Table IV-8   MAIN EXPORTS OF BENGKULU PROVINCE, 1986-1989 (JAN.-SEP.)

Commodity	1986		1987		1988		1989	
	Vol (ton)	Value ('000 US$)	Vol (ton)	Value ('000 US$)	Vol (ton)	Value ('000 US$)	Vol (ton)	Value ('000 US$)
Coffee	9,061	23,937	9,027	16,350	3,328	6,134	3,954	5,806
Rubber	2,228	1,477	2,479	2,140	1,981	1,919	454	423
Coal	88,185	2,539	178,688	4,658	180,172	5,254	104,074	3,300
Wood(M)	11,477	1,795	7,341	2,187	14,929	2,927	6,986	1,442

Source: Foreign Trade Statistics, BPS, Jakarta.1990

Table IV-9 TRANSMIGRATION PROGRAMME, BENGKULU PROVINCE

Pelita	Fiscal Year	Target (household)	Realization	
			Households	Population
II	1974-1975	600	314	1,338
	1975-1976	500	786	3,725
	1976-1977	500	499	2,517
	1977-1978	2,000	2,001	9,493
	1978-1979	2,000	2,000	8,067
Sub-total		5,600	5,600	25,140
III	1979-1980	2,000	2,000	7,846
	1980-1981	2,000	2,000	8,634
	1981-1982	3,050	2,901	12,127
	1982-1983	6,145	6,145	26,634
	1983-1984	1,200	1,149	5,285
Total		14,395	14,195	60,526

Source : Pemerintah Propinsi Daerah TK I Bengkulu,20 tahun
Propinsi Bengkulu,18 November 1989

Table IV-10 NUMBER OF TRANSMIGRANTS IN BENGKULU PROVINCE

Region of Origin	1985	1986	1987	1988	Total
West Java	174	140	394	50	758
Central Java	229	175	572	350	1,326
East Java	60	30	123	100	313
Yogyakarta	46	25	257	50	378
Jakarta	33	50	160	—	243
Local	277	81	215	—	573
Total in Bengkulu	819	501	1,721	550	3,591

Source : Dept. Transmigrasi

Table IV-11   TRANSMIGRATION SETTLEMENT IN KABUPATEN BENGKULU UTARA, REPELITA I-IV

(Number of Families and Region of Origin)

Pelita	Year	JAKARTA	W.JAVA	C.JAVA	JOGYAKARTA	E.JAVA	TOTAL
I (1969-1974)	1969-74				25		25
II (1974-1979)	1974-79		105	253	10	203	571
III (1979-84)	1979-84		50	122	11	110	293
IV (1984-1989)	1984-85	21	38	98	11	93	261
	1985-86	69	44	87	6	97	303
	1986-87	119	89	248		61	517
	1987-88	11	62	427		65	565
	1988-89	1	115	295	9	70	490
		221	503	1,530	72	699	3,025

Source: Laporan Tahun Anggaran 1988/89, Kantor Departemen Transmigrasi Keb. Bengkulu Utara, Arga Makmur.

Table IV-12 PLANNED TRANSMIGRATION PROGRAMME FOR KABUPATEN BENGKULU UTARA IN REPELITA V, 1989-94

Location	WPP/SKP	Kecamatan	Total KK	1989/ 90	1990/ 91	1991/ 92	1992/ 93	1993/ 94	Total Pelita
1 Air Manjuto	II/CE SP2	Muko2 Selatan	6,700	580	1,650	1,900	1,000	1,290	6,700
1 Air Manjuto	I/E	Muko2 Utara	450	450					450
2 Air Manjuto	I/G	SP2 Muko2 Utara	130	130					130
3 Air Manjuto	I/GE	Muko2 Utara	1,990		500	500	500	490	1,990
4 Ipuh	II/CE SP1	Muko2 Selatan	125	125					125
5 Ipuh	II/CE SP2	Muko2 Selatan	155	155					155
6 Ipuh	II/CE	Muko2 Selatan	400		400				400
7 Ipuh	II/E	Muko2 Selatan	1,000			500		500	1,000
8 Ipuh	II/D	Muko2 Selatan	300					300	300
9 Mukomuko	I/C	Muko2 Selatan	250		250				250
10 Mukomuko	I/D	Muko2 Selatan	400		400				400
11 Enggano		Enggano	1,500		500	500	500		1,500
TOTAL			6,700	860	1,650	1,900	1,000	1,290	6,700
Planned Transmigrants Kecamatan Muko2 Utara 1989-94:			580	580	500	500	500	590	2,570

Source: Kantor Wilayah Departemen Transmigrasi Propinsi Bengkulu

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Table IV-13   KECAMATAN MUKO-MUKO UTARA POPULATION, 1985-19(

Desa	Area (Km2)	1985 Family	1985 Total Population	1986 Family	1986 Total Population	1987 Family	1987 Total Population	1988 Family	1988 Total Population	1989 Family	1989 Total Population	Population Increase 1985-1989(%)	Average family size
Pasar Muko-Muko	42	489	2,232	504	2,388	505	2,388	509	2,415	509	2,414	7.50	4.74
Ujung padang	24	282	1,329	285	1,307	285	1,307	286	1,305	286	1,314	-1.20	4.59
Pasar Seblah	12	54	226	51	226	56	226	56	230	56	233	3.10	4.16
Pondok Batu	50	74	406	85	411	89	443	89	450	89	457	11.20	5.13
Tanah Rekah	66	139	770	172	846	180	886	181	881	181	888	15.30	4.91
Dusun Baru Pelc	23	126	490	152	608	154	620	154	635	154	645	31.60	4.19
Lubuk Sanani	31	235	1,015	264	1,109	267	1,115	275	1,153	291	1,248	23.00	4.29
Pauh Terenja	23	62	280	62	288	62	286	64	303	64	312	11.40	4.88
Tanjung Alai	27	117	466	120	462	121	637	123	597	123	597	28.10	4.85
Lubuk Gedang	15	68	303	78	395	80	381	82	380	82	379	25.10	4.62
Arah Tiga	33	105	456	112	574	112	569	115	575	115	575	26.10	5.00
Lubuk Pinang	28	402	1,812	402	1,761	409	1,788	410	1,811	410	1,812	0.00	4.42
Suka Pindah	9	88	395	80	390	81	392	81	391	81	384	-2.80	4.74
Pondok Panjang	16	110	440	107	435	107	440	108	440	108	449	2.00	4.16
Rasno	9	59	239	63	249	63	248	70	319	70	323	35.10	4.61
Lalang Luas	32	149	609	138	622	142	640	145	669	147	678	11.30	4.61
Talang Petai	75	189	837	189	848	189	850	189	847	189	849	1.40	4.49
Sungai Intang	70	99	435	73	370	73	369	73	375	75	383	12.00	5.11
Pondok Tengah	75	77	496	66	346	68	355	68	361	68	355	28.40	5.22
Pondok Kopi	65	104	401	104	413	108	460	108	469	109	476	18.70	4.37
Teras Terunjam	50	222	937	220	926	256	1,078	257	1,117	257	1,117	19.20	4.35
Lubuk Sahung	60	115	499	115	503	115	477	116	491	116	498	0.00	4.29
Surian Bungkal	72	58	240	61	252	65	251	85	365	83	360	50.00	4.34
Sungai Gading	51	135	562	135	580	138	587	151	617	150	611	8.70	4.07
Sungai Ipuh	16	230	995	230	1,005	235	1,036	239	1,050	239	1,055	6.00	4.41
Pondok Baru	100	248	1,110	253	1,073	255	1,126	256	1,244	256	1,239	11.60	4.84
Sungai Jerinjir	160	207	898	212	1,030	220	1,115	220	1,129	220	1,129	25.70	5.13
Penarik	130	148	700	170	756	250	1,026	250	1,025	252	1,035	47.90	4.11
Saribulan	37	90	390	91	411	94	410	95	425	116	475	21.80	4.09
Dusan Baru	44	75	315	75	312	77	335	78	342	78	346	9.80	4.44
Pondok Lunang	32	78	303	80	298	80	326	81	338	81	342	12.90	4.22
Air Dukit	11	72	298	70	302	70	306	73	315	73	319	7.10	4.37
SP 1 Lubuk Mukt	26	586	2,179	586	2,499	701	3,067	697	3,050	697	3,054	40.20	4.38
SP 2 Suka Maju	25	417	1,797	424	1,757	484	2,003	485	2,022	485	2,030	13.00	4.19
SP3 Penarik	25	444	2,026	450	2,014	559	2,506	559	2,514	559	2,509	24.70	4.49
Tunggal Jaya		481	2,026	516	2,408	518	2,428	518	2,524	518	2,524	24.60	4.87
SP 1 Air Manjuto		400	1,669	400	1,682	400	1,718	400	1,722	405	1,736	4.00	4.29
SP 2 Air Manjuto				395	1,693	395	1,721	397	1,721	397	1,721	4.34	
SP 3 Air Manjuto				50	100	250	1,115	250	1,119	250	1,222	4.49	
SP 4 Air Manjuto								100	443	500	2,224		4.47
SP 5 Air Manjuto										289	1,162		4.45
SP 6 Air Manjuto													4.02
TOTAL	1,564	7,034	30,567	7,640	33,649	8,313	37,031	8,493	38,179	9,498	42,587	39.30	4.48

Note : Average population density (excluding transmigration areas) = 15.7 persons per Km2
: Average area per capita (excluding transmigration areas) = 6.39 hectares

Table IV-14   POPULATION IN KECAMATAN MUKO-MUKO BY AGE GROUP

(Unit : Person)

Age group	1985	1986	1987	1988	1989
0 - 4	4,482	4,970	5,431	5,599	6,246
5 - 9	4,861	5,393	5,895	6,078	6,784
10 - 14	4,442	4,921	5,379	5,547	6,187
15 - 19	3,014	3,337	3,648	3,758	4,194
20 - 24	2,401	2,656	2,901	2,988	3,331
25 - 29	2,411	2,675	2,922	3,012	3,352
30 -	8,958	9,937	10,855	11,197	12,493
Total	30,569	33,889	37,031	38,179	42,587

Source) Metri Statistik Kecamatan, Muko-Muko Utara, Juli 1989

Table IV-15   VILLAGES LOCATED WITHIN THE PROJECT AREA

Village	No. of family	Population
1. Pasar Muko-Muko	509	2,414
2. Ujung Padang	286	1,314
3. Pondok Batu	89	457
4. Tanah Rekah	181	888
5. Pondok Kopi	109	476
6. Teras Terunjam	257	1,117
7. Lubuk Sahung	116	498
8. SP II Air Manjunto	397	1,721
9. SP III Air Manjunto	270	1,208
10. SP IV Air Manjunto	250	1,122
11. SP VI Air Manjunto	289	1,162
Total	2,753	12,377

Table IV-16   Unit Yield of Major Food Crops in Kabupaten Muko-Muko Utara (1987)

(Unit: ton/ha)

Kecamatan	Wetland Paddy	Dryland Paddy	Cassava	Maize	Soybeans	Peanuts
Enggano	2.57	2.00	14.35	2.00	0.57	1.25
Tolang Empat	2.80	1.71	14.96	1.37	0.71	0.56
Taba Penanjung	3.21	1.74	14.90	1.67	0.61	0.43
Pondok Kelapa	3.22	1.59	18.09	2.20	0.57	0.29
Kerkap	3.63	1.53	21.67	2.00	0.62	0.41
Lais	3.67	1.89	9.63	3.44	1.12	1.08
Ketahun	3.26	1.57	15.30	1.59	0.49	0.51
Muko-muko Selatan	3.83	1.50	14.48	2.29	0.77	0.67
Muko-muko Utara	3.45	1.58	16.38	1.91	0.54	1.03
Arga Makmur	4.50	1.78	18.09	2.67	1.09	0.75
Average	3.41	1.69	15.79	2.11	0.71	0.70

Source :   Bengkulu Utara Dalam Angka 1987, Kantor Statistik Kabupaten Bengkulu Utara

Table IV-17   Livestock Population in the Study Area by WKPP

WKPP	Cattle	Karabao	Sheep	Pig	Chicken	Duck
Lubuk Sanai	304	--	--	--	--	--
Pasar Muko-muko*	650	408	--	15	2,640	--
Pondok Lunang	62	--	49	--	--	--
Penarik	68	--	--	--	--	--
SP I Penarik	339	--	818	--	9,862	62
SP II Penarik	370	--	265	--	3,460	50
SP III Penarik	325	--	130	--	13,950	260
SP IV Air Manjuto*	43	--	20	16	8,000	--
SP Pondok Kopi*	516	--	--	--	--	--
Sei Gading	160	326	--	--	--	--
Sei Ipuh	--	542	--	--	--	--
SP III Air manjuto*	--	--	--	--	820	--
SP II Air Manjuto*	220	--	45	--	--	--
Total	3,057	1,276	1,327	31	38,732	372

Source) BPP Ujung Padang and Sido Mulyo,198
Remark) The Project area is included in the marked WKPP.
WKPP means the command area of extension worker.

Table IV-18   Distribution of Cattle in Bengkulu Province
              through IFAD

(Unit : Head)

	Distributed Location	Date of Distribution		Distributed Number	
				Bulls	Cows
1	Kepahyang	1983	July	49	498
2	Curup	1983	July	49	493
3	Kerkap	1983	September	50	494
4	Seluma	1983	September	50	500
5	Sebelat	1984	September	50	500
6	Ketahun	1984	September	50	500
7	Talu	1984	September	51	499
8	Ipuh IIc	1984	November	50	500
9	P.U Tanding I	1985	December	45	484
10	P.U. Tanding II	1985	December	37	449
11	Ipuh IID	1986	September	49	478
12	Penarik	1986	September	45	483
13	Pondok Kopi	1987	July	50	484
14	Air Manjuto	1987	July	50	499
15	Arga Makmur	1988	March	50	500
16	PIR Seluma	1988	March	50	500
17	Pondok Kelapa	1990	January	100	1,000
	T o t a l			875	8,861

Source) Internal data from Dinas Peternakan Bengkulu Province, 1990

Table IV-19   Current Farm Gate Prices of Farm Inputs and Outputs

Item		Unit	Curerent Price (Rp.)
1) Farm Outputs			
Paddy		(kg)	250
Maize		(kg)	150
Peanuts		(kg)	500
Soybeans		(kg)	600
Cassava		(kg)	100
Oil palm		(kg)	75
Rubber		(kg)	450
2) Farm Inputs			
a. Seed			
Paddy	Local	(kg)	250
	Improved	‟	450
Maize	Local	(kg)	350
	Improved	‟	1,500
Groundnuts	Local	(kg)	900
	Improved	‟	1,500
Soybeans	Local	(kg)	800
	Improved	‟	1,300
Green beans		(kg)	1,300
Cassava	Local	(per/ha)	7,000
	Improved	‟	10,000
Oil palm		(pieces)	2,000
Rubber		(pieces)	350
b. Fertilizers			
Urea		(kg)	185
T.S.P.		(kg)	210
KCl		(kg)	210
Magnesium		(kg)	90
c. Agro-chemicals			
– Insecticide			
Diasinon 60 EC		(liter)	7,500
Dursban		(liter)	7,700
Lannate L		(liter)	9,500
Mipcin		(liter)	6,200
Sevin		(kg)	6,000
– Fungicide			
Dithane M. 45		(kg)	4,300
– Rodenticide			
Klerat RM/RMB		(kg)	2,100
– Pesticide			
Temic 10 G		(kg)	6,100
d. Hired Labor		(man-day)	2,500
e. Hired Animal		(animal-day)	6,000

Table IV-20 Crop Budget of Major Crops under Present Condition

	Unit	Unit Price	Lowland Paddy Amount (per ha)	Value (Rp./ha)	Upland Paddy Amount (per ha)	Value (Rp./ha)	Maize Amount (per ha)	Value (Rp./ha)	Groundnuts Amount (per ha)	Value (Rp./ha)	Soybeans Amount (per ha)	Value (Rp./ha)	Cassaba Amount (per ha)	Value (Rp./ha)	Rubber Amount (per ha)	Value (Rp./ha)
1. Gross Income																
1) Unit Yield	(ton/ha)		1.5		1.0		1.5		0.8		0.5		7.0		0.75	
2) Unit Price	(Rp./ton)			250,000		250,000		150,000		500,000		600,000		100,000		450,000
3) Gross Income	(Rp./ha)			375,000		250,000		225,000		400,000		300,000		700,000		337,500
2. Production Cost																
1) Seed *1	(kg)		30	7,500	40	10,000	30	10,500	50	45,000	20	16,000	–	7,000	0	0
2) Fertilizers																
Urea	(kg)	185	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T.S.P.	(kg)	210	0	0	0	0	0	0	0	0	0	0	0	0	0	0
KCl	(kg)	210	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3) Agro-chemicals																
Insecticides	(ltr)	1500	2	3,000	2	3,000	2	3,000	2	3,000	2	3,000	0	0	0	0
4) Labor	(man-day)															
Land Preparation			25	0	25	0	25	0	25	0	25	0	25	0		0
Nursery			3	0	0	0	0	0	0	0	0	0	0	0		0
Seedling			0	0	20	0	10	0	15	0	15	0	15	0		0
Transplanting			30	0	0	0	0	0	0	0	0	0	0	0		0
Fertilizing			0	0	0	0	0	0	0	0	0	0	0	0		0
Weeding			25	0	25	0	20	0	20	0	20	0	20	0		0
Spraying			2	0	2	0	2	0	2	0	2	0	0	0		0
Harvesting			30	0	30	0	25	0	25	0	25	0	30	0		0
Threshing/Drying/ Transporting			10	0	10	0	10	0	20	0	10	0	10	0		0
Water Management			0	0	0	0	0	0	0	0	0	0	0	0		0
Total			125		112		92		107		97		100		185	0
5) Animal Power	(animal-day)															
6) Others (5% of (1)~(5))				525		650		675		2,400		950		350		0
Total				11,025		13,650		14,175		50,400		19,950		7,350		0
3. Net Income				363,975		236,350		210,825		349,600		280,050		692,650		337,500

Remarks)
*1 Unit price of Seed (Rp./kg)

Paddy	250
Maize	350
Groundnuts	900
Soybeans	800
Cassaba	7,000 (per Ha)

Table IV-21　　Farm Budget of Existing Farmers uunder Present Condition

(Unit: Rp. 1000/year)

Item	Transmigrants	Local Farmer
Farm Size (Unit: ha)		
1) Lowland Paddy Field		0.10
2) Upland Paddy Field	0.75	0.30
3) Upland Crop Field	0.25	0.60
4) Home Yard	0.25	
5) Rubber		1.50
Total Area	1.25	2.50
I Gross Income		
1) Farm Income *1		
a. Lowland Paddy		38
b. Upland Paddy	250	75
c. Upland Crops (Soybeans)	48	72
d. Upland Crops (Groundnuts)	400	320
e. Upland Crops (Maiz)	68	59
f. Upland Crop (Cassaba)	14	70
g. Rubber		506
Sub-total	780	1,139
2) Off-farm Income *2	96	96
Total (I)	876	1,235
II Gross Outgo		
1) Production Cost *1	72	55
2) Living Expenses *2	739	739
Total (II)	811	794
III Net Reserve (I - II)	65	442
IV Net Farm Income (Farm Income minus Production Cost)	804	1,181

Remarks)
*1　Refer to Table IV-19
*2　Result from farm economic survey

Table IV-22   Farmer's Group in Kecamatan Muko-muko Utara

BPP	Desa	Grade of Farmer's Group					No. of
		Beginner	Advance	Senior	Excelent	Total	farmers
Ujung Padang	SP IV Air Manjuto	—	9	—	—	9	250
	Penarik	4	2	—	—	6	173
	SP III Air Manjuto	—	2	3	—	5	105
	SP III Penarik	—	2	13	—	15	340
	Lubuk Sanai	3	—	—	—	3	60
	Pauh Terenja	2	—	—	—	2	40
	Dasun Baru	3	—	—	—	3	60
	Tunggal Jaya	—	1	22	1	24	511
	SP I Penarik	2	14	—	—	16	441
	Pondok Batu	—	1	—	—	1	30
	Pasar Muko-muko	7	1	—	—	8	171
	Ujung Padang	2	4	—	—	6	144
	Pasar Sebelah	—	3	—	—	3	60
	Suka Maju	13	3	—	—	16	412
	Sei Ipuh	—	3	—	—	3	115
	Sub Total	36	45	38	1	120	2912
Sido Mulyo	SP V Air Manjuto	—	5	12	—	17	503
	SP III Air Manjuto	—	9	7	—	16	370
	Lubuk Gedang	—	15	—	—	15	
	Lubuk Pinang	—	4	4	—	8	261
	Suka Pindah	—	2	—	—	2	31
	Lalang Luas	1	2	—	—	3	99
	Pondok Panjang	1	—	—	—	1	37
	Sub Total	2	37	23		62	1301

Source) Dinas Pertanian, Kabupaten Bengkulu Utara, 1989

Table IV-23 Extension Services in Kabupaten Bengkulu Utara

(Nos.)

Kecamatan/BPP	PPS	PPUP	PPL	PHP	RPH	KP2A	BRI	KUD	Kios
Muko-muko Utara									
Ujung Padang	—	4	10	—	5	—	—	(4)	—
Sido Mulyo	—	3	12	1	3	3	—	(3)	—
Talang Empat									
Jayokarta	—	5	12	1	52	5	1	—	5
Anak Dalam	—	3	10	1	5	5	—	6	—
Taba Penanjung									
Pagar Jahti	—	4	9	—	8	—	—	—	—
Pondok Kelapa									
Talang Pauh	—	5	14	2	33	4	1	5	5
Kerkap									
Batu Roto	—	5	19	2	60	29	2	9	23
Lais									
Kuro Tidur	—	5	19	2	145	3	1	14	18
Rotu Samban	—	3	13	1	13	2	—	3	18
Ketahun									
Ketahun	—	5	16	2	82	1	—	14	18
Sebelat	—	4	10	—	5	—	—	—	—
Mukomuko Selatan									
Medan Jaya	5	5	17	2	94	1	—	4	5

Note) 1 PPUP : Penyuluh Pertanian Urusan Programa (Sector Chief)
     2 PPL : Penyuluh Pertanian Lapangan (Field Extension Worker)
     3 PHP : Pengamat Hama Penyakit (Disease and Pest Controller)
     4 RPH : Regu Pemberantas Hama (Farmers' Land Warden Group)
     5 KP2A : Kelompok Petani Pemakai Air (Farmers' Water User Group)
     6 BRI : Bank Rakyat Indonesia
     7 KUD : Koperasi Unit Desa (Village Unit Cooperative)
     – Kecamatan Enggano does not have any BPP.
Source) – Dinas Pertanian Kabupaten Bengkulu Utar
        – BPP Ujung Padanç

Table IV-24 BPP, WKPP and PPL in Kecamatan Muko-muko Utara
(BPP Ujung Padang)

WKPP	No. of PPL	Name of Desa
1. Lubuk Sanai	1	Lubuk Sanai
		Pauh Terenja
		Dusun Baru Plokan
2. Pasar Muko-muko	1	Pasar Sebelah
		Ujung Padang
		Pasar Muko-muko
		Pondok Batu
		Tana Rekah
3. Pondok dunang	1	Air Dikit
		Pondok Lunang
		Dusum Baru
4. Penarik	1	Saribulan
		Penarik
5. Sei Gading	0	Trasterunjam
		Lubuk Sahung
		Sei Gading
		Surian Bungkal
6. Sei Ipuh	0	Pondok Baru
		Sei Ipuh
		Sei Jeringing
7. SP Pondok Kopi	1	Tunggal Jaya
		Pondok Kopi
8. SP I Penarik	1	Lubuk Mukti
9. SP II Penarik	1	Suka Maju
10. SP III Penarik	1	Bumi Mulya
11. SP IV Air Manjuto	1	SP IV Air Manjuto
12. SP III Air Manjutc	2	SP III Air Manjuto

Source) - Programa Penyuluhan Pertanian BPP Ujung Padang,
1989/1990
- Programa Penyuluhan Pertanian BPP Sido Mulyc
1989/1990

Table IV-25   BPP, WKPP and PPL in Kecamatan Muko-muko Utara
              (BPP Sido Mulyo)

WKPP	No. of PPL	Name of Desa
1. Lalang Luas	1	Lalang Luas
		Resno
2. Lubuk Pinang	1	Lubuk Pinang
		Suka Pindah
		Pondok Panjang
3. Arah Tiga	1	Arah Tiga
4. Lubuk Gedang	1	Lubuk Gedang
		Tanjung Alat
5. Pondok Tengah	1	Talang Petai
		Sungai Lintang
		Pondok Tengah
6. SP I Air Manjut	1	SP I Air Manjuto
7. SP II Air Manju	2	SP II Air Manjuto
8. SP V Air Manjut	2	SP V Air Manjuto
9. SP VI Air Manju	2	SP VI Air Manjuto

Source) - Programa Penyuluhan Pertanian BPP
            Ujung Padang, 1989/1990
         - Programa Penyuluhan Pertanian BPP Sido Mulyo
            1989/1990

Table IV-26 Present Situation of KUD in Bengkulu Province
and Kabupaten Bengkulu Utara

in Bengkulu Province

Kabupaten	No. of KUD	Member	Total Farm Household
Bengkulu Utara	70	17,359	38,799
Bengkulu Selatan	58	7,279	4,999
Lebong	53	7,696	2,331
Kotamadya Bengkulu	5	1,416	1,919

in Kabupaten Bengkulu Utara

Kabupaten	No. of KUD	Member	Total Farm Household
Enggano	1	52	200
Talang Empat	2	49	250
Taba Penanjung	2	185	1,311
Pondok Kelapa	5	641	5,025
Kerkap	6	648	5,730
Lais	16	1,174	8,600
Ketahun	19	3,108	7,530
Muko-muko Selatan	7	120	3,404
Muko-muko Utara	8	2,096	3,607
Arga Makmur	4	518	2,624

Table IV-27   Present Condition of KUD in Kecamatan Muko-muko Utara

Name of KUD	Name of Village	No. of Member	Total Farm Household of Village
1. KUD Harapan	Ps. Muko-muko	200	509
2. KUD Mudik Selagan Jaya	Pondok Baru	334	350
3. KUD Maja Makmur	Muko-muko IA	154	260
4. KUD Surya Ekonomi	SP III Penarik	416	661
5. KUD Usaha Makmur	DS. Tunggal Jaya	207	717
6. KUD Bangun Tani	Air Manjuto SP I	225	340
7. KUD Manjuto Jaya	Lubuk Pinang	60	170
8. KUD Kedung Makmur	SP V. Air Manjuto	500	600

Table IV-28 Estimated Cost of Land Clearing and land Levelling

(Unit : 1,000 Rp. per ha)

| | Present Land Use | | | |
	Heavy Forest	Light Forest	Bush	Upland Crops/Grass land
Proposed Government Assistance (1) by Contractors	850	500	400	300
Estimated Costs for Bengkulu (2) by Contractors				
Slope : 0 - 5 %	1617	1518	1122	990
5 - 10 %	2607	2508	2112	1980
10 - 20 %	3597	3498	3102	2970
> 20 %	3927	3828	3432	3300
by Farmers' Group				
Slope : 0 - 5 %	1225	1150	850	750
5 - 10 %	1975	1900	1600	1500
10 - 20 %	2725	2650	2350	2250
> 20 %	2975	2900	2600	2500
Transmigration Estimates (3)				
Slope : 3 - 8 %	1720	1420	950	850
> 8 %	2320	2020	1550	1450

Sources)
(1) Directorate General of Food Crops Agriculture, Jakarta, 1989
(2) Department of Food Crops Agriculture, Bengkulu, 1989
(3) Ministry of Transmigration, Jakarta, 1988

Table IV-29 Proposed Land Use

(Unit : ha)

Land Use	Without Project Condition	With Project Condition					
		Rice	Upland Crop	Oil Palm	House Lot	Public Land	Total
Right Bank : Irrigated rice							
1 Upland Rice	40		40				40
2 Lowland Rice	140	140					140
3 Garden	150		150				150
4 Natural Forest	1,650	1,650					1,650
5 Cleared Forest	100		40		60		100
6 Scrub	340	210			130		340
7 Rubber	280				40	240	280
Sub-total	2,700	2,000 (1,800)	230	0	230	240	2,700
Right Bank : Oil Palm Plantation							
1 Natural Forest	3,340		270	2,500	280	290	3,340
Left Bank : Irrigated rice							
1 Upland Rice	380				290	90	380
2 Lowland Rice	0						0
3 Garden	310		300		10		310
4 Natural Forest	2,270	2,270					2,270
5 Cleared Forest	0						0
6 Scrub	460	430				30	460
7 Rubber	180					180	180
Sub-total	3,600	2,700 (2,400)	300	0	300	300	3,600
Whole Area							
1 Upland Rice	420	0	40	0	290	90	420
2 Lowland Rice	140	140	0	0	0	0	140
3 Garden	460	0	450	0	10	0	460
4 Natural Forest	7,260	3,920	270	2,500	280	290	7,260
5 Cleared Forest	100	0	40	0	60	0	100
6 Scrub	800	640	0	0	130	30	800
7 Rubber	460	0	0	0	40	420	460
Total	9,640	4,700 (4,200)	800	2,500	810	830	9,640

Remark) The figure in the parenthesis means net area cultivated.

Table IV-30　Labour Balance for Alternative Cropping Pattern
(Alternative 1)

(Unit : man-day/ha)

Month		1st Rice	1st Palawija	2nd Rice	2nd Palawija	3rd Rice	Balance
1	(1)	0.16					0.16
	(2)	0.16					0.16
	(3)	1.22					1.22
2	(1)	2.28					2.28
	(2)	2.28					2.28
	(3)	1.68					1.68
3	(1)	0.5					0.50
	(2)	0.5					0.50
	(3)	0.5					0.50
4	(1)	0.5					0.50
	(2)	0.5					0.50
	(3)	0.42					0.42
5	(1)	2.19					2.19
	(2)	2.19					2.19
	(3)	2.19					2.19
6	(1)		1.74				1.74
	(2)		1.74				1.74
	(3)		2.03				2.03
7	(1)		0.34				0.34
	(2)		0.34				0.34
	(3)		0.46				0.46
8	(1)		0.46				0.46
	(2)		0.46				0.46
	(3)		0.34				0.34
9	(1)		2.50				2.50
	(2)		2.50				2.50
	(3)		2.50				2.50
10	(1)						0.00
	(2)			0.16			0.16
	(3)			0.16			0.16
11	(1)			1.22			1.22
	(2)			2.28			2.28
	(3)			2.28			2.28
12	(1)			1.68			1.68
	(2)			0.5			0.50
	(3)			0.5			0.50
13	(1)			0.5			0.50
	(2)			0.5			0.50
	(3)			0.5			0.50
14	(1)			0.42			0.42
	(2)			2.19			2.19
	(3)			2.19			2.19
15	(1)			2.19			2.19
	(2)				1.74		1.74
	(3)				1.74		1.74
16	(1)				2.03		2.03
	(2)				0.34		0.34
	(3)				0.34		0.34
17	(1)				0.46		0.46
	(2)				0.46		0.46
	(3)				0.46		0.46
18	(1)				0.34		0.34
	(2)				2.50		2.50
	(3)				2.50		2.50
19	(1)				2.50		2.50
	(2)						0.00
	(3)						0.00
20	(1)					0.16	0.16
	(2)					0.16	0.16
	(3)					1.22	1.22
21	(1)					2.28	2.28
	(2)					2.28	2.28
	(3)					1.68	1.68
22	(1)					0.5	0.50
	(2)					0.5	0.50
	(3)					0.5	0.50
23	(1)					0.5	0.50
	(2)					0.42	0.42
	(3)					2.19	2.19
24	(1)					2.19	2.19
	(2)					2.19	2.19
	(3)						

Table IV-31   Labour Balance for Alternative Cropping Pattern
                    (Alternative 2)

(Unit : man-day/ha)

Month	1st Rice	1st Palawija	2nd Rice	2nd Palawija	3rd Rice	Balance
1 (1)	0.12				1.54	1.66
(2)	0.12				1.18	1.30
(3)	0.82					0.82
2 (1)	1.61					1.61
(2)	1.61					1.61
(3)	1.91					1.91
3 (1)	1.91					1.91
(2)	1.20					1.20
(3)	0.47					0.47
4 (1)	0.47					0.47
(2)	0.42					0.42
(3)	0.42					0.42
5 (1)	1.59					1.59
(2)	1.54					1.54
(3)	1.54					1.54
6 (1)	1.54					1.54
(2)	1.18					1.18
(3)		1.17				1.17
7 (1)		1.17				1.17
(2)		1.42				1.42
(3)		1.42				1.42
8 (1)		1.42				1.42
(2)		0.37				0.37
(3)		0.37				0.37
9 (1)		0.37				0.37
(2)		0.37				0.37
(3)		1.81				1.81
10 (1)		1.73				1.73
(2)		1.73	0.12			1.85
(3)		1.73	0.12			1.85
11 (1)		1.48	0.82			2.30
(2)			1.61			1.61
(3)			1.61			1.61
12 (1)			1.91			1.91
(2)			1.91			1.91
(3)			1.20			1.20
13 (1)			0.47			0.47
(2)			0.47			0.47
(3)			0.42			0.42
14 (1)			0.42			0.42
(2)			1.59			1.59
(3)			1.54			1.54
15 (1)			1.54			1.54
(2)			1.54			1.54
(3)			1.18			1.18
16 (1)				1.17		1.17
(2)				1.17		1.17
(3)				1.42		1.42
17 (1)				1.42		1.42
(2)				1.42		1.42
(3)				0.37		0.37
18 (1)				0.37		0.37
(2)				0.37		0.37
(3)				0.37		0.37
19 (1)				1.81		1.81
(2)				1.73		1.73
(3)				1.73		1.73
20 (1)				1.73	0.12	1.85
(2)				1.48	0.12	1.60
(3)					0.82	0.82
21 (1)					1.61	1.61
(2)					1.61	1.61
(3)					1.91	1.91
22 (1)					1.91	1.91
(2)					1.20	1.20
(3)					0.47	0.47
23 (1)					0.47	0.47
(2)					0.42	0.42
(3)					0.42	0.42
24 (1)					1.59	1.59
(2)					1.54	1.54
(3)					1.54	1.54

Table IV-32   Labour Balance for Alternative Cropping Pattern
(Alternative 3)

(Unit : man-day/ha)

Month		1st Rice	1st Palawija	2nd Rice	2nd Palawija	3rd Rice	Balance
1	(1)	0.09				1.20	1.29
	(2)	0.09				1.20	1.29
	(3)	0.62				1.20	1.82
2	(1)	1.21					1.21
	(2)	1.21					1.21
	(3)	1.53					1.53
3	(1)	1.48					1.48
	(2)	1.48					1.48
	(3)	0.99					0.99
4	(1)	0.40					0.40
	(2)	0.40					0.40
	(3)	0.36					0.36
5	(1)	1.24					1.24
	(2)	1.24					1.24
	(3)	1.20					1.20
6	(1)	1.20					1.20
	(2)	1.20	0.88				2.08
	(3)	1.20	0.88				2.08
7	(1)		1.10				1.10
	(2)		1.10				1.10
	(3)		1.10				1.10
8	(1)		1.16				1.16
	(2)		0.32				0.32
	(3)		0.32				0.32
9	(1)		0.32				0.32
	(2)		1.39				1.39
	(3)		1.39				1.39
10	(1)		1.33				1.33
	(2)		1.33	0.09			1.42
	(3)		1.33	0.09			1.42
11	(1)		1.33	0.62			1.95
	(2)			1.21			1.21
	(3)			1.21			1.21
12	(1)			1.53			1.53
	(2)			1.48			1.48
	(3)			1.48			1.48
13	(1)			0.99			0.99
	(2)			0.40			0.40
	(3)			0.40			0.40
14	(1)			0.36			0.36
	(2)			1.24			1.24
	(3)			1.24			1.24
15	(1)			1.20			1.20
	(2)			1.20			1.20
	(3)			1.20			1.20
16	(1)			1.20	0.88		2.08
	(2)				0.88		0.88
	(3)				1.10		1.10
17	(1)				1.10		1.10
	(2)				1.10		1.10
	(3)				1.16		1.16
18	(1)				0.32		0.32
	(2)				0.32		0.32
	(3)				0.32		0.32
19	(1)				1.39		1.39
	(2)				1.39		1.39
	(3)				1.33		1.33
20	(1)				1.33	0.09	1.42
	(2)				1.33	0.09	1.42
	(3)				1.33	0.62	1.95
21	(1)					1.21	1.21
	(2)					1.21	1.21
	(3)					1.53	1.53
22	(1)					1.48	1.48
	(2)					1.48	1.48
	(3)					0.99	0.99
23	(1)					0.40	0.40
	(2)					0.40	0.40
	(3)					0.36	0.36
24	(1)					1.24	1.24
	(2)					1.24	1.24
	(3)					1.20	1.20

Table IV-33   Labour Balance for Alternative Cropping Pattern
(Alternative 4, 5 and 6)

(Unit : man-day/ha)

Month	Alternative 4 1st Rice	Alternative 4 2nd Rice	Alternative 4 Balance	Alternative 5 1st Rice	Alternative 5 2nd Rice	Alternative 5 Balance	Alternative 6 1st Rice	Alternative 6 2nd Rice	Alternative 6 Balance
1 (1)			0.00		1.54	1.54		1.20	1.20
(2)	0.16		0.16	0.12	1.18	1.30	0.09	1.20	1.29
(3)	0.16		0.16	0.12		0.12	0.09	1.20	1.29
2 (1)	1.22		1.22	0.82		0.82	0.62		0.62
(2)	2.28		2.28	1.61		1.61	1.21		1.21
(3)	2.28		2.28	1.61		1.61	1.21		1.21
3 (1)	1.68		1.68	1.91		1.91	1.53		1.53
(2)	0.50		0.50	1.91		1.91	1.48		1.48
(3)	0.50		0.50	1.20		1.20	1.48		1.48
4 (1)	0.50		0.50	0.47		0.47	0.99		0.99
(2)	0.50		0.50	0.47		0.47	0.40		0.40
(3)	0.50		0.50	0.42		0.42	0.40		0.40
5 (1)	0.42		0.42	0.42		0.42	0.36		0.36
(2)	2.19		2.19	1.59		1.59	1.24		1.24
(3)	2.19		2.19	1.54		1.54	1.24		1.24
6 (1)	2.19		2.19	1.54		1.54	1.20		1.20
(2)			0.00	1.54		1.54	1.20		1.20
(3)			0.00	1.18		1.18	1.20		1.20
7 (1)			0.00			0.00	1.20		1.20
(2)			0.00			0.00			0.00
(3)			0.00			0.00			0.00
8 (1)		0.16	0.16		0.12	0.12		0.09	0.09
(2)		0.16	0.16		0.12	0.12		0.09	0.09
(3)		1.22	1.22		0.82	0.82		0.62	0.62
9 (1)		2.28	2.28		1.61	1.61		1.21	1.21
(2)		2.28	2.28		1.61	1.61		1.21	1.21
(3)		1.68	1.68		1.91	1.91		1.53	1.53
10 (1)		0.50	0.50		1.91	1.91		1.48	1.48
(2)		0.50	0.50		1.20	1.20		1.48	1.48
(3)		0.50	0.50		0.47	0.47		0.99	0.99
11 (1)		0.50	0.50		0.47	0.47		0.40	0.40
(2)		0.50	0.50		0.42	0.42		0.40	0.40
(3)		0.42	0.42		0.42	0.42		0.36	0.36
12 (1)		2.19	2.19		1.59	1.59		1.24	1.24
(2)		2.19	2.19		1.54	1.54		1.24	1.24
(3)		2.19	2.19		1.54	1.54		1.20	1.20

Table IV-34 POTENTIAL MAXIMUM YIELD AND HARVESTING SEASON

(Unit : ton/ha)

Date		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
Mar	1	4.59																															4.59	4.59	4.59	4.59	
	2	4.75	4.75																															4.75	4.75	4.75	
	3	4.93	4.93	4.93																															4.93		
Apr	1	4.75	4.75	4.75	4.75																															4.75	
	2	4.46	4.46	4.46	4.46	4.46																														4.46	
	3	4.25	4.25	4.25	4.25	4.25	4.25																														
May	1		4.28	4.28	4.28	4.28	4.28	4.28																													
	2			4.32	4.32	4.32	4.32	4.32	4.32																												
	3				4.39	4.39	4.39	4.39	4.39	4.39																											
Jun	1					4.36	4.36	4.36	4.36	4.36	4.36																										
	2						4.29	4.29	4.29	4.29	4.29	4.29																									
	3							4.17	4.17	4.17	4.17	4.17	4.17																								
Jul	1								4.08	4.08	4.08	4.08	4.08	4.08																							
	2									4.12	4.12	4.12	4.12	4.12	4.12																						
	3										4.05	4.05	4.05	4.05	4.05	4.05																					
Aug	1											4.06	4.06	4.06	4.06	4.06	4.06																				
	2												4.13	4.13	4.13	4.13	4.13	4.13																			
	3													4.14	4.14	4.14	4.14	4.14	4.14																		
Sep	1														4.00	4.00	4.00	4.00	4.00	4.00																	
	2															3.99	3.99	3.99	3.99	3.99	3.99																
	3																4.06	4.06	4.06	4.06	4.06	4.06															
Oct	1																	4.15	4.15	4.15	4.15	4.15	4.15														
	2																		4.41	4.41	4.41	4.41	4.41	4.41													
	3																			4.52	4.52	4.52	4.52	4.52	4.52												
Nov	1																				4.54	4.54	4.54	4.54	4.54	4.54											
	2																					4.65	4.65	4.65	4.65	4.65	4.65										
	3																						4.63	4.63	4.63	4.63	4.63	4.63									
Dec	1																							4.67	4.67	4.67	4.67	4.67	4.67								
	2																								4.56	4.56	4.56	4.56	4.56	4.56							
	3																									4.51	4.51	4.51	4.51	4.51	4.51						
Jan	1																										4.40	4.40	4.40	4.40	4.40	4.40					
	2																											4.31	4.31	4.31	4.31	4.31	4.31				
	3																												4.41	4.41	4.41	4.41	4.41	4.41			
Feb	1																													4.48	4.48	4.48	4.48	4.48	4.48		
	2																														4.53	4.53	4.53	4.53	4.53	4.53	
	3																															4.50	4.50	4.50	4.50	4.50	4.50
Ave.		4.62	4.57	4.50	4.41	4.34	4.32	4.30	4.27	4.24	4.18	4.13	4.10	4.10	4.06	4.05	4.08	4.13	4.19	4.28	4.39	4.48	4.57	4.60	4.59	4.57	4.51	4.48	4.51	4.45	4.44	4.47	4.54	4.63	4.68	4.66

Harvesting season

Remarks)

$Y = S \times (278 - 7.07 \ t) \times 28 \times 0.85 \times 10^{-5}$

Where, Y = Potential maximum yield (ton/ha)
S = Average daily solar radiation during 25 days before flowering (cal/sq-cm)
t = Average daily temperature during 25 days before flowering (°C)
g = 1,000 grains weight (28 g)
R = Percentage of ripened grains (85 %)

1. Potential maximum yield is estimated according to the following formula and the recording data at the meteorological station in the project area.
2. Each figure means the average potential maximum yield for each 10 days in 2 months of harvesting season (1 to 36).

Table IV-35   FARM INPUT REQUIREMENT OF MAJOR CROPS

(Unit: per ha)

Item	unit	Paddy	Maize	Groundnuts	Soybeans
1) Seed	(kg)	30	35	70	40
2) Fertilizers					
Urea	(kg)	250	200	50	75
T.S.P.	(kg)	100	100	100	100
KCl	(kg)	75	50	50	50
3) Agro-chemicals					
Insecticides *1	(ltr)	4	2	2	7
Rodenticides*2	(ltr)	2	0	0	0
4) Labor	(man-day)				
Land Preparation		25	25	25	25
Nursery		3	0	0	0
Seedling		0	10	15	10
Transplanting		30	0	0	0
Fertilizing		6	6	6	6
Weeding		25	20	20	20
Spraying		4	2	2	10
Harvesting		35	30	35	30
Threshing/Drying/ Transporting		10	10	15	15
Water Management		5	5	0	5
Total		143	108	118	121
5) Animal Power	(animal-day)				
Plowing		8			
Levelling		5			
Total		13			

Remark)
*1 Agro-chamicals for each crops are provisionally proposed as follows:
Paddy   (Mipcin)
Maize   (Dursban)
Groundnuts   (Lannate L)
Soybeans   (Diasinon 60 EC)
*2 Proposed rodenticide: zinc phosphide

Table IV-36   PROPOSED FARM INPUT REQUIREMENT OF OIL PALM

(Unit: per ha)

Item	Unit	1st year	2nd year	3rd year	4th year	5th year
1) Seedling	(kg)	160	0	0	0	0
2) Fertilizers						
Urea	(kg)	90	143	143	286	286
T.S.P.	(kg)	60	143	143	215	215
KCl	(kg)	90	143	143	286	286
Dolomite	(kg)	70	10	10	215	215
3) Agro-chemicals						
Insecticide *1	(ltr)	5	0	1	1	1
Rodenticide *2	(ltr)	6	6	0.5	0.5	0.5
Pesticide *3	(kg)	2	1	1	1	1
4) Labor						
Total	(man-day)	113	75	64	55	66

Item	Unit	6th year	7th year	8-16th year	17-30th year
2. Production Cost					
1) Seed	(kg)	0	0	0	0
2) Fertilizers					
Urea	(kg)	286	286	286	286
T.S.P.	(kg)	215	215	215	215
KCl	(kg)	286	286	286	286
Dolomite	(kg)	215	215	215	215
3) Agro-chemicals					
Insecticide *1	(ltr)	1	1	1	1
Rodenticide *2	(ltr)	0.5	0.5	0.5	0.5
Pesticide *3	(kg)	1	1	1	1
4) Labor					
Total	(man-day)	73	74	69	66

Remarks)
*1 Proposed Insecticide: Sevin
*2 Proposed Rodenticide: Klerat
*3 Proposed Pesticide: Temic

Table IV-37   LABOURBALANCE IN TYPICAL FARMER (WITH-PROJECT CONDITION)

(Unit : man-day)

Month		Available labour force	1st Rice	2nd Rice	1st Palawija	2nd Palawija	Total Requirement	Labour Balance
Jan	(1)	2.48	1.32	0.14	0.49	0.00	1.95	0.53
	(2)	2.48	1.32	0.93	0.49	0.34	3.08	-0.60
	(3)	2.48	0.00	1.82	0.00	0.34	2.16	0.32
Feb	(1)	2.48	0.00	1.82	0.00	0.44	2.26	0.22
	(2)	2.48	0.00	2.33	0.00	0.44	2.77	-0.29
	(3)	2.48	0.00	2.33	0.00	0.44	2.77	-0.29
Mar	(1)	2.48	0.00	2.24	0.00	0.47	2.71	-0.23
	(2)	2.48	0.00	2.24	0.00	0.47	2.71	-0.23
	(3)	2.48	0.00	0.62	0.00	0.47	1.09	1.39
Apr	(1)	2.48	0.00	0.62	0.00	0.13	0.75	1.73
	(2)	2.48	0.00	0.56	0.00	0.52	1.08	1.40
	(3)	2.48	0.00	1.88	0.00	0.52	2.40	0.08
May	(1)	2.48	0.00	1.88	0.00	0.52	2.40	0.08
	(2)	2.48	0.00	1.82	0.00	0.52	2.34	0.14
	(3)	2.48	0.00	1.82	0.00	0.50	2.32	0.16
Jun	(1)	2.48	0.00	1.82	0.00	0.50	2.32	0.16
	(2)	2.48	0.00	1.32	0.00	0.39	1.71	0.77
	(3)	2.48	0.00	1.32	0.00	0.39	1.71	0.77
Jul	(1)	2.48	0.00	0.00	0.00	0.00	0.00	2.48
	(2)	2.48	0.14	0.00	0.00	0.00	0.14	2.34
	(3)	2.48	0.14	0.00	0.00	0.00	0.14	2.34
Aug	(1)	2.48	0.93	0.00	0.00	0.00	0.93	1.55
	(2)	2.48	1.82	0.00	0.42	0.00	2.24	0.24
	(3)	2.48	1.82	0.00	0.42	0.00	2.24	0.24
Sep	(1)	2.48	2.33	0.00	0.54	0.00	2.87	-0.39
	(2)	2.48	2.33	0.00	0.54	0.00	2.87	-0.39
	(3)	2.48	2.24	0.00	0.54	0.00	2.78	-0.30
Oct	(1)	2.48	2.24	0.00	0.57	0.00	2.81	-0.33
	(2)	2.48	0.62	0.00	0.29	0.00	0.91	1.57
	(3)	2.48	0.62	0.00	0.14	0.00	0.76	1.72
Nov	(1)	2.48	0.56	0.00	0.14	0.00	0.70	1.78
	(2)	2.48	1.88	0.00	0.63	0.00	2.51	-0.03
	(3)	2.48	1.88	0.00	0.63	0.00	2.51	-0.03
Dec	(1)	2.48	1.82	0.00	0.61	0.00	2.43	0.05
	(2)	2.48	1.82	0.00	0.61	0.00	2.43	0.05
	(3)	2.48	1.82	0.14	0.61	0.00	2.57	-0.09

Note)
- Harvested area of each crop in typical rice farmer is shown as follows :
      1st Rice :   1.5 ha (irrigated)
      2nd Rice :   1.5 ha (irrigated)
   1st Palawija :   0.5 ha (Upland field : 0.25 ha, Home yard : 0.25 ha)
   2nd Palawija :   0.5 ha (Upland field : 0.25 ha, Home yard : 0.25 ha)
- Active labour force   :   2.48 man-day
- Hired labour required is estimated at 32.0 man-days a year,
  according to the result of labour balance.

Table IV-38   MARKETING ANALYSIS FOR RICE IN THE PROJECT AREA

	Unit	Year 2000	Year 2005
1 Maarketable Surplus in the project area			
- Total paddy production	ton	38,860	42,000
- Waste and seeds***	ton	3,900	4,200
- Total rice supply	ton	22,700	24,600
- Per-capita consumption	kg	160	160
- Population*	persons	28,000	42,100
- Total demand in the project area	ton	4,500	6,700
- Marketable surplus	ton	18,200	17,900
2 Deficit in Bengkulu Province			
- Total paddy production	ton	420,500	498,500
- Waste and seeds***	ton	43,200	51,300
- Total rice supply	ton	243,000	288,100
- Per-capita consumption	kg	149	149
- Population**	persons	1,684,400	2,039,500
- Total demand in Bengkulu Province	ton	251,000	303,900
- Rice deficit	ton	8,000	15,800

Note)
  * Annual growth rate in the project area : 8.5 % per annum
 ** Annual growth rate in Bengkulu Province : 3.9 % per annum
*** The rate of waste and seeds :
        about 10 % of total production

Table IV-39   POPULATION PROJECTION FOR THREE PROVINCES

(Unit : 1,000)

	1988	1989	1990	1991	1992	1993
South Sumatera	5,902	6,073	6,243	6,414	6,584	6,755
Jambi	1,954	2,023	2,092	2,163	2,234	2,305
Riau	2,802	2,883	2,904	3,045	3,126	3,206
Total	10,658	10,979	11,299	11,622	11,944	12,266

Source: BPS Jakarta

Table IV-40   CONSUMPTION OF RICE FOR THREE PROVINCES

(Unit : 1,000 tons)

	1988	1989	1990	1991	1992	1993
South Sumatera	826	850	874	898	922	946
Jambi	274	283	293	303	313	323
Riau	392	404	415	426	438	449
DD TOTAL	1,492	1,537	1,582	1,627	1,673	1,718

Source: BPS Jakarta

Table IV-41   RICE PRODUCTION IN THREE PROVINCES

(Unit : 1,000 tons)

	1988	1989	1990	1991	1992	1993
South Sumatera	735	788	818	852	889	928
Jambi	313	331	350	371	393	415
Riau	198	212	224	237	245	266
Total	1,246	1,331	1,392	1,460	1,537	1,609

Source: Ministry of Agriculture, Jakarta

Table IV-42   FACILITIES AND SUPPORT PROVIDE TO TRANSMIGRANTS

Item	Nos.	Remarks
Fciliites for whole project		
1. Houses	2,450	36 m2 a house
2. Wells	612	1 unit for 4 families
3. Transmigration office	1	
4. Village office	1	
5. Mosque	1	
6. Godown	1	
7. Clinic	1	
8. Chief officer's residence	1	
9. Staff residences	2	
10. Wells for items 3 to 9	7	
Food supplies for each settled family		
1. Rice		
for Husband	17.5 kg/month	
for wife	10.0 kg/month	
for child	7.5 kg/month	up to 2 children
2. Cooking oil	3.0 ltr/month	
3. Kerosene	8.0 ltr/month	
4. Salt	2.0 ltr/month	
5. Sugar	3.0 ltr/month	
6. Soap	1.0 ltr/month	
Basic commodities for each settled family		
1. Man's Sarong	1 piece	
2. Sickle	1 unit	
3. Hand Harrow	1 unit	
4. Large Sickle	1 unit	
5. Fork	1 unit	
6. Crowbar	1 unit	
7. Hand Sprayer	1 unit	
Carpentry Tools for whole Project		
1. Axe	2,450	1 unit per family
2. Saw	490	1 per 5 families
3. Large Saw	490	1 per 5 families
4. Two Man Saw	163	1 per 15 families

Table IV-43   GOVERNMENT SUBSIDY FOR TRANSMIGRANTS

(Unit: per KK)

Item	Unit	Package A	Package B	Package C
(1) Seed				
1) Paddy	(kg)	20	(20) *1	
2) Maise	(kg)	10	(10) *1	
3) Soybeans	(kg)	15		
4) Vegetables	(kg)	12		
5) Cassaba and fruit tree	L.C			
(2) Fertilizers and agro-chemicals				
1) Urea	(kg)	100	75	100
2) TSP	(kg)	50	50	75
3) KCl	(kg)	50	25	25
4) Pesticides *2	(Lit)	5	4	4

Remarks)
*1 Farmer selects seed he wants.
*2 Pesticides consist of insecticide, rodenticide, fungicide and seed
treatment.

Table IV-44   IRRIGATED RICE SETTLEMENT DEVELOPED PROGRAMMES

Department Concerned	Activities	
Department of Transmigration		
1.Selection of Transmigrant	‡	
2.Transport of Transmigrant	‡	
3.Survey/Lalld Clearing	‡	(LU I, houselot, public
4.Housing	‡	faciliteis)
5.Roads/Bridges	‡	
6.Public Facilities	‡	
7.Supply Packages		
i Food	‡	
ii Clothes, etc.	‡	
iii Agric. tools	‡	
iii Agric. supplies		
Package A	‡	
Package B	‡	
Package C	‡	
Department of Public Works		
1.Survey/Land Clearing	‡	(Irrigation structures,
2.Irrigation Facilities	‡	canals, etc.)
3 Drainage Facilities	‡	(for irrigation area)
4.Inspection Roads/Bridges	‡	

Table IV-45   TREE CROP DEVELOPMENT PROGRAMMES
(Departmental Responsibilities)

Department Concerned	Tree Crops		
	PIR Khusus	PIR Trans	PIR Local
Department of Transmigration			
1. Selection of Transmigrant	‡	‡	
2. Transport of Transmigrant	‡	‡	
3. Survey/Lalld Clearing		‡	
4. Tree Crop Development			
5. Housing		‡	
6. Roads/Bridges			
7. Public Facilities		‡	
8 Supply Packages			
i Food	Rice 1 yr.	Rice 1 yr.	
ii Clothes, etc.			
iii Agric. toola			
iv Agric. Supplies			
Package A			
Package B			
Package C			
Department of Public Works			
1. Survey/Land Clearing			
2. Irrigation Facilities			
3 Drainage Facilities	‡	‡	‡
4. Inspection Roads			
Department of Estate Crops			
1. Survey/Land Clearing	‡	‡	‡
2 Tree Crop Development	‡	‡	‡
3. Tree Crop Maintenance	‡	‡	
4 Housing	‡		
5. Public Facilities	‡		
6. Roads/Bridges	‡	‡	‡
7 Drainage Facilities	‡	‡	‡
8. Agricultural Inputs	‡	‡	‡
9. Employment (4 yrs.)	‡	‡	‡
10. Farmer Training	‡	‡	‡

Table IV-46 (1/2) CROP BUDGET OF MAJOR CROPS UNDER WITH PROJECT CONDITION

	Unit	Unit Price	Irrigated Paddy Amount (per ha)	Value (Rp./ha)	Maize Amount (per ha)	Value (Rp./ha)	Groundnuts Amount (per ha)	Value (Rp./ha)	Soybeans Amount (per ha)	Value (Rp./ha)
1. Gross Income										
1) Unit Yield	(ton/ha)		4.0		3.0		1.2		1.0	
2) Unit Price	(Rp./ton)			250,000		150,000		500,000		600,000
3) Gross Income	(Rp.)			1,000,000		450,000		600,000		600,000
2. Production Cost										
1) Seed*1	(kg)		30	13,500	35	52,500	70	105,000	40	52,000
2) Fertilizers										
Urea	(kg)	185	250	46,250	200	37,000	50	9,250	75	13,875
T.S.P.	(kg)	210	100	21,000	100	21,000	100	21,000	100	21,000
KCl	(kg)	210	75	15,750	50	10,500	50	10,500	50	10,500
3) Agro-chemicals										
Insecticides*2	(ltr)		4	24,800	2	15,400	2	19,000	7	52,500
Rodenticides	(ltr)	2100	2	4,200	0	0	0	0	0	0
4) Labor	(man-day)									
Land Preparation			25	0	25	0	25	0	25	0
Nursery			3	0	0	0	0	0	0	0
Seedling			0	0	10	0	15	0	10	0
Transplanting			30	0	0	0	0	0	0	0
Fertilizing			6	0	6	0	6	0	6	0
Weeding			25	0	20	0	20	0	20	0
Spraying			4	0	2	0	2	0	10	0
Harvesting			35	0	30	0	35	0	30	0
Threshing/Drying/ Transporting			10	0	10	0	15	0	15	0
Water Management			5	0	5	0	0	0	5	0
Total			143	0	108	0	118	0	121	0
5) Animal Power	(animal-day)	6000	13	78,000						
6) Others (5% of (1)-(5))				10,175		6,820		8,238		7,494
Total				209,475		143,220		172,988		157,369
3. Net Income				790,525		306,780		427,013		442,631

*1 Unit Price of Seed (Rp/kg)
  Paddy   450
  Maize   1,500
  Groundnuts 1,500
  Soybeans 1,300

*2 Unit Price of Insecticide (Rp/kg)
  Paddy   6,200 (Mipcin)
  Maize   7,700 (Dursban)
  Groundnuts 9,500 (Lannate L)
  Soybeans   7,500 (Diasinon 60 EC)

Table IV-46 (2/2)   CROP BUDGET OF OIL PALM UNDER WITH PROJECT CONDITION

	Unit Price	1st year Amount (per ha)	1st year Value (Rp./ha)	2nd year Amount (per ha)	2nd year Value (Rp./ha)	3rd year Amount (per ha)	3rd year Value (Rp./ha)	4th year Amount (per ha)	4th year Value (Rp./ha)	5th year Amount (per ha)	5th year Value (Rp./ha)
1. Gross Income											
1) Unit Yield (ton/ha)		0.0		0.0		2.0		7.0		16.0	
2) Unit Price (Rp./ton)	75,000		75,000		75,000		75,000		75,000		75,000
3) Gross Income (Rp./ha)			0		0		150,000		525,000		1,200,000
2. Production Cost											
1) seed (kg)	2000	160	320,000	0	0	0	0	0	0	0	0
2) Fertilizers											
Urea (kg)	185	90	16,650	143	26,455	143	26,455	286	52,910	286	52,910
T.S.P. (kg)	210	60	12,600	143	30,030	143	30,030	215	45,150	215	45,150
KCl (kg)	210	90	18,900	143	30,030	143	30,030	286	60,060	286	60,060
Dolomite (kg)	90	70	6,300	10	900	10	900	215	19,350	215	19,350
3) Agro-chemicals											
Insecticides (Sevin) (ltr)	6000	5	30,000	0	0	1	6,000	1	6,000	1	6,000
Rodenticide (Klerat) (ltr)	2100	6	12,600	6	12,600	0.5	1,050	0.5	1,050	0.5	1,050
Pesticide (Temic) (kg)	6100	2	12,200	1	6,100	1	6,100	1	6,100	1	6,100
4) Labor (man-day)		113		75		64		55		66	
5) Animal Power (animal-day)			0		0		0		0		0
6) Others (5% of (1)-(5))			21,463		5,306		5,028		9,531		9,531
Total			450,713		111,421		105,593		200,151		200,151
3. Net Income			-450,713		-111,421		44,407		324,849		999,849

	Unit Price	6th year Amount (per ha)	6th year Value (Rp./ha)	7th year Amount (per ha)	7th year Value (Rp./ha)	8-16th year Amount (per ha)	8-16th year Value (Rp./ha)	17-24th year Amount (per ha)	17-24th year Value (Rp./ha)
1. Gross Income									
1) Unit Yield (ton/ha)		20.0		21.0		21.0		19.0	
2) Unit Price (Rp./ton)	75,000		75,000		75,000		75,000		75,000
3) Gross Income (Rp./ha)			1,500,000		1,575,000		1,575,000		1,425,000
2. Production Cost									
1) seed (kg)	2000	0	0	0	0	0	0	0	0
2) Fertilizers									
Urea (kg)	185	286	52,910	286	52,910	286	52,910	286	52,910
T.S.P. (kg)	210	215	45,150	215	45,150	215	45,150	215	45,150
KCl (kg)	210	286	60,060	286	60,060	286	60,060	286	60,060
Dolomite (kg)	90	215	19,350	215	19,350	215	19,350	215	19,350
3) Agro-chemicals									
Insecticides (Sevin) (ltr)	6000	1	6,000	1	6,000	1	6,000	1	6,000
Rodenticide (Klerat) (ltr)	2100	0.5	1,050	0.5	1,050	0.5	1,050	0.5	1,050
Pesticide (Temic) (kg)	6100	1	6,100	1	6,100	1	6,100	1	6,100
4) Labor (man-day)		73		74		69		66	
5) Animal Power (animal-day)			0		0		0		0
6) Others (5% of (1)-(5))			9,531		9,531		9,531		9,531
Total			200,151		200,151		200,151		200,151
3. Net Income			1,292,849		1,374,849		1,374,849		1,224,849

Table IV-47   FARM BUDGET UNDER WITH PROJECT CONDITION

(Unit: Rp. 1,000/year)

Item	With Project	
	Rice Farmer	Oil Palm Farmer
Farm Size (Unit: ha)		
1) Paddy Field	1.50	
2) Oil Palm Field		2.00
3) Upland Crop Field	0.25	0.25
4) Home Yard	0.25	0.25
Total Area	2.00	2.50
I Gross Income		
1) Farm Income *1		
a. Paddy	3,000	
b. Oil Palm		3,150
Upland Crops		
c. Soybeans	200	200
d. Peanuts	200	200
e. Maize	150	150
f. Cassaba		
Total (I)	3,550	3,700
II Gross Outgo		
1) Production Cost *1	786	558
2) Living Expenses *2	739	739
Total (II)	1,525	1,297
III Net Reserve (I - II)	2,025	2,403
IV Disposal Income (Gross Income minus Production Cost)	2,764	3,142

Remarks)
*1 Refer to Table IV-19
*2 Result from farm economic survey
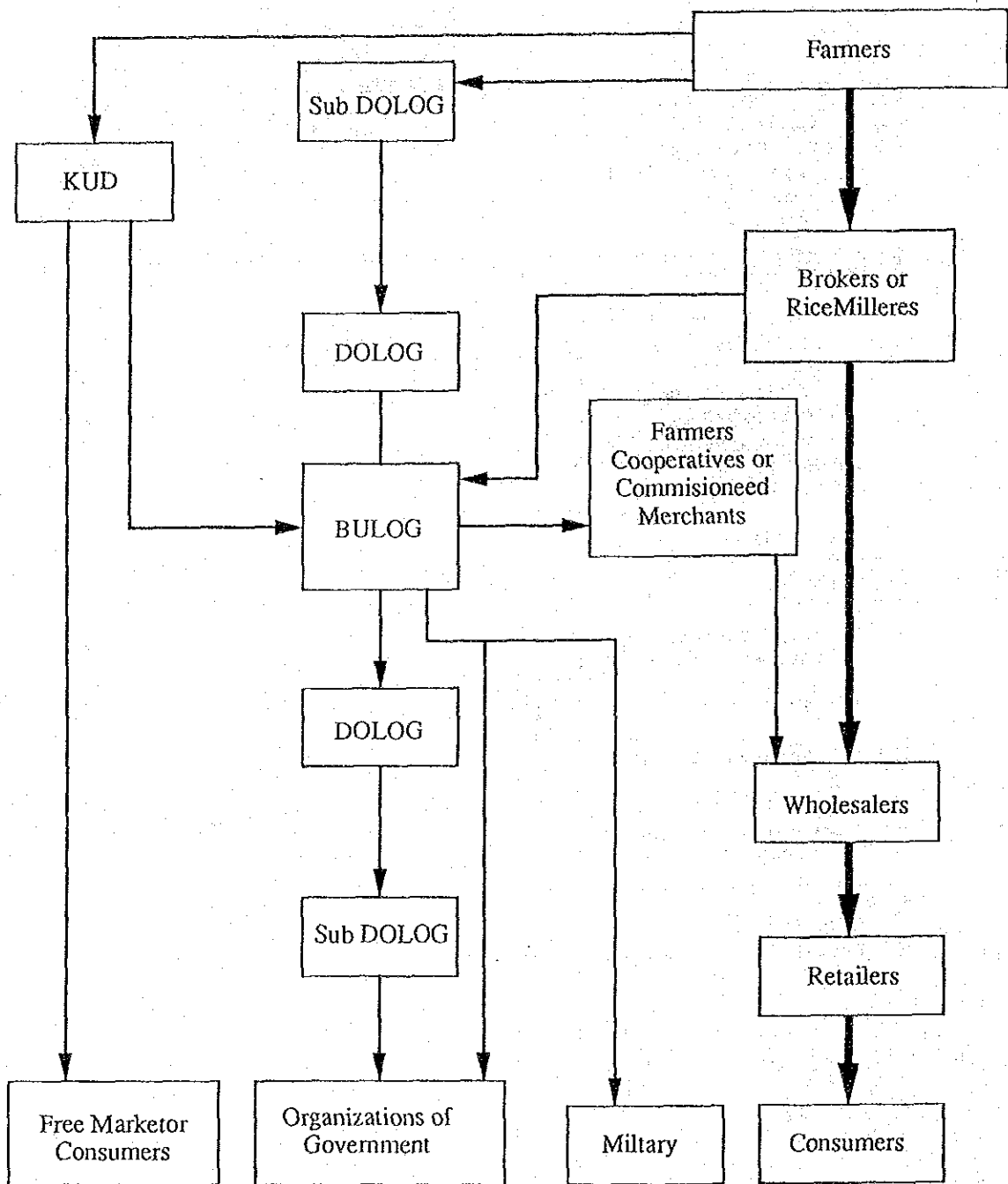
Fig. IV-1　GENERAL MARKETING FLOW OF RICE
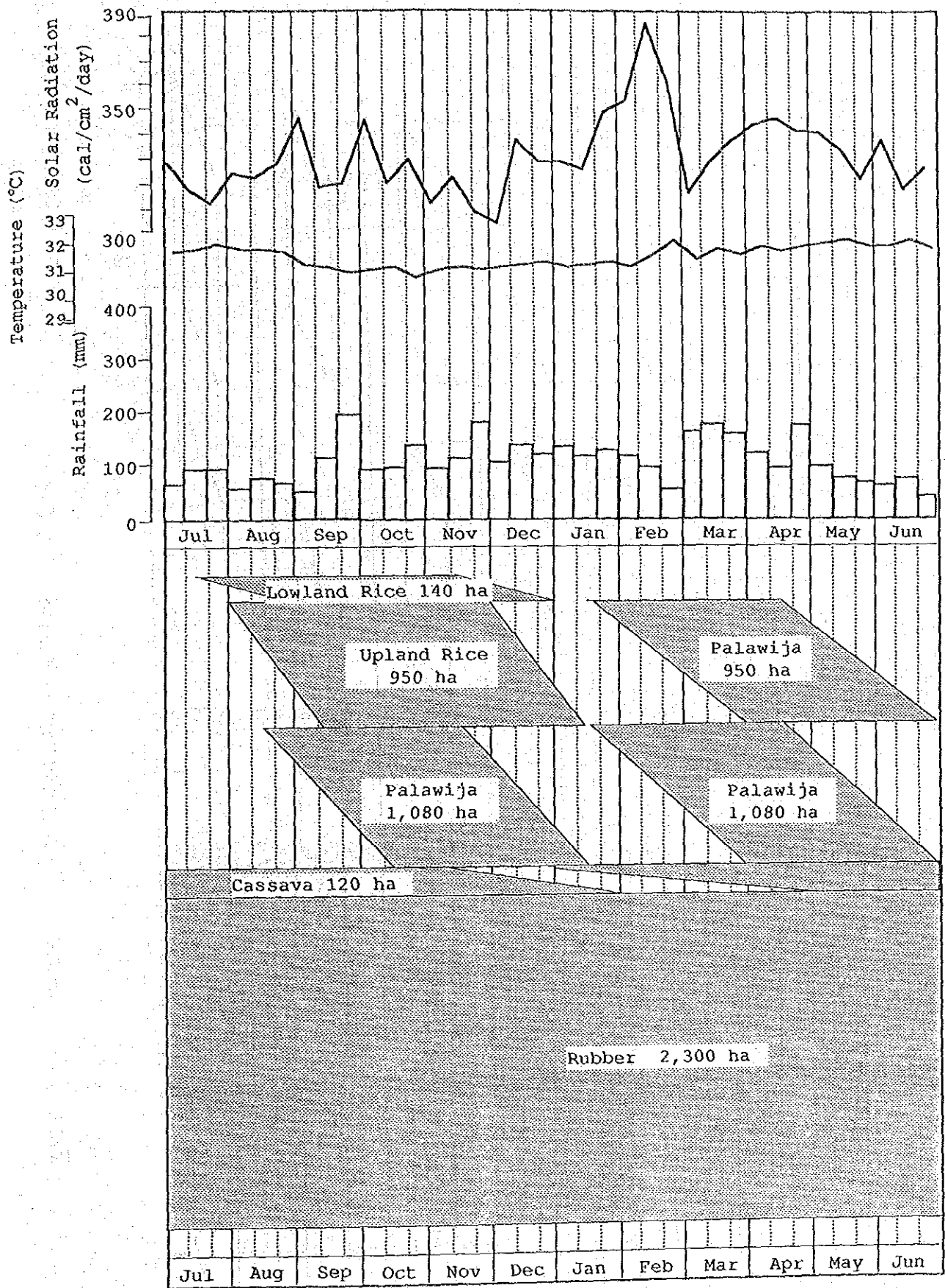
Fig. IV-2 Present Cropping Pattern
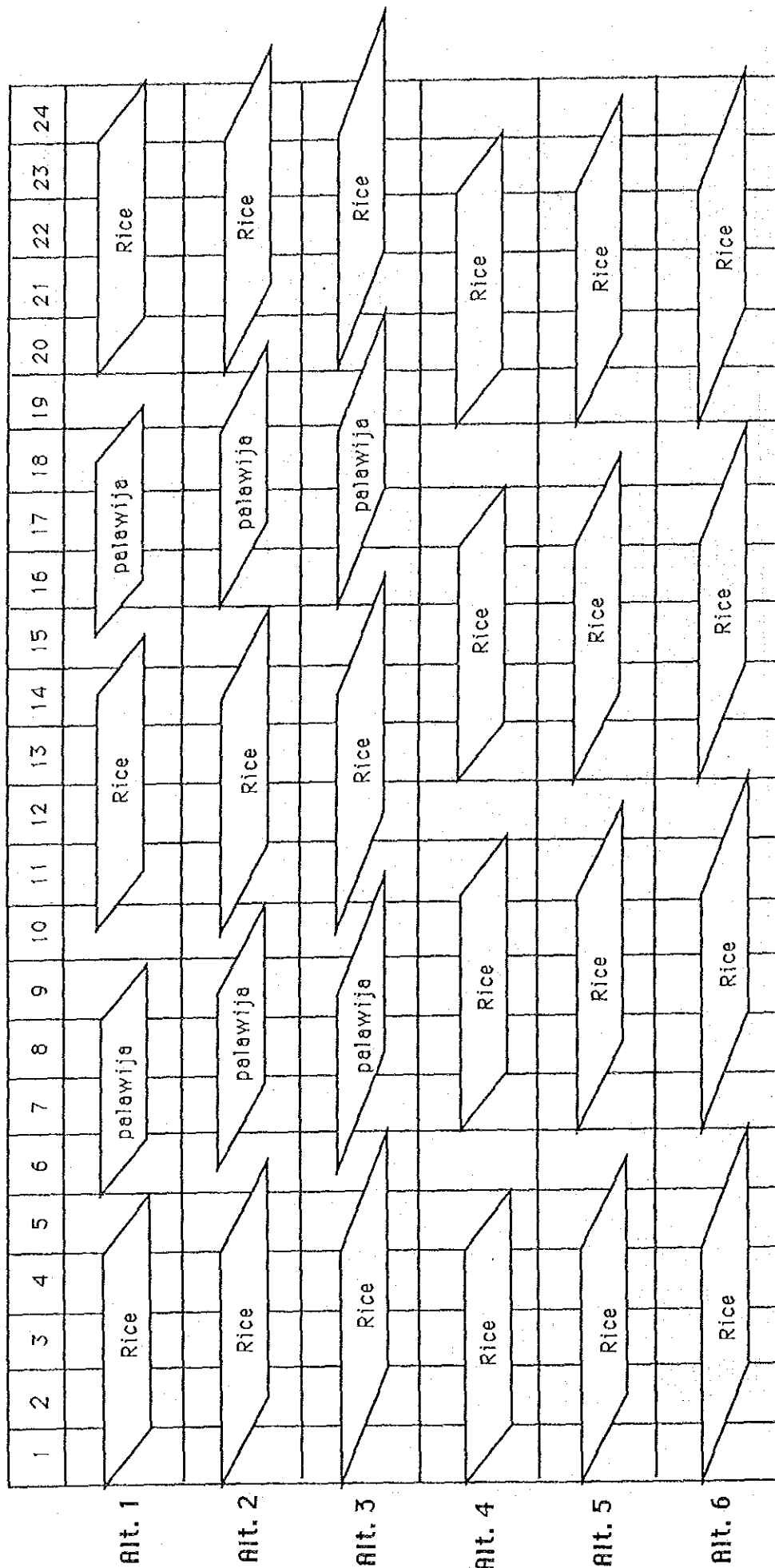
Figure IV-3   Alternative Cropping Pattern (Alternative 1 to 6)

IV-110
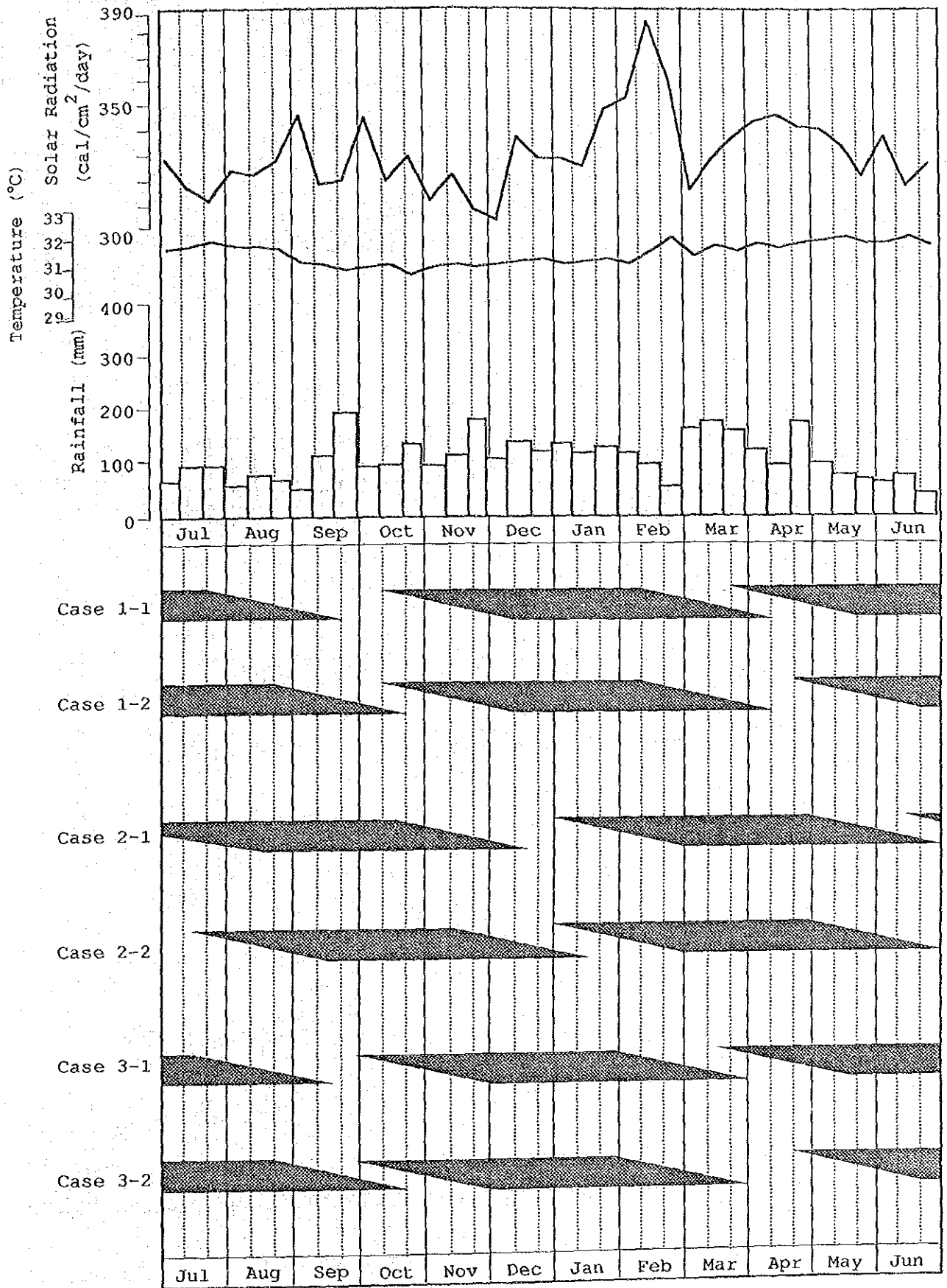
Figure IV-4 Alternative Cropping Pattern (Case 1-1 to 3-2)
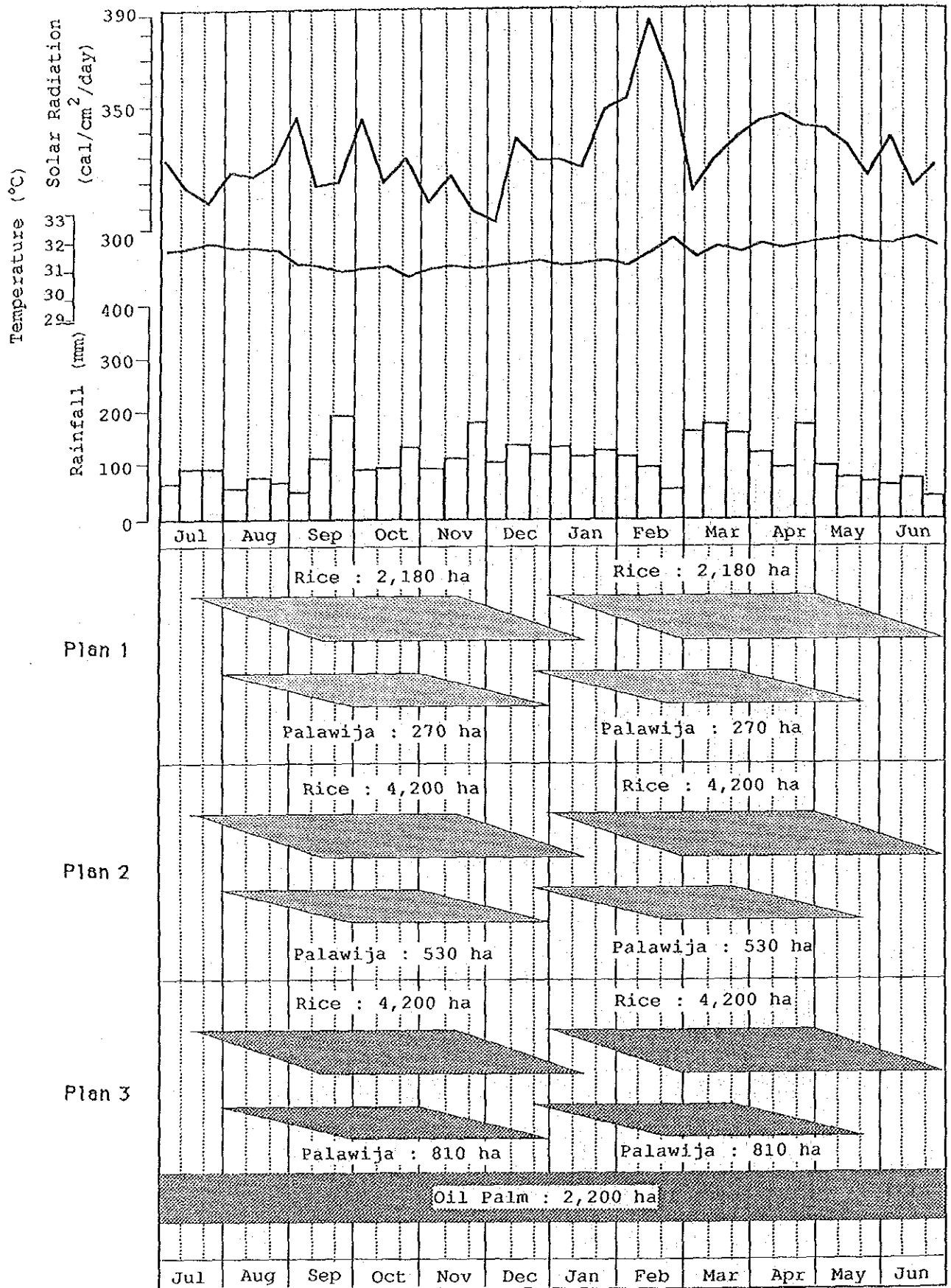
Figure IV-5　Proposed Cropping Pattern

APPENDIX V

IRRIGATION AND DRAINAGE

CHAPTER 1   FORMULATION OF BASIC DEVELOPMENT PLAN

1.1   General

In connection with the Air Selagan Irrigation development plan, various surveys and investigations have been carried out every year by the Directorate of Irrigation-II or the Institute of Hydraulic Engineering, DGWRD, or DPUP Bengkulu since 1983/1984. Actually, however, the construction for the Muko-Muko irrigation project adjacent to the right side of the Selagan river was proceeded, and the construction of the plantation has been implemented in some areas of the Study area for the Air Selagan Irrigation project.

Consequently, the irrigable area for the Project will be reduced from 12,600 ha initially estimated to 4,200 ha approximately. In addition, it is remarkable that the transmigration project has been executed in the objective area of the Project and the emergent transmigrants of about 1,300 families settled in the area from Kedung Ombo in the central Java in November 1988.

1.2   Present Condition of Development Area

The present situation of land use in the Study area is classified into seven different land use classifications shown below.

Land use classification	Area (ha)	% of Total
a. Paddy rice	140	0.9
b. Upland rice	950	6.4
c. Rubber	2,300	15.6
d. Natural forest including lake	8,620	58.3
e. Upland field, mixed cropping	1,200	8.1
f. Scrubland	1,040	7.0
g. Cleared and half burnt forest	250	1.7
h. Selagan river	300	2.0
Total	14,800	100.0

The above land will be used for the agricultural development project except Selagan river land, existing home yard, steep slope land and high elevation area considering topographic condition.

The area of 4,400 ha covered by peat material having 2.5 - 3.5 m depth in average is included in the national forest area, 8,620 ha mentioned above. The downstream area in the vicinity of Muko-Muko has a steeper topographical condition indicated by the slopes ranged from 1/400 to 1/500. In this peat area, at present, some drainage canals have been constructed under the cooperative works by local people, so that the ground surface of peat area located in the vicinity of such drainage canals is being dried. Therefore, the oil palm plantation which is already planted in the neighboring area can be considered as an effective land use for this area.

On the other hand, a hilly area in the upstream is mostly covered by the land having steeper slopes, so that the increase of irrigable area to be developed can not be expected, especially for the area having higher ground elevations than 20.0 m, as shown in Figure V-1 and Table V-6.

However, such hilly area can be used for home yard, upland field, tree crop and so on. In the home work under the Phase II, the irrigable area and the transmigration area were estimated based on the application of land slope to be less than 15%.

1.3 Basic Concept for Development

1.3.1 Objective for Development

The objective of the Project is to implement an irrigation project mainly for paddy cultivation aiming at contributing to increase the yield for food products to realize an economic stability of the farmers in the region, and encourage the transmigration scheme and the regional development.

The transmigration program has played an important role in sparsely populated area in outer islands for agricultural development and contributed in the regional development.

The local people of about 1,550 households composed of 7 villages, Government transmigration of 4 units and a few social transmigration have settled in the study area. Total 2,310 house holds are counted up from 1985 to present in the study area and neighboring Muko-Muko Kiri area. In the figure, the transmigrants of 1,290 households have settled since Nov. 1988 as an urgent transmigration program due to the commencement of reservoir operation from Kedung Ombo area in the central Java province.

The Bengkulu Province has limited land for paddy cultivation because of few flat lands and a lot of the land with poor soil condition. Therefore, the promotion of agricultural development in the study area situated in the agricultural region (northern part of the Province) contemplated by the Provincial Government is not only to contribute to the economic stabilization of the transmigrants and local people in the study area, but also to

imply the realization of a strong impact of the agricultural development to the region in the neighborhood.

For this purpose, it is necessary to realize prompt implementation of the following matters for the study area to be transmigration area and the land for local people with no irrigation and drainage facilities, using water resources effectively.

a. Construction of systematic irrigation facilities
b. Improvement of drainage conditions by the construction of drainage facilities
c. Development of paddy field and farmland in the transmigration area and uncultivated land
d. Coordination to the new transmigration/re-settlement plan in newly developed farm land
e. Construction of operation and maintenance facilities
f. Arrangement of agricultural support services and organization.
g. Construction of related social infra-structures.

1.3.2 Factors for Delineation of Areas to be Developed

In the delineation of the development area, the following factors are taken into consideration.

1) Location and intake water level of weir
2) Possible intake discharge and water requirement
3) Land suitability classification
4) Number of household of farmers, allocated area and land use plan

For the study area, the following matters are found for the above items.

1) Even if the intake water level is heightened, the benefited area is not increased so much from a topographical point of view and the backwater at the time of flood due to the proposed weir height does not influence the villages in the upstream of the weir.

2) The discharge of the Selagan river is comparatively abundant and the year-round paddy cultivation by double cropping can be proposed for all the estimated irrigable area.

3) The irrigable area is limited specially from the viewpoints of the soil condition with peaty soil and the land slope.

4) Taking into consideration the Local Government's policy for the agricultural development in this region, 1.5 ha of farm land is allocated for paddy cultivation per one transmigration family and 25% of the benefited area is

assured for the local people. Therefore, it is possible to decide the total number of agricultural household, the number of household of transmigrant and the land use plan.

With regard to the swampy area which the paddy cultivation could not be introduced because the poor soil condition, the introduction of oil palm cultivation after the excavation of drainage canal is proposed on the base of the allocated land of 2.0 ha per one transmigration family.

5) Ratio of oil palm farmer is 50% of Government transmigration and 50% of forestry worker or shifting farmer in the province.

6) Supply of irrigation water to the existing extension canal (S.S. Baru) in the Muko-Muko Kiri project is designed in the Selagan project considering the future development plan of Muko-Muko project. A part of existing canal facilities is improved and then irrigation to higher land is enabled.

1.3.3 Approach to a Basic Development Plan

(1) Study area and objective area

The study area is estimated at 22,400 ha as shown in the following table using the border between the Muko-Muko Irrigation Project and the Air Selagan Irrigation Project which is decided by the Provincial Public Works Office. Actually, however, the concession area for plantation by P.T. Tolan Tiga, the private enterprise was permitted by the Provincial Government in the study area and the objective area for the Air Selagan Irrigation Project is decided to be 14,800 ha except the plantation area.

Division	Left Side	Right Side	Total
Objective Area	5,350 ha	9,450 ha	14,800 ha
Plantation Area	7,600	–	7,600
Tolan Tiga – I	(5,600)	–	(5,600)
Tolan Tiga – II	(2,000)	–	(2,000)
Total	12,950	9,450	22,400

The objective area in the study area is divided into the following and the gross irrigable area is estimated at 4,700 ha

from the viewpoints of the intake water level, soil and land slope.

Division	Left Side	Right Side	Total
	ha	ha	ha
Gross irrigable area	2,700	2,000	4,700
High land for home yard	900	700	1,600
Steep and other high land	1,210	2,220	3,430
Swamp (Peat area)	260	3,600	3,860
Existing home yard	130	220	350
River and lake	150	180	330
Other (Flood area)	–	530	530
Total	5,350	9,450	14,800

Remarks: 1) The irrigable area is the land irrigated the intake water level of 25.50 m and the average canal slope of 1/2,600 and the land of which the slope is less than 15%.

Judging from topographic maps with scale of 1/5,000, high ground elevation part even if peat area is taken in irrigable area considering the possibility of paddy field.

2) The highest elevation of paddy field
in the right side : EL. 24.6 m
in the left side : EL. 23.0 m
The successive water level from the Muko-Muko Project is 14.00 m at B.B.4.

3) Other area means the area behind Kp. Udjung Padang, Pasar Muko-Muko and Kp. Pondok Batu. Such area remains as present secondary forest or bush considering flood influence due to low ground elevation.

(2) Basic concept of agricultural development

As to the agricultural development in the objective area under the circumstances of the present condition of the transmigration scheme and the land with poor soil condition proposed for oil palm cultivation, the following three (3) alternative development plans are considered as a basic concept.

Plan-1 : Most suitable land for paddy is selected in accordance with present transmigration program including the settlement of local people.

Plan-2 : Suitable land except for heavy peat area is selected in accordance with the condition of land suitability and water resources capacity for paddy.

Plan-3 : Perennial crop like oil palm in the swampy area after construction of drainage canal is introduced in addition to the above alternation Plan-2.

The development area of the study for each plan is formulated as follows:

Table V-1   DEVELOPMENT AREA OF EACH PLAN

Plan	Location	Gross Irrigable Area	Net Irrigable Area	Gross Oil Palm Area
		ha	ha	ha
Plan-1	Right Side	1,333	1,200	--
	Left Side	1,084	975	--
	Total	2,417	2,175	--
Plan-2	Right Side	2,000	1,800	--
	Lift Side	2,700	2,400	--
	Total	4,700	4,200	--
Plan-3	Right Side	2,000	1,800	2,500
	Left Side	2,700	2,400	--
	Total	4,700	4,200	2,500

CHAPTER 2 STUDY ON DEVELOPMENT PLAN

2.1 Study of Each Plan

Selection of benefited area is studied about 3 cases of Plan-1, 2 and 3 described in the Clause 1.3.3, Chapter 1.

The control point elevation of the benefited area for each plan is as follows:

Right side of Selagan river : The elevation, 15.0m at the highest farm land near existing transmigration area SP-II.

Left side of Selagan river : The elevation, 19.0m at the highest farm land near existing transmigration area SP-IV.

2.1.1 Location of Weir

From the view of ground elevation in the planning area and the intake water level, the site of weir is proposed at a certain place of the Selagan river within about 4 Km from the upstream part of the river near Kp. Lubuk Sahung to the downstream part near Kp. Surian Benkal.

As a result of the study by the available topographical maps with a scale of 1/2,000 and field reconnaissance, the following two (2) weir site are compared.

- Downstream site : at the place about 2.3 Km in the upstream from the Kp. Lubuk Sahung bridge (Plan of DPU, Province)

- Upstream site : at the place about 0.8 Km in the upstream from the downstream site (Plan of D.P.M.A)

As for the factor to select the weir site, line of existing river, river bed elevation, shape and elevation of both the sides of the river, location and condition of tributaries, geological condition, backwater level at the time of flood, construction method etc. were studied in the Clause 4.1.2, Chapter 4. The outline of both dimensions are as follows:

Table V-2 COMPARISON OF WEIR SITE

Division	Downstream		Upstream		Remarks
River bed elevation	22.2	m	21.0	m	From river survey
Width of river	64	m	50	m	
Catchment area	375	Km2	374	Km2	By map 1/100,000
Flood discharge	1,000	m3/s	997	m3/s	1/100 probability
Width of weir	74	m	73	m	
Weir height	3.80	m	5.35	m	
Weir crest elevation	26.00	m	26.35	m	
Length of river bank	205	m	40	m	
Canal length	-		800	m	
Ratio of Construction Cost	1.00		1.23		Table V-42

The results of the comparative study on the above two plans are as follows.

a. The weir at the upstream site has smaller width, but has higher height because the river bed elevation is lower than that of downstream caused by the reverse slope of the river.

b. The ground elevation along the scheduled canal route of upstream plan is about 10 meter higher than the downstream site. From this factor, the canal construction cost becomes expensive.

c. The size of the weir in the upstream site is higher by 1.55 meter of the weir height.

d. To deep the unit flood discharge which is the standard, $q = 12.0 - 14.0$ m^3/s/m, the width of weir in the upstream site becomes almost the same with the width of downstream site.

e. There is no influence of the back water to the upstream villages in both sites.

f. From view of technical, economical points and operation & maintenance, the downstream plan is more advantageous for the weir site.

Since, the downstream site is adopted as the weir site of this project.

2.1.2 Water Availability and Water Requirement

As a result of the study described in the Appendix-I, Clause 2.1.1, discharge of the Selagan river was estimated by tank model method as follows;

Table V-3 RIVER DISCHARGE ESTIMATED

(Unit: m³/s)

| Month | Downstream Site (CA = 375 Km2) | | |
	Monthly Average Discharge	1/5 Probable Average Discharge	Planning 10 days Min. Discharge
Jan.	51.5	40.2	34.3
Feb.	39.9	27.8	22.4
Mar.	53.1	41.6	39.7
Apr.	42.9	30.0	23.5
May	29.0	22.0	18.9
Jun.	22.1	14.7	11.5
Jul.	23.1	17.5	16.5
Aug.	24.3	12.9	9.2
Sep.	41.8	30.3	26.5
Oct.	44.7	29.3	27.2
Nov.	51.9	30.9	24.3
Dec.	50.6	36.1	30.8
Yearly	39.6	27.7	–

The peak diversion water requirement in the dry season was estimated at 1.53 1/s/ha in the Clause 4.2.4 and the total irrigable area is generally estimated to be less than about 6,000 ha from the above river discharge.

2.1.3 Height of Weir and Elevation of Benefited Area

With reference to the Plans -1, 2 and 3 as described in 1.3.3, the required head loss from the control point in the benefited area to the weir site is respectively calculated as follows:

Table V-4 COMPARISON OF TOTAL HEAD LOSS

Unit : m

Plan	Location	Canal length	Discharge	Slope	Conveyance loss	Other loss	Total loss
		m	m³/s		m	m	m
1	Right	4,577	3.33	1/3,800	1.18	0.70	1.88
	Side	6,710	2.05	1/3,500	1.92	0.47	2.39
		3,800	1.83	1/3,600	0.97	0.78	1.75
		1,566	1.14	1/3,400	0.46	0.26	0.72
		1,774	0.89	1/2,500	0.71	0.19	0.90
		2,925	0.82	1/2,700	0.90	0.86	1.76
	Total	21,352			6.14	3.26	9.40
	Left	4,577	3.33	1/3,800	1.18	0.70	1.88
	Side	5,620	1.80	1/3,600	1.34	1.30	2.64
		2,520	1.53	1/3,700	0.68	0.03	0.71
		3,918	0.78	1/2,700	1.45	0.18	1.63
	Total	16,635			4.65	2.21	6.86
2 & 3	Right	4,577	6.45	1/5,600	0.80	0.70	1.50
	Side	6,710	3.15	1/3,700	1.81	0.57	2.38
		3,800	2.83	1/2,900	1.21	0.79	2.00
		1,566	1.73	1/3,600	0.44	0.29	0.73
		1,774	1.39	1/3,200	0.55	0.22	0.77
		2,925	0.98	1/2,500	0.97	0.88	1.85
	Total	21,352			5.78	3.45	9.23
	Left	4,577	6.45	1/5,600	0.80	0.70	1.50
	Side	5,620	4.42	1/3,800	1.27	1.55	2.82
		2,520	4.17	1/3,600	0.70	0.02	0.72
		3,918	2.94	1/3,500	1.12	0.12	1.24
	Total	16,635			3.89	2.39	6.28

Taking the required elevation at the fields as the elevation of the field plus 0.60m, the required elevation of weir is respectively estimated as follows:

Table V-5 WEIR ELEVATION REQUIRED

Plan	Location	Elevation of Field	Canal Loss	Distribution Loss	Intake Loss	Elevation of Weir
1	Right	GH 15.0m	9.40m	0.60m	0.10m	EL 25.10m
	Left	GH 19.0	6.86	0.60	0.10	EL 26.56
2 & 3	Right	GH 15.0	9.23	0.60	0.10	EL 24.93
	Left	GH 19.0	6.28	0.60	0.10	EL 25.98

In the case of Plan-1, the required elevation of weir becomes 0.58 m higher than the height of Plan-2 and 3 cases.

2.1.4 Topographical Condition of the Benefited Area

The irrigable area of the Project was selected along the contour-line of the upper limit of 15% of the gradient from the topographical map (s = 1/5,000). The river bed, heavy slope area, existing houses, upland field, proposed transmigration are in heavy slope area, and proposed oil palm, etc. are omitted from the area in the following Table.

The irrigable area above GH.20.0m is quite limited with 30 ha. only, as seen from Table V-5 and Fig. V-1. Hence the main irrigable area is considered to be the area lower than GH.20m in ground elevation.

The above Table is made the calculation based on Plan-2. In the case of Plan-1, the irrigable area can be higher than about GH.5.0m as SP-II, -III, -IV and -VI of the existing transmigration area. In the case of Plan-3, it is the same with Plan-2. The expecting development area for plantation can be about 2,500 ha. of low and swampy area at the right bank of Hitam River, and about 900 ha. at the left bank.

In the other side, during 1985 to 1989 the sea level is as follows at the mouth of Selagan River. In this survey, a second-order triangulation station (TT.2142, EL.57.70m) was applied as vertical control point.

Highest tide sea level	GH - 2.45M
Average of daily high tide sea level	- 3.15
Mean tide sea level	- 3.57
Average of daily low tide sea level	- 3.99
Lowest tide sea level	- 4.48

The gradient of river-bed is 1/12,500 in the downstream of Selagan River. The drainage plan and the lowest irrigable area can be studied by the said gradient, tide sea level and flood discharge etc.

Table V-6   IRRIGABLE AREA BY 5 METER CONTOUR

(Unit : ha)

Elevation	Right Bank		Left Bank		Total	
	Area	Accumu-lated	Area	Accumu-lated	Area	Accumu-lated
-1.0 - +0.0	88	88	191	191	279	279
+0.0 - +5.0	582	670	1524	1715	2106	2385
+5.0 - +10.0	717	1387	430	2145	1147	3532
+10.0 - +15.0	523	1910	354	2499	877	4409
+15.0 - +20.0	63	1973	198	2697	261	4670
+20.0 - +25.0	27	2000	3	2700	30	4700
Total	2000		2700		4700	

(From map scale 1/5,000)

Fig. V-1   ACREAGE OF IRRIGABLE AREA
AT EACH ELEVATION IN THE STUDY AREA

GROUND ELEVATION (m)

— TOTAL ATRA ··· RIGHT BANK ---- LEFT BANK
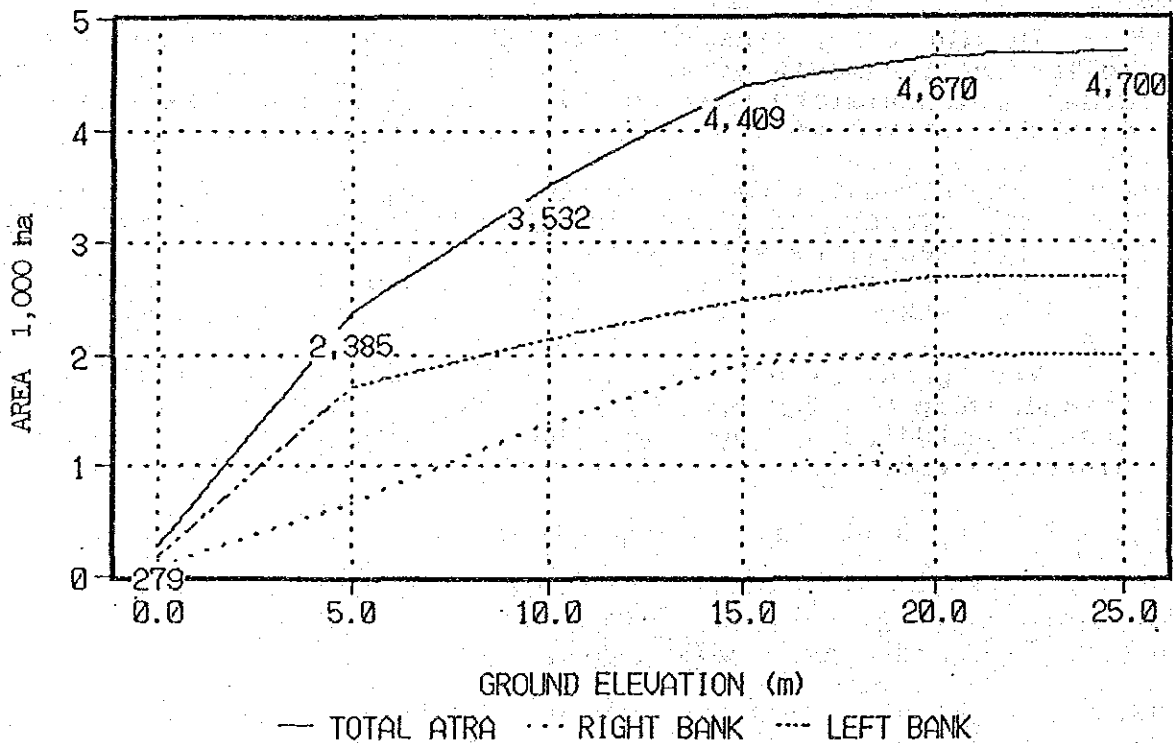
2.1.5 Land Suitability

Paddy rice will grow on a wide range of soils, and there is no preferred soil type, but heavy alluvial soils are better than light sandy soils. The optimum pH is between 5.5 and 6.5 when dry, and can be up to 7.2 when flooded. There is no highly suitable land, S1 for paddy. Moderately suitable, S2 land and Marginally suitable S3 land are used for paddy field. The S2 land is judged from the degree of ground slope. In this project, the slope of paddy field is less than 15%.

The palawija crops have been taken to be maize, peanuts and soy beans. Maize will tolerate a wide range of oil types, but likes good drainage, and well aerated silty loams. Peanuts also like well drained friable soil. In the project, the palawija crop is planned at higher places except for the case of oil palm farmers.

Oil palm has a shallow adventitions root system. The crop likes deep permeable well structured soils, with good drainage. Effective soil depth should be greater than one meter and slopes should be less than 15% not only because of the erosion hazard, but because of the difficulty of farming practice. Poorly drained soils and coastal sands should be avoided. In the project S3 land for oil palm should be used after improvement of drain by the construction of drainage canal.

The area classified by soil and the suitability to the crop are shown as in the following table.

Table V-7 LAND SUITABILITY

Crop	Suitability Classification				
	S1	S2	S3	N1	N2
Paddy	–	4610	3265	4400	2225
Palawija	–	2510	5365	4400	2225
Oil palm	–	2680	6330	–	5490
Rubber	–	6960	3140	–	4400
Coffee	–	6960	1040	–	6500

Note: S1, highly suitable
S2, Moderately suitable
S3, Marginally suitable
N1, Currently unsuitable
N2, Permanently unsuitable

2.1.6 Number of Household of Transmigrant and Distributed Area

As to the development plan which is mentioned in the Clause 1.3.3, following three development scales are formulated.

1) Development Plan-1 (In case that the area under the present transmigration scheme is developed).

a. Objective number of household

Division	Left side	Right side	Total
	KK	KK	KK
Existing transmigrant	290	460	750
Planned	200	140	340
Local people (25%)	160	200	360
Total	650	800	1,450

b. Distributed land

Division	Left side	Right side	Total
	KK	KK	KK
Number of household	650	800	1,450
	ha	ha	KK
Paddy field (gross)	1,083	1,333	2,175
Paddy field (net)	975	1,200	2,175
Upland field	123	150	273
Home yard	123	150	273
Public land	123	150	273
Total	1,452 ha	1,783 ha	3,235 KK

Remarks: 1) Local people can get paddy field only.
Net 1.5 ha/household

2) Distributed land for transmigrant;
Net paddy field ; 1.50 ha/household
(Lahan Usaha I and II)
Upland field   ; 0.25 ha/household
Home yard   ; 0.25 ha/household
Public land   ; 0.25 ha/household

c. Breakdown of distributed land

	Division	House-hold	Paddy (Gross)	Paddy (Net)	Upland	Home Yard	Public Land	Total
		KK	ha	ha	ha	ha	ha	ha
Right Side	Existing SP-II	50	83	75	13	13	13	122
	" SP-III	290	483	435	72	72	72	699
	" SP-VI	120	200	180	30	30	30	290
	Planned SP-II	130	217	195	32	32	32	313
	" SP-III	10	17	15	3	3	3	26
	Local People	200	333	300	–	–	–	333
	Sub total	800	1,333	1,200	150	150	150	1,783
		KK	ha	ha	ha	ha	ha	ha
Left Side	Existing SP-IV	250	415	375	63	63	63	604
	Planned SP-IV	200	335	300	50	50	50	485
	Spontaneous	40	67	60	10	10	10	97
	Local People	160	267	240	–	–	–	267
	Sub total	650	1,084	975	123	123	123	1,453
	Total	1,450	2,417	2,175	273	273	273	3,236

2) Development Plan-2 (In case that all the irrigable area is included for the plan)

a. Objective number of household

Division	Left side	Right side	Total
	KK	KK	KK
Existing transmigrant	290	460	750
Planned	200	140	340
New	710	300	1,010
Local people (25%)	400	300	700
Total	1,600	1,200	2,800

b. Distributed land

Division	Left side	Right side	Total
	KK	KK	KK
Number of household	1,600	1,200	2,800
	ha	ha	ha
Paddy field (gross)	2,700	2,000	4,700
Paddy field (net)	2,400	1,800	4,200
Upland field	300	230	530
Home yard	300	230	530
Public land	300	240	540
Total	3,600 ha	2,700 ha	6,300 ha

Remarks: 1) Net paddy   ; 2,800 KK x 1.5 ha/KK = 4,200 ha
             Gross paddy ; 4,200 ha ÷ 0.9   = 4,700 ha
             Upland   ; 2,100 KK x 0.25 ha/KK =   530 ha
             Home yard   ;   ditto   =   530 ha
             Public land ;   ditto   =   540 ha
                Total   6,300 ha

         2) For the local people, only paddy field is
             considered.

c. Existing local people and their paddy field

Name of village	Household of local people		Distribution of paddy field	
	Household	Ratio	Paddy field	Ratio
Lubuk Sahung	116 KK	11.5%	78 ha	7.4%
Terasterunjam	257	25.5	270	25.7
Pondok Kopi	109	10.8	105	10.0
Tanah Rekah	181	18.0	195	18.6
Pasar Muko-Muko (left side)	255	25.3	300	28.6
Pondok Batu	89	8.9	102	9.7
Total	1,007	100.0	1,050	100.0

d. Breakdown of distributed land

	Division		House-hold	Paddy (Gross)	Paddy (Net)	Upland	Home Yard	Public Land	Total
			KK	ha	ha	ha	ha	ha	ha
Right Side	Existing	SP-II	50	83	75	13	13	13	122
	"	SP-III	290	483	435	72	72	72	699
	"	SP-VI	120	200	180	30	30	30	290
	Planned	SP-II	130	217	195	32	32	32	313
	"	SP-III	10	17	15	3	3	3	26
	New		300	500	450	80	80	90	750
	Local People		300	500	450	-	-	-	500
	Sub total		1,200	2,000	1,800	230	230	240	2,700
			KK	ha	ha	ha	ha	ha	ha
Left Side	Existing	SP-IV	250	415	375	63	63	63	604
	Planned	SP-IV	200	335	300	50	50	50	485
	Spontaneous		40	67	60	10	10	10	97
	New		710	1,213	1,065	177	177	177	1,744
	Local People		400	670	600	-	-	-	670
	Sub total		1,600	2,700	2,400	300	300	300	3,600
	Total		2,800	4,700	4,200	530	530	540	6,300

Remarks: High land in the project area is applied for upland field, home yard and public land.

3) Development Plan-3 (In case that low land peat area is developed for oil palm cultivation in addition to Plan-2)

a. Development area for oil palm plantation

The low land peat area of about 4,400 ha is not suitable for paddy irrigation project caused by the thickness of peat soil. However after the improvement of drainage condition, oil palm and haramay that is called to be ramie (a kind of hemp), etc. are arable in the Bengkulu province.   In the study area, oil palm cultivation has an actual experience by PT. Tolan Tiga, and then the development plan of oil palm is formulated for newly transmigrated area after the improvement of drainage system from the view of an useful utilization of land resources. The location is selected to the peat area where the area has about 3,400 ha in the right side of Selagan river.   The total area is divided into the right side area of Hitam river, about 2,550 ha and the left side area of the same, about 850 ha.

b.   Distributed land of one household

PIR   TRANSE   type   is supposed for   the   settlement   of plantation area, then

Oil palm area (Net)	2.00	ha/household
Home yard and upland field	0.50	"
Public land	0.25	"
Total	2.75	

The   settler of oil palm plantation is composed of   50% of Government   transmigration and 50% of forest   worker   or shifting   farmers in the mountainous zone where   is   decided as the protect area for forest in Bengkulu province.

c.   Location of home yard and upland field

For   the   location of home yard and upland   field,   the behind area of Pasar Muko-Muko and Kp. Udjung Padang is more useful   because   of   near distance from   home   yard   to   the development   area   and   the soil   condition.   However,   the existing   local people are now developing such closing   area to present villages, so it is difficult to use the land   for new   development   for   the   transmigration   considering   the complication   of   coexistence.   If the home   yard   area   is located at hilly zone near transmigration SP-II and   SP-III, the   distance   between farm land and have yard   becomes   too far.   Therefore, the location is planned to arrange so   much as along the new planning road, small hilly land and   higher place   in   the   peat   area.   Furthermore,   it   has   more advantageous point to join a home yard and upland field in a same land.

d.   Objective number of household

Main Crop	Division	Left side	Right side	Total
		KK	KK	KK
Paddy	Government transmigration	1,200	900	2,100
"	Local people	400	300	700
Oil palm	Government transmigration	-	550	550
"	Provincial transmigration (PERAMBAH)	-	550	550
	Total	1,600 KK	2,300 KK	3,900 KK

e. Breakdown of distributed land

	Division	House-hold	Paddy (Gross)	Paddy (Net)	Upland	Home Yard	Public Land	Total
		KK	ha	ha	ha	ha	ha	ha
Right Side	Existing SP-II	50	83	75	13	13	13	122
	" SP-III	290	483	435	72	72	72	699
	" SP-VI	120	200	180	30	30	30	290
	Planned SP-II	130	217	195	32	32	32	313
	" SP-III	10	17	15	3	3	3	26
	New	300	500	450	80	80	90	750
	Local People	300	500	450	-	-	-	500
	Sub total	1,200	2,000	1,800	230	230	240	2,700
		KK	ha	ha	ha	ha	ha	ha
Left Side	Existing SP-IV	250	415	375	63	63	63	604
	Planned SP-IV	200	335	300	50	50	50	485
	Spontaneous	40	67	60	10	10	10	97
	New	710	1,213	1,065	177	177	177	1,744
	Local People	400	670	600	-	-	-	670
	Sub total	1,600	2,700	2,400	300	300	300	3,600
	Total	2,800	4,700	4,200	530	530	540	6,300

Division	House-hold	Oil Palm (Gross)	(Net)	Upland	Home Yard	Public Land	Total
	KK	ha	ha	ha	ha	ha	ha
Governmental transmigration	550	1,250	1,100	138	138	144	1,670
PERAMBAH	550	1,250	1,100	138	138	144	1,670
Total	1,100	2,500	2,200	276	276	288	3,340
	KK	ha	ha	ha	ha	ha	ha
Grand Total	3,900	7,200	6,400	806	806	828	9,640

4)   Summary of Each Plan

Table V-8   COMPARISON OF HOUSEHOLD

Division	Plan-1	Plan-2	Plan-3
Gross irrigation area	2,417 ha	4,700 ha	4,700 ha
Net irrigation area	2,175	4,200	4,200
Upland	273	530	806
Oil palm (net)	–	–	2,200
Total	2,448 ha	4,730 ha	7,206 ha
Number of household	KK	KK	KK
Existing (paddy)	750	750	750
Planning (paddy)	340	340	340
Sub total	1,090 KK	1,090 KK	1,090 KK
New Settler			
Government (paddy)	–	1,010 KK	1,010 KK
" (oil palm)	–	–	550
Province/PERAMBAH			
(oil palm)	–	–	550
Sub total	–	1,010 KK	2,110 KK
Total (household)	1,090 KK	2,100 KK	3,200 KK
Existing local people	360 KK	700 KK	700 KK
Total (household)	1,450 KK	2,800 KK	3,900 KK

2.1.7   Results from the Study

    In addition to the study mentioned in the above, further
studies   for Water Requirement Plan, Scale of Facilities, Rough
Estimate   for   Construction Cost and Economic Comparison were
carried out.

    Results obtained from such studies are shown in Table V-16,
Table V-17, Table V-18, Fib. V-2, Fib. V-3 and Fib. V-4
respectively.

    From the above results, the following characteristics can be
pointed out:

    a)   In the study area, there exist many hilly areas topo-
          graphically undulated with steeper slopes which are
          inadequate for irrigation area.

If the maximum ground surface slope to be employed as an irrigable area shall be 15%, the Gross Irrigation Area is estimated as 4,700 ha (maximum ground elevation : EL. 23.6 m).

b)   The maximum back water surface elevation caused by the construction of Headworks gets EL.33.05 m at Kp. Surian Bungkal under the application of 1/100 probability flood water.

The village is situated at GH.35.0 m elevation, so that no flood water surface elevation under Plan-1 and Plan-2 gets EL.32.45 m, lower by 60 cm than Plan-1.

c)   1/5 probability river discharge on Air Selagan gets 9.21 m^3/s in minimum, so that the irrigation water required for the planting ratio of 200 %/year can be sufficiently supplied.

d)   The Swamp Area reaching 4,400 ha is widely spread in the downstream area.

Such area is expected to be developed for agriculture by the application of drainage improvement.

e)   The location where the canal route is planned to be constructed on the hilly site is so topographically undulated that the rather high construction cost than that in flat area is required.

f)   Basic Specification for Plan-1, Plan-2 and Plan-3

Each Plan is basically specified as follows:

Plan-1 : Most suitable land for paddy is selected according to the present transmigration program including the settlement of local people.

Plan-2 : Full use of irrigable area for paddy in the Project Area with the settlement of new transmigrants is employed.

Plan-3 : In addition to the above Plan-2, the development of swampy area by the application of drainage canal construction is employed for perennial crop production (oil palm).

- The number of farmers under the Plan-3, which is the largest among 3 plans, is 3,900 KK in total consisting of 2,800 KK for paddy and 1,100 KK for oil palm.

(Remark : Plan-1 : 1,450 KK in total)

- In case of Plan-1, the slope for canal profile become steeper than that for Plan-2 because of the reduction of required canal water discharge.

  Accordingly, the required intake water surface elevation at the Weir Site is forced to be higher than the case of Plan-2 by about 60 cm.

  Judging from the increase of construction cost and the decrease of benefited area, the Economic Effect derived from Plan-1 is lower than that of Plan-2.

- In case of Plan-3, the farming area used for paddy field, upland field and plantation (oil palm) gets about 8,000 ha in total. Also, about 2,700 ha for Plan-1 and about 5,200 ha for Plan-2 are respectively expected.

  Therefore, Plan-3 has the best efficiency for Land Use among 3 plans.

- From the Economical Aspect, the priority is given as follows:

  Plan-3 > Plan-2 > Plan-1

From the above study, Plan-3 resulting high priority is finally employed for this Project Planning.

Therefore, the Project Size under the Study is given as follows:

Irrigation Area (paddy field)	: Net 4,200 ha
Plantation Area (oil palm)	: Net 2,200 ha
Household for paddy (existing trans.)	: 1,090 KK (incl. planned KK)
Household for paddy (new trans.)	: 1,010 KK
Household for paddy (local)	: 700 KK
Household for oil palm (new trans.)	: 1,100 KK
Headworks (downstream plan)	: 2.3 km upstream from Kp. Lubuk Sahung
Weir height	: 3.8 m
Flood water level (1/100)	: WS 30.05 m

Table V-9 COMPARISON OF STRUCTURAL PLAN

Item	Plan-1	Plan-2	Plan-3
Gross irrigation area	2,417 ha	4,700 ha	4,700 ha
Net irrigation area	2,175	4,200	4,200
Upland	273	530	806
Oil palm land (Gross)	-	-	2,500
Oil palm land (Net)	-	-	2,200
Existing transmigrants	1,090 KK	1,090 KK	1,090 KK
New settlers	-	1,010	2,110
Local people	360	700	700
Distributed land			
Homeyard	0.25 ha	0.25 ha	0.25/0.25 ha
Paddy field	1.50	1.50	1.50/-
Oil palm land	-	-	-/2.00
Upland	0.25	0.25	0.25/0.25
Water source	Selagan river	Selagan river	Selagan river
Intake facility	Weir	Weir	Weir
Catchment area	375 km^2	375 km^2	375 km^2
Location of weir	Approx. 2.3 km upstream from Kp. Lubuk Sahung		
Elevation of river bed	EL.22.20m	EL.22.20m	EL.22.20m
Height of weir	4.40m	3.80m	3.80m
Elevation of crest	EL.26.60m	EL.26.00m	EL.26.00m
Width of crest	74.00m	74.00m	74.00m
Max. water requirement			
For wet season paddy	1.36 l/s/ha	1.36 /s/ha	1.36 l/s/ha
For dry season paddy	1.53	1.53	1.53
Planning intake discharge	3.33 m^3/s	6.43 m^3/s	6.45 m^3/s
Intake water level	WS26.50 m	WS25.90 m	WS25.90 m
Flood discharge (1/100)	1,000 m^3/s	1,000 m^3/s	1,000 m^3/s
Flood discharge (1/1,000)	1,300	1,300	1,300
Main canal, right side	15.1 km	15.1 km	15.1 km
" left side	14.0	14.0	14.0
Secondary canal, right	13.8	18.1	18.1
" left	5.7	21.6	21.6
Tertiary system, right	1,200 ha	1,800 ha	1,800 ha
" left	975	2,400	2,400
Drainage canal, right	33.4 km	40.1 km	66.9 km
" left	17.9	32.7	32.7
Road	6.8 km	13.7 km	43.9 km

Table V-10 COMPARISON OF APPROXIMATE COST ESTIMATE

Unit : Million Rp.

Item	Plan-1	Plan-2	Plan-3
1. Preparatory Works	1,216	1,659	1,689
2. Main Civil Works	24,314	33,172	33,789
2.1 Weir	4,154	3,973	3,973
2.2 Main Irrig. Canal	11,833	13,436	13,436
2.3 Sec. Irrig. Canal	5,490	10,888	10,888
2.4 Drainage Canal	1,206	1,725	2,342
2.5 Tertiary System	1,631	3,150	3,150
3. O&M Facilities	882	931	980
4. Land Acquisition Cost	125	181	237
5. Administrative Cost	361	697	880
6. Engineering Services	4,342	4,583	4,824
6.1 Detailed Design	1,737	1,834	1,930
6.2 Construction Supervision	2,605	2,749	2,894
Sub-Total	31,240	41,223	42,399
7. Contingencies	1,562	2,061	2,120
Total	32,802	43,284	44,519
Farm Size (paddy + plantation)	2,175 ha	4,200 ha	6,400 ha
Index of Construction Cost	0.74	0.97	1.00
Construction Cost per ha by Farm Size (Mill. Rp./ha)	15.1	10.3	7.0
Economic IRR	6.8%	9.2%	12.7%

Table V-11.1 ANNUAL DISBURSEMENT SCHEDULE OF FINANCIAL CONSTRUCTION COST (Plan-1)

Unit Milliom Rp.

Item	Cost	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97
I. Irrigation & Drainage Construction							
1. Preparatory Works	1,216	182	365	243	243	182	
2. Civil Works	24,314			2,430	8,627	10,061	3,196
2.1 Weir	4,154			1,246	1,662	1,246	
2.2 Main Canal	11,833			1,183	5,325	4,733	592
2.3 Sec. Canal	5,490				1,098	2,745	1,647
2.4 Drainage Canal	1,206				543	603	60
2.5 Tertiary System	1,631					734	897
3. O & M Facility	882						882
4. Land Acquisition	125		38	38	25	25	
5. Administration	361	36	54	72	72	72	54
6. Engineering Services	4,342	347	1,650	521	651	651	521
6.1 D/D	1,737	347	1,390				
6.2 S/V	2,605		261	521	651	651	521
Sub-total	31,240	566	2,107	3,303	9,619	10,992	4,653
7. Physical Contingency	1,562	28	105	165	481	550	233
Total	32,802	594	2,212	3,469	10,100	11,542	4,886

Table V-11.2 ANNUAL DISBURSEMENT SCHEDULE OF FINANCIAL CONSTRUCTION COST (Plan-2)

Unit Million Rp.

Item	Cost	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97
I. Irrigation & Drainage Construction							
1. Preparatory Works	1,659	249	498	332	332	249	
2. Civil Works	33,172			2,536	10,589	14,290	5,757
2.1 Weir	3,973			1,192	1,589	1,192	
2.2 Main Canal	13,436			1,344	6,046	5,374	672
2.3 Sec. Canal	10,888				2,178	5,444	3,266
2.4 Drainage Canal	1,725				776	863	86
2.5 Tertiary System	3,150					1,418	1,733
3. O & M Facility	931						931
4. Land Acquisition	181		54	54	36	36	
5. Administration	697	70	105	139	139	139	105
6. Engineering Services	4,583	367	1,742	550	687	687	550
6.1 D/D	1,834	367	1,467				
6.2 S/V	2,749		275	550	687	687	550
Sub-total	41,223	685	2,399	3,611	11,784	15,402	7,342
7. Physical Contingency	2,061	34	120	181	589	770	367
Total	43,284	720	2,519	3,791	12,373	16,172	7,709

Table V-11.3 ANNUAL DISBURSEMENT SCHEDULE OF FINANCIAL CONSTRUCTION COST   (Plan-3)

Unit Milliopn Rp.

Item	Cost	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97
I. Irrigation & Drainage Construction							
1. Preparatory Works	1,689	253	507	338	338	253	
2. Civil Works	33,789			2,536	10,867	14,599	5,788
2.1 Weir	3,973			1,192	1,589	1,192	
2.2 Main Canal	13,436			1,344	6,046	5,374	672
2.3 Sec. Canal	10,888				2,178	5,444	3,266
2.4 Drainage Canal	2,342				1,054	1,171	117
2.5 Tertiary System	3,150					1,418	1,733
3. O & M Facility	980						980
4. Land Acquisition	237		71	71	47	47	
5. Administration	880	88	132	176	176	176	132
6. Engineering Services	4,824	386	1,833	579	724	724	579
6.1 D/D	1,930	386	1,544				
6.2 S/V	2,894		289	579	724	724	579
Sub-total	42,399	727	2,543	3,699	12,152	15,799	7,479
7. Physical Contingency	2,120	36	127	185	608	790	374
Total	44,519	764	2,670	3,384	12,759	16,589	7,853

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Table V-12.1   COMPARISON OF ECONOMIC EVALUATION(1/3)

Plan-1   Economic IRR   (Unit:Rp.million)

No	Year	Capital	O&M	Replace-ment	Total (C)	Gross Benefit (B)	Balance (B-C)
1	1991	525	0	1,347	1,872	0	-1,872
2	1992	1,936	0	34	1,970	0	-1,970
3	1993	2,946	0	40	2,986	0	-2,986
4	1994	8,600	0		8,600	0	-8,600
5	1995	9,826	0		9,826	0	-9,826
6	1996	4,229	28		4,257	724	-3,533
7	1997		55		55	1,552	1,497
8	1998		55		55	2,069	2,014
9	1999		55		55	2,586	2,531
10	2000		55		55	2,586	2,531
11	2001		55		55	2,586	2,531
12	2002		55		55	2,586	2,531
13	2003		55		55	2,586	2,531
14	2004		55		55	2,586	2,531
15	2005		55		55	2,586	2,531
16	2006		55	794	849	2,586	1,737
17	2007		55		55	2,586	2,531
18	2008		55		55	2,586	2,531
19	2009		55		55	2,586	2,531
20	2010		55		55	2,586	2,531
21	2011		55		55	2,586	2,531
22	2012		55		55	2,586	2,531
23	2013		55		55	2,586	2,531
24	2014		55		55	2,586	2,531
25	2015		55		55	2,586	2,531
26	2016		55	794	849	2,586	1,737
27	2017		55		55	2,586	2,531
28	2018		55		55	2,586	2,531
29	2019		55		55	2,586	2,531
30	2020		55		55	2,586	2,531
31	2021		55		55	2,586	2,531
32	2022		55		55	2,586	2,531
33	2023		55		55	2,586	2,531
34	2024		55		55	2,586	2,531
35	2025		55		55	2,586	2,531
36	2026		55	1,534	1,589	2,586	997
37	2027		55		55	2,586	2,531
38	2028		55		55	2,586	2,531
39	2029		55		55	2,586	2,531
40	2030		55		55	2,586	2,531
41	2031		55		55	2,586	2,531
42	2032		55		55	2,586	2,531
43	2033		55		55	2,586	2,531
44	2034		55		55	2,586	2,531
45	2035		55		55	2,586	2,531
46	2036		55	794	849	2,586	1,737
47	2037		55		55	2,586	2,531
48	2038		55		55	2,586	2,531
49	2039		55		55	2,586	2,531
50	2040		55		55	2,586	2,531
			NPV(6.8%)=		23,599	23,739	140
			EIRR		0.068		

Table V-12.2   COMPARISON OF ECONOMIC EVALUATION(2/3)

Plan-2   Economic IRR   (Unit:Rp.million)

| No | Year | COST | | | Total | Gross | Balance |
		Capital	O&M	Replace-ment	(C)	Benefit (B)	(B-C)
1	1991	635	0	1,347	1,982	0	-1,982
2	1992	2,189	0	1,223	3,412	0	-3,412
3	1993	3,210	0	1,259	4,469	0	-4,469
4	1994	10,528	0	858	11,386	0	-11,386
5	1995	13,757	0	888	14,645	0	-14,645
6	1996	6,636	54	45	6,735	1,298	-5,437
7	1997		107	25	132	2,959	2,827
8	1998		107		107	3,958	3,851
9	1999		107		107	4,957	4,850
10	2000		107		107	4,993	4,886
11	2001		107		107	4,993	4,886
12	2002		107		107	4,993	4,886
13	2003		107		107	4,993	4,886
14	2004		107		107	4,993	4,886
15	2005		107		107	4,993	4,886
16	2006		107	838	945	4,993	4,048
17	2007		107		107	4,993	4,886
18	2008		107		107	4,993	4,886
19	2009		107		107	4,993	4,886
20	2010		107		107	4,993	4,886
21	2011		107		107	4,993	4,886
22	2012		107		107	4,993	4,886
23	2013		107		107	4,993	4,886
24	2014		107		107	4,993	4,886
25	2015		107		107	4,993	4,886
26	2016		107	838	945	4,993	4,048
27	2017		107		107	4,993	4,886
28	2018		107		107	4,993	4,886
29	2019		107		107	4,993	4,886
30	2020		107		107	4,993	4,886
31	2021		107		107	4,993	4,886
32	2022		107		107	4,993	4,886
33	2023		107		107	4,993	4,886
34	2024		107		107	4,993	4,886
35	2025		107		107	4,993	4,886
36	2026		107	1,847	1,954	4,993	3,039
37	2027		107		107	4,993	4,886
38	2028		107		107	4,993	4,886
39	2029		107		107	4,993	4,886
40	2030		107		107	4,993	4,886
41	2031		107		107	4,993	4,886
42	2032		107		107	4,993	4,886
43	2033		107		107	4,993	4,886
44	2034		107		107	4,993	4,886
45	2035		107		107	4,993	4,886
46	2036		107	838	945	4,993	4,048
47	2037		107		107	4,993	4,886
48	2038		107		107	4,993	4,886
49	2039		107		107	4,993	4,886
50	2040		107		107	4,993	4,886
		NPV(9.1%)=			30,716	30,964	248
		EIRR			0.092		

Table V-12.3　　　　COMPARISON OF ECONOMIC EVALUATION(3/3)

Plan-3　　Economic IRR　　　　　　　　　　(Unit:Rp.million)

No	Year	COST Capital	O&M	Replace-ment	Total (C)	Gross Benefit (B)	Balance (B-C)
1	1991	674	0	1,347	2,021	-8	-2,029
2	1992	2,310	0	1,223	3,533	-14	-3,547
3	1993	3,278	0	1,259	4,537	-21	-4,558
4	1994	10,850	0	858	11,708	-25	-11,733
5	1995	14,106	0	888	14,994	-702	-15,696
6	1996	6,763	74	2,120	8,957	328	-8,629
7	1997		113	2,172	2,285	2,678	393
8	1998		113	120	233	4,431	4,198
9	1999		113	65	178	7,037	6,859
10	2000		113		113	8,704	8,591
11	2001		113		113	9,322	9,209
12	2002		113		113	9,458	9,345
13	2003		113		113	9,467	9,354
14	2004		113		113	9,467	9,354
15	2005		113		113	9,467	9,354
16	2006		113	882	995	9,467	8,472
17	2007		113		113	9,467	9,354
18	2008		113		113	9,467	9,354
19	2009		113		113	9,467	9,354
20	2010		113		113	9,467	9,354
21	2011		113		113	9,214	9,101
22	2012		113		113	8,962	8,849
23	2013		113		113	8,962	8,849
24	2014		113		113	8,962	8,849
25	2015		113		113	8,962	8,849
26	2016		113	882	995	8,962	7,967
27	2017		113		113	8,962	8,849
28	2018		113		113	8,962	8,849
29	2019		113		113	8,426	8,313
30	2020		113		113	7,435	7,322
31	2021		113		113	6,585	6,472
32	2022		113		113	5,886	5,773
33	2023		113		113	5,508	5,395
34	2024		113		113	5,993	5,880
35	2025		113		113	7,056	6,943
36	2026		113	1,891	2,004	8,005	6,001
37	2027		113		113	8,805	8,692
38	2028		113		113	9,284	9,171
39	2029		113		113	9,436	9,323
40	2030		113		113	9,465	9,352
41	2031		113		113	9,467	9,354
42	2032		113		113	9,467	9,354
43	2033		113		113	9,467	9,354
44	2034		113		113	9,467	9,354
45	2035		113		113	9,416	9,303
46	2036		113	882	995	9,315	8,320
47	2037		113		113	9,214	9,101
48	2038		113		113	9,114	9,001
49	2039		113		113	9,013	8,900
50	2040		113		113	8,962	8,849
		NPV(10%)=			32,693	43,691	10,998
		EIRR			0.127		
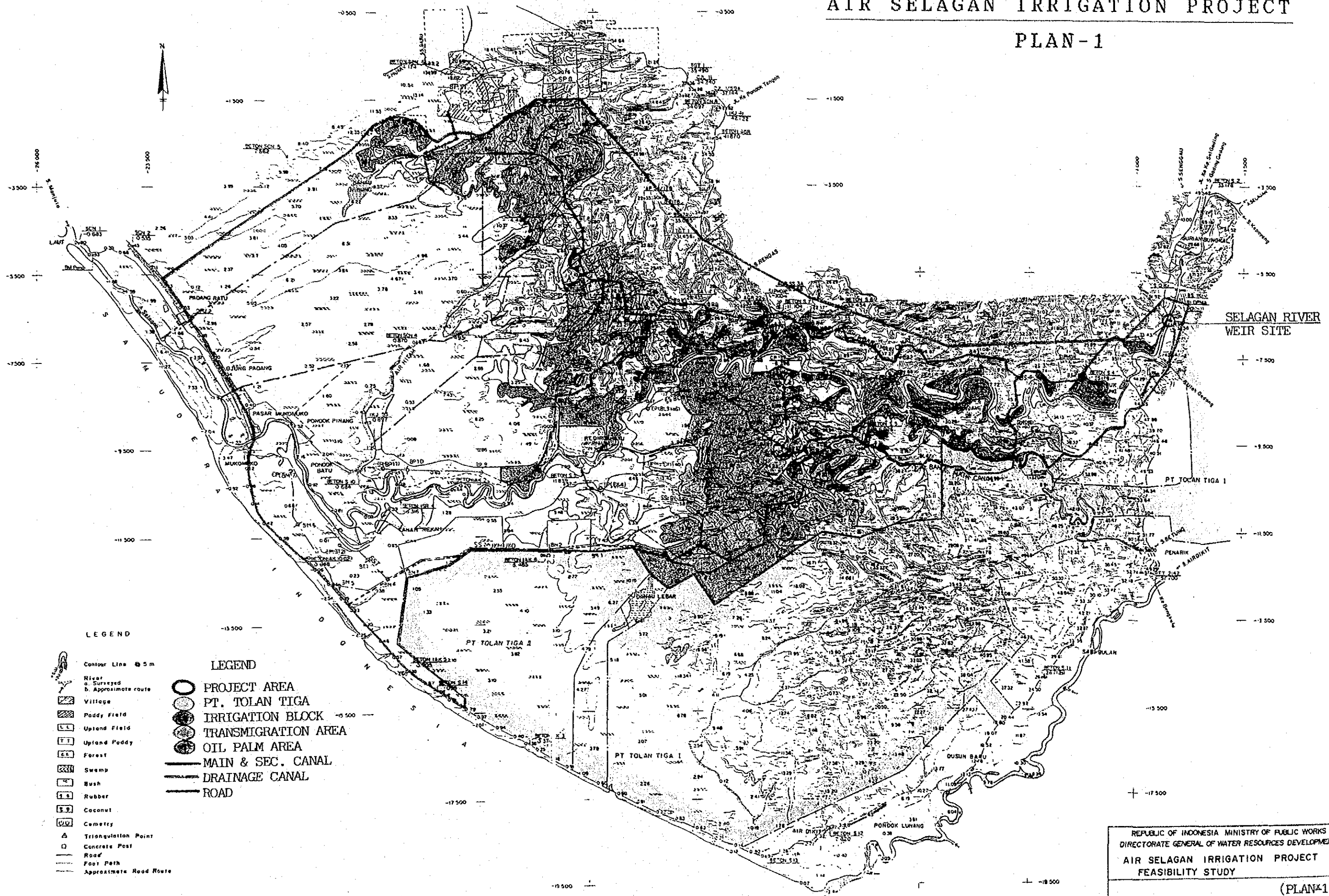
SELAGAN RIVER
WEIR SITE

LEGEND

	Contour Line @ 5 m
	River
	a. Surveyed
	b. Approximate route
	Village
	Paddy Field
	Upland Field
	Upland Paddy
	Forest
	Swamp
	Bush
	Rubber
	Coconut
	Cemetry
△	Triangulation Point
□	Concrete Post
	Road
	Foot Path
	Approximate Road Route

LEGEND

◯ PROJECT AREA
◯ PT. TOLAN TIGA
◯ IRRIGATION BLOCK
◯ TRANSMIGRATION AREA
◯ OIL PALM AREA
── MAIN & SEC. CANAL
── DRAINAGE CANAL
── ROAD

PT TOLAN TIGA II

PT TOLAN TIGA I

SCALE

0 1 2 3 4 5 km

Fig.V-2.1 BASIC DEVELOPMENT PLAN (PLAN-1)

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REPUBLIC OF INDONESIA MINISTRY OF PUBLIC WORKS
DIRECTORATE GENERAL OF WATER RESOURCES DEVELOPMENT

AIR SELAGAN IRRIGATION PROJECT
FEASIBILITY STUDY

(PLAN-1)
BASIC DEVELOPMENT PLAN

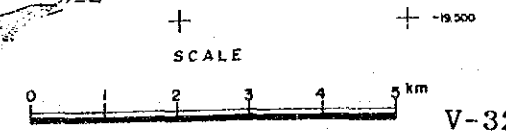JAPAN INTERNATIONAL COOPERATION AGENCY
TOKYO (JICA)

DWG. NO.

SELAGAN RIVER
WEIR SITE
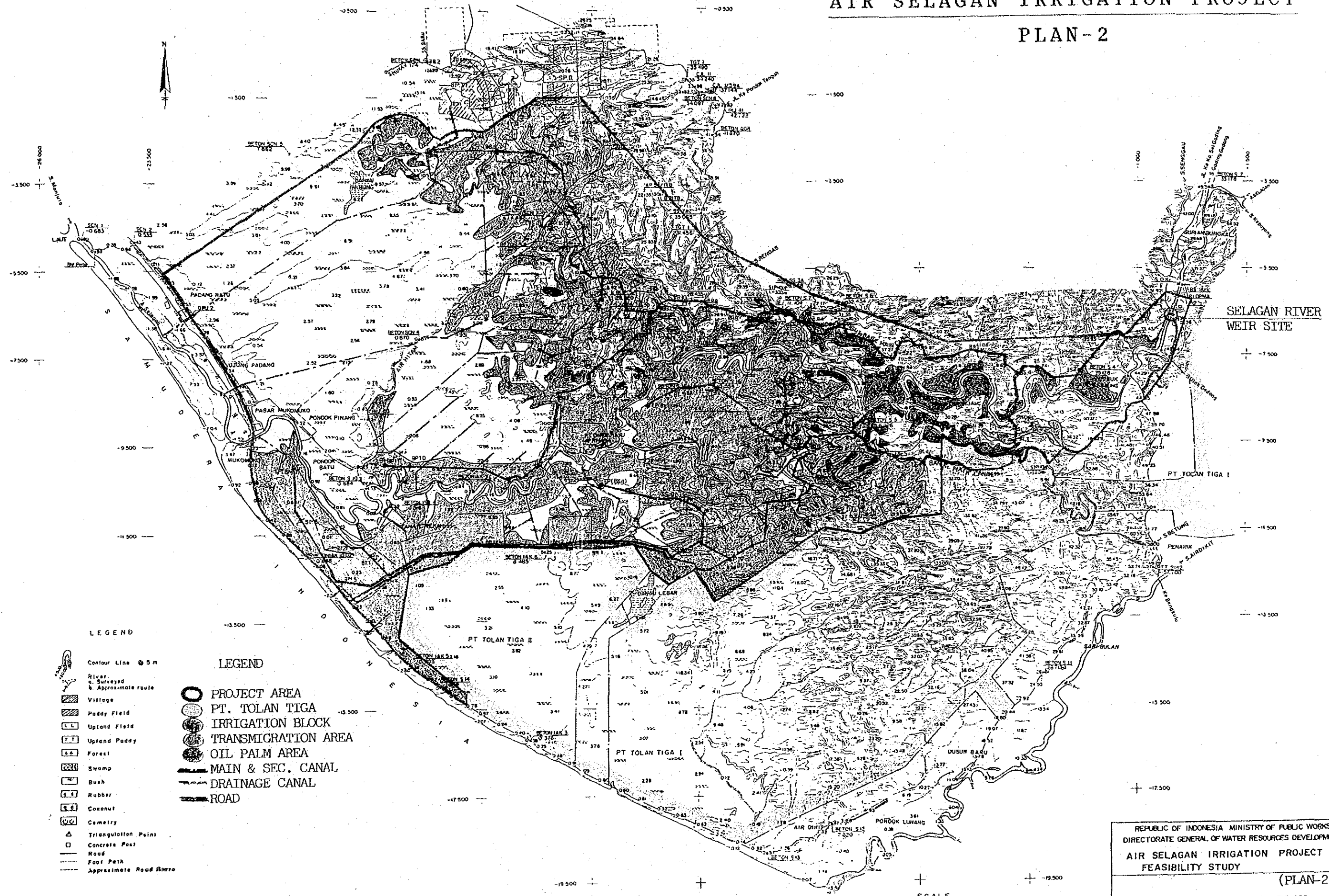
LEGEND

Contour Line @ 5 m
River.
a. Surveyed
b. Approximate route
Village
Paddy Field
Upland Field
Upland Paddy
Forest
Swamp
Bush
Rubber
Coconut
Cemetry
△ Triangulation Point
□ Concrete Post
Road
Foot Path
Approximate Road Route

LEGEND

○ PROJECT AREA
PT. TOLAN TIGA
IRRIGATION BLOCK
TRANSMIGRATION AREA
OIL PALM AREA
MAIN & SEC. CANAL
DRAINAGE CANAL
ROAD

Fig. V-2.2   BASIC DEVELOPMENT PLAN (PLAN-2)
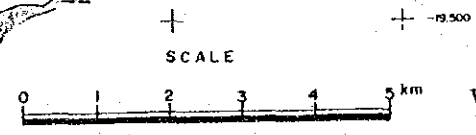
SCALE
0 1 2 3 4 5 km

V-31

REPUBLIC OF INDONESIA MINISTRY OF PUBLIC WORKS
DIRECTORATE GENERAL OF WATER RESOURCES DEVELOPMENT
AIR SELAGAN IRRIGATION PROJECT
FEASIBILITY STUDY
(PLAN-2)
BASIC DEVELOPMENT PLAN
JAPAN INTERNATIONAL COOPERATION AGENCY
TOKYO (JICA)   DWG. NO.

SELAGAN RIVER
WEIR SITE
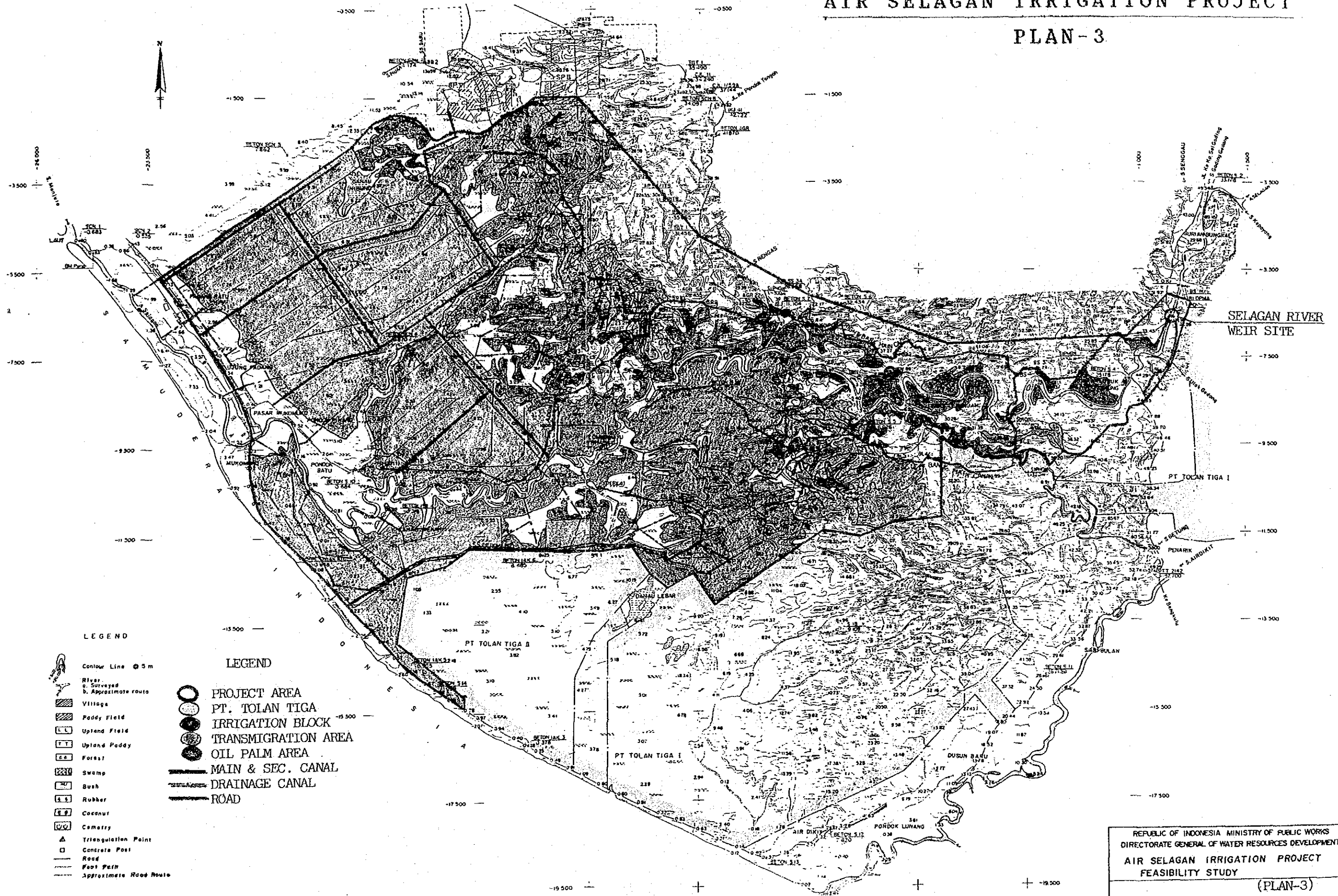
LEGEND

◉	Contour Line @5m
	River a. Surveyed b. Approximate route
	Village
	Paddy Field
	Upland Field
	Upland Paddy
	Forest
	Swamp
	Bush
	Rubber
	Coconut
	Cemetry
△	Triangulation Point
□	Concrete Post
	Road
	Foot Path
	Approximate Road Route

LEGEND

◯	PROJECT AREA
	PT. TOLAN TIGA
	IRRIGATION BLOCK
	TRANSMIGRATION AREA
	OIL PALM AREA
▬	MAIN & SEC. CANAL
	DRAINAGE CANAL
	ROAD

Fig.V-2.3 BASIC DEVELOPMENT PLAN.(PLAN-3)

SCALE

0 1 2 3 4 5 km