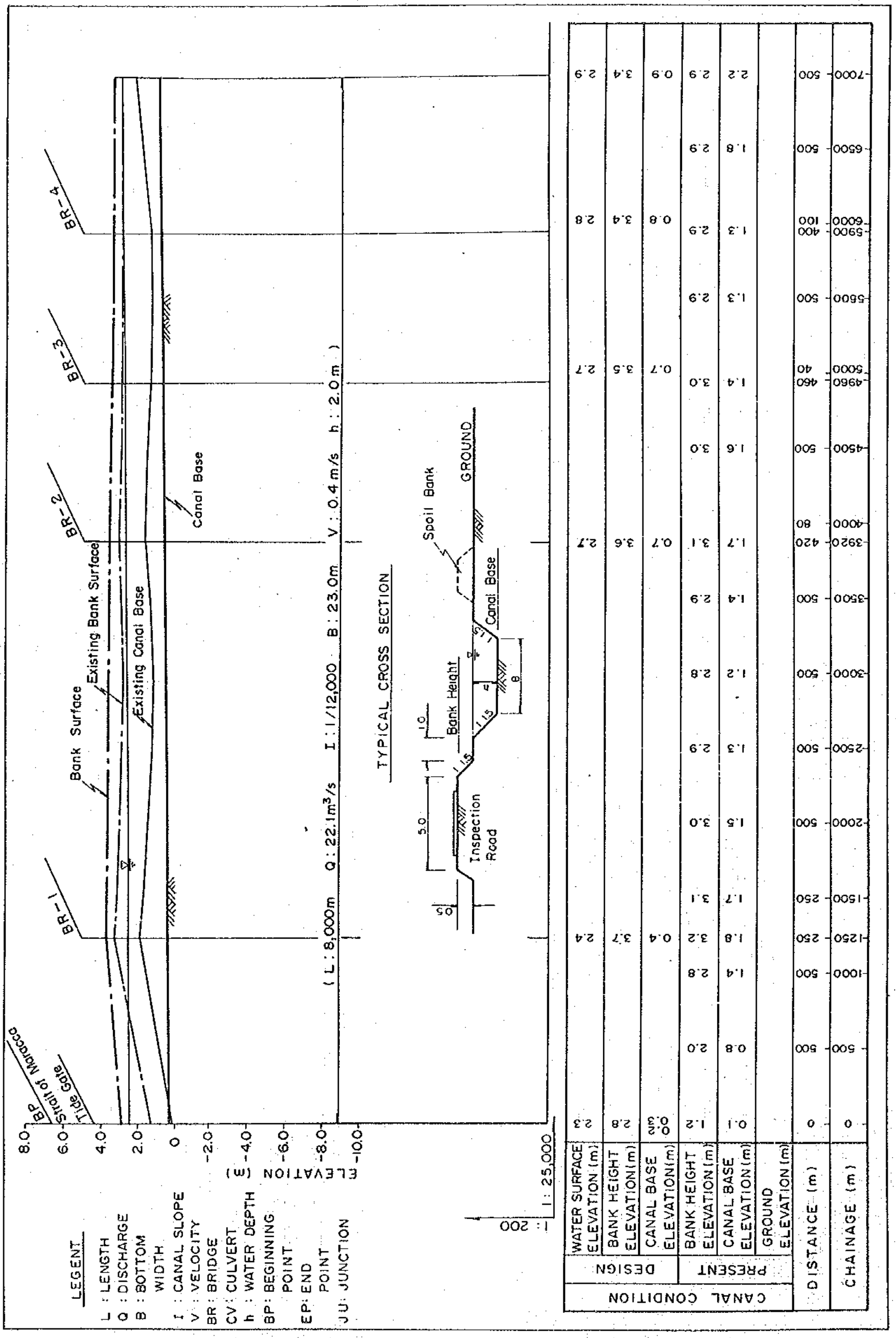


CHAINAGE (m)	DISTANCE (m)	DESIGN: WATER SURFACE ELEVATION (m)	DESIGN: BANK HEIGHT ELEVATION (m)	DESIGN: CANAL BASE ELEVATION (m)	PRESENT: BANK HEIGHT ELEVATION (m)	PRESENT: CANAL BASE ELEVATION (m)	PRESENT: GROUND ELEVATION (m)
0	0	2.3	2.8	0.2 / 0.3	1.2	0.1	
500	500				2.0	0.8	
1000	500				2.8	1.4	
1250	250	2.4	3.7	0.4	3.2	1.8	
1500	250				3.1	1.7	
2000	500				3.0	1.5	
2500	500				2.9	1.3	
3000	500				2.8	1.2	
3500	500				2.9	1.4	
3920	420	2.7	3.6	0.7	3.1	1.7	
4000	80						
4500	500				3.0	1.6	
4960	460	2.7	3.5	0.7	3.0	1.4	
5000	40						
5500	500				2.9	1.3	
5900	400	2.8	3.4	0.8	2.9	1.3	
6000	100						
6500	500				2.9	1.8	
7000	500	2.9	3.4	0.9	2.9	2.2	

Fig. C-25 PROFILE OF SILO BONTO MAIN DRAINAGE CANAL (1/2)

Republic of Indonesia
MASTER PLAN STUDY ON
LOWER ASAHAN RIVER BASIN DEVELOPMENT
Japan International Cooperation Agency

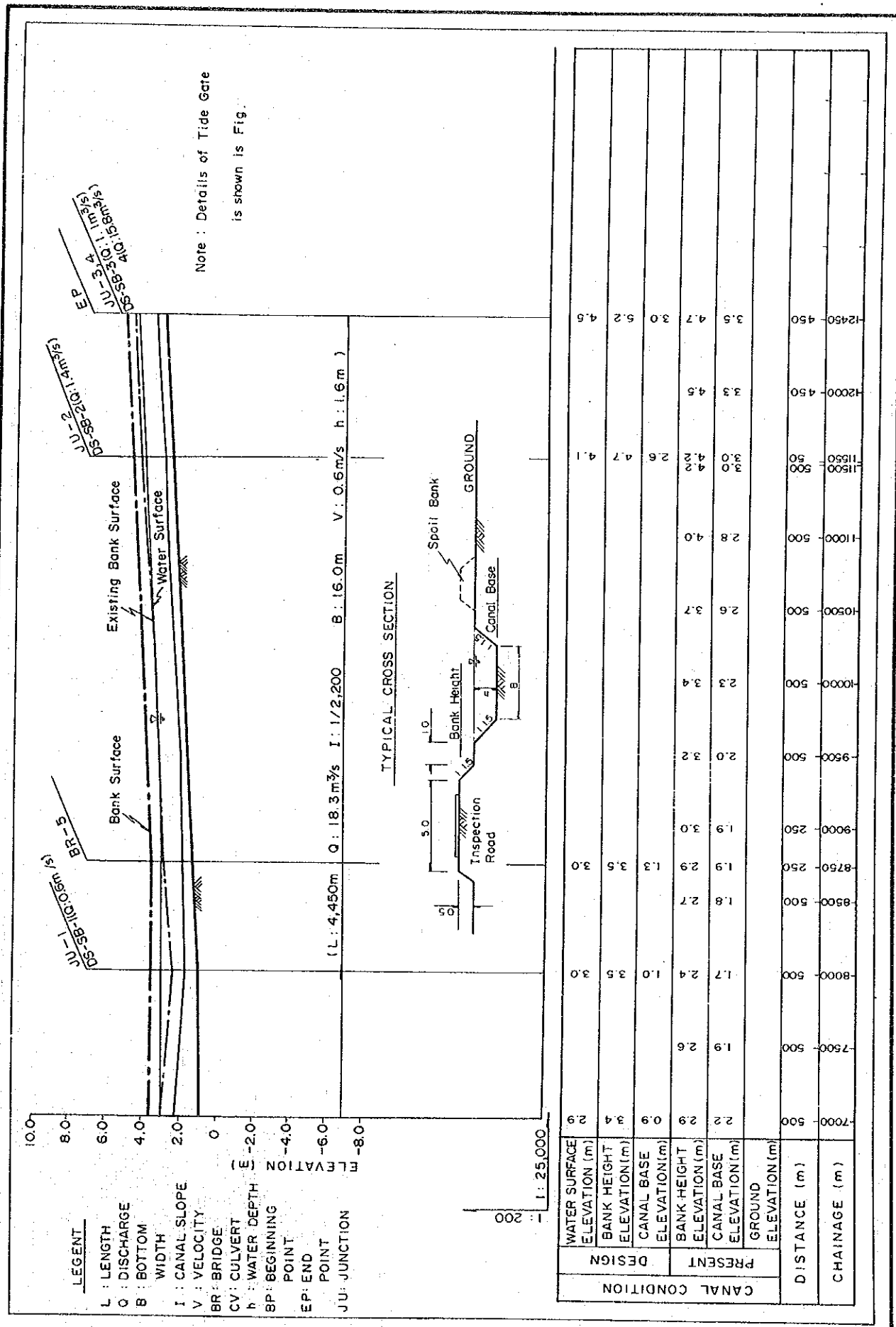


Fig. C-25 PROFILE OF SILO BONTO MAIN DRAINAGE CANAL (2/2)

Republic of Indonesia
MASTER PLAN STUDY ON
LOWER ASAHAN RIVER BASIN DEVELOPMENT
Japan International Cooperation Agency

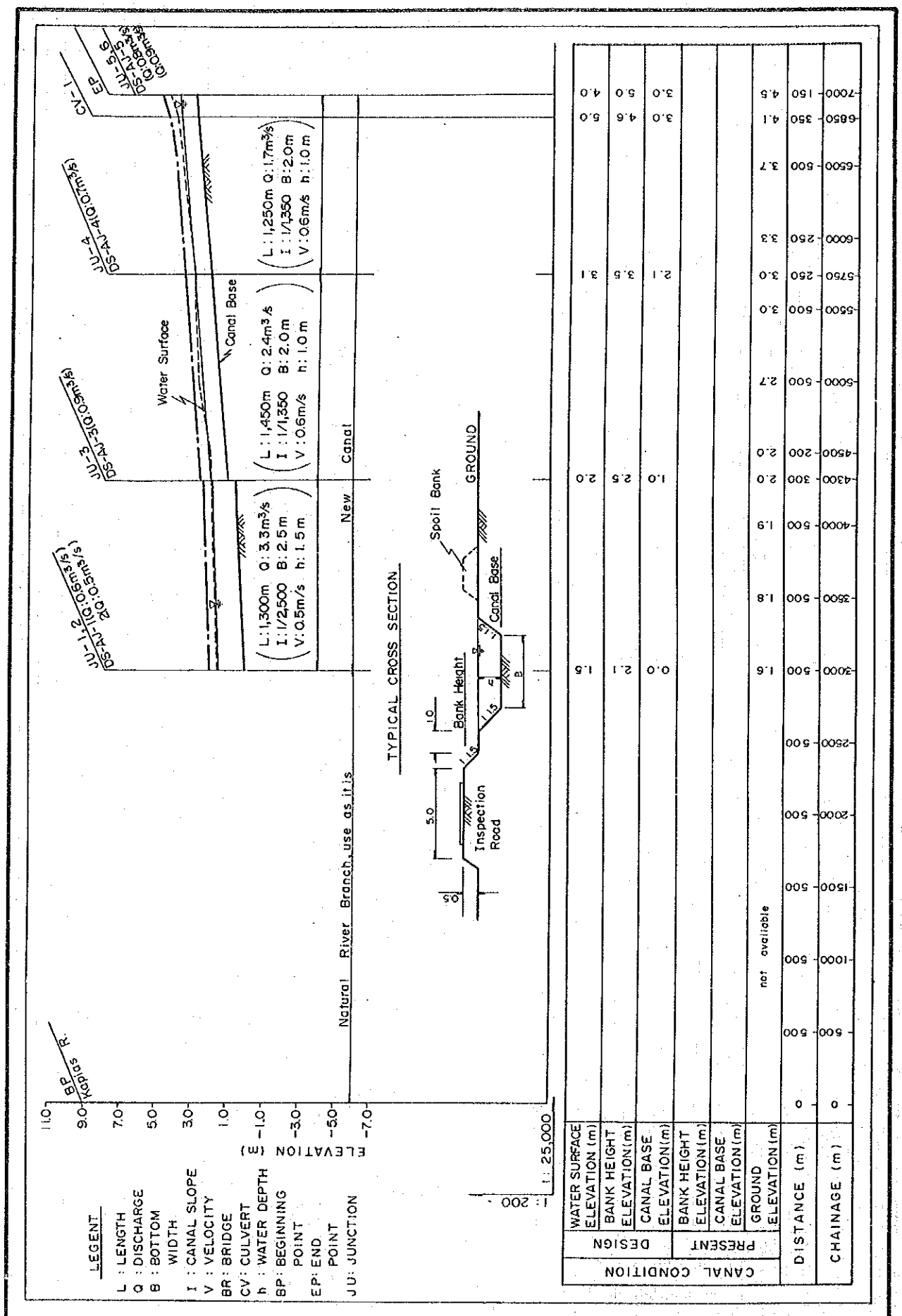


Fig. C-26 PROFILE OF AIR JOMAN MAIN DRAINAGE CANAL

Republic of Indonesia
MASTER PLAN STUDY ON
LOWER ASAHAN RIVER BASIN DEVELOPMENT
Japan International Cooperation Agency

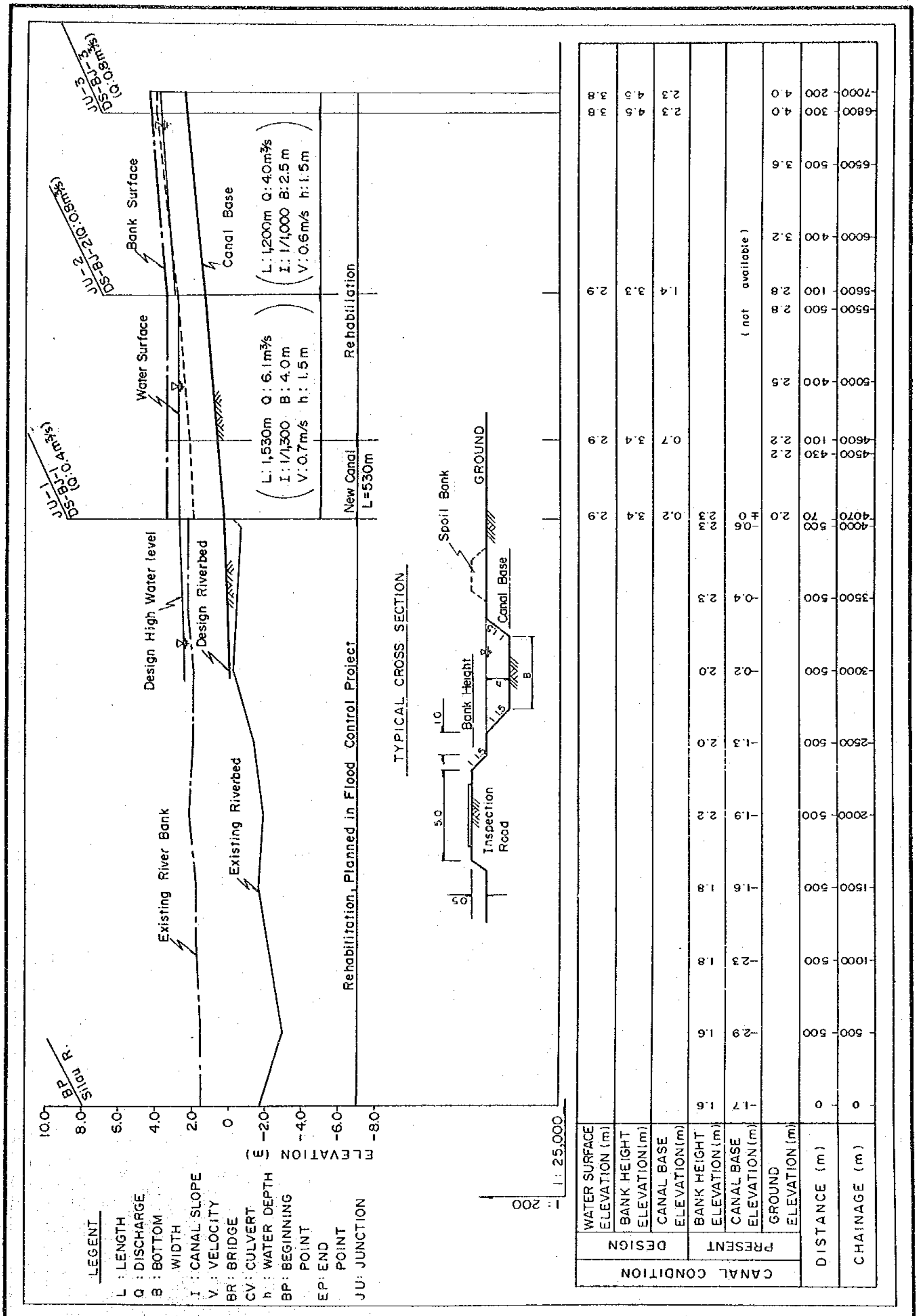


Fig. C-27 PROFILE OF BANDAR JEPANG MAIN DRAINAGE CANAL(1/2)

Republic of Indonesia
MASTER PLAN STUDY ON
LOWER ASAHAN RIVER BASIN DEVELOPMENT
Japan International Cooperation Agency

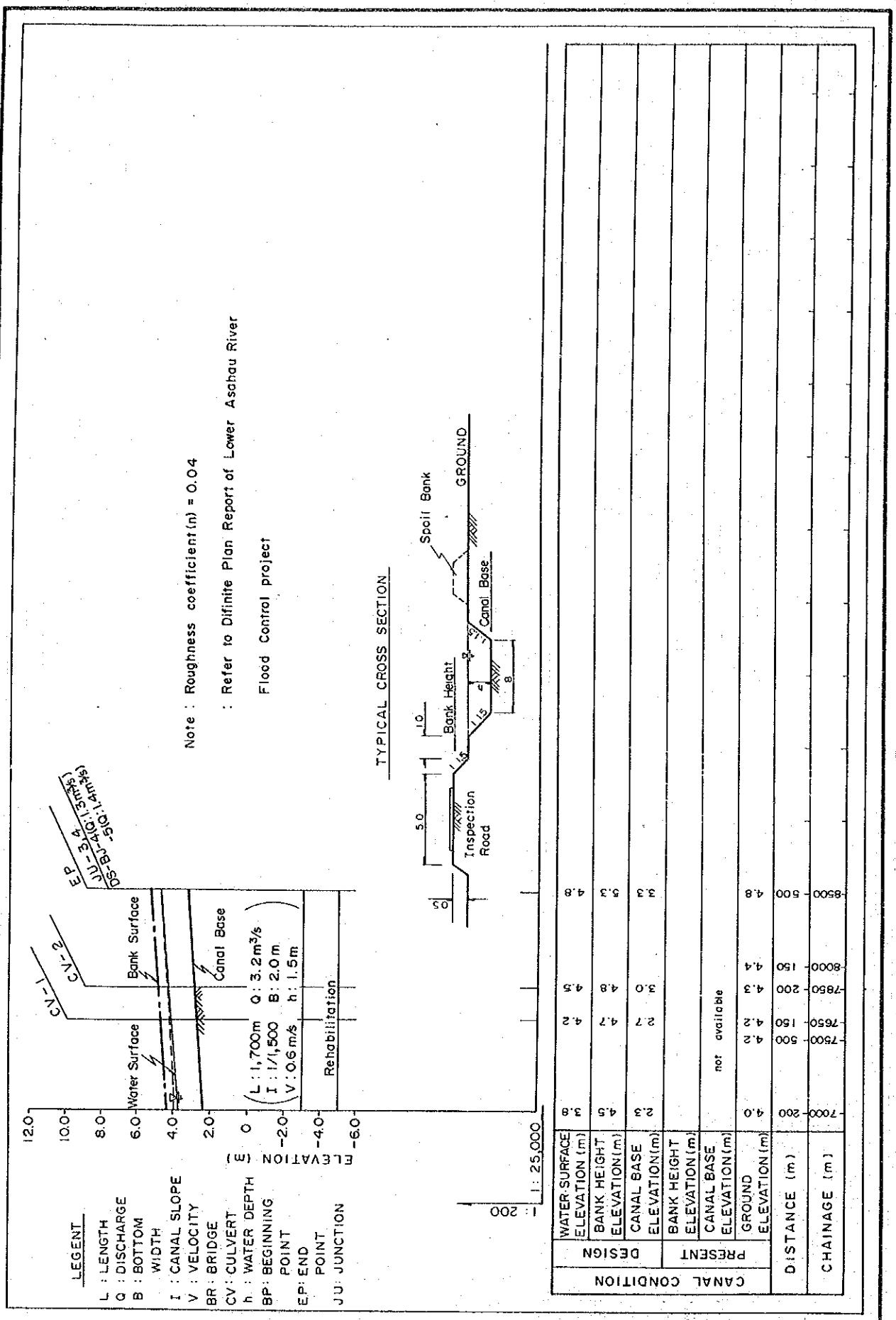


Fig. C-27 PROFILE OF BANDAR JEPANG MAIN DRAINAGE CANAL(2/2)

Republic of Indonesia
MASTER PLAN STUDY ON
LOWER ASAHAN RIVER BASIN DEVELOPMENT
Japan International Cooperation Agency

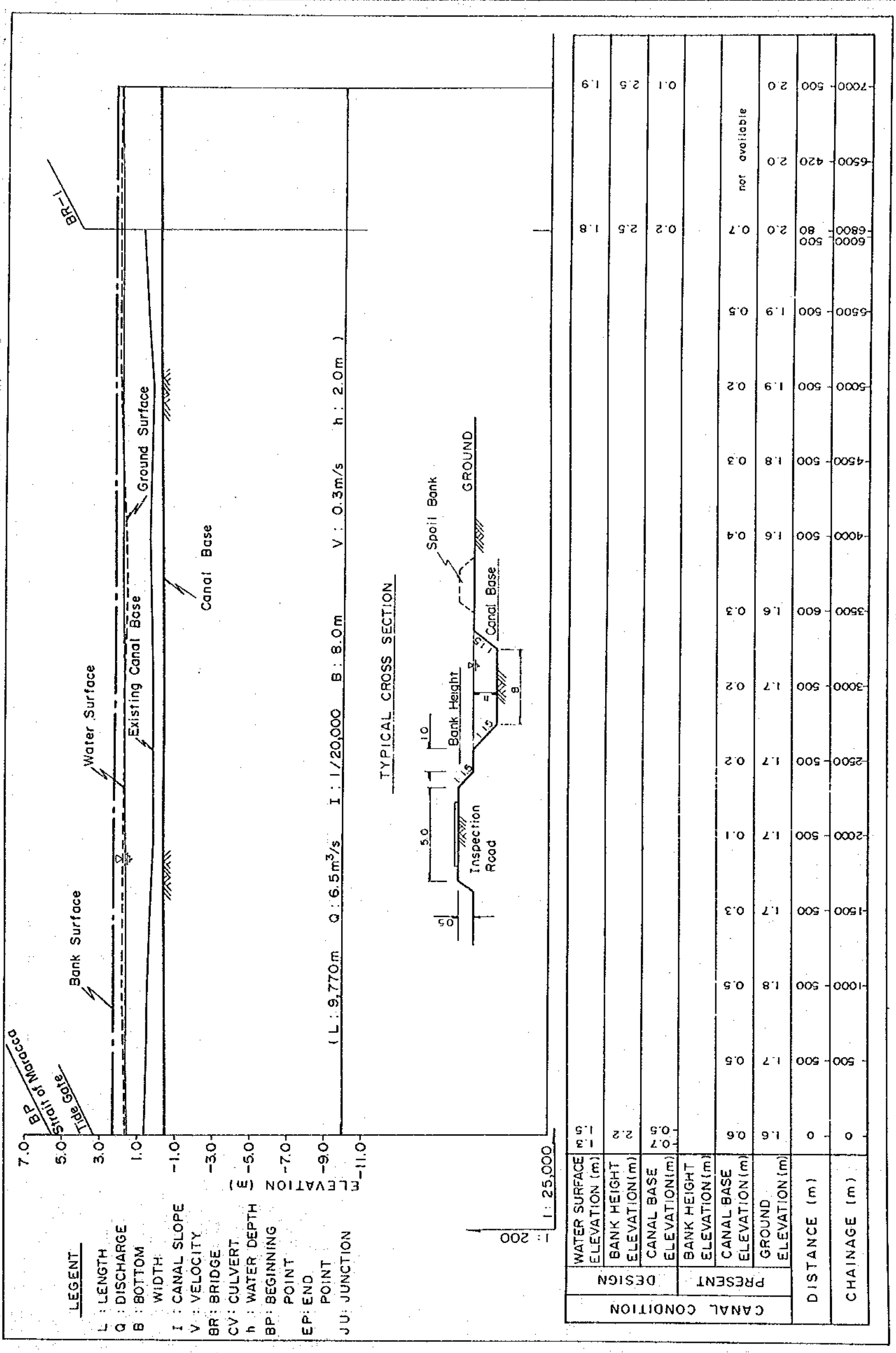


Fig. C-28 PROFILE OF BAGAN BATAK
MAIN DRAINAGE CANAL (1/2)

Republic of Indonesia
MASTER PLAN STUDY ON LOWER ASAHAN RIVER BASIN DEVELOPMENT
Japan International Cooperation Agency

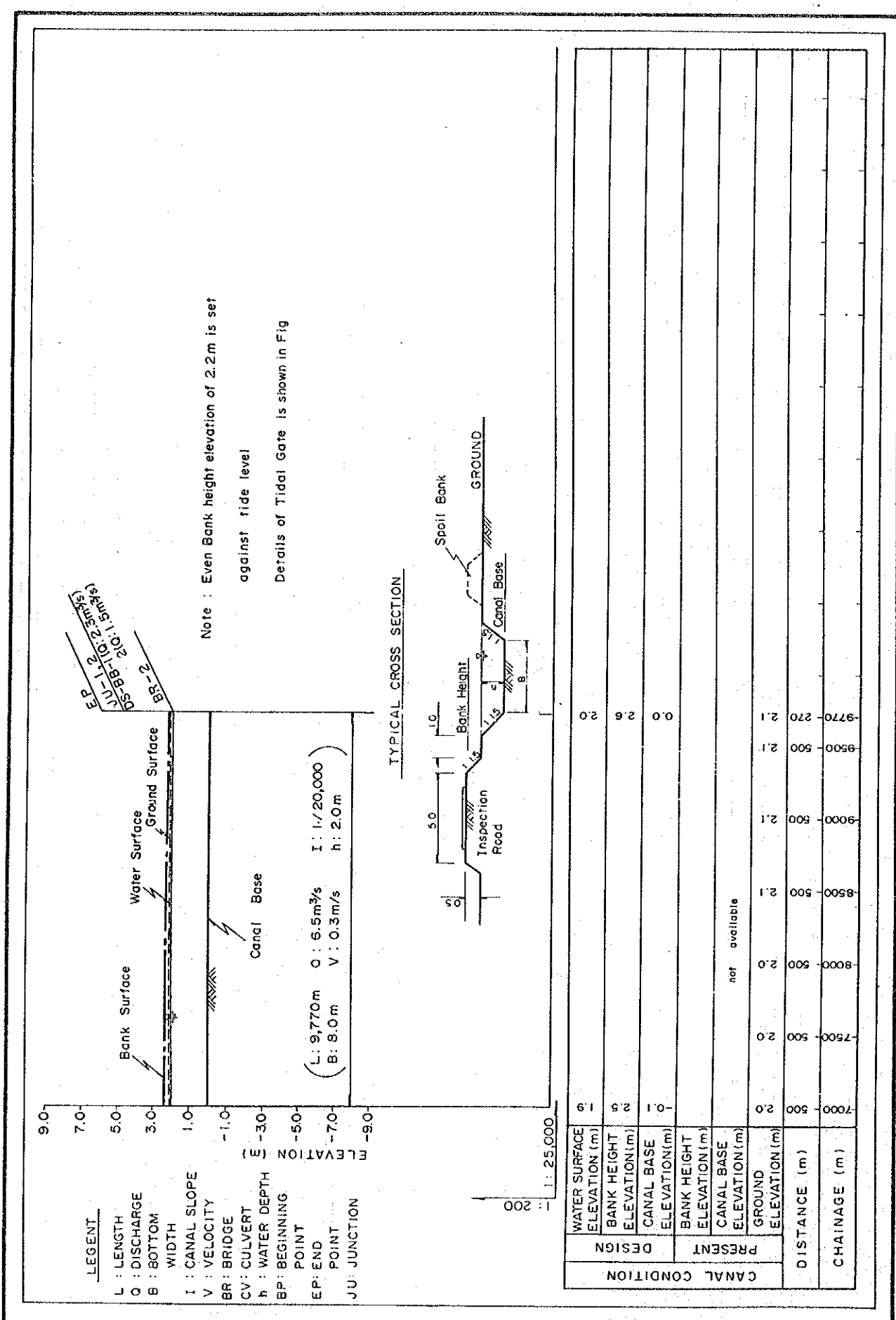
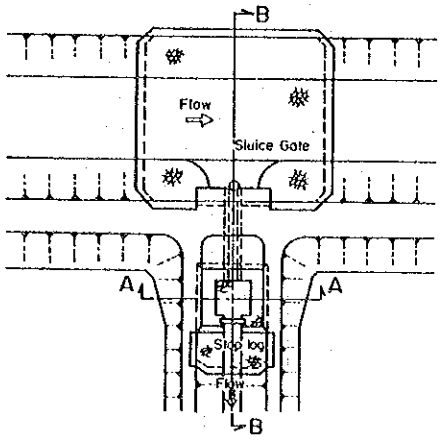


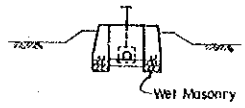
Fig. C-28 PROFILE OF BAGAN BATAK MAIN DRAINAGE CANAL (2/2)

Republic of Indonesia
MASTER PLAN STUDY ON
LOWER ASAHAN RIVER BASIN DEVELOPMENT
Japan International Cooperation Agency

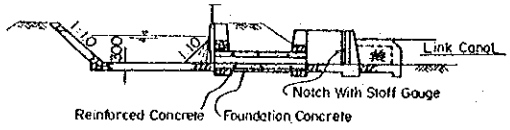
TURNOUT



PLAN

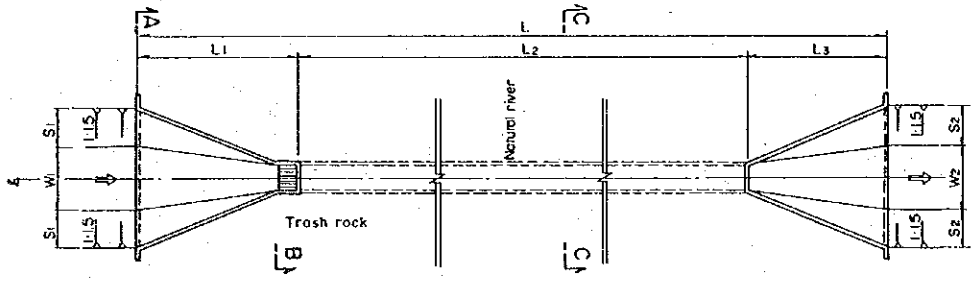


SECTION A-A

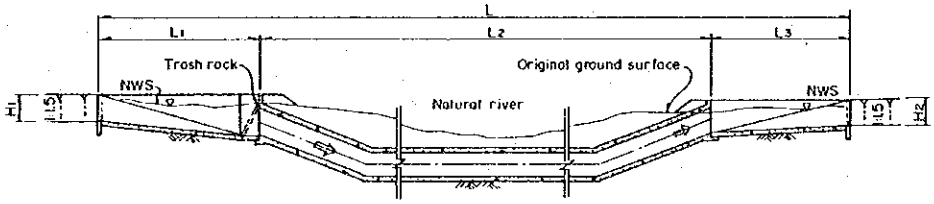


SECTION B-B

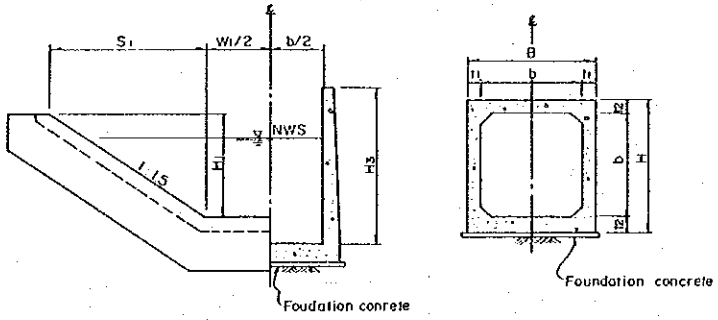
SYPHON



PLAN



PROFILE

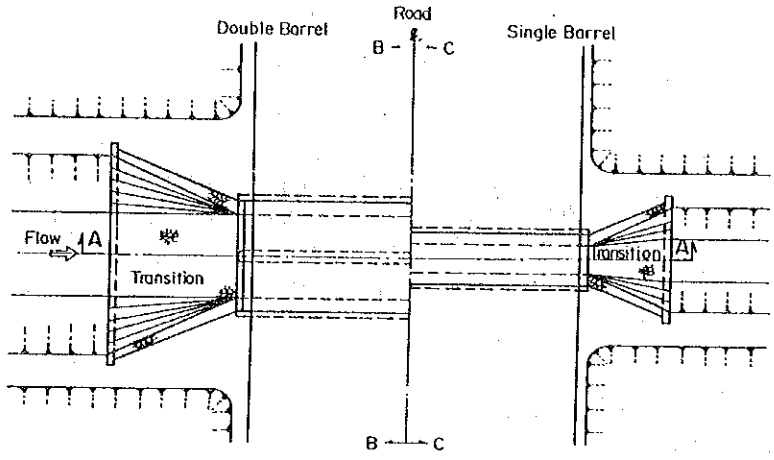


SECTION A-B SECTION C-C

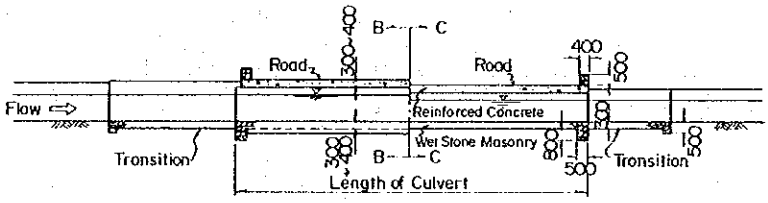
Fig. C-29 CANAL RELATED STRUCTURES (1/2)

Republic of Indonesia
MASTER PLAN STUDY ON
LOWER ASAHAN RIVER BASIN DEVELOPMENT
Japan International Cooperation Agency

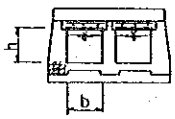
CULVERT



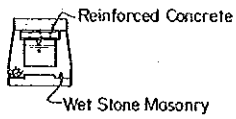
PLAN



SECTION A - A

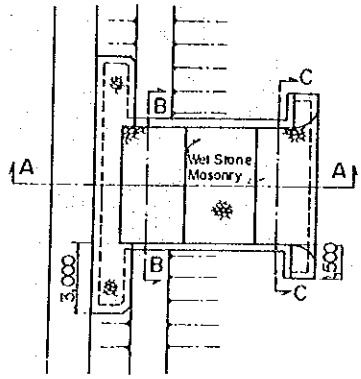


SECTION B-B

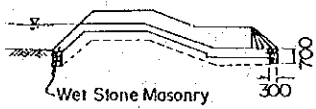


SECTION C-C

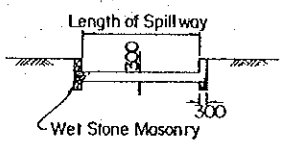
SPILLWAY



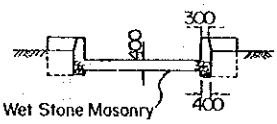
PLAN



SECTION A - A

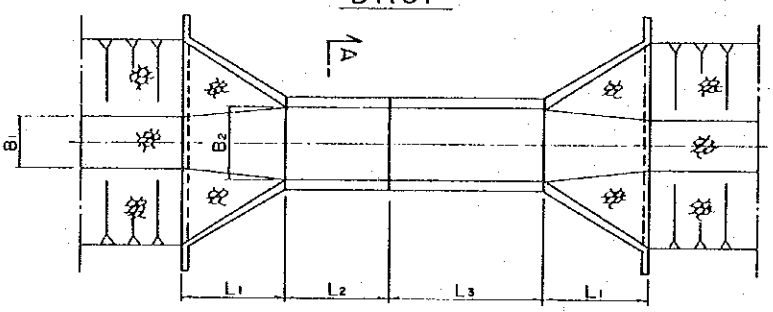


SECTION B - B

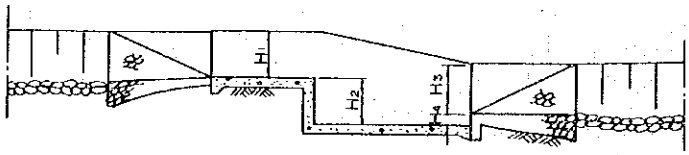


SECTION C - C

DROP



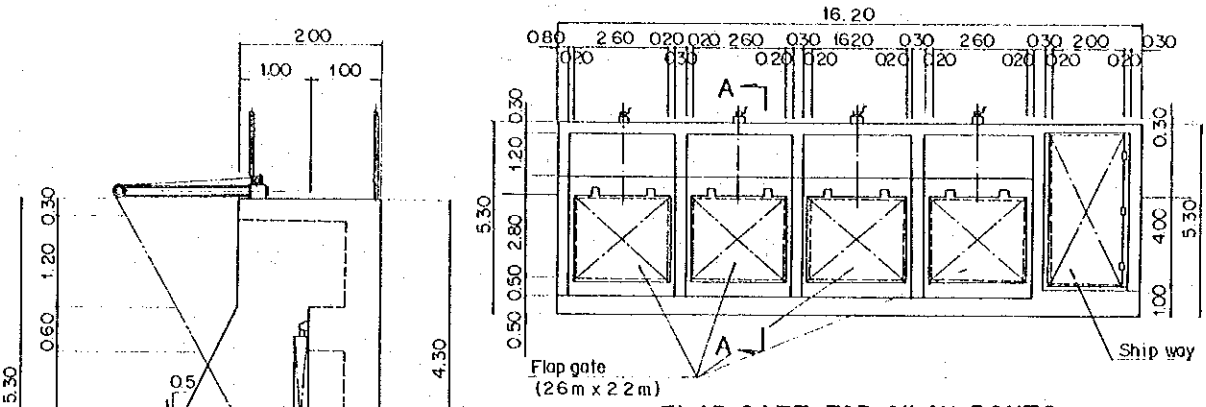
PLAN



PROFILE

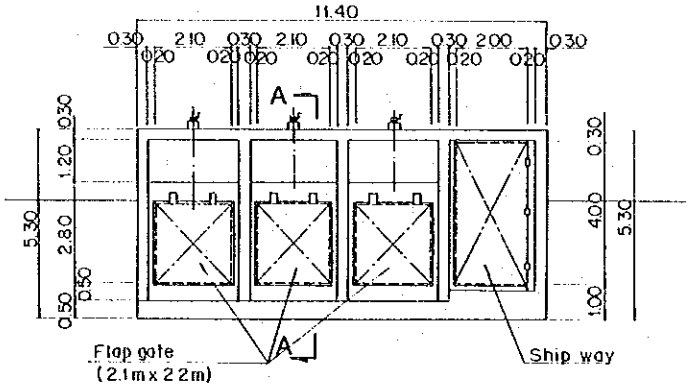
Fig. C-29 CANAL RELATED STRUCTURES (2/2)

Republic of Indonesia
MASTER PLAN STUDY ON
LOWER ASAHAN RIVER BASIN DEVELOPMENT
Japan International Cooperation Agency

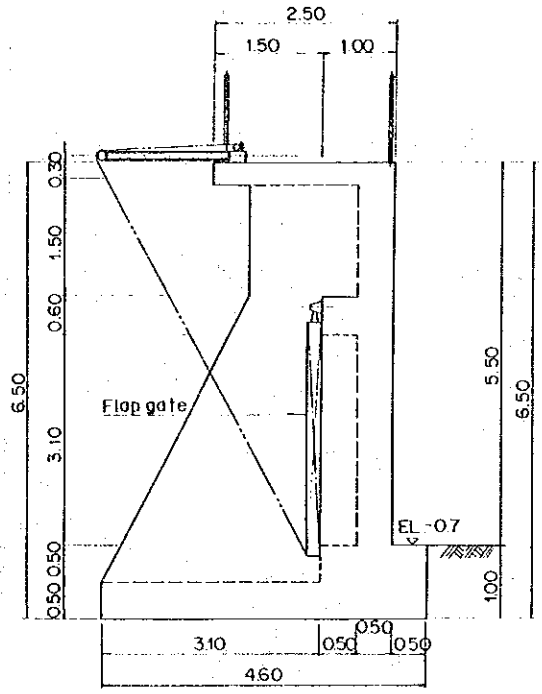


FLAP GATE FOR SILAU BONTO
(DP - SILO BONTO)

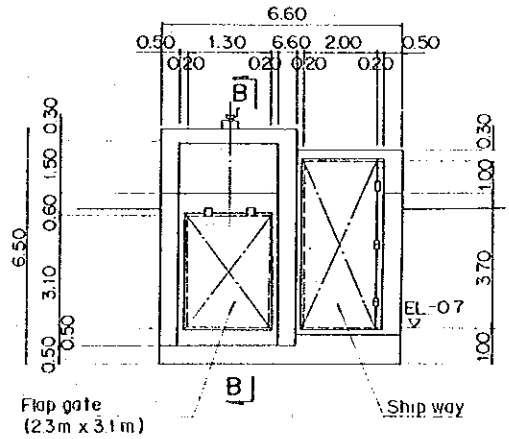
CROSS SECTION A-A



FLAP GATE FOR TAMBUNG TULANG
(DP - TAMBUNG TULANG)



CROSS SECTION B-B



FLAP GATE FOR UJUNG KUBU
(DP - BAGAN BATAK)

Scale
0 1 2 3 4 5m

Scale
0 5 10m

Fig. C - 30 TIDE GATE STRUCTURES ON EXTERNAL DRAINS

Republic of Indonesia
MASTER PLAN STUDY ON
LOWER ASAHAN RIVER BASIN DEVELOPMENT
Japan International Cooperation Agency

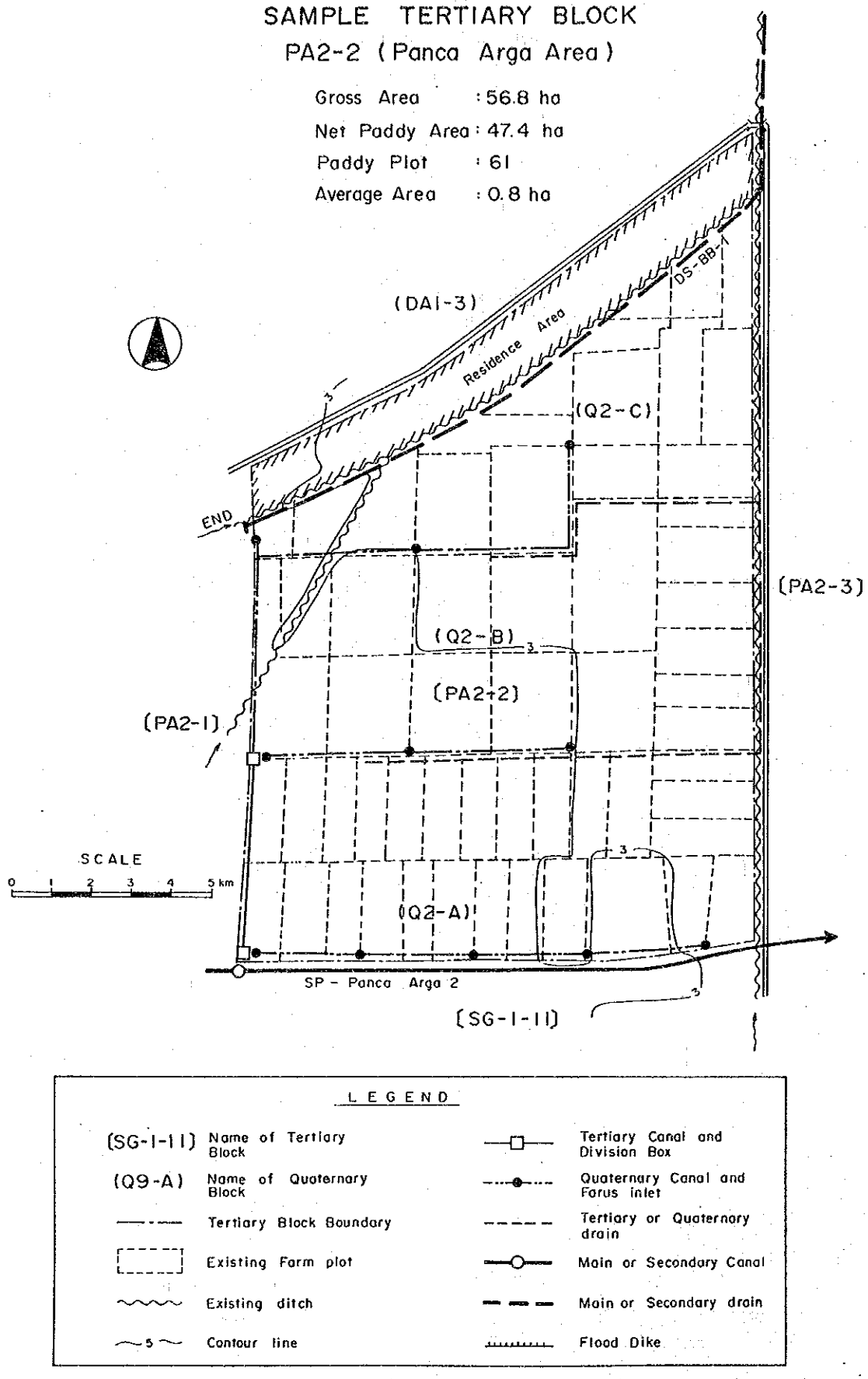


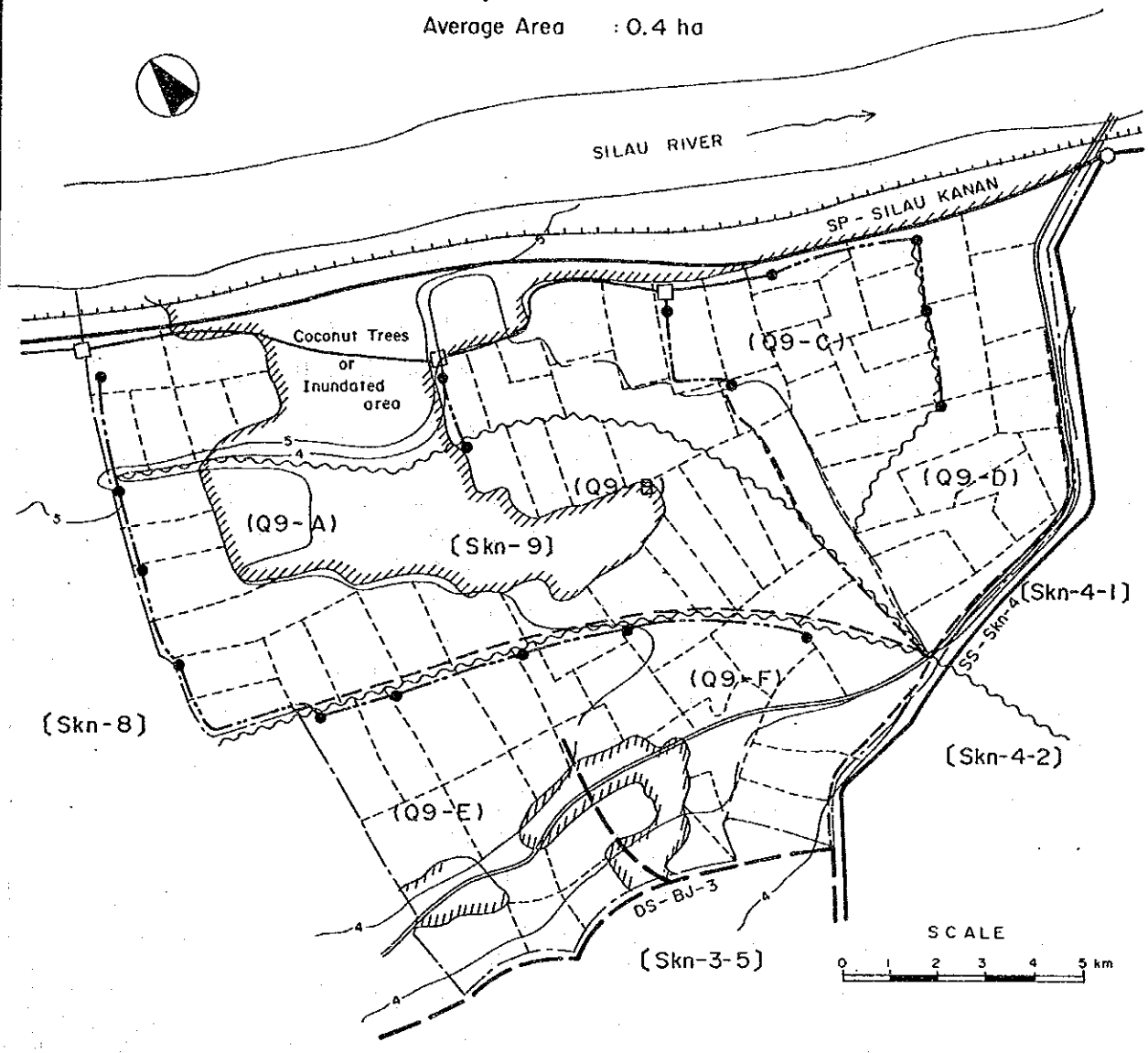
Fig. C-31 ON-FARM DEVELOPMENT PLAN (1/3)

Republic of Indonesia
MASTER PLAN STUDY ON
LOWER ASAHAN RIVER BASIN DEVELOPMENT
Japan International Cooperation Agency

SAMPLE TERTIARY BLOCK

Skn-9 (Silau Kanan Ared)

Gross Area : 56.9 ha
Net Paddy Area : 39.3 ha
Paddy Plot : 95
Average Area : 0.4 ha



LEGEND

(Skn-4-1)	Name of Tertiary Block		Tertiary Canal and Division Box
(Q9-A)	Name of Quaternary Block		Quaternary Canal and Farus inlet
	Tertiary Block Boundary		Tertiary or Quaternary drain
	Existing Farm plot		Main or Secondary Canal
	Existing ditch		Main or Secondary drain
5	Contour line		Flood Dike

Fig. C-31 ON-FARM DEVELOPMENT PLAN (2/3)

Republic of Indonesia
MASTER PLAN STUDY ON
LOWER ASAHAN RIVER BASIN DEVELOPMENT
Japan International Cooperation Agency

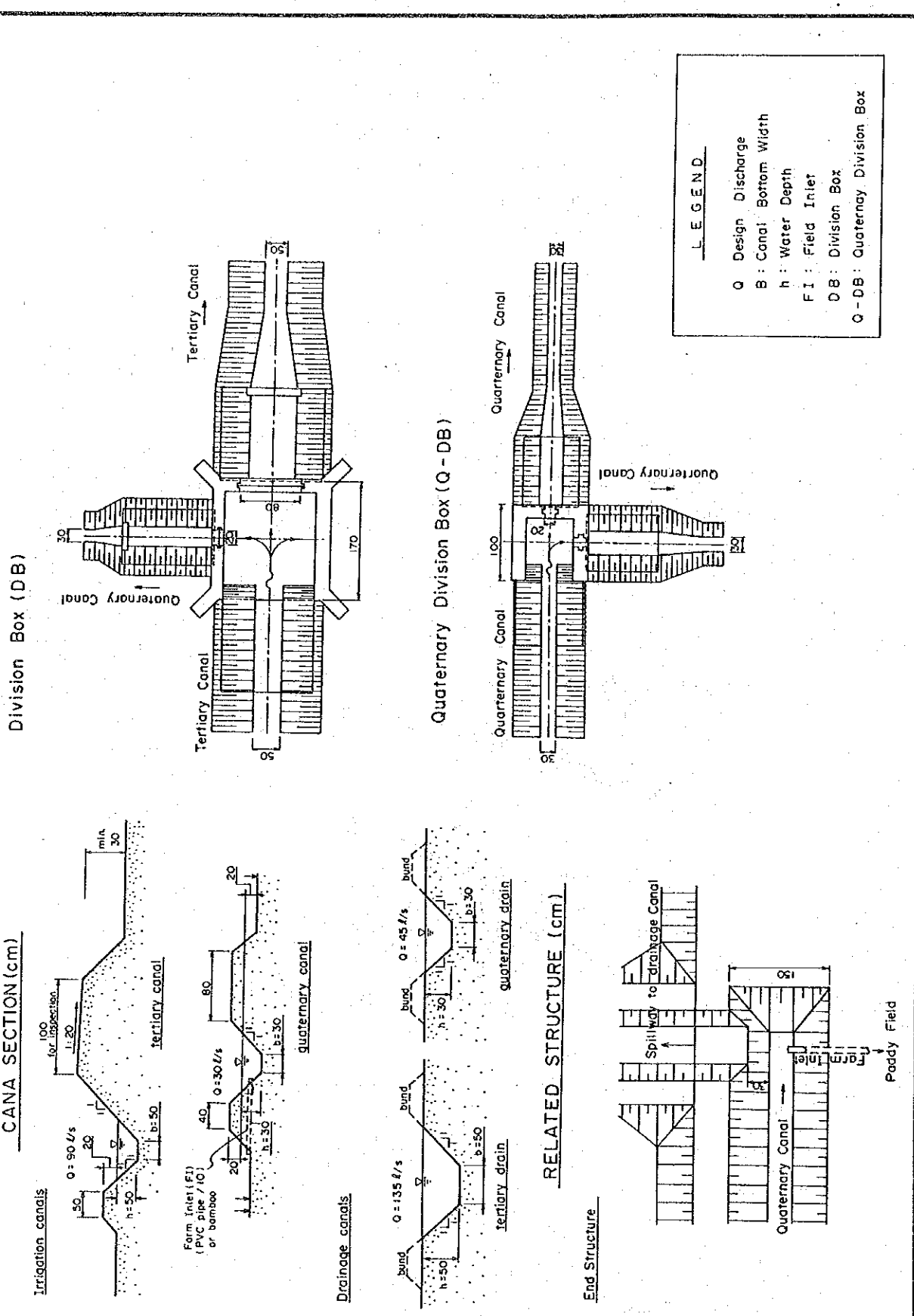


Fig. C-31 ON-FARM DEVELOPMENT PLAN (3/3)

Republic of Indonesia
MASTER PLAN STUDY ON
LOWER ASAHAN RIVER BASIN DEVELOPMENT
Japan International Cooperation Agency

Table C-21 PROPOSED ROAD NETWORK

Road Item	Pavement Condition (km)			Total(km)
	Asphalt	Macadam	Earth	
I. Silau river system				
- Canal Inspection Road	0.0	74.0	33.3	107.3
- Inspection/Trunk Road	0.0	31.2	0.0	31.2
- Trunk/Connection Road	0.0	2.5	0.0	2.5
Sub-total	0.0	107.7	33.3	141.0
II. Bunut river system				
- Canal Inspection Road	0.0	108.2	84.9	193.1
- Inspection/Trunk Road	10.4	7.5	0.0	17.9
- Trunk/Connection Road	0.0	1.8	0.0	1.8
Sub-total	10.4	117.5	84.9	212.8
Total	**10.4**	**225.2**	**118.2**	**353.8**

Note; Dimension of the proposed road is shown in the figures of main irrigation and drainage canals.

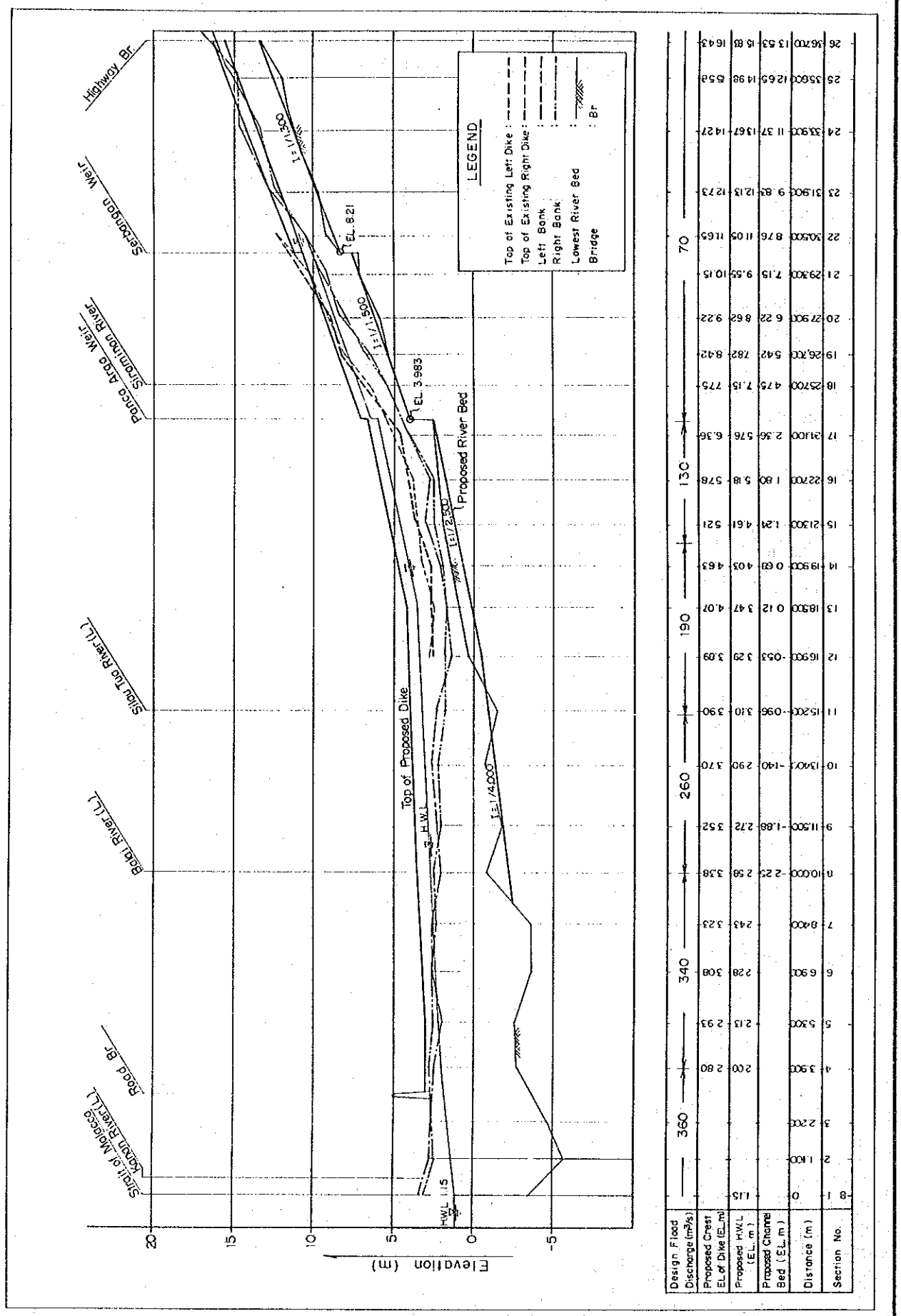
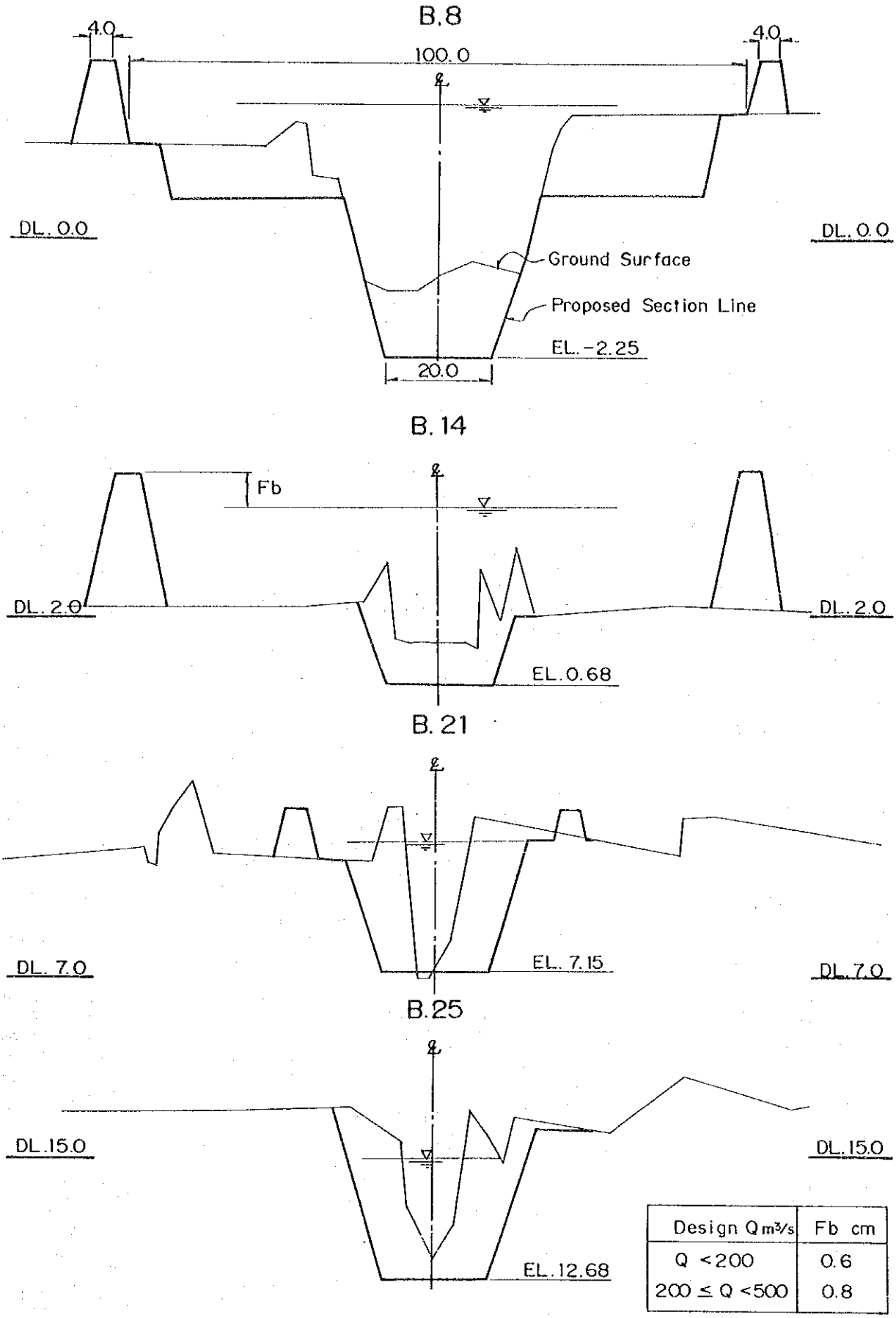


Fig. C - 32 LONGITUDINAL PROFILE OF PROPOSED FLOOD DIKE ALONG BUNUT RIVER

Republic of Indonesia
MASTER PLAN STUDY ON
LOWER ASAHAN RIVER BASIN DEVELOPMENT
Japan International Cooperation Agency



Design Q m³/s	Fb cm
Q < 200	0.6
200 ≤ Q < 500	0.8

Fig. C - 33 TYPICAL CROSS SECTION OF THE BUNUT FLOOD DIKE

Republic of Indonesia
MASTER PLAN STUDY ON
LOWER ASAHAN RIVER BASIN DEVELOPMENT
Japan International Cooperation Agency

Table C-22 LIST OF WAGE AND MATERIALS AT KISARAN

NO.	DESCRIPTION/NAME OF MATERIAL	UNIT	PRICE (Rp.)	NO.	DESCRIPTION/NAME OF MATERIAL	UNIT	PRICE (Rp)
I	WAGE						
1	Common Labour	Day	3,200	20	Reinforcement bar, round	1 kg	1,210
2	Semi skilled Labour	Day	3,450	21	Reinforcement bar, deform	1 kg	1,320
3	Skilled Labour	Day	4,600	22	Structural steel	1 kg	1,690
4	Head of skilled Labour	Day	5,100	23	Angle Iron 1 - 2 "	1 kg	1,400
5	Supervisor of Labour	Day	4,300	24	Angle Iron 2.5 - 3 "	1 kg	1,700
6	Mechanic man	Day	5,100	25	Steel Pipe dia. 65mm	1 kg	9,900
7	Mechanic man assistant	Day	4,000	26	Steel Pipe dia. 150mm	1 kg	29,400
8	Skilled operator	Day	4,600	27	Concrete wire	1 kg	1,950
9	Operator assistant	Day	3,450	28	General wire	1 kg	1,730
				29	Net wire	1 M2	1,950
II	FUEL, LUBRICANT AND ELECTRICITY			32	Nail 0.5 - 1"	1 kg	1,300
				33	Nail 1.5 - 5"	1 kg	1,000
1	Gasoline	Lit	385	34	Local zinc nail	1 kg	2,500
2	Diesel Oil	Lit	250	35	Nail for concrete wall 1 - 3"	1 gross	3,900
3	Engine Oil	Lit	2,200	36	Head sided bolt 3/8 - 12"	1 piece	1,500
4	Grease	Lit	3,300	37	Head sided bolt 3/8 - 14"	1 piece	2,100
5	Electricity	KWH	85	38	Head sided bolt 1 - 14"	1 piece	3,300
6	Acetylene gas (7 kg cylinder)	nos	40,000	39	Stapled bolt	1 piece	1,000
7	Propane gas	1 kg	600	40	Multiplex wood 4 mm	1 sheet	5,600
				41	Multiplex wood 6 mm	1 sheet	8,500
III	MATERIALS (Supplied at Kisaran)			42	Multiplex wood 9 mm	1 sheet	15,000
				43	Multiplex wood 12 mm	1 sheet	18,000
1	Sand for filling up holes	1 M3	3,000	44	Multiplex wood 18 mm	1 sheet	25,000
2	Sand for cement mixing	1 M3	3,000	45	PVC plastic zinc	1 sheet	6,000
3	Stone (big)	1 M3	31,740	46	Aphalt paint	1 kg	400
4	Stone for foundation	1 M3	39,700	47	PVC pipe " 1/2"	1 m	833
5	Small stone	1 M3	40,000	48	PVC pipe " 3/4"	1 m	1,000
6	Stone for aggragate	1 M3	41,000	49	PVC pipe " 1"	1 m	1,250
7	Mechanical broken stone of 0.5 cm	1 M3	54,000	50	PVC pipe " 1 1/4"	1 m	1,833
8	Stone for road metaline 5 - 7 cm	1 M3	42,000	51	PVC pipe " 1 1/2"	1 m	2,075
9	Stone for road metaline 3 - 5 cm	1 M3	43,000	52	Clamp nail	1 pcs	125
10	Stone for road metaline 2 - 3 cm	1 M3	44,000	53	Water measurement	1 pcs	37,500
11	Artificial brick	1 pcs	30	54	Supporting clamp	1 pcs	9,000
12	General pole/plank	1 ton	202,500	55	General plank	1 M3	151,200
13	Wood of dia. 4 - 5" (4.50 m)	1 pcs	2,000	56	Bamboo	1 pcs	900
14	Sea shore wood dia. 3-4" (4.50 m)	1 pcs	1,800	57	Bentonite	1 kg	650
15	Portland cement	1 zac	5,000	58	Concrete Pipe dia. 300mm	1 m	18,100
16	Galvanized zinc 0.20	1 feet	1,100	59	Concrete Pipe dia. 400mm	1 m	26,500
17	Asbestos zinc	1 feet	2,000	60	Concrete Pipe dia. 600mm	1 m	50,200
18	Flat zinc 0.20	1 feet	1,000	61	Concrete Pipe dia. 800mm	1 m	101,100
19	PC Tiled roof	1 sheet	350	62	Concrete Pipe dia. 1,000mm	1 m	139,900

Source; (1) Design Report on River Improvement Works for Lower Asahan Flood Control Project(Mar. 1989)
(2) List of Wage and Material Prices in Asahan Regency (Sep. 1989)

Note; All prices include transportation cost

Table C-23 UNIT CONSTRUCTION COST FOR MAJOR WORKS

(1S=Rp.1,770=Yen145)

WORK ITEM	L.C. (Rp)	F.C. (US$)	Total Unit Cost (Rp)
I. Compensation			
(1) Land Aquisition(m2)			
-Resident	440	0.00	440
-Farm	330	0.00	330
-Swamp	110	0.00	110
-Coconut palm	280	0.00	280
(2) House Compensate(m2)			
-Permanent	52,000	0.00	52,000
-Semi permanent	30,000	0.00	30,000
-Simple	19,000	0.00	19,000
(3) Tree Compensate(nos)			
-Large	1,500	0.00	1,500
-Small	300	0.00	300
-Banana,etc	200	0.00	200
II. Earth Work			
(1) Preparation(m2)			
-Clearing general	123	0.32	681
-Stripping t=25cm	194	0.50	1,080
(2) Excavation(m3)			
Main and Secondary work			
-Trench excavation(spoiling 500m)	647	1.48	3,259
-Trench excavation(spoiling 2,000m)	1,489	2.80	6,445
-Structural excavation	1,008	1.33	3,360
-Ex. manpower,dry condition	2,426	0.00	2,426
-Ex. manpower,wet condition	5,700	0.00	5,700
On-farm work	1,180	1.00	2,950
(3) Embankment(m3)			
Main and Secondary work			
-Em.,ex.material	334	0.45	1,123
-Em.,haul=500m	1,107	2.50	5,533
-Em.,haul=2000m	1,152	2.60	5,762
-Em.,Hydrostructure	611	1.38	3,053
-Backfill,manpower	1,135	0.00	1,135
-Backfill,machinery(haul dist.=500m	540	1.39	3,000
On-farm work	1,920	1.63	4,800
(4) Transportation(m3)			
-Haul dist.=500m	147	0.38	815
-Haul dist.=8,000m	1,192	3.07	6,621
-Haul dist.=10,000m	1,472	3.79	8,175
(5) Land Reclamation(ha)	150,000	84.75	300,000
III. Concrete Work			
(1) Concrete(m3)			
-Structure	33,929	35.60	96,941
-Foundation	29,745	34.12	90,136
-Mortar	42,595	44.69	121,699
-Concrete Plate	15,370	10.61	34,156
-Concrete lining	121,500	83.90	270,000
(2) Reinforcement Bar(kg)			
-Round bar	284	0.57	1,290
-Deform bar	323	0.66	1,486
-wire	585	0.77	1,950
(3) Form,etc			
-Wooden form(m2)	3,963	1.83	7,206
-Plywood form(m2)	5,409	2.04	9,015
-Water stop(lin.m),(W=200mm)	5,582	12.61	27,909
-Joint filler(m2),(t=10mm)	5,086	11.49	25,429
-Scaffolding(m2)	1,652	2.18	5,508
-Form support(m3)	3,011	1.70	6,022
-Dowel bar (pc,dia.19mm*1.0m)	1,272	1.68	4,241
-General Plunk(m2)	4,550	2.57	9,100
(3) Form,etc			
-Wooden form(m2)	3,963	1.83	7,206
(4) Concrete Pipe(lin.m)			
-dia.300mm	9,000	15.25	36,000
-dia.400mm	12,000	20.34	48,000
-dia.600mm	21,000	35.59	84,000
-dia.800mm	39,000	66.10	156,000
-dia.1,000mm	60,000	101.69	240,000
IV. Other Items			
(1) Finishing			
-sod facing(m2)	714	0.40	1,427
-Masonry lining(m3)	23,940	31.56	79,800
-Gravel metaling(m3)	12,854	16.94	42,846
-Gravel fill(m3)	10,660	14.05	35,533
-Sand fill(m3)	1,154	1.52	3,848
-Gabion(m3)	28,800	37.97	96,000
-Gabion matress(m3)	33,000	43.50	110,000
-Riprap Protection(m3)	12,720	10.78	31,800
-Asphalt Paving(m2)	2,910	3.84	9,700
(2) Piling(lin.m)			
-dia. 400mm	19,653	25.91	65,509
-Sheet pile (w: 400mm)	26,905	35.47	89,683
(3) Weep Hole(pc)			
-dia. 60 * 400mm	1,953	2.57	6,509
-dia. 60 * 600mm	2,596	3.42	8,652
-dia. 60 * 750mm	3,239	4.27	10,798
(4) PVC Pipe,60mm(lin.m)	3,240	4.27	10,800
V. Gates			
(1) Frap gate,timber(set)			
-W=1.0m	420,097	553.80	1,400,323
-W=1.25m	543,863	716.96	1,812,876
-W=1.50m	811,952	1,070.37	2,706,506
-W=1.75m	961,503	1,267.52	3,205,010
-W=3.0m	2,115,871	2,789.28	7,052,904
(2) Slide Gate,Steel(set)			
-1.25 * 1.25m	712,294	938.99	2,374,314
-1.5 * 1.5m	890,596	1,174.04	2,968,654
-0.4 * 3.85m	561,938	740.79	1,873,128
(3) Stop log(set)			
-1.15 * 1.0m	85,374	112.55	284,581
-1.5 * 1.4m	175,514	231.37	585,047
-1.5 * 1.8m	225,790	297.65	752,633
-1.75 * 1.6m	232,906	307.03	776,353
-1.75 * 2.0m	291,358	384.09	971,194
-2.0 * 1.8m	299,377	394.66	997,922
-3.25 * 3.0m	899,964	1,186.39	2,999,880
(4) staff gauge(nos)	18,968	25.01	63,228

Source; (1) Land Acquisition Commitee for Bah Bolong Project(Sep. 1989)
(2) Cost Estimatin Report of Ular Project(1989)
(3) Design Report of Lower Asahan Flood Control Project(Feb. 1990)

Note; L.C.: Local Currency, F.C.: Foreign Currency, I.F.C.: Indirect Foreign Currency, P.F.C.: Pure Foreign Currency

Table C-24 DIRECT CONSTRUCTION COST FOR CIVIL WORKS
SILAU SYSTEM (1/2)

(1$=Rp.1,770=Yen145)

Cost Item	Unit	Work Volume	Local Currency			Foreign Currency			Total Unit Cost
			Labour (1,000Rp)	Other (1,000Rp)	L.C. Total (1,000Rp)	F.C. (1,000Rp)	F.F.C. (US$)	F.C. Total (US$)	(1,000Rp)
Silau Scheme									
I. Preparatory Works	L.S.		435,937	414,401	850,408	676,958	700,011	1,082,283	2,766,041
II. Land Acquisition and Compensation			0	930,400	930,400	0	0	0	930,400
-Area Class I	ha	40	0	132,400	132,400	0	0	0	132,400
-Area Class II	ha	180	0	198,000	198,000	0	0	0	198,000
-House	nos	500	0	600,000	600,000	0	0	0	600,000
III. Silau Integrated Weir			561,995	563,041	1,125,037	2,044,056	1,804,614	2,959,225	6,362,946
3.1 Site Preparation	L.S.		73,304	73,440	146,744	266,616	235,557	385,992	829,949
3.2 Civil Work	L.S.		319,544	308,147	627,692	901,338	297,720	806,951	2,055,994
3.3 Gates and Accessories	L.S.		168,147	179,954	348,101	871,602	1,269,661	1,762,092	3,467,003
3.4 Operation House	m2	50	1,000	1,500	2,500	4,500	1,676	4,190	10,000
IV. Irrigation System			1,273,290	1,028,699	2,302,619	1,237,454	2,811,372	3,508,770	8,515,893
4.1 Main Canal (25.6 km)			631,407	510,173	1,142,211	520,184	1,465,146	1,759,304	4,255,442
4.1.1 Earth Work									
-Excavation I	1,000m3	210	304,823	89,247	394,070	66,621	286,672	324,311	968,100
-Embankment I	1,000m3	404	193,372	287,031	480,403	199,832	949,037	1,061,936	2,360,030
-Preparation and Finishing	L.S.		49,819	37,628	87,447	26,645	123,571	138,625	332,813
4.1.2 Structure									
-Turnout	nos	28	24,892	31,528	56,420	110,964	6,992	69,684	179,760
-Culvert I	nos	0	0	0	0	0	0	0	0
-Bridge Type I (11 nos)	m2	600	25,200	37,800	63,600	79,200	27,600	72,600	191,400
-Syphon Type I	nos	0	0	0	0	0	0	0	0
-Spillway	nos	0	0	0	0	0	0	0	0
-Aquiduct	nos	0	0	0	0	0	0	0	0
-Drop	nos	7	3,234	2,646	5,880	12,152	1,505	8,372	20,699
4.1.3 Miscellaneous	L.S.		30,067	24,294	54,391	24,771	69,769	83,776	202,640
4.2 Secondary Canal (61.4 km)			641,882	518,526	1,160,408	717,269	1,346,226	1,749,466	4,260,451
4.2.1 Earth Work									
-Excavation II	1,000m3	195	273,835	76,401	350,235	58,665	242,799	275,943	838,655
-Embankment II	1,000m3	412	193,228	263,680	456,908	189,520	887,546	994,619	2,217,384
-Preparation and Finishing	L.S.		46,706	34,008	80,714	24,818	113,034	127,056	305,604
4.2.2 Structure									
-Turnout	nos	70	62,230	78,820	141,050	277,410	17,290	172,270	449,400
-Culvert	nos	12	9,601	12,161	21,762	42,800	2,668	26,579	69,336
-Bridge Type II (38 nos)	m2	800	11,200	16,800	28,000	35,200	12,000	32,000	84,000
-Syphon Type II	nos	2	7,818	6,483	14,301	29,528	3,666	20,349	50,318
-Spillway	nos	10	3,696	3,024	6,720	13,888	1,720	9,568	23,656
-Aquiduct	nos	5	2,541	2,079	4,620	9,548	1,183	6,578	16,264
-Drop	nos	1	462	378	840	1,736	215	1,196	2,957
4.2.3 Miscellaneous	L.S.		30,566	24,692	55,258	34,156	64,106	83,308	202,879

Table C-24 DIRECT CONSTRUCTION COST FOR CIVIL WORKS
SILAU SYSTEM (2/2)

(1$=Rp.1,770=Yen145)

Cost Item	Unit	Work Volume	Local Currency			Foreign Currency			Total Unit Cost
			Labour (1,000Rp)	Other (1,000Rp)	L.C. Total (1,000Rp)	I.F.C. (1,000Rp)	P.F.C. (US$)	F.C. Total (US$)	(1,000Rp)
V. Drainage System			575,588	319,444	895,105	402,176	854,141	1,081,408	2,809,010
5.1 Main Drain (16.9 km)			154,623	90,783	245,479	101,116	252,569	309,727	793,611
5.1.1 Earth Work									
-Excavation I	1,000m3	68	99,522	29,138	128,660	21,751	93,596	105,885	316,076
-Embankment I	1,000m3	51	24,477	36,332	60,809	25,295	120,128	134,419	298,731
-Preparation and Finishing	L.S.		12,400	6,547	18,947	4,705	21,372	24,030	61,481
5.1.2 Structure									
-Culvert II	nos	11	7,921	10,033	17,954	35,310	2,225	22,174	57,202
-Bridge Type I (1 nos)	m2	70	2,940	4,410	7,420	9,240	3,220	8,470	22,330
-Syphon Type I	nos	0	0	0	0	0	0	0	0
-Tide Gate Type I (Bagan Batak)	nos	0	0	0	0	0	0	0	0
-Tide Gate Type II (Tambung Tulang)	nos	0	0	0	0	0	0	0	0
-Tide Gate Type III (Silo Bonto)	nos	0	0	0	0	0	0	0	0
5.1.3 Miscellaneous	L.S.		7,363	4,323	11,689	4,815	12,027	14,749	37,791
5.2 Secondary Drain (34.6km)			420,965	228,661	649,626	301,060	601,572	771,680	2,015,399
5.2.1 Earth Work									
-Excavation II	1,000m3	194	273,132	76,205	349,337	58,514	242,176	275,235	836,503
-Embankment II	1,000m3	125	58,391	79,680	138,071	57,270	268,203	300,558	670,059
-Preparation and Finishing	L.S.		33,152	15,588	48,741	11,578	51,038	57,579	150,656
5.2.2 Structure									
-Culvert II	nos	48	34,564	43,779	78,343	154,081	9,709	96,761	249,610
-Bridge Type II (5 nos)	m2	120	1,680	2,520	4,200	5,280	1,800	4,800	12,600
-Syphon Type II	nos	0	0	0	0	0	0	0	0
5.2.3 Miscellaneous	L.S.		20,046	10,889	30,935	14,336	28,646	36,747	95,971
VI. Farm Road (141.0 km)			655,861	444,103	1,099,964	1,398,574	672,794	1,462,949	3,689,215
6.1 Earth Work for Connection road(2.5 km)									
-Excavation	1,000m3	5	612	261	873	239	2,118	2,253	4,860
-Embankment	1,000m3	10	3,050	8,470	11,520	4,000	23,785	26,045	57,620
-Preparation and Finishing	L.S.		366	873	1,239	424	2,590	2,830	6,248
6.2 Metalling									
-Asphalt Paving (0 km)	1,000m2	0	0	0	0	0	0	0	0
-Macadam Metalling (107.7 km)	1,000m3	85	651,833	434,499	1,086,332	1,393,912	644,301	1,431,821	3,620,487
VIII. On-farm Works (3,861 ha)			1,292,633	858,323	2,150,956	1,687,324	857,192	1,810,482	5,352,944
-Tertiary Development Type I	ha	2,566	713,348	482,408	1,195,756	921,194	500,153	1,020,601	2,999,654
-Tertiary Development Type II	ha	1,295	508,935	345,765	854,700	665,630	357,040	733,102	2,152,290
-Land Reclamation	ha	670	70,350	30,150	100,500	100,500	0	56,780	201,000
SILAU SYSTEM TOTAL			4,795,303	4,558,411	9,354,489	7,446,543	7,700,124	11,905,118	30,426,449

Source; (1) Land Acquisition Commitee for Bah Bolong Project(Sep. 1989)
(2) Cost Estimatin Report of Ular Project(1989)
(3) Design Report of Lower Asahan Flood Control Project(Feb. 1990)
Note; L.C.: Local Currency, F.C.: Foreign Currency, I.F.C.: Indirect Foreign Currency, P.F.C.: Pure Foreign Currency

Table C-24 DIRECT CONSTRUCTION COST FOR CIVIL WORKS
BUNUT SYSTEM (1/2)

(1$=Rp.1,770=Yen145)

Cost Item	Unit	Work Volume	Local Currency			Foreign Currency			Total Unit Cost
			Labour (1,000Rp)	Other (1,000Rp)	L.C. Total (1,000Rp)	I.F.C. (1,000Rp)	P.F.C. (US$)	F.C. Total (US$)	(1,000Rp)
Bunut Scheme									
I. Preparatory Works	L.S.		855,506	722,546	1,578,201	1,767,063	1,061,535	1,839,384	4,833,442
II. Land Acquisition and Compensation			0	1,434,800	1,434,800	0	0	0	1,434,800
-Area Class I (ha)	ha	80	0	264,800	264,800	0	0	0	264,800
-Area Class II (ha)	ha	300	0	330,000	330,000	0	0	0	330,000
-House (nos)	nos	700	0	840,000	840,000	0	0	0	840,000
III. Weir Rehabilitation			240,812	165,052	405,865	442,547	384,135	634,162	1,528,968
3.1 Serbangan Weir	L.S.		174,784	121,490	296,274	307,494	305,247	478,972	1,144,055
3.2 Panca Arga Weir	L.S.		48,958	29,657	78,616	105,584	39,197	98,849	254,215
3.3 Beluru Weir	L.S.		17,070	13,905	30,975	29,469	39,691	56,341	130,698
IV. Flood Control	L.S.		2,078,450	1,700,550	3,779,000	8,671,500	1,075,424	5,974,576	14,354,000
V. Silau-Bunut Diversion Canal (8.3 km)			580,986	234,853	816,396	232,094	659,873	791,236	2,216,232
5.1.1 Earth Work									
-Excavation I	1,000m3	313	455,415	133,338	588,753	99,534	428,297	484,531	1,446,373
-Embankment I	1,000m3	51	24,429	36,261	60,690	25,245	119,893	134,156	298,146
-Preparation and Finishing	L.S.		47,984	16,960	64,944	12,478	54,819	61,869	174,452
5.1.2 Structure									
-Culvert I	nos	3	2,400	3,040	5,441	10,700	674	6,719	17,334
-Bridge Type I (11nos)	m2	450	18,900	28,350	47,700	59,400	20,700	54,450	143,550
-Railway Crossing(4 nos)	m2	80	3,360	5,040	8,480	10,560	3,680	9,680	25,520
-Spillway	nos	0	0	0	0	0	0	0	0
-Drop	nos	0	0	0	0	0	0	0	0
-Inflow Structure	nos	1	832	680	1,512	3,125	387	2,153	5,323
5.1.3 Miscellaneous	L.S.		27,666	11,183	38,876	11,052	31,423	37,678	105,535
V. Irrigation System			1,116,731	927,987	2,045,368	1,166,689	2,510,764	3,170,188	7,655,839
5.1 Main Canal (18.0 km)			310,061	293,817	604,402	339,006	800,958	992,711	2,360,885
5.1.1 Earth Work									
-Excavation I	1,000m3	78	113,927	33,356	147,282	24,899	107,143	121,210	361,824
-Embankment I	1,000m3	237	113,619	168,649	282,268	117,414	557,621	623,957	1,386,671
-Preparation and Finishing	L.S.		22,755	20,201	42,955	14,231	66,476	74,517	174,850
5.1.2 Structure									
-Turnout	nos	16	14,224	18,016	32,240	63,408	3,995	39,819	102,720
-Culvert I	nos	0	0	0	0	0	0	0	0
-Bridge Type I (8 nos)	m2	500	21,000	31,500	53,000	66,000	23,000	60,500	159,500
-Syphon Type I	nos	1	9,772	8,104	17,876	36,910	4,582	25,436	62,897
-Spillway	nos	0	0	0	0	0	0	0	0
-Aquiduct	nos	0	0	0	0	0	0	0	0
-Drop	nos	0	0	0	0	0	0	0	0
5.1.3 Miscellaneous	L.S.		14,765	13,991	28,781	16,143	38,141	47,272	112,423
5.2 Secondary Canal (65.2 km)			806,671	634,170	1,440,966	827,683	1,709,805	2,177,477	5,294,954
5.2.1 Earth Work									
-Excavation II	1,000m3	256	360,102	100,470	460,571	77,146	319,289	362,874	1,102,859
-Embankment II	1,000m3	524	245,850	335,488	581,338	241,132	1,129,251	1,265,484	2,821,244
-Preparation and Finishing	L.S.		60,595	43,596	104,191	31,828	144,854	162,836	392,410
5.2.2 Structure									
-Turnout	nos	91	80,899	102,466	183,365	360,633	22,724	226,472	584,220
-Culvert	nos	4	3,200	4,054	7,254	14,267	899	8,959	23,112
-Bridge Type II (26 nos)	m2	360	4,990	7,484	12,593	15,682	5,465	14,375	37,897
-Syphon Type II	nos	2	7,818	6,483	14,301	29,528	3,666	20,349	50,318
-Spillway	nos	5	1,848	1,512	3,360	6,944	861	4,784	11,828
-Aquiduct	nos	4	2,033	1,663	3,696	7,638	947	5,263	13,011
-Drop	nos	2	924	756	1,680	3,472	430	2,392	5,914
5.2.3 Miscellaneous	L.S.		38,413	30,199	68,617	39,413	81,419	103,689	252,141

Table C-24 DIRECT CONSTRUCTION COST FOR CIVIL WORKS
BUNUT SYSTEM (2/2)

(1$=Rp.1,770=Yen145)

Cost Item	Unit	Work Volume	Local Currency			Foreign Currency			Total
			Labour	Other	L.C. Total	I.F.C.	P.F.C.	F.C. Total	Unit Cost
			(1,000Rp)	(1,000Rp)	(1,000Rp)	(1,000Rp)	(US$)	(US$)	(1,000Rp)
VI. Drainage System			**2,418,844**	**1,172,402**	**3,592,295**	**1,520,056**	**3,811,192**	**4,067,361**	**10,790,295**
6.1 Main Drain (41.8 km)			1,464,446	672,417	2,137,808	870,274	1,960,966	2,312,241	6,229,368
6.1.1 Earth Work									
-Excavation I	1,000m3	729	1,060,259	310,426	1,370,685	231,727	997,125	1,128,044	3,367,323
-Embankment I	1,000m3	234	111,990	166,232	278,222	115,731	549,628	615,013	1,366,795
-Preparation and Finishing	L.S.		117,225	47,666	164,891	34,746	154,675	174,306	473,412
6.1.2 Structure									
-Culvert II	nos	13	9,361	11,857	21,218	41,730	2,630	26,206	67,603
-Bridge Type I (10 nos)	m2	900	37,800	56,700	95,400	118,800	41,400	108,900	287,100
-Syphon Type I	nos	0	0	0	0	0	0	0	0
-Tide Gate Type I (Bagan Batak)	nos	1	9,719	7,952	17,670	36,351	4,458	25,045	62,000
-Tide Gate Type II (Tambung Tulang)	nos	1	19,359	15,839	35,198	72,408	8,880	49,888	123,500
-Tide Gate Type III (Silo Bonto)	nos	1	28,999	23,726	52,725	108,466	13,301	74,732	185,000
6.1.3 Miscellaneous	L.S.		69,736	32,020	101,800	69,736	69,736	110,107	296,637
6.2 Secondary Drain (87.0 km)			954,398	499,985	1,454,486	541,692	1,449,035	1,755,120	4,560,927
6.2.1 Earth Work									
-Excavation II	1,000m3	452	635,341	177,262	812,603	136,112	563,334	640,233	1,945,817
-Embankment II	1,000m3	313	146,985	200,576	347,561	144,164	675,138	756,587	1,686,719
-Preparation and Finishing	L.S.		78,233	37,784	116,016	28,028	123,847	139,682	363,254
6.2.2 Structure									
-Culvert II	nos	56	40,325	51,075	91,400	179,762	11,327	112,887	291,211
-Bridge Type II (18 nos)	m2	300	4,158	6,237	10,494	13,068	4,554	11,979	31,581
-Syphon Type II	nos	1	3,909	3,242	7,150	14,764	1,833	10,174	25,159
6.2.3 Miscellaneous	L.S.		45,448	23,809	69,261	25,795	69,002	83,577	217,187
VII. Farm Road (212.8 km)			864,268	580,243	1,444,306	1,888,092	845,253	1,911,972	4,828,497
7.1 Earth Work for Connection road(1.8 km)									
-Excavation	1,000m3	3	435	186	621	170	1,506	1,602	3,456
-Embankment	1,000m3	6	1,830	5,082	6,912	2,400	14,271	15,627	34,572
-Preparation and Finishing	L.S.		227	527	753	257	1,578	1,723	3,803
7.2 Metalling									
-Asphalt Paving (10.4 km)	1,000m2	42	72,634	48,422	121,056	197,725	47,875	159,584	403,520
-Macadam Metalling (127.9 km)	1,000m3	102	789,142	526,027	1,314,964	1,687,541	780,023	1,733,436	4,383,146
VIII. On-farm Works (5,649 ha)			**1,835,957**	**1,244,423**	**3,080,380**	**2,385,886**	**1,287,623**	**2,635,581**	**7,742,018**
-Tertiary Development Type I	ha	3,340	928,520	627,920	1,556,440	1,199,060	651,017	1,328,452	3,904,460
-Tertiary Development Type II	ha	2,309	907,437	616,503	1,523,940	1,186,826	636,606	1,307,129	3,837,558
-Land Reclamation	ha	0	0	0	0	0	0	0	0
BUNUT SYSTEM TOTAL			**9,991,554**	**8,182,856**	**18,176,611**	**19,705,006**	**12,376,676**	**21,024,459**	**55,384,091**

Source; (1) Land Acquisition Commitee for Bah Bolong Project(Sep. 1989)
(2) Cost Estimatin Report of Ular Project(1989)
(3) Design Report of Lower Asahan Flood Control Project(Feb. 1990)
Note; L.C.: Local Currency, F.C.: Foreign Currency, I.F.C.: Indirect Foreign Currency, P.F.C.: Pure Foreign Currency

Table C-25 PROCUREMENT COST OF O&M EQUIPMENT

(US $)

No	Equipment	Nos.	Unit price F/C	Unit price L/C	Unit price Total	Amount F/C (US $)	Amount L/C (Rp.1,000)	Amount Total (Rp.1,000)
[I.MAINTENANCE EQUIPMENT]								
1.	Hydraulic backhoe	2	63,333	2,896	66,230	126,667	10,368	234,568
2.	Angle dozer	2	75,738	3,443	79,180	151,475	12,325	280,436
3.	Wheel loader	1	48,306	2,186	50,492	48,306	3,913	89,414
4.	Motor grader	1	62,568	2,842	65,410	62,568	5,086	115,832
5.	Slope compactor	4	1,038	55	1,093	4,153	391	7,742
6.	Concrete mixer	2	2,295	109	2,404	4,590	391	8,516
7.	Submergible pump	2	1,257	55	1,311	2,514	196	4,645
8.	Portable diesel generator	2	3,224	164	3,388	6,448	587	12,000
9.	Dump truck	2	30,273	1,366	31,639	60,546	4,891	112,058
10.	Cargo truck w/crane	1	42,185	1,913	845,738	42,185	3,423	78,091
11.	Pick-up truck, 4x4	2	16,120	710	16,831	32,240	2,543	59,609
12.	Spare (parts 10 % of above)		0	0	0	54,169	4,411	100,291
	Sub-total[I]					**595,863**	**48,526**	**1,103,202**
[II.OPERATION EQUIPMENT]								
13.	Jeep type car	4	17,596	820	18,415	70,383	5,869	130,446
14.	Station wagon	1	7,705	328	8,033	7,705	587	14,225
15.	Motor cycle	25	1,585	55	1,639	39,617	2,445	72,568
16.	Wireless radio(base)	1	36,612	1,639	38,251	36,612	2,934	67,738
17.	Wireless radio(field)	5	3,716	164	3,880	18,579	1,467	34,352
18.	Personnel computer	2	8,470	383	8,852	16,940	1,369	31,353
19.	Spare parts		44,918	0	44,918	11,770	890	21,724
	Sub-total[II]					**201,607**	**15,562**	**372,406**
[METEO-HYDROLOGICAL EQUIPMENT]								
20.	Rain gauge	3	1,140	60	1,200	3,420	322	6,376
21.	Meteo. station	1	9,880	520	10,400	9,880	931	18,418
22.	Water level gauge	5	1,330	70	1,400	6,650	627	12,397
	Sub-total[III]					**19,950**	**1,880**	**37,191**
	Total					**817,419**	**65,967**	**1,512,799**

Conversion rate : US$ 1.0 = Yen 145 = Rp. 1,770

Table C-26 ANNUAL DISBURSEMENT SCHEDULE OF THE PROJECT COST (Cost of Silau Flood Dike is NOT included)

(US$ 1.0 = Rp.1,770)

Description	Total			1990/91			1991/92			1992/93		
	F/C (US$ 1,000)	L/C (Rp. mil)	Total (Rp. mil)	F/C (US$ 1,000)	L/C (Rp. mil)	Total (Rp. mil)	F/C (US$ 1,000)	L/C (Rp. mil)	Total (Rp. mil)	F/C (US$ 1,000)	L/C (Rp. mil)	Total (Rp. mil)
1 Detailed Design	2,418	1,834	6,113	484	367	1,223	1,934	1,467	4,890			
2 Land Acquisition	0	2,500	2,500		2,500	2,500						
3 Construction works												
1\) Direct cost	34,539	26,194	87,327							4,317	3,274	10,916
2\) Value Added Tax	3,972	3,012	10,043							496	377	1,255
Sub-total	**38,511**	**29,206**	**97,370**	**0**	**0**	**0**	**0**	**0**	**0**	**4,814**	**3,651**	**12,171**
4 Contingencies												
1\) Physical contingency	5,181	3,929	13,099							648	491	1,637
2\) Price contingency	6,139	14,384	25,250	0	0	0	58	117	220	359	831	1,456
Sub-total	**11,320**	**18,313**	**38,349**	**0**	**0**	**0**	**58**	**117**	**220**	**1,007**	**1,322**	**3,104**
5 Procurement of O&M Equipment	817	66	1,513									
7 Engineering Service	3,454	2,619	8,733							432	327	1,092
8 Administration	0	2,620	2,620							0	524	524
9 Training Program	0	113	113									
TOTAL	**56,520**	**57,271**	**157,311**	**484**	**2,867**	**3,723**	**1,992**	**1,585**	**5,110**	**6,252**	**5,824**	**16,890**

Description	1993/94			1994/95			1995/96			1996/97		
	F/C (US$ 1,000)	L/C (Rp. mil)	Total (Rp. mil)	F/C (US$ 1,000)	L/C (Rp. mil)	Total (Rp. mil)	F/C (US$ 1,000)	L/C (Rp. mil)	Total (Rp. mil)	F/C (US$ 1,000)	L/C (Rp. mil)	Total (Rp. mil)
1 Detailed Design												
2 Land Acquisition												
3 Construction works												
1\) Direct cost	8,635	6,549	21,832	8,635	6,549	21,832	8,635	6,549	21,832	4,317	3,274	10,916
2\) Value Added Tax	993	753	2,511	993	753	2,511	993	753	2,511	496	377	1,255
Sub-total	**9,628**	**7,302**	**24,343**	**9,628**	**7,302**	**24,343**	**9,628**	**7,302**	**24,343**	**4,814**	**3,651**	**12,171**
4 Contingencies												
1\) Physical contingency	1,295	982	3,275	1,295	982	3,275	1,295	982	3,275	648	491	1,637
2\) Price contingency	1,131	2,495	4,497	1,479	3,411	6,030	1,942	4,457	7,894	1,144	2,930	5,143
Sub-total	**2,426**	**3,478**	**7,772**	**2,775**	**4,393**	**9,304**	**3,238**	**5,439**	**11,169**	**1,791**	**3,422**	**6,780**
5 Procurement of O&M Equipment	409	33	756				409	33	756			
7 Engineering Service	864	655	2,183	864	655	2,183	864	655	2,183	432	327	1,092
8 Administration	0	524	524	0	524	524	0	524	524	0	524	524
9 Training Program	0	113	113									
TOTAL	**13,326**	**12,104**	**35,691**	**13,266**	**12,874**	**36,354**	**14,137**	**13,952**	**38,975**	**7,037**	**7,924**	**20,567**

Remarks: Price escaration rate: F/C = 3% / year L/C = 8% / year

Appendix 4-D

Agriculture and Agro-economy

Appendix 4-D

AGRICULTURE AND AGRO-ECONOMY

CONTENTS

2.2 Farm Economic Conditions

2.3 Agricultural Supporting Services

3. Agricultura Development Plan

4. Organizational Development

5. Econmic Evaluation

Table D-1 (1/2) BASIC SOCIO DATA OF VILLAGES RELATED TO THE PROJECT AREA
(1987)

Name of Kecamatan	Name of village	Settled year	Area (Km2)	Population 1987	Population density (per/km2)	Sex ratio (%) Male	Sex ratio (%) Female	No.of total household	Average family size	Total farm household	Population classified by age: 0-4 number	(%)	5-9 number	(%)	10-14 number	(%)	15-24 number	(%)	25-49 number	(%)	over 50 number	(%)	Population classified by religion: Islam number	(%)	Protestant number	(%)	Catholic number	(%)	Buddism number	(%)	Other number	(%)
BUNUT IRRIGATION AREA																																
Air Joman	Banjar	1926	13.6	6,580	484	50	50	1,248	5		1,030	16	970	15	1,059	16	899	14	1,972	30	550	8	6,028	92	456	7	96	1	0	0	0	0
	Silau Lama	1940	19.3	2,795	145	46	54	489	6		479	17	499	18	365	13	456	16	633	23	363	13	2,631	94	66	2	98	4	0	0	0	0
	Silo Bonto	1960	29.0	5,342	184	49	51	897	6		1,014	19	969	18	821	15	961	18	1,152	22	425	8	5,342	100	0	0	0	0	0	0	0	0
Meranti	Rawang Baru	1952	25.3	2,545	101	53	47	478	5		246	10	407	16	352	14	243	10	964	38	160	6	803	32	1,530	60	212	8	0	0	0	0
	Rawang PasarIV	1936	17.4	5,444	313	49	51	1,009	5		455	8	653	12	637	12	1,083	20	2,007	37	609	11	4,247	78	1,098	20	99	2	0	0	0	0
	Meranti	1946	14.4	8,675	602	50	50	1,671	5		1,595	18	1,461	17	1,213	14	431	5	2,442	28	1,350	16	6,497	75	1,895	22	283	3	0	0	0	0
	Rawang Lama	1950	34.0	7,366	217	51	49	1,412	5		956	13	838	11	950	13	1,635	22	2,140	29	847	11	4,182	57	2,815	38	369	5	0	0	0	0
	Sei Beluru	1947	19.8	3,168	160	48	52	579	5		270	9	406	13	337	11	639	20	1,209	38	330	10	2,323	73	838	26	7	0	0	0	0	0
	Pd.Bungur	1950	18.8	2,981	159	48	52	534	6		345	12	410	14	270	9	403	14	1,246	42	457	15	2,517	84	375	13	80	3	9	0	0	0
Tj.Tiram	Sei Mentaram	1925	13.4	1,348	101	50	50	255	5		227	17	204	15	207	15	299	22	307	23	104	8	665	49	570	42	113	8	0	0	0	0
	Desa Gajah	1952	12.9	4,695	365	52	48	1,062	4		490	10	584	12	389	8	977	21	1,497	32	758	16	1,098	23	3,490	74	107	2	0	0	0	0
	Durian	1950	2.0	1,613	802	51	49	349	5		175	11	214	13	261	16	273	17	487	30	203	13	1,100	68	513	32	0	0	0	0	0	0
	Air Putih	1953	3.0	1,362	454	50	50	251	5		105	8	239	18	305	22	233	17	280	21	200	15	278	20	1,074	79	10	1	0	0	0	0
	Uj.Kubu	1930	137.4	12,632	92	54	46	2,451	5		1,982	16	1,447	11	2,550	20	2,342	19	3,039	24	1,272	10	10,912	86	1,097	9	623	5	0	0	0	0
sub-total			360.2	66,546	185	51	49	12,685	5		9,369	14	9,301	14	9,716	15	10,874	16	19,375	29	7,628	11	48,623	73	15,817	24	2,097	3	9	0	0	0
SILAU IRRIGATION AREA																																
Kisa.Timur	Mutiara	1956	4.8	6,732	1,408	48	52	1,121	6		712	11	721	11	859	13	1,478	22	1,978	29	964	14	5,525	82	839	12	314	5	99	1	0	0
	Si Umbut umbut	1942	5.6	5,216	931	48	52	843	6		653	13	366	7	412	8	798	15	2,261	43	1,006	19	4,905	94	0	0	4	0	9	0	0	0
Air Joman	Par.Lembu	1921	10.2	2,669	262	49	51	447	6		643	24	867	32	656	25	805	30	738	28	427	16	2,658	100	11	0	0	0	0	0	0	0
	Air Joman	1952	26.0	5,280	203	49	51	1,031	5		885	17	1,097	21	757	14	762	14	1,104	21	675	13	5,251	99	22	0	7	0	0	0	0	0
	Binjai Serbangan	1940	15.3	9,477	621	51	49	1,557	6		1,615	17	1,651	17	1,434	15	1,842	19	1,880	20	1,055	11	8,834	93	254	3	16	0	373	4	0	0
	Punggulan	1952	7.0	5,897	842	49	51	1,090	5		585	10	652	11	761	13	1,464	25	1,751	30	684	12	5,745	97	0	0	7	0	145	2	0	0
Air Batu	Sei Kamah II	1963	8.0	5,888	736	50	50	1,092	5		1,267	22	844	14	942	16	1,228	21	649	11	958	16	5,790	98	64	1	12	0	15	0	7	0
	Sei Kamah I	1937	4.8	3,033	632	48	52	609	5		533	18	230	8	222	7	511	17	1,099	36	438	14	2,702	89	331	11	0	0	0	0	0	0
S.Empat	Sei Lama	1931	20.5	5,157	252	51	49	943	5		197	4	768	15	724	14	1,508	29	1,505	29	638	12	3,732	72	1,187	23	311	6	2	0	0	0
T.Balai(1)	Kapias Batu VIII		20.0	8,528	426	46	54	1,654	5		1,363	16	1,398	16	1,199	14	1,851	22	1,912	22	805	9	8,272	97	47	1	0	0	209	2	0	0
D. Bandar	Sijambi II	1921	10.9	5,810	533	38	62	772	8				1,717	30			1,128	19	2,425	42	540	9	3,369	58	2,168	37	247	4	26	0	0	0
Meranti	Subur	1951	13.0	3,117	240	55	45	512	6		379	12	352	11	274	9	431	14	1,247	40	434	14	2,976	95	0	0	140	4	1	0	0	0
sub-total			146.0	66,804	457	49	51	11,671	6		8,832	13	10,663	16	8,240	12	13,806	21	18,549	28	8,624	13	59,759	89	4,923	7	1,058	2	879	1	7	0
Grand total			506.2	133,350	263	52	48	24,356	5.5		18,201	14	19,964	15	17,956	13	24,680	19	37,924	28	16,252	12	108,382	81	20,740	16	3,155	2	888	1	7	0

Table D-1 (2/2) BASIC SOCIO DATA OF VILLAGES RELATED TO THE PROJECT AREA
(1987)

Name of Kecamatan	Name of village	Population by ethic group												Population classified by occupation															
		Melayu		Jawa		Batak		Minang		Banjar		Others		Farmer		Fisherman		Trader		NGO. Employee		G.Employee		Worker		Others	
		number	(%)	number	(%)	number	(%)	number	(%)	number	(%)	number	(%)	number	(%)	number	(%)	number	(%)	number	(%)	number	(%)	number	(%)	number	(%)
BUNUT IRRIGATION AREA																													
Air Joman	Banjar	507	13	300	8	1,004	26	51	1	1,503	39	518	13	677	70	4	0	67	7	55	6	44	5	112	12	5	1
	Silau Lama	723	26	1,866	67	177	6	1	0	28	1	0	0	443	83	0	0	29	5	12	2	24	4	25	5	3	1
	Silo Bonto	785	15	2,545	48	1,861	35	39	1	82	2	30	1	319	36	126	14	38	4	0	0	13	1	379	43	7	1
Meranti	Rawang Baru	0	0	644	25	1,901	75	0	0	0	0	0	0	2,143	84	0	0	38	1	187	7	171	7	0	0	0	0
	Rawang PasarIV	20	0	4,196	77	1,197	22	4	0	0	0	27	0	2,891	74	0	0	34	1	828	21	38	1	40	1	74	2
	Meranti	357	4	6,130	71	2,178	25	0	0	0	0	10	0	3,069	81	0	0	147	4	50	1	58	2	413	11	35	1
	Rawang Lama	276	4	3,393	46	3,365	46	45	1	24	0	63	1	2,098	79	0	0	31	1	44	2	87	3	274	10	116	4
	Sei Beluru	16	1	2,138	67	1,010	32	3	0	0	0	1	0	538	58	0	0	10	1	35	4	46	5	287	31	10	1
	Pd.Bungur	1,302	44	1,207	40	455	15	0	0	0	0	17	1	330	23	2	0	20	1	700	49	57	4	220	15	100	7
Tj.Tiram	Sei Mentaram	291	22	334	25	723	54	0	0	0	0	0	0	535	83	3	0	3	0	6	1	4	1	10	2	80	12
	Desa Gajah	0	0	863	18	3,828	82	0	0	0	0	0	0	1,124	71	0	0	23	1	148	9	118	7	17	1	153	10
	Durian	324	20	692	43	577	36	0	0	9	1	0	0	209	59	7	2	9	3	16	5	15	4	16	5	80	23
	Air Putih	0	0	0	0	1,362	100	0	0	0	0	0	0	890	97	0	0	0	0	2	0	18	2	4	0	0	0
	Uj.Kubu	5,358	42	3,950	31	3,297	26	4	0	22	0	0	0	8,378	86	682	7	67	1	139	1	35	0	456	5	5	0
sub-total		9,959	15	28,258	42	22,935	34	147	0	1,668	3	666	1	23,644	77	824	3	516	2	2,222	7	728	2	2,253	7	668	2
SILAU IRRIGATION AREA																													
Kiss.Timur	Mutiara	694	10	3,070	46	2,082	31	547	8	98	1	97	1	261	35	11	1	3	0	269	36	72	10	116	15	19	3
	Si Umbut umbut	6	0	4,676	90	142	3	14	0	56	1	11	0	3,160	88	1	0	198	6	57	2	115	3	50	1	9	0
Air Joman	Par.Lembu	257	10	1,613	60	534	20	78	3	129	5	58	2	350	65	0	0	23	4	75	14	23	4	60	11	4	1
	Air Joman	769	15	2,355	45	2,052	39	0	0	72	1	0	0	619	60	7	1	64	6	0	0	62	6	262	25	19	2
	Binjai Serbangan	395	4	7,502	79	1,023	11	33	0	132	1	361	4	802	45	107	6	95	5	119	7	136	8	491	28	24	1
	Punggulan	959	16	3,381	57	1,305	22	0	0	26	0	131	2	4,450	82	0	0	800	15	110	2	48	1	50	1	0	0
Air Batu	Sei Kamah II	290	5	5,303	90	212	4	20	0	40	1	15	0	5,457	91	0	0	260	4	109	2	135	2	21	0	10	0
	Sei Kamah I	494	16	2,030	67	447	15	0	0	62	2	0	0	921	74	7	1	26	2	0	0	17	1	33	3	238	19
S.Empat	Sei Lama	84	2	2,589	50	1,946	38	230	4	281	5	102	2	2,649	67	112	3	357	9	78	2	271	7	191	5	285	7
T.Balai(1)	Kapias Batu VIII	1,064	12	1,822	21	4,674	55	169	2	154	2	645	8	618	17	1,954	55	264	7	184	5	52	1	109	3	352	10
D. Bandar	Sijambi II		10		68		18		0		0		4	1,503	26	8	0	171	3	2,065	36	807	14	798	14	461	8
Meranti	Subur	246	8	2,770	89	63	2	8	0	0	0	0	0	426	81	39	7	11	2	29	6	7	1	11	2	0	0
sub-total		5,258	8	37,111	56	14,480	22	1,099	2	1,050	2	1,420	2	21,216	62	2,246	7	2,272	7	3,095	9	1,745	5	2,192	6	1,421	4
Grand total		15,217	12	65,369	53	37,415	30	1,246	1	2,718	2	2,086	2	44,860	69	3,070	5	2,788	4	5,317	8	2,473	4	4,445	7	2,089	3

Table D-2 TENURIAL STATUS AND CULTIVATED FARM SIZE IN MAJOR DESAS RELATED TO THE PROJECT AREA

Desa	Total No. of Sample	Tenurial Status (%)			Average Cultivated Farm Size (ha)						Average Cultivated Farm Size ** in Desa (ha)	
					Owner Operator		Tenant		Partly Owner Operator***			
		Owner Operator	Tenant	Partly Owner Operator	Paddy Land	Total* Agri. Land	Paddy Land	Total Agri. Land	Paddy Land	Total Agri. Land	Paddy Land	Total Agri. Land
BUNUT IRRIGATION AREA												
Banjar	82	97	1	2	0.76	0.93	0.50	0.50	1.40	1.50	0.77	0.94
Silo Lama	57	93	2	5	0.69	1.10	0.50	0.50	0.72	0.77	0.68	1.08
Rawang Baru	77	90	0	10	0.76	0.77	-	-	0.91	0.91	0.80	0.79
Rawang Pasar IV	78	68	14	18	0.53	0.56	0.49	0.49	0.94	0.94	0.60	0.61
Rawang Lama	79	65	15	20	0.84	0.93	0.56	0.63	0.82	0.85	0.79	0.87
Sei Beluru	61	69	15	16	0.45	0.63	0.35	0.36	0.65	0.78	0.47	0.61
Pd. Bungur	74	96	4	0	0.65	0.75	0.44	0.44	-	-	0.64	0.74
Sei Mentaram	84	96	2	2	0.32	2.16	1.50	2.00	3.00	3.75	0.37	2.17
Desa Gajah	71	57	11	32	1.51	1.54	0.83	0.92	1.45	1.46	1.41	1.44
Durian	81	74	7	19	0.78	0.83	0.67	0.67	1.37	1.41	0.88	0.92
Air Putih	85	100	0	0	1.35	1.35	-	-	-	-	1.35	1.35
SILAU IRRIGATION AREA												
Mutiara	72	65	14	21	0.40	0.40	0.36	0.36	0.43	0.43	0.40	0.40
Si Umbut Umbut	85	80	20	0	0.48	0.64	0.40	0.45	-	-	0.47	0.60
Par lembu	73	88	1	11	0.56	1.44	0.50	0.50	0.72	2.00	0.58	1.35
Air Joman	67	42	35	23	0.66	1.41	0.44	1.77	1.28	2.34	0.71	1.74
Binjai Serbangan	80	78	8	14	1.51	1.77	0.43	0.53	0.54	2.06	1.29	1.71
Sei Kamah II	71	66	11	23	0.37	0.69	0.33	0.33	0.80	1.14	0.32	0.56
Sei Kamah I	82	58	26	16	0.54	0.56	0.36	0.36	1.05	1.05	0.57	0.58
Sei Lama	80	64	6	30	1.08	1.67	0.89	0.89	1.56	1.67	1.21	1.62
Sijambi II	40	29	48	23	1.04	1.17	1.05	1.05	1.37	1.76	1.12	1.24
Punggulan	76	92	0	8	0.67	1.02	-	-	1.11	1.35	0.70	1.05

* The total agricultural land contains paddy land, upland and estate crop land.
** An average cultivated farm size for all the farmers.
*** The partly owner operator is the owner operator who rent land.

Table D-3 (1/2) SOCIAL INFRASTRUCTURES BY DESA CONCERNED / 1988
(SOCIAL INFRASTRUCTURE)

Name of Kecamatan	Name of village	No. of Schools by Type							No. of Religious Buildings				No. and Type of Medical Facilities					No. And Type of Marketing Facilities							Other Facilities		
		Primary School	J.H. School	S.H. School	J.Moslim School	S.Moslim School	Others	Total	Mosque	Church	Others	Total	Hospital	Clinic	P.Health Center	Med.Post/ Baby HC	Total	Public Market	Livestock Market	Big Shop	Small Shop	Ware-house	Rice Storage	Bank	Village Meet.Faci.	Orphant Houses	Woman's House
BUNUT IRRIGATION AREA																											
Air Joman	Banjar	8	1	0	3	0	0	12	15	7	0	22	0	0	1	3	4	0	0	0	0	0	0	0	1	0	0
	Silau Lama	1	1	0	1	1	0	4	3	1	0	4	0	1	0	3	4	2	0	0	10	0	0	0	0	0	0
	Silo Bonto	1	1	0	3	0	0	5	21	0	0	21	0	0	0	7	7	2	0	0	10	0	0	0	1	0	1
Meranti	Rawang Baru	3	0	0	1	0	0	4	7	6	0	13	0	0	0	5	5	0	0	0	0	0	0	0	1	0	0
	Rawang PasarIV	7	2	1	1	0	0	11	8	3	0	11	0	2	0	8	10	0	0	4	40	3	0	0	1	0	1
	Meranti	7	3	3	1	0	1	15	16	5	1	22	0	0	1	6	7	1	0	45	30	2	0	0	1	0	0
	Rawang Lama	7	1	1	2	0	0	11	14	11	0	25	0	0	0	8	8	2	0	36	19	3	4	0	1	0	1
	Sei Beluru	1	0	0	1	0	0	2	2	1	0	3	0	0	1	6	7	0	0	0	4	0	0	0	1	0	0
	Pd.Bungur	1	0	0	1	0	0	2	8	2	0	10	0	0	0	0	0	0	0	0	4	0	0	0	1	0	0
Tj.Tiram	Sei Mentaram	2	0	0	0	0	0	2	2	7	0	9	0	0	1	2	3	0	0	0	3	0	0	0	1	0	0
	Desa Gajah	2	1	0	0	0	0	3	3	16	4	23	0	0	1	10	11	1	0	0	93	1	0	0	1	0	0
	Durian	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	5	0	0	0	0	0	0	0	0	0	0
	Air Putih	1	0	0	0	0	0	1	2	2	0	4	0	0	0	3	3	0	0	0	0	0	0	0	1	0	0
	Uj.Kubu	10	1	1	20	0	0	32	24	7	0	31	0	0	2	20	22	1	0	3	47	2	1	1	1	0	0
sub-total		51	11	6	34	1	1	104	125	68	5	198	0	3	8	85	96	9	0	88	260	11	5	1	12	0	3
SILAU IRRIGATION AREA																											
Kisa.Timur	Mutiara	9	6	11	1	0	1	28	12	0	0	12	0	0	0	10	10	0	0	0	0	0	0	0	0	0	0
	Si Umbut umbut	3	4	2	0	0	0	9	10	0	0	10	1	0	1	1	3	0	0	0	12	0	1	0	1	0	0
Air Joman	Par.Lembu	3	1	1	0	0	0	5	8	0	0	8	0	0	1	4	5	0	0	1	15	1	0	0	1	0	1
	Air Joman	4	0	0	2	0	0	6	14	0	0	14	0	1	0	8	9	0	0	0	43	1	0	0	1	0	0
	Binjai Serbangan	8	3	2	1	0	0	14	21	0	2	23	0	0	1	12	13	1	0	0	15	0	0	0	1	0	0
	Punggulan	4	1	0	2	1	0	8	11	1	0	12	0	0	1	4	5	0	0	0	28	0	0	0	1	0	0
Air Batu	Sei Kamah II	5	1	0	0	0	0	6	8	0	0	8	0	0	1	8	9	0	0	2	5	1	0	0	1	0	1
	Sei Kamah I	2	0	0	1	0	0	3	5	1	0	6	0	0	0	2	2	2	0	0	0	0	0	0	1	0	0
S.Empat	Sei Lama	5	1	0	2	0	0	8	8	8	0	16	0	1	0	0	1	1	0	17	23	1	0	0	1	0	0
T.Balai(1) D. Bandar	Kapias Batu VIII Sijambi II																										
Meranti	Subur	1	0	0	0	0	0	1	6	0	0	6	0	0	0	5	5	0	0	0	0	0	0	0	1	0	1
sub-total		44	17	16	9	1	1	88	103	10	2	115	1	2	5	54	62	4	0	20	141	4	1	0	9	0	3
Grand total		95	28	22	43	2	2	192	228	78	7	313	1	5	13	139	158	13	0	108	401	15	6	1	21	0	6

Table D-3 (2/2) SOCIAL INFRASTRUCTURES BY DESA CONCERNED / 1988
(LIVING CONDITIONS)

Name of Kecamatan	Name of village	Houses classified by potable water source (%)				Type of houses % of Houses having			
		Well	River	Tap Water	Others	Toilet facilities	Window	Floor	Electric supply
BUNUT IRRIGATION AREA					0				
Air Joman	Banjar	100	0	0	0	65.0	80.0	40.0	10.0
	Silau Lama	100	0	0	0	98.6	100	80.5	10.1
	Silo Bonto	90.0	0	0	10.0	44.9	44.9	33.7	17.2
Meranti	Rawang Baru	77.6	0	0	22.4	20.1	100	97.1	0
	Rawang PasarIV	100	0	0	0	17.1	100	100	13.7
	Meranti	100	0	0	0	100	100	56.1	0
	Rawang Lama	100	0	0	0	29.4	93.5	34.1	22.7
	Sei Beluru	100	0	0	0	42.2	93.3	67.6	34.3
	Pd.Bungur	100	0	0	0	16.7	3.3	51.1	0
Tj.Tiram	Sei Mentaram	100	0	0	0	0.8	100	81.0	0
	Desa Gajah Durian	84.0	9.0	0	7	65.0	100	40.0	13.0
	Air Putih	100	0	0	0	4.3	100	29.9	0
	Uj.Kubu	11.8	2.4	0	85.8	24.1	98.2	82.1	8.0
Whole area		79.5	1.2	0	19.3	42.5	87.4	62.1	11.5
SILAU IRRIGATION AREA									
Kisa.Timur	Mutiara	77.7	9.7	12.6	0	88.2	97.3	77.4	80.9
	Si Umbut umbut	96.4	3.6	0	0	91.8	95.9	71.7	14.4
Air Joman	Par.Lembu	100	0	0	0	10.1	95.6	94.3	7.1
	Air Joman	100	0	0	0	9.4	100	54.9	0
	Binjai Serbangan	80.5	0.2	9.0	10.3	0	0	0	29.7
	Punggulan	94.9	5.1	0	0	73.4	91.7	77.9	76.5
Air Batu	Sei Kamah II	95.4	1.6	0	3.0	97.0	97.1	82.4	78.8
	Sei Kamah I	70.0	30.0	0	0	81.3	100	100	67.8
S.Empat T.Balai(1) D. Bandar Meranti	Sei Lama Kapias Batu VIII Sijambi II Subur	89.8	5.7	0	4.5	67.6	86.5	89.2	5.0
		98.0	1.9	0.1	0	58.6	100	78.1	0
Whole area		89.3	5.0	3.2	2.5	55.1	79.4	65.6	40.1
Project area		84.2	3.0	1.6	11.3	48.5	83.6	63.8	25.3

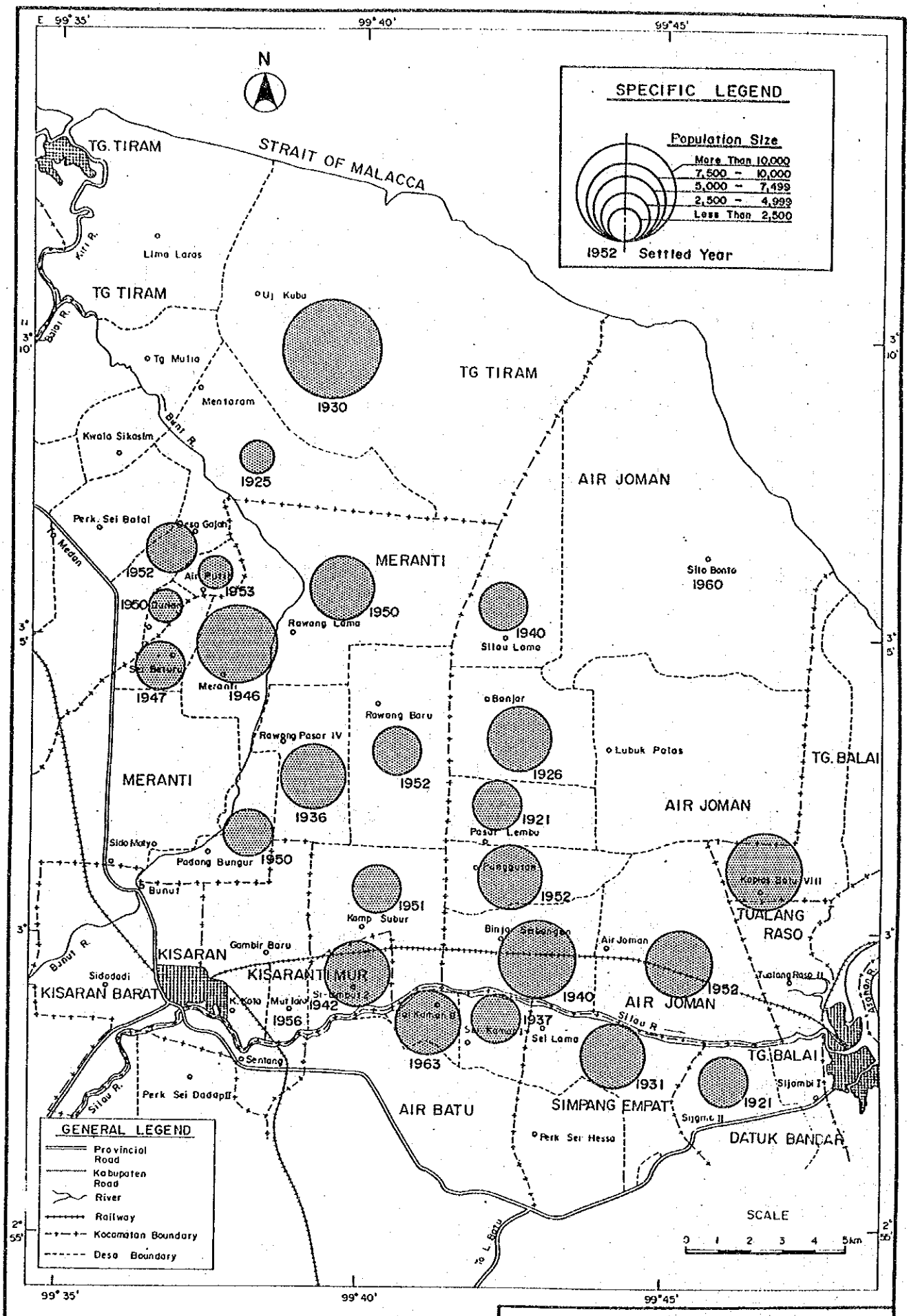


Fig. D - 1 DISTRIBUTION OF POPULATION BY DESA IN THE PROJECT AREA

Republic of Indonesia
MASTER PLAN STUDY ON
LOWER ASAHAN RIVER BASIN DEVELOPMENT
Japan International Cooperation Agency

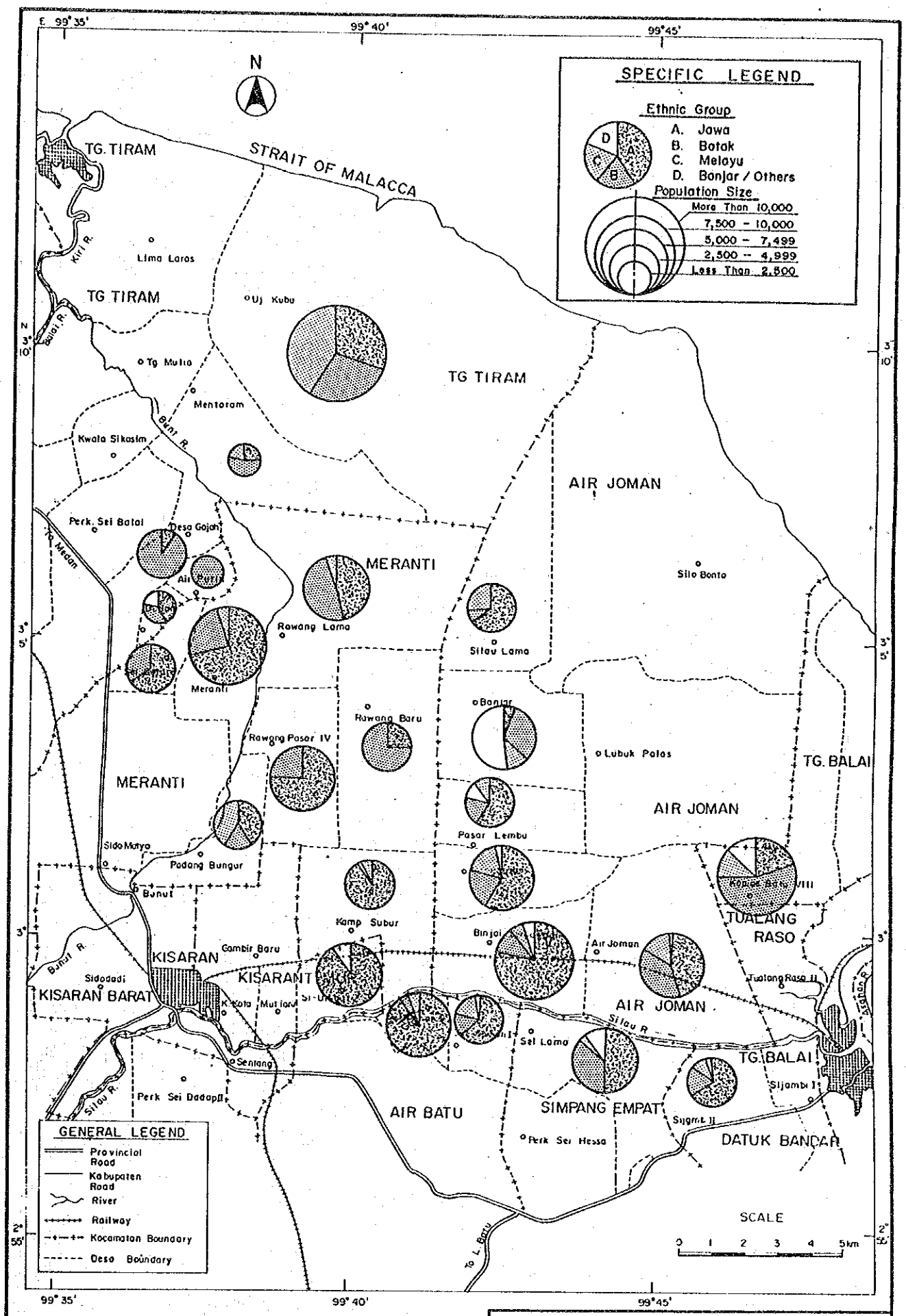


Fig. D - 2 POPULATION OF ETHNIC GROUP BY DESA IN THE PROJECT AREA

Republic of Indonesia
MASTER PLAN STUDY ON
LOWER ASAHAN RIVER BASIN DEVELOPMENT
Japan International Cooperation Agency

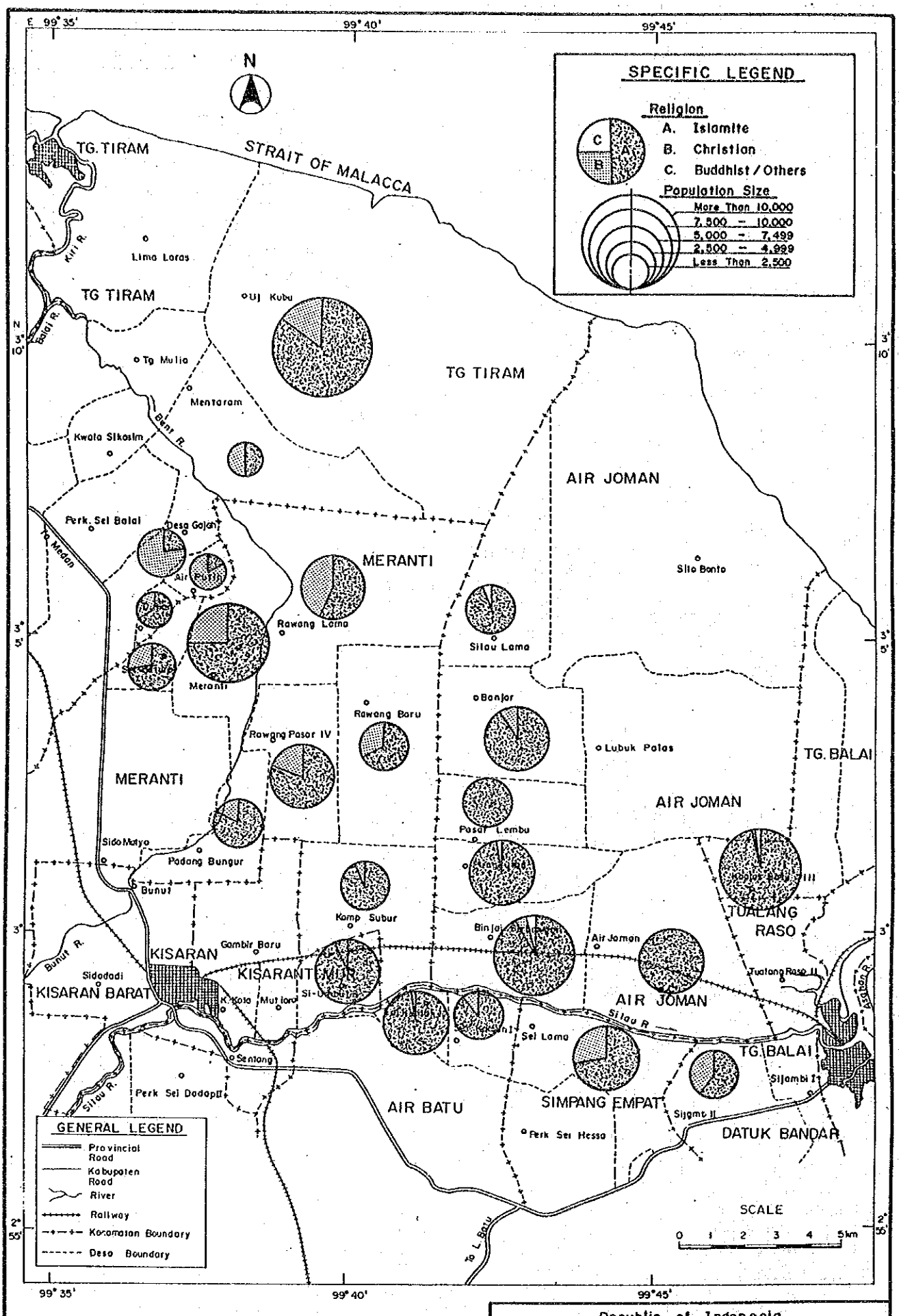


Fig. D - 3 POPULATION DISTRIBUTION CLASSIFIED BY RELIGION BY DESA IN THE PROJECT AREA

Republic of Indonesia
MASTER PLAN STUDY ON
LOWER ASAHAN RIVER BASIN DEVELOPMENT
Japan International Cooperation Agency

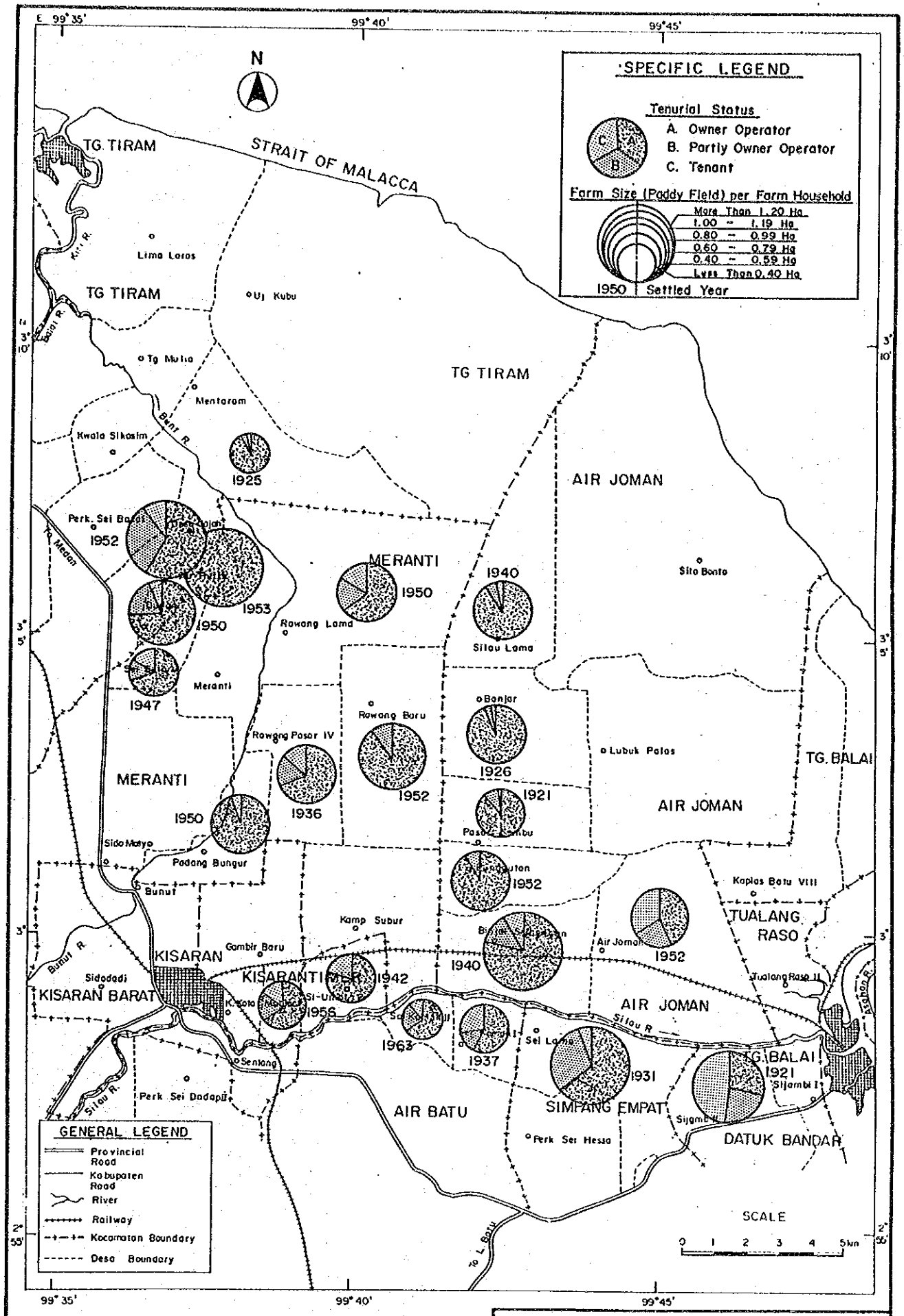


Fig. D - 4 AVERAGE FARM SIZE OF PADDY FIELD AND TENURIAL STATUS FOR MAJOR DESAS IN THE PROJECT AREA

Republic of Indonesia
MASTER PLAN STUDY ON
LOWER ASAHAN RIVER BASIN DEVELOPMENT
Japan International Cooperation Agency

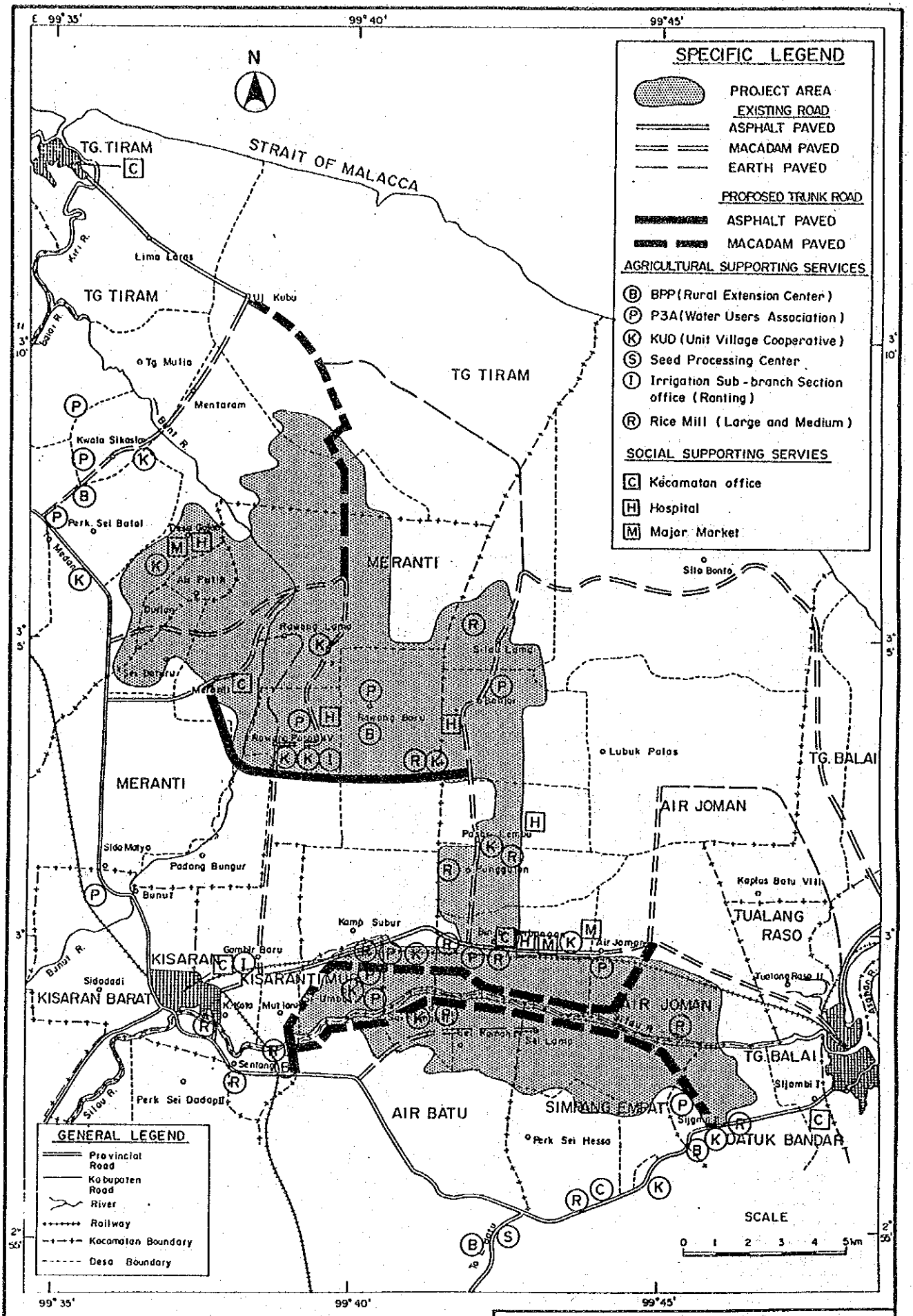


Fig. D - 5 GENERAL MAP ON AGRICULTURAL AND SOCIAL SUPPORTING SERVICES

Republic of Indonesia
MASTER PLAN STUDY ON
LOWER ASAHAN RIVER BASIN DEVELOPMENT
Japan International Cooperation Agency

Table D-4 MONTHLY PLANTED AREA OF PADDY BY DESA CONCERNED/1984-1988

(Unit: Ha/%)

Irrigation Area	Year		Monthly Planted Area											Total
			Dry Season						Wet Season					
			Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	
Bunut Irrigation Area	1984	Ha	0	0	383	397	2135	0	0	0	3631	3602	740	10888
		%	0.0	0.0	3.5	3.6	19.6	0.0	0.0	0.0	33.3	33.1	6.8	100.0
	1985	Ha	0	0	165	505	1357	0	0	0	4661	4597	199	11484
		%	0.0	0.0	1.4	4.4	11.8	0.0	0.0	0.0	40.6	40.0	1.7	100.0
	1986	Ha	0	0	170	548	2303	0	0	113	5111	4156	230	12631
		%	0.0	0.0	1.3	4.3	18.2	0.0	0.0	0.9	40.5	32.9	1.8	100.0
	1987	Ha	0	0	185	385	2157	0	0	15	3386	5338	617	12083
		%	0.0	0.0	1.5	3.2	17.9	0.0	0.0	0.1	28.0	44.2	5.1	100.0
	1988	Ha	0	0	969	1768	350	0	0	15	6091	3234	714	13141
		%	0.0	0.0	7.4	13.5	2.7	0.0	0.0	0.1	46.4	24.6	5.4	100.0
	Avg.	Ha	0	0	374	721	1660	0	0	29	4576	4185	500	12045
		%	0.0	0.0	3.1	6.0	13.8	0.0	0.0	0.2	38.0	34.7	4.2	100.0
Silau Irrigation Area	1984	Ha	100	275	1059	557	50	0	0	1011	1931	1850	1130	7963
		%	1.3	3.5	13.3	7.0	0.6	0.0	0.0	12.7	24.2	23.2	14.2	100.0
	1985	Ha	0	145	770	771	150	0	0	1134	1718	1726	125	6539
		%	0.0	2.2	11.8	11.8	2.3	0.0	0.0	17.3	26.3	26.4	1.9	100.0
	1986	Ha	0	0	875	424	50	0	0	1063	2208	1531	500	6651
		%	0.0	0.0	13.2	6.4	0.8	0.0	0.0	16.0	33.2	23.0	7.5	100.0
	1987	Ha	0	85	462	572	498	0	0	638	1500	1928	310	5993
		%	0.0	1.4	7.7	9.5	8.3	0.0	0.0	10.6	25.0	32.2	5.2	100.0
	1988	Ha	0	150	420	563	378	685	0	562	1764	2055	0	6577
		%	0.0	2.3	6.4	8.6	5.7	10.4	0.0	8.5	26.8	31.2	0.0	100.0
	Avg.	Ha	20	131	717	577	225	137	0	882	1824	1818	413	6745
		%	0.3	1.9	10.6	8.6	3.3	2.0	0.0	13.1	27.0	27.0	6.1	100.0
Total Project Area	1984	Ha	100	275	1442	954	2185	0	0	1011	5562	5452	1870	18851
		%	0.5	1.5	7.6	5.1	11.6	0.0	0.0	5.4	29.5	28.9	9.9	100.0
	1985	Ha	0	145	935	1276	1507	0	0	1134	6379	6323	324	18023
		%	0.0	0.8	5.2	7.1	8.4	0.0	0.0	6.3	35.4	35.1	1.8	100.0
	1986	Ha	0	0	1045	972	2353	0	0	1176	7319	5687	730	19282
		%	0.0	0.0	5.4	5.0	12.2	0.0	0.0	6.1	38.0	29.5	3.8	100.0
	1987	Ha	0	85	647	957	2655	0	0	653	4886	7266	927	18076
		%	0.0	0.5	3.6	5.3	14.7	0.0	0.0	3.6	27.0	40.2	5.1	100.0
	1988	Ha	0	150	1389	2331	728	685	0	577	7855	5289	714	19718
		%	0.0	0.8	7.0	11.8	3.7	3.5	0.0	2.9	39.8	26.8	3.6	100.0
	Avg.	Ha	20	131	1092	1298	1886	137	0	910	6400	6003	913	18790
		%	0.1	0.7	5.8	6.9	10.0	0.7	0.0	4.8	34.1	31.9	4.9	100.0

Source: BPP

Table D-5 CROPPING INTENSITY OF PADDY BY CROPPING SEASON AND BY IRRIGATION AREA/1984-88

(Unit: ha)

Irrigation Area/Year	Cultivable Area (1)	Dry Season Planted Area (2)	Dry Season Harvested Area (3)	Dry Season Cropping % (2)/(1)	Dry Season Intensity % (3)/(1)	Wet Season Planted Area (4)	Wet Season Harvested Area (5)	Wet Season Cropping % (4)/(1)	Wet Season Intensity % (5)/(1)	Annual Planted Area (6)	Annual Harvested Area (7)	Annual Cropping % (6)/(1)	Annual Intensity % (7)/(1)
Bunut Irrigation Area													
1984	10,252	2,911	2,896	28	28	7,973	6,350	78		10,884	9,246	106	
1985	10,252	2,027	1,941	20	19	9,457	9,005	92	88	11,484	10,946	112	107
1986	10,332	3,021		29		9,610		93		12,631		122	
1987	10,332	2,727		26		9,356		91		12,083		117	
1988	10,332	3,087	3,087	30	30	10,082	9,531	98	92	13,169	12,618	127	122
Avg.	10,300	2,755	2,641	27	26	9,296	8,295	90	90	12,050	10,937	117	114
Silau Irrigation Area													
1984	5,729	2,091	1,633	36	29	5,729		100		7,820		136	
1985	5,729	1,836	1,752	32	31	5,108	4,975	89	87	6,944	6,727	121	117
1986	5,729	1,349		24		5,602	4,630	98	81	6,951		121	
1987	5,679	1,617		28		4,726		83		6,343		112	
1988	5,679	1,828	1,757	32	31	5,261	4,933	93	87	7,089	6,690	125	118
Avg.	5,709	1,744	1,714	31	30	5,285	4,846	93	85	7,029	6,709	123	118
Total Project Area													
1984	15,981	5,002	4,529	31	28	13,702		86		18,704		117	
1985	15,981	3,863	3,693	24	23	14,565	13,980	91	87	18,428	17,673	115	111
1986	16,061	4,370		27		15,212		95		19,582		122	
1987	16,011	4,344		27		14,082		88		18,426		115	
1988	16,011	4,915	4,844	31	30	15,343	14,464	96	90	20,258	19,308	127	121
Avg.	16,009	4,499	4,355	28	27	14,581	14,222	91	89	19,080	18,491	119	116

Source: BPP

Table D-6 RESULT OF RICE YIELD SURVEY

Name of Kecamatan	Name of Desa	Irrigated Condition	Rice Variety	Number of hills per ha (1,000)	Number of panicle per hill	Number of panicle per ha (1,000)	Number of Spikelet per panicle	Percent of ripened grain (%)	Weight of 1000 grains (gr)	Yield * (t/ha)
1. T. Tiram	Desa Durian	Rainfed	IR-36	250.9	9	226	82	73.5	23.59	3.21
2. T. Tiram	Air Putih	Rainfed	IR-36	226.5	14	317	82	70.5	25.25	4.92
3. T. Tiram	Air Putih	Rainfed	IR-36	210.8	8	169	79	56.6	23.48	1.77
4. Meranti	Meranti	Irr.	IR-64	226.5	15	340	61	63.1	21.73	2.84
5. Meranti	Rawang Lama	Irr.	IR-46	233.4	14	327	44	55.5	26.77	2.14
6. Meranti	Rawang Lama	Irr.	IR-64	233.4	10	233	63	81.4	28.05	3.35
7. Meranti	Rawang Pasar IV	Irr.	IR-64	276.6	17	470	48	67.9	28.52	4.37
8. Meranti	Rawang IV	Irr.	IR-64	371.1	13	482	59	73.2	29.12	6.06
9. S. Empat	Sei Lama	Irr.	IR-64	285.7	11	314	63	77.1	25.22	3.85
10. S. Empat	Sei Lama	Rainfed	IR-64	294.5	16	471	72	56.9	21.92	4.22
11. Air Batu	Sei Kamah	Irr.	IR-46	303.6	11	334	67	59.2	28.53	3.78
12. K. Timur	Si Umbut umbut	Rainfed	IR-64	303.6	13	395	66	50.8	26.47	3.51
13. Meranti	Meranti	Irr.	Super	267.8	11	295	77	74.8	22.09	3.75
14. Meranti	Serdang II	Irr.	IR-64	371.1	13	482	48	60.5	28.58	4.00
15. T. Tiram	Desa Gadjah	Irr.	PN-55	331.2	16	530	67	75.7	22.59	6.07
16. T. Tiram	Desa Gadjah	Rainfed	Bah Bolon	276.1	10	276	45	45.6	21.23	1.20
17. T. Tiram	Sei Balai	Irr.	PN-55	375.0	10	375	71	70.7	23.07	4.34
Average				284.6	12.4	355.1	64.4	65.5	25.1	

* Dry paddy (moisture content : 14%).

Table D-7 BASIC TECHNICAL INFORMATION FROM FARM ECONOMIC SURVEY

	Farmers in Irrigated paddy field		Farmers growing high yielding rice variety in Rainfed paddy field		Farmers growing local rice variety in Rainfed paddy field	
	Wet Season	Dry Season	Wet Season	Dry Season	Wet Season	Dry Season
1. Unit yield						
Paddy kering panen (t/ha)	4.32	4.06	2.82	-	1.33	-
Dry paddy (t/ha)*	3.67	3.45	2.40	-	1.13	-
2. Farm input (Average)**						
Seed (Kg/ha)	55	55	68	-	44	-
Urea (Kg/ha)	150	159	148	-	17	-
TSP (Kg/ha)	114	120	94	-	38	-
ZA (Kg/ha)	13	14	16	-	0.6	-
KCl (Kg/ha)	40	37	6	-	2	-
Agri. chemicals (l/ha)	2.35	2.46	2.38	-	1.57	-
3. Farm input (Average)***						
Seed (Kg/ha)	55	55	68	-	44	-
Urea (Kg/ha)	150	159	155	-	51	-
TSP (Kg/ha)	117	122	106	-	8	-
ZA (Kg/ha)	76	88	35	-	19	-
KCl (Kg/ha)	71	65	45	-	22	-
Agri. chemicals (l/ha)	2.43	2.51	2.50	-	2.25	-
4. Percentage of farmers who use farm inputs (%)						
Urea (Kg/ha)	100	100	95	-	33	-
TSP (Kg/ha)	97	99	89	-	20	-
ZA (Kg/ha)	17	16	44	-	3	-
KCl (Kg/ha)	56	57	13	-	10	-
Agri. chemicals (l/ha)	97	98	95	-	70	-
5. Applied method of land preparation (%)						
- Animal power	31.5	32.9	43.5	-	3.3	-
- Man power	40.2	40.7	29.0	-	93.4	-
- Mechanical power	13.0	13.2	1.6	-	0.0	-
- Animal/man power	7.6	6.6	9.7	-	3.3	-
- Mechanical/man power	5.4	5.5	16.2	-	0.0	-
- Mechanical/animal power	2.3	1.1	0.0	-	0.0	-
6. Applied method of transplanting (%)						
- Farmer themselves	21.7	21.1	37.3	-	27.6	-
- Gotong royong	21.7	23.3	16.9	-	10.4	-
- Daily contract	13.0	12.2	10.2	-	13.8	-
- Borong	41.3	42.2	33.9	-	17.2	-
- Others (combination of above)	2.3	1.2	1.7	-	31.0	-
7. Applied method of Harvest (%)						
- Farmer themselves	15.2	15.1	33.3	-	37.9	-
- Gotong royong	2.2	3.2	1.6	-	3.4	-
- Daily contract	0.0	0.0	4.8	-	3.4	-
- Borong system	81.5	80.6	57.1	-	51.8	-
- Others (combination of above)	1.1	1.1	3.2	-	3.5	-

* Conversion rate from paddy kering panen to dry paddy = 1 : 0.85.
** Total amount of farm inputs/total sampled farmers.
*** Total amount of farm inputs/total farmers who used farm inputs.

Table D-8 FARMING PRACTICES PREVAILING IN THE PROJECT AREA

Practices	Paddy Field HYV Grown	Paddy Field Local Variety Grown
Land preparation	combined use of draft animal & manual labor common, partly mechanical & solely manual operation	manual operation prevailing, soil cultivation seldom practiced
Seed variety	HYV (IR 46, IR 64 etc.)	Pagi Sore (Ramos)
Nursery & transplanting	water & upland nursery, nursery period:20 days in general, sometimes aged seedling planted, semi-regular planting common, contract system for planting partly practiced	water & upland nursery, kernap system prevailing, 1st planting:30 days after sowing 2nd planting:60 days after sowing random planting prevailing
Fertilization	fairly intensive application, INSUS package A/B level	fertilization limited compared with area HYV grown 50 kg of urea/ha in average
Management after transplanting	manual weeding & insecticide spray practiced , herbicide application partly practiced	manual weeding & insecticide spray practiced
Harvesting & processing	by sickle, threshing by engine or pedal, partly by manual, marketing of harvested paddy without drying common	ani-ani harvest & manual threshing commonly practiced, marketing of harvested paddy without drying in general

Table D-9 ANNUAL INPUT OF FERTILIZER AND AGRO-CHEMICALS IN THE PROJECT AREA

	Irrigated Paddy I	Irrigated Paddy II		Rainfed Paddy/HYV	Rainfed Paddy/Local	Coconut	Project Area Total(%)	
		wet	dry					
Cropped Area	3,120	1,390	490	3,680	3,530	750	12,960	
Application/Ha								
Fertilizer (kg)								
Urea	155	155	101	148	17	57		
TSP	117	117	71	94	38	18		
KCl	39	39	16	6	2	5		
Anmm. Sulphate	14	14	20	16	1	-		
Total	325	325	208	264	58	80		
Agro-chemicals (l)	2.4	2.4	2.1	2.4	1.6	-		
Application/Year 1/								
Fertilizer (tons)								
Urea	484	215	49	545	60	43	1,396	(50)
TSP	365	163	35	346	130	14	1,057	(38)
KCl	122	54	8	22	7	4	217	(8)
Anmm. Sulphate	44	19	10	59	4	-	136	(5)
Total	1,014	452	102	972	205	61	2,806	(100)
Agro-chemicals (l)	7,488	3,336	1,029	8,832	5,648	-	26,333	

1/: Calculated based on average apllication rate per ha.

Table D-10 LABOR, DRAFT ANIMAL AND MACHINERY REQUIREMENT AT PRESENT PER HA AND IN THE PROJECT AREA

Land Use Category	Irrigated Paddy I	Irrigated Paddy II		Rainfed Paddy/HYV	Rainfed Paddy/Local	Coconut	Total
Per Ha							
Cropping Season	wet/dry	wet	dry	wet	wet		
Labor Requirement (man days)							
1. Nursey	5	5	5	5	5		
2. Land Preparation	35	35	30	30	40		
3. Transplanting	25	25	25	25	32		
4. Weeding	25	25	25	25	25		
5. Field Maintenance 1/	10	10	7	7	5		
6. Harvesting/Processing	40	40	35	35	30		
Total	140	140	127	127	137	50	
Draft Animal Requirement 2/ (animal days)	5	5	5	5	-	-	
Thresher Requirement (mechanical days)	3	3	3	3	-	-	
In The Project Area							
Cropped Area 3/	3,120	1,390	490	3,680	3,530	750	12,960
Labor Requirement/Ha (man days)	140	140	127	127	137	50	-
Total Labor Requirement (1000 man days)	436.8	194.6	62.2	467.4	483.6	37.5	1,682.1

1/: Include fertilizer/chemical application & irrigation
2/: A pair of animaldays, converted into 8 hrs work/day
3/: Assuming net cultivable area is 95% of gross area.

Table D-11 NUMBER OF FARM MACHINERY, FACILITIES, DRAFT ANIMALS AND AVAILABLE LABOR FORCES IN DESA CONCERNED AND IN THE PROJECT AREA

Kecamatan	Desa	Farm Machinery/Equipment/Facilities in Desas Concerned (unit)							Animals (head) in Desas Concerned		Estimated No. of Animals in The Project Area (head) 1/				No. of Farm Household & Labor Forces Estimated in The Project Area (persons) 1/			
		Hand Tractor	Tractor	Pedal Thresher	Thresher	Rice Mill	Ware-house	Rice Storage	Cattle	Water Buffalo	Proportion (%) 2/	Cattle	Water Buffalo	Total	In Desas Concerned 3/	Proportion (%) 2/	Farm Household	Farm Labor Forces
Bunut Irrigation Area																		
Air Joman	Banjar	0	0	6	5	4	0	0	86	106	80	69	85	154	749	75	562	1,405
	Silau Lama	0	0	2	5	3	0	0	33	15	50	17	8	24	293	60	176	440
Meranti	Rawang Baru	0	0	6	0	3	0	0	3	88	100	3	88	91	287	80	230	575
	Rawang Pasar IV	2	3	30	10	2	3	0	149	40	100	149	40	189	605	70	424	1,060
	Meranti	2	0	25	0	8	2	0	47	45	100	47	45	92	1,003	100	1,003	2,508
	Rawang Lama	4	2	10	3	8	3	4	0	85	100	0	85	85	847	90	762	1,905
	Sei Beluru	0	0	6	0	2	0	0	80	54	30	24	16	40	347	90	312	780
	Pd. Bungur	0	0	3	0	1	0	0	18	6	30	5	2	7	320	10	32	80
Tj. Tiram	Sei Mentaram	0	0	0	0	2	0	0	0	15	50	0	8	8	153	50	77	193
	Desa Gajah	2	0	9	0	6	1	0	21	89	100	21	89	110	637	100	637	1,593
	Durian	0	0	4	1	1	0	0	0	30	80	0	24	24	209	80	167	418
	Air Putih	0	0	8	0	3	0	0	0	20	100	0	20	20	151	100	151	378
	Ujung Kubu	0	0	0	0	11	2	1	0	0	5	0	0	0	1,471	10	147	368
Sub Total		10	5	109	24	54	11	5	437	593	-	335	509	844	7,072		4,680	11,700
Silau Irrigation Area																		
Kisaran Timur	Mutiara	0	0	0	7	1	0	0	0	12	20	0	2	2	673	20	135	338
	Siumbut-Umbut	0	0	8	50	3	0	1	10	95	100	10	95	105	506	90	455	1,138
Air Joman	Pasar Lembu	0	0	1	3	0	1	0	26	27	60	16	16	32	268	60	161	403
	Air Joman	0	0	0	5	2	1	0	5	6	80	4	5	9	619	70	433	1,083
	Binjai Serbangan	0	0	0	145	4	0	0	15	50	90	14	45	59	934	90	841	2,103
	Punggulan	0	0	0	10	3	0	0	40	160	80	32	128	160	654	70	458	1,145
Air Batu	Sei Kamah I	0	0	0	15	3	0	0	18	32	100	18	32	50	365	100	365	913
	Sei Kamah II	0	0	24	30	3	1	0	150	170	100	150	170	320	655	100	655	1,638
Simpang Empat	Sei Lama	1	1	3	7	5	1	0	4	42	90	4	38	41	566	90	509	1,273
Tj. Balai	Kapias Batu VIII	0	0	0	0	2	-	0	3	0	50	2	0	2	992	50	496	1,240
Datuk Bandar	Sijambi II	0	0	0	2	3	-	0	0	4	80	0	3	3	463	80	370	925
Meranti	Subur	0	0	12	6	1	0	0	37	65	60	22	39	61	307	70	215	538
Sub Total		1	1	48	280	30	4	1	308	663	-	270	573	844	7,002		5,093	12,733
Total		11	6	157	304	84	15	6	745	1,256	-	605	1,082	1,687	14,074		9,773	24,433

Suyrce: Kantor Desa

1/: Estimated No. of draft animals: No. of animals in desas concerned x proportion of animals in the project area
2/: Estimated proportion of draft animals holded or farm household in the project area to the totals in desas concerned
3/: Farm household estimated to be total household x 60%

Table D-12 LABOR BALANCE STUDY ON DRAFT ANNUAL AT PRESENT 1/

	8 Working Hrs. per Day 2/	5 Working Hrs. per Day 2/
Cropped area/season 3/	4,600	4,600
Draft animal requirement per ha (pair of animal days) 4/	5	8
Toatl requirement/season (pair of animal days)	23,000	36,800
No. of working draft animal in project area (head) 5/	1,265	1,265
Animal working days/season 6/	40	40
Available draft animal forces per season (pair of ani. days)	25,300	25,300
Labor balance (pair of ani.days)	2,300	-11,500

1/: Draft animal requirement for the presently prevailing land preparation methods in which combined use of draft animal & manual labor is done.
2/: 8 or 5 hrs. work per day is assumed for the estimation of requirement per ha.
3/: Assumed about 70% of paddy field where HYV is grown (6,630ha) are prepared by draft animal.
4/: Estimated requirement for presently prevailing land preparation practices of combination use of draft animal & manpower
5/: Ref. to Table D-11.
Total population 1,687 x ratio of working animal 75% = 1,265
6/: Assumed working period of 2 months/season and 20 days work/month

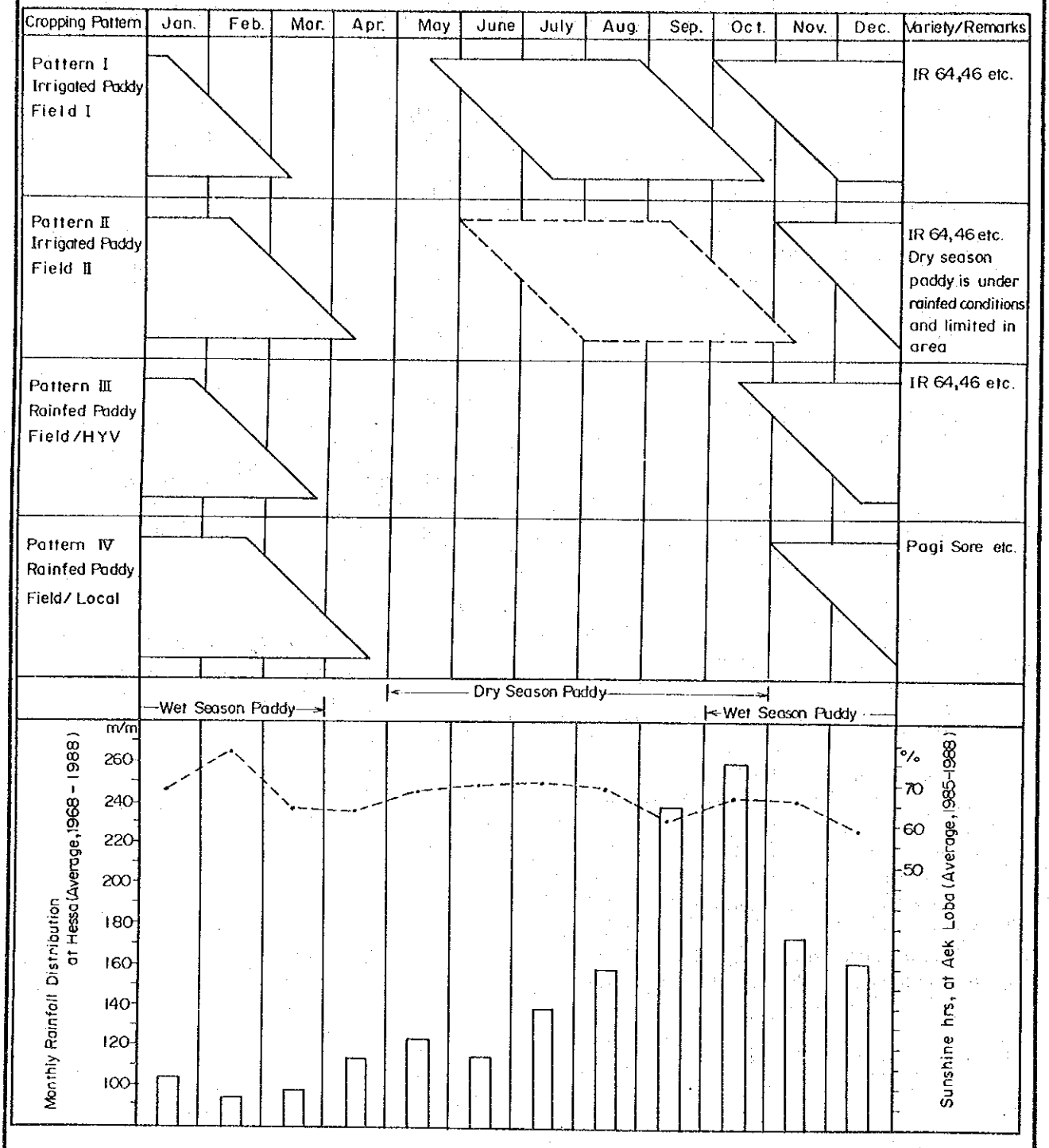


Fig. D - 6 CURRENTLY PREVAILING CROPPING PATTERN

Republic of Indonesia
MASTER PLAN STUDY ON
LOWER ASAHAN RIVER BASIN DEVELOPMENT
Japan International Cooperation Agency

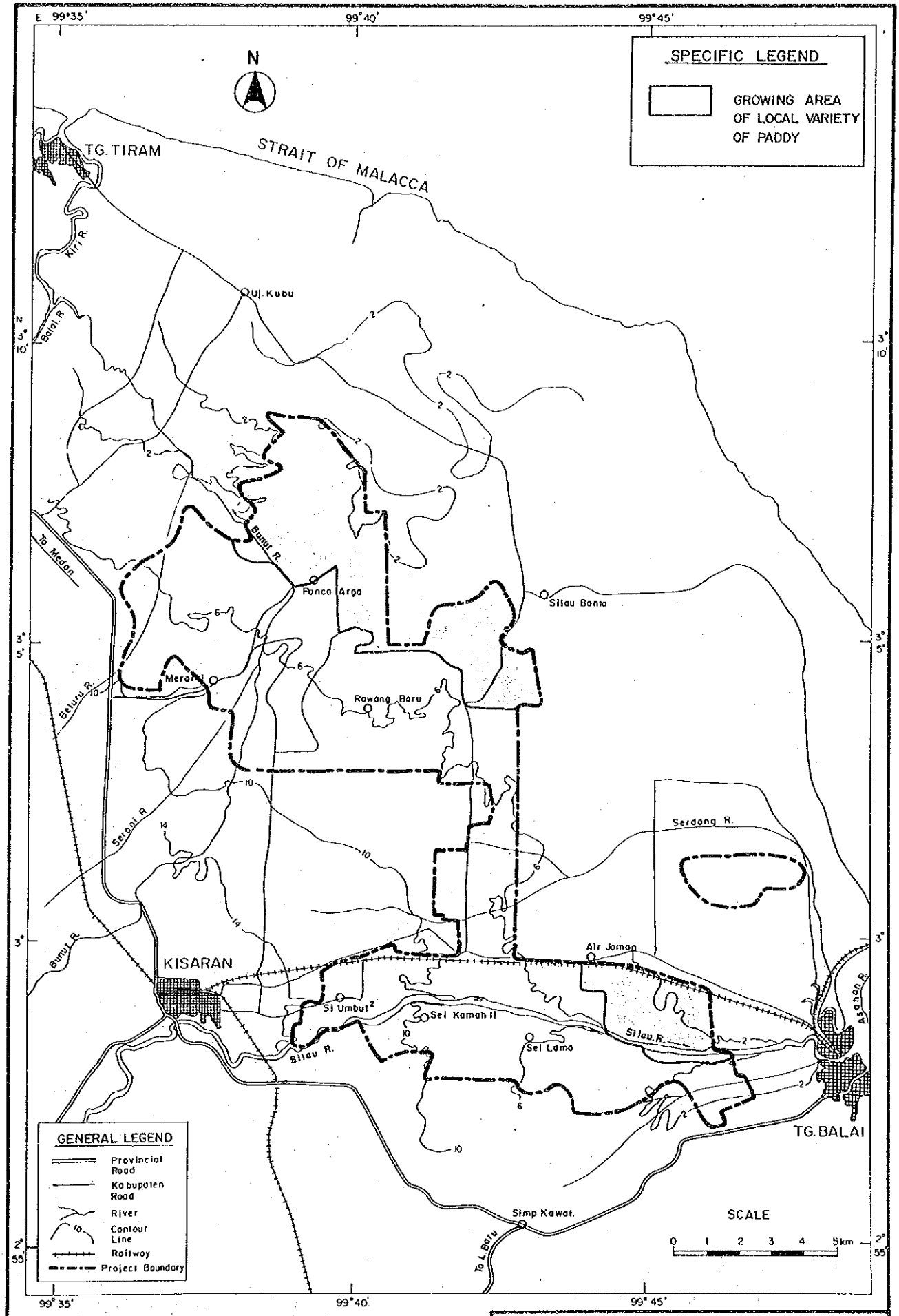


Fig. D-7 GROWING AREA OF LOCAL VARIETY OF PADDY IN THE PROJECT AREA

Republic of Indonesia
MASTER PLAN STUDY ON
LOWER ASAHAN RIVER BASIN DEVELOPMENT
Japan International Cooperation Agency

Table D-13 BASIC ECONOMIC INFORMATION FROM FARM ECONOMIC SURVEY

	Farmers in Irrigated paddy Land				Farmers growing by high yielding rice variety in Rainfed paddy land				Farmers growing by high local rice variety in Rainfed paddy land			
	Wet Season	Dry Season	Total	%	Wet Season	Dry Season	Total	%	Wet Season	Dry Season	Total	%
1. No. of sample size	93	93			63				30			
2. Family size			5.90				6.00				6.6	
3. Average cultivated farm size (paddy field) (ha)			1.10				0.79				1.85	
4. Cropping intensity (%)	95	90	185		94		-		95	0	95	
5. Average farm input (kg/farmer)												
(i) Seed	53	46			47				73	-		
(ii) Urea	148	144			96				26	-		
(iii) TSP	108	101			63				13	-		
(iv) ZA	10	10			8				3	-		
(v) KCl	33	30			5				6	-		
(vi) Agro. chemical	1.94	1.91			1.66				1.95	-		
6. Average total production cost of paddy/farmer (Rp.)	392,862	267,668			168,164				231,219	-		
(i) Seed	4,183	5,784			4,134				3,650	-		
(ii) Fertilizer	52,216	51,205			30,132				8,778	-		
(iii) Agro. chemical (Rp)	19,808	20,122			15,541				13,567	-		
(iv) Land preparation	45,721	38,843			41,040				63,582	-		
(v) Transplanting	35,565	26,590			20,731				49,102	-		
(vi) Harvesting	231,471	121,154			56,589				92,540	-		
(vii) Water charge	3,896	3,970			0				0	-		
7. Average production of paddy per farmer (ton)(gabah kering panen)	4.2	3.51			1.96				2.20	-		
8. Average gross income from paddy production/farmer (Rp)	1,018,851	890,368	1,909,219		445,109		445,109		621,231	-	621,231	
9. Average primary profit (Rp)	625,989	622,700	1,248,869		276,945		276,945		389,994	-	389,994	
10. Average annual total other income from (Rp)			448,592	100			286,856	100			665,030	100
(i) Livestock product			40,656	9			32,587	11			49,867	9
(ii) Other crops (coconut, vegetables)			109,495	24			22,143	8			68,387	10
(iii) Money borrowed from relatives			4,387	2			1,825	1			101,333	15
(iv) Money borrowed from KUD			47,427	11			4,587	2			0	0
(v) Money borrowed from others			44,677	10			1,587	1			43,333	7
(vi) Remittance			10,108	2			26,746	9			4,000	1
(vii) Labor cost from working in paddy field			39,129	9			51,587	18			88,000	13
(viii) Labor cost from working in estate			11,161	2			2,857	1			0	0
(ix) Fisheries			22,580	5			0	0			33,333	5
(x) Others			118,972	27			142,937	50			276,777	41
11. Average total annual income (Rp)			1,697,281				563,801				1,055,024	
12. Sharing rate under Borong system (%)												
20%	38.2	33.4			25.0				75.0			
19%	5.3	0.0			2.8				0.0			
18%	2.6	2.8			0.0				0.0	-		
17%	1.3	1.3			2.8				6.3	-		
16%	0.0	1.3			0.0				12.5	-		
15%	25.0	29.3			11.1				0.0	-		
14%	1.3	1.3			0.0				0.0	-		
13%	25.0	25.3			44.4				6.3	-		
12%	0.0	5.3			11.1				0.0	-		
11%	1.3	0.0			2.8				0.0	-		
13. % of farmers who keep seeds from their harvest (%)	81.7	77.8			90.5				96.7	-		
14. % of farmers who selled rice production fully or partly (%)	79.6	76.9			63.5				75.9	-		
15. Destination of paddy selled (%)												
- Local market	4.1	2.9			31.0				4.3			
- KUD	1.4	4.3			0.0				4.3			
- Rice millers	28.8	29.0			11.9				4.3			
- Agent	65.7	63.8			57.1				87.0			
16. Farmers who bought rice from local market (%)	33	33			53				76			
17. Number of month the farmers bought rice (%)												
- Less than 3 months			72				66				30	
- 3.1 - 6 months			24				28				35	
- 6.1 - 9 months			0				3				20	
- above 9.1			4				3				15	

Table D-14 RESULTS OF COCONUT FARMER'S INTENTION SURVEY ON CHANGE OF PRESENT COCONUT FIELD TO PADDY FIELD

Desa	Punggulan	Pasar Lembu	B. Serbangan	S. Kanah1	S. Kanah2	S. Lama	Subur	L. Palas	Banjar	Silo Honto	Silau Lama
Kecamatan	Air Joman	Air Joman	Air Joman	Air Batu	Air Batu	S. Empat	Meranti		Air Joman	Air Joman	Air Joman
Irrigation Area *	S	S	S	S	S	S	S	B	B	B	B
1. Sample size	135	63	123	62	51	63	30	43	36	97	10
2. Farmer's intention on change of coconut field to paddy field (%)											
(a) Yes	70.2	66.7	46.3	83.9	64.7	60.3	100.0	41.9	30.6	55.7	60.0
(b) No	26.1	9.5	30.9	0.0	5.9	27.0	0.0	44.2	50.0	35.1	20.0
(c) Pending answer	3.7	23.8	22.8	16.1	29.4	12.7	0.0	13.9	19.4	9.2	20.0
3. Kepala Desa's intention on change of coconut field to paddy field	Yes	Yes	Yes	Yes	Yes	Yes	Yes	-	No	Pending answer	Yes
4. Tenurial status (%)											
(a) Land owner	93	91	98	100	98	83	100	81	89	82	90
(b) Tenant	0	2	0	0	0	6	0	0	0	0	0
(c) Partly land owner	7	7	2	0	2	11	0	19	11	18	10
5. Cultivated land by farmer											
(a) Coconut field (ha)											
Average	0.67	0.81	0.68	0.55	0.34	0.50	0.42	1.56	0.82	1.96	0.38
Minimum	0.08	0.08	0.08	0.08	0.04	0.06	0.04	0.20	0.12	0.06	0.12
Maximum	4.36	3.00	2.50	2.80	0.80	2.00	1.00	7.00	2.00	11	0.88
(b) Paddy field (ha)											
% of farmers who cultivate paddy	73	60	60	77	96	90	63	21	39	26	40
Average (ha)	0.65	0.45	0.71	0.57	0.63	0.53	0.49	0.66	0.51	1.2	0.38
(c) Other land											
% of farmers who cultivate paddy	17	29	2	0	0	0	0	0	0	4	0
Average (ha)	0.20	0.44	0.27	0	0	0	0	0	0	0.5	0
6. Year when coconut was planted											
(a) Average	1960	1954	1953	1960	1944	1959	1957	1968	1962	1972	1960
(b) Earliest	1940	1926	1917	1949	1945	1920	1945	1945	1938	1950	1958
(c) Latest	1988	1983	1980	1979	1984	1987	1980	1968	1983	1989	1979
7. Whether coconut farmers have experience in rice cultivation											
(a) Yes	82	76	79	100	96	95	93	58	69	33	80
(b) No	18	24	21	0	4	5	7	42	31	67	20

* S : Silau irrigation area B : Bunut irrigation area

Table D-15 NUMBER OF EXTENSION STAFFS IN NORTH SUMATRA PROVINCE (1988/89)

	PPS	PPL
Province Total	73	1,743
Asahan Kabupaten	3	159

The Project Area	Leader	PPUP	PPL	PPH
BPP Sungai Balai	1	4	12	2
BPP Rawang Baru	1	4	6	1
BPP Sentang	1	4	8	1
BPP Sipaku	1	3	11	2
BPP Sijambi	1	3	10	2
T o t a l	5	18	47	8

Table D-16 GENERAL CONDITION OF RURAL EXTENSION CENTERS COVERING THE PROJECT AREA (1988)

Items	B P P					
	Sungai Balai	Rawang Baru	Sentang	Sipaku	Sijambi	Total
Kecamatan	2	1	3	2	2	10
Village	29	12	15	25	28	109
Population	117,680	55,930	95,570	80,530	58,670	408,380
Total Household	22,570	16,990	18,620	16,420	11,650	86,250
Farm Household	12,120	6,080	7,510	9,990	7,480	43,180
Rate of Farm Household (%)	53.70	35.79	40.33	60.84	64.21	50.06
Paddy Field (ha)						
1/2 T. Irrigation	1,768	2,252	700	650	300	5,670
Rural Irrigation	645	-	1,834	50	80	2,609
Rainfed	7,174	1,818	3,922	3,375	6,044	22,333
Total	9,587	4,070	6,456	4,075	6,424	30,612
Farmers Estate Crop Field	6,350	700	8,460	4,130	22,710	42,350
B P P Leader and P P U P	5	5	5	4	4	23
P P L	12	6	8	11	10	47
P H P	2	1	1	2	2	8
K U D	6	4	6	6	1	23
P 3 A	11	3	5	3	2	24
Farmer Group	176	95	123	176	130	700
Average paddy field by FG (ha)	55	43	53	23	49	44
Average number of farmer by FG	69	64	61	57	58	62
Large rice mill	2	-	2	6	-	10
Small rice mill	66	33	31	35	30	195
Mini tractor (land tractor)	6	5	-	10	19	40
Wheel tractor	9	2	-	-	-	11
Hand sprayer	755	810	634	1,974	347	4,520
Average unit yield (t/ha)						
Inmum	4.3	3.6	4.5	4.5	NA	4.2
Insus	6.2	6.4	6.8	5.9	NA	6.3

Table D-17 NUMBER OF KUD CLASSIFIED BY ANNUAL HANDLING AMOUNT IN 1988

	In the Bunut Area	In the Silau Area	Total
Per KUD			
No. record	3	2	5
Less than Rp. 10 Million	3	1	4
Rp. 10 Million - 100 Million	2	1	3
More than Rp. 100 Million	1	1	2
Per member			
No. record	3	2	5
Less than Rp. 10,000	-	1	1
Rp. 10,000 - 100,000	2	1	3
Rp. 100,000 - 1,000,000	3	1	4
More than Rp. 1,000,000	1	-	1

Table D-18 POTENTIAL AND ACTUAL HANDLING AMOUNT OF KUD IN THE PROJECT AREA IN 1988

(Unit : Rp. 1,000)

Name of KUD	Handling amount	Sales amount	Potantial handling amount on farm input	Rate	Rate
	(1)	(2)	(3)	(1)/(3)	(2)/(3)
Bunut Area					
1. Rezeki	14,224	7,299	44,175	32.2	16.5
2. Sumber Maju	8,371	-	11,028	75.9	-
3. Suka Maju	6,756	6,685			
4. Rawang Jaya	-	-			
5. Meranti	-	-	670,470	1.8	1.8
6. Pd. Soalagogo	5,265	5,211			
7. Sentosa	84,930	-	210,428	40.4	-
8. Mardos Nirohama	214,483	71,994	210,359	102.0	34.2
9. Harapan Maju	-	805	54,133	-	1.5
Sub - Total	334,029	91,994	1,200,593	27.8	7.7
Silau Area					
1. Sepadang	-	-	-	-	-
2. Panca Usaha	96	-	99,764	0.1	-
3. Sumber Jaya	284,826	276,539	165,291	172.3	167.3
4. Gotong Royong	15,849	15,574	102,941	15.4	15.1
5. Siumbut-umbut	-	141	78,995	-	0.2
Sub - Total	300,771	292,254	446,991	67.3	65.4
Grand Total	634,800	384,248	1,647,584	38.5	23.3

Table D-19 P3A IN BUNUT IRRIGATION AREA

	Name	Year	Irrigation System	Kec.	Village	1/2 T (ha)	Rural Irrig. (ha)	Total (ha)	Member	Non Member	Participation Rate (%)
1.	Banjar	1979	Banjar (PUK)	Air Joman	Banjar Cabang V	150	-	150	85	60	58.6
2.	Wilayah Serbangan Rawang Complex	1971	Sebangan (PUP)	Meranti	Rawang Baru	400	100	500	97	506	
					Rawang Pasar IV	380	117	497	301	424	
					Rawang Lama	500	125	625	85	567	
					Pondok Bungur	100	43	143	72	126	
					Sub-total	1,380	385	1,765	555	1,623	25.5
3.	Wilayah Sei Balai	1976	Sei Balai (PUP)	Tj. Tiram	Sei Balai	300	-	300	850	275	
					Kwala Sikasim	50	-	50	55	20	
					Tanjung Mulia	50	-	50	60	17	
					Sub-total	400	-	400	965	312	75.6
4.	Wilayah Sido Mulyo	1977	Sei Balai (PUP)	Tj. Tiram	Sei Balai	150	25	175	475	285	
					Kwala Sikasim	-	25	25	30	19	
					Tanjung Mulia	-	25	25	40	22	
					Sub-total	150	75	225	545	326	62.6
5.	Wilayah Sebajadi	1977	Desa Gajah (PUP)	Tj. Tiram	Sei Balai	100	-	100	130	60	
					Desa Gajah	-	175	175	136	238	
					Durian	-	50	50	30	25	
					Air Putih	-	125	125	174	68	
					Sub-total	100	350	450	470	391	54.6
6.	Wilayah Sukaramai	1977	Sukaramai (PUP)	Tj. Tiram	Sukaramai	175	25	200	250	40	
					Siajam	-	50	50	70	40	
					Perk. Sei Balai	-	50	50	68	15	
					Sukamakmur	-	88	88	68	57	
					Sub-total	175	213	388	456	152	75.0
7.	Wilayah Lolong Samsu	1977	Sukaramai (PUP)	Tj. Tiram	Sukaramai	150	-	150	120	110	
					Sei Balai	80	-	80	80	73	
					Sub-total	230	-	230	200	183	52.2
	Total 7 P3A	1971 - 79	5 PUP 1 PUK	3 Kec.	15 villages	2,585	1,023	3,608	3,276	3,047	51.8
	Average per P3A	-	-	0.43	2.1	369	146	515	468	435	

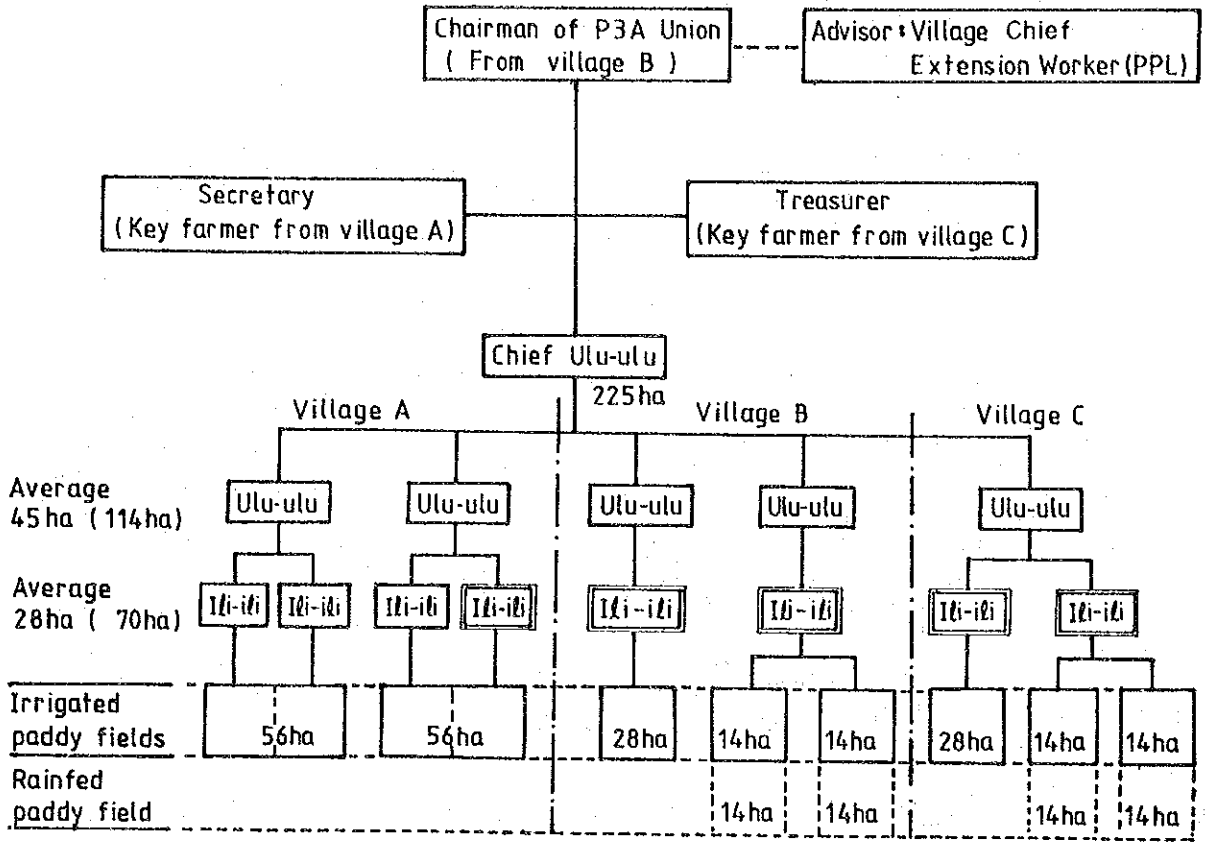
Note: 1/2 T = Semi Technical Irrigation Area.
Rural Irrig. = Simple irrigation area constructed by PU + Simple irrigation area constructed by non PU.

Table D-20 P3A IN SILAU IRRIGATION AREA

	Name	Year	Irrigation System	Kec.	Village	1/2 (ha)	Rural Irrig. (ha)	Total (ha)	Member	Non Member	Participation Rate (%)
1.	Wilayah Sijambi	1980	Sijambi (PUP) Simpang IV (PUK)	Tj. Balai	Sijambi Simpang Empat	100 50	42 50	142 100	176 42	54 82	
					Sub-total	150	92	242	218	136	61.6
2.	Wilayah Sei Kamal	1977-1979	Sei Silau (PUP)	Simpang IV Air Batu	Sei Lama Sei Kamah I Sei Kamah II	100 130 150	- 113 75	100 243 225	55 165 159	75 125 96	
					Sub-total	380	188	568	379	296	56.1
3.	Wilayah Binjai Serbangan	1979	Binjai Serbangan (PUK)	Air Joman	Binjai Serbangan LK XII Binjai Serbangan LK XIII	65 55	- -	65 55	170 164	32 20	
					Sub-total	120	-	120	334	52	86.5
4.	Air Joman	1979	Air Joman (PUK)	Air Joman	Air Joman	155	-	155	247	155	61.4
5.	Wilayah Gabungan	1976	Siumbut-umbut (PUK)	Kisaran Timur	Siumbut-umbut Subur	60 55	35 37	95 92	84 92	26 33	
					Sub-total	115	72	187	176	59	74.9
6.	Siumbut-umbut	1976	Siumbut-umbut (PUK)	Kisaran Timur	Siumbut-umbut	25	15	40	26	15	63.4
7.	Subur	1976	Siumbut-umbut (PUK)	Kisaran Timur	Subur	37	11	48	52	16	76.5
	Total 7 P3A	1976 - 80	2 PUP 4 PUK	5 Kec.	9 villages	982	378	1,360	1,432	729	66.3
	Average per P3A	-	-	0.71	1.3	140	54	194	205	104	

Source: Irrigation Section Branch Office in Asahan.

Note: 1/2 T = Semi Technical Irrigarion Area.
Rural Irrig. = Simple irrigation area constructed by PU + Simple irrigation constructed by non PU.



Ili-ili Farmer appointed to Ili-ili

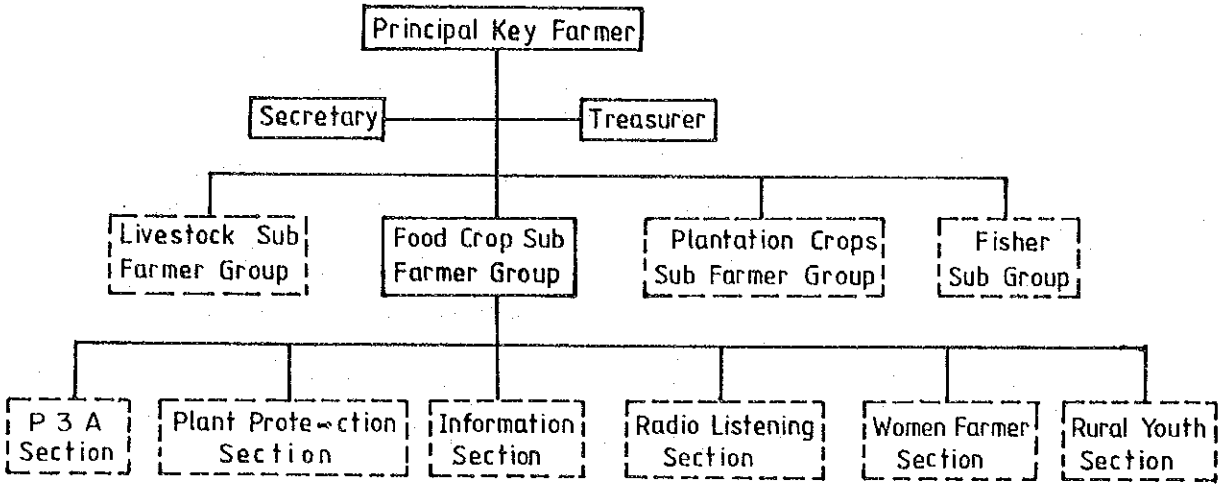
Ili-ili Key farmer (leader of farmer group) appointed to Ili-ili

Note : Consisting of 3 villages

- Initially planned irrigated area 568ha
- Presently defined irrigated area 225ha
- Number of present members 379
- Number of non members 296

Fig. D-8 ORGANIZATION OF TYPICAL WATER USER'S ASSOCIATION UNION

Republic of Indonesia
MASTER PLAN STUDY ON
LOWER ASAHAN RIVER BASIN DEVELOPMENT
Japan International Cooperation Agency



Level	Structure of Farmer Groups
A1	Each Farmer Group
A2	16 Key Farmers of Farmer Groups in each working area of an extension worker
A3	All Key Farmers in a KUD covering area
B1	All Chairman of Key Farmer Groups in one Rural Extension Center
B2	Reprentatives of Chairmans of Key Farmer Groups in SUPRA INSUS UNIT(UHS!)

Note:

- Commonly organized system
- Additionally organized system if necessary and reguired

Fig. D - 9 ORGANIZATION OF FARMER GROUP

Republic of Indonesia
MASTER PLAN STUDY ON
LOWER ASAHAN RIVER BASIN DEVELOPMENT
Japan International Cooperation Agency

Table D-21 PROPOSED FARMING PRACTICES 1/

Work Item	Farming Practices
Land preparation	1 ploughing,harrowing and levelling, possibly by draft animal or tractor, depth of ploughing 10 -15cm
Seed variety	certified HYV; IR 46, IR 64 etc.
Nursery	area: about 1/20 of field, nursery bed to be prepared properly in upland or paddy field, fertilization of N required, careful water mangement essential, spraying of insecticide if necessary, nursery period: 20days
Transplanting	density: 20 x 20cm or follow recommendation of extension services depending on variety, regular planting to be adopted
Fertilization	INSUS package D level (kg/ha) Urea 225 TSP 150 KCl 100 ZA 100 3 topdressings of N, following the package
Weeding	2 times at least manually, depending on weed growth, control by water mangement recommended
Plant protection 2/	application of insecticide to brown planthopper etc., from the earlier stage of growth required depending on infestation, spraying by sprayer, rodenticide essential, regulation of cropping season prerequisite
Harvesting & processing	by sickle & threshing machine, harvesting in dry weather & sundrying recommended

1/: Prepared based on recommended practices by Food Crops Agriculture Service. As for kind of chemicals and dosage, guideline of extension service to be followed.

2/: Recommended that plant protection works to be carried out in a systematic way through the farmer's cooperative operation and/or villages under the guidance of BPP to ensure safety and effective use of chemicals. The period after harvest and before planting is the best time to implement rat control. During this period, the vegetation which provide food and shelter for rat is considered to be minimum and the population is considerably low. Control efforts can be concentrated on this period, while, sustained practice of baiting using rodenticides throughout a year is required. The integrated control program of rat comprising chemical, physical and agronomical controls recommended by the Plant Protection Center to be introduced to the project area.

Table D-22 LABOR, DRAFT ANIMAL AND MACHINERY REQUIREMENT WITH AND WITHOIT PROJECT PER HA AND IN THE PROJECT AREA

Without Project Condition

Land Use Category	Irrigated Paddy I	Irrigated Paddy II		Rainfed Paddy/HYV	Rainfed Paddy/Local	Coconut	Total
Per Ha							
Cropping Season	wet/dry	wet	dry	wet	wet		
Labor Requirement (man days)							
1. Nursey	5	5	5	5	5		
2. Land Preparation	35	35	30	30	40		
3. Transplanting	25	25	25	25	32		
4. Weeding	25	25	25	25	25		
5. Field Maintenance 1/	10	10	7	7	5		
6. Harvesting & Processing	40	40	35	35	30		
Total	140	140	127	127	137	50	
Draft Animal Requirement (animal days) 2/	5	5	5	5	-	-	
Thresher Requirement (mechanical days)	3	3	3	3	-	-	
In The Project Area							
Cropped Area 3/	3,120	1,390	490	3,680	3,530	750	12,960
Labor Requirement/Ha (man days)	140	140	127	127	137	50	-
Total Labor Requirement (man days)	436,800	194,600	62,230	467,360	483,610	37,500	1,682,100

With Project Condition

Land Use Category	Irrigated Paddy I	Irrigated Paddy II		Rainfed Paddy/HYV	Rainfed Paddy/Local	Coconut	Total
Future Land Use	Irrigated Paddy	Irrigated Paddy		Irrigated Paddy	Irrigated Paddy	Irrigated Paddy	
Per Ha							
Cropping Season	wet/dry	wet/dry		wet/dry	wet/dry	wet/dry	
Labor Requirement (man days)							
1. Nursey	5	5		5	5	5	
2. Land Preparation	35	35		35	75	35	
3. Transplanting	25	25		25	25	25	
4. Weeding	30	30		30	30	30	
5. Field Maintenance 1/	10	10		10	10	10	
6. Harvesting & Processing	45	45		45	40	40	
Total	150	150		150	185	145	
Draft Animal Requirement (animal days) 2/	5	5		5	5	5	
Thresher Requirement (mechanical days)	4	4		4	4	4	
In The Project Area							
Cropped Area 3/	2,960	2,620		6,980	6,700	1,340	20,600
Labor Requirement/Ha (man days)	150	150		150	185	145	-
Total Labor Requirement (man days)	444,000	393,000	1,047,000	1,239,500		194,300	3,317,800

1/: Include fertilizer/chemical application & irrigation .
2/: A pair of animaldays, converted into 8 hrs. work/day.
3/: Assumed net culvivable area of 90% and 95%, respectively for with and without project.

Table D-23 LABOR BALANCE STUDY UNDER WITH PROJECT CONDITIONS

(Unit: man day)

	Area	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Total
Labor Requirement/100 Ha														
1. Irrigated I,II & Rainfed/IIYV														
Nursery	100			150	300	50					300	180	20	1,000
Land Preparation	100			800	1,620	1,080					1,620	1,620	260	7,000
Transplanting	100				1,390	1,110					560	1,670	270	5,000
Weeding/Maintenance	100	330	140		1,020	1,940	790	150	100		100	1,940	1,490	8,000
Harvesting/Processing	100		2,450	2,050				1,230	2,450	820				9,000
Total	100	330	2,590	3,000	4,330	4,180	790	1,380	2,550	820	2,580	5,410	2,040	30,000
2. Rainfed/Local														
Nursery	100			150	300	50					300	180	20	1,000
Land Preparation	100			1,730	3,460	2,310					3,460	3,460	580	15,000
Transplanting	100				1,390	1,110					560	1,670	270	5,000
Weeding/Maintenance	100	330	140		1,020	1,940	790	150	100		100	1,940	1,490	8,000
Harvesting/Processing	100		2,180	1,820				1,100	2,190	710				8,000
Total	100	330	2,320	3,700	6,170	5,410	790	1,250	2,290	710	4,420	7,250	2,360	37,000
3. Coconut Field														
Nursery	100			150	300	50					300	180	20	1,000
Land Preparation	100			800	1,620	1,080					1,620	1,620	260	7,000
Transplanting	100				1,390	1,110					560	1,670	270	5,000
Weeding/Maintenance	100	330	140		1,020	1,940	790	150	100		100	1,940	1,490	8,000
Harvesting/Processing	100		2,180	1,820				1,100	2,190	710				8,000
Total	100	330	2,320	2,770	4,330	4,180	790	1,250	2,290	710	2,580	5,410	2,040	29,000
Total Labor Requirement (Unit:1000)														
1. Irrigated I,II & Rainfed/HYV	6,280	20.7	162.7	188.4	271.9	262.5	49.6	86.7	160.1	51.5	162.0	339.7	128.1	1,883.9
2. Rainfed/Local	3,350	11.1	77.7	124.0	206.7	181.2	26.5	41.9	76.7	23.8	148.1	242.9	79.1	1,239.7
3. Coconut Field	670	2.2	15.5	18.6	29.0	28.0	5.3	8.4	15.3	4.8	17.3	36.2	13.7	194.3
Total Labor Requirement	10,300	34.0	255.9	331.0	507.6	471.7	81.4	137.0	252.1	80.1	327.4	618.8	220.9	3,317.9
Available Labor Force 1/		488.6	488.6	488.6	610.8	488.6	488.6	488.6	488.6	488.6	488.6	610.8	488.6	6,107.6
Balance		454.6	232.7	157.6	103.2	16.9	407.2	351.6	236.5	408.5	161.2	-8.0	267.7	2,789.7
Surplus Ratio (%)		93.0	47.6	32.3	16.9	3.5	83.3	72.0	48.4	83.6	33.0	-1.3	54.8	45.7

1/: Available Labor Force = 9773(total farm household)x2.5(avg. available labor force/farm huosehold)x20 working days/month
= 488,650/month ; for November and April, 25 working days/month assumed

Table D-24 LABOR BALANCE STUDY ON DRAFT ANIMAL REQUIREMENT AT FULL DEVELOPMENT STAGE 1/

	Case I 2/		Case II 3/	
	8 Working Hrs. per Day 4/	5 Working Hrs. per Day 4/	8 Working Hrs. per Day 4/	5 Working Hrs. per Day 4/
Cropped area/season	4,870	4,870	10,300	10,300
Animal requirement/ha (pair of ani. days) 5/	5	8	5	8
Toatl requirement/season (pair of animal days)	24,350	38,960	51,500	82,400
No. of working animal in project area(head) 6/	1,500	1,500	1,500	1,500
Working days/season 7/	30	30	30	30
Available ani. forces/season (pair of ani. days)	22,500	22,500	22,500	22,500
Labor balance (pair of ani.days)	-1,850	-16,460	-29,000	-59,900

1/: Draft animal requirement for the presently prevailing land preparation methods in which combined use of draft animal & manual labor is done.
2/: Case I: assumed land preparation of about 70% of paddy fields where HYV grown and coconut field at present are practiced by draft animal and manpower. 6,950 x 70% = 4,865
3/: Case II: assumed land preparation of all paddy field done by draft animal.
4/: 8 or 5 hrs. work per day; assumed for the estimation of requirement per ha.
5/: Estimated requirement for presently prevailing land preparation practices of combined use of draft animal & manpower
6/: Ref. to Table D-11. Assumed based on growth rate of draft animal population of 2.5% and increase of population through INTEK program, and rate of animal in working age of 75%.
7/: Assumed working period of 1.5 months/season and 20 days' work/month

Table D-25 ESTIMATED CROP PRODUCTION WITH AND WITHOUT PROJECT

(Unit: dry paddy & fresh copra, ton)

	Irrigated Paddy I	Irrigated Paddy II	Rainfed Paddy/HYV	Rainfed Paddy/Local	Coconut Field	Total
With Project						
Cropped area	2,960	2,620	6,980	6,700	1,340	20,600
Unit yield	5.5	5.5	5.5	5.0	5.0	
Porduction						
Paddy	16,280	14,410	38,390	33,500	6,700	109,280
Coconut	-	-	-	-	-	-
Without Project						
Cropped area	3,120	1,880	3,680	3,530	750	12,960
Unit yield	4.0	1/	2.8	1.5	2.1	
Porduction						
Paddy	12,480	6,932	10,304	5,295	-	35,011
Coconut	-	-	-	-	1,575	1,575
Increment						
Paddy	3,800	7,478	28,086	28,205	6,700	74,269
Coconut	-	-	-	-	-1,575	-1,575

1/: 1390 ha in wet season paddy (4.0t/ha) and 490 ha in dryseason paddy (2.8t/ha)

Table D-26 CROP BUDGET PER HA IN TERMS OF ECONOMIC VALUE/ WITH AND WITHOUT PROJECT CONDITIONS

Without Project Condition

Items	Unit	Irrigated paddy I (paddy: wet/dry season)			Irrigated paddy II (paddy: wet season)			Irrigated paddy II (paddy: dry season)			Rainfed HYV (paddy: wet season)			Rainfed Local (paddy: wet season)			Coconut (coconut)		
		Q'ty	unit price	amount	Q'ty	unit price	amount	Q'ty	unit price	amount	Q'ty	unit price	amount	Q'ty	unit price	amount	Q'ty	unit price	amount
Unit yield	ton/ha	4.0			4.0			2.8			2.8			1.5			2.1		
Unit price	Rp./ton		300,000			300,000			300,000			300,000			300,000			210,000	
Gross income	Rp./ha			1,200,000			1,200,000			840,000			840,000			450,600			441,000
Production cost(per ha)				455,573			455,573			380,401			410,678			256,054			111,472
seed	Rp./kg	55	230	12,650	55	230	12,650	72	230	16,560	68	230	15,640	44	230	10,120	-	230	0
urea	Rp./kg	155	448	69,440	155	448	69,440	101	448	45,248	148	448	66,304	17	448	7,616	57	448	25,536
TSP	Rp./kg	117	517	60,489	117	517	60,489	71	517	36,707	94	517	48,598	38	517	19,646	18	517	9,306
KCl	Rp./kg	39	326	12,714	39	326	12,714	16	326	5,216	6	326	1,956	2	326	652	5	326	1,630
Ammon.sulphate	Rp./kg	14	200	2,800	14	200	2,800	20	200	4,000	16	200	3,200	1	200	200	-	200	0
Agr.chemicals	Rp./lit	2.4	7,700	18,480	2.4	7,700	18,480	2.1	7,700	16,170	2.4	7,700	18,480	1.6	7,700	12,320	-	7,700	0
Agr.machinery	mecanical-day	3	3,000	9,000	3	3,000	9,000	2	3,000	6,000	2	3,000	6,000	-	3,000	0	-	3,000	0
Labour	man-day	140	1,500	210,000	140	1,500	210,000	127	1,500	190,500	127	1,500	190,500	137	1,500	205,500	50	1,500	75,000
Draft animal	animal-day 1/	5	12,000	60,000	5	12,000	60,000	5	12,000	60,000	5	12,000	60,000	-	12,000	0	-	12,000	0
Primary profit	Rp./ha			744,427			744,427			459,599			429,322			193,946			329,528

With Project Condition

Items	Unit	Irrigated paddy I (paddy: wet/dry season)			Irrigated paddy II (paddy: wet/dry season)			Rainfed HYV (paddy: wet/dry season)			Rainfed Local (paddy: wet/dry season)			Coconut (paddy: wet/dry season)		
		Q'ty	unit price	amount	Q'ty	unit price	amount	Q'ty	unit price	amount	Q'ty	unit price	amount	Q'ty	unit price	amount
Unit yield	ton/ha	5.5			5.5			5.5			5.0			5.0		
Unit price	Rp./ton		300,000			300,000			300,000			300,000			300,000	
Gross income	Rp./ha			1,650,000			1,650,000			1,650,000			1,500,000			1,500,000
Production cost(per ha)				557,950			557,950			557,950			550,450			550,450
seed	Rp./kg	30	230	6,900	30	230	6,900	30	230	6,900	30	230	6,900	30	230	6,900
urea	Rp./kg	225	448	100,800	225	448	100,800	225	448	100,800	225	448	100,800	225	448	100,800
TSP	Rp./kg	150	517	77,550	150	517	77,550	150	517	77,550	150	517	77,550	150	517	77,550
KCl	Rp./kg	100	326	32,600	100	326	32,600	100	326	32,600	100	326	32,600	100	326	32,600
Ammon.sulphate	Rp./kg	100	200	20,000	100	200	20,000	100	200	20,000	100	200	20,000	100	200	20,000
Agr.chemicals	Rp./lit	3.0	7,700	23,100	3.0	7,700	23,100	3.0	7,700	23,100	3.0	7,700	23,100	3.0	7,700	23,100
Agr.machinery	mecanical-day	4	3,000	12,000	4	3,000	12,000	4	3,000	12,000	4	3,000	12,000	4	3,000	12,000
Labour	man-day	150	1,500	225,000	150	1,500	225,000	150	1,500	225,000	185	1,500	277,500	145	1,500	217,500
Draft animal	animal-day 1/	5	12,000	60,000	5	12,000	60,000	5	12,000	60,000	-	12,000	-	5	12,000	60,000
Primary profit	Rp./ha			1,092,050			1,092,050			1,092,050			949,550			949,550

1/: A pair of animal days

Table D-27 FARM BUDGET ANALYSIS/WITH & WITHOUT PROJECT (1/3) 1/

Item	Unit	Present Land Use Category/Irrigated Paddy Field I Farm Size: Paddy Field 1.1 ha						Present Land Use Category/Irrigated Paddy Field II Farm Size: Paddy Field 0.8 ha					
		Owner Farm						Owner Farm					
		Without			With			Without			With		
		O'ty	Unit price	Amount (Rp.000)	O'ty	Unit price	Amount (Rp.000)	O'ty	Unit price	Amount (Rp.000)	O'ty	Unit price	Amount (Rp.000)
Paddy													
Cropped Area	ha	2.20			2.20			1.08			1.60		
Unit Yield	t/ha	4.0			5.5			*			5.5		
Unit Price	Rp/kg		270			270			270			270	
Gross Return	Rp.000			2,376.0			3,267.0			891.0			2,376.0
Production Cost	Rp.000			781.1			995.8			340.5			724.2
seed	Rp/kg	121	450	54.5	66	450	29.7	64	450	28.8	48	450	21.6
urea	Rp/kg	341	165	56.3	495	165	81.7	152	165	25.1	360	165	59.4
'TSP	Rp/kg	257	165	42.4	330	165	54.5	114	165	18.8	240	165	39.6
KCL	Rp/kg	86	165	14.2	220	165	36.3	35	165	5.8	160	165	26.4
anmm.sulphate	Rp/kg	31	165	5.1	220	165	36.3	17	165	2.8	160	165	26.4
agr.chemicals	Rp./ltr	5.3	6,500	34.5	6.6	6,500	42.9	2.5	6,500	16.3	4.8	6,500	31.2
agr.machinery	macine-day	6.6	3,000	19.8	8.8	3,000	26.4	3.0	3,000	9.0	6.4	3,000	19.2
hired labour 2/	man-day	22.0	2,500	55.0	22.0	2,500	55.0	11.0	2,500	27.5	16.0	2,500	40.0
draft animal 3/	animal-day	11.0	12,000	132.0	11.0	12,000	132.0	5.4	12,000	64.8	8.0	12,000	96.0
harvesting cost 4/				356.4			490.1			133.7			356.4
land tax	Rp./ha	1.1	10,000	11.0	1.1	10,000	11.0	0.8	10,000	8.0	0.8	10,000	8.0
land rent	Rp./ha	0	100,000	0.0	0	100,000	0.0	0	100,000	0.0	0	100,000	0.0
Net Income	Rp.000			1,594.9			2,271.2			550.5			1,651.8
Other Incomes 5/	Rp.000			448.0			448.0			448.0			448.0
Total Income	Rp.000			2,042.9			2,719.2			998.5			2,099.8
Family Expenditure 5/	Rp.000			803.0			960.0			803.0			960.0
Net Surplus	Rp.000			1,239.9			1,759.2			195.5			1,139.8
		Tenant Farm						Tenant Farm					
		O'ty	Unit price	Amount (Rp.000)	O'ty	Unit price	Amount (Rp.000)	O'ty	Unit price	Amount (Rp.000)	O'ty	Unit price	Amount (Rp.000)
Net Income 6/	Rp.000			1,495.9			2,172.2			478.5			1,579.8
Othe Incomes	Rp.000			448.0			448.0			448.0			448.0
Total Income	Rp.000			1,943.9			2,620.2			926.5			2,027.8
Family Expenditure	Rp.000			803.0			803.0			803.0			803.0
Net Surplus	Rp.000			1,140.9			1,817.2			123.5			1,224.8

1/: Unit price based on questionnaire results.
2/: Assumed hired labor of 10 womandays/ha/season for transplanting
3/: Unit - a pair of draft animal
4/: 15% of products are assumed under borong system.
5/: Based on questionnaire results. Assumed family expenditure will increase about 20% in future with project condition.
6/: Net income from paddy farming. Assumed land rent per ha = Rp.100,000

Table D-27 FARM BUDGET ANALYSIS/WITH & WITHOUT PROJECT (2/3) 1/

Item	Unit	Present Land Use Category/Rainfed Paddy Field/HYV Farm Size: Paddy Field 0.8 ha						Present Land Use Category/Rainfed Paddy Field/Local Farm Size: Paddy Field 1.9 ha					
		Owner Farm						Owner Farm					
		Without			With			Without			With		
		O'ty	Unit price	Amount (Rp.000)	O'ty	Unit price	Amount (Rp.000)	O'ty	Unit price	Amount (Rp.000)	O'ty	Unit price	Amount (Rp.000)
Paddy													
Cropped Area	ha	0.80			1.60			1.90			3.80		
Unit Yield	t/ha	2.8			5.5			1.5			5.0		
Unit Price	Rp/kg		270			270			300			270	
Gross Return	Rp.000			604.8			2,376.0			855.0			5,130.0
Production Cost	Rp.000			243.0			724.2			270.2			1,605.0
seed	Rp/kg	54	450	24.3	48	450	21.6	84	450	37.8	114	450	51.3
urea	Rp/kg	118	165	19.5	360	165	59.4	32	165	5.3	855	165	141.1
TSP	Rp/kg	75	165	12.4	240	165	39.6	72	165	11.9	570	165	94.1
KCL	Rp/kg	5	165	0.8	160	165	26.4	4	165	0.7	380	165	62.7
amm.sulphate	Rp/kg	13	165	2.1	160	165	26.4	2	165	0.3	380	165	62.7
agr.chemicals	Rp./ltr	1.9	6,500	12.4	4.8	6,500	31.2	3.0	6,500	19.5	11.4	6,500	74.1
agr.machinery	macine-day	1.6	3,000	4.8	6.4	3,000	19.2	0.0	3,000	0.0	15.2	3,000	45.6
hired labour 2/	man-day	8	2,500	20.0	16.0	2,500	40.0	19.0	2,500	47.5	114.0	2,500	285.0
draft animal 3/	animal-day	4.0	12,000	48.0	8.0	12,000	96.0	0.0	12,000	0.0	0.0	12,000	0.0
harvesting cost 4/				90.7			356.4			128.3			769.5
land tax	Rp./ha	0.8	10,000	8.0	0.8	10,000	8.0	1.9	10,000	19.0	1.9	10,000	19.0
land rent	Rp./ha	0	100,000	0.0	0	100,000	0.0	0	100,000	0.0	0	100,000	0.0
Net Income	Rp.000			361.8			1,651.8			584.8			3,525.0
Other Incomes 5/	Rp.000			287.0			287.0			665.0			665.0
Total Income	Rp.000			648.8			1,938.8			1,249.8			4,190.0
Family Expenditure 5/	Rp.000			803.0			960.0			803.0			960.0
Net Surplus	Rp.000			-154.2			978.8			446.8			3,230.0
		Tenant Farm						Tenant Farm					
		O'ty	Unit price	Amount (Rp.000)	O'ty	Unit price	Amount (Rp.000)	O'ty	Unit price	Amount (Rp.000)	O'ty	Unit price	Amount (Rp.000)
Net Income 6/	Rp.000			289.8			1,579.8			508.8			3,354.0
Othe Incomes	Rp.000			287.0			287.0			665.0			665.0
Total Income	Rp.000			576.8			1,866.8			1,173.8			4,019.0
Family Expenditure	Rp.000			803.0			803.0			803.0			803.0
Net Surplus	Rp.000			-226.2			1,063.8			370.8			3,216.0

1/: Unit price based on questionnaire results.
2/: Assumed hired labor of 10 womandays/ha/season for transplanting
3/: Unit - a pair of draft animal
4/: 15% of products are assumed under borong system.
5/: Based on questionnaire results. Assumed family expenditure will increase about 20% in future with project condition.
6/: Net income from paddy farming. Assumed land rent per ha = Rp.100,000

Table D-27 FARM BUDGET ANALYSIS/WITH & WITHOUT PROJECT (3/3)1/

Present Farming Pattern/Paddy + Coconut (coconut field converted to paddy field under with project)
Farm Size: Paddy Field 0.6 ha and Coconut Field, 0.5 ha at present; Paddy Field 1.1 ha in Future

Item	Unit	Owner Farm Without Project							Owner Farm With Project						
		Coconut			Paddy			Total	Paddy conveted from coconut			Paddy			Total
		O'ty	Unit price	Amount (Rp.000)	O'ty	Unit price	Amount (Rp.000)	Amount (Rp.000)	O'ty	Unit price	Amount (Rp.000)	O'ty	Unit price	Amount (Rp.000)	Amount (Rp.000)
Paddy															
Cropped Area	ha	0.50			1.20				1.00			1.20			
Unit Yield	t/ha	2.1			4.0				5.0			5.5			
Unit Price	Rp/kg		210			270				270			270		
Gross Return	Rp.000			220.5			1,296.0	1,516.5			1,350.0			1,782.0	3,132.0
Production Cost	Rp.000			11.8			426.1	437.9			432.4			543.2	975.5
seed	Rp/kg	-	450	0.0	66	450	29.7	29.7	30	450	13.5	36	450	16.2	29.7
urea	Rp/kg	29	165	4.8	186	165	30.7	35.5	225	165	37.1	270	165	44.6	81.7
TSP	Rp/kg	9	165	1.5	140	165	23.1	24.6	150	165	24.8	180	165	29.7	54.5
KCL	Rp/kg	3	165	0.5	47	165	7.8	8.3	100	165	16.5	120	165	19.8	36.3
anmm.sulphate	Rp/kg	0	165	0.0	17	165	2.8	2.8	100	165	16.5	120	165	19.8	36.3
agr.chemicals	Rp./ltr	0	6,500	0.0	2.9	6,500	18.9	18.9	3.0	6,500	19.5	3.6	6,500	23.4	42.9
agr.machinery	macine-day	0	3,000	0.0	3.6	3,000	10.8	10.8	4.0	3,000	12.0	4.8	3,000	14.4	26.4
hired labour 2/	man-day	0	2,500	0.0	12.0	2,500	30.0	30.0	10.0	2,500	25.0	12.0	2,500	30.0	55.0
draft animal 3/	animal-day	0	12,000	0.0	6.0	12,000	72.0	72.0	5.0	12,000	60.0	6.0	12,000	72.0	132.0
harvesting cost 4/		-					194.4	194.4	-		202.5			267.3	469.8
land tax	Rp./ha	0.5	10,000	5.0	0.6	10,000	6.0	11.0	0.5	10,000	5.0	0.6	10,000	6.0	11.0
land rent	Rp./ha	0	100,000	0.0	0	100,000	0.0	0.0	0	100,000	0.0	0	100,000	0.0	0.0
Net Income	Rp.000			208.7			869.9	1,078.6			917.6			1,238.9	2,156.5
Other Incomes 5/	Rp.000							339.0							339.0
Total Income	Rp.000							1,417.6							2,495.5
Family Expenditure 5/	Rp.000							803.0							960.0
Net Surplus	Rp.000							614.6							1,535.5

		Tenant Farm							Tenant Farm						
		O'ty	Unit price	Amount (Rp.000)	O'ty	Unit price	Amount (Rp.000)	Amount (Rp.000)	O'ty	Unit price	Amount (Rp.000)	O'ty	Unit price	Amount (Rp.000)	Amount (Rp.000)
Net Income 6/	Rp.000			163.7			815.9	979.6			872.6			1,184.9	2,057.5
Other Incomes	Rp.000							339.0							339.0
Total Income	Rp.000							1,318.6							2,396.5
Family Expenditure	Rp.000							803.0							803.0
Net Surplus	Rp.000							515.6							1,593.5

1/: Unit price based on questionnaire results.
2/: Assumed hired labor of 10 womandays/ha/season for transplanting
3/: Unit - a pair of draft animal
4/: 15% of products are assumed under borong system.
5/: Based on questionnaire results. Assumed family expenditure will increase about 20% in future with project condition.
6/: Net income from paddy farming. Assumed land rent per ha = Rp.100,000

Table D-28 OUTLINE OF STANDARD CURRICULUM OF TRAINING FOR PU-O&M STAFF

Goal of Training	Training Item	Aims	Contents	Training Method
1. Training orientation			- registration	lecture/discussion workshop
			- raising of expectations	- do -
2. To acquire knowledge of the irrigation plan	on-farm irrigation requirement	to understand approx. amount, constituent factors, seasonal variation of water requirement for paddy and diversified crops	- evapotranspiration - percolation - effective rainfall - irrigation efficiency - rotational irrigation and simultaneous irrigation	lecture - do - - do - - do - lecture/discussion
	irrigation requirements for tertiary block, and major diversion structure	to understand irrigation method such as rotational and simultaneous irrigation	- farming practice and irrigation method	- do -
		to understand diversion requirement	- seasonal diversion requirements	- do -
	hydrology	to understand regional hydrological characteristics	- general climate - rainfall/available water sources	lecture - do -
		to understand available water sources of the river	- water balance in the river system	- do -
		to understand water balance in the river system	- data bank system	- do -
3. To acquire knowledge of facilities	kind and function of irrigation facilities	to gain knowledge about the kind and function of irrigation facilities	- design criteria for canal - hydraulic features of structures	lecture lecture/ field practice
		to gain knowledge about water management facilities	- movable structures such as gate and check structures	- do -
	operation method of water management facilities	to learn how to measure discharge	- measuring device	lecture/ field practice
		to learn how to operate water management facilities	- operation rule of water management facilities	- do -
4. To acquire knowledge of organization and responsibilities	organizational sturcture, function and responsibilities	to obtain knowledge about organization structure and function	- organizations of the P3A - organization of PU	lecture - do -
		to make clear the responsibilities of O&M staff at various level of management	- other organization - responsibilities of each level staff	- do - - do -
5. To learn procedures for water management and reporting system	procedure for water management	to obtain knowledge about administrative procedure to determine the irrigation plan	- irrigation committees at various levels if available - determination of annual irrigation plan	lecture - do -
	reporting system	to make clear reporting system	- reporting system for water management - form of reports/ communication	- do - - do -
6. To acquire knowledge about monitoring and evaluation	monitoring on practice of water management	to obtain knowledge about monitoring and evaluation on water management	- monitoring and evaluation on water management at main system - monitoring and evaluation on water management at tertiary block level	lecture/ field practice - do -
		to obtain knowledge about monitoring and evaluation on economic benefit	- monitoring and evaluation system on economic benefits of project - survey method and forms	lecture lecture, exercise
7. To acquire knowledge on maintenance of irrigation facilities	maintenance of irrigation facilities	to understand the whole aspect related to maintenance of facilities	- maintenance system - maintenance method - responsibility of organization - budget	lecture - do - - do - - do -
8. To acquire knowledge on the overall management of the irrigation system	overall management	to understand an overall system management	- system management	field visit/ lecture
9. To evaluate effect of training	training evaluation	to evaluate effect of training	- evaluation	lecture/exercise

Table D-29 OUTLINE OF STANDARD CURRICULUM OF TRAINING FOR FIELD EXTENSION WORKERS (PPL)

Training Item	Aims	Contents	Training Method
1. Training orientation		- registration	lecture/workshop
		- raising of expectation	- do -
		- training design orientation	- do -
2. Organizational structure, function and responsibilities	to obtain knowledge about organizational structure and function	- organization of P3A	lecture
		- organization of PU	- do -
		- other organization	- do -
	to make clear the responsibility of P3A farmers and PU staff	- responsibility of farmers and PU staff	- do -
3. Overview of irrigation system management	to understand an overall system management	- irrigation facilities	lecture
		- irrigation schedule (pre-, normal-, and post-irrigation)	- do -
4. Operation method of water management	to understand operation method of water management	- operation rule of water management facilities	lecture/field practice
		- cropping pattern	- do -
		- water distribution plan	- do -
5. Procedure for water management	to understand about administrative procedure to determine the irrigation plan	- irrigation committee	lecture
		- determination of annual irrigation plan	- do -
6. Monitoring on practice of water management	to obtain knowledge about monitoring and evaluation on water management	- monitoring and evaluation on water management at main system	lecture/field practice
		- monitoring and evaluation on water management at tertiary block level	- do -
	to obtain knowledge about monitoring and evaluation on economic benefit	- monitoring and evaluation system on economic benefit	lecture
		- survey method and forms	lecture, exercise field visit/lecture
7. Overall management facilities	to understand an overall system management	- system management	field visit/lecture
8. Training evaluation	to evaluate training	- evaluation	lecture/exercise

Table D-30 OUTLINE OF STANDARD CURRICULUM OF TRAINING FOR FARMERS (CHAIRMAN OF P3A)

Training Item	Aims	Contents	Training Method
1. Training orientation		- registration - levelling of expectation	lecture/workshop - do -
2. Overview of irrigation system management	to understand an overall system management	- irrigation facilities - irrigation schedule (pre-, normal- and post-irrigation)	lecture - do -
3. Operation method of water management on facilities	to learn how to measure discharge to learn how to operate water management of facilities	- measuring devices - operation rule of water management facilities - cropping pattern - water distribution plan	lecture/field practice - do - - do - - do -
4. Maintenance of facilities	to maintain irrigation facilities	- maintenance system	lecture
5. Monitoring system	to obtain knowledge of procedure of monitoring	- reporting system - form of reports/communication	lecture - do -
6. Irrigation service fee collection	to collect fee efficiently	- procedure of fee collection - incentive of fee collection - fee collection plan	lecture - do - - do -
7. Conflict of management	to solve conflict of water management	- sample exercise	lecture/exercise
8. Organizational structure, function and responsibilities	to obtain knowledge about organizational structure and function to make clear the responsibilities of P3A farmers and PU staff	- organizations of P3A and PU - other organizations - responsibility of farmers and PU staff	lecture/exercise - do - - do -
9. Training evaluation	to evaluate training	- evaluation	lecture/exercise

Table D-31 OUTLINE OF STANDARD CURRICULUM OF TRAINING FOR FARMERS (ULU-ULU AND ILI-ILI)

Training Item	Aims	Contents	Training Method
1. Training orientation		- registration - raising of expectation	lecture/workshop - do -
2. Kind and function of facilities	to gain knowledge about function of irrigation facilities	- hydraulic features of structures	lecture/field practice
Operation method of water management facilities	to learn how to measure discharge and climate data	- measuring rainfall, evaporation, temperature, discharge, etc.	- do -
	to learn how to operate water management facilities	- operation rule of water management facilities	- do -
3. Organizational structure, function and responsibilities	to obtain knowledge about organizational structure and function	- organization of the P3A - organization of PU - other organization	lecture - do - - do -
	to make clear the responsibilities of ditchtender at various level of management	- responsibilities of ditchtender	- do -
4. Procedure for water management	to obtain knowledge about procedure for determination of the irrigation plan	- determination of annual irrigation plan	lecture
5. Reporting system	to make clear reporting system	- reporting system for water management - form of report/communication	lecture - do -
6. Maintenance of facilities	to understand the whole aspect of maintenance	- maintenance system	lecture
7. Overall management	to understand the overall system of management	- system management	field visit/lecture
8. Training evaluation	to evaluate effect of training	- evaluation	lecture/exercise

Table D-32 ECONOMIC PRICE FOR PADDY

projected 1995 world market price of rice(US$/ton)(1)	259
quality adjustment(2)	26
international shipping and handling (US$/ton)	28
CIF price at Belawan(US$/ton)	261
CIF price at Belawan (Rp./kg)(3)	462
port charge,handling,operation (Rp./Kg)	37
transport to wholesaler (Rp./Kg)	13
trader margin (Rp./Kg)	11
ex-mill or wholesale price (Rp./Kg)	501
conversion to paddy (4)	326
milling cost (Rp./Kg)	13
transport farm to mill (Rp./Kg)	13
economic farm gate price (Rp./Kg)	300

(1) Based on the IBRD commodity price projection, Feb.1989. The IBRD figures estimated are given in 1985 constant prices, which have been adjusted by a factor of 1.495(MUV) to allow for price escalation between 1985 and 1989.
pricing basis : rice Thai, milled, 5% broken, FOB Bangkok
(2) a 10 % discount for rice
(3) one US$ = Rp. 1,770
(4) 65%
(*) paddy: import parity

Table D-33 ECONOMIC PRICE FOR FERTILIZER

A) urea	
Price of FOB Europe ($/ton)	211
Price differential of Indonesian urea ($/ton)	16
export to Asia	
FOB price of baggd urea ex-factory Lhokseumawe($/ton)	227
Ex-factory Lhokseumawe(Rp/Kg)	402
Transport to project area(Rp./Kg)	18
Handling costs(Rp./Kg)	17
Transpot wholesaler to farm(Rp./Kg)	11
Economin farmgate price(Rp./Kg)	448
B) TSP	
Price FOB US Gulf($/ton)	206
Freight and insurance($/ton)	60
CIF Indonesia($/ton)	266
CIF Indonesia(Rp./Kg)	471
Transport to project area(Rp./Kg)	18
Handling costs(Rp./Kg)	17
Transport wholesaler to farm(Rp./Kg)	11
Economic farmgate price(Rp./Kg)	517
C) KCl	
Price FOB Vancourver($/ton)	108
Freight and insurance($/ton)	50
CIF Indonesia ($/ton)	158
CIF price Belawan(Rp./Kg)	280
Transpot to project area(Rp./Kg)	18
Handling costs(Rp./Kg)	17
Transport wholesaler to farm (Rp./Kg)	11
Economic farmgate price(Rp./Kg)	326

Remarks: exchange rate of one US$ = Rp.1,770
urea:export parity
TSP and KCl:import parity

Table D-34 PROBABLE FLOOD DAMAGE FOR SILAU AND BUNUT RIVERS

A.probable flood damage under present condition (Bunut river)

(Unit: Rp. million)

Item	Return Period (Year)					
	2	5	10	15	30	100
(I) House						
House/building	110	321	426	531	876	1,231
Household effect	241	640	840	1,040	1,610	2,200
Stored goods	23	52	67	81	120	161
subtotal	374	1,013	1,333	1,652	2,606	3,592
(II) Agricultural crop						
Paddy	718	1,091	1,278	1,465	1,989	2,561
Upland crops	36	55	64	73	100	128
Others(1)	38	57	67	77	104	134
subtotal	792	1,203	1,409	1,615	2,193	2,823
(III) Public facility (I+II)*30%	350	665	823	980	1,440	1,925
(IV) Indirect damage (I+II+III)*10%	152	288	356	425	624	834
Total	1,667	3,169	3,921	4,672	6,863	9,173

B.probable flood damage under present conditions (Silau river)

Item	Return Period (Year)					
	2	5	10	15	30	100
(I) House						
House/building	1,948	2,144	2,338	3,729	4,574	5,834
Household effect	2,770	2,895	3,058	5,658	6,875	8,862
Stored goods	2,070	2,139	2,244	3,302	3,997	5,124
subtotal	6,788	7,178	7,640	12,689	15,446	19,820
(II) Agricultural crop						
Paddy	1,275	1,709	2,032	2,084	2,187	2,367
Upland crops	7	10	12	12	13	13
Others(1)	64	86	102	105	110	119
subtotal	1,346	1,805	2,146	2,201	2,310	2,499
(III) Public facility (I+II)*30%	2,440	2,695	2,936	4,467	5,327	6,696
(IV) Indirect damage (I+II+III)*10%	1,057	1,168	1,272	1,936	2,308	2,901
Total	11,632	12,846	13,994	21,292	25,391	31,916