

APPENDIX IV

AGRICULTURE AND AGRO-ECONOMY



## CHAPTER 1. GENERAL

This report gives a full account of the general background to the agriculture development plan, the present agricultural and agro-economic condition in the study area of a gross area of 29,700 ha, and the proposed agricultural development plan for the project area having a net irrigable area of 8,000 ha.

Data and information used in this study were provided by the following government authorities concerned:

- 1) Directorate of Irrigation II (DOI-II), Directorate General of Water Resources Development, Ministry of Public Works
- 2) Provincial Public Works (DPU), Riau Province
- 3) Provincial Development Planning Agency (BAPPEDA), Riau Province
- 4) Directorate General of Settlement Preparation, Ministry of Transmigration
- 5) Representative Office of Transmigration Department, Riau Province
- 6) Directorate General of Food Crops Agriculture, Ministry of Agriculture
- 7) Food Crops Agriculture Service (DIPERTA), Riau Province
- 8) Farm Agriculture Service, Riau Province
- 9) Animal Husbandry Service, Riau Province
- 10) Rural Extension Center (BPP), Dalu-Dalu, Kabupaten Kampar
- 11) Statistical Office of Riau Province
- 12) Representative Office of Cooperative Department, Riau Province
- 13) Representative Office of Forestry Department, Riau Province
- 14) Sub Dit. of Land Use, Dit. of Agrarian, Riau Province
- 15) Logistic Depot (DOLOG), Riau Province
- 16) Bangkinang Branch Office of Bank Rakyat Indonesia (BRI), Kabupaten Kampar

17) Central Research Institute for Food Crops (CRIFC),  
Bogor

Aside from data collection, the field reconnaissance and farm interview survey were conducted so as to confirm the collected data with more practical information. List of reference used in this study is presented in Table IV-1.

## CHAPTER 2. GENERAL BACKGROUND

### 2.1 National Socio-Economy

#### 2.1.1 Land and Population

The Republic of Indonesia is located between latitude 6 08' north and 11 15' south, and between longitude 94 45' and 141 05' east with an area of 1.92 million km<sup>2</sup>. The Indonesia comprises a great diversity of culture and languages in an archipelago consisting of about 13,700 islands stretching over a distance of 5,200 km from east to west.

In 1986, the total population of the country was about 168.1 million with a population density of about 88 persons/km<sup>2</sup>, which had increased at an average growth rate of 2.15% per annum during the period from 1980 to 1985. The total labor force in the whole country was estimated at about 70.2 million in 1986. The structure of employment comprises 55.1% for agriculture, 8.2% for trade and manufacturing and remaining 36.7% for others.

#### 2.1.2 National Economy

In 1986, the gross domestic product (GDP) in Indonesia was Rp. 96,489 billion at current market prices or equivalent to US\$ 58.3 billion, as shown in Table IV-2. In the same year, per capita GDP was about Rp. 574,000 or US\$ 347. During the previous three years from 1984 to 1986, GDP in real terms increased at a rate of 3.8% per annum. Of the GDP in 1986, about 26% was derived from the agricultural sector followed by 17% from the trade sector.

During the period from 1981 to 1982, the balance of payments position of the Indonesia deteriorated severely, with the result that export prices for Indonesian's oil and LNG remained on the whole stagnant and the export volume declined due to the depressed international oil market. In 1982, total exports of oil and LNG on a net basis were estimated to have declined to US\$ 3.9 billion or 17 % below the 1981 level (see Table IV-2). At the same time, the total imports of capital and intermediate goods had increased. As a result, in 1982, the trade balance registered a current account deficit of US\$ 5.5 billion. After accounting for other transactions such as capital inflows of the Government and private sector, however, the balance of payments recorded an overall deficit of US\$ 1.9 billion. In 1983, the overall balance was improved, but it again deteriorated in 1986.

#### 2.1.3 Agriculture

##### (1) General

The agricultural sector has a dominant role in the Indonesian's economy. About 55% of the total labor force is

engaged in the agricultural sector, and two-thirds of the total population are dependent on agriculture for their livelihood. In 1986, the sector contributed about 26% of GDP, and accounted for about 27% of total exports or about 55% of non-oil exports (see Table IV-3). Food crop production is the major subsector constituting about 61% of total GDP added in agriculture, as shown in the following table. Livestock accounts for 10.7%, fishery 7.1% and forestry 3.9%.

GDP at Current Market Price		
	1986 (Rp.10 <sup>9</sup> )	%
Farm food crops	15,198	61.0
Farm non food crops	3,504	14.1
Estate crops	802	3.2
Livestock	2,667	10.7
Forestry	972	3.9
Fishery	1,779	7.1
<u>Total</u>	<u>24,922</u>	<u>100.0</u>

Source: Statistik Indonesia 1987, Biro Pusat Statistik.

## (2) Crop Production

Major crop products in the country are paddy, maize, groundnuts, soybeans, cassava, sweet potatoes, rubber, palm oil, coconuts, coffee and cane sugar (see Table IV-4).

The relatively high rate of growth in agricultural production during 1981-1986 was largely due to record paddy production. Paddy production increased at an annual rate of 3.9% during the same period to reach 39.7 million tons in 1986. This excellent production performance was attributable to almost all the major factors of the production which jointly influenced; i.e. favorable weather, expanded and improved irrigation facilities, introduction of high yielding varieties along with the supply of fertilizer and other related farm inputs stimulated by increased price incentive and better farming practices.

Cash crops such as rubber, palm oil, coconuts and coffee are major export crops. The exports of rubber and coffee are particularly important. In 1986, the production of these two crops was estimated at 1.5 million tons, and their export value was about US\$ 1.5 billion or 20.8% of non-oil exports (see Tables IV-3 and IV-4).

## (3) Demand and Supply of Principal Food Crops

The self-support ratio and per-capita consumption for the main agricultural products in Indonesia are summarized in the following table.

Crops	Self-Support Ratio (%)					Per-capita					Consumption (kg)*2
	1979	1980	1981	1982	1983	1984	1985	1986	1987		
Rice	90	88	94	99	95	98	100	100	100	144	
Maize	98	99	100	98	100	100	99	*	**1	27	
Groundnuts	99	100	99	88	92	96	97	*	*	3	
Soybeans	79	87	66	59	71	66	74	*	*	6	
Cassava	100	100	100	100	100	100	100	*	*	69	
Sweet Potatoes	100	100	100	100	100	100	100	*	*	11	

Remarks: \*1 No data is available. \*2 Average from 1983 to 1985.

Indonesia used to imported its staple food, rice, but the supply situation has improved since 1985, and now the country has attained self-sufficiency. With regard to maize and groundnuts, these have a high self-support ratio, and all cassava and sweet potatoes consumed in the country are self-supporting. The self-support ratio of soybeans averages about 70% during 1979-1985.

The per-capita consumption of rice was estimated at about 144 kg/year on an average from 1983 to 1985, and there has been no significant change in this figure during the same period. For the crops such as maize, groundnuts, soybeans, per-capita consumption is more or less stable.

In order to clarify the marketability of principal food crops in the country, demand and supply forecasts are made on the basis of past trends in their production (see Table IV-5).

#### a) Rice

Rice is the most important crops as the staple food of Indonesia and the Government's efforts have concentrated on increasing its production. Owing chiefly to the expansion of irrigated paddy field and the increased use of improved high yielding varieties and fertilizers through the crop intensification programs, rice production has increased rapidly at a rate of 4.6% per annum on average over the past 19 years from 1968 to 1987. Assuming that such Government's efforts will continue until 2005, the demand and supply of rice in Indonesia are forecast as follows (see Table IV-6).

		1990	1995	2000	2005
1) Supply	(10 <sup>6</sup> tons)	26.5	30.4	34.5	38.4
	(Annual Growth Rate : %)	-	( 2.8)	( 2.6)	( 2.2)
2) Demand	(10 <sup>6</sup> tons)	26.3	28.7	31.1	33.3
3) Balance	(10 <sup>6</sup> tons)	+0.2	+1.7	+3.4	+5.1

As shown in the above table, the Indonesia will increase its annual rice surplus over domestic demand by about 0.2 million tons in 1990, 1.7 million tons in 1995, 3.4 million tons in 2000 and over 5 million tons in 2005. Unless exports or new domestic outlets are established, the cumulative rice surplus from 1990 to 2005 will exceed 39 million tons.

Such probable growth of rice supply and a considerable amount of rice surplus were estimated on the basis of expected changes in the irrigation area which is expanding through newly implementing irrigation projects and the introduction of high yielding varieties along with the supply of fertilizers through the crop intensification programs, as mentioned before. In this context, the sensitivity analyses of demand and supply for rice are examined on the basis of the following assumptions:

- Case-I : Decrease in annual growth rate of rice supply from 2.5% to 1.25% on average between 1990 and 2005; namely, decrease of 50% for the Government's efforts such as the implementation of irrigation projects and the expansion of crop intensification programs until 2005.
- Case-II : No increasing trend of rice supply between 1990 and 2005; namely, no Government's efforts to increase in rice production.

The results of sensitivity analyses are shown below.

(Unit: 10<sup>6</sup> tons)

			1990	1995	2000	2005
1) Supply	Case-I		26.5	28.1	29.8	31.5
	Case-II		26.5	26.5	26.5	26.5
2) Demand			26.3	28.7	31.1	33.3
3) Balance	Case-I		+0.2	-0.6	-1.3	-1.8
	Case-II		+0.2	-2.2	-4.6	-6.8

As shown in the above table, a deficit of 1.8 million tons in 2005 will result in case of Case-I. Considering the recent aggravation of Indonesia's economy induced by the depressed international oil market (see section 2.1.2), it seems that this case is likely to occur, because of insufficient funds for implementation of new irrigation projects and for extension of crop intensification programs in the future.

According to the workshop report on the Secondary Food Crops Development Project (SFCDP) - USAID, on the other hand, a rice deficit of about 0.5 million tons is forecast in 2000, as shown in the following table. In 2005, the deficit of rice will reach about 1.1 million tons.



Item	1990	1995	2000	(2005)*
<b>Supply</b>				
- Production of rice (10 <sup>6</sup> tons)	29.7	33.0	36.1	( 39.7)
- Waste, seed & feed (10 <sup>6</sup> tons)	4.2	4.6	5.0	( 5.0)
- Available for consumption (10 <sup>6</sup> tons)	<u>25.5</u>	<u>28.4</u>	<u>31.1</u>	( <u>34.2</u> )
<b>Demand</b>				
- Population (10 <sup>6</sup> )	181.6	200.7	220.7	(242.7)
- Per-capita consumption (kg)	140.1	142.0	143.1	(145.3)
- Total demand (10 <sup>6</sup> tons)	<u>25.4</u>	<u>28.5</u>	<u>31.6</u>	( <u>35.3</u> )
<b>Balance</b> (10 <sup>6</sup> tons)	<u>+0.1</u>	<u>-0.1</u>	<u>-0.5</u>	( <u>-1.1</u> )

Source: Workshop SFCDP-USAID, Direktorat Jenderal Pertanian Pangan dengan Departemen Pertanian, 1987.

\*: Forecast in 2005 was made by the team of the Batang Kumu Irrigation Project, based on SFCDP Forecast (1990-2000).

As a result of the above forecast, a deficit of about one million tons at the lowest estimate is expected in 2005. It can be said that the increase in rice production through continuous expansion of irrigation area and powerful extension of crop intensification programs will be necessary to meet domestic demand increasing along with population growth.

#### b) Upland Crops

Principal upland crops produced and consumed in Indonesia are maize, groundnuts, soybeans, cassava and sweet potatoes. The demand and supply forecasts of these crops until 2005 were made as follows, based on these trends from 1968 to 1985. The details are presented in Tables IV-7 to IV-11.

(Unit: 10<sup>6</sup> tons)

Crops	Supply		Demand		Balance	
	1990	2005	1990	2005	1990	2005
Maize	4.98	7.03	4.93	7.17	+0.05	-0.14
Groundnuts	0.55	0.78	0.60	0.93	-0.05	-0.15
Soybeans	0.92	1.32	1.15	1.71	-0.23	-0.39
Cassava	12.50	14.90	13.20	16.70	-0.70	-1.80
Sweet Potatoes	1.71	1.50	1.68	1.37	+0.03	+0.13

Owing to fluctuations in rainfall, these trends in the supply of upland crops are erratic, but generally upward except for sweet potatoes. It is forecast that these trends will continue until 2005, and total supplies of maize, groundnuts, soybeans and cassava will reach about 7.03, 0.78, 1.32 and 14.90 million tons in 2005, respectively. On the other hand, the demand for these four crops have also increased over the supply

trends, and will amount to about 7.17, 0.93, 1.71 and 16.7 million tons in 2005, respectively. As a result, supply deficiencies will occur in 2005, which are estimated at 0.14 million tons for maize, 0.15 million tons for groundnuts, 0.39 million tons for soybeans and 1.80 million tons for cassava.

As for sweet potatoes, trends in demand and supply have decreased year by year. Assuming that these demand and supply trends for sweet potatoes will continue in the future, a surplus of about 0.13 million tons is forecast in 2005.

## 2.2 Regional Socio-economy

### 2.2.1 Location and Population

The Riau Province is located in the northern part of Sumatra island and has an area of 94,560 km<sup>2</sup>. The total population in 1986 was estimated at about 2.7 million with population growth of 3.9% on average from 1981 to 1986 (see Table IV-2). The population density is about 29 persons/km<sup>2</sup>. The workforce in the region was estimated at 859,000 in 1985. In the same year, the unemployment rate was estimated at 3.0% which was higher than the average rate for the whole country. Of the total workforce, about 60% were in the agricultural sector.

### 2.2.2 Regional Economy

The Gross Regional Domestic Product (GRDP) at current market prices of Riau Province was estimated at about Rp.5,583 billion in 1986, which accounted for 5.8% of GDP in the whole country in the same year (see Table IV-2). Out of GRDP in 1986, 67% was derived from the mining sector including petroleum production, followed by 9.4% from the trade sector. The agricultural sector only accounted for 6.7%. Per-capita GRDP at current market prices was estimated at Rp.2.04 million or US\$ 1,233 in 1986, which is higher than the national average figure of Rp.574,000 (US\$ 347) in the same period. But per-capita GRDP excluding petroleum production amounted only to Rp. 522,000 (US\$ 315).

Annual economic growth from 1981 to 1986 was estimated at -1.8% in terms of GRDP at 1983 constant prices. This minus growth is attributable to stagnation of the mining sector due to the depressed international oil market. Economic activities in Riau Province are specialized to the mining sector, especially to petroleum production and its related industry. During the period from 1981 to 1986, more than 70% of GRDP was derived from petroleum production. With the exception of petroleum, annual economic growth had increased steadily, which was estimated at 6.2% on average from 1981 to 1986.

### 2.2.3 Agriculture

Because half of the land in Riau Province is covered by

swamp, with the exception of some perennial crops such as oil palm and coconuts, crop production in this province is limited to the mountain slopes and high land areas distributed along the border of the Provinces of West Sumatra, North Sumatra and Jambi. The existing irrigation systems and transmigration areas are mainly distributed in these areas.

The main crops grown in Riau Province are paddy, maize, cassava, soybeans and such perennial crops as rubber, oil palm, coconuts and banana. The cultivated area, production and unit yield of these crops are presented in Tables IV-12 to IV-14.

During the 3 years from 1984 to 1986, the harvested area and production of paddy in Riau Province averaged about 150,100 ha and 402,000 tons, respectively, of which production of wet land paddy accounted for about 79%. The unit yield of this wet land paddy averaged about 3.3 tons/ha during the same period, which is still low as compared with the national average yield of 4.2 tons/ha.

Recently, the planted areas of rubber and oil palm have increased rapidly. These planted areas were estimated at 284,000 and 18,400 ha in 1982 and in 1986 expanded to 354,000 and 95,400 ha respectively (see Table IV-12). Their production has also increased along with the expansion of area, and reached 86,200 tons for rubber and 76,300 tons for palm oil in 1986, which was 7.9% and 5.9% of the whole country, respectively.

Although the production of rice in Indonesia as a whole has reached self-sufficiency level as mentioned in the preceding section, rice production in Riau Province could not meet its demand, as shown in the following table. In Riau Province, about 384,000 tons of rice were consumed in 1986, whereas the total supply of rice was only about 254,000 tons with a deficit of 130,000 tons in the same year. This deficit had to be imported from North Sumatra, South Sulawesi and Jawa.

	1973	1978	1983	1984	1985	1986
<b>Supply</b>						
- Production* <sup>1</sup> (10 <sup>3</sup> t)	131	169	193	210	228	267
- Net Supply* <sup>1</sup> (10 <sup>3</sup> t)	<u>125</u>	<u>161</u>	<u>183</u>	<u>199</u>	<u>216</u>	<u>254</u>
<b>Demand</b>						
- Population* <sup>2</sup> (10 <sup>6</sup> )	1.72	1.92	2.43	2.49	2.64	2.74
- Per-capita Consumption* <sup>1</sup> (kg)	120	140	140	140	140	140
- Total Demand (10 <sup>3</sup> t)	<u>206</u>	<u>269</u>	<u>340</u>	<u>349</u>	<u>370</u>	<u>384</u>
Balance (10 <sup>3</sup> t)	<u>-81</u>	<u>-108</u>	<u>-157</u>	<u>-150</u>	<u>-154</u>	<u>-130</u>

Sources:

- \*1 Hasil-Hasil Pembangunan Daerah Tingkat I Riau - Selama PELITA IV, Pekanbaru 1988.
- \*2 Riau Dalam Angka 1987, Kantor Statistik Propinsi Riau.

### 2.3 Agricultural Sector in the Forth and Fifth Five Year Development Plans

The Government of Indonesia is now engaged fourth five-year development plan (REPELITA IV; 1984/85-1988/89), of which the development plan for the agricultural sector puts primary emphasis on the following major objectives:

- a) To increase agricultural production to meet domestic requirements for food and industry,
- b) To promote export oriented crops,
- c) To improve and stabilize farmers' income,
- d) To support regional development, and
- e) To promote transmigration activities.

In September 1988, the REPELITA V was under preparation at both national and provincial levels. According to the BAPPEDA office in Riau Province, it is expected that the agricultural sector will continue to play an important role in the promotion of agro-industrial development and achievement of a more balanced economy in Riau Province.

### 2.4 Transmigration Program

The transmigration program has played an important role in providing manpower for labor-short areas outside Java, Bali and Lombok, so that these areas can develop as new centers of industry, especially of agricultural production. The Government's strong transmigration program is not only alleviating overcrowding in some areas but also the developing of underpopulated areas.

Since 1950, about 616,000 families have been settled in the whole country (see Table IV-15). During the three years from 1984 to 1986, the number of migrants settling in Riau Province amounted to 8,700 families which account for 14.4% of the whole country, as shown below:

Whole Country		Riau Province		%
1984	28,132	1984/1985	8,819	31.3
1985	55,491	1985/1986	117	0.2
1986/1987	25,072	1986/1987	6,767	27.0
Total	108,695		15,703	14.4

Sources: Whole Country: Statistik Indonesia 1987, Biro Pusat Statistik.

Riau Province: Riau Dalam Angka 1987, Kantor Statistik Propinsi Riau.

In Riau Province, transmigration has rendered significant service to developing the agricultural sector. About 65,000 families accounting for 10% of total families in this province are migrants who have been settled as farmers during the 19 years from 1969/1970 to 1987/1988 (see Table IV-16). In addition, the Government of Riau Province plans to settle about 56,000 families between 1989/1990 and 1993/1994 (see Table IV-17).

## CHAPTER 3. PRESENT CONDITIONS IN THE PROJECT AREA

### 3.1 Population and Labor Force

The study area belongs Kecamatan Tanbusai in Kabupaten Kampar, and includes one existing village (Rantau Kasai) and seven transmigration villages; viz. DU (Desa Utama - Central Village), DK (Desa Kucil - Small Village)-II, -III and -IV of Tanjung Medan SKP-C and DU, DK-I and -II of Tanjung Medan SKP-D.

In the study area, agriculture is the predominant activity, and more than 95 % of the active population are estimated to be engaged in agriculture and its related activities. On the basis of data collected from the Transmigration Office in each village, farm households and the population in the study area was estimated as follows:

(As of April 1988)

Transmigration Project	Name of Village* <sup>1</sup>	No. Total Families* <sup>2</sup>	No. Farm Families	Farm Population	Average Size of Family
<u>SKP-C</u>		<u>1,830</u>	<u>1,701</u>	<u>8,610</u>	<u>5.1</u>
DU	Bangun Jaya	630	570	2,790	4.9
DK-II	Pagar Mayang	400	378	1,820	4.8
DK-III	Payung Sekaki	410	386	1,990	5.2
DK-IV	Mekar Jaya	390	367	2,010	5.5
<u>SKP-D</u>		<u>1,340</u>	<u>1,269</u>	<u>6,020</u>	<u>4.7</u>
DU	Tanjung Medan	610	582	2,690	4.6
DK-I	Rantau Baru	270	254	1,150	4.5
DK-II	Mahato Sakti	460	433	2,180	5.0
-	Rantau Kasai* <sup>3</sup>	<u>110</u>	<u>100</u>	<u>470</u>	<u>4.7</u>
<b>Total</b>		<b>3,280</b>	<b>3,070</b>	<b>15,100</b>	<b>4.9</b>

Remarks: \*1 Name of village to be registered in the near future.  
 \*2 The total household was estimated at 5 % of farm household on the basis of the information of village chief in each village.  
 \*3 Non transmigration area (existing village)

Source: Laporan Bulanan, Kantor Departemen Transmigrasi Kabupaten Kampar, April 1988.

The number of families was about 3,280 in April 1988. Out of the total number of families, farmers accounted for 95 % or 3,070 of the families. The farm population was estimated at 15,100 and the average size of a farmer's family was 4.9 persons. As for the age distribution, 46.6% of the farm population are fourteen years old and under, and only 1.4% were sixty years old and over (see Table IV-18).

On the assumption that the age of farm laborers ranges between 15 and 59 years old, the family labor force per a farm household averages 2.5 persons. Furthermore, pupils and students of ten years old and over, who account for 10.9% of a farmer's family, usually do part time farm work, so that the family labor force is rather more than 2.5 persons. Most of the farm family contribute to the labor requirements of agricultural activities. If labor is short, in line with traditional farming, a system of aided self help (gotong royong) is used.

### 3.2 Climate

Since there is no meteorological station in the study area, the climate in the area was estimated on the basis of data obtained from the meteorological station at Pasir Pengarayan which is located at 20 km south of the area. The climatological records at Pasir Pengarayan are shown in Table IV-19.

The climate in the area is characterized by two wet seasons and two dry seasons. The wet seasons extend generally from September to January and from March to April, and the dry seasons are the remaining months of the year. The annual rainfall is about 2,440 mm, of which about 70 % occurs in the wet seasons. The annual mean temperature is 27.6 C with a maximum monthly mean of 34.2 C in May and a minimum of 20.6 C in December.

The relative humidity, solar radiation, wind velocity and evaporation in the area remain almost constant throughout the year. The mean monthly humidity varies from 77 % to 82 %, and the yearly means is 80 %. The annual mean solar radiation is about 311 Cal/cm<sup>2</sup>/day with a monthly mean ranging from 279 Cal/cm<sup>2</sup>/day in December and 328 Cal/cm<sup>2</sup>/day in April. The annual mean wind velocity is about 35.2 km/day. The annual mean evaporation is 1,710 mm equivalent to a daily mean of 4.7 mm. The maximum monthly mean evaporation of 5.0 mm/day occurs in September and the minimum of 4.1 mm/day in December and January.

The climatic conditions in the study area are suitable for profitable agricultural development, except for uneven distribution of rainfall.

### 3.3 Present Land Use

Present land use in the study area was ascertained by data obtained from transmigration and extension offices, interview surveys to each village chief, field surveys and planimeter reading from land use maps which were supplied by the Agrarian Office.

The land in the study area is classified into 5 land use categories, comprising farm land, grass land, forest land, village area (including home yard and public area) and others. These are summarized below, and the details are presented in Table IV-20.

Land Use Category	Area (ha)	Proportional Extent (%)
Farm land	3,100	10.4
- Paddy fields	(190)	(0.6)
- Upland fields	(2,410)	(8.1)
- Perennial crop fields	(500)	(1.7)
Grass land	2,600	8.8
Forest	21,800	73.4
Villages	1,610	5.4
Others	590	2.0
<b>Total</b>	<b>29,700</b>	<b>100.0</b>

The farm land including paddy fields, upland fields and perennial crop fields amount to about 3,100 ha or 10.4% of the total area. Paddy fields (Padi Sawah) occupy only 190 ha or 0.6 % of the total area. These are located mainly in DK-II, SKP-C and DU, SKP-D. Upland fields of about 2,400 ha extend in each transmigration area, which are presently used for cultivation of dry land paddy, maize, groundnuts, soybeans, etc. Part of the grass land was originally farm land allocated by the Government. This land has been abandoned by the farmers after cultivation two to three times, because of extremely poor soil fertility.

Perennial crop fields are located mainly on the land between the Kumu river and DK-I and -II of SKP-D. Rubber is the predominant perennial crop in the study area, and farmers of DK-III, SKP-C have planted rubber in about 25 ha of dry land paddy field adjacent to the road connecting DK-II and DK-III of SKP-C.

About 73.4% or 21,800 ha of the study area is covered with forest, and 16.2% consists of grass land, village (home yard) and others such as river and road. In the home yard, various crops including dry land paddy, maize, vegetables, coconuts, banana, orange, rambutan, pineapple, etc. are cultivated under a mixed culture system.

### 3.4 Land Holding and Land Tenure

Land tenure in the study area may be broadly divided into two types; i.e. national land and private land. National land represents 78 % of the total as shown in the following table.

The farmers in the study area hold 2.00 ha/household, as allocated by the Government after settlement. This land consists of 1.75 ha for farm field and 0.25 ha for home yard. According to the results of interview surveys, all of the farmers occupy their own farm land as initially allocated by the Government, and almost no lease land is found in the study area.



Land Tenure/Land Use	Area (ha)	Remarks
<u>Private Land</u> *1	6,600	
- Farm land*2	2,100	
- Grass land	1,800	
- Forest	1,940	Land not yet reclaimed.
- Home yard	760	
<u>National Land</u>	23,100	
- Forest		Private timber companies have the right of timber-felling.
- Farm land		These are located outside of the transmigration areas.
- Grass land, public areas and others		
<b>Total</b>	<b>29,700</b>	

Remarks: \*1 The lands held by transmigrants were classified as private land, even if their lands had not yet been registered.

\*2 Include 500 ha of rubber field.

Source: Status Tanah (1/25,000), Direktorat Tata Guna Tanah Dit, 1983.

Out of the transmigration area, about 370 ha which are situated in DU of SKP-D are still covered by forest, because the right of timber-felling is held by a private company. It is necessary that this right is resolved before implementation of the Project.

### 3.5 Cropping Pattern and Farming Practices

#### 3.5.1 Cropping Pattern

All the farm fields in the study area are listed as rainfed. The cultivation pattern is generally affected by seasonal distribution of rainfall, and the planted and/or harvested areas fluctuate year by year, depending on rainfall water. In the study area, cultivation of wet land paddy is concentrated in the wet season, while dry land paddy and palawija crops are generally planted in the both seasons. The present rotation pattern is illustrated in Fig. IV-1.

In general, most of the wet season crops are sown in August and September and are harvested from December to February. Dry season crops start in February/March, after harvesting of the wet season crops. Farmers aim to plant dry season crops four or six weeks after the wet season harvest in the hope of avoiding dry season water shortage. Mixed culture of palawija crops is common practice in the study area.

The cultivation of wet land paddy generally starts in August /September. Wet land paddy under present cropping patterns requires four weeks for the nursery period and four months growing period from transplanting to harvesting, depending on variety.

The harvested area of crops grown in the study area is summarized as follows, based on the data collected from the rural extension center (BPP), Dalu-Dalu.

(Unit: ha)

	Wet Season*1	Dry Season*1	Total
Paddy - Wet land paddy	102	-	102
- Dry land paddy	776	422	1,198
Maize	255	343	598
Soybeans	150	238	388
Groundnuts	62	116	178
Green beans	33	64	97
Cassava	131	105	236
Rubber			500
<u>Sub-total</u>			<u>3,296</u>
(Multi-cropping intensity)*2			(106%)
Vegetables and perennial crops (Home yard)			219
<u>Total</u>			<u>3,515</u>

Remarks: \*1 Average figure between 1986 and 1987.  
 \*2 Total Harvested Area/Total Farm Land  
 = 3,296 ha / 3,100 ha = 1.06

Source: Programa Penyuluhan Pertanian 1988/1989, BPP Dalu-Dalu, Dinas Pertanian Tanaman Pangan Kabupaten Kampar.

The harvested area of paddy in the study area is estimated at about 100 ha for wet land paddy and 1,200 ha for dry land paddy. These figures correspond to 0.3% and 39% of total farm lands, respectively. The palawija crops are about 1,500 ha, corresponding to 48% of the total farm lands. In addition to these crops, about 220 ha of vegetables and perennial crops such as long beans, chillies, oranges, coconuts, bananas and rumbutan are cultivated mainly in home yards, except for rubber.

Based on the harvested areas above, the present multi-cropping intensity in the study area was estimated at 106%. Such a low cropping intensity is basically attributable to the shortage of available water and poor soil fertility.

### 3.5.2 Farming Practices

Typical farming practices in the study area are given below, based on the results of farm interview surveys. Farm inputs and labor requirements for each crop were estimated as shown in Table IV-21.

#### (1) Wet Land Paddy

Local improved varieties of paddy have been widely introduced throughout the area. These varieties are now dominant in the study area making up almost all of the planted area.

Local varieties are still used mainly for home consumption and local marketing. These varieties are selected from the last harvest or are supplied from KUD.

Paddy seeds are generally sown at rate of 25 to 30 kg per ha in the nursery which is prepared in the size of about 1/20 to 1/25 of the paddy field to be transplanted. Seedlings of local improved varieties as well as those of local varieties are transplanted when 25-30 days old. The field will not be transplanted until rainfall is assured. Transplanting is generally carried out by hand. The number of hills for transplanting is generally 16/m<sup>2</sup>. The land preparation, plowing and puddling, is made before transplanting using animal power.

The fertilizers being used in the area are urea, triple superphosphate (TSP) and potassium chloride (KCl). The average dosages are 91 kg, 12 kg and 4 kg per hectare, respectively. Half of TSP and some of the urea and KCl are generally supplied as a basal dressing two to three days before transplanting and the remaining fertilizers are applied as a top dressing about 30-40 days after transplanting. Weed control is effectively carried out manually on two to three occasions per crop. Application of insecticides is common practice. These dosages average 2.4 liter/ha. They are applied to the field by knapsack type sprayer.

Harvesting is mostly carried out by using sickles or ani-ani. The harvested paddy is immediately threshed, and is dried on the field or home yards. Mutual exchange of labor among the farmers groups is common for harvesting.

## (2) Dry Land Paddy

Main varieties of dry land paddy grown in the study area are Perak, Mutiara, etc. Direct seeding is common practice among the farmers, and the seed rate is about 38 kg/ha. Seeds are sown by using a wooden stick, with distance of about 30 x 30 cm. Before seeding, plowing is done once to twice by animal and man power.

The application of fertilizers and agro-chemicals is common among the farmers, and the average dosages per hectare are 63kg of urea, 44 kg of TSP, 11 kg of KCl and 1.6 liter of insecticides. Spraying of insecticides is done by knapsack type sprayer. Weeding is carried out by hand several times. Harvesting is carried out by the same method as for wet land paddy.

## (3) Secondary (Palawija) Crops

A wide range of palawija crops is grown in the study area. Maize is the second most important crop and others are groundnuts, soybeans, green beans and cassava. These crops are cultivated in both the wet and the dry seasons.

The cultivation methods for these crops are very primitive,

and mixed culture is common practices. After the burning of grass, plowing is done once or twice by animal and man power. Seeding is done manually by using a stick. Most of the varieties used in the study area are local, and the seed rate per hectare ranges between 25 and 30 kg.

Fertilizers and insecticides are applied, except for cassava. The application amounts of fertilizers including urea, TSP and KCl average 90 kg/ha for maize, 33 kg/ha for groundnuts, 106 kg/ha for soybeans and 11 kg/ha for green beans. The dosage of insecticides is estimated at 1.5 liter/ha on an average of palawija crops. Two to three weedings are done by hand, and herbicides are sprayed by several farmers. Harvesting is done manually. Processing and drying are carried in home yards.

### 3.6 Agricultural Production

#### 3.6.1 Crop Yields and Production

The crop yields and production in the study area were estimated on the basis of data collected from BPP (Rural Extension Centers) of Kota Bangun, the Transmigration Office of Kab. Kampar and the farmers' interview survey. The present average yield and production of crops are summarized below, and the details are shown in Tables IV-22 and IV-23.

Crops	Harvested Area (ha)	Production (ton)	Yield (ton/ha)
Paddy	1,300	1,673	1.3
- Wet land	102	283	2.8
- Dry land	1,198	1,390	1.2
Maize	598	760	1.3
Groundnuts	178	160	0.9
Soybeans	388	280	0.7
Green beans	97	60	0.6
Cassava	236	1,650	7.0

Source: Programa Penyuluhan Pertanian 1988/1989, BPP Dalu-Dalu.

The yield of paddy is influenced by variety, rainfall, amount of farm inputs, etc. The average yield of paddy in the study area is estimated to be 2.8 tons/ha for wet land paddy and 1.2 tons/ha for dry land paddy. These yields are still low as compared with the average yields in Riau Province of about 3.3 tons/ha and 1.6 tons/ha, respectively. Such low yields are thought to be caused by various factors such as poor soil fertility, traditional farming practices, the low input levels of fertilizers and agro-chemicals. Of these, the biggest constraint is water stress such as drought.

Yields of palawija crops vary substantially with varieties, soil fertility, rainfall condition and density of farm inputs.

Yields are also badly affected by wild boar damage.

### 3.6.2 Livestock Production

The livestock grazed in the study area are cattle, goats, chickens and ducks. The numbers are summarized in the following table. Livestock raising is not a mainline of agricultural activity in the area, and most livestock are grazed on a small scale in and around the farm land and home yard.

(Unit: head)

Livestock	Total Number	Per Farm Household*
Cattle	1,900	0.62
Goat	150	0.05
Chicken	34,000	11.07
Duck	150	0.05

\* Per farm household = Total number/3,070 households  
Source: Programa Penyuluhan Pertanian 1988/1989,  
BPP Dalu-Dalu.

Annual income derived from livestock raising is of little significance to the farm economy. As far as livestock raising in the area is concerned, however, it plays an important role not only in farm operation but also in protein food supplies for local people. The cattle are usually utilized as motive power in land operation, and live goats, chicken, ducks and eggs are sold in the local markets or used for home consumption.

## 3.7 Marketing and Prices

### 3.7.1 Marketing

In Riau Province, there are three channels for rice marketing from farmers to consumers. The surplus of paddy produced by the farmers is generally sold to KUD and/or middle men through brokers. The paddy collected by KUD is sold to DOLOG after milling, while the paddy collected by middle men is generally taken to the local market in Riau Province. Part of surplus is sold at local markets by the farmers.

In the study area, most paddy is consumed by farmers themselves, and only a small quantity is sold at local markets in and around the study area either by the farmers themselves or through brokers in order to get some cash income. The palawija crops are also consumed by farmers and the surplus produce are sold in local markets like the paddy.

Market flows of major farm inputs such as fertilizers and

agro-chemicals may be broadly divided into two flows; i.e. free market flow and controlled market flow. The former is for private estates, and the latter is for crop intensification programs which are controlled by the Government. For the farmers under these programs, distribution of fertilizers is mainly handled by P.T. Pusri, and agro-chemicals and some farm implements are dealt by P.T. Pertani, the government enterprise.

### 3.7.2 Demand and Supply of Rice

The demand and supply of rice in the study area were analyzed as follows:

Supply	Production of Paddy	(ton)	1,673
	Production of Rice *1	(ton)	1,138
	Seed and Losses *2	(ton)	57
	Net Supply of Rice	(ton)	<u>1,081</u>
Demand	Population*3		15,100
	Per-capita Consumption*4	(kg)	130
	Total Demand	(ton)	<u>1,963</u>
Balance		(ton)	<u>-882</u>

Remarks: \*1 Milling recovery rate: 68%  
 \*2 5% of rice production.  
 \*3 As of 1988.  
 \*4 Result of farm interview survey.

In the study area, the net supply of rice was estimated at about 1,080 tons, while the demand for rice for the total population of 15,100 was 1,960 tons. As a result, a rice shortage in the area of about 880 tons was identified. This shortage has been met mainly from North Sumatra Province.

### 3.7.3 Prices of Farm Inputs and Outputs

The present farm gate prices of farm products and farm inputs in the study area were estimated on the basis of the data obtained from Agricultural Offices and through the farmers' interview survey. The details are presented in Table IV-24.

In order to stabilize the price of rice in the market, DOLOG generally purchases rice when the market price falls below the floor price, and when the price is over the ceiling price, DOLOG sells its stock.

The present low production of palawija crops has resulted from poor marketability together with large fluctuation of market prices. Such poor marketability is mainly due to poor quality of products. According to the information from agricultural

services offices and the results of farm interview survey, the best quality products of palawija crops have no problems for marketing. But strong government support is necessary for stabilization of market prices of palawija crops.

### 3.8 Processing and Storage Facilities

There are 10 rice mills in the study area (see Table IV-28). Most of these rice mills are privately owned. The capacity of one unit is estimated at 4 tons/day for paddy and total milling capacity per day amounts to 40 tons. Assuming that there will be 60 workable days per crop season, this capacity would be sufficient for present production estimated at 1,670 tons.

The total number of storage facilities is estimated at 8 godowns which have floor space of only 40-60 m<sup>2</sup> per unit. The farm inputs and subsidies from the WFP Project (see 3.11.2) are temporarily stored until its distribution to farmers. There are no facilities for storage of crops produced in the study area, and most of these are stored in farmers' houses.

### 3.9 Profitability of Crops and Farmers' Economy

#### 3.9.1 Profitability of Crops

The crop budget analyses for each crop grown in the study area were made on the basis of the data and information obtained from agricultural office and the farm interview survey. The results of analyses are presented in Table IV-25, and are summarized below.

(Unit: Rp 10<sup>3</sup>/ha)

	Gross Income	Production Cost	Net Income
Wet land paddy	588	259	329
Dry land paddy	252	234	18
Maize	227	217	10
Groundnuts	612	228	384
Soybeans	350	266	84
Green beans	360	143	217
Cassava	350	157	193

The main crop grown in the study area is dry land paddy, which accounts for about 43 % of the total harvested area. The farmers expend a great efforts on paddy cultivation, nevertheless, the net income which they get in return for their work is negligible, due to low yields. To improve the productivity of their paddy, the farmers desire to cultivate wet land paddy under irrigation.

### 3.9.2 Farmers' Economy

In order to clarify the economic activities and living standards of farmers (transmigrants) in the study area, a farm budget analysis was made on the basis of a crop budget analysis and the farm interview survey. The results of the analysis are presented in Table IV-26, and are summarized below:

(Unit: Rp 10<sup>6</sup>; Sept. 1988)

Item	With Subsidy	Without Subsidy
Farm Size* (ha/family)	(1.01)	(1.01)
I. Gross Income	<u>737</u>	<u>737</u>
- Farm Income	386	386
- Off-farm Income	351	351
II. Gross Outgoings	<u>732</u>	<u>953</u>
- Production Cost	70	70
- Living Expenses	662	883
III. Net Reserve	<u>5</u>	<u>-216</u>

\* 3,100 ha / 3,070 families = 1.01 ha/family

The farmers in the study area have received considerable subsidies from WFP (FAO Project) through the transmigration office. The subsidy consists of rice, canned fish and cooking oil, and the annual quantities are estimated at 282 kg of rice, 25 kg of canned fish and 15 kg of cooking oil per family, which are equivalent to about Rp 220,000 in total. Without this subsidy, their living standards would drop severely, as shown in the above table.

In addition to the above, the general characteristics of the farmers' economy may be summarized as follows:

- a) Two thirds of the farm income are derived from upland crops such as maize, groundnuts and vegetables, and income from paddy production is only 30 %.
- b) A considerable amount of the gross income is derived from off-farm income consisting of wages earned from other farms or non-farm works.
- c) Food expenses amount to 68% represent the largest portion of total living expenses.
- e) The net reserve is negligibly small. This indicates that the farmers in the study area have no reinvestment funds for improvement of their farming activities.

As a result, it can be said that farmers' economy in the study area remains at the subsistence level.



### 3.10 Agricultural Support Services

Agricultural support services are one of the most important sectors for agricultural development. They influence the increase of crop production and subsequent increase of farm incomes as well as improvement of the farmer's living standard. The present condition of agricultural support services related to agricultural development in the study area is summarized below.

#### 3.10.1 Agricultural Research

Research into agriculture, especially food crops, is centralized and undertaken by the Central Research Institute for Food Crops (CRIFC) at Bogor in West Java. Under supervision of CRIFC, there are six (6) branch research stations for food crops in whole Indonesia, which are listed below.

Research Station	Province	Major Activities
Bogor	(BORIF) West Jawa	Fundamental research for rice.
Sukamandi	(SURIF) West Jawa	Irrigated field for rice.
Malang	(MARIF) East Jawa	Fundamental research for secondary crop.
Sukarami	(SARIF) West Sumatra	Dry land and wet climate conditions for food crops.
Maros	(MORIF) South Sulawesi	Dry land and dry climate conditions for food crops.
Banjarmasin	(BARIF) S. Kalimantan	Tidal swamp and swamp condition for rice.

In Riau Province, there is no agricultural research station. Agricultural research in this province is covered by the West Sumatra Branch Research Station, Sukarami. The main activities of this station are to execute experimental work under the instruction and supervision of the Central Station at Bogor and to collect information from extension services on the technical problems associated with the farming practices of local farmers.

#### 3.10.2 Extension Services

Since 1974, the agricultural extension services in Indonesia have been strengthened with the founding of the Agency for Agricultural Education, Training and Extension as one of the extra-ministerial bureaus under the direction of the Ministry of Agriculture. The Government also intends to establish an Agricultural Development Centers (ADC) in each province and several Rural extension Center (BPP) in rural areas. The main function of ADC is to conduct adaptability tests for new recommended agricultural techniques and training for extension workers at provincial level. The BPP is a kind of base camp for agricultural education activities, its function being the

preparation of programs, dissemination of agricultural information and training of key farmers at a local level.

In Riau Province, the total number of staff for agricultural extension services is 14 subject-matter specialists (PPS), 132 extension supervisors (PPM) and 424 field extension workers (PPL).

The PPS resident in each Kabupaten and advises about 10 PPMs of which 2 to 4 are working in Kabupaten Office and the rest are staying in the Rural Extension Center (BPP). The PPMs in BPP assist and advise about 7 to 10 PPLs. Each PPL is required to visit a farmers' group (Kelompok Tani) in each extension area once a week. There are 8 extension areas under each village unit. The extension worker visits 2 extension areas a day and all 8 areas over 4 days from Monday to Thursday every week, and receives training on Friday and Saturday. This system is called training and visit system (Sistem Kerja Latihan dan Kunjungan; LAKU).

The study area is covered by BPP Dalu-Dalu (Kota Bangung). The total number of staff in this BPP are 2 PPMs and 14 PPLs including 8 PPLs for food crops, 5 PPLs for estate crops and one PPL for livestock, as shown below.

	Riau Province	Kabupaten Kampar	BPP Dalu-Dalu			
			SKP-C	SKP-D	Other	Total
PPS	14	*	-	-	-	-
PPM	132	46	-	-	2	2
PPL	424	209	8	5	1	14

\* No data

Sources: 1) Laporan Tahunan 1986/1987, Dinas Pertanian Tanaman Pangan, Propinsi Riau.

2) Programa Renyuluhan Pertanian 1988/89, BPP Dalu-Dalu.

### 3.10.3 Agricultural Credit

The Indonesian People's Bank (Bank Rakyat Indonesia (BRI)) is the state bank specializing in agricultural credit covering the whole country. The Bank is authorized to finance the credits of crop intensification programs for qualified individual farmers. In order to provide an efficient loan service, the BRI has established a broad network consisting of regional offices, branch offices and sub-branch offices (called BRI Unit Desa or Village Unit BRI).

Credit is extended to the farmers through the BRI Desa under the BIMAS package system which decides the size of loans based on the conditions in each region and the possible cropping

seasons. The BIMAS credit for paddy production was a short term loan over a period of seven (7) months with a monthly interest rate of 1 percent. In 1981, the Government strengthened the BIMAS credit by introducing INSUS intensification program through the farmers group system. Each INSUS area should be more than 25 ha and should have irrigation facilities owned by a group of farmers who are eager to improve their farms.

According to Memorandum No. 18 of the Agriculture Minister dated January 31, 1985, the BIMAS package system has been replaced by other credit system as follows: continuation of the BIMAS credit which uses the free credit system through a reliable KUD as an intensification credit channel, whereby the farmer can get a loan which is not limited by a package, and is therefore according only to their requirements.

In addition to the above credit, there are three credits; General Credit for Rural Area (Kupedes), Small Investment Credit (KIK) and Pre-financing Loan for Working Capital (KMKP).

The former (Kupedes) can be utilized by farmers if a reliable KUD is not available. Since May 1984, this credit has been extended through BRI village units for farmers who have more than 1.0 ha of sawah and 2.0 ha of upland. The loan amount of the credit is between Rp. 25,000 and Rp. 1,000,000 for investment and operational purposes with an interest of 1% to 2% depending on certain conditions.

The second (KIK) is a Government credit program especially for small investment which is applied to land development programs where new paddy fields are to be constructed as well as KMKP. This credit is financed by cash with an interest of 1.0 % per month, and has the repayment period of 4 years.

The latter (KMKP) form a link in the chain of the Land Development Project (see Sub-section 3.10.6), and has for its object to promote on-farm development of the farmer's group. The loan consists of the following 4 kinds depend on the categories of land to be developed by the farmer's group.

Land Category	Interest (%)	Grace period (years)	Repayment period (years)
Dry Land	10.5	2	6
Grass/Shrubs	10.5	2	7
Light Forest	10.5	2	10
Heavy Forest	10.5	2	14

Although there is no BRI Unit Desa in the study area, the farmers/KUDs can receive credit services from BRI in Pasir Pengarayan. But it is difficult to use these services, because traffic conditions between the study area and Pasir Pengarayan

are not so good, especially in the wet season. For the improvement of agricultural credit situation, it will be necessary to establish BRI Unit Desa in the study area.

The KUDs in the study area have loans (BIMAS, KIK, etc.) from BRI Pasir Pengarayan. Their credit amount and its repayment situation are shown below.

(Unit: Rp 1,000)

	Credit	Repayment	(%)
SKP-C	3,400	2,465	72.5
SKP-D	18,650	13,091	70.2

Source: BRI Bangkinang.

#### 3.10.4 Agricultural Cooperative

The existing KUD cooperative system was established in accordance with Presidential Decree No. 4, 1984. The purposes of the system are to increase production of food crops, and to support farmers in marketing their own produce. The main activities of KUD are as follows:

- To purchase farm products directly from farmers and to sell them to DOLOG,
- To supply farm inputs such as seeds, fertilizers and agro-chemicals, and
- To channel agricultural credits from BRI to farmers.

In the study area, 6 KUDs have been organized so far. The total number of KUD members including candidates is about 49 % of total farm households in the study area, as shown below.

Village	Name of KUD	Member	Farm Household	%
SKP-C: DU	Sari Mukti	247	571	43.3
DK-II	Suka Karya Abadi	262	378	69.3
DK-III	Karya Maju	262	386	67.9
DK-IV	Sepakat	220	367	59.9
SKP-D: DU	Makarti	173	582	29.7
DK-I	-	-	254	-
DK-II	Mekar Jaya	354	433	81.8
Rantau Kasai	-	-	100	-
Total		1,518	3,071	49.4

Source: Laporan Perkembangan Koperasi Unit Desa (KUD) di Daerah Transmigrasi, Kantor Wilayah Departemen Koperasi Propinsi Riau, 1988.

### 3.10.5 Distribution of Farm Inputs

Distribution of farm inputs such as fertilizers, agro-chemicals and agro-machinery in Riau Province is handled by P.T. Pertani and P.T. Pusri which are government enterprises.

Fertilizers and agro-chemicals used in the area are distributed to the farmers through the distribution networks of P.T. Pertani and P.T. Pusri consisting of Kiosks in the village units and/or KUD. In the study area, there are 6 KUDs as of 1988, and fertilizers and agro-chemicals were mainly distributed through these cooperatives.

The distribution prices of farm inputs under the crop intensification programs are set by Government uniformly throughout Indonesia. The distribution prices of urea and TSP to farmers at present are Rp. 135/kg.

### 3.10.6 Land Reclamation Services

#### (1) Land Development Project

The DPU is responsible for implementation of irrigation projects. For construction of these projects, the responsibility of DPU is limited to up to the secondary canal and 50 m of tertiary canal from its turnout structure. On-farm development within the tertiary irrigation block such as tertiary canal, quaternary canal, farm ditch, farm road and land reclamation of field is left to the farmer's hand. Because of the lack of funds, inadequate local leaders and insufficient technique, this on-farm development is usually delayed in its commencement.

In order to promote and facilitate the construction of this development, the Land Development Project (LD Project) was introduced by the Ministry of Agriculture in 1979. The LD Project has two components; i.e. the establishment of the pre-financing loan for working capital (KMKP) and the Small Investment Credit (KIK), as mentioned in the preceding section.

Other than credit services, the Government also assists the farmers free of charge by providing survey, design, guidance and supervision for construction works of on-farm development. The LD Project is executed under the responsibility of the Director General of Food Crop Agriculture (DGFA), and as the executing agency, UPP (UNIT PELAKSANA PROYEK) is organized in each province. The main tasks of UPP are as follows:

- a) Dissemination of information concerning the LD Project.
- b) Assistance to farmers in obtaining pre-finance loans.
- c) Investigation of candidate areas for the LD Project.

- d) Supervision and control of the survey, design and construction of land reclamation to be done by the contractor and/or farmer's group.
- e) Assistance to the agrarian services in issue of land certificate.
- f) Transformation of pre-financing loan into KIK.
- g) Monitoring of all UPP activities and preparation of report to DGPCA.

Under the supervision of DGPCA, a leader of the LD Project is appointed at the central office (Jakarta) and in each province. The Project Leaders at the provincial level decide two operational areas of UPP; the land reclamation area of about 1,000 ha and the investigation area of about 2,000 ha to be developed within two years.

## (2) PTPT

PTPT (or PLPT) is one of the new organizations established under the Ministry of Public Works with the objectives of strengthening coordination between the Transmigration office, UPP Office and Agricultural Office, and executing the transmigration program related to the Ministry of Public Works. The operation of PTPT is controlled directly by the Provincial Public Works, and has the following tasks:

- a) Survey and planning for land clearing and public facilities such as roads and bridges in the proposed transmigration area.
- b) Execution of land clearing.
- c) Construction of public facilities.

The land and public facilities reclaimed and constructed by the PTPT will be handed over to Kabupaten Transmigration Office after 5 years from the completion of those facilities.

### 3.11 Related Projects in the Study Area

#### 3.11.1 Existing Transmigration Project in the Study Area

Most of the farmers in the study area are transmigrants who were settled through two transmigration projects called Tanjung Medan SKP-C and -D. The settlement was started in December 1981. The SKP-C and -D comprise 9 transmigration villages; Desa Utama (DU), Desa Kucil (DK)-I, -II, -III, -IV of SKP-C; and DU, DK-I, II, V of SKP-D. These villages are located on both left and right sides of the Kumu river. Of these, the study area covers 7 villages except for DK-I of SKP-C and DK-V of SKP-D. The number of transmigrants in the study area is 2,970 families as of June

1988, as shown below.

Villages	No. of Settlement (Family)				Present Settlement	Population
	Initial Settlement	Spontan	Re-set- tlement	Outflow		
<u>SKP-C</u>						
DU	616	67	55	167	571	2,790
DK-II	400	19	30	71	378	1,820
DK-III	400	12	34	60	386	1,990
DK-IV	400	23	50	106	367	2,010
<u>SKP-D</u>						
DU	600	65	44	127	582	2,690
DK-I	259	27	14	46	254	1,150
DK-II	512	28	28	135	433	2,180
<b>Total</b>	<b>3,187</b>	<b>241</b>	<b>255</b>	<b>712</b>	<b>2,971</b>	<b>14,630</b>

Source: Laporan Buran Juni 1987 - Juni 1988, Kantor Departemen Transmigrasi, Kabupaten Kampar.

Each transmigration village has its public facilities near the center, home yards surrounding them, farm land of first arable farm land (Lahan Usaha I (LU I)) surrounding home yards, and farm land of second arable farm land (Lahan Usaha II (LU II)) surrounding first arable farm land.

The land allocated to one family is 2.0 ha comprising home yard and farm land as shown below.

- Home yard: 0.25 ha (50m x 50m)
- Farm land: 1.75 ha
  - LU I - 1.0 ha (100m x 100m)
    - Paddy field.
    - Land clearing is done by the Ministry of Transmigration, but land leveling is left to the transmigrant.
  - LU II - 0.75 ha (100m x 75m)
    - Not specified for land use.
    - Land clearing and leveling are done by the transmigrant himself.

For the right of land holding, the issuance is the responsibility of Transmigration Office, and this right is granted when the following conditions are met:

- a) The allocated land shall be cultivated actively by the transmigrants.
- b) The transmigrants shall reside on the land given.
- c) The allocated land shall not be transferred or rented to other persons, or mortgaged.

The right of land holding is converted to ownership when the distributed land has been cultivated satisfactorily over for the 5 years.

The total areas of farm land and home yard in the study area, which were allocated initially by the Government, are 5,325 ha and 761 ha, respectively. The progress of land reclamation including clearing and leveling as of April 1988 is presented in Table IV-27, and is summarized in the following table. More than 80% of the first arable farm land has already been reclaimed by the Ministry of Transmigration and transmigrants, but reclamation of the second arable farm land has been hardly started by the transmigrants.

(Unit: ha)

Villages	Initially Allocated Area	Reclaimed Area	(%)
Farm Land	5,325	3,363	63.2
LU-I	3,041	2,486	81.7
LU-II	2,284	877	38.4
Home Yard	761	751	98.7
<b>Total</b>	<b>6,086</b>	<b>4,114</b>	<b>67.6</b>

Source: Laporan Buran April 1988, Kantor Departemen Transmigrasi, Kabupaten Kampar.

In the transmigration villages, the public facilities such as school, clinic, market, village office and agricultural extension office are constructed in each village by the government authorities concerned for these facilities. The kind of facilities is listed below.

Facilities	Unit	Facilities	Unit
Transmigration Office	1	Meeting Hall	1
Extension Office	1	School	1
Post	1	Storehouse	1
Clinic	1	Religious Building	L.S.
Houses for Officials	L.S.	Market	1

An inventory of public facilities with the data on social conditions in existing transmigration villages in the study area is presented in Table IV-28.

In order to settle the transmigrants successfully, the Government has provided infrastructures with a considerable amount of subsidies consisting of certain quantities of living accommodation and commodities needed for their farming and living, during an initial period of 12 months after settlement



(see Table IV-29).

### 3.11.2 Agricultural Development Projects

In the study area, there are one FAO program, three World Bank projects and one private project; i.e. i) World Food Program (WFP), ii) Small Holder Rubber Development Project (SRDP), iii) International Fund for Agricultural Development (IFAD) Project, iv) Second Stage Development Program (SSDP) and v) the estate project by PT. Hutahaean.

#### (1) World Food Program (WFP)

The WFP has been executed by the Ministry of Transmigration with the objective of subsidizing the food supply to settlers. If the settlers have farm work, they can take the following foods per one man-day for its work.

- Canned fish: 0.25 kg/man-day
- Cooking oil: 0.20 kg/man-day
- Rice: 2.00 kg/man-day

The upper limit of work days for these subsidies is 15 man-days/month/family. This Program was commenced in 1984 and will be terminated in 1988. All of the settlers in the study area have received the above foods from WFP. According to the interview survey of settlers, they had received about 282 kg of rice, 25 kg of canned fish and 15 kg of cooking oil per family in one year.

#### (2) Small Holder Rubber Development Project (SRDP)

The executive agency of SRDP is the Bureau of Estate. The project period ranges from 1986 to 1990. In order to increase rubber production, SRDP has given credit to small farmers in the form of rubber seedlings and land reclamation costs for rubber fields. In the study area, there are about 16 ha of SRDP, which is located near the DK-II of SKP-D. For the distribution of rubber seedlings to the farmers, SRDP has nursery farms of 180 ha in Desa Pasir Pengarayan in Kabupaten Rambah.

#### (3) International Fund for Agricultural Development (IFAD)

All cattle raised in the study area were supplied through the IFAD Project which is executed by the Bureau of Livestock. The period of this Project is ten years from 1983 to 1992. The main objective is to supply animal power to farmers. The farmers who need animal power can receive one (female) or two (male and female) adult cattle from IFAD Project. Repayment is made by the cash equivalent to two calves for one adult cattle or three calves for two adult cattle. One veterinarian has been assigned to provide after care of the cattle supplied in the study area.

#### (4) Second Stage Development Program (SSDP)

The Second Stage Development Program has been carried out by the Ministry of Transmigration with finance and technical cooperation of the World Bank. The Project aims to improve the welfare and low income of large numbers of transmigrants, and covers the whole country. In the study area, the following rehabilitation and improvements have been planned under this project.

a) Rehabilitation of road between DU of SKP-C and Dalu-Dalu.

b) Rehabilitation of road in each transmigration village.

- Road	Pavement	924 m
	Shoulder	522 m
	Side Ditch	17,168 m
- Bridge	Rehabilitation	3 nos.
	Replacement	1 no.

c) Improvement of shallow wells: 80 nos.

d) Reconstruction of houses: 230 nos.

e) Land clearing and relocation of farm land.

- Forest clearing	1,268 ha
- Alang-alang clearing	1,124 ha
- Reallocation of farm land	149 ha

In addition, cultivation of perennial crops such as hybrid coconuts and rubber has been promoted by SSDP in the SKP-C and SKP-D.

#### (5) Estate Project

A private company (PT. Hutahaean) has planned an estate project for rubber, coconuts palm, cacao, etc. This project is located on the right bank of the Kumu river, and borders on the farm land of DK-II, SKP-C and the Kumu river between Kota Bangung and its DK-II. The total area is about 4,800ha, and the cultivated area of each crop will be as follows:

- Rubber	: 2,000 ha
- Coconuts palm (hybrid)	: 1,000 ha
- Cacao	: 1,500 ha
- Others	: 300 ha

According to information from the Plantation Office in Pekanbaru, land clearing will be commenced at the beginning of 1989. The main canal, which will be planned by the Batang Kumu Irrigation Project, will be constructed in the northern part of this estate project. It is necessary for there to be some arrangement and coordination between the parties immediately interested.

## CHAPTER 4. AGRICULTURAL DEVELOPMENT PLAN

### 4.1 Objectives and Basic Concepts for Agricultural Development Plan

#### (1) General

The only active industry in Riau Province is in the mining sector (petroleum production) which accounts for 67 % of the total GRDP. In order to grow out of this monoculture economy and to achieve further economic development, the Provincial Government has been promoting diversification of industry and into the agricultural sector especially.

For agricultural development in Riau Province, one of the key factors is to promote transmigration, which solves the lack of human resources. Since 1969, a great deal of effort has gone into the transmigration program. About 65,000 families accounting for 10 % of total families in the province were settled as farmers. In spite of such efforts, production for staple food crops is found to be inactive in this province, especially in rice production. Although Indonesia as a whole has almost achieved self-sufficiency in rice supply, Riau Province is still short of rice. During the three years (1984-1986), the domestic supply of rice in the province has only been 60 % of total domestic demand, and it is forecasted that this shortage will continue in future.

Such rice shortage is attributable to unfavorable topographical conditions for paddy fields. Half of the land in Riau Province is covered by swamp, and rice production is limited to mountain slopes and high land areas located along the border of the Provinces of West Sumatra, North Sumatra and Jambi. Existing transmigration areas are mainly distributed in these areas which form an arch, and the Project area including Tanjung Medan SKP-C and Tanjung Medan SKP-D is located at northern part of arched area.

Among these transmigration areas, the Project area has favorable topographic condition for irrigation development as compared with other areas. About 29,700 ha of the study area are flat to gently steep, and the Kumu river as a water resource flows in the area. But, it seems that present agricultural activities are rather less than in other areas. The main crop grown in the study area is dry land paddy, which accounts for about 43 % of the total harvested area. The net income per ha of dry land paddy is only Rp 18,000. The farmers expend great efforts on paddy cultivation, nevertheless, the net income which they get in return for work is negligible, due to the low yield. In accordance with the low net income, their living standards remain at the subsistence level in consequence.

There are various problems for development in the area. Of these the biggest constraints are soil limitations such as low pH value and poor soil fertility, and water stress such as poor

drainage in the wet season and drought in the dry season. The soils having such specific characteristics are only marginally suitable for the cultivation of palawija. But these constraints could be overcome by introduction of paddy cultivation under the irrigation which has wide range for natural adaptability.

Owing to the increase in production of staple food to meet increasing domestic consumption, the Provincial Government has a strong intention to implement irrigation development in the area, just as transmigrants in the area have the desire to introduce the irrigated farming of paddy in order to improve their living standards. Moreover, it is expected by the Provincial Government that the Project area could play an important role in the supply of the staple food crop of the province.

## (2) Objectives

Under the circumstances described above, the objectives of the agricultural development plan are set to:

- a) Increase staple food crop production,
- b) Promote the transmigration program in order to activate agricultural industry in the rural area,
- c) Improve and stabilize the farmers' (transmigrants') living standard, and
- d) Equalization of living standards and more equitable distribution of development benefits through implementation of irrigation and drainage facilities.

## (3) Basic Concepts

In order to accomplish the objectives of the Project, the basic concepts for the agricultural development plan would be as follows:

- a) High development priority should go to the existing transmigration areas (SKP-C and SKP-D) which have various problems and constraints, even if natural conditions are only marginally favorable for agricultural development.
- b) Yield and production of crops in the wet season should be stabilized and improved through establishment of a new irrigation system and introduction of irrigation farming practices.
- c) Planting area of crops in the dry season should be increased with year-round irrigation and thereby total production of crop maximized.

- d) In formulating agricultural development, special attention should be given to the expansion of the irrigation area up to the potential maximum area in conformity with government policy for equalization of social infrastructure.
- e) The proposed crops and cropping pattern must conform with the existing social conditions and be acceptable to the farmers.

In addition to the above concepts, the promotion of crop diversification should be considered to formulate the agricultural development plan in the Project area, in accordance with the development policy of the Government.

#### 4.2 Proposed Land Use

After completion of the Project, most of the farm field in the area will be fully irrigated, and about 7,300 ha of new irrigated farm field can be reclaimed. More intensive use of the farmland will become possible. The proposed future land use in the Project area is summarized below (see Table IV-30).

(Unit: ha)

	Development Area	Existing Area	Project Area
- Paddy field (Irrigated)	7,300	-	7,300
- Perennial crops* <sup>1</sup>	5,480	400	5,880
- Villages* <sup>2</sup>	2,120	1,400	3,520
- Right of Way* <sup>3</sup>	800	-	800
- Forest		3,470	3,470
- Others		430	430
<b>Total</b>	<b>15,700</b>	<b>5,700</b>	<b>21,400</b>

\*1 Total families x 0.75 ha = 7,300 x 0.75 = 5,480 ha

\*2 Includes villages of new transmigrants and resettlers.  
4,230 families x 0.5 ha/family = 2,120 ha  
(Home yard: 0.25 ha, Public area: 0.25 ha)

\*3 10 % of gross irrigable area.

According to the criteria of the Transmigration Office, farm land allocated to the transmigrants in the Project area consists of two types; first arable farm land (Lahan Usaha I; LU-I) and second arable farm land (Lahan Usaha II; LU-II). The land use of LU-I is paddy field and LU-II is upland or perennial field. Paddy cultivation with irrigation is proposed in the land of LU-I. In the land of LU-II, rubber cultivation without irrigation is recommended in accordance with a plan of SSDP which has been carried out by the Ministry of Transmigration.

The land use patterns cannot basically be changed without provision of irrigation development. The land use in the surrounding areas which will not be incorporated in the Project area will have to remain as it is.

#### 4.3 Proposed Cropping Pattern

##### 4.3.1 Selection of Crops

The study on selection of crops was made in parallel with the alternative study on the optimum cropping pattern. As a result of study, rice would be taken as the suitable crop to be introduced in the Project area, from such considerations as natural adaptability, profitability of crops, marketability and farmers' intention, as mentioned below.

###### a) Natural Adaptability

The soils in the Project area are broadly classified into 4 great groups including 9 soil units; Cambisols, Alluvial Soils, Gleysols and Podzolic Soils. The lands covered by these soils are marginally suitable for the cultivation of palawija crops, because of serious limitations such as low pH value (pH 4.3 - 5.6) and high aluminum content (see Table III-1 in Appendix III). But there is no problem for rice cultivation which has wide natural adaptability. From the standpoint of "right crop for right land", it is recommended to cultivate rice in the area.

###### b) Profitability of Rice

The profitability of rice under the irrigated condition is higher than other food crops such as maize, green beans, cassava, soybeans and groundnuts. Considering the subsistence level of the farmers' living standard in the area, the introduction of rice cultivation, which has high profitability, will produce good results in improving their living standard. Moreover, the price of rice has been controlled and stabilized by the Government, and this stabilized price will bring also good results in maintaining improved living standards.

###### c) Demand and Supply for Rice

The increase in rice production in recent year has much relieved the shortage of rice supply in the whole country. Such successful increase in rice is mainly attributable to the Government's efforts that went into the expansion of the irrigated area and the extension of crop intensification programs. As mentioned in the preceding section, it is expected that the Government's

efforts will be continued in order to meet the domestic demand for rice increasing along with population growth.

d) Farmers' Intention

Through the interview survey of farmers in the Project area, it was confirmed that they have a strong intention to produce rice, whenever provision of irrigation water is permitted.

With regard to the palawija crops, the soils in the Project area are marginally suitable for these cultivation, due to soil limitations as mentioned in 4.3.1 (a). None of these crops are proposed in the area just yet. The introduction of these crops would however be recommended at a future stage, taking the following matters into account.

- 1) Groundnuts and green beans have high profitability like paddy (see Table IV-31).
- 2) Cropping patterns which consist of paddy and palawija crops can create the maximum development benefits as a whole (see 4.3.2).
- 3) As a policy of agricultural development, crop diversification has been promoted by the Government.

Prior to the introduction of palawija crops, it is necessary to establish advanced and assured farming practices on the soils in the area. It would therefore be proposed to establish a pilot farm in the Project area, in order to introduce these crops. The proposed pilot farm is described in section 4.11.

On the other hand, although vegetables including chilies have the highest profitability, even more than rice (see Tables IV-31 and IV-38), they are not recommended, except for small scale cultivation. Since vegetables have no price and no marketing controls, cultivation of these crops on a large scale would involve much risk, due to extreme fluctuation of price depending on demand and supply conditions and the limited market in Riau Province. In due consideration of such marketing condition, the production of vegetables under the future with project condition would be recommended at the same level as at present.

#### 4.3.2 Alternative Study for Proposed Cropping Pattern

In order to determine the optimum cropping pattern to be introduced in the Project area, alternative studies were made in parallel with the studies on crop selection. The alternative cropping patterns are illustrated in Fig. IV-2, and are

summarized below. The studies were made to the area of LU-I where is irrigated by the Project.

	Wet Season		Dry Season		Cropping Intensity
	Wet Season Paddy	Dry Season Paddy	Palawija		
			With Irrigation*1	Traditional Cultivation*2	
Type-I	4,500	4,500	-	-	2.00
Type-II	7,300	3,100	-	2,700	1.79
Type-III	7,300	-	5,800	-	1.79
Type-IV	6,100	3,050	2,750	-	1.95
Type-V	7,300	2,400	2,400	1,000	1.79

\*1 Improved farming with irrigation.

\*2 Exclude poor drainage area of 1,500 ha.

The Type-I and -II consist of double cropping of paddy. The Riau Province still has a rice shortage, and the Provincial Government has promoted the increase in rice production in order to meet demand. In addition, the farmers desire to introduce paddy cultivation, whenever provision of irrigation water is permitted. In due consideration of such Government policy and the farmers' intentions, the cropping pattern to be adopted in the Project area would be either Type-I or Type-II. For the cropping pattern of paddy, intensive patterns such as triple cropping were excluded from the studies. Although farmers in the Project area have desire introduction of such intensive cropping of paddy, it is not recommendable, because continuous cropping would encourage the outbreak of insects such as brown plant hoppers and stem borers.

The Type-III to Type-V are combinations including paddy and palawija crops by improved farming with irrigation, and these are made on the basis of the assumption that soil constraints will be solved by improved farming practices in future. The studies for these types were done in order to clear the possibility of further development in future, though none of these types are recommendable just yet.

As for the Type-II, and V, they have fallow areas which are estimated at 2,700 and 1,000 ha except for poor drainage area of 1,500 ha, respectively. In these fallow areas, traditional cultivation of palawija crops such as maize, groundnuts, soybeans and green beans is possible, though good yields of these cannot be expected due to the soil constraints as mentioned in preceding section. It is considered that this traditional cultivation would be carried out by the farmers, in order to get some cash income and/or take the crops for home consumption.



For the determination of the optimum pattern through alternative studies, the following key factors were set, taking into consideration the basic concepts for agricultural development.

- Maximum irrigable area
- Number of beneficiaries
- Profitability (total net income and net income per ha)
- Provincial Government policy for development
- Farmers' intention

In the above key factors, the maximum irrigable area and number of beneficiaries were estimated through the water balance study made on the basis of the water requirements per ha. The profitability for each alternative was calculated by net income per ha for each crop (see Tables IV-31 and IV-38). Through studies using these key factors, the optimum scale of the project facilities and irrigation area were clarified with the proposed cropping pattern, not only from technical and economic view points but also social view points such as the maximization of beneficiaries and equitable distribution of social infrastructure and development benefits. The results of alternative study are summarized below.

	Type-I	Type-II	Type-III	Type-IV	Type-V
Development area based on water availability (ha)	4,500	7,300	7,300	6,100	7,300
Harvested area					
Paddy (ha)	9,000	10,400	7,300	9,150	9,700
- WSP*1 (ha)	(4,500)	(7,300)	(7,300)	(6,100)	(7,300)
- DSP*2 (ha)	(4,500)	(3,100)	-	(3,050)	(2,400)
Palawija-IR*3 (ha)	-	-	5,800	2,750	2,400
Palawija-TR*4 (ha)	-	2,700	-	-	1,000
Total (ha)	9,000	13,100	13,100	11,900	13,100
Cropping intensity	2.00	1.79	1.79	1.95	1.79
Number of beneficiaries (KK)*5	4,500	7,300	7,300	6,100	7,300
Total net income (Rp.10 <sup>6</sup> )	6,224	7,682	7,213	7,354	7,785
Net income per ha (Rp.10 <sup>3</sup> /ha)*6	1,383	1,052	988	1,206	1,066

Remarks: \*1 WSP = Wet Season Paddy      \*2 DSP = Dry Season Paddy  
 \*3 Improved farming with irrigation.  
 \*4 Traditional cultivation.  
 \*5 KK = Families, Farm Size = 1.00 ha (Paddy Field).  
 \*6 Net income per ha = Total net income / Development area.

Type-I has the highest net income per ha, and the highest economic internal rate of return (EIRR) among the alternatives to be evaluated in this type. Although this would be favorable from a view point of national economy, it may be not recommendable, because the number of beneficiaries would be only 62 % of Type-II. This would mean that the development benefits would be to limited to 4,500 families of farmers.

In case of Type-II, the development area and the number of beneficiaries would be bigger than Type-I. The total cropping area of paddy will reach about 10,400 ha. The cropping intensity of paddy could be increased from the present level, though this intensity would be lower than for Type-I. This type will provide equitable distribution of development benefits to a considerable number of the existing transmigrants who have a subsistence level of living standard.

As a result, it can be said that Type-II is the most applicable to the Project area. The proposed cropping pattern, together with climatic data, are illustrated in Fig. IV-3.

As for Types-III, -IV and -V, the introduction of palawija crops can save much irrigation water as compared with paddy, thereby these patterns can create the maximum cropping area. Of these, Type-V make possible the maximum total net income as a whole. In future, if the introduction of palawija crops becomes possible technically through the experimental works which are proposed in the area, Type-V will be recommended in order to promote further development.

#### 4.3.3 Cropping Area and Timing of Operation

Through the alternative study, cropping pattern of Type-II was proposed. The annual cropping areas of this type are estimated at 7,300 ha for wet season paddy, 3,100 ha for dry season paddy and 2,700 ha for palawija crops. Cropping intensity under the future with project condition is 179%.

A land preparation period of one month is allowed for preparing the land for both of wet and dry season paddy. The growth period is put at 90-105 days from transplanting to harvesting, following a nursery period of 20 days. Irrigation water is not required during the last two weeks of the growth period when the crop is in the ripening stage. The maintenance period of canals is set at about two months between the beginning of August and the end of September (see Fig. IV-4).

#### 4.4 Proposed Farming Practices and Farm Inputs

##### 4.4.1 Proposed Farming Practices

Proper farming practice is one of the essential factors for realizing full exploitation of agricultural potential in the Project area. The farming practices of paddy to be introduced in the area are proposed as follows. These proposed farming practices will essentially be carried out manually with animal power and some minor tools and equipment.

Early maturing and high yielding varieties like PB 46, PB 56, PB 64, Kelara and Bahhutong are proposed, which have been recommended by the Agricultural Extension Office. The growing periods of these varieties are as follows:

Varieties	Days	Varieties	Days
PB 46	125 - 130	Kelara	115
PB 56	110 - 115	Bahbutong	115 - 125
PB 64	115		

Sources: 1) Pengendalian Hama Terpadu Wereng Cokolat Pada Tanaman Padi, Direktorat Jenderal Pertanian Tanaman Pangan, 1986.  
 2) Deskripsi Berbagai Varitas Komoditi Tanaman Pangan, Dinas Pertanian Riau, 1983.

The seed requirement will be 30 kg per ha. Although seed treatment is not commonly carried out at present, the paddy seeds to be used in the area will have to be the certificated extension seeds and be selected by using a solution of 1:13 specific gravity before pre-germination. The selected seeds will also have to be disinfected by using an adequate seed disinfectant like Benrate. Pre-germination practice is recommendable for increasing the germination percentage.

The nursery has to be prepared as flat as possible. The size of nursery should be about 1/20 of the paddy field to be transplanted. Fertilization to nursery bed is essential for healthy growth of seedlings. The recommendable dosage is 5 kg/ha of urea. The nursery period is 20 days after seeding.

Plowing is carried out by animal power, at least 10 days before transplanting. After plowing, harrowing and puddling are required for land levelling. These works are recommended to be carried out by using animal power.

Transplanting is carried out by manual labor. The spacing of transplanting is set to be 30 cm x 10 cm with 3 seedlings per hill, and planting depth of 2-3 cm is recommended. The soils of the Project area are poor in plant nutrients; nitrogen, phosphate and potassium. These chemical elements have to be supplemented by fertilizers. Considering the soil condition, the suitable fertilizers are urea, triple superphosphate (T.S.P) and potassium chloride (KCl). The total fertilizer requirement for sustaining the target yields would be 200 kg/ha of urea, 100 kg/ha of TSP and 50 kg/ha of KCl. The dosage of basic fertilizer application is one third of urea, all of T.S.P. and one third of KCl, when field preparation is practiced. Top dressing is done twice at the initial tillering stage about 20 days after transplanting, and at the spikelet differentiation stage corresponding to 20 days before heading. The amount of top dressing to be applied per ha is one third of urea and KCl each time.

Weeds may be eradicated by manually. After transplanting, weeding is carried out manually 3 times, depending on the condition of weed growth. For effective weeding, it is recommended that a rotary weeder, namely "landak" being widely used in Java, be introduced in the area. At present, herbicides

have been developed for weeding purposes, and their efficiency is acceptable, particularly for saving labor. However, as some kinds of chemicals are harmful not only for human beings but also to livestock production and the natural environment, careful selection of these chemicals must be made.

As regards plant protection, ecological control will be proposed in the area. But application of some insecticides is required for the control of brown plant hoppers, stem borers, etc. Considering the life cycle of these insects, 3 lit./ha of insecticides are required for 2 to 3 applications during one cropping season. In addition, spraying of fungicides will be recommended, if the outbreak or appearance of diseases is forecast. For ratting, it is necessary to apply 100 gram/ha of rodenticide for each cropping season.

In selecting suitable insecticides and fungicides, chemical toxicity which directly or indirectly affects the human being should be taken into consideration. Furthermore, fifty seven types of insecticides for enhancing the control of brown hoppers/locusts of paddy plants have been prohibited by the Presidential Decree No. 3 (November 5, 1986). The recommended insecticides are Applaud 10 WP (Buprofezin) for brown plant hoppers, and Furadan 3G, Dharmafur 3G and Curate 3G for stem borers. Mipcin 50 WP, Bassa 50 EC and Hopcin 50 EC are proposed, if there is no Applaud 10 WP. Zinc Phosphate and Clerat are recommended as rodenticide.

It is proposed that plant protection works should be carried out in a systematic way through the farmer's cooperatives. Individual protection is not recommended, because insects and diseases are not limited to the individual plot which can be re-infected unless protection is undertaken on as wide an area as possible.

Proper water control is very important for paddy cultivation. There are periods in the life of the paddy plant in which water supply is critical namely, just after sowing time or transplanting time, the panicle initiation stage, reduction division stage and flowering stage. Careful water management is required particularly for the cultivation of dry season paddy.

Harvesting and threshing are carried out by manual labor. The harvested paddy will be dried on the paddy field or home yard. For threshing, it is proposed to use a treadle thresher, instead of traditional hand threshing, because a lot of grain is being lost by this method. Moreover, it will be recommended that harvested paddy is dried on a sun-drying floor, in order to maintain the quality of the rice.

#### 4.4.2 Proposed Farm Inputs and Labor Requirement

The proposed farm inputs and labor requirement under the future with project condition are presented in Tables IV-32 and IV-33. These were basically designed on the basis of

recommendations of the Directorate General of Food Crops Agriculture, Ministry of Agriculture. As for farm inputs and labor requirement under the future without project condition, it is forecast that there would be no substantial changes and still remain at present levels.

The labor requirement for crop production under the proposed cropping pattern is presented in Table IV-34. The family labor force will be mainly used for farming throughout the year. Temporary laborer (seasonal laborer) will also be used during the peak times of transplanting and harvesting of crops. As a mutual exchange of labor force, these laborers can be hired from other farmers in the Project area.

#### 4.5 Anticipated Crop Yields and Production

After completion of the Project, it is expected that unit yields of crops under the future with project condition would increase considerably on account of adequate irrigation water supply and improved farming practices. These unit yields are estimated on the basis of best judgement from the experimental data and actual yields recorded around the Project area.

The paddy yields for the wet and the dry seasons at the experimental station in Java were reported by the Crop Research Institute of Agriculture (Bogor) as follows:

Location	Longi- tude	Lati- tude	Eleva- tion	Yield (tons dried paddy/ha)	
				Dry season	Wet season
Muara	106 45'E	6 40'S	250 m	8.00	6.45
Mojosari	112 30'E	7 30'S	30 m	8.85	6.90
Singamerta	106 15'E	6 10'S	0 m	7.00	6.80
Genteng	114 E	8 20'S	171 m	7.75	7.20
Ngale	11 10'E	7 20'S	55 m	7.15	6.50
Kuningan	108 24'E	6 58'S	559 m	7.85	7.50
Kendal Payak	112 20'E	8 05'S	450 m	8.05	7.40
Pusakanegara	107 45'E	6 18'S	7 m	7.80	7.20
Average	-	-	-	7.81	6.90

Source: CRIA, Bogor, November 30, 1977.

As shown in the above table, the paddy yields average about 7.8 tons/ha in the dry season and about 7.0 tons/ha in the wet season. The paddy yields in the dry season are about 10% higher than those in the wet season. It must be recognized that the yields of paddy are significantly affected by the solar radiation. In the Project area, solar radiation is relatively low. For the estimation of yields at the area under such climatic conditions, photosynthesis capacity must be taken into consideration, however, there is no literature to refer to about

it. Apart from photosynthesis capacity, these high yields are from experimental plots of a small size, therefore, some adjustment to these experimental results would be necessary for the estimation of unit yields in an actual farmer's field.

The average yields of paddy (wet land paddy) in Riau Province are rather low as compared with the national average yields. But the high yields show in several Kabupaten as follows.

(Unit: ton/ha)

Kabupaten	1985	1986	1987
Kampar	4.13	4.43	3.99
Indragiri Hulu	3.28	4.40	3.75
Indragiri Hilir	3.82	3.73	4.15
Benkalis	2.93	4.84	3.16
Kepulauan	2.00	2.00	2.00

Source: Laporan Tahunan 1985-1987, Dinas Pertanian Tanaman Pangan Propinsi Riau.

These high yields were obtained under similar climatic condition to those of the Project area. In addition, their paddy fields consist of semi-technical or non-technical irrigation and rainfed areas, whereas all the paddy fields in the Project area will be technical irrigation areas where the water supply can fully controlled.

Judging from the above data, a yield of 5.0 tons/ha for both wet and dry seasons can be anticipated under the future with project condition. The anticipated yields of paddy are summarized as follows. The yields of these crops under the future without project condition are estimated to remain at present level.

(Unit: ton/ha)

Crops	Without	With
Wet season paddy (dry clean paddy)	-	5.0
Dry season paddy (dry clean paddy)	-	5.0
Wet land paddy	2.8	-
Dry land paddy	1.2	-
Maize (dry grain)	1.3	1.3
Groundnuts (dry grain)	0.9	0.9
Soybeans (dry grain)	0.7	0.7
Green beans	0.6	0.6
Cassava	7.0	-

The palawija crops under with project condition would be cultivated traditionally by the farmers (see sub-section 4.3.2 and Fig.IV-4). High yields of these crops in the Project area,

however, cannot be expected due to soil constraints. It is estimated that the yields of these crops under with project condition remain at present level.

In order to achieve the anticipated unit yields, the optimum application of farm inputs must be required together with effective water supply. With the advance and extension of these conditions, the unit yields will increase gradually from the present level to the anticipated yield in the 6th year after completion of the Project.

The annual crop production under the future with project condition is estimated by multiplying the anticipated unit yields by the future cropping areas as shown in the following table.

Crops	Area (ha)	Unit Yield (ton/ha)	Production (ton)
Paddy*	10,400	-	52,000
(Wet season)	(7,300)	(5.0)	(36,500)
(Dry season)	(3,100)	(5.0)	(15,500)
Maize	900	1.3	1,170
Groundnuts	900	0.9	810
Soybeans/Green Beans	900	0.6-0.7	585

\* Dry clean paddy

#### 4.6 Processing and Storage Facilities

The present milling capacity for paddy in the area was estimated at 40 tons/day (see sub-section 3.5.8). Assuming that working days for milling are 128 days (365 days x 70% / 2 seasons = 128 days) in a crop season, about 5,120 tons of paddy can be milled with the present milling facilities. On the other hand, production of paddy in the area under the future with project condition will amounts to about 36,500 tons in the wet season. Consequently, the present capacity of rice mills will be insufficient for milling the increased paddy production at the full development stage.

At present, there are no storage facilities in the Project area, except for 8 godowns which have a floor space of less than 60 m each. Most of crops produced by the farmers have to be stored in their houses. After implementation of the Project, construction of storage facilities would be required in the area. Sufficient storage facilities to meet the increase in crop production would be required not only for the purpose of its storage but also for maintaining the high quality of products and minimizing storage losses at the farmer's level.

Such rice mills and storage facilities will be expected to be owned by KUD. Since the irrigation development would be provide a powerful incentive to farmers' cooperative movement in

the area, many KUDs having rice mills and godowns will be established over the area.

#### 4.7 Marketing of Agricultural Products

The marketable surplus of rice produced in the Project area and the domestic demand to be expected in the whole country in 2005 were analyzed in order to assess the marketability. The results of these analyses are presented in Table IV-35 and are summarized below.

Item		2000	2005
1) Marketable surplus			
in the Project area	(10 <sup>3</sup> t)	30	30
2) Shortage in the whole country	(10 <sup>3</sup> t)	500	1,100
3) Shortage in Riau Province	(10 <sup>3</sup> t)	246	317
4) Percentage of marketable surplus			
- Whole country	(%)	6.0	2.7
- Riau Province	(%)	12.2	9.5

The domestic demand for rice in the whole country is shown in sub-section 2.1.3 (3). Unless the Government continues to invest in extension of crop intensification programs and expansion of irrigation area through the newly implementing irrigation projects, the shortage of rice supply coming from the increase in domestic demand along with population growth will be at least 1.1 million tons in 2005. On the other hand, the marketable surplus of rice to be produced in the Project area in 2005 is expected to be about 30,000 tons which would account for about 2.7% of the shortage in the whole country.

The Riau Province had about 130,000 tons of rice shortage in 1986. In 2005, this shortage will reach about 317,000 tons. By implementation of the Project, the rice shortage would be reduced only by about 30,000 tons or about 9.5% of its total.

In short, the marketable surplus of rice produced in the Project area would be marketed in Riau Province with no marketing dislocation, because there is much demand.

#### 4.8 Transmigration Program

By implementation of the Project, about 7,300 ha of paddy field (including 190 ha of existing paddy field) would be reclaimed, and then it would become possible to settle or resettle a considerable number of transmigrants in the area. In accordance with the regulation of the Transmigration Office, the transmigration program in the Project area is as follows:



#### 4.8.1 Land Allocation

According to the criteria of the Transmigration Office, the area of land allocated to the transmigrants is 2.00 ha per family, which consisting of 0.25 ha for home yard and 1.75 ha for farm land as follows:

- a) Farm land:
  - LU-I: 1.00 ha (Paddy field)
  - LU-II: 0.75 ha (Perennial crop field)
- b) Home yard: 0.25 ha

The farm land is of two types, LU-I (Lahan Usaha I) of 1.00 ha and LU-II (Lahan Usaha II) of 0.75 ha. The land use of LU-I is paddy field and the land clearing is done by the Ministry of Transmigration. LU-II is perennial crop field (rubber), and is opened by the transmigrants themselves. The land use of LU-II is not specified specifically in the criteria of Transmigration Office, but rubber cultivation without irrigation would be recommended for this land. The transmigrants can reclaim the perennial crop field more easily than paddy field or upland field.

In order to promote and facilitate reclamation of LU-II land, various kinds of support by the Government such as credit services (KMKP and KIK credits), technical services and subsidy of food have been made to the transmigrants through UPP, PTPT, BRI and other authorities concerned. It is expected that these services will be given to all transmigrants to be newly settled in the area.

#### 4.8.2 Number of Transmigrants

The number of new transmigrants and resettlers who have the irrigated paddy field of 1.0 ha and 0.75 ha of rubber field were estimated at 4,230 families (see Table IV-36). All of the existing transmigrants living in DU, DK-II, DK-III and DK-IV of Tanjung Medan SKP-C and DU, DK-I and DK-II of Tanjung Medan SKP-D are incorporated into this Project, as the resettlers. About 100 families of farmers in Rantau Kasai village are also included in the Project. At present, shifting cultivation is widely practiced by the farmers in this village, which devastates the land. This cultivation can be stopped by implementation of the Project.

#### 4.8.3 Community Development

For the layout of transmigration villages constructed by the Transmigration Office, there are four types:

- a) Scattered system (open country, trade center community)
- b) Group system (nucleate agricultural village community)
- c) Long row system
- d) Circle system (circle village community)

The group system would be adopted for the Project area, which is common among the existing transmigration villages in Riau Province. Villages by this system consist of Central villages (DU) and Small Villages (DK). The size of DU and DK, which are newly established in the area, are 600 and 400 families in accordance with the typical size of these existing villages. The total number of new villages is three DU and six DK.

The setting of new transmigration villages is planned to avoid farm land topographically suitable for irrigation. The paddy fields allocated to DK-IV, SKP-C are about 7 km away from their village. According to the farmers of this village, they can go to the fields and back for their daily farm work. Rubber cultivation without irrigation was proposed in the farm lands of LU-II. These lands are allocated in the area surrounding the Project area (irrigation area).

In the new transmigration area, the houses and shallow wells adequate to the transmigrants are constructed before the settlement. The number of these facilities are 4,230 houses and 1,060 wells in total. In addition, the public facilities such as school, clinic and market will also be constructed by the Government authorities concerned. In the light of the present conditions in existing transmigration areas and the standard of the Transmigration Office, necessary public facilities in new villages would be estimated as shown in Table IV-37.

#### 4.8.4 Schedule of Settlement

The settlement of new transmigrants and resettlers would be implemented during the 3 years along with the progress of land clearing for Lahan Usaha I. The annual number of families to be settled in the area is estimated as follows:

(Unit: Families)

Year*1	New Transmigrants and Resettlers	Existing Transmigrants and Farmers	Total
1993/1994	1,060	3,070	4,130
1994/1995	2,110	-	2,110
1995/1996	1,060	-	1,060
Total	4,230	3,070	7,300

\*1: This is assumption in order to estimate the annual settlement numbers, and does not indicate its real year.

The Transmigration Office is responsible for planning and implementation of this transmigration program. This Office will coordinate the activities of all relevant governmental agencies for implementation of the transmigration program.

#### 4.8.5 Government Support

As mentioned in 3.7.1, the Government has given considerable subsidies to transmigrants, which consist of foods, clothes, farm inputs, farm tools and equipment, during the initial period of 12 months after settlement (see Table IV-29). After implementation of the Project, the new transmigrants and resettlers to be settled in the Project area could receive fully these subsidies from the Government.

#### 4.9 Crop Production Cost and Farm Budget

##### 4.9.1 Crop Production Cost

Production cost of paddy under the future with project condition would increase substantially due to application of increased amounts of labor force and farm inputs such as fertilizers and agro-chemicals. Based on the proposed labor force and farm inputs, production cost of paddy under "with project" was estimated below (see Table IV-38).

(Unit: Rp/ha)

1) Gross Income	<u>1,050,000</u>
2) Production Cost	<u>358,500</u>
- Seed	6,600
- Fertilizers	47,300
- Agro-chemicals	20,500
- Labor	237,000
- Animal Power	30,000
- Others	17,100
3) Net Income	<u>691,500</u>

Production costs of palawija crops and rubber are shown in Tables IV-39 and IV-40. As for the production cost of rubber, it was estimated on the basis of the plan of SSDP, because this crop would be introduced in the area along with SSDP.

##### 4.9.2 Farm Budget

After implementation of the irrigation facilities, year round irrigation would be provided to all farmers in the Project area, thereby, making possible an increase in yield and production of rice. As a result, a significant increase in farm income would be expected in the future with project condition. In contrast to the future with project, no substantial increase in farm income would be incurred in the future without project condition.

Typical farm budgets for both the future without and the with project conditions are analyzed as shown in Table IV-41 and are summarized as follows:

(Unit: Rp 1,000/year)

Item	Without Project*1	With Project*2			
		With Palawija*3		Without Palawija*3	
		W. Rubber	W/O Rubber	W. Rubber	W/O Rubber
(Farm Size)	(1.01)	(1.75)	(1.00)	(1.75)	(1.00)
1) Gross Income	737	2,817	2,179	2,586	1,948
- Farm incomes	386	2,466	1,828	2,235	1,597
- Off-farm income	351	351	351	351	351
2) Gross Outgoing	732	1,384	1,234	1,335	1,186
- Production cost	70	501	351	452	303
- Living expenses*2	662	883	883	883	883
3) Net reserve	5	1,433	945	1,251	762

\*1 Include subsidy from WFP Project. \*2 No WFP subsidy.

\*3 Palawija crops are cultivated traditionally in the dry season.

The farm incomes of farmers under the future with project condition would be expected to increase remarkably as compared with the future without project condition, and the net reserves would also be improved up to Rp. 0.76 - 1.43 million. The increased net reserves will offer the farmers incentives for further development, and will enable the farmers to make some payment for a water charge, if it is imposed on them.

#### 4.10 Agricultural Support Services

The major objectives of the Project are to increase agricultural production and to improve and stabilize the farmers' economy through the irrigation development. For these objectives, the Project will provide the necessary infrastructures such as irrigation and drainage facilities. In order to realize the objectives, however, there would remain various ancillary works which would be carried out by the governmental authorities concerned and the farmers themselves. These are agricultural support services such as extension, credit and farmers cooperatives.

The following are recommendations for improvement and strengthening of agricultural support services related to the Project. It is expected that improvements and strengthening of these would be carried out in parallel with the construction of Project facilities.

##### (1) Extension Services

- a) Conducting training courses for extension personnel, especially about irrigation farming in order to enable them to carry out their duties effectively.
- b) Introducing improved cultivation and management techniques to farmers such as use of High Yielding

Varieties (HYV), practice of new cropping patterns and calendars with project, and operation of field water management for the proper supply of irrigation water and draining off excessive water.

- c) Assisting in production of seed multiplication of HYV for farmers' use.
- d) Field trials should be carried out for paddy. The field trials would include fertilizer trials, variety tests and adaptation tests.
- e) Improvement of the prevailing training and visit system of extension work held by PPL to be more effective in activity.
- f) Strengthening the expansion of BIMAS/INMAS programs and helping to solve the problem of poor loan repayment by some of the farmers.
- g) Supply of a motor cycle for each PPL to ensure adequate mobility and effectiveness of the services.

## (2) Agricultural Credit

- a) BRI sub-branch office in Pasir Pengarayan should cooperate more with the agricultural services and cooperative offices and work out a loaning plan based on the total acreage of paddy field to be cultivated by the irrigation project.
- b) The procedure for credit application should be simplified as much as possible both for individuals and groups of farmers, so that realization of BIMAS/INMAS credit will meet the needs of farmers in time. Provision of simplified application form with an easy procedure and readiness of farmers' background data are necessary in making rapid procedure for credit application.
- c) To develop advanced agriculture in an integrated way is feasible only with the strengthening of all activities of BRI, PPL and KUD in good coordination and function. By means of linking up all these activities, the farmers will become more capable and effective in performing the BIMAS program with confidence.

## (3) Agricultural Cooperative

- a) In meeting the needs of the new irrigation scheme in expansion of irrigation area, the role of KUDs will become increasingly important. The existing KUDs have to expand their businesses in order to provide better service to farmers in the Project area.

- b) With realization of the irrigation project, it is certain that crop production will be greatly increased and the requirements of input supply also. In order to meet the new situation, improvement of and additions to KUD facilities will be indispensable. This means that each KUD should have an adequate rice mill, storage facilities and sun-drying floor.
- c) To enable the agricultural cooperatives (KUD) become viable organizations for agricultural and rural development, and to make them self-sustaining in business activity, the full support of members as well as Government is needed. The Government's support may be provided either through policy measures or in the form of financial help as subsidies or low-interest loans. However, government financial assistance to KUD should be given on an annual decreasing basis to help them become self-sustaining.

#### 4.11 Pilot Farm

The introduction of palawija crops remains a future possibility, though the soils in the Project area have serious constraints to cultivation of these crops. The cropping pattern including palawija crops make saving of much irrigation water possible, and can create the maximum development benefits overall (see 4.3.1).

In due consideration of these benefits, it is necessary to establish a pilot farm in order to solve the constraints. The pilot farm should be established in the area for:

- a) Establishment of advanced farming practices of palawija crops in order to overcome the present soil constraints.
- b) Experimental research on quality improvement and reduction of production costs for paddy and palawija crops.
- c) Selection of varieties suited to the cultivation of paddy and palawija crops in and around the area.
- d) Demonstration of improved farming practices.

The objectives of this pilot farm will be to conduct research not only for improvement of farming practices under irrigation but also for their improvement without irrigation, in order to promote further development in and around the Project area.

It is recommended that the pilot farm be organized under the Government authority concerned. The area required for the experimental farm is estimated at around 5 ha.

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Table IV-2 NATIONAL AND REGIONAL SOCIO-ECONOMIC INDICATORS (1/2)

		1981	1982	1983	1984	1985	1986
<b>I. NATIONAL SOCIO-ECONOMY</b>							
1) Population	(10 <sup>6</sup> )	150.7	153.9	157.2	160.6	164.6	168.1
- Growth Rate	(%)	2.15	2.15	2.15	2.15	2.15	2.10
- Population Density (Person/km <sup>2</sup> )		79	80	82	84	86	88
2) Economically Active							
Population	(10 <sup>6</sup> )	60.8	59.6	* <sup>*1</sup>	*	63.8	70.2
- Employed	(%)	97.3	97.0	*	*	97.9	97.4
- Unemployed	(%)	2.7	3.0	*	*	2.1	2.6
3) Employment by Industry	(%)	100.0	100.0	*	*	100.0	100.0
- Agriculture	(%)	61.5	54.7	*	*	54.7	55.1
- Mining & Manufacturing	(%)	8.5	11.1	*	*	9.9	8.2
- Others	(%)	30.0	34.2	*	*	35.4	36.7
4) Gross Domestic Product (GDP)							
- GDP (Current Market) (Rp.10 <sup>9</sup> )		54,027	59,633	73,698	87,055	94,492	96,489
- GDP (1983 Constant) (Rp.10 <sup>9</sup> )		66,847	68,349	73,698	78,144	79,911	82,475
- Growth Rate	(%)	7.9	2.2	7.8	6.0	2.3	3.2
- Per Capita GDP at CMP <sup>*2</sup> (Rp.10 <sup>3</sup> )		359	387	469	542	576	574
	(US\$)	558	559	472	504	509	347
5) GDP by Industry at CMP	(%)	100.0	100.0	100.0	100.0	100.0	100.0
- Agriculture	(%)	25.3	26.3	24.0	23.4	23.7	25.8
- Mining	(%)	24.0	19.6	19.0	18.4	16.3	11.1
- Manufacturing	(%)	10.8	12.9	11.1	12.7	13.5	14.4
- Trade	(%)	14.7	14.9	16.3	16.1	15.4	16.7
- Others	(%)	25.2	26.3	29.6	29.4	31.1	32.0
6) Price Index							
- Wholesale <sup>*3</sup> (1983=100)		*	*	100	109	115	121
Annual Change	(%)				9.0	5.5	5.2
- Consumer (Apr.1977 - Mar.1978 = 100)							
Jakarta		163	177	196	219	230	242
Pekanbaru		*	196	220	241	256	270
Whole Country		180	198	222	242	252	275
7) Exchange Rate <sup>*4</sup> (US\$ 1.00=)		643	692	994	1,076	1,131	1,655
8) Balance of Payment (US\$ 10 <sup>6</sup> )							
A. Goods & Services		-499	-5,458	-6,442	-1,970	-1,950	-4,099
Exports (FOB)		23,665	19,747	18,689	20,754	18,527	14,396
Imports (FOB)		-16,542	-17,854	-17,726	-15,047	-12,705	-11,938
Services		-7,622	-7,351	-7,405	-7,677	-7,772	-6,557
B. Special Drawing Rights (S.D.R)		62	-	-	-	-	-
C. Of Private Capital (net)		148	1,639	1,826	757	68	1,291
D. Transfer of Government Capital		1,963	4,117	4,776	2,865	1,739	3,074
E. Total (A through D)		1,674	298	160	1,652	-143	266
F. Net Errors & Omissions		-2,069	-2,229	494	-709	238	-810
G. Overall Balance		-395	-1,931	654	943	95	-544
H. Monetary Movement		395	1,931	-654	-943	-95	544
Net IMF Position		-100	-10	163	-6	-7	-10
Short Term Liabilities		-	-	1	1	-	-
Short Term Assets		495	1,941	-818	-938	-88	554

Remarks: \*1 No data is available. \*2 CMP: Current Market Price.  
 \*3 Price index of construction for public work in agricultural sector.  
 \*4 The Rupiah was devalued from US\$ 1.00 = Rp.703 to US\$ 1.00 = Rp.970 on March 30, 1983 and from US\$ 1.00 = Rp.1,134 to US\$ 1.00 = Rp.1,644 on September 12, 1986.

Sources: (1) Statistik Indonesia 1985, 1986 and 1987, Biro Pusat Statistik.  
 (2) Indonesia, Strategy for Economic Recovery, World Bank, 1987.

Table IV-2 NATIONAL AND REGIONAL SOCIO-ECONOMIC INDICATORS (2/2)

	1981	1982	1983	1984	1985	1986
<b>II. REGIONAL SOCIO-ECONOMY (RIAU)</b>						
1) Population (10 <sup>3</sup> )	2,261	2,333	2,429	2,490	2,644	2,736
- Growth Rate (%)	4.2	3.2	4.1	2.5	7.0	2.7
- Population Density(Person/km <sup>2</sup> )	24	25	26	26	28	29
2) Economically Active						
Population (10 <sup>3</sup> )	**1	*	*	*	859	*
- Employed (%)	*	*	*	*	97.0	*
- Unemployed (%)	*	*	*	*	3.0	*
3) Employment by Industry (%)	*	*	*	*	100.0	*
- Agriculture (%)	*	*	*	*	59.7	*
- Mining (%)	*	*	*	*	1.6	*
- Manufacturing (%)	*	*	*	*	4.3	*
- Trade (%)	*	*	*	*	11.1	*
- Others (%)	*	*	*	*	23.3	*
4) Gross Regional Domestic Product (GRDP)						
- GRDP at Current Market Prices						
Included Petroleum (Rp.10 <sup>9</sup> )	6,455	4,847	7,517	7,633	6,772	5,583
Excluded Petroleum (Rp.10 <sup>9</sup> )	530	785	969	1,157	1,286	1,427
- GRDP at 1983 Constant Prices						
Included Petroleum (Rp.10 <sup>9</sup> )	7,654	5,616	7,517	6,799	6,040	6,997
Excluded Petroleum (Rp.10 <sup>9</sup> )	846	888	969	1,036	1,084	1,141
- Growth Rate						
Included Petroleum (%)	-0.4	-26.6	33.8	-9.6	-11.2	15.8
Excluded Petroleum (%)	7.0	5.0	9.1	6.9	4.6	5.3
- Per Capita GRDP at CMP*2						
Included Petroleum (Rp.10 <sup>3</sup> )	2,855	2,078	3,094	3,065	2,542	2,041
(US\$)	4,440	3,003	3,113	2,849	2,248	1,233
Excluded Petroleum (Rp.10 <sup>3</sup> )	234	336	399	465	483	522
(US\$)	364	486	401	432	427	315
5) GDP by Industry at CMP - Included Petroleum						
- Agriculture (%)	2.9	4.9	3.7	4.3	5.2	6.7
- Mining (%)	87.9	83.5	85.4	82.4	77.0	66.6
- Manufacturing (%)	2.4	1.8	2.8	3.6	5.1	9.0
- Trade (%)	3.8	4.8	4.3	5.1	6.7	9.4
- Others (%)	3.0	5.0	3.8	4.6	6.0	8.3
6) GDP by Industry at CMP - Excluded Petroleum						
- Agriculture (%)	35.3	30.0	28.7	28.1	27.2	26.3
- Mining (%)	8.3	6.3	7.5	7.5	7.6	7.9
- Manufacturing (%)	5.6	6.8	7.4	7.5	7.5	7.5
- Trade (%)	32.9	26.3	26.7	26.8	26.1	25.8
- Others (%)	18.0	30.6	29.7	30.1	31.5	32.4

Remarks: \*1 No data is available.

\*2 CMP: Current Market Price

Sources: (1) Statistik Indonesia 1987, Biro Pusat Statistik.

(2) Riau Dalam Angka 1983-1987, BAPPEDA dan Kantor Statistik Propinsi Riau.

(3) Perkiraan Pendapatan Regional, Riau 1975-1982, Kantor Statistik dan BAPPEDA, 1984.

(4) Perkiraan Pendapatan Regional, Riau 1983-1986, Kantor Statistik dan BAPPEDA, 1987.

Table IV-3 EXPORTS BY MAJOR COMMODITIES

Commodities	1982/83 (US\$10 <sup>6</sup> )	1983/84 (US\$10 <sup>6</sup> )	1984/85 (US\$10 <sup>6</sup> )	1985/86 (US\$10 <sup>6</sup> )	1986/87 (US\$10 <sup>6</sup> )	Proportional Extent (1986/87)	
						With Oil (%)	Without Oil (%)
1) Crude Oil, Oil Products and LNG	<u>14,744</u>	<u>14,449</u>	<u>13,994</u>	<u>12,437</u>	<u>7,909</u>	<u>51.7</u>	-
- Crude oil and oil products	12,283	12,050	10,625	8,816	5,765	37.7	-
- LNG	2,461	2,399	3,369	3,621	2,144	14.0	-
2) Agriculture, Fishery and Forestry	<u>2,523</u>	<u>3,454</u>	<u>3,382</u>	<u>3,482</u>	<u>4,059</u>	<u>26.6</u>	<u>55.1</u>
- Timber	899	1,161	1,167	1,206	1,556	10.2	21.1
- Rubber	615	984	856	709	730	4.8	9.9
- Palm oil	103	92	95	170	115	0.8	1.6
- Coffee	363	506	568	656	803	5.3	10.9
- Tea	116	156	211	133	106	0.7	1.4
- Tobacco	37	50	44	55	67	0.4	0.9
- Pepper	41	58	66	82	139	0.9	1.9
- Palm kernel	1	4	9	2	1	0.0	0.0
- Copra cake	38	33	18	35	32	0.2	0.4
- Tapioca	9	33	31	42	57	0.4	0.8
- Other foodstuff	50	101	98	121	92	0.6	1.2
- Animal products	251	276	219	271	361	2.4	4.9
3) Minerals	<u>676</u>	<u>800</u>	<u>775</u>	<u>801</u>	<u>696</u>	<u>4.6</u>	<u>9.5</u>
- Tin	349	309	252	248	156	1.0	2.1
- Copper	115	89	132	133	155	1.0	2.1
- Others	212	402	391	420	385	2.5	5.2
4) Manufactured Exports and Miscellaneous	<u>729</u>	<u>1,113</u>	<u>1,752</u>	<u>1,893</u>	<u>2,608</u>	<u>17.1</u>	<u>35.4</u>
Total	18,672	19,816	19,903	18,613	15,272	100.0	100.0

Source: Indonesia, Strategy for Economic Recovery, World Bank, 1987.

Table IV-4 CROP PRODUCTION IN INDONESIA

(Unit: 1,000 tons)

	1981	1982	1983	1984	1985	1986
1) Food Crops						
Paddy	32,774	33,584	35,303	38,136	39,033	39,727
Maize	4,509	3,235	5,087	5,288	4,330	5,920
Groundnuts	475	437	460	535	528	642
Soybeans*1	704	521	536	769	870	1,227
Cassava	13,301	12,988	12,103	14,167	14,057	13,312
Sweet Potatoes	2,094	1,676	2,213	2,157	2,162	2,091
2) Cash Crops						
Rubber*2	943	887	982	1,029	1,055	1,095
Palm Oil	753	837	895	1,084	1,202	1,285
Coconut*3	1,765	1,587	1,590	1,738	1,895	2,091
Palm Kernel	134	150	157	231	244	261
Coffee*4	314	282	304	329	313	361
Tea*5	109	90	112	126	132	130
Cane Sugar	2,108	2,982	2,821	2,893	3,146	3,430
Tobacco*5	110	109	109	92	163	159
Pepper*4	40	40	46	43	40	40
Cashew nut	11	17	18	19	21	30
Clove	29	32	40	43	43	53

Remarks: \*1 Shelled  
\*2 Dry rubber  
\*3 Equivalent copra  
\*4 Dry beans  
\*5 Dry leaf

Source: Statistik Indonesia 1986-1987, Biro Pusat Statistik.

Table IV-5 AREA HARVESTED, UNIT YIELD AND PRODUCTION  
FOR PRINCIPAL FOOD CROPS (1/2)

Year	Wet Land Paddy			Dry Land Paddy		
	Area Harvested (10 <sup>3</sup> ha)	Unit Yield (t/ha)	Production (10 <sup>3</sup> t)	Area Harvested (10 <sup>3</sup> ha)	Unit Yield (t/ha)	Production (10 <sup>3</sup> t)
1968	*	*	*	*	*	*
1969	*	*	*	*	*	*
1970	*	*	*	*	*	*
1971	6,893	2.70	18,588	1,432	1.11	1,549
1972	6,602	2.71	17,895	1,296	1.15	1,491
1973	7,064	2.80	19,807	1,340	1.25	1,674
1974	7,340	2.87	21,053	1,168	1.21	1,411
1975	7,334	2.84	20,850	1,161	1.28	1,481
1976	7,229	3.02	21,852	1,139	1.27	1,449
1977	7,202	3.03	21,808	1,157	1.33	1,539
1978	7,698	3.14	24,172	1,231	1.30	1,599
1979	7,675	3.22	24,732	1,128	1.38	1,551
1980	7,824	3.58	27,993	1,181	1.40	1,659
1981	8,191	3.78	30,989	1,191	1.50	1,785
1982	7,873	4.04	31,776	1,116	1.62	1,808
1983	7,987	4.17	33,294	1,176	1.71	2,009
1984	8,547	4.21	36,017	1,216	1.74	2,119
1985	8,756	4.23	37,027	1,147	1.75	2,006
1986	8,888	4.25	37,740	1,100	1.81	1,987
1987	8,797	4.32	37,970	1,126	1.87	2,109

  

Year	Total Paddy			Maize		
	Area Harvested (10 <sup>3</sup> ha)	Unit Yield (t/ha)	Production (10 <sup>3</sup> t)	Area Harvested (10 <sup>3</sup> ha)	Unit Yield (t/ha)	Production (10 <sup>3</sup> t)
1968	8,021	2.14	17,156	3,220	0.98	3,166
1969	8,014	2.25	18,013	2,435	0.94	2,295
1970	8,315	2.38	19,324	2,939	0.96	2,285
1971	8,325	2.42	20,182	2,627	0.99	2,606
1972	7,898	2.45	19,386	2,160	1.04	2,254
1973	8,404	2.56	21,481	3,433	1.07	3,690
1974	8,508	2.64	22,464	2,667	1.13	3,011
1975	8,495	2.63	22,331	2,445	1.19	2,905
1976	8,368	2.78	23,301	2,095	1.23	2,572
1977	8,359	2.79	23,347	2,567	1.22	3,143
1978	8,929	2.89	25,771	3,025	1.33	4,024
1979	8,803	2.99	26,283	2,594	1.39	3,606
1980	9,005	3.29	29,652	2,735	1.46	3,991
1981	9,382	3.49	32,774	2,955	1.53	4,509
1982	8,988	3.74	33,584	2,061	1.57	3,235
1983	9,163	3.85	35,303	3,002	1.69	5,087
1984	9,746	3.91	38,136	3,086	1.71	5,288
1985	9,902	3.94	39,033	2,440	1.77	4,330
1986	9,988	3.98	39,727	3,143	1.88	5,920
1987	9,923	4.04	40,078	2,626	1.96	5,155

Sources: 1968-1980: Economic Survey on Indonesia, ADB, 1985.  
1981-1982: Statistik Indonesia, Biro Pusat Statistik.  
1983-1987: Luas Panen Rata-Rata Hasil dan Produksi - Padi dan Palawija di Indonesia 1987, Direktorat Jenderal Pertanian Tanaman Pangan, 1988.



Table IV-5 AREA HARVESTED, UNIT YIELD AND PRODUCTION  
FOR PRINCIPAL FOOD CROPS (2/2)

Year	Soybeans			Groundnuts		
	Area Harvested (10 <sup>3</sup> ha)	Unit Yield (t/ha)	Production (10 <sup>3</sup> t)	Area Harvested (10 <sup>3</sup> ha)	Unit Yield (t/ha)	Production (10 <sup>3</sup> t)
1968	676	0.62	420	395	0.73	287
1969	554	0.69	380	372	0.72	267
1970	695	0.72	498	380	0.74	281
1971	680	0.76	516	376	0.76	284
1972	698	0.74	518	354	0.80	282
1973	744	0.73	541	416	0.70	290
1974	768	0.77	589	411	0.75	307
1975	752	0.78	590	475	0.63	300
1976	646	0.81	522	414	0.82	341
1977	662	0.79	523	507	0.81	409
1978	733	0.84	617	506	0.88	446
1979	784	0.87	680	473	0.90	424
1980	732	0.89	653	506	0.93	470
1981	810	0.87	704	508	0.94	475
1982	608	0.86	521	461	0.95	437
1983	640	0.84	536	481	0.96	460
1984	859	0.90	769	538	0.99	535
1985	896	0.97	870	510	1.04	528
1986	1,254	0.98	1,227	601	1.07	642
1987	1,101	1.06	1,161	551	0.97	533

  

Year	Cassava			Sweet Potatoes		
	Area Harvested (10 <sup>3</sup> ha)	Unit Yield (t/ha)	Production (10 <sup>3</sup> t)	Area Harvested (10 <sup>3</sup> ha)	Unit Yield (t/ha)	Production (10 <sup>3</sup> t)
1968	1,503	7.56	11,356	404	5.85	2,364
1969	1,467	7.44	10,917	369	6.12	2,260
1970	1,398	7.49	10,478	358	6.08	2,175
1971	1,406	7.60	10,690	357	6.19	2,211
1972	1,468	7.07	10,385	338	6.11	2,066
1973	1,429	7.83	11,186	379	6.30	2,387
1974	1,509	8.64	13,031	330	7.48	2,470
1975	1,410	8.90	12,546	311	7.82	2,433
1976	1,353	9.01	12,191	301	7.91	2,381
1977	1,364	9.16	12,488	326	7.55	2,460
1978	1,383	9.33	12,902	301	6.92	2,083
1979	1,439	9.56	13,751	287	7.64	2,194
1980	1,412	9.26	13,079	276	7.53	2,079
1981	1,388	9.58	13,301	275	7.61	2,094
1982	1,324	9.81	12,988	220	7.62	1,676
1983	1,221	9.91	12,103	280	7.90	2,213
1984	1,350	10.49	14,167	264	8.17	2,157
1985	1,292	10.88	14,057	256	8.45	2,162
1986	1,170	11.37	13,312	253	8.26	2,091
1987	1,222	11.75	14,356	229	8.79	2,013

Sources: 1968-1980: Economic Survey on Indonesia, ADB, 1985.

1981-1982: Statistik Indonesia, Biro Pusat Statistik.

1983-1987: Luas Panen Rata-Rata Hasil dan Produksi - Padi dan Palawija di Indonesia 1987, Direktorat Jenderal Pertanian Tanaman Pangan, 1988.

Table IV-6 DEMAND AND SUPPLY FORECAST - RICE

Year	Year in Order	SUPPLY					DEMAND				Total Balance (10 <sup>3</sup> t)
		Pro-duction of Paddy (10 <sup>3</sup> t)	Feed, Waste and Seed* <sup>1</sup> (10 <sup>3</sup> t)	Supply of Rice* <sup>2</sup> (10 <sup>3</sup> t)	Import of Rice (10 <sup>3</sup> t)	Waste* <sup>3</sup> (10 <sup>3</sup> t)	Total Supply* <sup>4</sup> (10 <sup>3</sup> t)	Popu-lation (10 <sup>6</sup> )	Per- <sup>5</sup> capita Con-sumption (kg)	Total Demand (10 <sup>3</sup> t)	
Actual		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1968	1	17,156	1,458	10,675	*	*	*	112.1	*	*	-
1969	2	18,013	1,531	11,208	*	*	*	114.4	*	*	-
1970	3	19,324	1,643	12,023	804	320	12,506	116.8	107	12,506	-
1971	4	20,182	1,715	12,588	771	333	12,996	119.2	109	12,996	-
1972	5	19,386	1,648	12,062	524	315	12,271	122.1	100	12,271	-
1973	6	21,481	1,826	13,365	1,229	365	14,229	125.0	114	14,229	-
1974	7	22,464	1,909	13,977	1,225	380	14,822	128.0	116	14,822	-
1975	8	22,331	1,898	13,894	1,137	376	14,655	131.0	112	14,655	-
1976	9	23,301	1,981	14,498	670	379	14,789	134.2	110	14,789	-
1977	10	23,347	1,984	14,527	1,301	396	15,432	137.4	112	15,432	-
1978	11	25,771	2,191	16,034	1,973	450	17,557	140.7	125	17,557	-
1979	12	26,283	2,234	16,353	1,842	455	17,740	144.0	123	17,740	-
1980	13	29,652	2,520	18,450	2,606	526	20,530	147.5	139	20,530	-
1981	14	32,774	2,786	20,392	1,229	541	21,080	150.7	140	21,080	-
1982	15	33,584	2,855	20,896	310	530	20,676	153.9	134	20,676	-
1983	16	35,303	3,001	21,965	1,169	578	22,556	157.2	143	22,556	-
1984	17	38,136	3,242	23,728	414	604	23,538	160.6	147	23,538	-
1985	18	39,033	3,318	24,286	34	608	23,712	164.6	144	23,712	-
1986	19	39,727	3,377	24,718	28	619	24,127	168.1	144	24,127	-
1987	20	40,078	3,407	24,936	84	626	24,394	171.6	142	24,394	-
Forecast		* <sup>7</sup>						* <sup>8</sup>			
1990	23	43,700	3,700	27,200	-	700	26,500	182.7	144	26,300	+200
1995	28	50,200	4,300	31,200	-	800	30,400	199.6	144	28,700	+1,700
2000	33	56,800	4,800	35,400	-	900	34,500	216.1	144	31,100	+3,400
2005	38	63,300	5,400	39,400	-	1,000	38,400	231.4	144	33,300	+5,100

\*1 Feed, waste and seeds of paddy are estimated at 8.5% of total production on the basis of the Food Balance Sheet in Indonesia, Biro Pusat Statistik, 1983.

\*2 Milling recovery rate: 68%

\*3 Waste of rice is estimated at 2.5% of domestic supply and import quantities {(3)+(4)} on the basis of the Food Balance Sheet mentioned above.

\*4 (6) = (3)+(4)-(5)

\*5 Source: Statistik Indonesia, Biro Pusat Statistik.

\*6 (8) = (9)/(7)

\*7 Assuming that the government efforts to increase in production will continue until 2005, the production forecast was made by the following formula which was computed on the basis of the past trend from 1968 to 1987.

$$Y = 13646.4 + 1306.7X \quad (r = 0.97)$$

Where, Y = Production of paddy

X = Year in order

\*8 Since 1983, per-capita consumption of rice has been no significant change. Based on this no trend, the future per-capita consumption was assumed at 144 kg on an average from 1983 to 1987.

Table IV-7 DEMAND AND SUPPLY FORECAST - MAIZE

Year	in Order	SUPPLY				DEMAND				
		Pro- duction of Maize (10 <sup>3</sup> t)	*1 Import (10 <sup>3</sup> t)	*1 Export (10 <sup>3</sup> t)	Waste*2 and Seeds (10 <sup>3</sup> t)	Total Supply (10 <sup>3</sup> t)	*3 Popu- lation (10 <sup>6</sup> )	Per- capita Con- sumption (kg)	Total Demand (10 <sup>3</sup> t)	Balance (10 <sup>3</sup> t)
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<u>Actual</u>										
1968	1	3,166	*	*	*	*	112.1	*	*	-
1969	2	2,295	*	*	*	*	114.4	*	*	-
1970	3	2,825	*	*	*	*	116.8	*	*	-
1971	4	2,606	24	219	265	2,146	119.2	18.0	2,146	-
1972	5	2,254	-	80	239	1,935	122.1	15.8	1,935	-
1973	6	3,690	-	181	386	3,123	125.0	25.0	3,123	-
1974	7	3,011	-	197	310	2,504	128.0	19.6	2,504	-
1975	8	2,905	-	51	314	2,540	131.0	19.4	2,540	-
1976	9	2,572	69	4	290	2,347	134.2	17.5	2,347	-
1977	10	3,143	14	10	346	2,801	137.4	20.4	2,801	-
1978	11	4,024	46	21	445	3,604	140.7	25.6	3,604	-
1979	12	3,606	84	7	405	3,278	144.7	22.8	3,278	-
1980	13	3,991	38	15	442	3,572	147.5	24.2	3,572	-
1981	14	4,509	2	5	496	4,010	150.7	26.6	4,010	-
1982	15	3,235	76	1	364	2,964	153.9	19.1	2,946	-
1983	16	5,087	28	18	561	4,536	157.2	28.9	4,536	-
1984	17	5,288	59	160	571	4,616	160.6	28.7	4,616	-
1985	18	4,330	50	4	481	3,895	164.6	23.8	3,895	-
1986	19	5,920	*	*	*	*	168.1	*	*	-
1987	20	5,155	*	*	*	*	171.6	*	*	-
<u>Forecast</u>										
1990	23	5,600	-	-	620	4,980	182.7	27.0	4,930	+50
1995	28	6,360	-	-	700	5,660	199.6	29.0	5,790	-130
2000	33	7,130	-	-	780	6,350	216.1	30.0	6,480	-130
2005	38	7,900	-	-	870	7,030	231.4	31.0	7,170	-140

\*1 Source: FAO Trade Yearbook.

\*2 Waste and seeds are estimated at 11 % of production and import quantities {(1)+(2)} on the basis of the Food Balance Sheet in Indonesia, Biro Pusat Statistik, 1983.

\*3 Source: Statistik Indonesia, Biro Pusat Statistik.

\*4  $Y = 2071 + 153.3X$  ( $r = 0.84$ )

Where, Y = Production  
X = Year in order

\*5  $X = 11.8186X^{0.2693}$  ( $r = 0.66$ )

Where, Y = Per-capita consumption  
X = Year in order

Table IV-8 DEMAND AND SUPPLY FORECAST - GROUNDNUTS

Year	in Order	SUPPLY				DEMAND				
		Pro- duction of Groundnut (10 <sup>3</sup> t)	*1 Import (10 <sup>3</sup> t)	*1 Export (10 <sup>3</sup> t)	Waste*2 and Seeds (10 <sup>3</sup> t)	Total Supply (10 <sup>3</sup> t)	*3 Popu- lation (10 <sup>6</sup> )	Per- capita Con- sumption (kg)	Total Demand (10 <sup>3</sup> t)	Balance (10 <sup>3</sup> t)
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<u>Actual</u>										
1968	1	287	*	*	*	*	112.1	*	*	-
1969	2	267	*	*	*	*	114.4	*	*	-
1970	3	281	*	*	*	*	116.8	*	*	-
1971	4	284	-	21	32	231	119.2	1.94	231	-
1972	5	282	-	13	32	237	122.1	1.94	237	-
1973	6	290	-	21	32	237	125.0	1.90	237	-
1974	7	307	-	11	36	260	128.0	2.03	260	-
1975	8	300	-	7	35	258	131.0	1.97	258	-
1976	9	341	6	2	41	304	134.2	2.27	304	-
1977	10	409	-	3	49	357	137.4	2.60	357	-
1978	11	446	-	2	53	391	140.7	2.78	391	-
1979	12	424	5	1	51	377	144.0	2.62	377	-
1980	13	470	7	5	57	415	147.5	2.81	415	-
1981	14	475	9	2	58	424	150.7	2.81	424	-
1982	15	437	63	1	60	439	153.9	2.85	439	-
1983	16	460	42	1	60	441	157.2	2.81	441	-
1984	17	535	21	1	67	488	160.6	3.04	488	-
1985	18	528	17	1	65	479	164.6	2.92	479	-
1986	19	642	*	*	*	*	168.1	*	*	-
1987	20	533	*	*	*	*	171.6	*	*	-
<u>Forecast</u>										
1990	23	620	-	-	70	550	182.7	3.30	600	-50
1995	28	710	-	-	90	620	199.6	3.50	700	-80
2000	33	800	-	-	100	700	216.1	3.80	820	-120
2005	38	890	-	-	110	780	231.4	4.00	930	-150

\*1 Source: FAO Trade Yearbook.

\*2 Waste and seeds are estimated at 12 % of production and import quantities {(1)+(2)} on the basis of the Food Balance Sheet in Indonesia, Biro Pusat Statistik, 1983.

\*3 Source: Statistik Indonesia, Biro Pusat Statistik.

\*4  $Y = 213.5 + 17.8X$  ( $r = 0.94$ )

Where, Y = Production  
X = Year in order

\*5  $Y = 1.0705X^{0.359}$  ( $r = 0.94$ )

Where, Y = Per-capita consumption  
X = Year in order

Table IV-9 DEMAND AND SUPPLY FORECAST - SOYBEANS

Year	in Order	SUPPLY				DEMAND				
		Pro- duction of Soybeans (10 <sup>3</sup> t)	*1 Import (10 <sup>3</sup> t)	*1 Export (10 <sup>3</sup> t)	Waste*2 and Seeds (10 <sup>3</sup> t)	Total Supply (10 <sup>3</sup> t)	*3 Popu- lation (10 <sup>6</sup> )	Per- capita Con- sumption (kg)	Total Demand (10 <sup>3</sup> t)	Balance (10 <sup>3</sup> t)
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<u>Actual</u>										
1968	1	420	*	*	*	*	112.1	*	*	-
1969	2	380	*	*	*	*	114.4	*	*	-
1970	3	498	*	*	*	*	116.8	*	*	-
1971	4	516	-	1	46	469	119.2	3.93	469	-
1972	5	518	-	3	46	469	122.1	3.84	469	-
1973	6	541	-	36	45	460	125.0	3.68	460	-
1974	7	589	-	4	53	532	128.0	4.16	532	-
1975	8	590	18	-	55	553	131.0	4.22	553	-
1976	9	522	172	1	62	631	134.2	4.70	631	-
1977	10	523	89	-	55	557	137.4	4.05	557	-
1978	11	617	130	-	67	680	140.7	4.83	680	-
1979	12	680	177	-	77	780	144.0	5.42	780	-
1980	13	653	101	-	68	686	147.5	4.65	686	-
1981	14	704	361	-	96	969	150.7	6.43	969	-
1982	15	521	361	-	79	803	153.9	5.22	803	-
1983	16	536	222	-	68	690	157.2	4.39	690	-
1984	17	769	401	-	105	1,065	160.6	6.63	1,065	-
1985	18	870	302	-	105	1,067	164.6	6.51	1,067	-
1986	19	1,227	*	*	*	*	168.1	*	*	-
1987	20	1,161	*	*	*	*	171.6	*	*	-
<u>Forecast</u>										
1990	23	1,010	-	-	90	920	182.7	6.30	1,150	-230
1995	28	1,160	-	-	100	1,060	199.6	6.70	1,340	-280
2000	33	1,300	-	-	120	1,180	216.1	7.10	1,530	-350
2005	38	1,450	-	-	130	1,320	231.4	7.40	1,710	-390

\*1 Source: FAO Trade Yearbook.

\*2 Waste and seeds are estimated at 9 % of production and import quantities {(1)+(2)} on the basis of the Food Balance Sheet in Indonesia, Biro Pusat Statistik, 1983.

\*3 Source: Statistik Indonesia, Biro Pusat Statistik.

\*4  $Y = 333.4 + 29.4X$  ( $r = 0.79$ )

Where, Y = Production

X = Year in order

\*5  $Y = 2.1876X^{0.3366}$  ( $r = 0.79$ )

Where, Y = Per-capita consumption

X = Year in order

Table IV-10 DEMAND AND SUPPLY FORECAST - CASSAVA

Year	Year in Order	SUPPLY				DEMAND				
		Pro-duction of Cassava (10 <sup>3</sup> t)	*1 Import (10 <sup>3</sup> t)	*1 Export (10 <sup>3</sup> t)	Waste*2 and Seeds (10 <sup>3</sup> t)	Total Supply (10 <sup>3</sup> t)	*3 Popu-lation (10 <sup>6</sup> )	Per-capita Con-sumption (kg)	Total Demand (10 <sup>3</sup> t)	Balance (10 <sup>3</sup> t)
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<u>Actual</u>										
1968	1	11,356	*	*	*	*	112.1	*	*	-
1969	2	10,917	*	*	*	*	114.4	*	*	-
1970	3	10,478	*	*	*	*	116.8	*	*	-
1971	4	10,690	-	1,381	1,396	7,931	119.2	66.4	7,931	-
1972	5	10,385	-	1,032	1,403	7,950	122.1	65.1	7,950	-
1973	6	11,186	-	232	1,643	9,311	125.0	74.5	9,311	-
1974	7	13,031	-	1,220	1,772	10,039	128.0	78.4	10,039	-
1975	8	12,546	-	910	1,745	9,891	131.0	75.5	9,891	-
1976	9	12,191	-	476	1,757	9,958	134.2	74.2	9,958	-
1977	10	12,488	-	549	1,791	10,148	137.4	73.9	10,148	-
1978	11	12,902	-	924	1,797	10,181	140.7	72.4	10,181	-
1979	12	13,751	-	2,135	1,742	9,874	144.0	68.6	9,874	-
1980	13	13,079	-	1,158	1,788	10,133	147.5	68.7	10,133	-
1981	14	13,301	-	221	1,962	11,118	150.7	73.8	11,118	-
1982	15	12,988	-	92	1,934	10,962	153.9	71.2	10,962	-
1983	16	12,103	-	165	1,791	10,147	157.2	64.5	10,147	-
1984	17	14,167	-	227	2,091	11,849	160.6	73.8	11,849	-
1985	18	14,057	-	*	*	*	164.6	*	*	-
1986	19	13,312	*	*	*	*	168.1	*	*	-
1987	20	14,356	*	*	*	*	171.6	*	*	-
<u>Forecast</u>										
1990	23	14,700	-	-	2,200	12,500	182.7	72.0	13,200	-700
1995	28	15,600	-	-	2,300	13,300	199.6	72.0	14,400	-1,100
2000	33	16,500	-	-	2,500	14,000	216.1	72.0	15,600	-1,600
2005	38	17,500	-	-	2,600	14,900	231.4	72.0	16,700	-1,800

\*1 Source: FAO Trade Yearbook.

\*2 Waste and seeds are estimated at 15 % of production and import quantities {(1)+(2)} on the basis of the Food Balance Sheet in Indonesia, Biro Pusat Statistik, 1983.

\*3 Source: Statistik Indonesia, Biro Pusat Statistik.

\*4  $Y = 10559 + 181.5X$  ( $r = 0.85$ )

Where, Y = Production  
X = Year in order

\*5 Correlation rate (r) between per-capita consumption and year was estimated at 0.16 ( $Y = 69.84X^{0.01219}$ ). This indicate no trend in its annual change. Therefore, the future per-capita consumption applied an average figure from 1971 to 1984.

Table IV-11 DEMAND AND SUPPLY FORECAST - SWEET POTATOES

Year	Year in Order	SUPPLY				DEMAND				Balance (10 <sup>3</sup> t)
		Pro-duction of Sweet Potatoes (10 <sup>3</sup> t)	*1 Import (10 <sup>3</sup> t)	*1 Export (10 <sup>3</sup> t)	Waste*2 and Seeds (10 <sup>3</sup> t)	Total Supply (10 <sup>3</sup> t)	*3 Popu- lation (10 <sup>6</sup> )	Per- capita Con- sumption (kg)	Total Demand (10 <sup>3</sup> t)	
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<u>Actual</u>										
1968	1	2,364	-	-	355	2,009	112.1	17.9	2,009	-
1969	2	2,260	-	-	339	1,921	114.4	16.8	1,921	-
1970	3	2,175	-	-	326	1,849	116.8	15.8	1,849	-
1971	4	2,211	-	-	332	1,879	119.2	15.8	1,879	-
1972	5	2,066	-	-	310	1,756	122.1	14.4	1,756	-
1973	6	2,387	-	-	358	2,029	125.0	16.2	2,029	-
1974	7	2,470	-	-	371	2,099	128.0	16.4	2,099	-
1975	8	2,433	-	-	365	2,068	131.0	15.8	2,068	-
1976	9	2,381	-	-	357	2,024	134.2	15.1	2,024	-
1977	10	2,460	-	-	369	2,091	137.4	15.2	2,091	-
1978	11	2,083	-	-	312	1,771	140.7	12.6	1,771	-
1979	12	2,194	-	-	329	1,865	144.0	13.0	1,865	-
1980	13	2,079	-	-	312	1,767	147.5	12.0	1,767	-
1981	14	2,094	-	-	314	1,780	150.7	11.8	1,780	-
1982	15	1,676	-	-	251	1,425	153.9	9.3	1,425	-
1983	16	2,213	-	-	332	1,881	157.2	12.0	1,881	-
1984	17	2,157	-	-	324	1,833	160.6	11.4	1,833	-
1985	18	2,162	-	-	324	1,838	164.6	11.2	1,838	-
1986	19	2,091	*	*	*	*	168.1	*	*	-
1987	20	2,013	*	*	*	*	171.6	*	*	-
<u>Forecast</u>										
1990	23	2,010	-	-	300	1,710	182.7	9.2	1,680	+30
1995	28	1,930	-	-	290	1,640	199.6	8.0	1,600	+40
2000	33	1,850	-	-	280	1,570	216.1	6.9	1,490	+80
2005	38	1,770	-	-	270	1,500	231.4	5.9	1,370	+130

\*1 Source: FAO Trade Yearbook.

\*2 Waste and seeds are estimated at 15 % of production and import quantities ((1)+(2)) on the basis of the Food Balance Sheet in Indonesia, Biro Pusat Statistik, 1983.

\*3 Source: Statistik Indonesia, Biro Pusat Statistik.

\*4  $Y = 2360.8 + 15.5X$  ( $r = 0.49$ )

Where, Y = Production  
X = Year in order

\*5  $Y = 18.37 \times e^{-0.0298X}$  ( $r = 0.89$ )

Where, Y = Per-capita consumption  
X = Year in order

Table IV-12 HARVESTED AREA OF CROPS IN RIAU PROVINCE

(Unit: 1,000 ha)

	1982	1983	1984	1985	1986	1984-1985
1) FOOD STUFFS						
Paddy	133.07	139.88	153.22	146.89	150.19	150.10
- Wet Land	87.42	89.24	96.67	93.08	101.29	97.01
- Dry Land	45.65	50.64	56.55	53.81	48.90	53.09
Maize	13.99	26.69	7.47	11.70	15.25	11.47
Cassava	7.20	7.53	6.65	6.24	5.81	6.23
Sweet Potatoes	2.17	2.39	2.07	2.15	2.11	2.11
Groundnuts	3.42	3.40	1.94	2.41	4.19	2.85
Soybeans	1.70	3.33	2.37	5.03	12.17	6.52
Shall Greenpea	2.85	3.91	1.67	3.72	2.96	2.78
2) VEGETABLES						
Chilly	2.56	1.73	2.24	5.52	5.87	4.54
Cucumber	1.35	1.48	1.97	2.45	2.76	2.39
Egg Plant	2.10	1.74	2.84	3.38	3.55	3.26
Vegetable Bean	1.44	1.22	2.31	4.61	5.45	4.12
Spinach	0.86	0.83	1.11	1.39	1.61	1.37
3) FRUITS						
Banana	4.63	4.97	9.11	7.39	1.18	5.89
Durian	1.28	0.83	1.12	1.45	0.33	0.97
Manggos	0.31	0.41	0.29	0.31	0.12	0.24
Orange	1.61	1.51	5.21	2.48	1.81	3.17
Rambotan	1.35	1.95	1.22	1.80	1.09	1.37
Papaya	0.25	0.35	0.94	0.34	0.12	0.47
Pineapple	2.45	2.45	1.28	2.39	3.30	2.32
Guaves	0.22	0.28	0.29	0.39	0.99	0.56
4) PERENNIAL CROPS						
Rubber	283.54	306.20	318.18	346.60	353.54	339.44
Coconut	260.22	264.98	277.96	282.16	287.68	282.60
Clove	13.61	14.38	13.20	15.13	15.83	14.72
Coffee	7.53	8.12	9.48	9.65	10.95	10.03
Oil palm	18.40	26.20	42.34	68.49	95.44	68.76

Source: Riau Dalam Angka 1983-1987, Kantor Statistik Propinsi Riau.  
Laporan Tahunan 1986, Dinas Perkebunan Propinsi Riau.



Table IV-13 PRODUCTION OF CROPS IN RIAU PROVINCE

(Unit: 1,000 tons)

	1982	1983	1984	1985	1986	1984-1985
1) FOOD STUFFS						
Paddy	356.96	370.55	403.38	437.94	366.06	402.46
- Wet Land	283.74	283.98	323.48	332.51	292.32	316.10
- Dry Land	73.22	86.57	79.90	105.43	73.74	86.36
Maize	14.37	33.95	13.45	22.38	37.97	24.60
Cassava	85.09	105.24	103.08	100.47	67.92	90.49
Sweet Potatoes	15.08	15.47	13.12	18.97	16.22	16.10
Groundnuts	3.84	4.21	3.01	3.96	4.24	3.74
Soybeans	1.28	2.87	2.25	5.57	15.10	7.64
Shall Greenpea	2.25	4.94	2.10	5.63	4.03	3.92
2) VEGETABLES						
Chilly	2.29	2.52	2.25	5.79	5.36	4.47
Cucumber	5.36	4.92	5.64	11.68	11.66	9.66
Egg Plant	2.55	2.64	2.67	6.43	5.64	4.91
Vegetable Bean	7.38	2.17	2.18	5.18	5.75	4.37
Spinach	1.81	2.03	2.76	4.80	4.88	4.15
3) FRUITS						
Banana	48.72	66.24	73.63	77.97	82.00	77.87
Durian	6.00	3.63	5.77	12.58	11.54	9.96
Manggos	0.47	0.53	0.50	0.48	0.66	0.55
Orange	57.95	60.65	62.44	71.39	74.79	69.54
Rambotan	3.65	2.84	5.88	6.52	7.28	6.56
Papaya	1.06	1.60	2.07	1.96	1.96	2.00
Pineapple	22.48	28.83	23.60	23.41	38.71	28.57
Guaves	0.83	1.05	1.11	0.90	2.97	1.66
4) PERENNIAL CROPS						
Rubber	60.39	63.37	87.28	81.59	86.24	85.04
Coconut	118.28	134.77	126.46	144.37	146.58	139.14
Clove	0.71	0.79	1.78	0.49	0.52	0.93
Coffee	2.20	2.18	3.06	1.93	1.44	2.14
Oil palm	0.36	2.05	13.49	40.16	76.32	43.32

Source: Riau Dalam Angka 1983-1987, Kantor Statistik Propinsi Riau.  
Laporan Tahunan 1986, Dinas Perkebunan Propinsi Riau.

Table IV-14 UNIT YIELD OF CROPS IN RIAU PROVINCE

(Unit: ton/ha)

	1982	1983	1984	1985	1986	1984-1985
<b>1) FOOD STUFFS</b>						
Paddy	2.68	2.65	2.63	2.98	2.44	2.68
- Wet Land	3.25	3.18	3.35	3.57	2.89	3.26
- Dry Land	1.60	1.71	1.41	1.96	1.51	1.63
Maize	1.03	1.27	1.80	1.91	2.49	2.14
Cassava	11.82	13.98	15.50	16.10	11.69	14.52
Sweet Potatoes	6.95	6.47	6.34	8.82	7.69	7.63
Groundnuts	1.12	1.24	1.55	1.64	1.01	1.31
Soybeans	0.75	0.86	0.95	1.11	1.24	1.17
Shall Greenpea	0.79	1.26	1.26	1.51	1.36	1.41
<b>2) VEGETABLES</b>						
Chilly	0.89	1.46	1.00	1.05	0.91	0.98
Cucumber	3.97	3.32	2.86	4.77	4.22	4.04
Egg Plant	1.21	1.52	0.94	1.90	1.59	1.51
Vegetable Bean	5.13	1.78	0.94	1.12	1.06	1.06
Spinach	2.10	2.45	2.49	3.45	3.03	3.03
<b>3) FRUITS</b>						
Banana	10.52	13.33	8.08	10.55	69.49	13.21
Durian	4.69	4.37	5.15	8.68	34.97	10.31
Manggos	1.52	1.29	1.72	1.55	5.50	2.28
Orange	35.99	40.17	11.98	28.79	41.32	21.96
Rambotan	2.70	1.46	4.82	3.62	6.68	4.79
Papaya	4.24	4.57	2.20	5.76	16.33	4.28
Pineapple	9.18	11.77	18.44	9.79	11.73	12.30
Guaves	3.77	3.75	3.83	2.31	3.00	2.98
<b>4) PERENNIAL CROPS</b>						
Rubber	0.21	0.21	0.27	0.24	0.24	0.25
Coconut	0.45	0.51	0.45	0.51	0.51	0.49
Clove	0.05	0.05	0.13	0.03	0.03	0.06
Coffee	0.29	0.27	0.32	0.20	0.13	0.21
Oil palm	0.02	0.08	0.32	0.59	0.80	0.63

Source: Riau Dalam Angka 1983-1987, Kantor Statistik Propinsi Riau.  
Laporan Tahunan 1986, Dinas Perkebunan Propinsi Riau.

Table IV-15 IMPLEMENTATION OF TRANSMIGRATION IN INDONESIA

(Unit: Family)

Year	Total families moved	Local families	Families resettled	Total families settled	Total people settled
1950-54	21,037	-	1,280	22,317	87,000
1955-59	32,114	-	128	32,242	134,000
1960-64	26,456	-	-	26,456	111,000
1965-69	21,633	-	-	21,633	92,000
1969-74	39,436	-	75	39,511	176,000
1974-79	44,484	7,600	-	52,084	228,000
1979-84	301,279	22,284	42,414	365,977	1,492,000
1985	*	*	*	55,491	(222,000)
Total				615,711	(2,542,000)

Sources: 1950-1984 Transmigration Sector Review, World Bank, 1986.  
1985 Statistik Indonesia 1987, Biro Pusat Statistik.

Table IV-16 IMPLEMENTATION OF TRANSMIGRATION IN RIAU PROVINCE

Year	Families (KK)	Population
1969/1970	298	1,325
1970/1971	-	-
1971/1972	150	735
1972/1973	-	-
1973/1974	150	732
1974/1975	200	821
1975/1976	-	-
1976/1977	-	-
1977/1978	500	2,034
1978/1979	2,400	10,261
1979/1980	9,021	37,791
1980/1981	10,396	44,427
1981/1982	7,433	31,936
1982/1983	8,570	35,966
1983/1984	3,743	17,055
1984/1985	8,819	35,638
1985/1986	117	457
1986/1987	6,767	28,854
1987/1988	4,161	17,627
As of March 1988	1,840	11,950
Total	64,565	277,879

Source: Transmigration Office, Riau Province.

Table IV-17 TRANSMIGRATION PROGRAM IN RIAU PROVINCE (1989/1990 - 1993/1994)

No.	Location	WPP/SKP	Total Family	Annual Schedule				
				1989/1990	1990/1991	1991/1992	1992/1993	1993/1994
<b>I. KAB. KAMPAR</b>								
(1)	Bangkinang	X/F	2,549	549	500	500	500	500
(2)	Kota Tengah	XIII b/A.1	1,344	344	500	500	-	-
(3)	Kota Tengah	XIII b/A.3	431	431	-	-	-	-
(4)	Bangkinang	X/G	2,463	463	500	500	500	500
(5)	Kota Iana	XII A/G	1,980	480	500	500	500	-
(6)	Kota Iana	XIII a/B	2,179	179	500	500	500	500
(7)	Kota Tengah	XIII b/C	1,283	283	500	500	-	-
(8)	Tanjung Medan	XI b/G.1	2,029	529	500	500	500	-
(9)	Tanjung Medan	XI b/G.2	1,596	96	500	500	500	-
(10)	Tanjung Medan	XI b/G.3	1,596	96	500	500	500	-
(11)	Kota Tengah	XIII b/D.1	1,421	421	500	500	-	-
(12)	Kota Tengah	XIII b/D.2	2,085	85	500	500	500	500
(13)	Kota Iana	XIII a/A, D	1,099	539	500	-	-	-
(14)	Kota Tengah	XIII b/F	1,323	323	500	500	-	-
(15)	LANGGAM II	VI b/A, C, D, G	3,277	777	500	1,000	500	500
(16)	LIPAT KAIN	XI b/F	2,700	700	500	500	500	500
(17)	LANGGAM II	VI b/H	1,500	1,000	500	-	-	-
(18)	BUATAN	-	4,250	500	750	1,000	1,000	1,000
(19)	AEK TANGON	-	100	100	-	-	-	-
(20)	PORO II	-	200	200	-	-	-	-
(21)	TAMPAN I + II	-	200	200	-	-	-	-
(22)	PASIR JAMBU	-	100	100	-	-	-	-
(23)	SUNCAI PAKU	-	200	200	-	-	-	-
(24)	SUNCAI KUMANG	-	200	200	-	-	-	-
(25)	SUNCAI GARO	-	2,250	1,750	500	-	-	-
(26)	SUNCAI GALUH	-	3,000	2,500	500	-	-	-
(27)	SUNCAI PAGAR	-	750	-	750	-	-	-
(28)	SUNCAI INTAN	-	1,300	1,050	250	-	-	-
(29)	KALANTAN	-	1,400	1,400	-	-	-	-
(30)	KOTO KAMPAR	-	1,895	1,200	695	-	-	-
<b>II. KAB. INDRAGIRI HULU</b>								
(1)	Teluk Kuantan	XI a/E, F	513	513	-	-	-	-
<b>III. KAB. BANGKALIS</b>								
(1)	Sungai Buatani	-	2,500	750	1,750	-	-	-
(2)	Lubuk Dalam	-	5,300	2,000	1,500	1,800	-	-
<b>IV. KAB. KEP. RIAU</b>								
(1)	Jemaja	-	300	300	-	-	-	-
(2)	Bunguran Barat	-	700	700	-	-	-	-
<b>Total</b>			<b>55,953</b>	<b>20,958</b>	<b>14,695</b>	<b>10,300</b>	<b>6,000</b>	<b>4,000</b>

Source: RANCANGAN: REPELITA V BIDANG TRANSMIGRASI PADA KANTOR WILAYAH DEPARTEMEN TRANSMIGRASI PROPINSI RIAU, APRIL 1988.

Table IV-18 AGE DISTRIBUTION IN THE STUDY AREA  
(Person)

Age	SKP-C				SKP-D			Rantau	Total
	DU	DK-II	DK-III	DK-IV	DU	DK-I	DK-II	Kasai	
0 - 4	589	385	517	413	422	231	448	97	3,101
5 - 9	382	222	318	306	465	202	332	72	2,300
10 - 14	382	195	189	218	243	125	236	51	1,641
15 - 19	268	127	135	161	224	85	175	38	1,213
20 - 24	286	171	202	185	197	103	200	43	1,389
25 - 29	265	171	237	189	183	124	205	44	1,419
30 - 34	265	139	131	147	119	109	159	34	1,104
35 - 39	115	143	67	111	167	81	120	26	830
40 - 44	111	105	115	107	146	75	116	25	799
45 - 49	92	129	38	78	141	8	85	18	588
50 - 54	19	15	25	37	129	5	40	9	279
55 - 59	16	11	5	30	125	0	33	7	227
60 <	0	9	10	28	127	0	30	7	211
Total	2,790	1,820	1,990	2,010	2,690	1,150	2,180	170	15,100

( % )

Age	SKP-C				SKP-D			Rantau	Total
	DU	DK-II	DK-III	DK-IV	DU	DK-I	DK-II	Kasai	
0 - 4	21.1	21.1	26.0	20.6	15.7	20.1	20.6	20.6	20.5
5 - 9	13.7	12.2	16.0	15.2	17.3	17.5	15.2	15.2	15.2
10 - 14	13.7	10.7	9.5	10.8	9.0	10.9	10.8	10.8	10.9
15 - 19	9.6	7.0	6.8	8.0	8.3	7.4	8.0	8.0	8.0
20 - 24	10.3	9.4	10.2	9.2	7.3	9.0	9.2	9.2	9.2
25 - 29	9.5	9.4	11.9	9.4	6.8	10.8	9.4	9.4	9.4
30 - 34	9.5	7.6	6.6	7.3	4.4	9.5	7.3	7.3	7.3
35 - 39	4.1	7.8	3.4	5.5	6.2	7.1	5.5	5.5	5.5
40 - 44	4.0	5.8	5.8	5.3	5.4	6.5	5.3	5.3	5.3
45 - 49	3.3	7.1	1.9	3.9	5.2	0.7	3.9	3.9	3.9
50 - 54	0.7	0.8	1.2	1.8	4.8	0.4	1.8	1.8	1.8
55 - 59	0.6	0.6	0.2	1.5	4.7	0.0	1.5	1.5	1.5
60 <	0.0	0.5	0.5	1.4	4.7	0.0	1.4	1.4	1.4
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Sources: Data and information obtained from Transmigration Offices in Tanjung Medan SKP-C and -D.

Table IV-19 CLIMATOLOGICAL RECORD AT PASIR PENGARAYAN

		JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	Average/ Total
Rainfall	(mm)	217	167	223	222	167	115	138	149	225	211	259	349	2,442
Air Temperature														
- Maximum	(°C)	32.5	33.1	33.4	34.0	34.2	34.1	34.0	33.8	33.1	34.0	33.5	33.3	33.6
- Mean	(°C)	26.7	27.1	27.4	28.3	28.5	28.3	28.2	27.6	27.5	27.7	27.4	26.9	27.6
- Minimum	(°C)	20.9	21.4	21.7	22.6	23.0	22.6	23.0	22.0	21.9	21.3	21.3	20.6	21.9
Relative Humidity	(%)	80	82	82	82	81	79	77	77	78	80	77	79	80
Solar Radiation (Cal/cm <sup>2</sup> /day)		299	321	317	328	308	318	303	306	304	321	322	279	311
Wind Velocity	(km/day)	35.8	38.2	37.9	35.4	35.1	34.0	35.3	36.0	34.6	33.8	34.9	31.7	35.2
Evaporation	(mm/day)	4.1	4.8	4.7	4.9	4.6	4.8	4.8	4.8	5.0	4.7	4.6	4.1	4.7

Table IV-20 PRESENT LAND USE IN THE STUDY AREA

(Unit: ha)

	Paddy Field	Upland Field	Perennial Crops	Grass Land	Forest	Village *1	Other	Total
Transmigration Area	170	1,420	-	1,770	1,970	1,600	140	7,070
SKP-C								
DU	-	260	-	430	310	300	30	1,330
DK-II	68	170	-	260	200	210	22	930
DK-III	16	110	-	200	380	210	14	930
DK-IV	8	-	-	360	340	210	22	940
SKP-D								
DU	58	340	-	250	370	310	22	1,350
DK-I	8	210	-	190	40	130	12	590
DK-II	12	330	-	80	330	230	18	1,000
Outside Area*2	20	990	500	830	19,830	10	450	22,630
Study Area Total	190	2,410	500	2,600	21,800	1,610	590	29,700

## Remarks:

- \*1 Include public area such as school, market, etc.
- \*2 Include Rantau Kasai village.
- (1) The land use in the transmigration area was estimated on the basis of the data and information obtained from village chief and the transmigration offices located in each village.
- (2) The farm lands located in the outside transmigration area have been cultivated the settlers in the transmigration area and the farmers in Rantau Kasai village.