattern will mainly be introduced in the Muncak Kabau area, Lempuing area and the Tulangbawang west sub-area. In these areas, the total area of 2 ha per farm consists of a farm land of 1.75 ha and a homeyard of 0.25 ha. The farm land of 1.75 ha further consists of an irrigated paddy field of 1.5 ha and a perennial crop field of 0.25 ha which will not be irrigated. For the assessment of the irrigation benefit in the economic evaluation, only the benefits to be derived from 1.5 ha of the irrigated land is counted.

The Muncak Kabau area has relatively flat lowlands. This area has been settled by two types of transmigrants, i.e. spontaneous and general transmigrants. The Lempuing area has flat to gently sloping lands. Most of the area has been settled by the general transmigrants since 1972. The Tulangbawang west sub-area is mostly covered with forest at present. Many streams run in the north-south direction, and dissect the area into small patches. Some areas along the Tulangbawang river have been settled by spontaneous transmigrants.

(2) Cropping pattern Type - II: This cropping pattern will mainly be introduced into the Tulangbawang east sub-area located in the northern part of Menggala. This area has relatively flat to gently undulating topography. This area has been settled by the general transmigrants since 1977, and every transmigrant has been given 5 ha. The land of 5 ha thus distributed consists of a farm land of 4.75 ha and a home yard of 0.25 ha. The farm land of 4.75 ha comprises the irrigated paddy field of 2.75 ha and the non-irrigated perennial crop field of 2 ha. In the assessment of the irrigation benefits only the benefits from 2.75 ha of irrigated land is counted in this case also.

The sowing or transplanting periods and harvesting periods of crops in each proposed cropping pattern are tabulated as follows:

Type of Cropping Pattern	Crops	Sowing or Transplanting Period		Harvesting Period	
I	Rainy season paddy	Early Dec.	Late Jan.	Mid. Mar.	Early May
	Dry season paddy	Late Apr.	Early Jun.	Late Jul.	Early Sept.
	Polowijo	Mid. Jun.	Mid. Jul.	Mid. Sept.	Mid. Oct.
II	Rainy season paddy	Early Dec.	Late Jan.	Mid. Mar.	Early May
	Dry season paddy	Mid. May	Early Jul.	Mid. Aug.	Early Oct.
	Polowijo	Early Feb.	Early Mar.	Mid. May	Mid. Jun.
I-1	Rainy season paddy	Early Dec.	Late Jan.	Mid. Mar.	Early May
	Dry season paddy	Late Apr.	Late May	Late Jul.	Late Aug.
	Polowijo	Mid. Jun.	Mid. Jul.	Mid. Sept.	Mid. Oct.
I-2	Rainy season paddy	Early Dec.	Late Jan.	Mid. Mar.	Mid. May
	Dry season paddy	Early May	Mid. Jun.	Early Aug.	Mid. Sept.
	Polowijo	Late Jun.	Late Jul.	Late Sept.	Late Oct.
I-3	Rainy season paddy	Early Dec.	Late Jan.	Mid. Mar.	Early May
	Dry season paddy	Late Apr.	Early Jun.	Late Jul.	Early Sept.
	Polowijo	Mid. Jun.	Mid. Jul.	Mid. Sept.	Mid. Oct.
	Polowijo (Green bean)	Early Sept.	Late Sept.	Early Nov.	Late Nov.
II-1*	Rainy season paddy	Early Dec.	Late Jan.	Mid. Mar.	Mid. May
	Dry season paddy	Late Jun.	Late Jul.	Late Sept.	Late Oct.
	Polowijo	Early Feb.	Early May	Mid. May	Mid. Jan.

Note * : Alternative pattern for Type-II.

3.4 Proposed Farming Practices

Together with the introduction of modernized irrigation and drainage system, the improved farming practices will be introduced into the area to maintain the high crop productivity. These are use of high yield variety, proper fertilizer application, pest and disease control, agro-mechanization, proper management of irrigation water, etc.

3.4.1 Lowland Paddy

Generally, the yield of paddy is mainly affected by the number of grains per unit area and percentage of ripened grains as explained in Fig. V-21. The results of analysis of sample survey carried out in the project area also indicate that the important factors for the increase of paddy yield are to increase the number of panicles per unit area and the high percentage of ripened grains. The essential points to be taken for the above two factors are presented in Fig. V-20.

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.

Varieties of paddy being cultivated in the project area at present are PB-5, IR-36, IR-38 as the high yield varieties, Pelita I/1, Pelita I/2 as the improved local varieties and Senggolo, Pembongkar, Kwatik as the local varieties, etc. (Refer to Table V-20). These are cultivated under rain-fed conditions with a little or without agricultural inputs such as fertilizers and agro-chemicals. Thus, yield of paddy in the project area is comparatively lower than that 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.

For the increase of yields, distribution of good quality as well as high yielding varieties of seeds from the seed center to the farmers is essential. In this context, the IR series such as IR-36 and IR-38 and the improved local varieties such as Gehar, Adil and Gata, etc. are recommended in the project area from the view points of physiology and productivity. Table V-60 shows the recommendable local varieties in the project area.

Table V-61 shows the standard cultivation method of irrigated paddy. According to this standard, the proper amount of seed is about 25 kg per hectare of main paddy field. The required amount of fertilizer for nursery bed of 400 m^2 which are required for 1 ha of main paddy field, is around 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, and further be treated by using agro-chemicals such as Benlate-T or Homai to control the diseases.

Land preparation, especially rough ploving will be started from a half month before the transplanting time in order to relieve the peak labor requirements, and a harrowing cum paddling will be carried out for land leveling. The recommended number of seedling per hill is 3 to 4, and the optimum planting density is about 20 to 25 hills per m^2.

With regard to the basal fertilizer application for paddy field, it is better to apply fertilizer at the time of about 5 days before transplanting and a dose of fertilizer per ha is at about 50 kg of urea, and about 90 kg of T.S.P. respectively. Additional fertilizer application will be carried out 2 to 3 times, i.e. about 15 days after transplanting, at the time of the 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 to 70 kg of urea for each dressing time.

Insect and disease control for paddy cultivation will also be carried out without delay from the proper time. Recommendable agro-chemicals for insects are sumithion, diazinon, etc. and for disease control, kasumin and kitazin are recommended. The rat damage is very serious. Rodenticides like Zink-phosphate will be applied at the rate of about 0.2 kg per ha.

Weed control in the paddy field will be carried out about 2 or 3 times according to the conditions of weed growth. The proposed practice for weed control is to use the rotary weeder, which is widely used in Java island. For the weed control in near future, a careful consideration should be given to applying herbicides in the project area, because various kinds of effective herbicides have been developed recently.

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

Although harvesting paddy by sickle has been introduced recently for the high yielding varieties of paddy which are commonly of short straw. At present, ani-ani system is still predominant in the project area, because of high lodging and shattering, long growing period and uneven maturation of panicles and tall plant height of main local varieties. In view of necessary harvesting of the short-culmed variety within a short period as well as saving of labor to be hired, the harvesting 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 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 future.

3.4.2 Polovijo

Polowijo crops such as peanuts, soybeans and maize will be introduced into the project area. In the Muncak Kabau area, the Lempuing area and the Tulanbawang west sub-area, the polowijo crops are mainly cultivated after harvesting the rainy season paddy. In the Tulangbawang east sub-area, the polowijo crops are mainly cultivated in every other rotation way in the paddy field after harvesting of the rainy season paddy.

The standard cultivation methods of these crops are shown in Table V-62 through V-64 respectively. Modern cultivation techniques such as introduction of high yield varieties, reasonable fertilizer application method and control of insects and diseases are introduced into the area for polowijo crop cultivation after completion of the project. In order to attain the expected high yield of these crops, it is inevitable to provide not only the above various modern cultivation techniques but also strengthening of the present agricultural support services.

3.5 Farm Inputs and Labor Requirements

3.5.1 Farm Inputs

After implementation of the project, the farm inputs for improved irrigation farming will increase substantially. Table V-65 shows the amount of farm inputs needed in each crop under "with project" condition. These requirements were estimated based on the standard input requirement of BIMAS program and data collected from the Agricultural Extension Office and through farm economy survey. The quantity of fertilizers needed will remarkably increase in both paddy and polovijo cultivation in order to produce those expected yields.

Table V-66 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.

3.5.2 Labor Requirements

The bulk of the works for farming is generally operated by the family labors throughout the year except for transplanting and harvesting of paddy. Some temporary laborers will be employed during the period of transplanting and harvesting of paddy, especially in the Tulangbawang east sub-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-67 shows the labor requirement for the proposed irrigation farming per hectare. Although the available farm labor is estimated to be about 62 man-days per month on an average, some hired laborers are still required during the peak time of farming as seen in Table V-69. Particularly in the Tulangbawang east sub-area, the labor shortage in the peak time of farming will be supplemented by employing some temporary laborers from the Tulangbawang west sub-area.

Table V-68 shows the labor requirement under "without project" condition estimated based upon the field survey in the project area.

3.6 Anticipated Yield and Production

3.6.1 Crop Yields

The anticipated crop yields are estimated on the basis of the data on recent achievement obtained from the well-irrigated fields in and around the project area and with reference to the results of crop experiment in the Central Research Institute for Agriculture, Bogor (CRIA).

Table V-70 shows the potential grain yields for both the rainy and dry season paddies at various 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 around 12% on an average ranging from 3% to 28%.

Fig. V-22 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-23 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-71 through V-73 show the paddy yields by varieties, the date of planting experimented at the Belitang Seed Center and the effect of irrigation on paddy field. It can be said from these tables that the yield of paddy varies depending on the varieties and the irrigation influences substantially on its yield, particularly in the dry season.

On 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 records of paddy yield are reached 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 properly irrigated conditions with proper farming practices as shown in Table V-74.

As for the yields of upland crops, the target yields are estimated as shown in Table V-74 based on various data provided by the authorities concerned (see Table V-75, V-76 and V-77).

Yields of crops under "without project" condition are considered to increase slightly from the present yields owing to instable rainfall distribution even in the rainy season. Particularly for paddy, a yearly increase of about 2% is taken in this study based on the statistical data from 1972 to 1980 collected from Kab. OKU Agricultural Extension Office. Table V-78 shows the estimated yield of each crop in "without project" condition.

3.6.2 Build-up Period of Anticipated Yield

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

(1) Development of O&M techniques of irrigation and drainage facilities under the project.

(2) Improvement of the infrastructure 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 future after the reclamation of the project area.

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

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

After 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 Muncak Kabau and Lempuing areas, where the farmers are rather accustomed to intensive farming, the crop yields would reach the expected yield within seven years after commencement of the irrigation. In the case of the Tulangbawang area, where the farmers have settled recently, its anticipated yield will be attained within ten years. In the estimation of the project, the increase of yield from the present level to the anticipated level is assumed to take a linear increase.

3.6.3 Anticipated Crop Production

The yield and production of crop 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.

Based on the proposed cropping patterns, the irrigable area and target yields of the crops, the total crop production under both "with project" and "without project" conditions is estimated for each development area as shown in Table V-79 through 82. The increase of each crop production after the implementation of the project is estimated as shown in Table V-89. The annual paddy production at the full development stage in the project area would be about 436,000 tons of dry paddy, and the incremental production would be about 412,000 tons.

The annual crop production for the alternatively proposed cropping patterns is shown in Table V-83 through V-88. In this table the alternatively proposed cropping patterns of Type I-2 and Type II-1 are omitted because these patterns are same as Type I and Type II except the variety of paddy as seen in those proposed cropping patterns.

3.7 Marketing and Price Prospects

3.7.1 Marketing System

As described in the previous sub-section 2.9, the marketing systems in both South Sumatra province and Lampung province are not so well developed and often provide the disadvantage to the farmers. The seasonal fluctuation of crops in market is relatively large. Because of inadequate transportation system, insufficient storage facilities of products and lack of market information, the farmers are often compelled to sell their products when the prices are low. In order to improve such poor marketing systems and stabilize the prices, particularly for price, the following activities on marketing are to be systematically introduced under the direct control of the agricultural cooperatives;

(a) collection of paddy from farmers in time,

(b) storing of the paddy in the cooperatives' warehouse, as much as possible,

(c) milling of the paddy under the contract with rice millers, and

(d) selling the milled rice to the DOLOG through BUUD/KUD.

3.7.2 Marketing Prospects of Paddy

Indonesia is still rice importing country, though production of rice has increased substantially. About 1.7 million tons of rice per annum on an average were imported in recent five years. Considering the growth rate of population and increase of per capita consumption, the shortage of rice in Indonesia will still continue to some extent as shown in Fig. V-24.

Both South Sumatra province and Lampung province also face substantial shortage of rice, though the production in Kab. OKU and Kab. OKI has been in surplus because of their comparatively large cultivation area and less population. In recent 5 years about 132,000 tons of rice in South Sumatra province and 23,000 tons in Lampung province on an average were imported as shown below.

(Unit: 1,000 tons)

	1975/76	1976/77	1977/78	1978/79	1979/80	Average
South Sumatra Province						
Internal	0.2	-	0.5	0.6	10.0	2.2
Import	43.4	140.5	163.4	119.2	191.4	131.6
Total	43.6	140.5	163.9	119.8	201.4	133.8
Lampung Province						
Internal	6.5	1.4	0.3	19.9	0.3	5.7
Import	-	13.7	24.1	10.4	68.3	23.3
Total	6.5	15.1	24.4	30.3	68.6	29.0

Sources: DOLOG Office in South Sumatra Province and Lampung Province 1980, 1981

Although the rice production in both provinces is significantly increasing, the high rate of population growth in both provinces would accelerate the shortage of rice in the future as shown in Fig. V-24. In forecasting the future demand and supply of rice, the following increase rates are applied.

	Indonesia		South Sumatra Province	Lampung Province	
1) Population growth rate	2 % (1980-1995)		3 % (1980-1995)	4 % (1980-1983)	3 % (1984-1995)
2) Rice consumption increase rate per capita	1.5 %		1.5 %	1.5 %	
3) Rice production increase rate	3.3 % (1980-1983)	3.0 % (1984-1995)	3.5 % (1980-1995)	5 % (1980-1983)	4 % (1984-1995)
4) Amount of rice consumption at present	130 kg		131 kg	131 kg	
5) Amount of final target for rice consumption	150 kg		150 kg	150 kg	

Data source:

1) Statistical Yearbook of Indonesia, 1976, 1979
2) Statistic Offices in South Sumatra and Lampung Provinces
3) BAPPEDA Offices in South Sumatra and Lampung Provinces
4) Agricultural Offices in South Sumatra and Lampung Procinces
5) Asia Economy Institute in Japan (Economy of Indonesia, 1978)
6) BULOG in Indonesia
7) DOLOG in South Sumatra and Lampung Provinces

After implementation of the project works, about 296,000 tons of rice would be produced annually in the project area. Out of the above total production of rice, about 51,000 tons in the Muncak Kabau area, about 62,000 tons in the Lempuing area and about 183,000 tons in the Tulangbawang area would be produced respectively. Out of this production amount, around 260,000 tons will be marketed mainly to Palembang and Tanjung Karang/Teluk Betung.

3.7.3 Price Prospect

(1) Rice

Economic Prices: Economic price of paddy at farm gate is estimated on the basis of the international market price forecasted by IBRD for the period of 1990 in 1981 constant dollar taking into account the costs for transporation, processing and others. Table V-90 shows the price of rice at the farm gate estimated for economic evaluation of the Project. (Refer to Table V-91, -92-(1) and -92-(2).

Financial Prices: Financial price of paddy at farm gate is estimated based upon available data on farm gate price collected through farm economy survey and prevailing local market in Martapura and Palembang. The estimated financial price of rice is given in Table V-93.

(2) Other Crops

Cassava is the next main staple food crops in the project area at present. The inhabitants, mostly transmigrants, usually eat rice mixing with cassava in the form of OJEK. The amount of consumption is in decreasing tendency according to the raise of living standard. Present production of soybeans and peanuts is very low, approximately 1,000 tons in total, which are mostly consumed within the project area. After full development of the project, about 30,000 tons of those products in total are expected in the project area. Most of the production will be marketed to Palembang and exported abroad.

Economic prices of soybeans, peanuts and others at farm gate are estimated on the basis of projected international market price forecasted by IBRD for the constant dollar in 1981 as shown in Table V-93. As for

the financial prices of soybeans and peanuts, the economic prices estimated above are taken in the farm budget calculation, because after the full development of the project, considerable amount of these crops would be exported abroad. Financial prices of other crops are estimated based on the present prices prevailing in the local market.

(3) Farm Inputs

Economic prices of fertilizers and agro-chemicals at farm gate are estimated based upon the projected international market prices forecasted by IBRD in 1981 constant dollars as shown in Table V-90. Financial prices of fertilizers and agro-chemicals at farm gate are estimated on the basis of the results of farm economy survey and village survey carried out during the survey period and referring to the local market prices in Martapura as shown in Table V-93.

3.8 Typical Farm Budget

From the farmers' viewpoint, the financial evaluation under "with project" and "without project" conditions are made for two typical farmers; 1.75 ha farm holding farmer and 4.75 ha farm holding farmer. Calculations of both income and outgo are made based on the production and price of crops estimated and the inputs applied under "with project" and "without project" conditions respectively.

In every case, the income from rice and polovijo is predominant under "with project" condition. Income from livestock is insignificant. The gross income in each type will increase remarkably after the full development of the project as compared with the income under "without project" condition, owing to the level-up of crop cultivation techniques under sufficient irrigation condition.

Crop production expenditure under "with project" condition would increase substantially due to application of certain amount of fertilizer needed. Although living expenses of farmer under "without project" condition would increase to some extent from the present basis, those under "with project" condition would substantially increase by approximately two or three times mainly due to raise of food consumption particularly for rice. The following table shows the comparison of income, outgo and balance (capacity to pay) under "with project" and "without project" conditions for each type.

(Unit: Rp.10^3)

Description	(Muncak Kabau area) With-Project	(Muncak Kabau area) Without-Project	(Lemputing area) With-Project	(Lemputing area) Without-Project	(Tulangbawang west sub-area) With-Project	(Tulangbawang west sub-area) Without-Project	(Tulangbawang east sub-area) With-Project	(Tulangbawang east sub-area) Without-Project
1. Gross income	1,521.0	472.4	1,525.2	478.4	1,528.0	300.2	2,356.7	342.8
2. Farm outgo	1,132.4	468.8	1,021.8	474.3	1,085.5	299.5	1,309.6	341.8
3. Balance or capacity to pay (US$)	388.6 (622.2)	3.6 (5.8)	503.4 (805.9)	4.1 (7.6)	442.5 (708.0)	0.7 (1.1)	1,047.1 (1,675.3)	1.0 (1.6)

It is quite clear that the capacity to pay expected under "with project" condition will increase more than that of "without project"condition in each type. Details are shown in Table V-94 and Table V-95.

3.9 Project Benefit

Irrigation benefit (direct benefit) or incremental benefit of the agricultural development is defined as the difference between the net production value under "with project" condition and the net production value under "without project" condition. The net production value is defined as the difference between the gross production value and the gross production cost.

Table V-96 through Table V-107 show the production costs for anticipated crops in both "with project" and "without project" conditions. Table V-108 through Table V-115 show the gross and net production values at the full development stage in both "with project" and "without project" conditions in four areas. Table V-116 shows the incremental benefits of the project. The benefit from the paddy production is predominant in most of the development area. The following table shows a summary of the incremental benefit of the project at the full development stage.

(Unit: 10^6 Rp)

Area	With Project	Without Project	Incremental Benefit
Muncak Kabau area	10,004	867	9,137
Lemputing area	12,248	1,411	10,837
Tulangbawang west sub-area	29,266	97	29,169
Tulangbawang east sub-area	8,222	487	7,735
Total	59,740	2,862	56,878

3.10 Proposed Agricultural Support Services

3.10.1 General

Agricultural support services are one of the most important and fundamental sectors for the agricultural development, in particular, for rapid increase of crop production and subsequent increase of farm income as well as improvement of the farmers' living standard.

As described in the sub-chapter V.2.10 hereof, the project area is not fully served by particular organization from the viewpoint of socio-economy at present. Especially, agricultural support services, namely village unit co-operatives (KUD) and farmers' associations, etc., are not so attractively organized.

The present insufficient management of agricultural support services such as inadequate contacts in between the administrative organizations, insufficient extension services, lack of extension paddy seed improved, insufficient farmers' credits and lack of farmers' organization should be improved before implementation of the project.

3.10.2 Research and Extension Services

In order to ensure the present crop development program and to provide the successful implementation of the farming for the project, a systematic program of adaptation test of agriculture in the project area is indispensable. The research works will mainly be conducted in the Provincial Seed Center.

Present Provincial Seed Center located at BK-X in Belitang Proper Area is proposed to be strengthened under the Agricultural Development Center (ADC) in the province, for which this station will comprise seven divisions in function as shown in Fig. V-25.

Each Division should be staffed with competent senior agronomist who have an enough knowledge and experiences about the paddy cultivation techniques. One subject-matter specialist (PPS) specialized in paddy cultivation is preferably appointed to work at Publication and Training Division.

As described in the sub-chapter 2.10 hereof, existing field extension workers are insufficient in number for the proper guidance of crop cultivation techniques to the farmers. Especially in the case of "with project", it is important to up-grade farmers' knowledge on crop cultivation techniques such as introduction of new high yield varieties, improvement of fertilizer application system and control of insects and diseases and guidance of demonstration farm with Kontak Tani (key farmer).

In the project area, each PPL (field extension worker) is dealing with about 1,400 farmers with 1,600 ha of cropping field on an average in the seven Kecamatans concerned with the project area at present. The present agricultural extension services are insufficient in proper guidance on application of improved irrigation farming techniques mainly because of shortage of PPL, lackof equipment and materials for extension activities and shortage of budget. It is desired to increase the number of PPL and strengthen their technical knowledge in order to spread evenly the improved farming techniques to the individual farmer. An appropriate command area per PPL would be about 500 ha of paddy field. Furthermore, some technical testing apparatus and information instruments, i.e. pH meter, soil auger, movie projector, slide projector, motor cycle, etc. are also proposed to be equipped for effective extension services.

In order to maintain high crop production throughout the project operation, the training of farmers is required to be constantly carried out through Kontak Tani. Group meeting of the voluntary organization, such as rural youth club and farmers' activity group, will also be held from time to time with the assistance of the Kontak Tani and PPL.

3.10.3 Seed Multiplication and Its Distribution

One seed center is situated in the Belitang Proper Area under the control of the Provincial Agricultural Extension Service. Foundation seeds required for this center are provided by CRIA (Central Research Institute of Agriculture), Bogor.

When irrigation water becomes available through the project, the improvement and extension of the seed center will become necessary for

the timely and sufficient supply of seed to the farmers. In this context, the staff members, facilities, fields, equipment, etc. should be strengthened before the completion of the project.

In general, the original purity of the seeds not only for paddy but for other crop seeds can not be maintained beyond two or three cropping seasons due to the degeneration under the ordinary farming conditions. Therefore, it is needed to renew the seeds for maintaining the original purity.

The stock seeds of newly recommended varieties of paddy in South Sumatra province such as IR-36, IR-38 will be produced at the Belitang Seed Center, and the stock seeds thus produced will be distributed to seed stations, seed growers and demonstration farmers. The extension seeds produced by these seed stations, seed growers, etc. will be supplied to the farmers through BUUD/KUD and seed distributers.

The required amount of paddy seeds for Belitang Proper Area is about 20 tons and is almost distributed to seed grower and BIMAS/INMAS programs farmers at present. When the project is realized, however, around 560 tons of improved seed will be required for 68,300 ha of rainy season paddy in every 3 years for renewal. It is needed to have about 100 ha of field in order to produce above amount of improved seed. Seed distribution system to the farmers through BUUD/KUD or seed growers should also be improved for smooth and wide distribution of seeds.

3.10.4 Agricultural Credits

The most important agricultural credit in Indonesia is the BIMAS/INMAS credit, for which operation was commenced from 1965. For the participation in the BIMAS/INMAS programs, particularly for paddy cultivation, one of the prerequisites is that the technical or semi-technical irrigation system is to be basically provided in the fields.

There are three kinds of loan for agriculture by the Bank Rakyat Indonesia, i.e. short term, medium term and long term loans. The BIMAS/INMAS credit for paddy production loan is the short term loan with 7-month loan term with monthly interest rate of 1%. The loan amount of BIMAS package per ha was in the range of Rp.30,000 to Rp.50,000 in 1980. This amount varies from region to region.