The LD Project is carried out under the responsibility of Director General of Food Crop Agriculture. Under the supervision of Director General of Food Crop Agriculture, a Project Leader is appointed at the central office and at the same time, a Project Leader at each Province is also appointed. The Project Leader at the Provincial level decides the operational area of UPP which covers about 1,000 ha of land reclamation, and 2,000 ha of "investigation" of the land to be developed within two years.

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

Under the chief of UPP, there are three Sections, i.e. Data Section, Technical Section and Administrative Section, and five to seven Field Workers in-charge of about 200 ha each. As a coordination body, there are three teams, namely Steering Team at Central level, Supervisory Team at Provincial level and Executive Team at Kabupaten level, respectively as shown in Fig VI-6. The amount of loan and repayment period depend on the type of area as shown in Table VI-45.

In South Sumatra, the LD Project is being carried out by three UPPs with 1,600 ha of operated area as shown in Table VI-46. Future program of LD Project during the period of Repelita III covers about 3,700 ha of the project area as shown also in Table VI-46.

3.4 Present Typical Farm Budget

Table VI-47 shows the present farm budget of typical farmer in the project area. In case of Type-I and Type-II farmers, major source of income comes from rice, while, upland crops in Type-III area is predominant.

Income from the livestock is still insignificant. The farmer raises mainly chicken and duck for home consumption. The average annual farm income throughout the project area is still low as compared with that in the whole Indonesia. Miscellaneous income means temporary-labor income, selling income of coconuts in home yard and other miscellaneous income.

Recently, the living expenses of family have increased substantially owing to upgrading of living standard. Surplus or capacity to pay in their budget is rather small in the project area as seen in Table VI-47.

3.5 Socio-Economic Constraints

From the socio-economic viewpoints, the present major constraints for the agricultural development are pointed out as follows:

i) Lack of sufficient and effective coordination between respective administrative organizations concerned. For example, it is necessary to keep same figures between offices concerned.

ii) Inefficiency of marketing system for smooth flow of farm products and farm inputs including the DOLOG activities.

iii) Insufficient agricultural support services such as agricultural extension service, seed multiplication system, agricultural credits, etc. Especially, increase of field extension worker (PPL) and arrangement of extension equipment, etc. are essential.

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

4. PROPOSED AGRICULTURAL SUPPORT SERVICES

4.1 General

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

The present insufficient management of agricultural support services such as lack of close contacts in between the administrative organizations, inefficient marketing system, lack of farmers' organizations, insufficient extension services, etc. should be improved before implementation of the project.

4.2 Research and Extension Services

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

Present Provincial Seed Center located at BK-X in Belitang Proper Area is proposed to be strengthened under the Agricultural Development Center (ADC) in the Province, for which this station will comprise seven divisions in function as shown in Fig. VI-7.

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

As described in the previous chapter, existing field extension workers are insufficient for the proper guidance of crop cultivation techniques to the farmers. Especially, in the case of "With Project" it will become important to up-grade farmers knowledge on crop cultivation techniques such as introduction of new high yield varieties, improvement of fertilizer application system and control of insects and diseases, guidance of demonstration farm with Kuotak Tani (key farmer), etc.

In the project area, each PPL (field extension work) is dealing with about 1,700 farmers with 1,200 ha of paddy field on an average in the five Kecamatan concerned with the project area at present. The present agricultural extension service is insufficient for proper guidance on application of improved irrigation farming techniques mainly because of short of PPL, lack of equipment and materials for extension activities, and shortage of budget. It is desired to increase number of PPL and strengthen their technical knowledge in order to spread evenly the improved farming techniques to the individual farmer. Appropriate command area per PPL would be about 500 ha of paddy field. Furthermore, some technical testing apparatus and information instruments such as pH meter, soil auger, movie projector, slide projector, motor cycle, etc. are also proposed to be equipped for effective extension services.

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

4.3 Seed Multiplication and Its Distribution

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

When irrigation becomes available through the project, the improvement and extension of the seed center is necessary for the timely and sufficient supply of seed to the farmers. In this context, the staff members, facilities, fields, equipment, etc. should be strengthened before the completion of the Project.

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

The required amount of paddy seeds is about 20 tons of dry paddy seed for mainly Belitang Proper Area at present and is almost distributed for seed grower and BIMAS/INMAS programs farmers. When the project is realized, however, around 300 tons of improved seed will be required for 36,700 ha of rainy season paddy in every 3 years for reneval. It is needed to have about 50 ha of field in order to produce above amount of improved seed. Seed distribution system to the farmers through BUUD/KUD or seed growers should also be improved for smooth and wide distribution of seeds.

4.4 Agricultural Credits

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

There are three kinds of loan for agriculture by the Bank Rakyat Indonesia, i.e. short term, medium term and long term loans. The BIMAS/INMAS credits for paddy production loan is short loan with 7 month loan term with monthly interest rate of 1%. The loan amount of BIMAS package per ha was in the range of Rp.30,000 to Rp.50,000 in 1979. This amount varies from region to retion.

In order to extend the BIMAS/INMAS programs area, it is necessary to improve field conditions through construction of irrigation facilities, etc. The area having irrigation facilities; both the technical and semi-technical areas in the project area has gradually increased in recent years resulting in the increase of the BIMAS program areas, but still far less than that in the case of whole Indonesia. After implementation of the project, the BIMAS/INMAS program will be fully introduced into the project area.

4.5 Farmers Co-operatives, etc.

The establishment of Village Unit Co-operative (KUD) is scheduled to be completed for about 21% of total Village Units in South Sumatra

Province by the end of 1979/80. In the project area, 14 KUDs out of 65 village units have been organized, but membership is less than 10% of total member of farmers. Much effort should be paid to improve such farmers co-operatives for proper operation of irrigation farming by means of strong guidance of the Government through governmental regional offices.

In addition, more rice mill, paddy drying yards, warehouse, agro-equipment and tools, etc. should also be sufficiently provided to the BUUD/KUD organizations in the project area so as to process smoothly the farm outputs and inputs.

4.6 Water Management

As mentioned the previous Sub-section 3.3.5, there is no proper irrigation facilities in the project area at present. Only in the vicinity of the Belitang Proper Irrigation Project area, there exist some technical and semi-technical irrigation systems. Though the Belitang Proper Irrigation Project area has adequate irrigation facilities throughout the whole Belitang Proper area, operation and maintenance of the facilities are not so satisfactorily and properly carried out due to certain circumstances.

For the smooth water management in the proposed Komering-I Project, the following recommendations are desired to be incorporated into the project keeping the above constraints in mind.

1) Present organization of Provincial Public Works should be reinforced by establishing a new Branch Office (CABANG) which is in charge of maintenance and operation of new canal system with adequate number of competent engineers and PP Airs.

2) The following regular activities should be carried out:

   a) collection of the basic data of cultivation such as cropping pattern, cropping calendar, planting area, farm practices and yield by crops by each resort each ten-day;

b) regular meeting once a ten-day with the watermen (ULu2) working in each Water User's Association concerned by each resort, in which daily problems about operation and maintenance and discussed and solved;

c) regular meeting at the Branch Office (CABANG) every three months for discussion about operation and maintenance works;

d) regular meeting at Kecamatan level every month by the officers of Irrigation Section (SEKSI), Agricultural Office and other authorities concerned in order to discuss irrigation amount and period, and other periodic topics under the supervision of the District Irrigation Committee.

3) Before the completion of construction works of the Irrigation Project, the Water User's Association should be established under the initiation of each village chief, CAMAT and BUPATI with strong guidance of Agricultural Office and the Branch Office of Irrigation Section concerned.

4) Provincial Public Works should prepare adequate annual budget for carrying out above mentioned activities.

The proposed organization of the project is described in ANNEX-IX in detail.

5. MARKET AND PRICE PROSPECTS

5.1 Marketing Prospects of Paddy

Although the rice production in Indonesia as well as in South Sumatra Province has remarkably increased in recent years, the demand of rice will still exceed the production because of the rapid population growth and increase of per capita rice consumption. While the rice production in Kabupaten OKU has been in surplus because of less population density.

Indonesia is still rice importing country, though production of rice has increased substantially. About 1.4 million tons of rice per annum on an average were imported in recent five years. Considering the growth rate of population and increase of per capita consumption, the shortage of rice in Indonesia will be still continued to some extent as shown in Fig. VI-8.

The South Sumatra Province is also faced with substantial shortage of rice. In recent 5 years about 130,000 tons of rice on an average were imported as shown below.

Unit: 1,000 tons

	'75/76	'76/77	'77/78	'78/79	'79/80	Average
Internal import	0.2	-	0.5	0.6	10.0	2.3
Import	43.4	140.5	163.4	119.2	191.4	131.6
Total	43.6	140.5	163.9	119.8	201.4	133.9

Source: DOLOG Office in Palembang

Although the rice production in the province is significantly increasing, the high rate of population growth in the province would a accelerate the shortage of rice in the future as shown in Fig. VI-8. In forecasting the future demand and supply of rice, the following increase rates are assumed to be applied.

Item	Indonesia	South Sumatra Province	Kabupaten OKU
1) Population growth rate (year)	2.0% (1978-1995)	2.9% (1978-1995)	3% (1979-1995)
2) Rice consumption increase rate per capita	1.5%	1.5%	1.5%
3) Rice production increase rate (year)	3.3% (1978-1983) 2.6% (1984-1995)	3.0% (1979-1995)	3.0% (1979-1983) 2.8% (1984-1995)
4) Amount of rice consumption at present	128 kg	131 kg	131 kg
5) Amount of final target for rice consumption	150 kg	150 kg	150 kg

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Reference data source:

1) Statistic Office in South Sumatra Province
2) BAPPEDA Office in South Sumatra Province
3) Agricultural Office in South Sumatra Province and Kabupaten OKU
4) Bureau of Statistic, Indonesia
5) Asia Economy Institute in Japan (Economy of Indonesia, 1978)
6) BULOG in Indonesia

After implementation of the project works, about 180,000 tons of rice would be produced from the project area, of which about 160,000 tons would be marketed to the vicinity of the project area, Palembang and Tanjung Karang, as the substitute of import rice.

5.2 Price Prospect

5.2.1 Rice

Economic Prices: Economic price of paddy at farm gate is estimated on the basis of the projected international market price forecasted by IBRD for the period of 1990 in 1979 constant dollars, taking into account the costs for transportation, processing and others. Table VI-49 shows the rice price at the farm gate estimated for economic evaluation of the Project.

Financial Prices: Financial prices of farm products at farm gate are estimated based upon available data on farm gate prices collected through farm economy survey and prevailing local market prices of farm products in Martapura and Palembang. The estimated financial prices of farm products were given in Table VI-51.

5.2.2 Other Crops

Cassava is the next main stable food crops in the project area at present. The inhabitants, mostly transmigrants, usually eat rice mixing with cassava in the form of OJEK. The amount of consumption is decreasing tendency according to raising of living standard, and amount of marketing is also limited in small local market. Present production of soybeans and peanuts is very low, approximately 1,800 tons, which are mostly consumed within the project area. After full development of the project, about 16,000 tons of those products are expected in the project area. The most of the production would be marketed to Palembang and exported abroad.

Economic prices of soybeans and peanuts at farm gate are estimated on the basis of projected international market price forecasted by IBRD as shown in Table VI-50. Financial prices of the above products are

estimated to be those economic prices at farm, though the present prices prevailing in the local market is considerably high as shown in Table VI-51.

5.2.3 Farm Inputs

Both economic and financial prices of farm inputs at farm gate are estimated based on the farm economy survey carried out in 1980 referring to the market prices in Martapura. The prices of fertilizers and agro-chemicals are fixed by the Government. Table VI-48 and VI-51 are economic and financial prices of major farm inputs respectively.

6. TIPICAL FARM BUDGET

From the farmers' viewpoint, the finantial evaluation with and without project conditions was made for three (3) typical farmers, 1.0 ha farm holding farmer, 1.75 ha farm holding farmer and Pisang area farmer with 1.75 ha. Calculation of both income and outgo was made based on the production and price of crops estimated and inputs applied in with and without project conditions respectively.

In every cases, income from the rice and polowijo is predominant with the project. Income from livestock is insignificant. The gross income in each type will increase remarkably after the full development of the project as compared with its income in without project condition.

Crop production expenditures with project would increase substantially due to application of certain amount of fertilizers needed. Although living expenses of farmer without project would increase to some extent from the present basis, those in with project conditions would substantially increase by approximately two to three times mainly due to raising food consumption particularly rice. The following table shows the comparison of income, outgo and balance (capacity to pay) in with and without project conditions in each type. Details are shown in Table VI-52 and Table VI-53.

Description	Type I area		Type II area		Pisang area	
	with-project	without-project	with-project	without-project	with-project	without-project
1. Gross income	1,027	342	1,267	403	1,266	274
2. Farm outgo	813	335	904	388	1,034	272
3. Balance or capacity to pay	215	8	363	15	232	1
	(343.2)	(12.4)	(580.3)	(24.0)	(370.9)	(2.1)

Unit: $Rp.10^3$ (US$)

7. TRANSMIGRATION

According to the information obtained from the Transmigration Offices in both Kabpaten OKU and North Lampung, no concrete transmigration program to the project area is contemplated so far. In the project area, certain transmigrants have been spontaneously settled in scattered places in addition to the Governmental transmigration plan executed. As the results of land use survey carried out in 1980, there exist certain forest and alang-alang lands which are considered to be not allocated to the transmigrants from the Authorities concerned, i.e. about 10,000 ha in total could be provided to the farmers to be newly settled. These areas are scattered within the project area except for the Pisang area where center part of the area has a sizable amount of room to be settled.

In order to settle successfully the transmigrants, it is proposed to provide the farm land reclaimed satisfactorily in addition to the subsidy of certain quantities of living accommodation and commodities needed for farming to the general immigrant as shown in Table VI-39.

8. PROJECT BENEFIT

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

Table VI-54 through Table VI-66 show the production costs for anticipated crops in both with and without project conditions. Table VI-67 through Table VI-72 show the gross and net production values at the full development stage in both with and without project conditions in three types of area. Table VI-73 shows the incremental benefits of the project. The benefit from the paddy production is predominant in the most of the development area. The following table shows a summary of the incremental benefit of the project at the full development stage.

Area	With project	Without project	Increment Benefit
1.0 ha area	8,800	2,390	6,410
1.5 ha area	20,970	3,310	17,660
Pisang area	2,390	60	2,330
Total	32,160	5,760	26,400

(Unit: RP. 10^6)

Table VI-1. POPULATION IN THE PERIOD FROM 1973 TO 1980

Unit: 1,000 persons

	1973	1974	1975	1976	1977	1978	1979	1980
Indonesia	126,088	129,083	132,110	135,190	138,342	141,579	144,912	147,383
South Sumatra Province	3,688	3,795	3,905	4,018	4,135	4,257	4,383	4,622
Kabupaten OKU	560	572	599	622	635	683	702	-

Source: Central Bureau of Statistics, 1971 - 1981
Kantor Sensus & Statistik, Palembang & Kab.OKU, 1977.78.79

Table VI-2. POPULATION DENSITY AND GROWTH RATE

	Area (Km^2)	Density (Person/Km^2)	Growth Rate (%)
Indonesia	1,919,400	77	2.34
South Sumatra Prov.	103,688	45	2.93
Kabupaten OKU	11,133	63	4.05

Source: Central Bureau of Statistics, 1971 - 1981
Kantor Sensus & Statistik, Palembang & Kab.OKU, 1978.79

Table VI-3. POPULATION BY AGE GROUPS

Age-Groups	South Sumatra Province /1			Kabupaten OKU /2		
	Male	Female	Total	Male	Female	Total
0 - 4	416,900	404,880	821,780	60,750	61,840	122,590
5 - 9	332,290	324,690	656,980	47,210	48,070	95,280
10-14	285,290	279,650	564,940	43,750	44,540	88,290
15-19	243,320	237,920	481,240	28,330	28,840	57,170
20-24	197,850	195,290	393,140	17,940	18,260	36,200
25-29	142,760	149,580	292,340	19,520	19,870	39,390
30-34	109,960	125,830	235,790	20,140	20,510	40,650
35-39	95,970	109,580	205,550	19,200	19,550	38,750
40-44	92,260	98,840	191,100	16,050	16,340	32,390
45-49	78,260	79,080	157,340	12,910	13,140	26,050
50-54	63,180	61,730	124,910	10,070	10,250	20,320
55-59	46,780	45,260	92,040	6,610	6,730	13,340
60-64	33,230	32,280	65,510	5,350	5,450	10,800
65-69	22,300	23,280	45,580	3,460	3,520	6,980
70-74	13,340	13,840	27,180	1,570	1,600	3,170
75	12,460	14,710	27,170	1,900	1,930	3,830
Total	2,186,140	2,196,670	4,382,810	314,760	320,440	635,200

Source: Kantor Sensus & Statistik Tk.I. Sumatra Selatan
Kantor Sensus & Statistik Tk.II. Kab. OKU.

/1 : 1979

/2 : 1977

Table VI-4. ECONOMIC ACTIVE POPULATION (1978)

Sector	Indonesia		South Sumatra		Kab. OKU	
	Person (1,000)	Ratio (%)	Person (1,000)	Ratio (%)	Person (1,000)	Ratio (%)
Agriculture	35,259	66.0	1,127	69.3	209.4	87.0
Mining	44	-	35	2.2	-	-
Manufacturing	3,560	6.7	56	3.4	2.3	0.2
Electircity, Gas & Water	34	-	1	-	0.1	-
Construction	1,098	2.1	31	1.9	1.3	0.1
Trade, Restaurant & Hotels	6,253	11.7	128	7.9	9.7	4.2
Transport, Storage & Communication	1,112	2.1	40	2.5	2.2	0.2
Finance & Insurance	74	0.2	3	0.2	-	-
Community Service	5,157	9.6	121	7.4	14.2	6.2
Others	853	1.6	84	5.2	5.2	2.1
Total	53,444	100.0	1,626	100.0	244.4	100.0

Source: Central Bureau of Statistic, Indonesia
Kantor Sensus & Statistik, Palembang
Kantor Sensus & Statistik, Kab. OKU.

Table VI-5. GROSS DOMESTIC PRODUCT IN 1978

Item	Indonesia Amount ($Rp.10^9$)	Indonesia (%)	South Sumatra Prov. Amount ($Rp.10^9$)	South Sumatra Prov. (%)
Agriculture, Forestry and Fishery	6,781.4	31.1	208.5	24.8
i) Farm food crops	4,221.2	19.4	98.1	11.7
ii) Non farm food crops	748.8	3.4	*	*
iii) Estate crops	338.3	1.6	55.0	6.5
iv) Livesfock	462.5	2.1	21.8	2.6
v) Forestry	657.5	3.0	20.3	2.4
vi) Fishery	353.1	1.6	13.3	1.6
Mining	3,869.2	17.8	199.9	23.8
Manufacturing	2,034.2	9.3	169.3	20.1
Electric, Gas and Water supply	115.8	0.5	2.8	0.6
Construction	1,129.7	5.2	23.1	2.7
Commerce	3,746.6	17.2	117.8	14.0
Transportation and Information	1,022.8	4.7	40.6	4.8
Finance	240.0	1.1	7.9	0.9
Immovable property	488.8	2.2	13.8	1.6
Governmental service	1,678.2	7.7	43.1	5.1
Other service	681.7	3.1	13.5	1.6
Total	21,788.4	100.0	840.3	100.0
Percapita G.D.P. ($Rp.10^3$)	153.9		203.2	

Source: Central Bureau of Statistic, Indonesia, 1978
Dalam Angka, South Sumatra, 1978

Note : All the values shown in this table are in current prices.

* No data is available.

Table VI-6. GROSS REGIONAL PRODUCT BY INDUSTRIAL ACTIVITIES IN REPELITA I TO III IN INDONESIA

Sector	Repelita I/1 (Rp.10^9)	(%)	Repelita II/2 (Rp.10^9)	(%)	Repelita III/3 (Target) (Rp.10^9)	(%)
Agriculture	2,710	40.2	6,781	31.1	12,347	27.2
Mining	831	12.3	3,869	17.8	7,217	15.9
Manufacturing	650	9.6	2,034	9.3	5,719	12.6
Construction	262	3.9	1,130	5.2	2,496	5.5
Trans. & Information	258	3.8	1,023	4.7	2,451	5.4
Others	2,042	30.2	6,951	31.9	15,160	33.4
Total	6,753	100.0	21,788	100.0	45,390	100.0

Source: Repelita I, II and III

/1 : Repelita I (1969/70 - 1973/74)
/2 : Repelita II (1974/75 - 1978/79)
/3 : Repelita III (1979/80 -1983/84)

Note : The figures mentioned in this table are the prices at the end of respective Repelita period.

Table VI-7. TARGET AND ACTUAL PRODUCTION OF FERTILIZERS (Unit: 1,000 tons)

Kind of fertilizer		Repelita I	Repelita II					Repelita III
		1973/74	1974/75	1975/76	1976/77	1977/78	1978/79	1982/83
Urea	Demand forecast		1,104	1,386	1,554	1,794	1,975	
	Target		189	400	820	1,272	2,084	3,340
	Actual	116	209	387	406	990	-	
Ammonium Sulphate	Demand forecast		169	176	187	197	205	
	Target		110	110	110	110	110	150
	Actual	123	129	114	105	93	-	
TSP/1	Demand forecast		376	432	494	549	579	
	Target		-	-	52	167	254	330
	Actual	-	-	-	-	-	-	
DAP/2	Target							80
NPK/3	Target							50

Source: Repelita II
Repelita III

/1 : Triple Super Phosphate

/2 : Double Ammonium Phosphate

/3 : Combination fertilizer of N, P, K - fertilizer

Table VI-8. BALANCE OF TRADE IN INDONESIA (Unit: US$ 10^6)

Year	Including Petroleum and Products			Excluding Petroleum and Products		
	Export	Import	Balance	Export	Import	Balance
1960	840.8	577.7	263.1	620.0	551.9	68.1
1965	707.7	694.7	13.0	435.7	682.1	-246.4
1970	1,108.1	1,001.5	106.6	661.8	986.8	-325.0
1971	1,233.6	1,102.8	130.8	755.7	1,082.4	-326.7
1972	1,777.7	1,561.7	216.0	864.6	1,531.4	-666.8
1973	3,210.8	2,729.1	481.7	1,602.1	2,685.3	-1,083.2
1974	7,426.3	3,841.9	3,584.4	2,214.9	3,658.9	-1,444.0
1975	7,102.5	4,769.8	2,332.7	1,791.7	4,516.3	-2,724.6
1976	8,546.5	5,673.1	2,873.4	2,542.4	5,235.4	-2,693.0
1977	10,852.6	6,230.3	4,622.3	3,554.7	5,498.3	-1,943.6
1978	11,643.2	6,690.4	4,952.8	4,201.6	6,110.7	-1,906.1
1979	15,590.1	7,202.3	8,387.8	6,719.3	6,409.0	310.3

Source: 1) Statistik Indonesia, 1977 - 1978

2) Statistik Perdagangan Luar Negeri, 1979
Biro Pusat Statistik Indonesia

Table VI-9. EXPORT AND IMPORT OF MAJOR COMMODITIES IN INDONESIA (Unit: US$ 10^6)

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Export (FOB)										
Crude Petroleum & Products	446	478	913	1,609	5,211	5,311	6.004	7.298	7.438	8,870
Wood	104	161	229	574	725	500	781	954	995	1,797
Rubber	252	222	189	391	479	358	530	588	717	937
Coffee	69	55	77	78	98	100	238	599	491	614
Tin Ore	54	52	64	93	175	140	165	250	286	404
Palm Oil	35	45	41	70	157	152	136	184	209	204
Others	148	221	265	396	581	542	692	980	1.507	2,764
Total	1,108	1,234	1,778	3,211	7,426	7,103	8,546	10.853	11.643	15.590
Import (CIF)										
Crude Petroleum & Products	15	20	34	44	183	254	438	732	580	797
Machines (for Industrial and commerce)	113	155	236	329	426	528	691	596	686	1,651/1
R i c e	52	20	50	382	374	327	450	678	592	596
Fertilizer	19	29	47	63	227	401	24	27	58	56
Cement	13	17	22	33	68	69	60	53	54	52
Others	790	862	1.173	1,878	2,564	3.191	4.010	4.144	4.720	4.050
Total	1,002	1,103	1,562	2,729	3,842	4,770	5,673	6,230	6,690	7,202
Trade Balance	106	131	216	482	3,584	2,333	2,873	4.623	4,953	8,388

Source: 1) Key Indicators of Developing Member Countries of ADB(Asian Development Bank). October 1979
2) EKSPOR and IMPOR, 1979. Indonesia

/1 : Including Electrical Equipments, Parts, etc.

Table VI-10. EXPORT OF SELECTED COMMODITIES IN INDONESIA

Item	1979	
	Amount (10^3 tons)	Value (US$ 10^6)
Rubber	861	937
Coffee	220	615
Palm Oil	351	204
Tobacco	23	57
Pepper	25	47
Tin	28	404
Tea	54	83
Copra cake	317	41
Wood	15,658	1,797
Natural Gases	8,977	1,293
Fertilizer	233	37
Cement	930/1	31/1
Shrimp/prawn	35	200
Others	1,544	973
Total	32,256	6,719

Source: EXPORT 1979

Note : Excluding Petroleum and Products

/1 : Including art of stones, lime, etc.

Table VI-11. EXPORT OF AGRICULTUREL PRODUCTS IN SOUTH SUMATRA PROVINCE

Commodity	Net Weight (tons)	Value (FOB) (US$ 10^3)
Rubber	16,138	58,278
Coffee	29,262	72,150
Tea	343	474
Pepper	5,603	12,582
Sesame seeds	10	1

Source: EXPORT 1979

Table VI-12. BUDGET AND ITS REALIZATION IN REPELITA II AND III PERIODS (Unit: Rp.10^9)

	Repelita II						Repelita III					
	1974/75	1975/76	1976/77	1977/78	1978/79	Total	1979/80	1980/81	1981/82	1982/83	1983/84	Total
Budget	616	972	1,058	1.196	1,408	5,250	3,488	3.892	4.350	4,778	5,341	21,849
Realization	962	1.398	2.055	2.157	2.455	9,027						
G D P	10.708	12.643	15.467	19.047	23,165	81.030	26.920	30.675	34.955	39.835	45.390	177.775

Source: Bureau of Statistic, Indonesia.
Repelita II and III

Table VI-13. THE RATIO OF BUDGET ALLOCATION IN REPELITA III

		Repelita II (%)	Repelita III (%)	Balance
1.	Agriculture, Irrigation	19.1 (100 %)	14.0 (100 %)	- 5.1
	Food crops	(79.1)	(35.9)	
	Livestock	(3.7)	(6.4)	
	Fishery	(5.0)	(11.5)	
	Estate	(8.5)	(45.2)	
	Forestry	(3.7)	(1.0)	
2.	Industry, Mining & Energy	10.9	19.1	+ 8.2
3.	Transportation, Tourism	15.9	15.4	- 0.5
4.	Commerce, Cooperatives	0.7	0.9	+ 0.2
5.	Manpower, Immigration	1.3	5.7	+ 4.4
6.	Rural Development	17.7	9.8	- 7.9
7.	Religion	0.3	0.7	+ 0.4
8.	Education & Culture	10.0	10.3	+ 0.3
9.	Welfare, Family Planning	3.7	3.8	+ 0.1
10.	Houses, Water Supply	1.9	2.4	+ 0.5
11.	Laws	0.6	0.8	+ 0.2
12.	National Defence	2.4	6.8	+ 4.4
13.	Information	0.5	0.7	+ 0.2
14.	Science, Technology	1.9	2.0	+ 0.1
15.	National Organization	2.4	2.7	+ 0.3
16.	Governmental Capital Expenditure	10.7	1.7	- 9.0
17.	National Resources Circumstances	-	3.2	+ 3.2
	T O T A L	100.0	100.0	

Source: Repelita II and III

Table VI-14. INVESTMENT PROGRAM FOR AGRICULTURE AND IRRIGATION SECTORS BY REPELITA I, II AND III

	Repelita I (%)	Repelita II (%)	Repelita III (10^9 RP.)	Repelita III (%)
Agriculture Sector	26.0	50.4	1,515.8	49.6
Foodcrops	9.4	39.9	544.1	17.8
Estatecrops	7.2	4.3	684.6	22.4
Livestock	3.1	2.5	97.9	3.2
Forestry	3.1	1.9	15.0	0.5
Fishery	3.1	1.9	174.2	5.7
Irrgiation Sector	74.0	49.6	1,513.0	50.4
T O T A L	100.0	100.0	3,058.8	100.0

Source: Repelita I, II and III.

Table VI-15. ANNUAL GROWTH RATE OF AGRICULTURE SECTOR BY REPELITA I, II AND III

	Realized		Target
	Repelita I (1971 - 1977)	Repelita II (1973 - 1977)	Repelita III (1979/80 - 1983/84)
Agriculture Sector	3.75	2.94	4.1
Food crops	3.56	3.01	4.0
Estate crops (Small holder)	1.91	1.16	2.0
(Estate)	5.46	8.65	5.0
Livestock	5.11	5.68	5.5
Forestry	5.24	-0.32	4.8
Fishery	2.95	3.87	4.5
Non-Agricultural Sector	10.74	9.09	7.6
G.D.P.	7.94	6.75	6.5

Source: Repelita I, II and III.

Table VI-16. DISTRIBUTION OF G.D.P IN RESPECTIVE INDUSTRIAL SECTOR IN REPELITA I, II AND III

Sector	Repelita I 1973/74		Repelita II 1978/79		Repelita III 1983/84
	Target (%)	Realized (%)	Target (%)	Realized[1] (%)	Target (%)
Agriculture	40.1	40.2	35.0	31.1	27.2
Mining	9.6	12.3	10.8	17.8	15.9
Manufacturing	9.8	9.6	12.6	9.3	12.6
Construction	3.8	3.9	4.1	5.2	5.5
Trans. and Information	4.1	3.8	4.6	4.7	5.4
Others	32.6	30.2	32.9	31.9	33.4
G.D.P.	100.0	100.0	100.0	100.0	100.0

Source: Repelita I, II and III.
Annual Economy Report - Indonesia - Asian Economy Institute, 1979.

/1 : 1978 Fiscal Year.

Table VI-17. PRESENT GENERAL CONDITION IN THE PROJECT AREA (1979)

Item	Martapura	Buay Madang	Belitang	Cempaka	Bahuga	Total
Total Population	52,940	138,930	105,000	87,350	25,540	409,760
Total household	10,600	26,020	15,930	14,980	4,600	72,130
Average number per family	4.99	5.34	6.59	5.83	5.55	5.68
Farm household	8,000	24,710	12,420	14,720	4,350	64,200
Total area	55,700	113,340	41,490	110,570	39,410	360,510
Paddy field (sawah) (ha)	2,090	15,510	9,000	14,460	1,470	42,530
Technical (ha)	-	1,500	2,470	550	-	4,520
½ Technical (ha)	-	-	1,130	520	-	1,650
Rainfed (ha)	2,090	14,010	5,400	13,390	1,470	36,360
Upland (ha)	1,840	7,150	4,050	2,040	3,200	18,280
No. of Village	23	61	51	38	14	187
No. of P3A	-	5	1	-	-	6
Member	-	105	180	-	-	285
No. of farmers group	35	127	212	25	9	408
Member	700	2,510	4,120	NA	NA	
No. of BUUD/KUD	-	7	5	1	1	14
Member	-	4,441	1,527	784	-	6,752
WKPP WUD	9	24	19	7	6	65
Total number of small rice mill	32	51	48	39	14	184
KIOSK	2	8	9	3	2	24
Unit BRI	1	5	5	2	-	13

Source: Each Kecamatan office, 1980.
Kabupaten OKU, 1980.

Table VI-18. POPULATION IN EACH KECAMATAN

Kecamatan	1971	1972	1973	1974	1975	1976	1977	1978	1979	Average Annual Growth rate
Martapura	34,220	34,010	38,080	38,580	41,890	45,340	47,740	48,910	52,940	5.6
Buay Madang	112,920	115,370	115,510	115,930	130,150	132,490	135,260	139,670	138,930	2.7
Belitang	74,990	76,200	76,740	81,190	83,050	90,540	93,660	97,670	105,000	4.3
Cempaka	71,980	73,060	73,640	75,290	76,890	77,020	79,470	83,290	87,350	2.4
		*	*	*	*					
Bahuga	17,450	18,330	19,240	20,200	21,210	22,880	23,020	24,330	25,540	5.2
Sub-Total	311,560	316,960	323,210	331,190	353,190	368,270	377,150	393,870	409,760	3.4%
Kab. OKU	541,960	549,720	560,220	572,230	599,290	621,720	635,200	682,780	701,530	3.3

Source: - Kantor Sensus & Statistik Tingkat II. Kab. OKU.
- Data from Kecamatan offices, 1980.
- Lampung Dalam Angka, 1977.
- Laporan Dinas Pertanian 1979. Kab. North Lampung.

* : Estimated figures because of no data.

Table VI-19. POPULATION, FAMILY AND POPULATION DENSITY INCREASE IN EACH KECAMATAN

Kecamatan	1971			1979		
	Population	Family	Density (Person/Km^2)	Population	Family	Density (Person/Km^2)
Martapura	34,220	7,600	68	52,940	10,600	106
Buay Madang	112,920	22,580	106	138,930	26,020	131
Belitang	74,990	17,850	94	105,000	15,930	131
Cempaka	71,980	12,850	81	87,350	14,980	97
Bahuga	17,470	3,180	5	25,540	4,600	7
Total	312,560	64,060	46	409,760	72,130	60

Source: - Kantor Sensus & Statistik Tingkat II. Kab. OKU.
- Data from Kecamatan office, 1980.
- Lampung Dalam Angka, 1977.
- Laporan Dinas Pertanian 1979, Kab. North Lampung.

Table VI-20. NUMBER OF SCHOOL CHILDREN AND ILLITERACY IN KAB. OKU

Year	Population	Age - group (7 - 12 year old)	Elementary School	Illiteracy (7 - 12 year old)	(%)/1
1975	599,290	95,890	69,820	26,070	27.2
1976	621,720	99,470	77,260	22,210	22.3
1977	635,200	101,630	80,030	21,600	21.2
1978	682,780	109,250	96,050	13,200	12.1
1979	701,530	112,940	102,490	10,450	9.3

Source: Education office in Kabupaten OKU, 1980
Kecamatan Bahuga office, 1980

1 : Percentage - to the total children in age group of 7 to 12 years old.

Table VI-21. NUMBER OF PUPILS IN GRADE AND PERCENTAGE OF SCHOOL ATTENDANCE IN 1978

Unit: 1,000

	Age-group (7 - 12)	Elementary School (No.)	(%)	Junior High School (No.)	Senior High School (No.)
Indonesia	22,953.7	19,232.9	83.8	2,674.0	1,290.0
South Sumatra Province	797.6/1	576.7	72.3	80.9	41.9
Kabupaten OKU/2	112.9	102.5	90.7	10.5	2.5
Kec. Concerned/2	63.0/1	49.4	78.4	5.3	0.9

Note: Percent means the ratio to the total children of age-group during 7 - 12 years ol .

/1 : Estimation from population statistics by age-group

/2 : in 1979

Source: Statistic Indonesia 1977 - 1978

Kantor Sensus & Statistik Tingkat I Sumateta Selatan

Education Office in Kabupaten OKU

Kecamatan Bahug Office

Table VI-22 NUMBER OF SCHOOLS, TEACHERS AND PUPILS IN 1978

(Unit: 1,000)

	Elementary School				Junior High School				Senior High School			
	School	Teacher	Pupil	Pupil/ Teacher	School	Teacher	Pupil	Pupil/ Teacher	School	Teacher	Pupil	Pupil/ Teacher
Indonesia	92.2	592.5	19,232.9	33	9.5	149.4	2,674.0	18	3.5	85.9	1,290.0	15
South Sumatra	2.4	16.7	576.7	35	0.32	4.3	80.9	19	0.15	2.8	41.9	15
Kab. OKU /1	0.41	2.12	102.5	48	0.05	0.57	10.5	18	0.02	0.18	2.50	14
Kecamatan /2 Concerned	0.22	0.99	49.4	50	0.025	0.28	5.3	19	0.01	0.09	0.88	10

Source: Statistik Indonesia 1977 - 78

Kantor Sensus & Statistik Tingkat I Sumatera Selatan

Education Office in Kabupaten OKU

Kecamatan Bahuga Office

/1 : Statistic in 1979

/2 : Total of Kecamatan Martapura, Buay Madang, Belitang, Cempaka and Bahuga and Statistic in 1979

Table VI-23 NUMBER OF SCHOOLS, TEACHERS AND PUPILS IN KAB. OKU AND KECAMATAN CONCERNED WITH THE PROJECT AREA IN 1979

Kabupaten OKU & Kecamatans	Elementary Schools				Junior High Schools				Senior High Schools			
	Schools	Teachers	Pupils	Pupils/ Teachers	Schools	Teachers	Pupils	Pupils/ Teachers	Schools	Teachers	Pupils	Pupils/ Teachers
Martapura	31	176	8,060	46	2	22	638	29	-	-	-	-
Buay Madang	74	266	11,170	42	10	94	1,231	13	2	17	102	6
Belitang	46	238	13,628	57	10	141	2,903	21	4	77	782	10
Cempaka	40	234	11,827	51	2	13	380	29	-	-	-	-
Bahuga	24	78	4,693	60	1	7	160	23	-	-	-	-
Sub-Total	215	992	49,378	50	25	277	5,312	19	6	94	884	9
Kab. O.K.U.	412	2,120	102,491	48	54	573	10,506	18	22	184	2,500	14

Souce: Education Office in Kabupaten OKU, 1980

Kecamatan Bahuga Office, 1980

Table VI-24 HEALTH FACILITIES

Kecamatan	Hospital			Puskesmas /1	No. of			B.K.I.A. /2			Clinic		
	Government	Army	Particular		Doctor	Nurse	Midwife	Government	Army	Particular	Government	Army	Particular
Martapura	-	-	-	1	1	7	5	1	1	-	2	2	-
Buay Madang	-	-	-	2	2	15	5	4	-	-	7	-	3
Belitang	-	-	1	3	3	19	5	3	-	-	6	-	3
Cempaka	-	-	-	2	2	8	4	1	-	-	5	-	-
Bahuga	-	-	-	1	1	6	-	1	-	-	-	-	-
Sub-Total	-	-	1	9	9	55	19	10	1	-	20	2	6
Kab. OKU	1	1	2	18	23	125	36	26	2	3	59	4	8

Source: Government Service of Health in Kabupaten OKU, 1980
Kecamatan Bahuga Office, 1980

/1 : Public Health Center

/2 : Clinic for Female and Baby

Note : Puskesmas including BKIA yard, building, medical equipment, etc. and puskesmas is bigger than BKIA, in general.
BKIA covers only female and baby for diagnosis and medical treatment.

Table VI-25 RATIO OF POPULATION TO MAJOR HEALTH FACILITIES, ETC.

Kecamatans	Population (1979)	Hospital	Puskesmas	Total	Population/major health facility	Doctor	Population/ Doctor
Martapura	52,940	-	1	1	52,940	1	52,940
Buay Madang	138,930	-	2	2	69,465	2	69,465
Belitang	105,000	1	3	4	26,250	3	35,000
Cempaka	87,350	-	2	2	43,670	2	43,675
Bahuga	25,540	-	1	1	25,540	1	25,540
Sub-Total	409,760	1	9	10	40,980	9	45,530
Kab. OKU	701,530	2	18	20	35,080	23	30,500

Source: Government Service of Health in Kabupaten OKU, 1980

Kecamatan Bahuga Office, 1980

Table VI-26 PROCUREMENT AND DISTRIBUTION OF RICE IN SOUTH SUMATRA

(1,000 tons)

	1970/71	1971/72	1972/73	1973/74	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80
Original Stock	18.6	29.8	31.3	5.5	23.6	35.2	13.1	27.6	37.1	36.1
Procurement										
a. Internal	-	-	-	0.1	-	0.2	-	0.5	0.6	10.0
b. Import	116.0	91.6	89.3	143.1	91.2	43.4	140.5	163.4	119.2	191.4
Distribution										
a. South Sumatra	95.7	86.3	108.9	117.2	79.6	65.0	124.7	149.3	118.8	182.9
b. Outside	9.0	3.9	6.2	7.9	-	0.7	1.3	5.1	2.0	9.1
Remaining Stock	29.8	31.3	5.5	23.6	35.2	13.1	27.6	37.1	36.1	45.5

Source: DOLOG Office in Palembang

Table VI-27 NUMBER OF WAREHOUSE BY SIZE IN SOUTH SUMATRA

Capacity (tons)	Privates	DOLOG	Total
Under 1,000	3		3
1,000 - 2,000	7	1	8
2,000 - 3,000	5		5
3,000 - 4,000	4	10	14
4,000 - 5,000	4		4
5,000 - 6,000	2		2
6,000 or more	2		2
Total number	27	11	38
Total capacity	81,400(tons)	36,000(tons)	117,400(tons)
(%)	(69.3)	(30.7)	(100.0)

Source: DOLOG Office in Palembang

Table VI-28 FINANCIAL PRICES (FARM GATE PRICES IN THE PROJECT AREA)

Item	Unit Price (RP./kg, lit. or head)	Remarks
Rice	175	
Paddy	100	Dry paddy
Cassava	25	
Peanut	430	
Soybean	300	
Maize	150	
Coffee	800	
Rubber	250	
Seed or (Paddy)	150	
Seedling (Maize)	200	
(Peanut)	500	
(Soybean)	380	
(Cassava)	1	
Fertilizer (Urea)	70	
(TSP)	70	
Agro-chemical		
(Diazinon)	1,230	
(Zink-phosphate)	2,500	
Liverstock		
Cattle	250,000	1 head
Buffalo	400,000	"
Pig	40,000	"
Goat	20,000	"
Sheep	25,000	"
Chicken	1,400	"
Duck	1,500	"
Egg (Chicken)	50	1 piece
(Duck)	60	"
Agro-equipment		
Plow	5,000	
Sprayer	12,000	
Hoe	3,000	
Sickle	500	

(to be continued)

Item	Unit Price (RP./kg, lit. or head)	Remarks
Labor		
Land Preparation	1,200	
Transplanting	700	
Weeding	500	
Spraying	700	
Harvesting	500	
Milling Charge	7%	

Reference data:
1) Farm economy survey together with Desa Survey in the project area, 1980
2) Local market price in Martapura, Kota Martapura Office, 1980
3) Kabupaten OKU Agricultural Office, 1979
4) Market price of rice in Palembang

Table VI-29 DEVELOPMENT OF AGRICULTURAL SUPPORT SYSTEM IN SOUTH SUMATRA PROVINCE

	1975	1976	1977	1978	1979	1980
South Sumatra Province						
Village	1,995	1,995	1,995	1,955	1,995	1,995
Village Unit	-	123	251	547	547	547
BUUD/KUD	-	42	89	111	115	115
KIOSK	-	104	104	149	196	196
Village Unit BRI	16	38	51	68	69	71
Subject Matter Specialist	-	8	11	13	14	14
Extension Supervisor	-	-	-	27	32	62
Field Extension Worker	60	136	192	245	369	362
Rular Extension Center	-	-	-	21	22	22
OKU District						
Village	344	344	344	344	344	344
Village Unit	-	28	38	107	107	107
BUUD/KUD	-	10	14	17	19	19
KIOSK	-	28	28	23	24	24
Village Unit BRI	5	10	13	18	18	19
Subject Matter Specialist	-	-	-	2	2	2
Extension Supervisor	-	-	-	3	6	13
Field Extension Worker	12	17	29	44	75	76
Rural Extension Center	-	-	-	4	4	4

Source: Provincial Agricultural Extension Service, Palembang, 1980

Table VI-30 PRESENT CONDITION OF AGRICULTURAL INSTITUTION IN THE PROJECT AREA

	Belitang	Buay Madang	Cempaka	Martapura	Bahuga	Total
Farm Household	12,420	24,710	14,720	8,000	4,350	64,200
Total Paddy Field	9,000	15,510	14,460	2,090	1,470	42,530
Village	51	61	38	23	14	187
Village Unit	19	24	7	9	6	65
BUUD/KUD	5	7	1	-	1	14
Rural Extension Center (BPP Por REC)	1	1	1	-	-	3
Extension Specialist (PPS)	1	-	-	-	-	1
Extension Supervisor (PPM)	1	1	1	-	-	3
Field Extension Worker (PPL)	14	14	2	4	3	37
Kontak Tani	226	256	80	16	3	581
Demo. Farm	4	5	5	-	-	14
Motor Cycle for Extension Activities	4	4	3	1	1	13

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

Table VI-31 STANDARD AMOUNT OF BIMAS PACKAGE CREDIT (PER HA) IN SOUTH SUMATRA 1980

		UREA	T S P	Z.A	Insecti-cide	Rodenti-cide	Seed	Sprayer	Additional Expenses	Total
Paddy in Wet Field										
A	Amount (kg)	150	75	-	2(ℓ)	100(g)	-	-	-	-
	Value (Rp)	10,500	5,250	-	2,460	400	5,000	2,000	10,000	35,610
B	Amount (kg)	75	50	-	2(ℓ)	100(g)	-	-	-	-
	Value (Rp)	5,250	3,500	-	2,460	400	-	2,000	10,000	23,610
C	Amount (kg)	250	75	-	2(ℓ)	100(g)	-	-	-	-
	Value (Rp)	17,500	5,250	-	2,460	400	5,000	2,000	10,000	42,610
D	Amount (kg)	97	75	119	2(ℓ)	100(g)	-	-	-	-
	Value (Rp)	6,790	5,250	7,735	2,460	400	5,000	2,000	10,000	39,635
E	Amount (kg)	48	50	60	2(ℓ)	100(g)	-	-	-	-
	Value (Rp)	3,360	3,500	3,900	2,460	400	-	2,000	10,000	25,620
F	Amount (kg)	170	75	185	2(ℓ)	100(g)	-	-	-	-
	Value (Rp)	11,200	5,250	12,025	2,460	400	5,000	2,000	10,000	48,335
G	Amount (kg)	150	75	-	-	100(g)	-	-	-	-
	Value (Rp)	10,500	5,250	-	5,000	400	5,000	1,000	10,000	37,150
H	Amount (kg)	75	50	-	-	100(g)	-	-	-	-
	Value (Rp)	5,250	3,500	-	5,000	400	-	1,000	10,000	25,150
I	Amount (kg)	250	75	-	-	100(g)	-	-	-	-
	Value (Rp)	17,500	5,250	-	6,000	400	5,000	1,000	10,000	45,150

(to be continued)

		UREA	T S P	Z.A	Insecti-cide	Rodenti-cide	Seed	Sprayer	Additional Expenses	Total
J	Amount (kg)	97	75	119	-	100(g)	-	-	-	-
	Value (Rp)	6.790	5.250	7.735	5.000	400	5,000	1.000	10.000	41.175
K	Amount (kg)	48	50	60	-	100(g)	-	-	-	-
	Value (Rp)	3.360	3.500	3.900	5.000	400	-	1.000	10.000	27.160
L	Amount (kg)	160	75	185	-	100(g)	-	-	-	-
	Value (Rp)	11,200	5.250	12.025	6.000	400	5,000	1.000	10.000	50.875
M	Amount (kg)	135	-	75*	2(ℓ)	100(g)	-	-	-	-
	Value (Rp)	9,450	-	6.750	2.460	400	5.000	1,000	10,000	35,060
N	Amount (kg)	67.5	-	50*	2(ℓ)	100(g)	-	-	-	-
	Value (Rp)	4.725	-	4,500	2,460	400	-	1,000	10.000	23.085
O	Amount (kg)	220	-	75*	2(ℓ)	100(g)	-	-	-	-
	Value (Rp)	15,400	-	6,750	2,460	400	5,000	1,000	10,000	41,010
Paddy in Swamp Field										
A	Amount (kg)	75	50	-	3(ℓ)	200(g)	-	-	-	-
	Value (Rp)	5.250	3,500	-	3.690	800	5,000	2,000	10,000	30.240
B	Amount (kg)	-	-	-	3(ℓ)	200(g)	-	-	-	-
	Value (Rp)	-	-	-	3,690	800	-	2,000	10,000	16.490
Paddy in Tidal Irri Field										
A	Amount (kg)	50	35	-	3(ℓ)	200(g)	-	-	-	-
	Value (Rp)	3,500	2.450	-	3,690	800	5,000	2,000	10,000	27,440
B	Amount (kg)	-	-	-	3(ℓ)	200(g)	-	-	-	-
	Value (Rp)	-	-	-	3,690	800	-	2,000	10,000	16,490

(to be continued)

		UREA	T S P	Z.A	Insecti-cide	Rodenti-cide	Seed	Sprayer	Additional Expenses	Total
Paddy in Upland Field										
Alternative I	Amount (kg)	100	75	100**	2(ℓ)	100(g)	-	-	-	-
	Value (Rp)	7,000	5.250	7,000	2,460	400	-	2,000	10,000	34,110
" II	Amount (kg)	85	100**	75*	2(ℓ)	100(g)	-	-	-	-
	Value (Rp)	5,950	7,000	6.750	2,460	400	-	2,000	10,000	34,560
" III	Amount (kg)	150	75	-	2(ℓ)	100(g)	-	-	-	-
	Value (Rp)	10,500	3,250	-	2,460	400	-	2,000	10,000	30,610
" IV	Amount (kg)	135	-	75*	2(ℓ)	100(g)	-	-	-	-
	Value (Rp)	9,450	-	6,750	2,460	400	-	2,000	10,000	31,060
					(Pesticide)					
Maize	Amount (kg)	250	100	-	500(g)	-	-	-	-	-
	Value (Rp)	17,500	7.000	-	615	-	3,250	-	4.000	32,365
					(Fungicide)					
Soybean	Amount (kg)	75	100	-	4(ℓ)	-	-	-	-	-
	Value (Rp)	5,250	7,000	-	4,920	-	15,000	2,000	4,000	38.170
Peanuts	Amount (kg)	100	100	-	2(ℓ)	-	-	-	-	-
	Value (Rp)	7,000	7,000	-	2,460	-	35,000	1,000	4,000	56,460
Long Kidney	Amount (kg)	50	50	-	2(ℓ)	-	-	-	-	-
Beans	Value (Rp)	3.500	3,500	-	2,460	-	8.000	1,000	4,000	22.460
Sorghum	Amount (kg)	150	100	-	1(ℓ)	-	-	-	-	-
	Value (Rp)	10.500	7,000	-	1.230	-	2.000	500	4.000	25.230
Cassava	Amount (kg)	200	75	-	-	500(g)	-	-	-	-
	Value (Rp)	14.000	5.250	-	-	2.000	7.000	-	4.000	32,250
Sweet Potato	Amount (kg)	150	50	-	-	-	-	-	-	-
	Value (Rp)	10.500	3.500	-	-	-	5.000	-	4.000	23.000

Source: Provincial Agricultural Office, Palembang, 1980

Note : A, B, C ... means kinds of BIMAS Package Credit, *: DAP, **: kcal/K_2O

Table VI-32 BIMAS PACKAGE CREDIT PER HA IN THE BELITANG AREA

		Fertilizer			Agro-Chemicals					
		URES	TSP	DAP	Insecti-cide	Rodenti-cide	Seed	Sprayer	Other Expenses	Total
Paddy in Sawah										
New BIMAS	Amount (kg)	175	75	-	2(ℓ)	100(g)	-	-	-	-
	Value (Rp.)	12,250	5,250	-	2,460	230	-	2,000	10,000	32,190
Common BIMAS	Amount (kg)	75	50	-	2(ℓ)	100(g)	-	-	-	-
	Value (Rp.)	5,250	3,500	-	2,460	230	-	2,000	10,000	23,440
INMAS	Amount (kg)	50	12.5	-	1(ℓ)	50(g)	-	-	-	-
	Value (Rp.)	3,500	875	-	1,230	115	-	-	-	5,720
Upland Crops										
Peanut	Amount (kg)	100	100	-	2(ℓ)	-	100	-	-	-
	Value (Rp.)	7,000	7,000	-	2,460	-	29,040	1,000	4,000	50,500
Soybean	Amount (kg)	75	100	-	4(ℓ)	-	50	-	-	-
	Value (Rp.)	5,250	7,000	-	4,980	-	12,330	2,000	4,000	35,500

Source: Kec. Belitang Agricultural Extension Office, 1980

Table VI-33 AREA UNDER BIMAS PROGRAM IN KABUPATEN OKU

Cropping Season	BIMAS Program Area						Kab. Total Paddy Area (Ha)	% of Total BIMAS area
	Rainy Season Paddy (Ha)	Dry Season Paddy (Ha)	Swamp Paddy (Ha)	Sub-Total	Upland Paddy (Ha)	Total Paddy (Ha)		
1974		2,330		2,330		2,330	75.310	8.5
1974/75	4,070			4,070		4,070		
1975		2,900	2,180	5,080		5,080	76,530	18.5
1975/76	8,030			8,030	1.070	9.100		
1976		1,200	5,030	6,230	430	6.660	75.340	17.1
1976/77	5,670			5,670	530	6,200		
1977		190		190		190	73,240	9.9
1977/78	6.620			6,620	420	7,040		
1978		1,550	2,210	3,760	550	4,310	73.740	15.0
1978/79	5,950			5,950	830	6,780		
Average	6.070	1,630	1,880	9,580	770	10,350	74,830	13.8

Source Kabupaten OKU Agricultural Office, 1979

Table VI-34 CREDIT AND REPAYMENT OF BIMAS PROGRAM IN KABUPATEN OKU

(Unit: 1,000 Rp.)

Cropping Season	Credit	Repayment	Outstanding	Repayment percent (%)
1974	24,527	20,065	4,462	81.8
1974/75	69,024	52,938	16,086	76.7
1975	76,543	56,045	20,498	73.2
1975/76	121,971	86,828	35,143	71.2
1976	92,069	42,006	50,063	45.6
1976/77	87,568	58,963	28,605	67.3
1977	3,302	2,750	552	83.3
1977/78	116,982	71,082	45,900	60.8
1978	92,281	35,928	56,353	38.9
1978/79	174,305	68,421	105,884	39.3
Total or Average	858,572	495,026	363,546	57.7

Source: BRI (Bank Rakyat Indonesia) Office in Kabupaten OKU, 1979

Table VI-35 AREA UNDER BIMAS AND INMAS PROGRAMS IN EACH KECAMATAN

(Unit: ha)

Kecamatans	BIMAS		INMAS		TOTAL	
	Rainy Season Paddy (1978/79)	Dry Season Paddy (1979)	Rainy Season Paddy (1978/79)	Dry Season Paddy (1979)	Rainy Season Paddy (1978/79)	Dry Season Paddy (1979)
Martapura	320	0	110	0	430	0
Buay Madang	1,200	598	300	121	1,500	719
Belitang	718	364	1,396	180	2,114	544
Cempaka	231	0	117	0	348	0
Bahuga	493	0	367	0	860	0
Sub-Total	2,962	962	2,290	301	5,252	1,263
Kab. OKU	5,950					

Source: Kecamatan Offices. 1980
Kab. OKU Agricultural Office, 1979

Table VI-36 AREA UNDER BIMAS AND INMAS PROGRAMS IN THE PROJECT AREA

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

Source: Kecamatan Offices, 1980

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

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

/2 : Rainy season Paddy

/3 : Dry season Paddy

Note : According to the farm economy survey, certain rainfed area are included under BIMAS/INMAS Programs.

Table VI-37 PRESENT CONDITION AND ACTIVITIES OF BUUD/KUD

	Belitang	Buay Madang	Cempaka	Martapura	Bahuga	Total
Farm Household	12,420	24,710	14,720	8,000	4,350	64,200
No. of Village	51	61	38	23	14	187
No. of Village Unit	19	24	7	9	6	65
No. of BUUD/KUD	5	7	1	-	1	14
Members	1,527	4,441	361	NA	NA	6,329
KUD Members/Farm H.H.(%)	12.3	18.0	2.5	-	-	9.9
Fertilizer Distribution by BUUD/KUD (t)	112	279	80	-	-	471
By Non BUUD/KUD	490	549	2,406	-	-	3,445
Proportion of KUD (%)	18.6	33.7	3.2	-	-	12.0
Pesticide Distribution by BUUD/KUD (kg/lit.)	1,705	3,856	3,281	-	-	8,842
By Non BUUD/KUD (kg/lit.)	6,532	7,318	3,511	2,648	-	20,009
Proportion of KUD (%)	20.7	34.5	48.3	-	-	30.6

Source: Each Kecamatan Office, 1980

Table VI-38 MAIN EQUIPMENT OWNED BY BUUD/KUD

	Belitang	Buay Madang	Cempaka	Martapura	Bahuga	Total
Warehouse	3	4	*	*	*	7
Storing Capacity (t)	1,000	4,000	*	*	*	5,000
Rice Mill Unit	3	7	1	-	-	11
Milling Capacity (t/year)	1,200	10,800	480	-	-	12,480
Hand Sprayer	-	12	2	-	-	14
Mist Blower	4	8	-	-	-	12

Source: Each Kecamatan Office, 1980

* : No available data

Table VI-39 SUBSIDIES TO GENERAL TRANSMIGRATION

	Per/Household/Month
1. Food Stuff for 12 months	
Rice	50 kg/household/month
Salt fish	5 "
Soap	1 "
Food oil	3 lit./household/month
Kelosin	8 "
Salt	2 kg/household/month
Sugar	3 "
2. Clothes - Transmigrant received one set of uniform (1 shirt + 1 trousers) from the Transmigration Office of original place	
3. Cooking utensils such as cooling pot, frying pan, kettle, etc.	
4. House	33 m^2 of floor space
5. Farm land	2 ha /1
6. Agricultural equipment such as broad hoe, chopping knife, crowbar, etc.	
7. Agricultural input materials	
Paddy seed	25 kg
Pertilizer (Urea)	70 kg
(DAP)	75 kg
Insecticide	2 lit.
Rodenticide	100 gram as zink-phosphate
Rp.5,000 for other seeds to be purchased (Coconuts, rubber, coffee, clove, etc.)	
Agricultural input materials are provided through Agricultural Extension Offices concerned with the project area since 1979.	

Source: Transmigration Office in South Sumatra Province, 1980

/1 : 1.0 ha of paddy field, 0.75 ha of upland field and 0.25 ha of home yard.

Table VI-40 TRANSMIGRANTS IN SOUTH SUMATRA BY ORIGIN

(No. of Household, 1969/70 - 1978/79)

Origin	South Sumatra	%	OKU	%	The Project Area					Total
					Belitang	Buay Madang	Cempaka	Martapura	Bahuga	
West Java	11,404	20.9	802	12.7	200	-	-	602		802
Central Java	15,978	29.3	2,468	38.9	1,068	430	170	800		2,468
Yogyakarta	9.087	16.7	829	13.1	292	70	77	390		829
East Java	15,407	28.3	2,101	33.1	1,566	-	75	460		2,101
Bali	1,611	3.0	138	2.2	38	-	-	100		138
D.K.I. Jakarta	348	0.6	-	-	-	-	-	-		-
Others	615	1.2	-	-	-	-	-	-		-
Total	54,450	100.0	6,338	100.0	3,164	500	322	2,352		6.338

Source: Provincial Department of Transmigration, Palembang, 1980

Table VI-41 PROGRESS OF TRANSMIGRATION IN KAB. OKU

Year	Main Location	No. of Family	No. of Persons
1950	Belitang	7	13
1951	Belitang	108	341
1952	Belitang	216	1,080
1953	Belitang	4,644	21,071
1954	Belitang, B. Madang	1,223	5,150
1955	Belitang, B. Madang	2,317	10,378
1956	Buay Madang	763	3,342
1957	Bahuga	804	2,170
1958	Buay Madang	871	4,419
1959	Bahuga	846	4,169
1961	Belitang	627	3,409
1963	Belitang	419	1,863
1964	Belitang	343	1,718
1965	Belitang	1,609	7,476
1967	Belitang	201	862
1968	Belitang	128	906
1969	Belitang	38	187
1970	Belitang, B. Madang	127	456
1971	Belitang	673	2,535
1972	Belitang	936	3,724
1973	Belitang	1,122	4,715
1974	Buay Madang	822	4,057
1976	Baturaja - Martapura	406	1,724
1977	Baturaja - Martapura	244	1,109
1978	Baturaja - Martapura	650	2,828
Total		20,144	89,702

Source: Transmigration Office in Kab. OKU, 1978

Table VI-42 PROGRAM OF TRANSMIGRATION IN REPELITA III

	Unit	1979/80	1980/81	1981/82	1982/83	1983/84	Total
Family	1,000	50	75	100	125	150	500
No. of Settle Land		25	38	50	62	75	250
(Coastal or Swamp Area)		(12)	(8)	(8)	(8)	(8)	(44)
(Upland)		(13)	(30)	(42)	(54)	(67)	(206)
Access Road	km	260	600	840	1,080	1,340	4,120
Village Road	km	1,000	1,500	2,000	2,480	3,000	10,000
Forest Road	km	1,500	2,280	3,000	3,720	4,500	15,000
Farm Raod	km	1,500	2,280	3,000	3,720	4,500	15,000
Total Road	km	4,260	6,680	8,840	11,000	13,340	44,120
Farm Land + Home Yard	Ha	62,500	93,750	125,000	156,250	187,500	625,000

Source: Repelita III

Table VI-43 PROGRAM OF TRANSMIGRATION IN REPELITA III IN KAB. OKU AND SOUTH SUMATRA PROVINCE

Location		1979/80		1980/81		1981/82		1982/83		1983/84		Total
		NPS	PS	NPS	PS	NPS	PS	NPS	PS	NPS	PS	
South Sumatra Province (1)		7,000	8,500	10,000	8,000	11,800	10,000	10,300	10,300	13,500	0	89,400
Kab. OKU	Baturaja	1,000										1,000
	Martapura					300						300
	Sungai Liat											0
	Tanjung							300				300
	Pandang			2,000								2,000
	Kelingi II					1,000		1,000		2,000		4,000
	Sub-Total (2)	1,000	0	2,000	0	1,300	0	1,300	0	2,000		7,600
	(2)/(1) (%)		6.5		11.1		6.0		6.3		14.8	8.5

Source: 1) Transmigration Office in South Sumatra Province
2) Transmigration Office in Kab. OKU

Note : NPS: Upland area
PS : Lowland area
Unit: Family

Table VI-44 PUBLIC FACILITIES TO BE PROVIDED BY GOVERNMENT FOR ONE UNIT/1 TRANSMIGRATION AREA

Facilities	No.	Building (m^2)	Yard (Ha)
Office	1	60	0.25
Village house	500	30 - 34	0.25
Store house			
Official residence	1	42	0.25
Post Office			
Clinic	1	60	0.25
Heligious building	2	36	0.25 - 0.50
School	1 (S.D)*	540	0.50 - 1.00
Market			
Cemetary	1		2.00
House of official	6	42	0.25

Source: Transmigration Office in South Sumatra Province

/1 : More than 1,000 ha or 500 family

* : Elementary school

Table VI-45 AMOUNT OF LOAN BY TYPE OF AREA

TYPE OF WORK	TYPE OF AREA (Rp./ha)			
	Upland	Shrubs/Grass	Light Forest	Heavy Forest
a. Construction work				
Land clearing	30,000	60,000	130,000	200,000
Land leveling	60,000	60,000	60,000	60,000
Land reclamation	50,000	50,000	50,000	50,000
Farm road	30,000	30,000	30,000	30,000
Sub - Total	170,000	200,000	270,000	340,000
b. Certificate issuance				
Land certificate	17,500	17,500	17,500	17,500
Mortgage document	3,450	3,600	3,950	4,300
Sub - Total	20,950	21,100	21,450	21,800
c. Grand Total	190,950	211,100	291,450	361,800
d. Loan Condition				
Interest	10.5%	10.5%	10.5%	10.5%
Grace period (years)	2	2	2	2
Repayment period (years)	6	7	10	14

Source: Agricultural Department of South Sumatra Province, 1980

Table VI-46 LAND RECLAMATION PROGRAM IN THE PROVINCE DURING REPELITA III (1979/80 - 1983/84)

(Unit: ha)

Kabupaten	Kecamatan	1979/80	1980/81	1981/82	1982/83	1983/84
M.U.R.A.	Kota L.Linggau	777	149		350	
	B.K.L.U.		200			
	Muara Beliti		150			
	Tugumulyo			1,270		
	L. Linggau			290		
	Sidodadi				1,200	
	Teravas					1,560
O.K.U.	Banding Agung	43				450
	Pengendonan		250			
	(Belitang)		605	1,500		
	Muara Dua			860		
	Cempaka				1,600	
LAHAT	Tanjung Sakti	121				
	L a h a t	101				
	Tebing Tinggi		107		300	
	Kota Agung		150	350		
	Pendopo				300	
PALEMBANG	Ilir Barat I	400		300		
	Ilir Timur		239	300		
LIOT	Gelumbang	161				
MUARA ENIM	Pendopo		250			
	Prabumulih			250		
	Tanjung Agung				300	
	Gunung Megang					225
	Semendo					165
M.U.B.A.	Talang Kelapa		100	250		
	Sungai Lilin				391	
	S e k a y u					350
BELITUNG	Membalong			330		
BANGKA	Toboali			300		
	Payung				300	
O.K.I.	Kayu Agung					750
South Sumatra	Total	1,603	2,200	6,000	4,741	3,500

Source: Agricultural Department of South Sumatra Province, 1980

Table VI-47 PRESENT TYPICAL FARM BUDGET

Cropping Pattern	Type I	Type II	Type III (Pisang area)
Family size (No.)	5.1	5.4	6.4
Farm size (ha)	1.0	1.75	1.75
1) Farm Income (Rp.)			
Crop income	257,870	292,030	189,760
Rainy season paddy	225,000	170,500	25,000
Dry season paddy	2,500	5,500	-
Upland paddy	5,500	35,200	25,300
Polovijo and upland crops.	24,870	65,830	111,960
Perennial crops.	-	15,000	27,500
Livestock income	18,820	20,250	19,050
Miscellaneous income	30,000	35,000	50,000
Total	306,690	347,280	258,810
2) Farm Outgo (Rp.)			
Crop Production cost	23,700	39,800	28,450
Rainy season paddy	19,870	15,270	2,180
Dry season paddy	220	510	-
Upland paddy	730	4,670	3,360
Polovijo and upland crops	2,880	7,430	10,630
Perennial crops.	-	11,920	12,280
Livestock cost	1,880	2,030	1,910
Tax, etc.	6,700	1,500	1,500
Living expenses	272,510	301,470	226,240
Total	304,790	344,800	258,100
3) Balance or capacity to pay (Rp.)	1,900 (US$3.0)	2,480 (US$4.0)	710 (US$1.1)

Note: 1) Conversion rate; US$1=Rp.625

2) Application area

Type I ; 1.0 ha farm holding area
Type II ; 1.5 ha farm holding area
Pisang area; 1.5 ha farm holding area

3) Livestock income is estimated from livestock production of Kecamatan livestock office.

4) Living cost is estimated based upon the farm economy survey.

Table VI-48 ECONOMIC PRICES OF FARM PRODUCTS AND INPUTS AT FARM GATE

	Item	Unit Price (Rp./kg or lit.)	Remarks
1. Farm products	Rice	235	
	Paddy	163	Dry paddy
	Maize	45	
	Cassava	11	
	Peanut	222	
	Soybean	132	
2. Inputs	Paddy seed	192	
	Urea	70	
	TSP	70	
	Insecticide (Diazinon)	1,230	
	(Sumithion)	1,230	
	Rodenticide (Zink-phosphate)	2,500	
	Labor (light)	600	1 person/day
	Labor (heavy)	850	1 person/day

Note: Conversion rate; US$1=Rp.625

Source: Document of the IBRD, January 1980
"Price Prospects for Major Primary Commodities"

Table VI-49 ECONOMIC PRICE OF DRY PADDY AT FARM GATE

	US$/ton	Rp./ton	Balance (Rp./ton)
1. International market price/1 (FOB Bangkok)	380	237,500	
2. Transportation cost (Bangkok - Palembang)	20	12,500	250,000
3. Handling charge & storing cost/2		6,550	256,550
4. In-land transportation cost (Belitang - Palembang)		-7,500	249,050
5. Processing cost/3		-7,000	242,050
6. Conversion to the price of dry paddy (68% of rice)			164,594
7. Local transportation cost (Farm gate to Mill)		-1,500	163,094
8. Farm gate price of dry paddy			163,000

Source: Document of the IBRD, January 1980 "Price Prospects for Major Primary Commodities"

/1: Forecast price of rice in 1990 by World Bank

/2: Handling charge at Harber 50 Rp./ton
Storing charge 10 Rp./ton/days x 150 days
Cost of sacks 5,000 Rp./ton

/3: Milling charge, etc. 7,000 Rp./ton

Note: Conversion rate; US$1=Rp.625

Table VI-50 ECONOMIC PRICE OF PEANUT AND SOYBEAN (FOR EXPORT)

	Peanut			Soybean		
	US$/ ton	Rp./ton	Balance (Rp./ton)	US$/ ton	Ro./ton	Balance (Ro./ton)
1. International market price/1	450	281,250		290	181,250	
2. Transportation cost (PLG-Japan)	35	21,870	259,370	35	21,870	159,370
3. Port handling & warehouse charge/2		4,950	254,420		4,950	154,420
4. Transportation cost (Belitang-PLG)		7,500	246,920		7,500	146,920
5. Marketing cost (10% of the market price)		24,690	222,230		14,690	132,230
Farm gate price		222,230 ≒ 222,000			132,230 ≒ 132,000	

/1: Forecast price of peanut in 1990 by World Bank

/2: Including cost of sacks, etc.

Note: Conversion rate; US$1=Rp.625

Source: Document of the IBRD, January 1980
"Price Prospects for Major Primary Commodities"

Table VI-51 FINANCIAL PRICES OF FARM PRODUCTS AND INPUTS AT FARM GATE

Unit: Rp./kg or lit.

	Item	Unit Price: Local Market Price	Unit Price: Financial Price	Remarks
1. Farm Products	Rice	175		
	Paddy	100	100	Dry paddy
	Maize	150		
	Cassava	25		
	Peanut	430	222/1	
	Soybean	300	132/1	
	Coffee	800		
	Rubber	250		
2. Farm Inputs	Seed (Paddy)	150		
	(Maize)	200		
	(Peanut)	500		
	(Soybean)	380		
	Seedling (Cassava)	1		
	Pertilizer (Urea)	70		
	(TSP)	70		
	Agro-chemical			
	(Diazinon)	1,230		
	(Sumithion)	1,230		
	(Zink-phosphate)	2,500		
3. Livestock	Cattle	250,000		Rp./head
	Buffalo	400,000		"
	Pig	40,000		"
	Goat	20,000		"
	Sheep	25,000		Rp./piece
	Chicken	1,400		"
	Egg (Chicken)	50		
	(Duck)	60		
4. Agro-equipment	Plow	10,000		
	Winnower	12,000		
	Hoe	3,000		
	Sickle	500		
5. Labor	Light	500		1 person/day
	Heavy	700		1 person/day

Sources: 1) Farm economy survey together with Desa Survey.
2) Kota Martapura Office, 1980
3) Kabupaten OKU Agricultural Office
4) Market price of rice in Palembang

/1: After the full development of the project, considerable amount of peanuts and soybeans would be exported abroad so that financial price of those products is estimated to be the economic price at farm gate (see detail Table VI-50).

Table VI-52 TYPICAL FARM BUDGET IN WITHOUT PROJECT

Cropping Pattern	Type I	Type II	Type III (Pisang area)
Family size (No.)	5.1	5.4	6.4
Farm size (ha)	1.0	1.75	1.75
1) Farm Income (Rp.)			
Crop income	288,560	342,690	197,710
Rainy season paddy	251,400	201,700	35,100
Dry season paddy	2,800	6,100	-
Upland paddy	6,000	40,800	25,200
Polowijo and upland crops	28,360	79,090	109,910
Perennial crops	-	15,000	27,500
Livestock income	20,700	22,000	21,000
Miscellaneous income	33,000	38,000	55,000
Total	342,260	402,690	273,710
2) Farm Outgo (Rp.)			
Crop production cost	23,920	41,640	28,540
Rainy season paddy	20,070	16,470	2,870
Dry season paddy	220	520	-
Upland paddy	750	5,100	3,450
Polowijo and upland crops	2,880	7,640	9,940
Perennial crops	-	11,910	12,280
Livestock cost	2,100	2,200	2,100
Tax, etc.	7,700	7,700	7,700
Living expenses	300,780	336,160	234,040
Total	334,500	387,700	272,380
3) Balance or Capacity to pay (Rp.)	7,760 (US$12.4)	14,990 (US$24.0)	1,330 (US$2.1)

Note: 1) Conversion rate; US$1=Rp.625
2) Application area
Type I ; 1.0 ha farm holding area
Type II ; 1.5 ha farm holding area
Pisang area; 1.5 ha farm holding area
3) Livestock income is estimated from livestock production of Kecamatan livestock office.
4) Living cost is estimated based upon the farm economy survey.
5) Especially, in the Pisang area, both of farm income and living expenditure couldn't expect to increase gradually owing to no infrastructure improved under without condition.

Table VI-53 TYPICAL FARM BUDGET IN WITH PROJECT

Cropping Pattern	Type I	Type II	Type III (Pisang area)
Family size (No.)	5.1	5.4	6.4
Farm size (ha)	1.0	1.75	1.75
1) Gross income (Rp.)			
Crop income	994,300	1,232,550	1,232,550
Rainy season paddy	400,000	600,000	600,000
Dry season paddy	450,000	450,000	450,000
Polowijo	144,300	115,050	115,050
Perennial crops	0	67,500	67,500
Livestock income	23,000	24,000	23,000
Miscellaneous income	10,000	10,000	10,000
Total	1,027,300	1,266,550	1,265,550
2) Outgo (Rp.)			
Crop production cost	109,300	181,450	181,450
Rainy season paddy	42,600	77,850	77,850
Dry seasnn paddy	42,600	42,600	42,600
Polowijo	24,100	20,400	20,400
Perennial crops	0	40,600	40,600
Livestock cost	2,300	2,400	2,300
Tax, etc.	10,000	15,000	15,000
Living expenses	691,200	705,000	835,000
Total	812,800	903,850	1,033,750
3) Balance or capacity to pay (Rp.)	214,500 (US$343.2)	362,700 (US$580.3)	231,800 (US$370.9)

Note: 1) Target year of family living expenses is estimated at grace period of each types.

2) Application area
Type I ; 1.0 ha farm holding area
Type II ; 1.5 ha farm holding area
Pisang area; 1.5 ha farm holding area

3) About 10% of annual growth rate of family living expenses is estimat on the basis of various index such as growth rate by Repelita III, general index in Jakarta and Palembang, etc.

4) Conversion rate; US$1=Rp.625.

Table VI-54 CROP PRODUCTION COST OF RAINY SEASON PADDY PER HA IN WITHOUT PROJECT (BIMAS)

Item	Amount (kg or lit./ha)	Economic Price (Rp./kg or lit.)	Value (10^3Rp./ha)
Seed	33	192	6.3
Fertilizer			
Urea	65	70	4.6
TSP	25	70	1.8
Agro-chemicals			
Diazinon	3	1,230	3.7
Zink-phosphate (g)	100	2,500	0.2
Agro-equipment			1.3
Sub-total			17.9
Labor/1 (Men/days)			
Nursery bed	8	600	4.8
Land preparation	21	1,490	31.3
Transplanting	25	850	21.2
Weeding	55	600	33.0
Fertilizing	3	600	1.8
Protecting	2	850	1.7
Harvest	45	600	27.0
Others	29	600	17.4
Sub-total	188		138.2
Miscellaneous/2			7.8
Total			163.9

/1: Labor charges include the expenses for meal services to the labors.

/2: Miscellaneous cost is estimated at 5% of the total crop production cost.

Table VI-55 CROP PRODUCTION COST OF RAINY SEASON PADDY PER HA IN WITHOUT PROJECT (NON-BIMAS)

Item	Amount (kg or lit./ha)	Economic Price (Rp./kg or lit.)	Value (10^3Rp./ha)
Seed	33	192	6.3
Fertilizer			
Urea	11	70	0.8
TSP	5	70	0.4
Agro-chemicals			
Diazinon	1	1,230	1.2
Zink-phosphate (g)	100	2,500	0.2
Agro-equipment			1.3
Sub-total			10.2
Labor/1 (Men/days)			
Nursery bed	8	600	4.8
Land preparation	21	1,490	31.3
Transplanting	25	850	21.3
Weeding	55	600	33.0
Fertilizing	3	600	1.8
Protecting	2	850	1.7
Harvest	45	600	27.0
Others	29	600	17.4
Sub-total	188		138.2
Miscellaneous/2			7.4
Total			155.9

/1: Labor charges include the expenses for meal services to the labors.

/2: Miscellaneous cost is estimated at 5% of the total crop production cost.

Table VI-56 CROP PRODUCTION COST OF DRY SEASON PADDY PER HA IN WITHOUT PROJECT (BIMAS)

Item	Amount (kg or lit./ha)	Economic Price (Rp./kg or lit.)	Value (10^3Rp./ha)
Seed	35	192	6.7
Fertilizer			
Urea	54	70	3.8
TSP	13	70	0.9
Agro-chemical			
Diazinon	2.0	1,230	2.5
Zink-phosphate (g)	100	2,500	0.2
Agro-equipment			1.3
Sub-total			15.4
Labor/1 (Men/Days)			
Nursery bed	8	600	4.8
Land preparation	21	1,490	31.3
Transplanting	25	850	21.2
Weeding	55	600	33.0
Fertilizing	3	600	1.8
Protecting	2	850	1.7
Harvest	45	600	27.0
Others	29	600	17.4
Sub-total	188		138.2
Miscellaneous/2			7.7
Total			161.3

/1: Labor charges include the expenses for meal charges to the labors.

/2: Miscellaneous cost is estimated at 5% of the total crop production cost.

Table VI-57 CROP PRODUCTION COST OF DRY SEASON PADDY PER HA IN WITHOUT PROJECT (NON-BIMAS)

Item	Amount (kg or lit./ha)	Economic price (Rp./kg or lit.)	Value (10^3 Rp./ha)
Seed	35	192	6.7
Fertilizer			
Urea	8	70	0.6
TSP	2	70	0.1
Agro-chemical			
Diazinan	1	1,230	1.2
Zink-phosphate (g)	100	2,500	0.2
Agro-equipment			1.3
Sub-total			10.1
Labor /1 (Men/Days)			
Nursery bed	8	600	4.8
Land preparation	21	1,490	31.3
Transplanting	25	850	21.4
Weeding	55	600	33.0
Fertilizing	3	600	1.8
Protecting	2	850	1.7
Harvest	45	600	27.0
Others	29	600	17.4
Sub-total	188		138.4
Miscellaneous /2			7.4
Total			155.9

/1 : Labor charges include the expenses for meal charges to the labors.

/2 : Miscellaneous cost is estimated at 5% of the total crop production cost.

Table VI-58 CROP PRODUCTION COST OF UPLAND PADDY PER HA IN WITHOUT PROJECT

Item	Amount (kg or lit./ha)	Economic price (Rp./kg or lit.)	Value (10^3 Rp./ha)
Seed	40	192	7.7
Fertilizer			
Urea	15	70	1.1
Agro-chemical			
Diazinan	1.0	1,230	1.2
Agro-equipment			1.0
Sub-total			11.0
Labor /1 (Men/Days)			
Land preparation	35	850	29.7
Soving	20	600	12.0
Weeding	35	600	21.0
Pertilizing	2	600	1.2
Protecting	2	850	1.7
Harvest	30	600	24.0
Others	16	600	9.6
Sub-total	140		99.2
Miscellaneous /2			5.5
Total			115.7

/1 : Labor charges include the expenses for meal charges to the labors.

/2 : Miscellaneous cost is estimated at 5% of the total crop production cost.

Table VI-59 CROP PRODUCTION COST OF MAIZE PER HA IN WITHOUT PROJECT

Item	Amount (kg or lit./ha)	Economic price (Rp./kg or lit.)	Value (10^3 Rp./ha)
Seed	20	41	0.8
Agro-equipment			0.4
Sub-total			1.2
Labor /1 (Men/Days)			
Sowing	7	600	4.2
Weeding	20	600	12.0
Harvest	20	600	12.0
Others	8	600	4.8
Sub-total	55		33.0
Miscellaneous /2			1.7
Total			35.9

/1 : Labor charges include the expenses for meal charges to the labors.

/2 : Miscellaneous cost is estimated at 5% of the total crop production cost.

Table VI-60 CROP PRODUCTION COST OF CASSAVA PER HA IN WITHOUT PROJECT

Item	Amount (kg or lit./ha)	Economic price (Rp./kg or lit.)	Value (10^3 Rp./ha)
Seed	10,000	0.5	5.0
Agro-equipment			0.4
Sub-total			5.4
Labor /1 (Men/Days)			
Planting	10	600	6.0
Weeding	25	600	15.0
Harvest	30	600	18.0
Others	10	600	6.0
Sub-total	75		45.0
Miscellaneous /2			2.5
Total			52.9

/1 : Labor charges include the expenses for meal charges to the labors.

/2 : Miscellaneous cost is estimated at 5% of the total crop production cost.

Table VI-61 CROP PRODUCTION COST OF PEANUT PER HA IN WITHOUT PROJECT

Item	Amount (kg or lit./ha)	Economic price (Rp./kg or lit.)	Value (10^3 Rp./ha)
Seed	60	253	15.2
Agro-equipment			0.4
Sub-total			15.6
Labor /1 (Men/Days)			
Sowing	7	600	4.2
Weeding	25	600	15.0
Harvest	25	600	15.0
Others	8	600	4.8
Sub-total	65		39.0
Miscellaneous /2			2.7
Total			57.3

/1 : Labor charges include the expenses for meal charges to the labors.

/2 : Miscellaneous cost is estimated at 5% of the total crop production cost.

Table VI-62 CROP PRODUCTION COST OF SOYBEAN PER HA IN WITHOUT PROJECT

Item	Amount (kg or lit./ha)	Economic price (Rp./kg or lit.)	Value (10^3 Rp./ha)
Seed	20	145	2.9
Agro-equipment			0.4
Sub-total			3.3
Labor /1 (Men/Days)			
Sowing	7	600	4.2
Weeding	20	600	12.0
Harvest	20	600	12.0
Others	8	600	4.8
Sub-total	55		33.0
Miscellaneous /2			1.8
Total			38.1

/1 : Labor charges include the expenses for meal charges to the labors.

/2 : Miscellaneous cost is estimated at 5% of the total crop production cost.

Table VI-63 CROP PRODUCTION COST OF RAINY SEASON PADDY PER HA IN WITH PROJECT

Item	Amount (kg or lit./ha)	Economic price (Rp./kg or lit.)	Value (10^3 Rp./ha)
Seed	25	192	4.8
Fertilizer			
Urea	180	70	12.6
TSP	90	70	6.3
Agro-chemicals			
Diazinan	2	1,230	2.5
Sumithion	1	1,230	1.2
Kasumin	2	1,230	2.4
Zink-phosphate (g)	200	2,500	0.5
Agro-equipment			11.3
Sub-total			41.6
Labor /1 (Men/Days)			
Nursery bed	10	600	6.0
Land preparation	40	1,490	59.6
Transplanting	35	850	29.7
Weeding	40	600	24.0
Fertilizing	4	600	2.4
Protecting	4	850	3.4
Water management	5	600	3.0
Harvest	40	600	24.0
Threshing	15	600	9.0
Others	7	600	4.2
Sub-total	200		165.4
Miscellaneous /2			10.4
Total			217.4

/1 : Labor charges include the expenses for meal charges to the labors.

/2 : Miscellaneous cost is estimated at 5% of the total crop production cost.

Table VI-64 CROP PRODUCTION COST OF DRY SEASON PADDY PER HA IN WITH PROJECT

Item	Amount (kg or lit./ha)	Economic price (Rp./kg or lit.)	Value (10^3 Rp./ha)
Seed	25	192	4.8
Fertilizer			
Urea	180	70	12.6
TSP	90	70	6.3
Agro-chemicals			
Diazinan	2	1,230	2.5
Sumithion	1	1,230	1.2
Kasumin	2	1,230	2.4
Zink-phosphate (g)	200	2,500	0.5
Agro-equipment			11.3
Sub-total			41.6
Labor /1 (Men/Days)			
Nursery bed	10	600	6.0
Land preparation	40	1,490	59.6
Transplanting	35	850	29.8
Weeding	40	600	24.0
Fertilizing	4	600	2.4
Protecting	4	850	3.4
Water management	5	600	3.0
Harvest	45	600	27.0
Threshing	15	600	9.0
Others	7	600	4.2
Sub-total	205		168.4
Miscellaneous /2			10.5
Total			220.5

/1 : Labor charges include the expenses for meal charges to the labors.

/2 : Miscellaneous cost is estimated at 5% of the total crop production cost.

Table VI-65 CROP PRODUCTION COST OF PEANUT IN WITH PROJECT

Item	Amount (kg or lit./ha)	Economic price (Rp./kg or lit.)	Value (10^3 Rp./ha)
Seed	60	253	15.2
Fertilizer			
Urea	20	70	1.4
TSP	40	70	2.8
Lime	300	15	4.5
Agro-chemical			
Sumithion	1	1,250	1.3
Zink-phosphate (g)	100	2,500	0.2
Agro-equipment			5.7
Sub-total			31.1
Labor /1 (Men/Days)			
Soving	15	600	9.0
Weeding	35	600	21.0
Fertilizing	2	600	1.2
Protecting	1	850	0.8
Water management	2	600	1.2
Harvest	30	600	18.0
Others	5	600	3.0
Sub-total	90		54.2
Miscellaneous /2			4.3
Total			89.6

/1 : Labor charges include the expenses for meal charges to the labors.

/2 : Miscellaneous cost is estimated at 5% of the total crop production cost.

Table VI-66 CROP PRODUCTION COST OF SOYBEAN PER HA IN WITH PROJECT

Item	Amount (kg or lit./ha)	Economic price (Rp./kg or lit.)	Value (10^3 Rp./ha)
Seed	40	145	5.8
Fertilizer			
Urea	30	70	2.1
TSP	40	70	2.8
Lime	300	5	4.5
Agro-chemical			
Sumithion	1	1,250	1.3
Zink-phosphate (g)	100	2,500	0.2
Agro-equipment			5.7
Sub-total			22.4
Labor /1 (Men/Days)			
Sowing	15	600	9.0
Weeding	35	600	21.0
Fertilizing	2	600	1.2
Protecting	1	850	0.8
Water management	2	600	1.2
Harvest	25	600	15.0
Others	5	600	3.0
Sub-total	85		51.2
Miscellaneous /2			3.7
Total			77.3

/1 : Labor charges include the expenses for meal charges to the labors.

/2 : Miscellaneous cost is estimated at 5% of the total crop production cost.

Table VI-67 GROSS AND NET PRODUCTION VALUE AT FULL DEVELOPMENT STAGE IN 1.0 HA AREA (WITHOUT PROJECT CONDITIONS)

Major crops	Cropped area (ha)	Production (tons)	Unit price (10^3Rp./ton)	Gross value (10^6Rp.)	Unit production cost (10^3Rp./ha)	Total production cost (10^6Rp.)	Net production value (10^6Rp.)
R.S.P (BIMAS)	870	2,870	163	468	163.9	143	325
(NON-BIMAS)	6,380	17,860	163	2,911	155.9	994	1,917
D.S.P (BIMAS)	30	100	163	16	161.3	5	11
(NON-BIMAS)	40	110	163	18	155.9	6	12
Upland paddy	460	550	163	90	115.7	53	37
Total paddy	7,780	21,490		3,503		1,201	2,302
Maize	230	250	45	11	35.9	8	3
Cassava	580	4,060	11	44	52.9	30	14
Peanut	360	320	222	71	57.3	21	50
Soybean	290	230	132	30	38.1	11	19
Total	9,240			3,660		1,272	2,388

Note: R.S.P; Rainy season paddy. D.S.P; Dry season paddy.

Table VI-68 GROSS AND NET PRODUCTION VALUE AT FULL DEVELOPMENT STAGE IN 1.5 HA AREA (WITHOUT PROJECT CONDITIONS)

Major crops	Cropped area (ha)	Production (tons)	Unit price (10^3Rp./ton)	Gross value (10^6Rp.)	Unit production cost (10^3Rp./ha)	Total production cost (10^6Rp.)	Net production value (10^6Rp.)
R.S.P (BIMAS)	2,000	6,600	163	1,076	163.9	328	748
(NON-BIMAS)	6,250	17,500	163	2,852	155.9	974	1,878
D.S.P (BIMAS)	70	430	163	70	161.3	11	59
(NON-BIMAS)	130	360	163	58	155.9	20	38
Upland paddy	4,050	4,860	163	792	115.7	468	324
Total paddy	12,500	29,750		4,849		1,802	3,047
Maize	570	630	45	28	35.9	20	8
Cassava	3,480	24,360	11	268	52.9	184	84
Peanut	1,090	980	222	217	57.3	62	155
Soybean	230	180	132	24	38.1	9	15
Total	17,870			5,387		2,078	3,309

Note: R.S.P; Rainy season paddy. D.S.P: Dry season paddy.

Table VI-69 GROSS AND NET PRODUCTION VALUE AT FULL DEVELOPMENT STAGE IN PISANG AREA (WITHOUT PROJECT CONDITIONS)

Major crops	Cropped area (ha)	Production (tons)	Unit price (10^3Rp./ton)	Gross value (10^6Rp.)	Unit production cost (10^3Rp./ha)	Total production cost (10^6Rp.)	Net production value (10^6Rp.)
R.S.P (BIMAS)	25	80	163.0	13	163.9	4	9
(NON-BIMAS)	75	210	163.0	34	155.9	12	22
D.S.P (BIMAS)							
(NON-BIMAS)							
Upland paddy	170	200	163.0	32	115.7	19	13
Total paddy	270	490		79		35	44
Maize	120	130	45.0	6	35.9	5	1
Cassava	320	2,240	11.0	25	52.9	17	8
Peanut	50	50	222.0	11	57.3	3	8
Soybean	25	20	132.0	3	38.1	1	2
Total	785			124		61	63

Note: R.S.P; Rainy season paddy. D.S.P; Dry season paddy.

Table VI-70 GROSS AND NET PRODUCTION VALUE AT FULL DEVELOPMENT STAGE IN 1.0 HA AREA (WITH PROJECT CONDITIONS)

Major crops	Cropped area (ha)	Production (tons)	Unit price (10^3Rp./ton)	Gross value (10^6Rp.)	Unit production cost (10^3Rp./ha)	Total production cost (10^6Rp.)	Net production value (10^6Rp.)
R.S.P	8,400	33,600	163.0	5,477	217.4	1,826	3,651
D.S.P	8,400	37,800	163.0	6,161	220.5	1,852	4,309
Total paddy	16,800	71,400		11,638		3,678	7,960
Peanut	4,200	5,460	222.0	1,212	89.6	376	836
Total	21,000			12,850		4,054	8,796

Note: R.S.P; Rainy season paddy. D.S.P; Dry season paddy.

Table VI-71 GROSS AND NET PRODUCTION VALUE AT FULL DEVELOPMENT STAGE IN 1.5 HA AREA (WITH PROJECT CONDITIONS)

Major crops	Cropped area (ha)	Production (tons)	Unit price (10^3Rp./ton)	Gross value (10^6Rp.)	Unit production cost (10^3Rp./ha)	Total production cost (10^6Rp.)	Net production value (10^6Rp.)
R.S.P	25,400	101,600	163.0	16,561	217.4	5,522	11,039
D.S.P	16,940	76,230	163.0	12,425	220.5	3,735	8,690
Total paddy	42,340	177,830		28,986		9,257	19,729
Peanut	4,230	5,500	222.0	1,221	89.6	379	842
Soybean	4,230	5,500	132.0	726	77.3	327	399
Total	50,800			30,933		9,963	20,970

Note: R.S.P; Rainy season paddy. D.S.P; Dry season paddy.

Table VI-72 GROSS AND NET PRODUCTION VALUE AT FULL DEVELOPMENT STAGE IN PISANG AREA (WITH PROJECT CONDITIONS)

Major crops	Cropped area (ha)	Production (tons)	Unit price (10^3Rp./ton)	Gross value (10^6Rp.)	Unit production cost (10^3Rp./ha)	Total production cost (10^6Rp.)	Net production value (10^6Rp.)
R.S.P	2,900	11,600	163.0	1,891	217.4	631	1,260
D.S.P	1,930	8,690	163.0	1,416	220.5	425	991
Total paddy	4,830	20,290		3,307		1,056	2,251
Peanut	485	630	222.0	140	89.6	44	96
Soybean	485	630	132.0	83	77.3	37	46
Total	5,800			3,530		1,137	2,393

Note: R.S.P; Rainy season paddy. D.S.P; Dry season paddy.

Table VI-73 INCREMENTAL BENEFIT AT FULL DEVELOPMENT STAGE IN THE PROJECT AREA

(1.0 ha area)

Major Crops	Without Project (10^6Rp.)	With Project (10^6Rp.)	Incremental Value (10^6Rp.)
Rainy season paddy	2,242	3,651	1,409
Dry season paddy	23	4,309	4,286
Upland paddy	37	-	-37
Total paddy	2,302	7,960	5,658
Upland crops & polowijs	86	836	750
Total	2,388	8,796	6,408

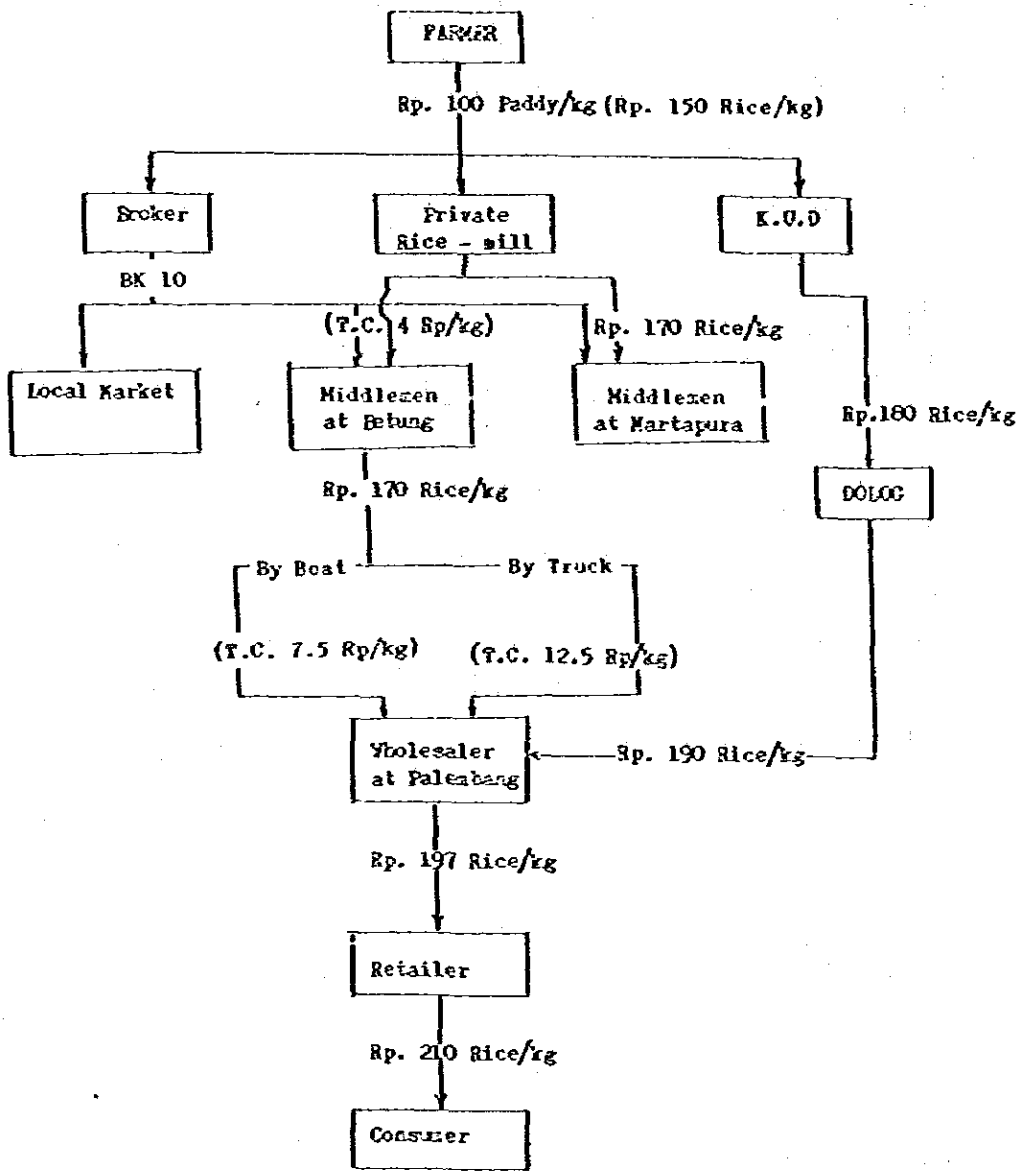
(1.5 ha area)

Rainy season paddy	2,626	11,039	8,413
Dry season paddy	97	8,690	8,593
Upland paddy	324	-	-324
Total paddy	3,047	19,729	16,682
Upland crops & polowijs	262	1,241	979
Total	3,309	20,970	17,661

(Pisang area)

Rainy season paddy	31	1,260	1,229
Dry season paddy	-	991	991
Upland paddy	13	-	-13
Total paddy	44	2,251	2,207
Upland crops & polowijs	19	142	123
Total	63	2,393	2,330

Fig. VI - 1 MARKETING FLOW OF RICE IN THE PROJECT AREA



Note : Milling charge in the project area is about 7% of the Paddy amount on an average.

T.C.: Transportation cost

Fig.VI-2 LOCAL MARKET PRICES OF MAJOR CROPS IN KOTA MARTAPURA No.1

Unit;Rp/kg

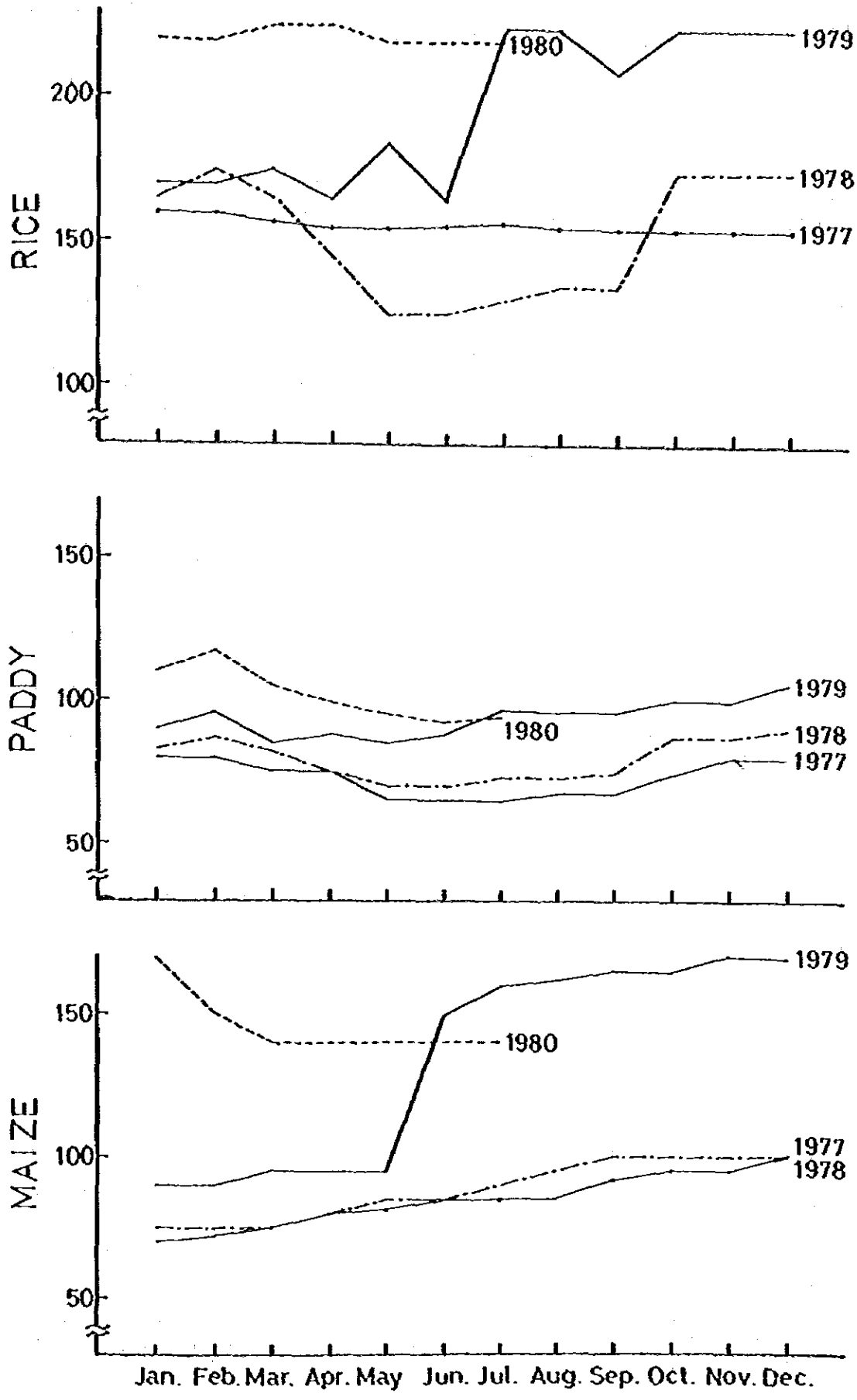
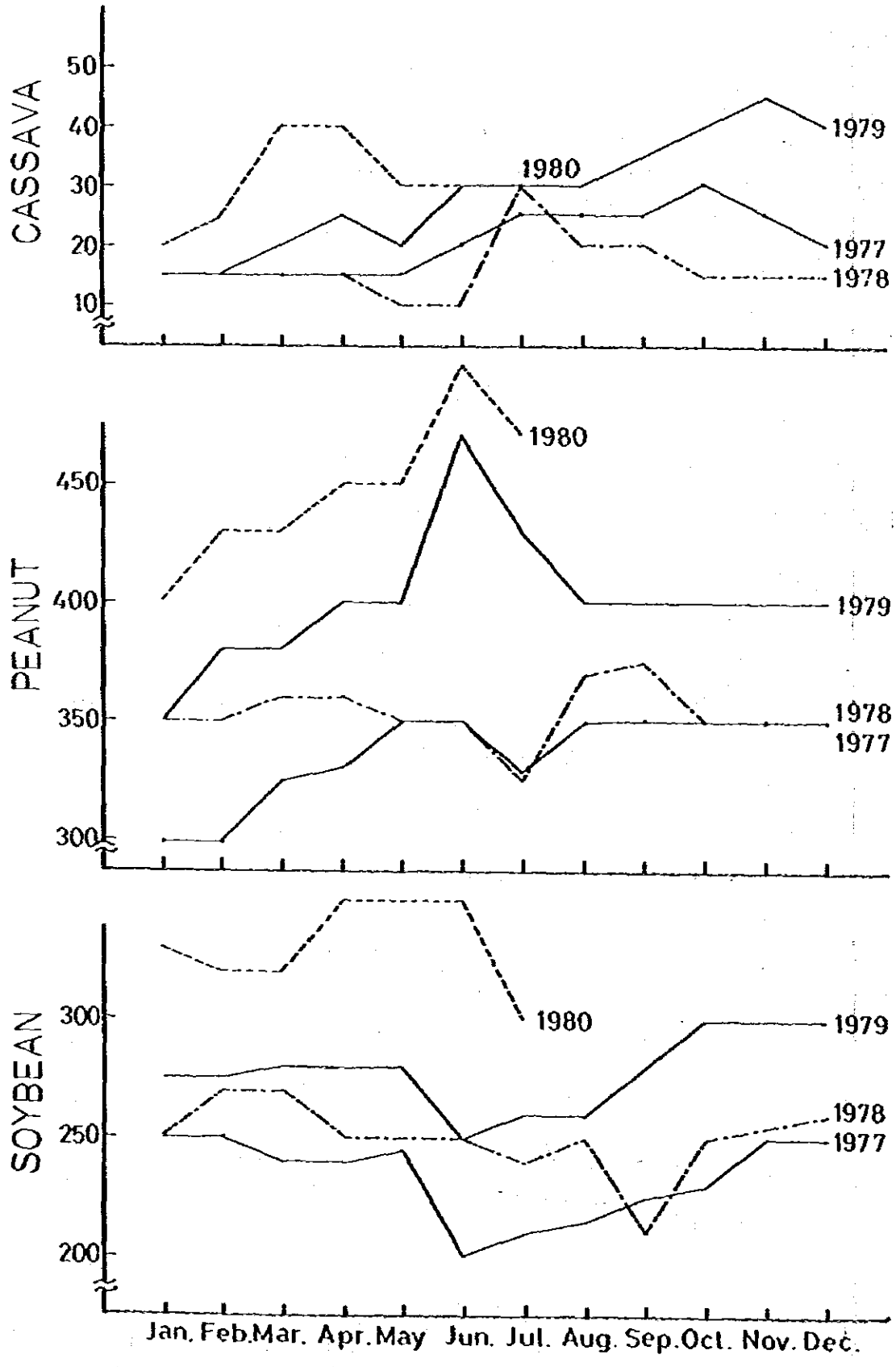


Fig.VI-2 LOCAL MARKET PRICES OF MAJOR CROPS IN KOTA MARTAPURA No.2

Unit : Rp/Kg



Pig.VI-3 ORGANIZATION CHART OF AGRICULTURAL EXTENTION SERVICE IN SOUTH SUMATORA PROVINCE

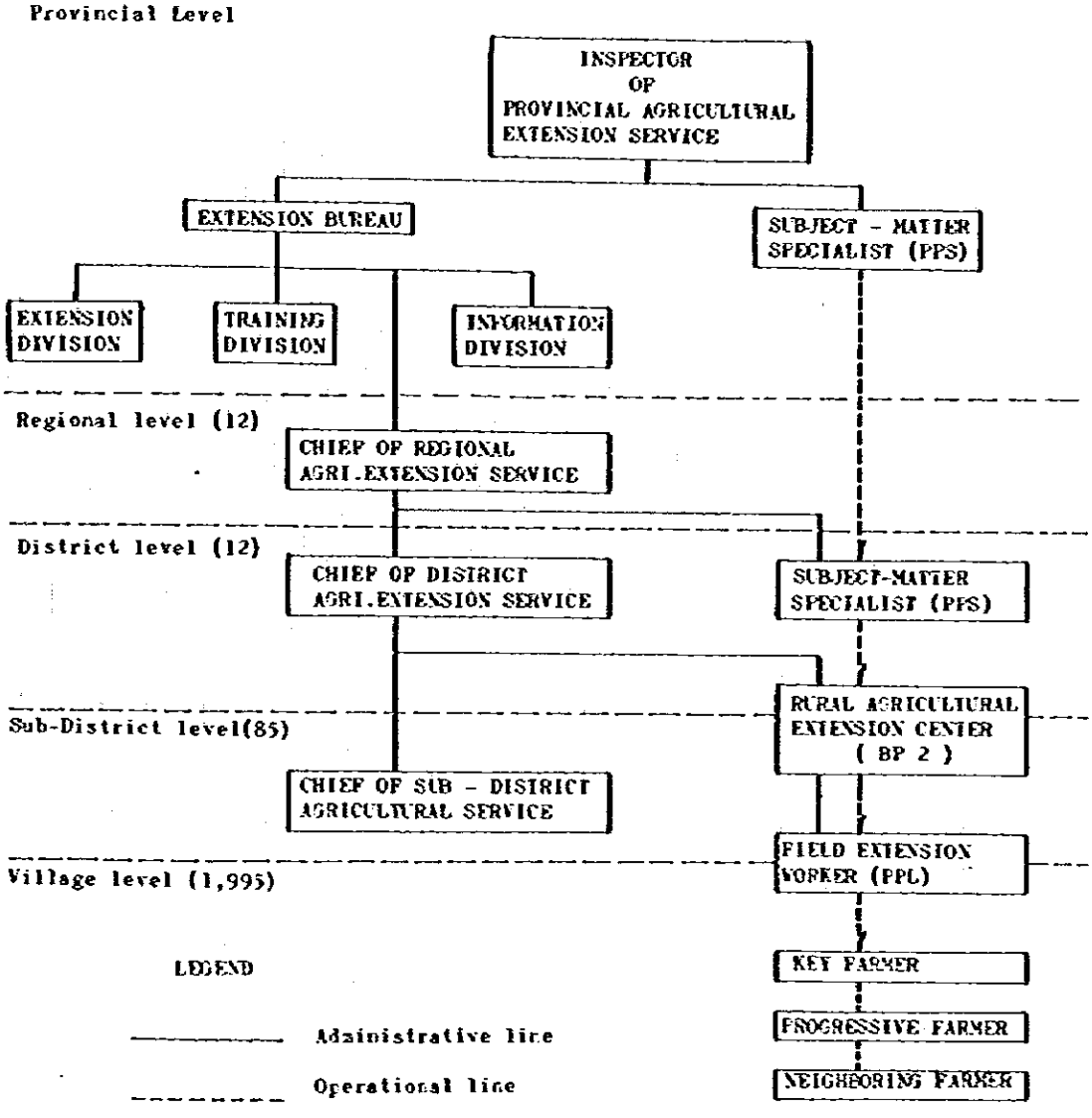
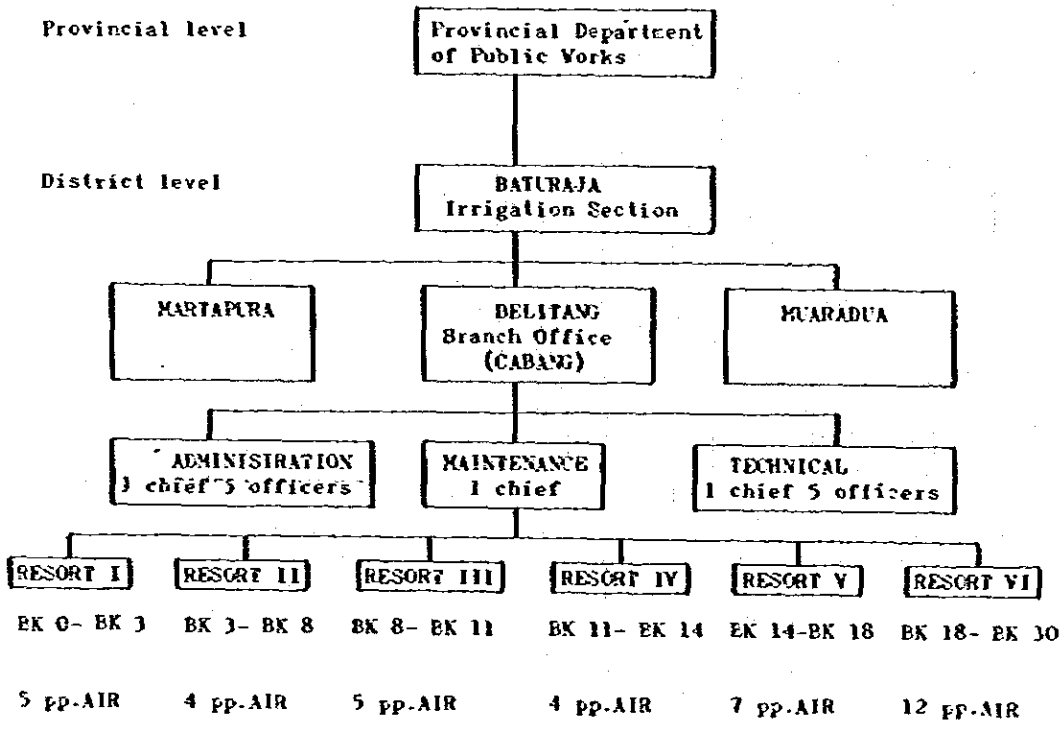
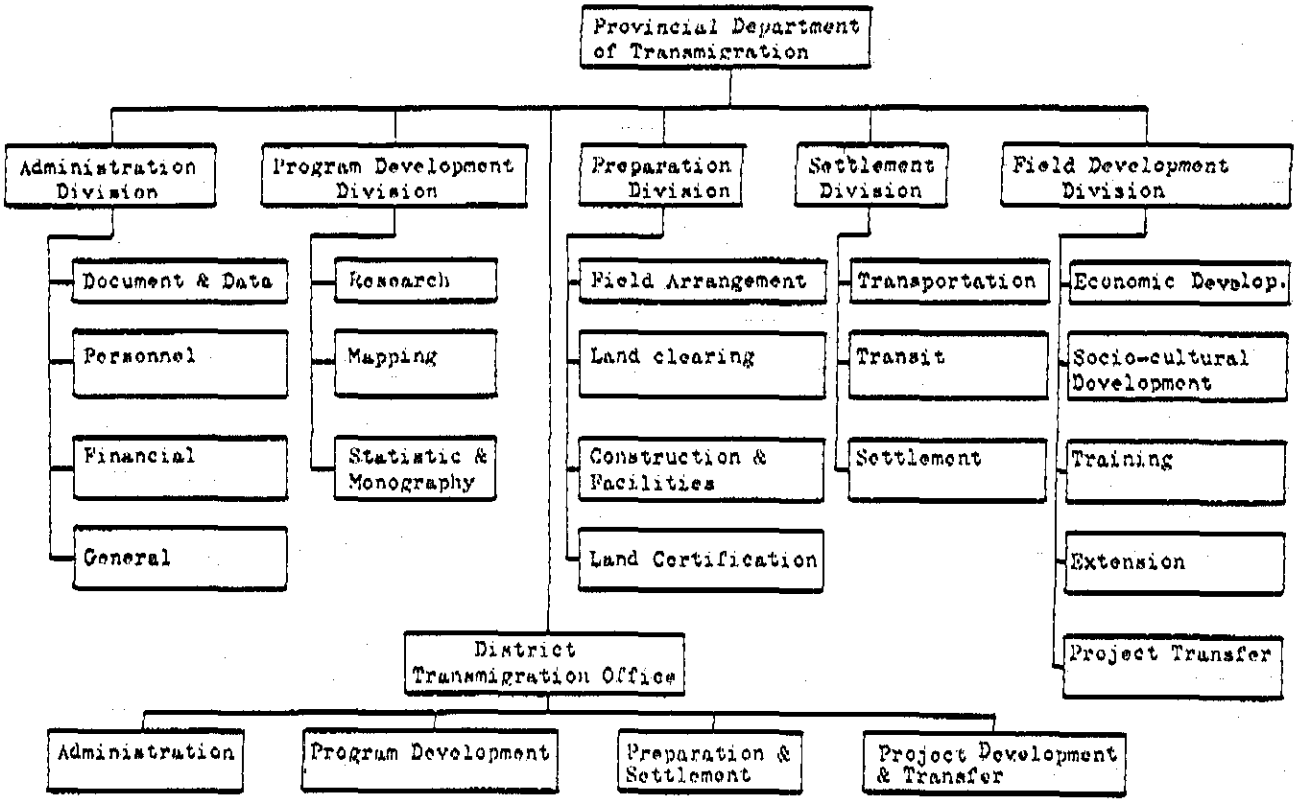


Fig. VI-4 ORGANIZATION CHART OF O & M OF IRRIGATION FACILITIES IN THE PROJECT AREA

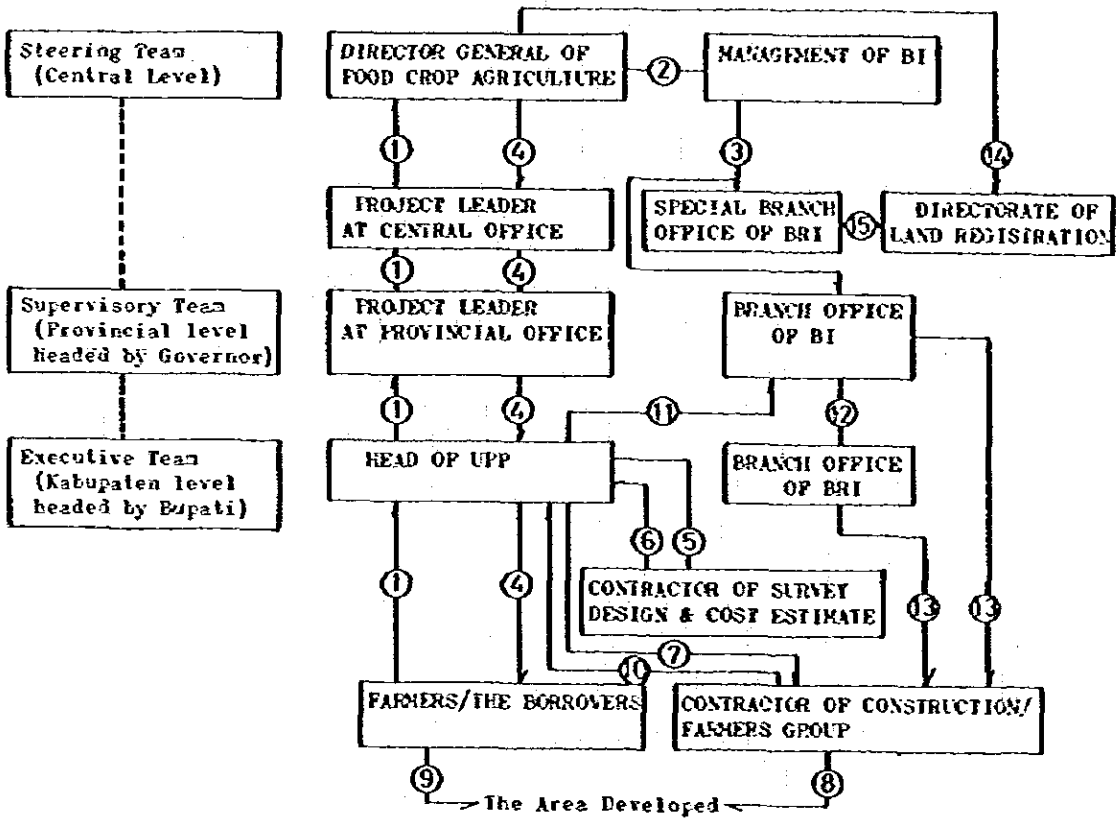


Main canal(m)	11,900	8,265	10,665	6,250	11,569	18,400
Second canal(m)	7,300	6,600	8,480	3,630	9,000	3,750
Terti. canal(m)	38,900	69,900	98,800	54,550	65,250	75,300
Irrig. Area (ha)	1,595	2,955	4,210	2,574	3,844	5,416

Fig.VI-5 ORGANIZATION CHART OF PROVINCIAL DEPARTMENT OF TRANSMIGRATION



Pig.VI- 6 ORGANIZATION AND OPERATION CHART OF LAND DEVELOPMENT PROJECT



1). Prefinancing application
2). Prefinancing request
3). Allocation of prefinancing
4). Information of prefinancing approved
5). Contract for survey, design & cost estimation
6). Submitting the survey results
7). Contract for construction
8). Construction work
9). Statement of completion of paddy field
10). Delivery document for completion
11). Prefinancing release
12). Prefinancing allocation
13). Payment for construction
14). Making land certificate and land mortgage
15). Payment for certificate

Fig. VI-7 PROPOSED ORGANIZATION CHART OF BRANCH STATION OF AGRICULTUAL DEVELOPMENT CENTER , SOUTH SUMATRA PROVINCE

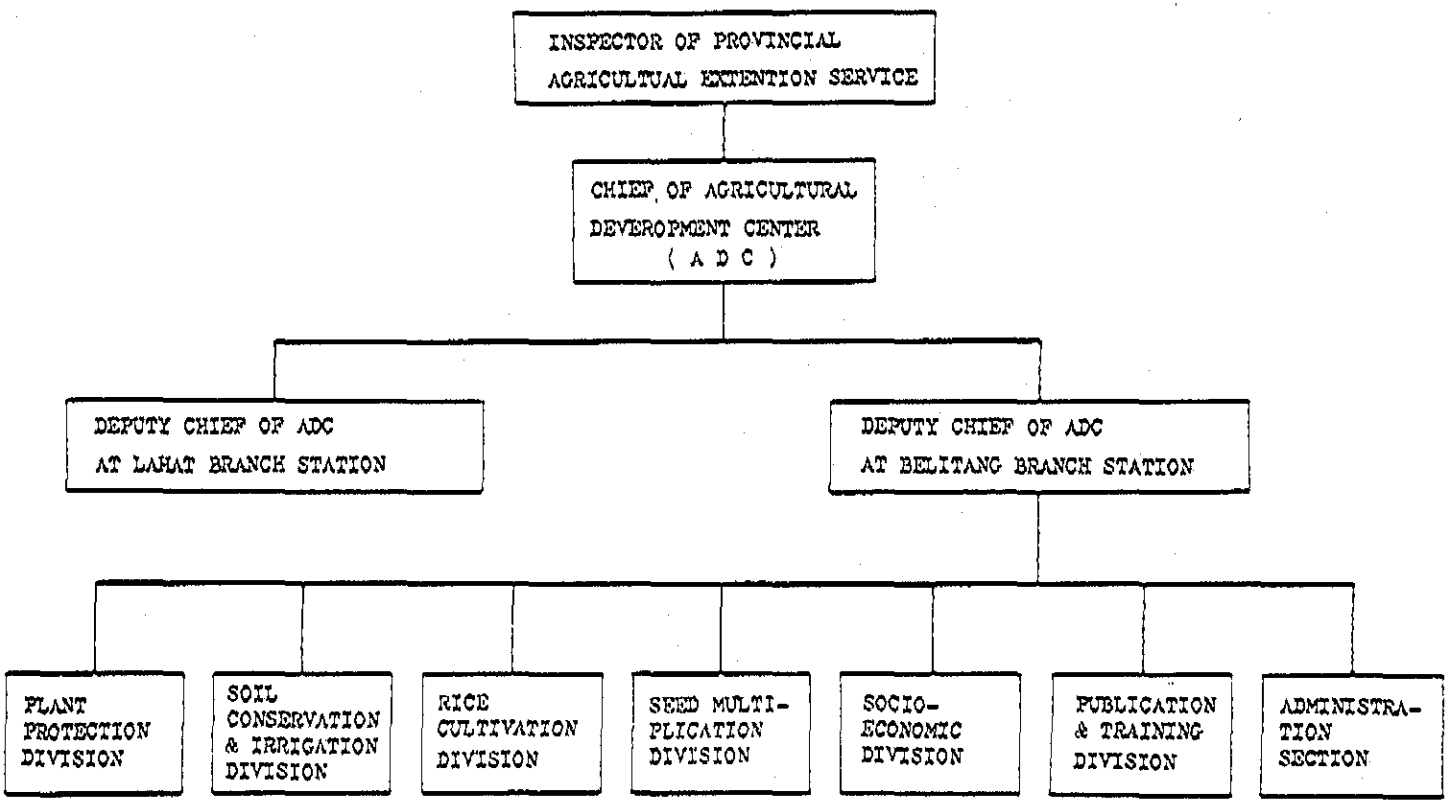
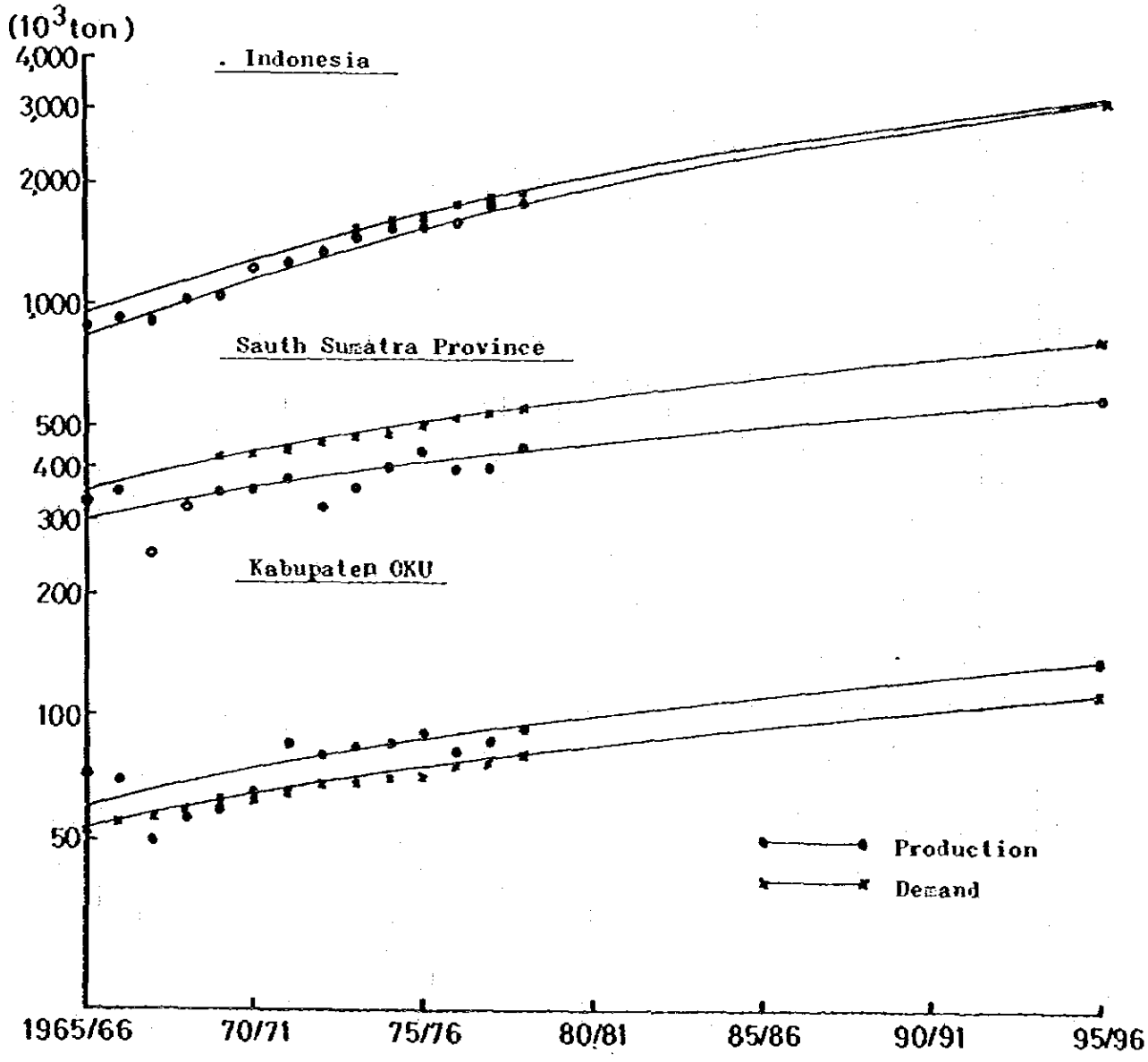


Fig. VI-8 PROJECTION OF RICE DEMAND AND SUPPLY



ANNEX VII

IRRIGATION AND DRAINAGE

ANNEX - VII

IRRIGATION AND DRAINAGE

1. DELINEATION OF THE PROJECT AREA

1.1 General

Various data on complex natural resources and interrelated land data have been collected and analized in delineating the area for irrigation development. Systematic appraisal for the soils and substrata, topography and drainage conditions is conducted as an integrated study with economics, engineering and other disciplines in selection of land suitable for irrigation and their relative degree of suitability. This chapter aims at the delineation of the irrigation development area within the Komering-1 Area.

1.2 Considerations Affecting Selection

(1) Land, soil and topography

The land classification survey related to the soil, topography and drainage characteristics has revealed the grade of irrigation suitability. Typical characteristics of the natural soil bodies involved are texture, structure, depth, stoniness, horizon arrangement and layering, soluble salts (EC), pH, infiltration rate, moisture characteristics, etc.

Micro and macro topography are evaluated with respect to degree and direction of slope, land capability and land development requirement. Irrigability in relation to location and topography is the main point in this context.

The drainability of the area as a whole has been considered in relation to the drainage characteristics of the soil and topography.

(2) Crop, value, etc.

The land classification supplemented by overall agricultural studies makes it possible to assess the crop suitability of the soil.

In determining crop values, within the framework of marketing system, estimate of these benefits has been made taking into account not only the gross of value of the products, but also the international market prices, national value of the products, but also the international market prices, national demand, the capacity of the existing processing factories available, etc.

(3) People, social and economic conditions

The field survey includes figures on the population of the area and their social and economic conditions. Their farming experience, farming practices, family labor forces, land holding size, land tenure, agricultural supporting services, etc. are taken into account for future successful development.

(4) Government's policy

The most important factor is the Indonesian Government's development policy. The areas which have been selected for transmigration program or irrigation development program are given a high priority for the selection of project area.

1.3 Areas to be Developed under the Project

Following the result of the land suitability evaluation which was made on the basis of erodability of lands, cultivable depth of soil, topography, flooding condition, drainability and degree of soil acidity (see ANNEX-II), the land with a total area of 50,630 ha in gross are tentatively taken up as the project area which includes 10,070 ha of Grade-I in the land suitability classification, 9,900 ha of Grade-II and 24,410 ha of Grade-III. The area thus selected, however, will further be assessed for its suitability from the viewpoints of socio- and agro-economy and the Government's policy of which study are in process.

Since the above gross area includes the non-irrigable lands such as village compounds, perennial crops, roads, canals, forest to be conserved, etc., the net irrigable area will amount to around 36,700 ha consisting of 33,800 ha of the Belitang Extension Central area and 2,900 ha of the Pisang Area.

2. IRRIGATION AND DRAINAGE PLANS

2.1 Irrigation Water Requirements

2.1.1 General

In planning of irrigation project, a full knowledge of irrigation water requirements of crops from time of seeding until harvest is needed. It is also necessary to know the total amount of water required in each season to produce optimum yields for the climate and soils involved.

Peak water requirement by crop must be known in order to determine the capacity of irrigation system. It is also important to check whether the peak use periods for different crops in the study area occur at the same time or at different months. This can be a very important consideration where water resources are limited compared with the magnitude of irrigable area.

Since field measurement of consumptive use of water by crops was not carried out in the study period because of shortage of time, the study was mainly depending on the field measurement results for the "Belitang Extension Area, Agricultural Development Project" by FAO/UNDP in 1974, "Way Sekampung Irrigation Project" by Lampung Provincial Public Works in 1978 and "Way Seputih Irrigation Project" by I.P.B. in 1973. The empirical and theoretical formulas developed in the past by various experts were also used in this study.

2.1.2 Consumptive Use of Water

The consumptive use of water is the sum of the volumes of water used by vegetative growth in a given area in the transpiration or building of plant tissue, and that evaporated from adjacent soil or intercepted precipitation on the area in any specified time. In the case of rice cultivation where a water level is maintained above the ground surface, evaporation from the water surface will be substituted for evaporation from soil surface.

Practically the consumptive use of water is obtained by multiplying the class-A pan evaporation or potential evapotranspiration by the crop coefficient.

(1) Potential evapotranspiration

In the study area, the evaporation data are available at Belitang (1971 - 1980), but these data are not used in this study, because there found some disturbances in these data, i.e. extremely high and low values and many blanks in the daily data. Instead, the potential evapotranspiration calculated using the Modified Penman Formula is used in the study. In the selection of formula among the various empirical and theoretical formulas, the latitudinal and altitudinal location of the study area and availability of meteorological data are fully taken into consideration.

The following is a calculated result using the meteorological data at Belitang.

(Unit: mm)

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
118	115	140	132	124	117	124	133	132	140	126	133	1,534

(2) Crop coefficients, kc

The crop coefficient of paddy is referred to the kc-curve mentioned in the ANNEX-VIII of the Reconnaissance Planning Report on "Belitang Extension Area, Agricultural Development Project" prepared by FAO/UNDP in 1974. This curve is also shown in Fig. VII-1. As for the kc-values for soybeans and peanuts, the curves shown in the Technical Release No. 21 published by USDA in 1967 are used in the calculation. These curves are shown in Fig. VII-2 and VII-3.

2.1.3 Unit Irrigation Water Requirements

After knowing the consumptive use of water, the unit irrigation water requirements for each crop are calculated using the daily water balance method. For this method, the following equations are employed:

Equation for Paddy:

$$IWD = (CU + PL + NW + PW - ER)/Ei$$

Equation for Upland Crop:

$$IWS = (CU + PA - ER)/Ei$$

where, IWD, IWS ; unit irrigation water requirements
CU ; consumptive use of water

PL ; percolation loss (for paddy field only)
NW ; nursery water requirement (for paddy field only)
PW ; paddling water requirement (for paddy field only)
ER ; daily effective rainfall
FA ; farm application losses (for upland crop only)
Ei ; combined irrigation efficiencies

(1) Percolation loss (PL)

In addition to the percolation rates observed at 20 sites in the project area as presented in Table VII-1, the values observed in the Way Sekampung Irrigation Project and Way Seputih Irrigation Project areas in Lampung Province are fully referred to. As the result, the percolation rates for irrigation planning in this project area are suggested as follows:

	Percolation Rate (mm)	
	dry season	rainy season
Elevated paddy field	4	2
Lowland paddy field	2	1

(2) Nursery water requirement (NW)

The nursery water requirement is estimated for the following assumptions.

(a) Area required for nursey bed: 1/20 of main field
(b) Nursery period : 25 days
(c) Water required for 25 days period:

- Preparation of nursery bed	150 mm
- Evapotranspiration, 5mm/day	125 mm
- Percolation loss, for lowland area	25 mm
(for elevated area)	(50 mm)
Total:	300 mm
	(325 mm)

The calculated results of nursery water requirements for Cropping Pattern-I and Cropping Pattern-II are as shown in Table VII-2.

(3) Puddling water requirement (PW)

The quantity of water required for puddling works is theoretically assessed for the soil depth to be puddled and porosity, which vary relatively from place to place. In this study, the following formula and assumptions are adopted for the approximation. In the calculation, the results of soil physical analyses made in the period of field work are also adopted.

(a) Formula:

$$PW = DS + WS + PL$$

where, PW ; puddling water requirement in mm

DS ; required water depth above soil surface after puddling in mm

WS ; difference in soil moisture contents before and after puddling in mm

PL ; field loss including percolation and other application losses

(b) Assumption:

i) Water depth above soil surface after puddling is 20 mm.

ii) Porosity is 50% in both surface soil (20 cm depth) and sub-soil (10 cm depth).

iii) Vapor phase in soils after puddling is 5%.

iv) Soil moisture before irrigation is 15% in volume which corresponds approximately to the permanent wilting point.

v) Field loss is assumed to be 40% of (DS + WS).

The calculated result is as follows:

$$PS = (20 + 300 \times (0.5-0.05)-300\times0.15) \times (1+0.40)$$
$$\doteq 150 \text{ mm}$$

The watering schedule of puddling for Cropping Pattern-I and II are shown in Table VII-2.

(4) Daily effective rainfall (ER)

The daily rainfall data have been collected from the following stations mainly.

i) Belitang BK-IX (1956 - 1974, 1978 - 1980)
ii) Belitang BK-XVIII (1972 - 1979)
iii) Kurungan Nyawa (1956 - 1974, 1978 - 1980)
iv) Martapura (1972 - 1975, 1977 - 1979)

Among them, the data at the Belitang BK-IX are used for the estimation of effective rainfall in the project area.

The daily rainfalls at this station are processed in the calculation of effective rainfalls on the basis of the following assumptions for each crop which were introduced in the FAO series No. 25 "Irrigation and Drainage Paper."

for paddy

(a) Around 80% of daily rainfall is used in the calculation, taking into consideration the locality of rainfall in case that the spot rainfall data is applied to the whole project area.

(b) Water depth to be stored in paddy field is taken at 30 mm. If the sum of daily rainfall and the residual water depth from the previous day exceeds 30 mm, the exceeding amount is regarded as the surplus.

for upland crop

(a) Daily rainfall less than 2 mm is not effective for the calculation.

(b) If the daily rainfall is more than 3 mm, 80% of the rainfall is used for the calculation.

(c) If the sum of daily rainfall and the residual moisture from the previous day exceeds the water depth to be available for crop growth, the exceeding amount is regarded as the surplus. The water depth to be stored in soil is governed by holding capacity of soil and effective root zone depth of crop. The water depth to be stored in soil is calculated for each crop as follows.

- for soybeans : 70 mm
- for peanuts : 40 mm

The detailed calculation of available water depth is shown in Table VII-3.

The effective rainfall for each crop is determined with a 80% probability of exceedance of drought year which is calculated using the effective rainfall obtained through the above daily water balance methods.

(5) Farm application losses (FA)

Farm application losses in upland irrigation include deep percolation, surface run-off, etc. Taking into account the soil characteristics, topography, climate, irrigation practice and experience, etc., the application efficiency is assumed to be 70% of (CU - ER) on an average over the whole study area.

(6) Combined irrigation efficiencies (Ei)

Certain losses are unavoidable for conveying water and applying it to the farm. Irrigation water requirements are obtained by dividing the farm requirements by the canal conveyance and operation efficiencies. In this study, the canal conveyance efficiency is estimated to be 85% and canal operation efficiency to be 70% of the diversion requirements. Those make combined irrigation efficiencies of 59.5% (≒ 60%).

(7) Results of calculations

The calculation procedures of unit irrigation water requirements for each crop are shown in Table VII-4. The unit irrigation water requirements for respective cropping pattern are summed up in Table VII-5 based on crop intensity. According to this table, the peak unit irrigation water requirements are as follows:

i) for cropping pattern-I : 1.28 lit/sec/ha
(farm holding size; 1.0 ha area)

ii) for cropping pattern-II : 1.12 lit/sec/ha
(farm holding size; 1.5 ha area)

iii) for cropping pattern-III : 1.28 lit/sec/ha /1
(farm holding size; 2.0 ha area)

/1 ; This figure is extracted as a peak unit irrigation requirement for the Tulangbawang area from the comprehensive study report.

2.1.4 Design Diversion Requirements

The design diversion requirements are defined as the peak diversion discharge and used for the design of headworks and headreach. The design diversion requirements for each development stage are obtained as follows:

(1) for Komering-I area (36,700 ha):
44.1 m^3/sec /1 (peak value in June)

(2) for the Komering-I and Lempuing areas (49,700 ha):
58.7 m^3/sec /1 (peak value in June)

(3) for the total area of the Komering-I, the Lempuing and the Tulangbawang areas (92,700 ha):
107.2 m^3/sec /1 (peak value in July)

2.2 Drainage Water Requirements

2.2.1 Standard for Drainage Plan

Around 30% of the project area extends over low-lying and flat plain and suffers from maldrainage in every rainy season. If the lands are not drained well within a feasible range, the productivity will not go up even after the provision of well-designed irrigation facilities.

From the past experiments and observations in Japan /2 on the relation between the yield reduction rate of paddy and depth and duration of submergence at different growing stages of paddy, the following considerations could be made:

(a) The submergence at the growing stage of young panicle formation gives the serious damage to the yield of paddy, on the contrary, damage due to submergence at the stage of maturing is insignificant.

(b) The duration of submergence within 1 to 3 days is not significant, but damage of paddy remarkably increases due to submergence beyond 3 days.

/1 ; These diversion discharges include the irrigation water requirement (1.6 m^3/sec) for BK-I area in the Belitang Proper area as explained in Section 2.3.

/2 ; These are presented in "Hand Book on Yield Reduction Rates of Summer Crop due to Various Causes" published by the Ministry of Agriculture, Forestry and Fisheries of Japan in 1975.

(c) When a part of leaves still remains above water surface, the damage to paddy is decreased as compared with that when leaves are completely submerged.

While, the midest rainy season in the project area occurs in the period between November and April. The growing stage of paddy between middle stage of tillering and beginning stage of panicle formation would correspond to the midest rainy season.

Taking into account the above considerations, the following design standard would be applied for making the future drainage plan in the project.

(1) The allowable depth of submergence in the paddy fields should be 30 cm, and duration of submergence should not exceed 3 days.

(2) The submergence more than 30 cm in depth should not last more than 24 hours.

2.2.2 Drainage Requirement

In general, the criteria for the calculation of unit drainage requirement defines the rainfall intensity with certain probability and a drain period necessary for removal of excess water to an allowable extent. In the on-going irrigation projects in Indonesia, drainage requirements have been estimated by applying their own ways considering the natural and physical conditions prevailing over the project area.

In this study, the drainage requirements are estimated on the basis of following assumptions and procedures:

(1) Since long term and reliable daily rainfall data is available only at Belitang, the daily rainfall data at Belitang (1956 - 1980) are used for this study, and applied to all the development areas.

(2) Design rainfall is estimated to be 245 mm of 3 days consecutive rainfall at Belitang with a 10-year return period.

(3) Based on the average rainfall distribution pattern, the distribution percentage of the design daily rainfall is estimated as follows:

Distribution Percentage

Day	Pattern
1st day	33 %
2nd day	31 %
3rd day	36 %

(4) Relationship between rainfall and runoff distribution is assumed as follows:

Relationship between Cumulative Rainfall and Total Runoff

Cumulative Rainfall (mm)	Runoff Coefficient (f)
less than 10	0
10 - 30	0.1
30 - 50	0.3
50 - 100	0.5
100 - 300	0.8

Relationship between Rainfalland Runoff Distribution

Rainfall (mm)	1st day	2nd day	3rd day	4th day
less than 30	100	-	-	-
30 - 50	70	30	-	-
50 - 100	60	30	10	--
more than 100	50	30	15	5

(5) Based on the above assumptions, the drainage requirements are estimated as follows:

Design Rainfall (mm)	Cumulative Rainfall (mm)	f	Runoff (mm) 1st day	2nd day	3rd day	4th day	5th day
81	81	0.5	24.3	12.1	4.1	-	-
76	157	0.8	-	36.5	18.2	6.1	-
88	247	0.8	-	-	42.2	21.1	7.0
Total:			24.3	48.6	64.5	27.2	7.0
	Lit/sec/ha		2.8	5.6	7.5	3.1	0.8

From the above calculation, the design drainage requirement for the secondary and tertiary drains is determined to be 7.5 l/sec/ha which is defined as the peak requirement in the above calculation. As for the Belitang and the Macak rivers to be used as the main drains in this project, the drainage requirement is computed by using the "Rational Method" as shown in Table VII-6, considering the time lag of outflow to be caused due to their large drainage area.

2.3 Alternative Study on Diversion Works

2.3.1 General Conditions

In the comprehensive study made by JICA in 1980, two alternative headworks sites; Pracak and Perjaya sites, were examined from the technical and economical points of view, and it was concluded on the preliminary basis that the Pracak site might be more atractive than the Perjaya site. The further field investigation at those sites conducted in this stage, however, disclosed the following topographic, hydrological and geological conditions of those two sites:

(1) Headworks

(a) Pracak weir site

The river width is fairly narrow, approximately 130m. However, the ground level of the right bank is 10 to 20 m higher than the required intake water level. This will necessitate deep excavation for an intake and headreach construction.

The river bed underlies compacted and hard layers at 10 to 14 m below the river bed, which has a bearing capacity enough for foundation of the concrete diversion weir.

The flood water level for the flood with 100-year return period is confirmed to be 87.0 m, which is 7-m high from the river bed.

(b) Perjaya weir site

The Perjaya site is comparatively wide in river cross section.

It is approximately 170 m. The right bank is not so high and has flat topography.

Geology of foundation is of alternating layers of sandstone and claystone laying at around 10 m below the river bed with the standard penetration value of more than 50 and permeability coefficient of 10^{-4} to 10^{-5} cm/sec in the order. This site is also favourable in geology for the construction of concrete diversion weir.

The flood water level of 81.50 m is estimated for 100-year return period based on the past flood mark and the flood routing analysis using the non-uniform flow formula.

(2) Headreach

The alternative alignment of headreaches starting from both the Pracak and Perjaya headworks sites, which are one of the most influential factors for determination of the diversion plan of the project, are determined using the topographic maps on a scale of 1:5,000. The field investigation and topographic survey were also carried out along the routes proposed. The findings are as follows:

(a) Pracak headreach

The headreach runs through two portions of topography; undulating hilly area and flat area. The former extends from Pracak to Perjaya and the latter extends from Perjaya up to the proposed bifurcation site. The required length of headreach is approximately 18 km. The ground level of the hilly area ranges from EL. 80 m to EL. 100 m. Numerous natural streams flow to the Komering river across the proposed headreach route in the hilly area. In the flat area, mostly paddy field, the ground level is between EL.75m and EL.85m.

(b) Perjaya headreach

The Perjaya headreach passes through the existing paddy fields. Most of the area along the headreach route is fairly flat. The required length of headreach is approximately 8 km.

The ground level ranges from EL. 74 m to EL. 83 m.

The above findings will much affect the general features of the headworks and the headreach. The detailed technical and economical comparison, therefore, is needed in this stage study period. The principal characteristics of both sites are summarized below.

- River width : The river width is narrower at Pracak site (130m) than at the Perjaya site (170m)
- Geology : Geology of both sites is the hard layers underlying the river bed, which are favourable for concrete weir construction.
- Hydrology : The hydrological conditions are almost same at both sites.
- Topography : The long driving channel, leading water to a settling basin, is needed for the Pracak headreach. A long deep cut channel of approximate 8 km is also needed in the upper part of the Pracak headreach out of the total length of 18 km. Whereas, the Perjaya headreach is shallow in excavation over the whole reaches of 8 km.
- Intake water level : The high intake water level at Pracak site, 4 to 6 m higher than that at the Perjaya site, can ensure the increase in irrigation area in the order of 500 to 1,000 ha.
- Construction access : The Perjaya site provides more favourable access for construction and O & M purposes.

2.3.2 Alternative Study

(1) Alternative cases to be studied

The irrigation water taken at the headworks is conveyed by the long headreach to the irrigation areas which have gentle slope toward the Belitang Proper Area from both sides of the north and the south. In this condition, the water level at the lower end of the headreach

will largely affect the hectareage of the irrigation area. The major factors which influence the water level at the end of headreach are the crest level of a diversion weir and the hydraulic gradient of the headreach. Considering the abovementioned factors, the alternative study is made for the following cases.

(a) Different intake water level at the diversion weir site

The intake water levels will be determined with the following range.

- The maximum intake water level is so determined that the design flood water level in the upstream of the diversion weir does not exceed for 0.5 m above the flood water level with 100-year return period.
- The minimum water level is taken to be 1.0 m lower than the elevation of the second bottom of river at the weir site.

Within the above range of the intake water level, the following cases are established taking 1.0 m interval of the water level.

	Alternative intake water level (m)			
	Case 1	Case 2	Case 3	Case 4
Pracak Site	86.60	85.60	84.60	-
Perjaya Site	81.30	80.30	79.30	78.30

(b) Lining of headreach

The canal will be constructed with the comparatively low velocity within the permissible range. The gentle slope of canal will increase the canal section and the canal reservation area. The lined canals, such as concrete lined and masonry lined canals are the oposite case. In order to examine the advantage of canal lining with respect of the saving of construction cost, three canal types are taken into account in the comparison; concrete lining, masonry lining and unlined canals.

As for the construction cost per unit canal lining area, the cost of concrete lining is rather cheaper than that of masonry lining.

In addition, the time required for lining work of concrete canal would be much shorter than that of masonry work.

(c) Hydraulic gradient

Although the steep gradients of canals much economize the construction of canals, the irrigation area will decrease by the lowered elevation at the end of the headreach. In this context, three kinds of alternative gradients are considered within the limit of the allowable velocities for the above respective lining types.

(2) Design conditions

(a) Headworks

The preliminary design of headworks is made for the comparison under the following conditions:

- Diversion weirs for both sites are of concrete weir type.
- Crest level of the overflow portion of weir is to be the same as intake water level of headreach in each case.
- A movable weir is provided at the right side of the weir to maintain the back water level of the river below the design flood level.
- Bottom level of intake structure is to be set at 1.5 m above the river bed.
- Hydraulic gradient of a driving channel is determined to have enough flow velocity to eject the sediment materials transported.
- Settling basins are provided at the site suitable for ejecting the settlement materials gravitationally.

The preliminary designs of the headworks at the two alternative sites for the different weir crest levels were made and the typical cases for each site are shown in Fig. VII-4 and Fig. VII-5. The construction costs of headwarks for the respective sites with the different water levels are estimated as shown in Table VII-7. They consist of the construction costs of intake weir, intake, driving channel

and settling basin. As far as the construction cost of the headworks is concerned, the Pracak site is more economical than the Perjaya site mainly due to economical construction cost of weir.

(b) *Headreach*

In general the steep hydraulic gradient of headreach provides economical construction costs but reduces the irrigable land to some extent. Accordingly, numerous cases of conbination of weir heights and hydraulic characteristics of the headreach are conceivable with respect of the construction costs and the ensured irrigation area. In this comparison, three hydraulic profiles of the headreach are examined, starting from the alternative intake water levels at both weir sites.

The maximum canal slope is determined from the permissible velocity of 0.8 m in earth canal and that of 2.0 m in concrete lined canal. Based on the water levels at the lower end of the headreach, the irrigable area is delineated and estimated. Then, the construction costs of the headreach and the canal reservation area are estimated for the respective case as shown in Table VII-8.

2.3.3 Conclusion

The alternative cases differ in the extent of the irrigation area as well as the construction cost. In determination of the most economical diversion plan, the annual equivalent construction cost of the headworks and the headreach including the O & M costs per unit irrigation area is used as an index in this comparison. The result is summarized in Table VII-8. As shown in the table, the most economical diversion plan of the project is :

- Headworks
  - Weir site : Perjaya site
  - Intake water level : El. 79.30 m
- Headrach
  - Canal type : Earth canal
  - Canal slope : 1 / 8,000

- Irrigation area : 36,700 ha

The conclusion is obtained by the following main reasons:

(1) The difference in the maximum extent of the irrigation area between the Pracak and Perjaya headworks plans is only about 1,000 ha, whereas that estimated in the previous study was about 2,300 ha. The hydrological and topographic conditions of the Perjaya site disclosed in this stage make it possible to raise the intake water level 2.0 m higher than that estimated in the previous study, which results in decreasing the difference of irrigation area between two sites.

(2) Considerable number of crossing structures for the existing streams and a large crossing structure for the National Railway and Highway are required in the case of Pracak headworks, resulting in increasing construction cost.

(3) Earth excavation volume in the headreach in the case of Pracak headworks is substantially larger than that in case of Perjaya headworks because of two reasons, phisically longer distance of headreach required and route passing along the hilly land. Moreover, rock excavation is required for the construction of the headreach in the Pracak case.

(4) It is disclosed that the location of a settling basin of the Pracak headworks is shifted for approximately 1 km downstream from the previously planned location, to make sure the natural flushing out of sediment loads deposited in the settling basin. This shifting of the settling basin increases the length of a driving channel, resulting in the increase of construction cost of the Pracak headworks.

2.4 Alternative Study on Development Strategy for Diversion Works

2.4.1 General

It is concluded in the previous study that the irrigation area in the upper Komering river basin of about 125,000 ha consisting of five irrigation projects can be served from the Komering river with provision of reservoirs in its upper reaches, and the stage-wise development has been suggested. The Komering-I Irrigation Project, now under study, is recommended as the first stage development project.

According to the geographical location of the Komering river and the irrigation areas of the selected projects, the irrigation water of the Lempuing and Tulangbawang Project Areas has to be served through the irrigation system of the Komering-I Project.

The Muncak Kabau Project is planned to take water from an intake structure to be constructed on the right bank of the Komering river near village Muncak Kabau, which is far downstream from Perjaya headworks site. In view of the relation of the water levels in the river and a headreach to be constructed the Muncak Kabau intake site will have no suitable locations for a settling basin to be able to eject the sediment materials gravitationally to the Komering river. The artificial removal of the loads is absolutely needed. To cope with the expected expensive dredging works, the diversion of water from the Komering-I system is conceived.

The existing Belitang Proper Area of 20,600 ha, for which the irrigation water is presently taken from BK-0 at Kurugan Nyava, is constrained with a low intake capacity and silt deposit in its headreach. Similarly to the Muncak Kabau Project, the unification of the intake of the Belitang Proper Area to the Komering-I headworks can be conceived.

In determination of the system capacity of the headworks and the headreach of the Komering-I Project, the abovementioned requirements and possibility should be taken into account.

2.4.2 Consideration of the Future Development of Lempuing and Tulangbawang Projects

The development of the Lempuing and Tulangbawang Projects will follow the realization of the Komering-I Project according to their priority order. It is worthy to study whether the headworks and the headreach of the Komering-I Project have to be constructed with the increased capacities for the future development projects from the initial construction stage, or extension of their capacities to be carried out at their development stages is economical.

In this context, the following alternative plans are established.

(1) Consideration to development of the Lempuing Project

The Lempuing area extends on the northeast of the Komering-I area. The irrigation water for this project will be diverted throuth the Perjaya headworks, the headreach and the North Main Canal of the Komering-I irrigation system. Therefore, the following cases are compared.

Case-1 : Joint construction of the related facilities with an increased capacity after inclusion of water for Lempuing area

Case-2 : Future expansion of the related facilities at the implementation stage of Lempuing area.

The construction cost estimate for each case is as shown in Table VII-9.

(2) Consideration to development of the Tulangbawang Project

The irrigation water of the Tulangbawang area will be diverted from the South Main Canal as mentioned above. Similarly to the Lempuing area, the following alternative cases are compared:

Case-1 : Joint construction of the related facilities with an increased capacity after inclusion of water for Tulangbawang area

Case-2 : Future expansion of the related facilities at the implementation stage of Tulangbawang area

The construction cost estimate for each case is as shown in Table VII-10.

According to the estimated costs, the joint construction sequence, that is to construct the headworks, headreach and other related facilities required for the Lempuing or the Tulangbawang area during the Komering-I Project works, is much economical in terms of the initial investment. However, the pre-invested capital does not get effective until the respective irrigation projects have been realized. In making the best choice of the economical construction sequence between the above-mentioned alternative cases, the economic comparison by means of internal rate of return (IRR) is made, by assuming the different length of time span from the start of the Komering-I Project works to the realization of the Lempuing and Tulangbawang Projects. The results are as shown in Fig. VII-6 and Fig. VII-7.

In both cases of the Lempuing and the Tulangbawang Projects, the IRR for the case of the joint construction is higher than that of the expansion works only within the time of three to four years after the start of the Komering-I Project works. This indicates that it is not economical to construct the headworks and headreach of the Komering-I Project with the increased capacities to meet the future development of the Lempuing and the Tulangbawang Projects, except for realization of such projects in the near future of 5 years after the start of the Komering-I Project.

Consequently, since the development of the Lempuing and the Tulangbawang Projects will follow the Komering-I Project and it is unlikely to be realized within 5 years after the start of the Komering-I Project it is proposed that the Perjaya headworks and headreach should be constructed with the capacity only for the Komering-I Project Area at the initial stage.

2.4.3 Economic Comparison on Integration of Intake of the Belitang Proper Area

The irrigation water for the Belitang Proper Area of 20,600 ha is presently taken from BK-0 at Kurungan Nyawa. The BK-0 intake structure, however, does not function enough to serve the whole irrigation area. The water level in the headreach is regulated and raised to irrigate the elevated land of the upper part of the Belitang Proper Area by BK-1; a check structure with turnout locating at about 7 km downstream of BK-0 in order to divert the water to its command area. This raising of water level makes a hydraulic gradient mild in the headreach of the Belitang Irrigation Canal, resulting in the low intake in BK-0 and low flow capacity.

In addition, since there is no provision of a settling basin in the BK-0, a large amount of the sediment loads is deposited in the headreach. It is estimated at about 30,000 m^3 per year at present. The maintenance will be needed by means of dredging continuously.

The above-mentioned unfavourable conditions in Proper area will be improved with the following countermeasures to be taken upon implementation of the Komering-I Project.

Case-1 : Water supply to the high elevated area from the Komering-I system

The water level in the headreach of the Belitang Irrigation Canal is raised at BK-1 to irrigate the elevated area of about 1,300 ha covered by BK-1 and this is one of the causes of the low intake capacity of BK-0 as mentioned previously. According to the results of the field investigation and hydraulic analysis of the headreach, the present Belitang Irrigation Canal can convey the water required of the whole Belitang Proper Area, if the hydraulic gradient of the headreach is improved by lowering of the water level at BK-1. Therefore, the following plan is conceived with respect of the irrigation system capacity of Komering-I Project and the improvement of the unfavourable hydraulic conditions of the Proper area:

- The irrigation water for the elevated area about 1,300 ha commanded by BK-1 is supplied from the Komering-I system.
- Regulating stoplogs provided at BK-1, which are the main cause to reduce the hydraulic gradient in the headreach, are removed.
- Sediment problem in the headreach remains. Annual sediment loads are estimated to be 104,000 m^3 based on the design discharge of 25 m^3/sec.

Case-2 : Diversion of the whole required water of the Proper area from the Komering-I system

The North Main Canal of the Komering-I system crosses over the Belitang Irrigation Canal with an adequate water level to supply water to the Proper area. The irrigation water for the Proper area can be diverted from the Komering-I system when the headworks, headreach and North Main Canal of the Komering-I system are constructed with the increased capacities for the Proper area. Consequently, the adequate irrigation water for the whole Proper area will be secured and the expensive O & M of the Belitang Irrigation Canal due to desilting work will become needless. Although the micro-hydropower generation in the order of 1,000 kW can be conceived at the inlet point from the Komering-I system using the head difference between the Belitang Irrigation Canal and the Komering North Main Canal, this benefit is not counted in the comparative study.

In order to determine the most economical plan to solve the hydraulic constraint of the Proper Area, the economic comparison was made for the above two cases. The construction costs and related annual costs for each case are estimated as shown in Table VII-11. According to the result, the Case-1 is more economical than the Case-2.

Consequently, the headworks, headreach and North Main Canal and related canal of the Komering-I Project are constructed with the increased capacities to be able to supply water of 1.6 m^3/sec only for the upper part of the Proper area, 1,300 ha covered by BK-1.

2.4.4 Economic Comparison on Integration of Intake of the Muncak Kabau Project

In the previous study, the intake structure for Muncak Kabau Project is contemplated on the right bank of the Komering river in the vicinity of the village Muncak Kabau. No diversion weir is planned to be constructed because of considerable costs required for diversion weir if constructed. Since there is no adequate difference in water level between the river and canal, the removal of sediment loads will have to be conducted by means of dredging. In consideration of the ground level of the Muncak Kabau Project Area and the water level of the Komering-I North Main Canal, the diversion of water to the Muncak Kabau from the Komering-I system is easily made with provision of short length of a connecting channel.

In determination of the irrigation system capacity of the Komering-I system, the economic comparison on unification of the intake structure of the Muncak Kabau Project into the Komering-I system is needed.

Case-1 : Water intake through own intake near Muncak Kabau

The relating costs to the comparison are the construction costs of intake structure, settling basin and headreach, and the annual cost for O & M of the related facilities and dredging.

Case-2 : Diversion of water from Komering-I system

The comparative costs concerned are the allocated construction costs of the headworks, headreach and North Main Canal, the construction

cost of a connecting channel, and the annual cost for O & M of the related facilities.

The cost estimate and comparison for the above cases are as shown in Table VII-12. As clearly shown in the table, the Case-1 is more economical than the Case-2 in terms of the annual cost.

The irrigation system of the Komering-I Project is constructed not to include the diversion capacity for the Muncak Kabau Project.

3. PLANNING AND DESIGN OF PROJECT FACILITES

3.1 General

The major feature of the Komering-I Irrigation Development Project is to supply irrigation water of 44.1 m^3/sec [1] at the maximum to the area of 36,700 ha from the Komering river. The facilities required for the project include regulating dam, headworks, headreach, canals and their relevant structures, drainage facilities and farm roads.

The basis for determining the facility requirements for each function is that enough project facilities be provided in the most effective and economical manner so that each function can be combined with the fully compatible with the other farming operations required at each stage of development. Based on the above requirements, the following planning and preliminary design of project facilities are prepared. The general features of the project facilities designed are summarized in Table VII-13.

3.2 Ranau Regulating Dam

3.2.1 General

The main function of this dam is to regulate the discharge from Lake Ranau. The lake is located in the upmost of the Komering river. It has 127 km^2 of water surface area at HWL. 542.5 m from the mean sea water level and about 508 km^2 of catchment area. Active storage capacity of the lake would be around 300 million m^3 using 2.5 m of the operating depth.

In order to utilize this large water body efficiently for irrigation and other purposes, the present outflow pattern of the lake should be regulated to the following pattern as mentioned in the comprehensive study made by JICA in 1980.

(Unit: m^3/sec)

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
12	12	12	12	12	30	50	20	15	12	12	12

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[1] : If the future development area of 56,100 ha (the Tulangbawang and Lempuing areas) is included, design discharge would be around 107 m^3/sec.

3.2.2 Selection of Site

For the selection of the regulating dam site, the following items are surveyed and checked on the preliminary basis.

(a) Topography and geology of the site

i) Narrow portion of the river course will first be selected.

ii) The site where stable rock foundation exists is preferable.

iii) The river course of the site should be stable.

iv) Considering the Ranau hydropower project in future, the dam site should be favorable for the hydropower project also.

(b) Construction

The site should provide easy and cheap construction work.

(c) Operation and Maintenance

The site should provide good access for operation and maintenance.

Taking into consideration the above items, the regulating dam site is selected at 2.3 km downstream from the outlet of Lake Ranau.

3.2.3 Basic Conditions for Design

Based on the results of reconnaissance survey and water depth soundings of Lake Ranau, the following basic conditions for the design are established.

(1) Hydrological and hydraulic conditions

Regulation of outflow: The regulation of the outflow from the lake will be made using the active capacity of around 300 million m^3 which will be created by providing the drawdown of 2.5 m from the WL. 543.0 m to 540.5 m.

Design discharge: Considering the future regulation pattern of outflow mentioned in the section 3.2.1 hereof, the peak discharge of 50 m^3/sec is taken as the design discharge.

Design water level: Following the regulation method mentioned above, EL. 543.0 m and EL. 539.0 m are taken as design high water level and design low water level for the design of regulating dam, respectively.

Design flood: There is no need of consideration for design flood, because the outflow pattern from the lake varies only within the range from 15 m^3/sec to 20 m^3/sec throughout the year.

(2) Geological conditions at the site

As stated in Section 5.4 of ANNEX-III, the base rock of the propsed dam site is composed of the ryolitic andwelded tuff, having a thickness of more than 20 meters. The results of field permeability test show that the permeability coefficient in the base rock is in order of 10^{-4} to 10^{-7} cm/sec. From the above results, geological condition of this site is favorable as the foundation of the proposed dam.

3.2.4 Specific Design Conditions

The regulating dam consists of concrete dam portion, gated weir and stilling basin. In order to give the design capacity of 50 m^3/sec to the Selabung river at the design low water level, the expansion of the river is required particularly between the outlet of Lake Ranau and the rapid located at 0.6 km downstream from the dam site. The followings are specific conditions for the design of respective portion of the dam.

(1) Concrete dam portion

(a) Since there exists good rock foundation at the site, the dam is of gravity type supported by rock foundation.

(b) The dam crest is one meter higher than the design high water level.

(c) The weir is stable against the overturning, sliding and overstressing.

(2) Gated weir portion

(a) The weir portion is of overflow type to simplify the operation and maintenance of the gates.

(b) The length and height of weir is so determined as to give a design flow capacity at the design low water level. The length of weir is taken to be the same as the width of the upstream channel.

(c) Since the gate is manually operated, the weight of gate is limited to 2.5 - 3.5 tons/unit.

3.3 Headworks

3.2.1 General

The main function of headworks is to introduce the required quantity of irrigation water from the Komering river to the project area at every stage of river water. In order to fulfil this purpose, the structure should be stable against floods and other forces, and should not hamper the river flow, navigation and others.

The headworks consists of various components such as fixed weir, movable weir, intake, miscellaneous structures and operating facilities. For the well functioning as the headworks, each function mentioned above should be combined with and fully compatible with each other.

3.3.2 Basic Conditions for Design

For the preliminary design of Perjaya headworks, the following basic conditions are established.

(1) Hydrological and hydraulic conditions

Design flood discharge: The flood with 100-year return period, 1,398 m^3/sec, is taken as the design flood discharge.

Design flood water level: By using the non-uniform flow formula and the natural river gradient and cross section, the river water level at the headworks site for the design flood discharge of 1,398 m^3/sec is calculated to be El.81.5 m. By adding 0.3 m of back-water affection to the upstream by the weir construction, the design flood

water level is obtained to be EL.81.8 m, which will not give any damages to the houses, bridges and farmlands along the upstream.

Design intake discharge: The design intake discharge is taken as the peak diversion requirements of 44.1 m^3/sec[/1] for Komering-I area as estimated in Section 2.1.

Design intake water level: Following the result of the alternative study of diversion works, the design intake water level is determined to be EL. 79.30 m.

(2) Geological conditions at the site

The results of the geological investigation at the weir site show that the compact and massive layer strong enough for the construction of weir exists at the depth of 5 to 11 m from the ground surface or river bed. The permeability coefficient of this layer is observed to be around 10^{-5} cm/sec.

3.3.3 Specific Design Conditions

The Perjaya headworks is composed of diversion weir, intake structure, driving channel and settling basin. The diversion weir is facilitated with a raft way and a fish ladder as well as the fixed weir and movable weir. The following specific conditions are established for the design of respective structure.

(1) Movable weir

(a) The structure is designed for super critical flow in order to flush out the bed load.

(b) Net width of movable weir is so determined as to keep the back-water level below the design flood water level.

(c) Top elevation of gates for movable weir has an allowance of around 10 cm above the design intake water level.

/1: This diversion discharge includes the requirement of 1.6 m^3/sec for BK-1 area (1,300 ha) of Belitang Proper Area.

(d) Height of base floor of the movable weir is so determined as to give smooth flushing-out of river bed loads.

(e) The gates are operated by motor, considering the heavy weight of the gates and frequency of operation.

(f) The gate width and number are determined after economic comparison and further taking into consideration the passing of drift wood between the gate piers.

(g) Height of gate pier is determined using the following equation:

$$EP = FWL + HG + h1 + H2$$

Where,

EP : Required height of gate pier
FWL: Design flood water level (EL.81.8 m)
HG : Height of gate (5.4 m)
H1 : Clearance between the design flood water level and the bottom of gate in the full open position ($\doteqdot$ 1.0 m)
H2 : Allowance between the crest of gate and the top of pier ($\doteqdot$ 1.0 m)

(h) Thickness of gate pier will be determined using the folloving empirical formula:

$$Tp = 0.12\ (Hp + 0.2\ Bi) \pm 0.25$$

Where,

Tp : Required thickness of gate pier
Hp : Height of gate pier (16.6 m)
Bi : Span length between piers (20.0 m)

(3) Fixed weir

(a) The crest elevation of fixed weir is given to be the same as the intake water level of EL. 79.30 m.

(b) The length of weir is determined to be 171 m considering the river width.

(c) Shape of weir is hydraulically favourable for the overflow of flood water.

(4) Apron

(a) Apron is provided to protect the river bed against erosion and to increase the creep length.

(b) Required lengths of upstream and downstream aprons are calculated as follows.

- for the upstream apron:

Taking into consideration the future extension of intake structure, the length of upstream apron is determined to be 88 m.

- for the downstream apron:

$$\ell = 0.9\ C\ \sqrt{Ha}$$

Where,

ℓ : Required length of downstream apron,

C : Coefficient after Bligh's formula (= 15, for coarse sand),

Ha : Difference of height between the top of weir crest (height of gate in case of movable weir) and downstream apron (= 5.4 m).

(c) Thickness of the apron is calculated by the following formula:

$$Ta \geqq \frac{4}{3} \times \frac{Pu}{g-1}$$

Where,

Ta : Thickness of apron

Pu : Uplift pressure (1.8 m)

g : Specific gravity of the concrete (2.3)

(5) Raft Way

(a) This structure is provided only for raft passing.

(b) Width of the raft way is 8 meters.

(c) The raft way is of chute type with a draft of 1 meter.

(6) Intake Structure

(a) Bottom height of intake structure fulfils the following two conditions:

(i) ELi ≧ ELs + 1.50

(ii) ELi ≧ (FWL - ELs) x 1/6

Where,

ELi : Required bottom height of intake structure
ELs : Height of base floor of scouring sluice
FWL : Design flood water level (81.8 m)

(b) Flow velocity at the intake gate is 0.7 m/sec.

(c) Net width of intake structure is calculated using the following formula:

$$B = Q/hl \cdot vl$$

Where,

B : Required net width of intake structure
Q : Design intake discharge (44.1 m^3/sec)
hl : Intake water depth (3.0 m)
vl : Intake water velocity (0.7 m/sec)

(d) The operation of gates is done combinedly by motor and manual. The size of gates is decided after cost comparative study among the various sizes.

(7) Driving Channel

The driving channel between the intake structure and settling basin is designed under the following conditions:

(a) Type of canal : Trapezoidal
(b) Lining material : Concrete
(c) Side slope of canal : 1:1.5

(8) Settling Basin

(a) The location of settling basin is at 1.6-km downstream from the intake structure.

(b) The settling basin is divided into two units from a standpoint of operation and maintenance.

(c) The design discharge for settling basin of one unit is 22 m^3/sec.

(d) The maximum daily sediment load is estimated as follows.

$$Vs = Ds \times Q \times 86{,}400 \ (m^3/day)$$

Where,

Vs : Daily sediment load

Ds : Annual sediment production rate (3×10^{-4} m^3 per 1 m^3/sec of irrigation water /1)

Q : Design discharge (22 m^3/sec)

(e) The minimum particle size of sediment loads considered in the design is 0.3 mm.

(f) The required length of settling basin is calculated using the following formula:

$$L = K \frac{H \cdot V}{Vg}$$

Where,

L : Required length of settling basing

K : Safety ractor ($\doteqdot$ 1.5)

H : Design water depth in the settling basin (2.0 m)

v : Design flow velocity in the settling basin (0.3 m/sec)

Vg : Sinking speed of 0.3 mm suspended load (0.03 m/sec)

(g) The required width of settling basin is calculating using the following equation:

$$B = \frac{Q}{H \cdot v}$$

Where,

B : Required width of settling basin

Q : Design discharge in the settling basin (22 m^3/sec)

H : Design water depth in the settling basin (2.0 m)

v : Design flow velocity in the settling basin (0.3 m/sec)

(h) Sediment load in the settling basin is flushed out to the Komering river with gravity flow within four hours.

/1: This figure is estimated based on the observation results in the Belitang Proper Main Canal.

(8) Foundation work

(a) The foundation of gate pier and weir body is of floating type supported by piles.

(b) Particular foundation treatment is not needed for the construction of apron.

(c) The foundation of intake structure is independent from those of other structures.

3.4 Irrigation Canal System

3.4.1 Function and Requirement of Canal

Irrigation canal system in the project area includes headreach, main canals, secondary canals, and tertiary systems. The layout planning of these canals is done after understanding their respective function and requirement mentioned below.

(1) Headreach

A headreach will be constructed between the headworks and a bifurcation structure to lead irrigation water to South and North Main canals. Before the design is made, it is necessary to make cost comparative study between unlined and lined cases. For the lined case, canal section will become smaller and excavation volume will be reduced to great extent, though lining cost will be high. Furthermore, for the selection of lining materials, comparative study among concrete lining, masonry lining and other materials is made for their technical and economical merits.

The above comparative studies are incorporated in the alternative study for the selection of headworks site described in Section 2.3.

(2) Main canals

In the project area, there are three main canals; South Main Canal, North Main Canal and Pisang Main Canal. The main function of the main canal is to deliver irrigation water from the headreach to development area in the shortest or in the most economical way. The canals is basically unlined and trapezoidal. The raised portion is lined with concrete.

(3) Secondary canal

This canal is branched off from the main canal to distribute water up to the secondary unit area. The size of secondary unit area varies from 500 to 2,000 ha which is divided into around 5 to 20 tertiary blocks. The canal is principally unlined, but the raised canal portion is lined with concrete.

(4) Tertiary system

The tertiary block includes one tertiary canal and 10 - 15 quaternary canals. The maximum size of tertiary block is 150 ha. Whereas, a quaternary canal covers 10 - 15 ha (for details vide Section 3.7 hereof).

3.4.2 Layout Planning of Canal

The layout planning of canals is done through the following procedure.

(1) Layout planning on map

Before start of field survey, a layout planning of canals is made on the map. For this work, the map on a scale of 1/5,000 prepared by JICA in 1980 is used. In the planning, the following matters are taken into consideration.

(a) Canal alignment should be straight and short as much as possible.

(b) The alignment should be planned so as not to pass through village areas and not to give damages to public facilities.

(c) Embankment portions should be minimized as much as possible.

(d) Canal construction cost should be minimized by selecting the proper alignment.

(e) Canal water level should be kept as high as possible for easy operation of canal system.

(f) The canal layout should be convenient for the grouping of future water users' association.

(2) Field survey

(a) Based on the layout planning prepared on the map, the detailed field reconnaissance is made along the alignments to know the

micro-topography, hydrological conditions and soil conditions, and to collect farmers' opinion toward the development plan.

(b) The following topographic survey are carried out for the layout planning and preliminary design:

- check leveling for existing benchmarks,
- route survey along the major canals such as headreach and main canals,
- cross section survey along headreach.

(c) Geological investigation including drilling, field penetration tests and water pressure tests are carried out at the major structure sites along the headreach by the Government of Indonesia.

(d) Soil mechanical survey carried out in this planning stage includes:

- penetration tests at main structure sites,
- soil mechanical survey along the headreach and main canals and soil mechanical tests in laboratory,
- measurement of groundwater table along the major canal routes.

(e) The construction material survey is made for their availabilities and prices.

(f) For the layout planning, agricultural, economical and sociological data are also collected.

3.4.3 Design of Irrigation Canal

(1) Design discharge

Based on the irrigation water requirement calculated in Section 2.1 hereof, the design discharges for the headreach and the main canals are obtained as shown in Fig. VII-8. As for the secondary and the tertiary canals, the design discharge for respective canal is calculated as follows:

(a) The design discharge for the secondary canal is calculated based on the unit irrigation water requirements for each cropping pattern obtained in Section 2.1.3 hereof. The unit irrigation water requirements are as follows:

- for Cropping Pattern-I area ; 1.28 lit/sec/ha
- for Cropping Pattern-II area ; 1.12 lit/sec/ha

(b) The design discharge for the tertiary canal is calculated by using the following formula.

$$Q = 5.32 \times a \times A^{2/3}$$

where, Q : design discharge (lit/sec)

a : unit irrigation water requirement (lit/sec/ha)
1.28 lit/sec/ha for Cropping Pattern-I area
1.12 lit/sec/ha for Cropping Pattern-II area

A : commanding area (ha)

(2) Velocity

The maximum permissible velocity in unlined canals is determined so as not to give the erosion, the minimum permissible velocity is determined so as not to induce the growth of aquatic plant and moss. Considering the characteristics of soil materials and the conditions of aquatic vegetation in the Komering river, the maximum and minimum permissible velocities are determined as follows:

- Maximum velocity : 0.8 m/sec
- Minimum velocity : 0.3 m/sec

(3) Roughness coefficient

The roughness coefficients of the canals for determination of their hydraulic properties are as follows:

	n-value after Manning Formula
- Earth canal	
$Q \geq 3$ m^3/sec :	0.0225
$Q < 3$ m^3/sec :	0.025
- Concrete lined portion :	0.015

(4) Freeboard

The freeboard height is normally subject to canal size and location, velocity, water surface fluctuations caused by check gates and wind action and availability of materials for embankment. The minimum freeboard for

the respective canal discharge is determined as follows:

Discharge (m^3/sec)	Freeboard (m)
$Q \leq 0.3$	0.3
$0.3 < Q \leq 1.0$	0.3 - 0.5
$1.0 < Q \leq 7.5$	0.5 - 0.6
$7.5 < Q \leq 25.0$	0.6 - 0.9
$25.0 < Q \leq 44.1$	0.9 - 1.2

(5) Canal base width/water depth (B/h) ratio

Ratio of canal base width and water depth is determined with reference to the criteria of L.P.M.A.[/1] of Indonesia. For the headreach design, however, more hydraulically economical section, i.e. the smaller ratio than the criteria, is adopted in order to reduce the canal excavation volume. The criteria of B/h ratio is summarized as follows:.

Discharge (m^3/sec)	B/h ratio
$Q \leq 0.3$	1.0
$0.3 < Q \leq 1.5$	1.0 - 2.0
$1.5 < Q \leq 4.5$	2.0 - 3.0
$4.5 < Q \leq 7.5$	3.0 - 4.0
$7.5 < Q \leq 11.0$	4.0 - 5.0
$11.0 < Q \leq 25.0$	5.0 - 8.0

(6) Side slope

The side slope of 1:1.5 is adopted for the design of both earth and lined canals taking into account the results of soil mechanical investigations.

(7) Lining of canal

For the raised portion of the earth canal, particularly for the main and the secondary canals is lined with 10-cm thick plain concrete to check seepage.

/1: L.P.M.A.: Lembaga Penyeledikian Masalah Air (Institute of Research for Hydraulics and Hydrology), Bandung.

3.4 Design of Related Structures

A number of canal structures of various type are required in conjunction with the irrigation canals. The configurations of these structures are selected properly considering their functions, canal layout, operational program and social conditions in the project area.

(1) Bifurcation structure

A bifurcation structure is constructed at the end of headreach to distribute irrigation water strictly to the South and North Main Canals in accordance with the design water requirements. The structure is partitioned into two channels by concrete wall and these channels will lead irrigation water to the South and North Main Canals respectively. Each channel is provided with steel gates for the control of discharge to the main canal.

(2) Check gate

In order to maintain the required water level at the site of diversion or off-taking even during periods of partial discharge, a check gate is provided where a number of turnouts is densely provided or where fairly large discharge is diverted. Over the project canals, two types of check gates is constructed depending on the topography along the canal. One type simply has a function as a check gate and the other type is of combined type with drop structure.

At the sites where farm road crossings are required from the viewpoint of canal and road layouts, concrete slabs are provided on the check gates. Other check gates will be provided with only foot path crossings.

(3) Turnout

Turnout is constructed to divert the required water from a parent canal to its branch canal. The free flow type of turnout is introduced for this project. The rectangular box barrel or precast concrete pipe to cross the road or canal embankment is adopted depending on the discharge. The rectangular box barrel is applied for discharge more than 0.6 m^3/sec. All the turnouts are designed for full capacity at every water surface regulated by the check gate.

(4) Aqueduct

An aqueduct will be constructed to transport irrigation water across a canal or river. For the aqueduct on the North Main Canal to cross over the Belitang Irrigation canal, a free flow type of aqueduct is constructed so as not to change the present hydraulic condition in the canal.
As for the aqueduct on the Pisang Main Canal for crossing the Pisang river, a pressure flow type is applied taking into consideration the around 30 m-depth of the river. The steel pipe of 1,500 mm in diameter is used for the barrel portion.

(5) Bridge and culvert

A bridge or culvert is constructed where a road crosses over the canal. These bridges and culverts are strong enough for the increase of heavy traffic after the project implementation. For selection of bridge or culvert, a comparative study of construction cost is made between them considering the cutting depth of canal and canal width, and has drawn the preliminary conclusion that the construction of bridge is more economical for the main canal with design capacity of 2 m^3/sec. The maximum span length is 10 m and a concrete T-beam type is applied.

(6) Spillway

A spillway is constructed in the canal system for the purpose of flushing off all the water in the canals or spilling out excess flow in case of emergency and clearing and repairing canals. This structure is provided in the mid-course of respective main canal and at the end of secondary canal. All the spillways are equipped with slide gates (waste-way) and connected to the nearby drainage canals.

(7) Crossdrain

A crossdrain is constructed at the site where the irrigation canal runs across a depressed land or natural stream. As the crossing structure, a rectangular-shaped barrel or precast concrete pipe is laid under the irrigation canal. The former is used for the design discharge of more than 1.0 m^3/sec, and the latter is for less than 1.0 m^3/sec.

(8) Water measuring device

There is no doubt that the conventional use of water for agriculture is, to some extent, wasteful. There is considerable room for economy in water use, and effort should increasingly be made toward eliminating waste and harmful irrigation practices which give rise to waterlogging. For this, accurate and reliable measurement is essential, as this can be accomplished by knowing with reasonable accuracy; the amount of water being diverted and delivered. Water measurement is also needed to establish charges to water users, if required. In this context, the installation of following measuring devices is proposed for the respective canal system.

Place of installation	Measuring devices
- for intake structure	Gauging staff
- for bifurcation structure	Broad crested weir type
- for main canal	1. Gauging staff at check gate
	2. Broad crested weir type at check gate
- for secondary canal	1. Romijn gate at turnout (upto 1 m^3/sec)
	2. Cipolletti weir at turnout
- for tertiary canal	1. Romijn gate at turnout
	2. Cipolletti weir at turnout

3.5 Drainage Canal System

3.5.1 Function and Requirement of Drainage Canal

The drainage canals are classified by function as follows:

(a) Quaternary drain is provided to drain out excessive water in fields and to lower or control the subsurface water level.

(b) Tertiary drain is provided to drain out the excessive water and subsurface water collected by the quaternary drain to secondary drain or directly to river.

(c) Main and secondary drains transport water from field drains and collector drains to outlets or disposal points.

The layout of the irrigation system and topography are the main factors determining the location of all the drainage canals.

Quaternary and tertiary drain

Detailed description will be made in Section 3.7 hereof.

Secondary drain

These drains are designed to collect water from quaternary drains and tertiary drains and to transport to main drains or rivers. Depressed areas or old stream beds are used for location of the secondary drains.

Main drain

The location of main drain is dominated by natural streams and rivers crisscrossing in the development area. These natural streams and rivers are used as much as possible as the main drains.

3.5.2 Layout Planning of Drainage Canal

The layout planning of drainage canals is carried out through the following procedure.

(1) Establishment of basic concepts

First of all, the following basic concepts for planning the drainage system are confirmed.

(a) What extent should the area be protected against the floods from the river ?

(b) Where should the main drainage canal or disposal points be located ?

(c) How will the excessive water in the area be collected and transported to the disposal points ?

(d) Is there any necessity of mechanical drain ?

(e) What extent can the drainage benefit be expected after the project implementation ?

(2) Field survey

(a) Field damage due to floods and mal-drainage is surveyed for its

extent and magnitude.

(b) Present drainage mechanism is observed in the project area and in its vicinal areas.

(c) Reconnaissances along the Macak and Belitang rivers are made to check the highest flood water level in the past and their present flow capacities.

(d) Sub-surface water level is observed by digging several pits in the representative sites.

(e) Rainfall data is calculated for the analysis of the intensity and duration of rainfall in the area and estimation of drainage requirements.

(f) Present land use in the area is surveyed for the use of analysis on drainage requirements.

(g) Soil characteristics in the area is surveyed on the reconnaissance basis.

(h) Present farming practices and socio and agro-economic surveys area carried out in the project area and in its vicinal areas.

(3) Preliminary study of drainage canal layout

Based on the result of field survey mentioned above, preliminary layout of the drainage canal system is planned on the topographic map on a scale of 1/5,000 prepared by JICA in 1980 and map on a scale of 1/50,000 prepared by PAO in 1974. In the planning, the following matters is fully taken into consideration.

(a) Drainage water requirements, drainage method, required canal elevations at key points and general layout of drainage system are first confirmed.

(b) Drainage alignment is planned along the lowest land and as straight as possible.

(c) The alignment is planned so as not to pass through village areas and not to give damages to public facilities.

(d) Raised portions of drain are minimized in order to keep

canal water level below ground surface as much as possible.

(e) Alternative study is made to assure the suitable alignment. In this alternative study, canal slope, kind, type and configuration of related structures are incorporated.

(f) The canal alignment thus obtained is confirmed whether the alignment will satisfy the operational and social requirements or not.

3.5.3 Design of Drainage Canal

(1) Design discharge

Based on the drainage water requirement calculated in Section 2.2 hereof, the unit design discharge for the secondary and tertiary drains is determined to be 7.5 lit/sec/ha. As for the main drains, i.e. the Macak and Belitang rivers, the discharge estimated in the said Section 2.2 hereof is used for the improvement of the rivers.

(2) Canal section

The drainage canal sections are designed for the following criteria:

Type of canal	: Trapezoidal earth canal
Permissible velocity	
Maximum velocity	: 0.6 m/sec
Minimum velocity	: 0.3 m/sec
Roughness coefficient for the use of Manning's formula	: 0.03
Side slope of canal	: 1:1.5

3.5.4 Design of Related Structures

The structures related to the drainage network are bridges, culverts, drops and drainage outlets.

The brdges and culverts are planned and designed with the same principles as mentioned in Section 3.4.4. For drainage culverts, two types are provided depending on their design capacities; i.e. rectangular box barrel type and precast concrete pipe type. The former is applied

for the design capacity of more than 1.0 m^3/sec. The drops are of vertical type with rectangular cross section. The drainage outlets are provided at the end of drainage canals, which will flow directly into the rivers or streams, to prevent the river bed erosion and retrogressive erosion in the drainage canals.

3.6 Inspection Road

For the proper operation and maintenance of project facilities, well arranged inspection roads are of vital importance. Since these roads will be used as village roads and farm roads after the project implementation, the arrangement of the inspection roads should be made considering the existing and planned road networks.

(1) Main inspection road

The main inspection roads are required for inspection, operation and maintenance of the headreach and main canals. Considering the future increase of vehicles for the inspection and operation and heavy construction equipment to be required for the canal maintenance and repair, all the main inspection roads are so designed as to have an effective width of 7 meters and to be gravel-metalled. These roads are also used for the movement of agricultural products and equipment and for the day-to-day services between villages and from them to the highway and railway station.

(2) Secondary inspection road

The secondary inspection road is mainly provided alongside the secondary canals. All these roads have an effective width of 5 meters and are paved with laterite soil. These roads link the cultivable areas to population centers in the area and are used for the purpose of farm operation, particularly for harvesting.

(3) Tertiary inspection road

For the same purpose as that of the secondary farm roads, the tertiary farm roads are constructed along one side of all the tertiary canals. These roads have an effective width of 3 meters and is of earth without any metalling.

The networks of the main and secondary inspection roads is shown in PLATE No.1 and 2.

3.7 Tertiary Development

3.7.1 General

Tertiary development program aims at efficient water management by establishing the well organized tertiary system and through refined rotational irrigation program. For this subject, the Directorate of irrigation of P.U has prepared the report titled as "Guideline Manual for Planning of Tertiary Network". For the details of criteria and standards for the design and operational programming, this guideline manual is referred to.

3.7.2 Definition and Recommended Size of Irrigation Block

The tertiary development program is prepared for every tertiary block. This tertiary block is further divided into several subordinate blocks like sub-tertiary blocks and quaternary blocks. The definition and recommended size of each irrigation block is briefed as follows:

(1) Tertiary block

The tertiary block is covered by one tertiary canal. The distribution of irrigation water in the tertiary block is managed by farmers themselves. In some cases, however, it is difficult for the farmers to manage the distribution of water to vast lands and large number of farmers equally. The past experiences in Indonesia showed that the suitable size to be covered by one tertiary canal would be in the order of 50 ha. Considering the appropriate organization of water users' group in future, the maximum size of tertiary block is proposed to be 150 ha.

(2) Sub-tertiary block

In case that the tertiary block can not be formed within one village: in many cases, the boundary of tertiary block crosses the administrative boundaries of villages, a sub-tertiary block is formed in each village to simplify the organization of water users' group.

(3) Quaternary block

In order to distribute irrigation water equally and efficiently to all

parts of the fields through more intensive water control, it is advisable to sub-divide the tertiary block into several subordinate blocks: the quaternary blocks. The quaternary block is served by respective quaternary canal. The recommended size of one quaternary block is 10 to 15 ha. The rotational irrigation is practiced on the quaternary basis.

3.7.3 Irrigation Canal System

(1) Canalization system

The tertiary system consists of tertiary canal, sub-tertiary canals and quaternary canals which respectively cover the tertiary block, sub-tertiary blocks and quaternary blocks as mentioned above in layout planning of these canals, the following respective function and design principle are taken into consideration.

(a) Tertiary canal

The tertiary canal delivers irrigation water from secondary irrigation canal or sometimes directly from main canal to the sub-tertiary canals and/or quaternary canals. The irrigation water should not be taken directly from the tertiary canal into fields. For the alignment of these canals in the area with steep topography: more than 1% of land slope, the canal should be in perpendicular to the contour line (perpendicular type)

(b) Sub-tertiary canal

The sub-tertiary canal leads irrigation water from the tertiary canal to the quaternary canals. In this case also, irrigation water should not be taken directly from this canal to fields. In principle, the alignment of this canal is made in the same manner as that of the tertiary canal.

(c) Quaternary canal

The quaternary canal is terminal system. Irrigation water to be carried by this canal flows in fields directly or through sub-quaternary canals (branch of quaternary canal). The end of quaternary canal is connected to nearby drainage canal so as to drain off excess water in the canal. Especially in steep-slope

area, more than 1% of land slope, the canal should be aligned in parallel to the contour line (contour type). In order to avoid irrigation water from spilling-out from one paddy field to the next field, the width of one plot of quaternary sector should be limited to 200 m at maximum. Furthermore, in order to minimize the area to be occupied by the canal alongside the drainage canal should be avoided as much as possible. Instead, all the quaternary canals except the canal to be constructed in the highest position in the respective area are so designed as to have dual functions; irrigation and drainage functions, where possible.

The typical layout and sample layout of tertiary system are illustrated in Fig.VII-9 and VII-10.

(2) Related structures

In order to attain its primary objective, the canalization system thus aligned requires the following structures.

(a) Tertiary division box

Many division boxes are constructed on the tertiary canals and all of them are equipped with gates to regulate irrigation water in accordance with the rotational irrigation program.

(b) Quaternary division box

All the division boxes to be constructed on the quaternary canal are not equipped with gates.

(c) Measuring device

The measuring device such as Romijn gate, Cipolletti weir, etc. is installed at the head of tertiary block.

(d) Drop structure

A drop structure is provided where the ground surface slope is steeper than the required canal gradient. In principle, the division box is not provided on the canal system as an independent structure but as a supplementary structure of division box. Especially for the fall height of less than 30 cm, in case of the quaternary canal, the drop structure are not constructed independently.

(e) Culvert

A culvert is constructed at the crossing point of canal with road. This structure is of combined type with the division box as far as possible.

(f) Crossdrain

A crossdrain is provided at the site where the irrigation canal has to cross over the drainage canal.

3.7.4 Drainage Canal System

(1) Drainage canalization system

In the tertiary block, quaternary drains and tertiary drains are required to evacuate excess water from the block. In the layout planning of these drainage canals, the following respective function and design principle are taken into consideration.

(a) Quaternary drain

Quaternary drain is excavated to collect excess water in the quaternary block and drain off the water to the tertiary drain. In case the quaternary canal has dual functions, the quaternary drain is not excavated.

(b) Tertiary drain

Tertiary drain is provided to lead the excess water to be collected by the quaternary in the tertiary block to the secondary drain or directly to the river. In the typical layout, the tertiary drain is aligned alternately with the tertiary canal.

(2) Related structure

In order to facilitate the proper function to the drainage system mentioned above, the following structures are required on the canals.

(a) Drainage drop structure

This structure is placed where the natural ground slope is steeper than the designed gradient of drain bed.

(b) Drainage culvert

A drainage culvert is provided at the site where the drainage canal will cross under the road. For crossing, the precast concrete pipe is installed.

3.7.5 Farm Road Networks

For the purpose of canal inspection and farm operation, two types of road; tertiary inspection road and farm road, are required in the tertiary block. The respective function and design principle are mentioned below:

(a) Tertiary inspection road

A tertiary inspection road is required alongside the tertiary canal and the sub-tertiary canal. This road is used only for the inspection of canals and farm operation.

(b) Farm operation road

This road suitable for trucks and tractor is required throughout the tertiary block for the purpose of farm operation particularly for harvesting. This road is provided for the connection of tertiary inspection road to other roads. This is used only for farming operation.

(c) Related structures

Farm approaches are provided at the entrances from the tertiary road into the field plots.

3.8 Land Reclamation

3.8.1 Land Reclamation Plan

The total areas to be reclaimed for paddy fields are 27,650 ha in gross. The distribution of the lands is tabulated as follows:

Present Land Use	Sub-area I	Sub-Area II	Total
Upland fields	2,800	5,980	8,780
Shifting culture land	2,690	150	2,840
Forest	2,320	5,880	8,200
Wasted land	1,370	5,910	7,280
Perennial crop land	300	250	550
Total	9,480	18,170	27,650

The land clearing works for forest are carried out by the farmers themselves under the transmigration program of the Indonesian Government. Therefore, the cutting work of trees is not included in the project work.

3.8.2 Procedure of Construction

For the reclamation of the shrub land, bush clearing is made either by manpower or machines. These works are followed by firing. After being cut, the small trees and the bushes will be well dried during the dry season. The area for one firing would be a range from 3 ha to 5 ha.

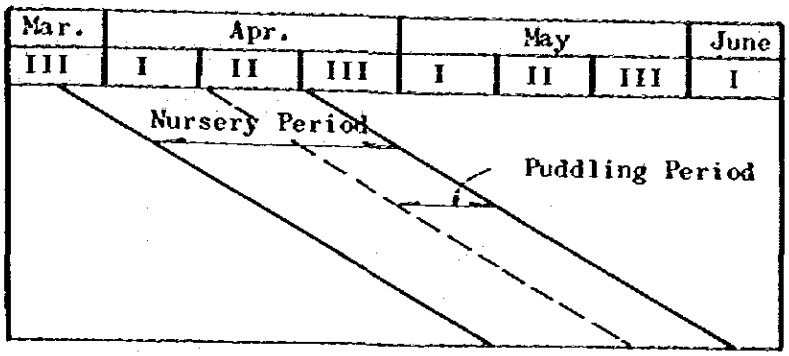
Stumping or uprooting is made after firing. There are several methods for stumping such as by manpower, by machine, by explosive, etc. It seems practical to use either bulldozer or rakedozer taking into account the present vegetation of shrub.

Exclusion of roots is practiced after the above works. It is usually common to use rakedozers. Finally the rough levelling work is carried out to make the cultivable land for paddy. The final levelling work and the construction of quaternary canal and border ridge are practiced by the farmers themselves.

Table VII-1 RESULT OF PERCOLATION RATE MEASUREMENT

No.	Observed Date (1980)	Observed Site	Physiography /Soil Condition	Percolation Rate (mm/day)
1	Sept. 2	BK-X	Alluvial plain Gley soil	1.55
2	Sept. 3	BK-X	Alluvial plain Gley soil	1.38
3	Sept. 4	Banjarnegaka	Alluvial plain Gley soil	1.17
4	Sept. 4	Suko Sari	Alluvial plain Gley soil	2.18
5	Sept. 5	Madugondo	Alluvial plain Alluvial soil	1.31
6	Sept. 5	Madugondo	Alluvial plain Alluvial soil	1.85
7	Sept. 8	Taman Agung	Flat valley Gley soil	2.20
8	Sept. 9	Taman Agung	Flat valley Gley soil	1.72
9	Sept. 11	Muljosari	Flat valley Gley soil	2.50
10	Sept. 12	Muljosari	Flat valley Gley soil	2.43
11	Sept. 15	Pahang Asri	Alluvial plain Alluvial Soil	2.15
12	Sept. 16	Way Handa	Alluvial plain Gley soil	1.68
13	Sept. 17	Muljosari	Flat valley Gley soil	1.43
14	Sept. 19	Way Halom	Alluvial plain Gley soil	0.44
15	Sept. 20	Kurungan Njava	Alluvial plain Gley soil	0.91
16	Sept. 25	Lebak harjo	Depression Organic soil	1.72
17	Sept. 29	Lebak harjo	Depression Organic soil	1.82
18	Sept. 29	Toto Margo	Flat valley Gley soil	1.47
19	Sept. 30	Pakuhadja	Flat valley Gley soil	1.52
20	Oct. 2	Way Halom	Alluvial plain Gley soil	0.53

Table VII-2 (1) PUDDLING AND NURSERY WATER REQUIREMENTS
(CROPPING PATTERN-I, DRY SEASON PADDY)



1. Puddling Water Requirement

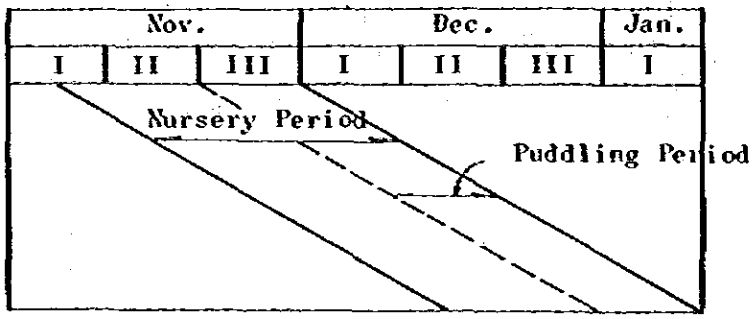
Phase	Period (day)	Puddling Area	Puddling Water (mm)	Planted Area
Apr. II	10	2/9	34	2/9
III	10	2/9	33	4/9
May I	10	2/9	33	6/9
II	10	2/9	33	8/9
III	10	1/9	17	9/9
June I	10	-	-	-
Total			150 mm	

2. Nursery Water Requirement

Phase	Period (day)	Puddling Water (mm)	Crop Index	Consumptive Use (mm)	Percolation (mm)	Total (mm)	Weighted Average (mm)
Mar. III	5	17	-	-	-	17	1
Apr. I	10	16	1/9	3	1	20	2
	15	17	2/9	6	1	24	
II	20	16	3/9	9	2	27	3
	25	17	4/9	13	3	33	
III	30	16	5/9	16	3	35	4
	35	17	5/9	16	3	36	
May I	40	17	5/9	16	3	36	3
	45	17	5/9	15	3	35	
II	50	-	4/9	13	2	15	1
	55	-	3/9	9	2	11	
III	60	-	2/9	6	1	7	1
	65	-	1/9	3	1	4	
June I	70	-	-	-	-	-	-
Total		150 mm		125 mm	25 mm	300 mm	15 mm

Table VII-2 (2) PUDDLING AND NURSERY WATER REQUIREMENTS

(CROPPING PATTERN-I, RAINY SEASON PADDY)



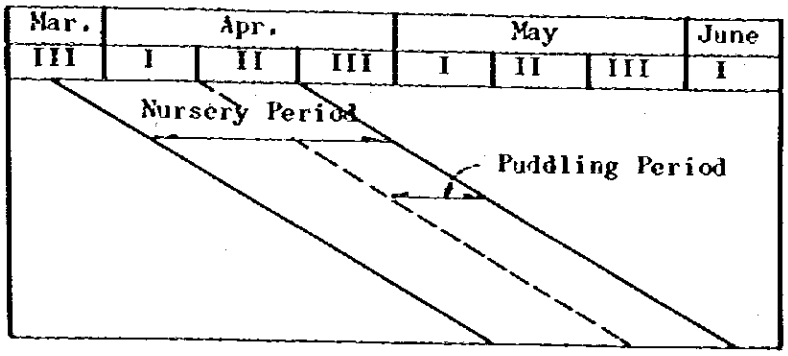
1. Puddling Water Requirement

Phase	Period (day)	Puddling Area	Puddling Water (mm)	Planted Area
Nov. III	10	1/4	38	1/4
Dec. I	10	1/4	37	2/4
II	10	1/4	37	3/4
III	10	1/4	38	4/4
Jan. I	10	-	-	-
Total			150 mm	

2. Nursery Water Requirement

Phase	Period (day)	Puddling Water (mm)	Crop Index	Consumptive Use (mm)	Percolation (mm)	Total (mm)	Weighted Average (mm)
Nov. I	5	19	-	-	-	19	1
II	10	18	1/8	4	1	23	3
	15	19	2/8	7	1	27	
III	20	18	3/8	11	2	31	3
	25	19	4/8	14	3	36	
Dec. I	30	19	5/8	18	4	41	4
	35	19	5/8	18	4	41	
II	40	19	5/8	17	3	39	3
	45	-	4/8	14	3	17	
III	50	-	3/8	11	2	13	1
	55	-	2/8	7	1	8	
Jan. I	60	-	1/8	4	1	5	0
	65	-	-	-	-	-	
Total		150 mm		125 mm	25 mm	300 mm	15 mm

Table VII-2 (3) PUDDLING AND NURSERY WATER REQUIREMENTS
(CROPPING PATTERN-II, DRY SEASON PADDY)



1. Puddling Water Requirement

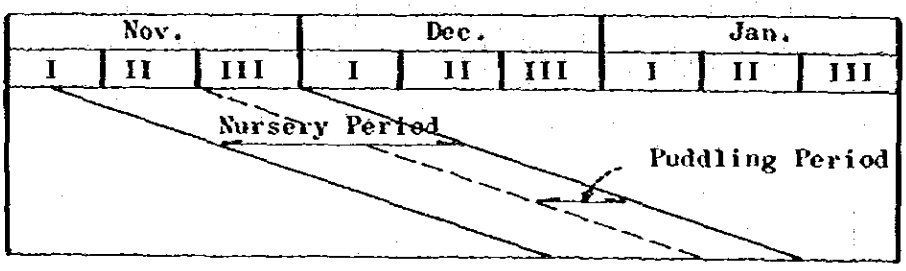
Phase		Period (day)	Puddling Area	Puddling Water (mm)	Planted Area
Apr.	II	10	2/9	34	2/9
	III	10	2/9	33	4/9
May	I	10	2/9	33	6/9
	II	10	2/9	33	8/9
	III	10	1/9	17	9/9
Total				150 mm	

2. Nursery Water Requirement

Phase		Period (day)	Puddling Water (mm)	Crop Index	Consumptive Use (mm)	Percolation (mm)	Total (mm)	Weighted Average (mm)
Mar.	III	5	17	-	-	-	17	1
Apr.	I	10	16	1/9	3	1	20	2
		15	17	2/9	6	3	26	
	II	20	16	3/9	9	4	29	3
		25	17	4/9	13	5	35	
	III	30	16	5/9	16	6	38	4
		35	17	5/9	16	6	39	
May	I	40	17	5/9	16	6	39	4
		45	17	5/9	15	6	38	
	II	50	-	4/9	13	5	18	2
		55	-	3/9	9	4	13	
	III	60	-	2/9	6	3	9	1
		65	-	1/9	3	1	4	
June	I	70	-	-	-	-	-	-
Total			150 mm		125 mm	50 mm	325 mm	17 mm

Table VII-2 (4) PUDDLING AND NURSERY WATER REQUIREMENTS

(CROPPING PATTERN-II, RAINY SEASON PADDY)



1. Puddling Water Requirement

Phase	Period (day)	Puddling Area	Puddling Water (mm)	Planted Area
Nov. III	10	1/6	25	1/6
Dec. I	10	1/6	25	2/6
II	10	1/6	25	3/6
III	10	1/6	25	4/6
Jan. I	10	1/6	25	5/6
II	10	1/6	25	6/6
Total			150 mm	

2. Nursery Water Requirement

Phase	Period (day)	Puddling Water (mm)	Crop Index	Consumptive Use (mm)	Percolation (mm)	Total (mm)	Weighted Average (mm)
Nov. I	5	13	-	-	-	13	1
II	10	12	1/12	2	1	15	2
	15	13	2/12	5	2	20	
III	20	12	3/12	7	3	22	2
	25	13	4/12	10	4	27	
Dec. I	30	12	5/12	11	4	27	3
	35	13	5/12	11	4	28	
II	40	12	5/12	11	4	27	3
	45	13	5/12	11	5	29	
III	50	12	5/12	11	5	28	3
	55	13	5/12	11	4	28	
Jan. I	60	12	5/12	11	4	27	2
	65	-	4/12	10	4	14	
II	70	-	3/12	7	3	10	1
	75	-	2/12	5	2	7	
III	80	-	1/12	2	1	3	0
	85	-	-	-	-	-	
Total		150 mm		125 mm	50 mm	325 mm	17 mm