Tables

Table H.1.1 Status of Land Classification as of December 1995

(unit: ha)

	Total	Alienable & Disposal Land	Total Forest Land	Un-classified Forest Land	Classified Public Forest Land						
					Established Forest Reserve	Established Timber Land	National Parks GRBS/WA	Military & Naval Reservation	Civil Reservation	Fishpond Develop-ment	Sub-total
	A=B+C	B	C=D+K	D	E	F	G	H	I	J	K
Country	30,000,000	14,117,200	15,882,800	881,200	3,272,900	10,015,900	1,341,000	130,300	165,900	75,600	15,001,600
	100.0%	47.1%	52.9%	2.9%	10.9%	33.4%	4.5%	0.4%	0.6%	0.3%	50.0%
Region 6	2,022,300	1,408,800	613,500	1,600	135,300	429,000	23,500	0	200	23,900	611,900
	100.0%	69.7%	30.3%	0.1%	6.7%	21.2%	1.2%	0.0%	0.0%	1.2%	30.3%
Aklan	181,800	102,800	79,000	700	0	74,400	0	0	0	3,900	78,300
	100.0%	56.5%	43.5%	0.4%	0.0%	40.9%	0.0%	0.0%	0.0%	2.1%	43.1%
Antique	252,200	144,700	107,500	0	24,600	82,900	0	0	0	0	107,500
	100.0%	57.4%	42.6%	0.0%	9.8%	32.9%	0.0%	0.0%	0.0%	0.0%	42.6%
Capiz	263,300	169,500	93,800	100	0	88,600	0	0	0	5,100	93,700
	100.0%	64.4%	35.6%	0.0%	0.0%	33.6%	0.0%	0.0%	0.0%	1.9%	35.6%
Iloilo	532,400	396,100	136,300	0	41,800	85,500	900	0	0	8,100	136,300
	100.0%	74.4%	25.6%	0.0%	7.9%	16.1%	0.2%	0.0%	0.0%	1.5%	25.6%
Negros O.	792,600	595,600	197,000	800	68,900	97,600	22,700	0	200	6,800	196,200
	100.0%	75.1%	24.9%	0.1%	8.7%	12.3%	2.9%	0.0%	0.0%	0.9%	24.8%

Note; Alienable and disposal land: Areas with less than 18% sloping, and available for other land use than forest within the criteria set by law.
Alienable lands refer to the lands of public domain which have been declared as not needed for forest purposes by the government.
Forest land: All the land with 18% in slope or over, regardless of whether the lands have corest cover or not.
Forest lands refer to the lands of public domain, including public forest, permanent forests or forest reserves, forerst reservations, timberlands, grazing lands and game refuge and bird sanctuaries.
GRBS/WA: Game refuge and bird sanctuaries/wilderness areas.
Fishpond: Originated from mangrove forest.
Lande classification:

Source: 1996 Philippine Statistical Yearbook, National Statistical Cordination Board.

Table H.1.2 Slope Classification in Region VI

(unit: 1,000 ha)

Slope Code and Class	Aklan		Antique		Capiz		Iloilo*1						Negros Occ.		Total	
							Iloilo*2		Guimaras Is.		Total					
M 0% to 3%	48.1	26%	47.5	19%	52.6	20%	148.3	31%	7.4	12%	155.7	29%	183.5	23%	487	24%
N 3% to 8%	3.1	2%	6.0	2%	18.5	7%	36.5	8%	3.3	5%	39.8	7%	123.1	16%	191	9%
O 8% to 18%	13.7	8%	14.8	6%	47.9	18%	64.0	14%	27.7	46%	91.7	17%	156.5	20%	325	16%
Sub-total < 18%	64.8	36%	68.3	27%	119.1	45%	248.9	53%	38.3	63%	287.2	54%	463.1	58%	1,002	50%
P 18% to 30%	29.4	16%	53.1	21%	80.3	30%	110.1	23%	22.1	37%	132.2	25%	123.9	16%	419	21%
Q 30% to 50%	23.2	13%	23.9	9%	27.8	11%	65.4	14%	0.0	0%	65.4	12%	133.8	17%	274	14%
R > 50%	64.4	35%	107.0	42%	36.2	14%	47.6	10%	0.0	0%	47.6	9%	71.9	9%	327	16%
Sub-total ≥ 18%	117.0	64%	183.9	73%	144.3	55%	223.1	47%	22.1	37%	245.2	46%	329.5	42%	1,020	50%
Total	181.8	100%	252.2	100%	263.3	100%	472.0	100%	60.5	100%	532.4	100%	792.6	100%	2,022	100%

Slope class: M (0% to 3%): Level to Very Gently Sloping, N (3% to 8%): Gently Sloping to Undulating, O (8% to 18%): Moderately Sloping to Rolling, P (18% to 30%): Rolling to Moderately Steep, Q (30% to 50%): Steep Hills and Mountains, R (> 50%): Very Steep Hills and Mountains.

Note: *1: Iloilo province includes Panay and Guimaras Islands, before 1992.

*2: Iloilo province includes on Panay island portion, excluding Guimaras island.

Source: Slope Map, Region VI, Bureau of Soil & Water Management, August 1990.

Table H.1.3 Population, Growth Rate and Density by Province in Region VI and Philippines

(unit: 1,000 persons)

Deacription	Aklan	Antique	Capiz	Iloilo			Negros Occ.	Region VI	Philippines		
				City*1	Rural*2	Sub-total			NCR*3	Others	Total
Population (thousand persons)											
Census 1948	197	234	245	-	-	816	1,039	2,531	1,569	17,665	19,234
Census 1960	226	238	315	-	-	966	1,332	3,077	2,462	24,626	27,088
Census 1970	263	289	394	210	958	1,168	1,504	3,618	3,967	32,717	36,684
Census 1975	293	308	446	227	1,086	1,313	1,786	4,146	4,970	37,101	42,071
Census 1980	325	345	492	245	1,189	1,434	1,930	4,526	5,926	42,172	48,098
Census 1990	381	406	584	310	1,455	1,765	2,257	5,393	7,948	52,755	60,703
Census 1995	411	432	624	335	1,541	1,876	2,434	5,777	9,454	59,160	68,614
Average Annual Growth Rate from previous Census (% per annum)											
Census 1948	-	-	-	-	-	-	-	-	-	-	2.1%
Census 1960	1.2%	0.1%	2.1%	-	-	1.4%	2.1%	1.6%	3.8%	2.8%	2.9%
Census 1970	1.5%	2.0%	2.3%	-	-	1.9%	1.2%	1.6%	4.9%	2.9%	3.1%
Census 1975	2.2%	1.3%	2.5%	1.6%	2.5%	2.4%	3.5%	2.8%	4.6%	2.5%	2.8%
Census 1980	2.1%	2.3%	2.0%	1.5%	1.8%	1.8%	1.6%	1.8%	3.6%	2.6%	2.7%
Census 1990	1.6%	1.6%	1.7%	2.4%	2.0%	2.1%	1.6%	1.8%	3.0%	2.3%	2.4%
Census 1995	1.4%	1.2%	1.2%	1.5%	1.1%	1.1%	1.4%	1.3%	3.3%	2.2%	2.3%
Population Density (persons per sq. km)											
Census 1948	108.4	92.8	93.0			153.3	131.1	125.2			64.1
Census 1960	124.3	94.4	119.6			181.4	168.1	152.2			90.3
Census 1970	144.7	114.6	149.6	3,745.3	181.9	219.4	189.8	178.9	6,237.4	109.3	122.3
Census 1975	161.2	122.1	169.4	4,054.1	206.1	246.6	225.3	205.0	7,814.5	123.9	140.2
Census 1980	178.8	136.8	186.8	4,371.9	225.7	269.3	243.5	223.8	9,317.6	140.9	160.3
Census 1990	209.6	161.0	221.8	5,526.9	276.3	331.5	284.8	266.7	12,496.9	176.2	202.3
Census 1995	226.1	171.3	237.0	5,973.9	292.6	352.4	307.1	285.7	14,864.8	197.6	228.7
Land Area (sq. km)	1,818	2,522	2,633	56	5,268	5,324	7,926	20,223	636	299,364	300,000

Remarks; *1: Iloilo city, *2: Province excluding Iloilo city, *3: Metropolitan Manila Area

Source: 1996 Philippine Statistical Year Book, National Statistical Coordination Board.

Table H.1.4 Status of Land Classification in Iloilo Province, 1983 to 1997

(unit: ha)

	Total	Alienable & Disposal Land	Total Forest Land	Un-classified Forest Land	Classified Public Forest Land						
					Established Forest Reserve	Established Timber Land	National Parks GRBS/WA	Military & Naval Reservation	Civil Reservation	Fishpond Develop-ment	Sub-total
1981	532,400	385,700	146,700	11,200	41,800	92,800	900	0	0	0	135,500
	100.00%	72.45%	27.55%	2.10%	7.85%	17.43%	0.17%	0.00%	0.00%	0.00%	25.45%
1982	532,300	387,000	145,300	8,800	41,800	93,800	900	0	0	0	136,500
	100.00%	72.70%	27.30%	1.65%	7.85%	17.62%	0.17%	0.00%	0.00%	0.00%	25.64%
1983	532,400	395,100	137,300	8,800	41,800	83,000	900	0	0	2,800	128,500
	100.00%	74.21%	25.79%	1.65%	7.85%	15.59%	0.17%	0.00%	0.00%	0.53%	24.14%
1984	532,400	395,100	137,300	0	41,800	91,800	900	0	0	2,800	137,300
	100.00%	74.21%	25.79%	0.00%	7.85%	17.24%	0.17%	0.00%	0.00%	0.53%	25.79%
1985	532,400	396,600	135,800	0	41,800	90,200	900	0	0	2,900	135,800
	100.00%	74.49%	25.51%	0.00%	7.85%	16.94%	0.17%	0.00%	0.00%	0.54%	25.51%
1986	532,400	391,300	141,100	0	41,800	95,200	900	0	0	3,200	141,100
	100.00%	73.50%	26.50%	0.00%	7.85%	17.88%	0.17%	0.00%	0.00%	0.60%	26.50%
1987	532,400	396,100	136,300	0	0	127,400	900	0	0	8,000	136,300
	100.00%	74.40%	25.60%	0.00%	0.00%	23.93%	0.17%	0.00%	0.00%	1.50%	25.60%
1988	532,400	396,100	136,300	0	41,800	85,500	900	0	0	8,100	136,300
	100.00%	74.40%	25.60%	0.00%	7.85%	16.06%	0.17%	0.00%	0.00%	1.52%	25.60%
1989	532,400	396,100	136,300	0	41,800	85,500	900	0	0	8,100	136,300
	100.00%	74.40%	25.60%	0.00%	7.85%	16.06%	0.17%	0.00%	0.00%	1.52%	25.60%
1990	532,400	396,100	136,300	0	41,800	85,500	900	0	0	8,100	136,300
	100.00%	74.40%	25.60%	0.00%	7.85%	16.06%	0.17%	0.00%	0.00%	1.52%	25.60%
1991	532,400	396,100	136,300	0	41,800	85,500	900	0	0	8,100	136,300
	100.00%	74.40%	25.60%	0.00%	7.85%	16.06%	0.17%	0.00%	0.00%	1.52%	25.60%
1996	532,400	396,100	136,300	0	41,800	85,500	900	0	0	8,100	136,300
	100.00%	74.40%	25.60%	0.00%	7.85%	16.06%	0.17%	0.00%	0.00%	1.52%	25.60%

Source: Province Profile of Iloilo 1995, National Statistical Office, and 1996 Philippine Statistical Yearbook, National Statistical Coordination Board..

Table H.1.5 Land Use and Forest Type in 1969 and 1987

(unit: ha)

		Forest Lands							Alienable and Desposable Land							Total
		Diptero-carp Forest	Man-grove	Mossy and Sub-marginal Forest	Sub-Total	Brush-land	Others	Total	Diptero-carp Forest	Man-grove	Mossy and Sub-marginal Forest	Sub-Total	Brush-land	Others	Total	
Alkan	1969	12,800	7,600	18,200	38,600	35,900	55,400	129,900	-	-	-	0	-	-	0	129,900
	1987	15,500	2,600	3,500	21,600	29,200	79,100	129,900	0	500	0	500	0	51,400	51,900	181,800
	Increment	21%	-66%	-81%	-44%	-19%	43%	0%								
Antiquue	1969	9,600	0	21,800	31,400	21,600	67,900	120,900	-	-	-	0	-	-	0	120,900
	1987	12,400	0	9,600	22,000	15,600	83,300	120,900	500	0	100	600	500	130,200	131,300	252,200
	Increment	29%	-	-56%	-30%	-28%	23%	0%								
Capits	1969	10,600	2,400	6,400	19,400	33,700	63,800	116,900	-	-	-	0	-	-	0	116,900
	1987	6,900	1,800	7,800	16,500	24,400	76,000	116,900	0	0	0	0	1,900	144,500	146,400	263,300
	Increment	-35%	-25%	22%	-15%	-28%	19%	0%								
Iloilo	1969	8,400	1,600	6,000	16,000	26,700	86,400	129,100	-	-	-	0	-	-	0	129,100
	1987	4,800	0	2,100	6,900	9,000	113,200	129,100	0	0	0	0	300	403,000	403,300	532,400
	Increment	-43%	-100%	-65%	-57%	-66%	31%	0%								
Negros O.	1969	88,100	2,600	10,900	101,600	31,700	144,700	278,000	-	-	-	0	-	-	0	278,000
	1987	20,200	0	13,400	33,600	2,900	241,500	278,000	0	0	0	0	0	514,600	514,600	792,600
	Increment	-77%	-100%	23%	-67%	-91%	67%	0%								
Region 6	1969	129,500	14,200	63,300	207,000	149,600	418,200	774,800	-	-	-	0	-	-	0	774,800
	1987	59,800	4,400	36,400	100,600	81,100	593,100	774,800	500	500	100	1,100	2,700	1,243,700	1,247,500	2,022,300
	Increment	-54%	-69%	-42%	-51%	-46%	42%	0%								

Source: Forest Resources of Region 6 and 7, Philippine-German Forest Resources inventory Project 1988, Forest Management Bureau, DENR.

Table H.1.6 Changing of Watershed Condition for the Last Three Decades

Year	Phase	Degree of deforestation *1 / condition of watershed	Reason for degradation (Improvement ways)	Government activities
1965-1975	Degradation "Full dependence"	quite severe / poor vegetation	1. Logging for timber 2. Logging for fuelwood of sugarcane factory 3. Slash and burn cultivation	1. Operating regular tree planting activities
1975-1985	Consideration "Screaming forest"	severe / poor vegetation	1. Logging for fuelwood of sugarcane factory 2. Slash and burn cultivation 3. Tree cutting for own consumption	1. Proclamation of forest conservation regulation 2. Starting implementation of Forest Occupancy 3. Management (FOM) Program, Family Approach to and Reforestation (FAR), Communal Tree Farm (CTF) Integrated Social Forestry (ISF) Program.
1985-1995	Implementation "Independence from forest"	moderate (improving)	1. Slash and burn cultivation 2. Upland crop farming 3. Tree cutting for own consumption (reforestation program (fast growing tree, fruit tree, rattan, and bamboo))	1. Starting the implementation of Contract Reforestation program 2. Starting community-based approach to rehabilitations 3. Starting community-based approach to rehabilitations and the issuance of improved land tenure instruments 4. Tapping of NGO services to assist in community organization 5. Integrated approach with rural and agricultural development (community development) aspects 6. Promoting of participatory management program
1995-future	Recovering "Symbiosis with forest"	minimum / well condition	(Applying of soil conservation measures for upland crop fields) (Establishment of community forest)	1. Close coordination between inter-government agencies, such as the MERC *2 2. Development of alternative energy source

Remarks : *1 Deforestation rates of each phase at national level are 3,000km2/year on 1970, 2,000km2/year on 1980, and less than 1,000km2/year on1990, respectively.
*2 NGAs / DENR - LGUs - NGOs - PDs collaboration

Table H.2.1 Present Land Use in the Watershed Area

(Unit: ha)

Mapping Code and Land Cover Items	Watershed: Aganan		Tigum		Suage		Jalaur		Grand Total	
1. F: Forest (*1)	0	0%	400	2%	1,000	6%	7,600	7%	9,000	6%
Fp Pine forest	0	0%	0	0%	0	0%	0	0%	0	0%
Fy Mossy forest	0	0%	0	0%	0	0%	0	0%	0	0%
Fd Dipterocarp and/or other broad-leaved forest										
Fdc Closed canopy, mature trees covering > 50%	0	0%	0	0%	0	0%	0	0%	0	0%
Fdo Open canopy, mature trees coverung < 50%	0	0%	400	2%	1,000	6%	7,600	7%	9,000	6%
Fm Mangrove vegetation	0	0%	0	0%	0	0%	0	0%	0	0%
2. E: Extensive Land Use (*2)	5,500	53%	14,000	73%	12,700	70%	68,000	64%	100,200	65%
Ec Cultivated area mixed with brush & grass	5,500	53%	14,000	73%	12,700	70%	64,400	60%	96,600	63%
Eg Grassland, grass covering > 70%	0	0%	0	0%	0	0%	3,600	3%	3,600	2%
3. I: Intensive Land Use (*3)	4,900	47%	4,900	25%	4,400	24%	30,800	29%	45,000	29%
Ip Plantations larger than 100 ha										
Ipc Coconuts plantations	0	0%	0	0%	0	0%	0	0%	0	0%
Ipo Other plantations	0	0%	0	0%	0	0%	0	0%	0	0%
Ic Arable land, crops mainly paddy and sugarcane	1,700	16%	4,000	21%	4,400	24%	30,800	29%	40,900	27%
Im Mixed intensive cultivation (crop land and plantations less than 100 ha)										
Imc Crop land mixed with coconut plantation	3,200	31%	600	3%	0	0%	0	0%	3,800	2%
Imo Crop land mixed with other	0	0%	300	2%	0	0%	0	0%	300	0%
If Fishponds										
Ifm Fishponds derived from mangrove	0	0%	0	0%	0	0%	0	0%	0	0%
Ifo Other fishponds	0	0%	0	0%	0	0%	0	0%	0	0%
4. Others (Eroded area, Quarry, Other barren land, Riverbeds, Built-up area, Marshy area and swamp, Lake, Siltation patter in lake or along the coast, Coral reef)										
B Built-up area	0	0%	0	0%	0	0%	100	0%	100	0%
Total	10,400	100%	19,300	100%	18,100	100%	106,500	100%	154,300	100%

Note: *1; Forest: forest trees and reproduction brush, < 10% cultivated and other open areas.
*2: Extensive Land Use: populated areas in uplands and grasslands, > 10% cultivated and other open areas, < 70% cultivatd area.
*3: Intensive Land Use: crop lands, plantations and fishponds, > 70% cultivated area.

Source: Digital data of Land Cover Maps (Iloilo City:P.C.G.S 2528, Roxas City:P.C.G.S 2523, Bogo:P.C.G.S 2524) at the scale of 250,000, prepared by NAMRIA under the assistancee of Swedish Space Corporation, August 1988. Digital data was originally obtained from 1987 SPOT Satellite images.

Table II.2.2 Existing Forest Management Program and Reserved Areas in Public Forest Land

Program / Reserved Area	Aganan Area		Tigum Area		Suage Area	
	Alimodian		Maasin		Janiuay	
	ha	%	ha	%	ha	%
1. Reforestation Program Area						
1.1 Regular Reforestation	0	0	0	0	0	0
1.2 Contract Reforestation	180	7	215	3	188	3
1.3 Integrated Social Forestry Program	0	0	0	0	459	8
1.4 Industrial Tree Plantation	0	0	0	0	0	0
Sub-total	180	7	215	3	646	12
2. Demarcated Area						
2.1 National Park	0	0	0	0	0	0
2.2 Watershed Area	0	0	5,800	83	0	0
2.3 Civil Reserve	0	0	0	0	0	0
2.4 Military Reserve Forest	0	0	0	0	0	0
2.5 Communal Forestry Program	0	0	0	0	0	0
2.6 Grazing Land	0	0	0	0	0	0
Sub-total	0	0	5,800	83	0	0
3. Un-designated Area	2,356	93	965	14	4,803	88
4. Total land	2,536	100	6,980	100	5,449	100

Source : Provincial Environmental Natural Resource Office (PENRO), Iloilo

Program / Reserved Area	Jalaur Area					
	Lambunao		San Enrique		Calinog	
	ha	%	ha	%	ha	%
1. Reforestation Program Area						
1.1 Regular Reforestation	143	2	0	0	735	5
1.2 Contract Reforestation	250	3	300	13	519	3
1.3 Integrated Social Forestry Program	376	4	873	38	1,144	8
1.4 Industrial Tree Plantation	0	0	28	1	0	0
Sub-total	769	9	1,201	52	2,398	16
2. Demarcated Area						
2.1 National Park	0	0	124	5	0	0
2.2 Watershed Area	0	0	0	0	9,228	62
2.3 Civil Reserve	2,335	27	0	0	695	5
2.4 Military Reserve Forest	0	0	0	0	20	0
2.5 Communal Forestry Program	306	4	376	16	34	0
2.6 Grazing Land	0	0	176	8	0	0
Sub-total	2,640	31	676	29	9,977	67
3. Un-designated Area	5,136	60	437	19	2,579	17
4. Total land	8,546	100	2,314	100	14,954	100

Source : Provincial Environmental Natural Resource Office (PENRO), Iloilo

Table II.4.1 List of Soil Erosion Control Measures

Descriptions	Merits	Demerits
Vegetative Measures		
1. Contour hedgerow (Strip cropping) Vegetative rows or strips established along the contour. Trees serve as live barrier to surface runoff and soil erosion. If the nitrogen fixing crops or trees such as leguminous crops are used, it can improve soil condition	1. Economical 2. Adaptable to various conditions 3. Easier to establish and repair 4. Durable if maintained properly 5. Improve the soil condition, if nitrogen fixing crops are used	1. It takes some time to attain benefits 2. Less effective when slope is too steep 3. Hedgerows may pose competition with crops
2. Mulching The mulching is the covering of the soil with crop residues such as straw, maize stalks, palm fronds or standing stubbles. The effect of mulching is the reducing of raindrop impact and of the velocity of runoff.	1. Economical 2. Adaptable to various conditions 3. Easier to establish and repair 4. Keeping of soil moisture and temperature 5. Improve the soil condition	1. Application of mulch may be required on each cropping season in tropical area 2. It requires a large amount of grasses (materials) for mulching
3. Wattling It is vegetative structure established in contour line or intermittently along the contour. It is used to trap the soil particles that are eroded down with surface runoff. Cutting of brushwoods are interwoven to form fence.	1. Very effective and stable 2. Early achievement of protection 3. When bushwoods sprout, the leaves can be used as green manure or mulching materials	1. Difficult to find suitable sprouting brushwood rods 2. Difficult to construct
4. Agroforestry It is a system to incorporate trees within a farming system by planting them on land.	1. Economically 2. Trees can provide fuels, fodder, fruits, etc. to the farmers	1. It takes some time to attain benefits 2. Trees may pose competition with crops 3. Less effective when slope is too steep
Structural Measures		
5. Contour bunds They are earth bunds, 1.5 to 2 m wide, thrown across the slope to act as a barrier to runoff, to form a water storage area on their upslope side and to break up a slope into segments shorter in length than is required to generate overland flow. They are frequently used with strip-cropping system	1. Relatively easier to construct and repair 2. They are suitable for slopes of 1 to 7 degree.	1. The effectiveness is limited when heavy rains continue long. 2. The effectiveness is limited when used in very steep slope.
6. Terraces They are series of level or nearly level strips running across the slopes supported by steep risers.	1. Most effective measures for minimising soil erosion	1. They require a lot of time and manpower to construct 2. Soil erosion during construction stage may be high. 3. Not suitable for the sites in which topsoils only have thin layer.
7. Waterways (Contour Ditches and Drainage Canals) They are digging structures established in the hillsides to check the erosive power of surface runoff by tapping soil particles. Drainage canal (grass waterways) are used as the outlet for contour ditches. It runs downslope and empty into river system or other outlets.	1. Relatively easier to construct and repair 2. Ditches and canals can be good water impoundment structures that can hold water for plants	1. The effectiveness is limited when heavy rains continue long. 2 The effectiveness is limited when used in very steep slope.
Cultural Measures		
8. Contour Plowing It is a plowing method to create furrows following the contour of the land.	1. It increases water absorption capacity of the soil. 2. It also reduces both the quantity and velocity of surface runoff.	1. A bit difficult to plow properly.
9. Contour Planting It is a planting method following the contour of the land. The crops planted act as barriers to the force of surface runoff.	1. Easy to adopt	1. The effect is not high, if only it is adopted .

Table H.5.1 The Results of Selection of Priority Watershed Area for Model Development Project

Selection Criteria	Magapa	Suague	Panay	Jalaur	Asisig	Alibunan	Tagbacan	Ulian	Lumunan	Tambunac
Total Area (sq. km)	65	118	118	128	74	79	137	150	320	59
1. Land Category										
(Present Land Category)										
(1) Forest Land (sq. km)	4.5	47.8	114.8	2.6	21.1	57.9	30.8	67.7	67.5	29.5
(2) A&D Land (sq. km)	60.5	70.2	3.2	125.4	52.9	21.1	106.2	82.3	252.5	29.5
Ratio of Forest Land	6.9%	40.5%	97.3%	2.0%	28.5%	73.3%	22.5%	45.1%	21.1%	50.0%
Evaluation	**Low**	**Moderate**	**High**	**Low**	**Low**	**High**	**Low**	**Moderate**	**Low**	**Moderate**
2. Emergency (identified by field observation)	**High**	**High**	**Moderate**	**Moderate**	**Moderate**	**High**	**Moderate**	**High**	**Moderate**	**High**
3. Demonstration Effect										
(1) Accessibility	Moderate	Poor	Poor	Well	Well	Poor	Well	Poor	Poor	Moderate
(2) Similarity	Low	High	High	Low	Moderate	High	Moderate	High	Moderate	Moderate
Overall Evaluation	**Moderate**	**Moderate**	**Moderate**	**Moderate**	**Moderate**	**Moderate**	**Moderate**	**Moderate**	**Moderate**	**Moderate**
4. Unification										
(1) Distribution of Forest Land	High	High	High	High	Low	Moderate	High	High	Low	High
(2) Topographic Condition	High	High	High	Moderate	Moderate	High	High	High	Low	Moderate
Overall Evaluation	**High**	**High**	**High**	**Moderate**	**Moderate**	**Moderate**	**High**	**High**	**Low**	**Moderate**
5. Area Sixe (Size of Forest Land) (2,000 ha - 5,000 ha)	**Low** (too small)	**High** (suitable)	**Low** (too large)	**Low** (too small)	**High** (suitable)	**Moderate** (large)	**High** (suitable)	**Moderate** (large)	**Moderate** (large)	**High** (suitable)
6. Administratove cpndition	**Moderate** (2 munici.)	**Well** (1 munici.)	**Well** (1 munici.)	**Low** (4 munici.)	**Low** (3 munici.)	**Well** (1 munici.)	**Moderate** (2 munici.)	**Moderate** (2 munici.)	**Low** (4 munici.)	**Moderate** (2 munici.)
Based on the above evaluation on each selection criteria, the scoring evaluation is carried out. In the evaluation, three (3) point are given to "High" or "Well", and two (2) point for "Moderate and one (1) point for "Low".										
Total Score	**12**	**16**	**14**	**9**	**11**	**15**	**13**	**14**	**9**	**14**

Table II.5.2 Socio-economic Profile of Relative Barangays in Suague Sub-watershed

	Unit	Barasalon	Canawillian	Panuran	Quipot
1. General					
Population (1996)	persons	1,200	1,242	800	3,096
Households (1996)	nos.	230	207	145	578
2. Access to Infrastructures					
2.1 Power supply	-	No	No	No	No
2.2 Water supply					
Type	-	Dug well	Spring	Open well	Jetmatic pump
Water source	-	Dug well	Spring	Spring water	J-pump/spring
Beneficial household	nos.	83	7	14	23
2.3 School					
Elementary	nos.	Yes	Yes	Yes	Yes
Secondary	nos.	No	No	No	Yes
2.4 Transportation Services					
Type	-	None	Porter	Porter	Porter / None
Duration	-	-	all year	all year	all year / -
Barangay road condition	-	Passable in dry	Never	Never	Passable in dry
Distance to Poblacion	km	20	24	25	15
Sitio road condition	-	Never	Never	Never	Never
2.5 Post harvest facilities					
Rice mill	nos.	1	2	5	1
Capacity	sack/day	30	30	60	50
3. Agriculture					
3.1 Main crop					
name	-	Rice	Rice	Rice	Rice
cropped area	ha	87	82	34	94
production	ton	226	213	87	244
3.2 Second crop					
name	-	Maize	Maize	Maize	Maize
cropped area	ha	35	27	14	7
production	ton	88	68	32	18
3.3 Third crop					
name	-	Monggo	Coffee	Coffee	Banana
cropped area	ha	-	-	-	13
production	ton	-	-	-	104
4. Villagers' Intention					
1st priority concern	-	Road improvement	Water supply	Water supply	Road improvement
2nd priority concern	-	Transport service	Health service	Agri. input	Secondary school
3rd priority concern	-	Secondary school	Road improvement	Road improvement	Water supply

Source : Barangay Accessibility Survey, 1996 , Municipality of Janiuay

Table II.5.3 Seedling Requirements for Watershed Management Project in Suague Sub-watershed

Work Items	Type of Seeds	Total area (ha)	Density (nos.)	Spacing (m x m)	Year-1		Year-2		Year-3		Year-4		Total	
					Area (ha)	Nos.	Area (ha)	Nos.	Area (ha)	Nos.	Area (ha)	Nos.	Area (ha)	Nos.
1. Reforestation														
1-1 Full reforestation														
1-1 (1) Nara	seedlings	90	1,000	5 x 2	27	29,700	45	54,900	18	28,800	0	3,600	90	117,000
1-2 (2) Mahogany	seedlings	90	1,000	5 x 2	27	29,700	45	54,900	18	28,800	0	3,600	90	117,000
1-3 (3) A. Mangium	seedlings	90	1,000	5 x 2	27	29,700	45	54,900	18	28,800	0	3,600	90	117,000
1-4 (4) Teak Tree	seedlings	90	1,000	5 x 2	27	29,700	45	54,900	18	28,800	0	3,600	90	117,000
1-5 (5) Rain Tree	seedlings	89	1,000	5 x 2	27	29,700	45	54,900	17	27,700	0	3,400	89	115,700
Sub-total		449			135	148,500	225	273,500	89	142,900	0	17,800	449	583,700
1-2 Supplementary reforestation														
1-2 (1) Nara	seedlings	226	500	5 x 4	68	37,400	113	68,950	45	36,050	0	4,500	226	146,900
1-2 (2) Mahogany	seedlings	210	500	5 x 4	63	34,650	105	64,050	42	33,600	0	4,200	210	136,500
1-2 (3) A. Mangium	seedlings	210	500	5 x 4	63	34,650	105	64,050	42	33,600	0	4,200	210	136,500
1-2 (4) Teak Tree	seedlings	210	500	5 x 4	63	34,650	105	64,050	42	33,600	0	4,200	210	136,500
1-2 (5) Rain Tree	seedlings	210	500	5 x 4	63	34,650	105	64,050	42	33,600	0	4,200	210	136,500
Sub-total		1,066			320	176,000	533	325,150	213	170,450	0	21,300	1,066	692,900
Total-1		1,515			455	324,500	758	599,650	302	313,350	0	39,100	1,515	1,276,600
2. Agro-forestry														
2-1 (1) Rambutan	seedlings	201	100	10 x 10	60	6,633	101	12,261	40	24,522	0	804	201	44,220
2-1 (2) Coffee	seedlings		625	4 x 4	60	41,456	101	76,631	40	47,738	0	5,025	201	170,850
Sub-total (1)					121	48,089	201	88,892	80	72,260	0	5,829	402	215,070
2-2 (1) Lanzones	seedlings	200	100	10 x 10	60	6,600	100	12,200	40	24,400	0	800	200	44,000
2-2 (2) Coffee	seedlings		625	4 x 4	60	41,250	100	76,250	40	47,500	0	5,000	200	170,000
Sub-total (2)					120	47,850	200	88,450	80	71,900	0	5,800	400	214,000
2-3 (1) Nangka	seedlings	200	278	6 x 6	60	18,348	100	33,916	40	32,232	0	2,224	200	86,720
2-3 (2) Cacao	seedlings		1,111	3 x 3	60	73,326	100	135,542	40	68,884	0	8,888	200	286,640
Sub-total (3)					120	91,674	200	169,458	80	101,116	0	11,112	400	373,360
2-4 (1) Chico	seedlings	200	278	6 x 6	60	18,348	100	33,916	40	32,232	0	2,224	200	86,720
2-4 (2) Cacao	seedlings		1,111	3 x 3	60	73,326	100	135,542	40	68,884	0	8,888	200	286,640
Sub-total (4)					120	91,674	200	169,458	80	101,116	0	11,112	400	373,360
Total-2		601				279,287		516,258		346,392		33,853		1,175,790
3. Hedgerows														
Kakauate	seedlings	-	400	1 x 1	7	3,036	12	5,612	5	4,324	0	365	23	13,310
4. Fire-break (Banana)	suckers													
Banana	suckers	-	150	1 x 1	7	1,035	12	2,105	5	3,059	0	135	23	6,337
5. River bank protection														
Giant Bamboo	cuttings	81	2,500	2 x 2	24	66,825	41	123,525	16	52,650	0	8,100	81	251,100
6. Ground Total														
Seedlings						606,823		1,121,520		664,066		73,321		2,465,730
Cutting / Suckers						66,825		123,525		52,650		8,100		251,100

Table H.5.4 Cost Estimate for the Watershed Management Project in Suague Sub-watershed

(Unit : '000peso)

Activity	1st year	2nd year	3rd year	4th year	5th year	6th year	Total
1. Reforestation							
1.1 Nursery Establishment	0	989	1,828	956	119	0	3,892
1.2 Plantation Establishment	0	873	1,455	579	0	0	2,907
1.3 Maintenance	0	0	1,593	4,247	3,715	1,061	10,616
Sub-total	0	1,862	4,876	5,782	3,835	1,061	17,415
2 Agro-forestry							
2.1 Nursery Establishment	0	1,313	2,426	1,628	159	0	5,526
2.2 Plantation Establishment	0	944	1,581	632	0	0	3,157
2.3 Maintenance	0	0	1,695	4,524	3,959	1,130	11,307
Sub-total	0	2,257	5,702	6,784	4,118	1,130	19,991
3. Riverbank Protection							
3.1 Nursery Establishment	0	597	1,103	470	72	0	2,242
3.2 Plantation Establishment	0	36	120	48	0	0	204
3.3 Maintenance	0	0	174	472	414	116	1,176
Sub-total	0	633	1,397	990	486	116	3,622
4. Hedgerows and Firebreak							
4.1 Nursery Establishment	0	1,044	1,739	696	0	0	3,479
4.2 Plantation Establishment	0	56	184	74	0	0	314
4.3 Maintenance	0	0	0	0	0	0	0
Sub-total	0	1,100	1,924	770	0	0	3,793
5. Rural Infrastructures							
5.1 Barangay road improvement	5,943	8,121	0	0	0	0	14,064
5.2 Rural water supply	1,178	771	0	0	0	0	1,949
5.3 Bunkhouse	600	0	0	0	0	0	600
5.4 Lookout Tower	250	0	0	0	0	0	250
Sub-total	7,971	8,892	0	0	0	0	16,863
6. Preparatory work (Land use survey)	1,220	0	0	0	0	0	1,220
Total (Direct Cost)	9,191	14,741	13,898	14,325	8,438	2,307	62,904
7. Project Management Cost (Consultant / NGOs)	919	1,474	1,390	1,433	844	231	6,290
8 Physical Contingency	1,011	1,622	1,529	1,576	928	254	6,919
Total Project Cost	11,121	17,841	16,817	17,334	10,211	2,791	76,114

Table H.5.5 Budgetary Requirements for Seedling Poduction in Watershed Management Project

Work Items	Cost	Total area	Spacing	Year-1			Year-2			Year-3			Year-4			Total		
		(ha)	(m x m)	Area (ha)	Nos	Cost (p)	Area (ha)	Nos	Cost (p)	Area (ha)	Nos	Cost (p)	Area (ha)	Nos	Cost (p)	Area (ha)	Nos	Cost (p)
1. Reforestation																		
1-1 Full reforestation																		
1-1 (1) Nara	3.54	90	5 x 2	27	29,700	105,138	45	54,900	194,346	18	28,800	101,952	0	3,600	12,744	90	117,000	414,180
1-1 (2) Mahogany	3.54	90	5 x 2	27	29,700	105,138	45	54,900	194,346	18	28,800	101,952	0	3,600	12,744	90	117,000	414,180
1-1 (3) A. Mangium	2.30	90	5 x 2	27	29,700	68,310	45	54,900	126,270	18	28,800	66,240	0	3,600	8,280	90	117,000	269,100
1-1 (4) Teak Tree	3.54	90	5 x 2	27	29,700	105,138	45	54,900	194,346	18	28,800	101,952	0	3,600	12,744	90	117,000	414,180
1-1 (5) Rain Tree	2.30	89	5 x 2	27	29,700	68,310	45	54,900	126,270	17	27,700	63,710	0	3,400	7,820	89	115,700	266,110
Sub-total		449		135	148,500	452,034	225	274,500	835,578	89	142,900	435,806	0	17,800	54,332	449	583,700	1,777,750
1-2 Supplerentary reforestation																		
1-2 (1) Nara	3.54	226	5 x 4	68	37,400	132,396	113	68,950	244,083	45	36,050	127,617	0	4,500	15,930	226	146,900	520,026
1-2 (2) Mahogany	3.54	210	5 x 4	63	34,650	122,661	105	64,050	226,737	42	33,600	118,944	0	4,200	14,868	210	136,500	483,210
1-2 (3) A. Mangium	2.30	210	5 x 4	63	34,650	79,695	105	64,050	147,315	42	33,600	77,280	0	4,200	9,660	210	136,500	313,950
1-2 (4) Teak Tree	3.54	210	5 x 4	63	34,650	122,661	105	64,050	226,737	42	33,600	118,944	0	4,200	14,868	210	136,500	483,210
1-2 (5) Rain Tree	2.30	210	5 x 4	63	34,650	79,695	105	64,050	147,315	42	33,600	77,280	0	4,200	9,660	210	136,500	313,950
Sub-total		1,066		320	176,000	537,108	533	325,150	992,187	213	170,450	520,065	0	21,300	64,986	1,066	692,900	2,114,346
1-3 Sub-total																		
(1) Nara	3.54	316	5 x 4	95	67,100	237,534	158	123,950	438,429	63	64,850	229,569		8,100	28,674	316	263,900	934,206
(2) Mahogany	3.54	300	5 x 4	90	64,350	227,799	150	118,950	421,083	60	62,400	220,896		7,800	27,612	300	253,500	897,390
(3) A. Mangium	2.30	300	5 x 4	90	64,350	148,005	150	118,950	273,585	60	62,400	143,520		7,800	17,940	300	253,500	583,050
(4) Teak Tree	3.54	300	5 x 4	90	64,350	227,799	150	118,950	421,083	60	62,400	220,896		7,800	27,612	300	253,500	897,390
(5) Rain Tree	2.30	299	5 x 4	90	64,350	148,005	150	118,950	273,585	59	61,300	140,990		7,600	17,480	299	252,200	580,060
Total-1		1,515		455	324,500	989,142	758	599,650	1,827,765	302	313,350	955,871	0	39,100	119,318	1,515	1,276,600	3,892,096
2. Agro-foresury																		
2-1 (1) Rambutan	4.70	201	10 x 10	60	6,633	31,175	101	12,261	57,627	40	24,522	115,253	0	804	3,779	201	44,220	207,834
2-1 (2) Coffee	4.70		4 x 4	60	41,456	194,843	101	76,631	360,167	40	47,738	224,366	0	5,025	23,618	201	170,850	802,995
Sub-total (1)				121	48,089	226,019	201	88,892	417,794	80	72,260	339,620	0	5,829	27,396	402	215,070	1,010,829
2-2 (1) Lanzones	4.70	200	10 x 10	60	6,600	31,020	100	12,200	57,340	40	24,400	114,680	0	800	3,760	200	44,000	206,800
2-2 (2) Coffee	4.70		4 x 4	60	41,250	193,875	100	76,250	358,375	40	47,500	223,250	0	5,000	23,500	200	170,000	799,000
Sub-total (2)				120	47,850	224,895	200	88,450	415,715	80	71,900	337,930	0	5,800	27,260	400	214,000	1,005,800
2-3 (1) Nangka	4.70	200	6 x 6	60	18,348	86,236	100	33,916	159,405	40	32,232	151,490	0	2,224	10,453	200	86,720	407,584
2-3 (2) Cacao	4.70		3 x 3	60	73,326	344,632	100	135,542	637,047	40	68,884	323,755	0	8,888	41,774	200	286,640	1,347,208
Sub-total (3)				120	91,674	430,868	200	169,458	796,452	80	101,116	475,245	0	11,112	52,226	400	373,360	1,754,792
2-4 (1) Chico	4.70	200	6 x 6	60	18,348	86,236	100	33,916	159,405	40	32,232	151,490	0	2,224	10,453	200	86,720	407,584
2-4 (2) Cacao	4.70		3 x 3	60	73,326	344,632	100	135,542	637,047	40	68,884	323,755	0	8,888	41,774	200	286,640	1,347,208
Sub-total (4)				120	91,674	430,868	200	169,458	796,452	80	101,116	475,245	0	11,112	52,226	400	373,360	1,754,792
Total-2		801			279,287	1,312,650		516,258	2,426,414		346,392	1,629,040	0	33,853	159,109		1,175,790	5,526,213
3. Hedgerows Kakawate	0.28	-	1 x 1	7	3,036	850	12	5,612	1,571	5	4,324	1,211	0	368	103	23	13,340	3,735
4. Firebreak (Banana) Banana	1.07	-	1 x 1	7	1,035	1,107	12	2,105	2,252	5	3,059	3,273	0	138	148	23	6,337	6,780
5. River bank protection Giant Banboo	8.93	81	2 x 2	24	66,825	596,747	41	123,525	1,103,078	16	52,650	470,165	0	8,100	72,333	81	251,100	2,242,323
6. Ground Total						2,900,497			5,361,080			3,058,559			351,011			11,671,147

Table II.5.6 Budgetary Requirements for Establishment of Plantation in Watershed Manangement Project

Work Items	Cost*1	Total area (ha)	Spacing (m x m)	Year-1		Year-2		Year-3		Year-4		Total	
				Area (ha)	Cost (p)	Area (ha)	Cost (p)	Area (ha)	Cost (p)	Area (ha)	Cost (p)	Area (ha)	Cost (p)
1. Reforestation													
1-1 Full reforestation													
1-1 (1) Nara	2.96	90	5 x 2	27	79,920	45	133,200	18	53,280	0	0	90	266,400
1-1 (2) Mahogany	2.96	90	5 x 2	27	79,920	45	133,200	18	53,280	0	0	90	266,400
1-1 (3) A. Mangium	2.96	90	5 x 2	27	79,920	45	133,200	18	53,280	0	0	90	266,400
1-1 (4) Teak Tree	2.96	90	5 x 2	27	79,920	45	133,200	18	53,280	0	0	90	266,400
1-1 (5) Rain Tree	2.96	89	5 x 2	27	79,920	45	133,200	17	50,320	0	0	89	263,440
Sub-total		449		135	399,600	225	666,000	89	263,440	0	0	449	1,329,040
1-2 Supplecentary reforestation													
1-2 (1) Nara	2.96	226	5 x 4	68	100,640	113	167,240	45	66,600	0	0	226	333,480
1-2 (2) Mahogany	2.96	210	5 x 4	63	93,240	105	155,400	42	62,160	0	0	210	310,800
1-2 (3) A. Mangium	2.96	210	5 x 4	63	93,240	105	155,400	42	62,160	0	0	210	310,800
1-2 (4) Teak Tree	2.96	210	5 x 4	63	93,240	105	155,400	42	62,160	0	0	210	310,800
1-2 (5) Rain Tree	2.96	210	5 x 4	63	93,240	105	155,400	42	62,160	0	0	210	310,800
Sub-total		1,066		320	473,600	533	788,840	213	315,240	0	0	1,066	1,577,680
1-3 Sub-total													
1-3 (1) Nara	2.96	316		95	180,560	158	300,440	63	119,880	0	0	316	600,880
1-3 (2) Mahogany	2.96	300		90	173,160	150	288,600	60	115,440	0	0	300	577,200
1-3 (3) A. Mangium	2.96	300		90	173,160	150	288,600	60	115,440	0	0	300	577,200
1-3 (4) Teak Tree	2.96	300		90	173,160	150	288,600	60	115,440	0	0	300	577,200
1-3 (5) Rain Tree	2.96	299		90	173,160	150	288,600	59	112,450	0	0	299	574,210
Total-1		1,515		455	873,200	758	1,454,840	302	578,650	0	0	1,515	2,906,720
2 Agro-forestry													
2-1 (1) Rambutan	3.72	201	10 x 10	60	22,432	101	37,386	40	14,954	0	0	201	74,772
2-1 (2) Coffee	3.72		4 x 4	60	140,195	101	233,663	40	93,465	0	0	201	467,325
Sub-total (1)				121	162,629	201	271,049	80	108,419	0	0	402	542,097
2-2 (1) Lanzones	3.72	200	10 x 10	60	22,320	101	37,386	40	14,954	0	0	201	74,660
2-2 (2) Coffee	3.72		4 x 4	60	139,500	101	233,663	40	93,465	0	0	201	466,628
Sub-total (2)				120	161,820	201	271,049	80	108,419	0	0	401	541,288
2-3 (1) Nangka	3.72	200	6 x 6	60	62,050	101	103,933	40	41,573	0	0	201	207,556
2-3 (2) Cacao	3.72		3 x 3	60	247,975	101	415,358	40	166,143	0	0	201	829,477
Sub total (3)				120	310,025	201	519,292	80	207,717	0	0	401	1,037,033
2-4 (1) Chico	3.72	200	6 x 6	60	62,050	101	103,933	40	41,573	0	0	201	207,556
2-4 (2) Cacao	3.72		3 x 3	60	247,975	101	415,358	40	166,143	0	0	201	829,477
Sub-total (4)				120	310,025	201	519,292	80	207,717	0	0	401	1,037,033
Total-2		801		481	944,499	804	1,580,680	322	632,272	0	0	1,606	3,157,451
3 Hedgerows Kakauare	0.20	-	1 x 1	246	19,704	816	65,240	326	26,096	0	0	1,388	111,040
4. Firebreak (Banana) Banana	0.93	-	1 x 1	246	36,206	816	119,879	326	47,951	0	0	1,388	204,036
5. River bank protection Giant Bamboo	17.18	81	2 x 2	24	1,013,655	41	1,739,475	16	695,790	0	0	81	3,478,950
6. Ground Total				1,453	2,917,294	3,234	4,960,114	1,292	1,980,789	0	0	5,975	9,858,197

Table H.5.7 Budgetary Requirements for Plantation Maintenance in Watershed Management Project

Work Items	Cost	Spacing	Year-1		Year-2		Year-3		Year-4		Year-5		Total	
		(m x m)	Area (ha)	Nos.	Area (ha)	Nos.	Area (ha)	Nos.	Area (ha)	Nos.	Area (ha)	Nos.	Area (ha)	Nos.
1. Reforestation														
1-1 Full reforestation														
1-1 (1) Nara	5.40	5 x 2	0	0	27	145,800	72	388,800	63	340,200	18	97,200	180	972,000
1-2 (2) Mahogany	5.40	5 x 2	0	0	27	145,800	72	388,800	63	340,200	18	97,200	180	972,000
1-3 (3) A. Mangium	5.40	5 x 2	0	0	27	145,800	72	388,800	63	340,200	18	97,200	180	972,000
1-4 (4) Teak Tree	5.40	5 x 2	0	0	27	145,800	72	388,800	63	340,200	18	97,200	180	972,000
1-5 (5) Rain Tree	5.40	5 x 2	0	0	27	145,800	72	388,800	63	340,200	18	97,200	180	972,000
Sub-total			0	0	135	729,000	360	1,944,000	315	1,701,000	90	486,000	900	4,860,000
1-2 Supplerentary reforestation														
1-2 (1) Nara	5.40	5 x 4	0	0	68	183,600	181	488,700	158	426,600	45	121,500	452	1,220,400
1-2 (2) Mahogany	5.40	5 x 4	0	0	63	170,100	168	453,600	147	396,900	42	113,400	420	1,134,000
1-2 (3) A. Mangium	5.40	5 x 4	0	0	63	170,100	168	453,600	147	396,900	42	113,400	420	1,134,000
1-2 (4) Teak Tree	5.40	5 x 4	0	0	63	170,100	168	453,600	147	396,900	42	113,400	420	1,134,000
1-2 (5) Rain Tree	5.40	5 x 4	0	0	63	170,100	168	453,600	147	396,900	42	113,400	420	1,134,000
Sub-total			0	0	320	864,000	853	2,303,100	746	2,014,200	213	575,100	2,132	5,756,400
Total-1			0	0	455	1,593,000	1,213	4,247,100	1,061	3,715,200	303	1,061,100	3,032	10,616,400
2. Agro-forestry														
2-1 (1) Rambutan	6.68	6 x 6	0	0	60	40,080	161	107,548	141	94,188	40	26,720	362	241,816
2-1 (2) Coffee	6.68	3 x 3	0	0	60	250,500	161	672,175	141	588,675	40	167,000	362	1,511,350
2-2 (1) Lanzones	6.68	6 x 6	0	0	60	40,080	160	106,880	140	93,520	40	26,720	360	240,480
2-2 (2) Coffee	6.68	3 x 3	0	0	60	250,500	160	668,000	140	584,500	40	167,000	360	1,503,000
2-3 (1) Nangka	6.68	6 x 6	0	0	60	111,422	160	297,126	140	259,986	40	74,282	360	668,534
2-3 (2) Cacao	6.68	3 x 3	0	0	60	445,289	160	1,187,437	140	1,039,007	40	296,859	360	2,671,733
2-4 (1) Chico	6.68	6 x 6	0	0	60	111,422	160	297,126	140	259,986	40	74,282	360	668,534
2-4 (2) Cacao	6.68	3 x 3	0	0	60	445,289	160	1,187,437	140	1,039,007	40	296,859	360	2,671,733
Total-2			0	0	480	1,694,582	1,282	4,523,729	1,122	3,958,869	320	1,129,722	2,884	10,177,180
3. Hedgerows														
Kakauate	0.00	1 x 1	0	0	7	0	19	0	147	0	42	0	173	0
4. Firebreak (Banana)														
Banana	0.00	1 x 1	0	0	7	0	19	0	147	0	42	0	173	0
5. River bank protection														
Giant Banboo	2.90	2 x 2	0	0	24	174,150	65	471,656	57	413,606	16	116,100	146	1,059,413
6. Ground Total														
seedlings				0		3,287,582		8,770,829		7,674,069		2,190,822		21,852,993

Table II.5.8 Estimated Benefits on the Implementation Stage

Work Items	Total area (ha)	Density (nos.)	Spacing(m x m)	Type of Products	Yield (ton/ha)	Year of Harvest	Estimated Price (peso)	Benefit/year (peso /year)
Agro-forestry								
2-1 (1) Rambutan	201	100	10 x 10	Fruit	0.2	8th - 25 th	10.0	450,240
2-1 (2) Coffee		625	4 x 4	Dried beans	0.5	5th - 25 th	12.0	1,206,000
Sub-total (1)								
2-2 (1) Lanzones	200	100	10 x 10	Fruit	0.4	8th - 25 th	8.0	574,400
2-2 (2) Coffee		625	4 x 4	Dried beans	0.5	5th - 25 th	12.0	1,200,000
Sub-total (2)								
2-3 (1) Nangka	200	278	6 x 6	Fruit	5.2	7th - 25 th	2.0	2,079,440
2-3 (2) Cacao		1,111	3 x 3	Dried beans	0.7	4th - 25 th	15.0	2,100,000
Sub-total (3)								
2-4 (1) Chico	200	278	6 x 6	Fruit	5.8	6th - 25 th	2.5	2,917,610
2-4 (2) Cacao		1,111	3 x 3	Dried beans	0.7	4th - 25 th	15.0	2,100,000
Sub-total (4)								
Total	801							12,627,690
Hedgerows								
Kakauate	-	400	1 x 1	Fuel wood	0.3 (cu. meter)	8th - 25 th	100.0	598,000
Firebreak (Banana)								
Banana	-	150	1 x 1	Fruit	0.5	2th - 15 th	4.0	49,680
River bank protection								
Giant Banboo	81	2,500	2 x 2	Culms	10,000 (poles)	10th - 25 th	7.5	6,075,000
Ground Total (after 10 years)								19,350,370

Remark : The benefit from reforestated area is not counted since the reforestated forest shall be protected from harvesting.

Figures

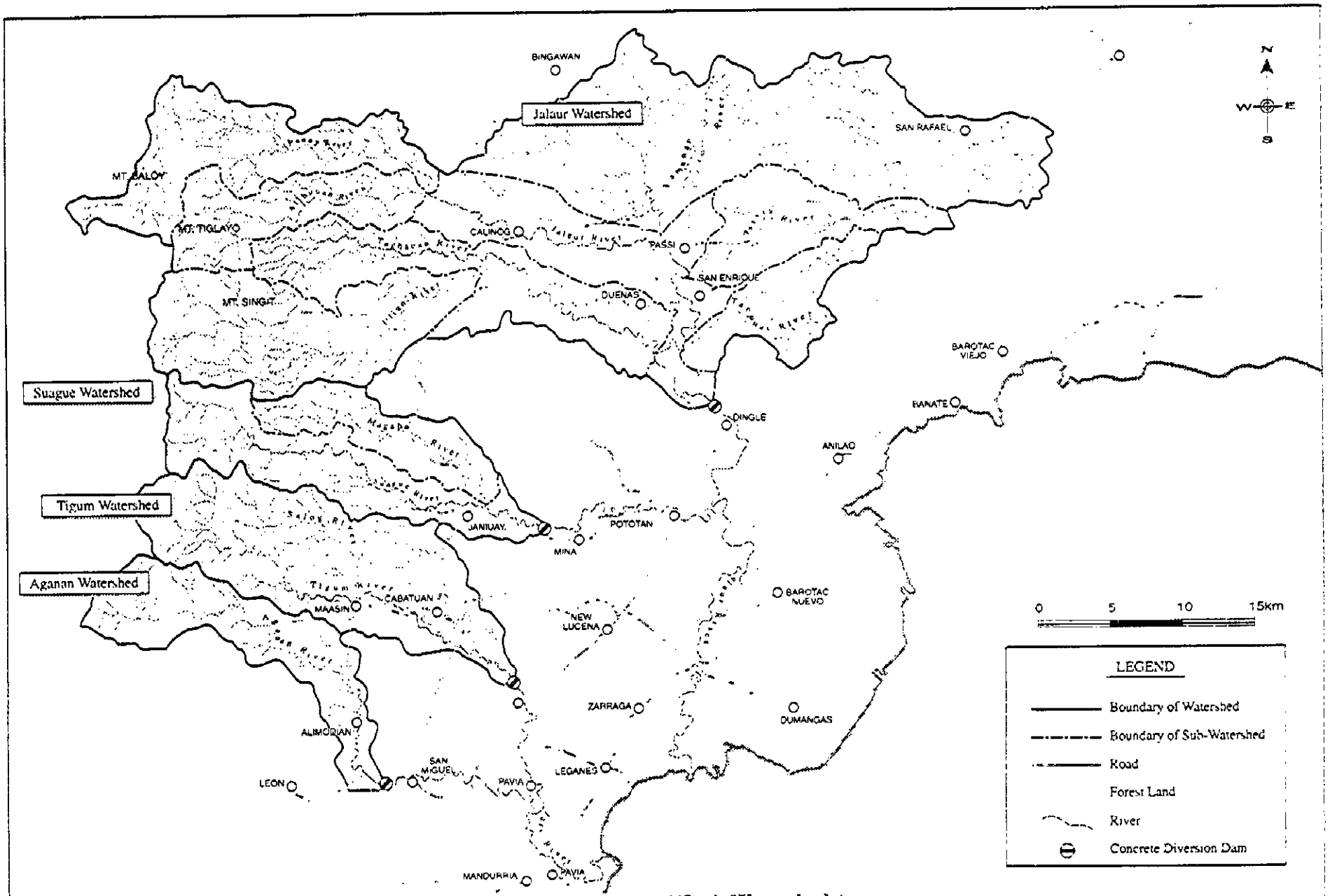


Figure H.2.1 Location Map of Each Watershed Area

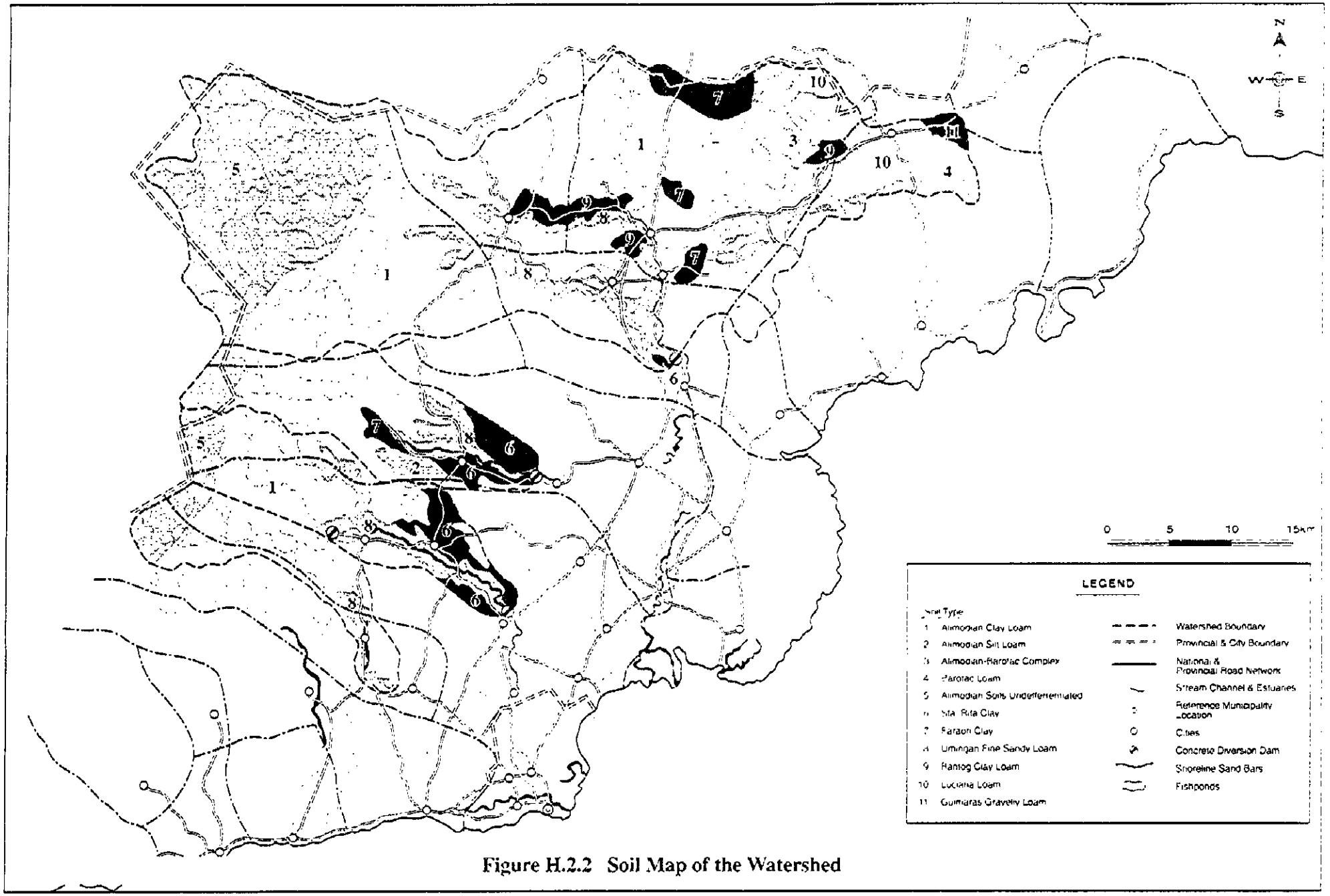


Figure H.2.2 Soil Map of the Watershed

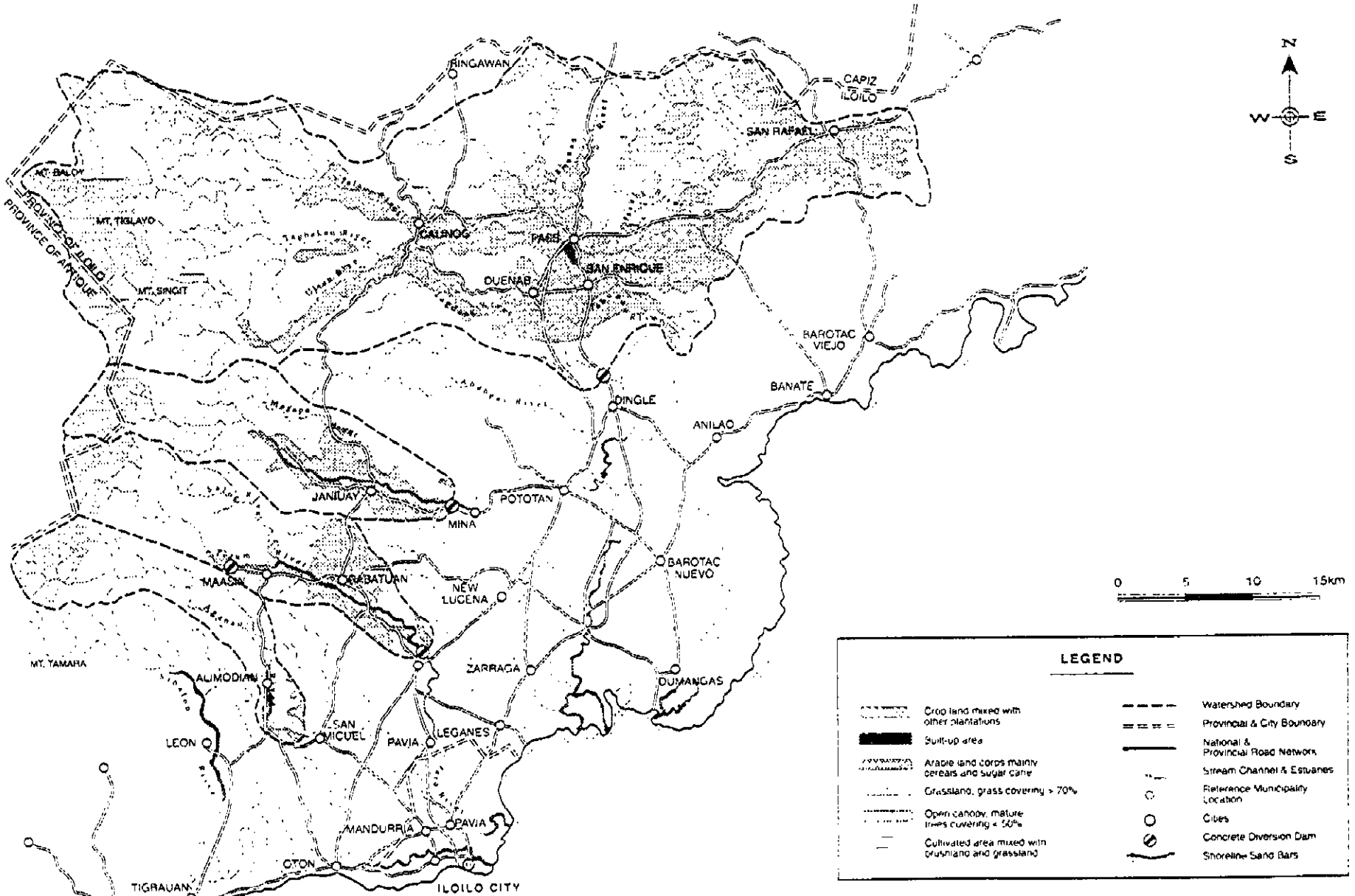


Figure H.2.3 Land Cover Map of the Watershed

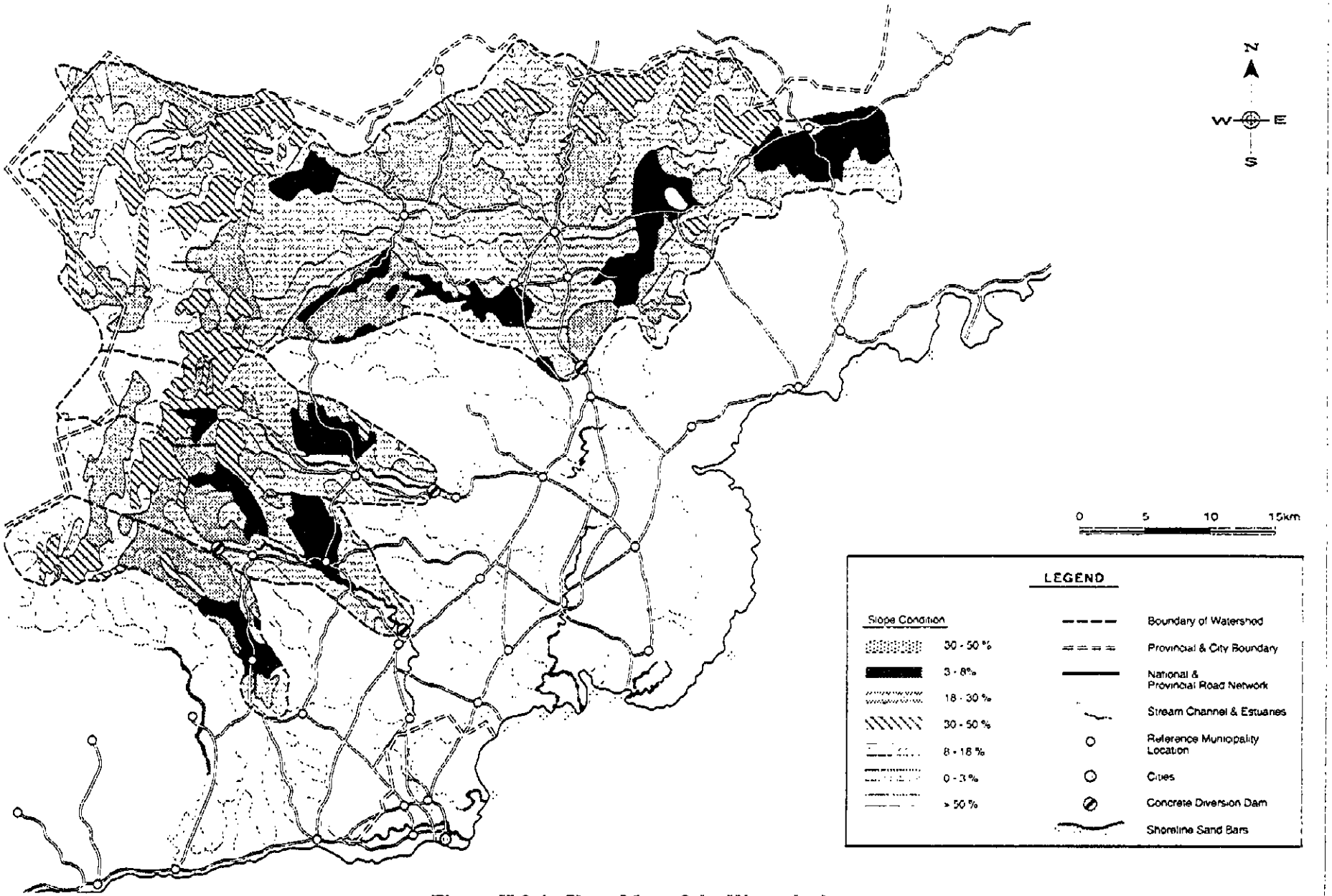


Figure H.2.4 Slope Map of the Watershed

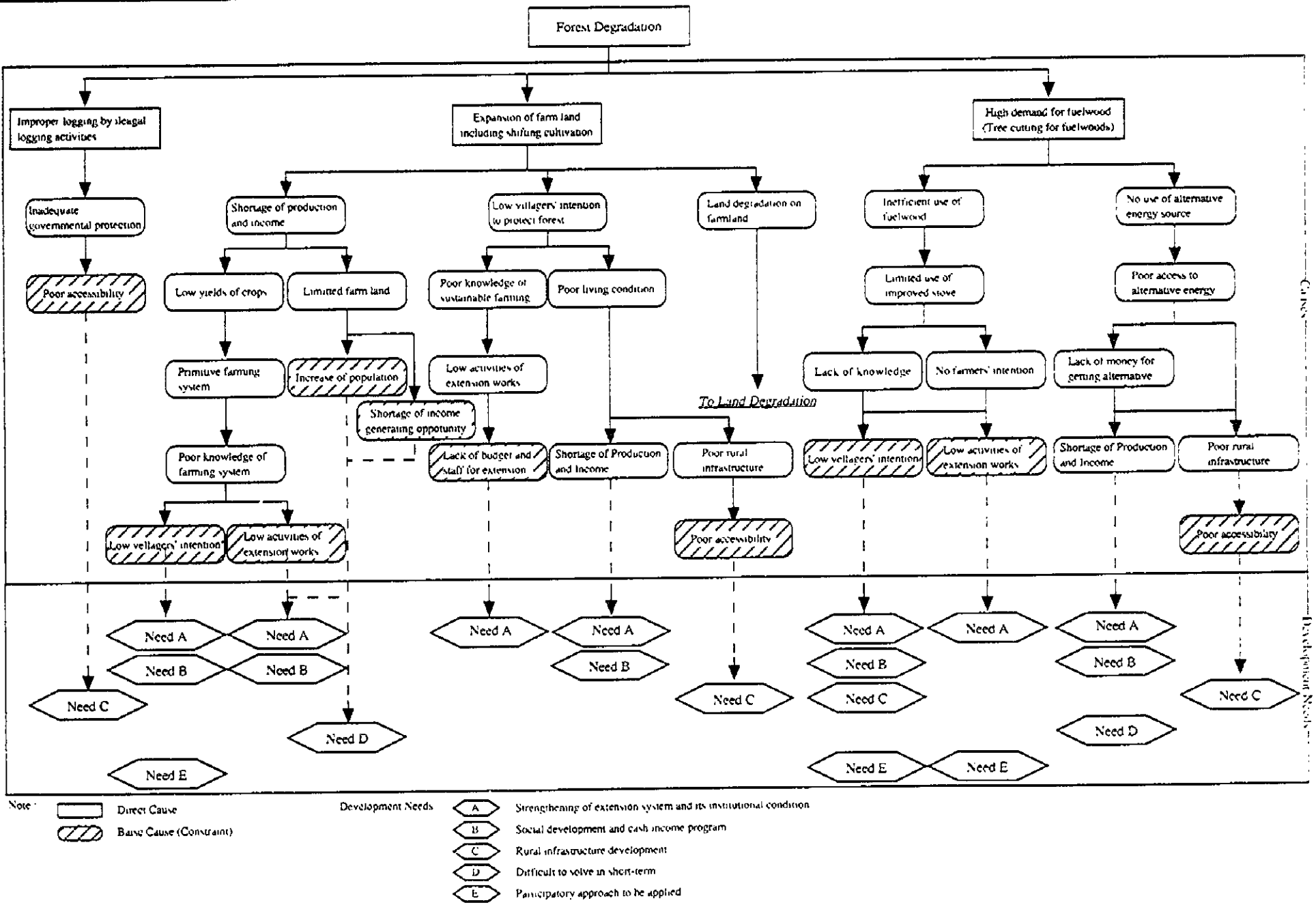


Figure H.3.1 (1/2) Causes of Watershed Degradation and Development Needs (Forest Degradation)

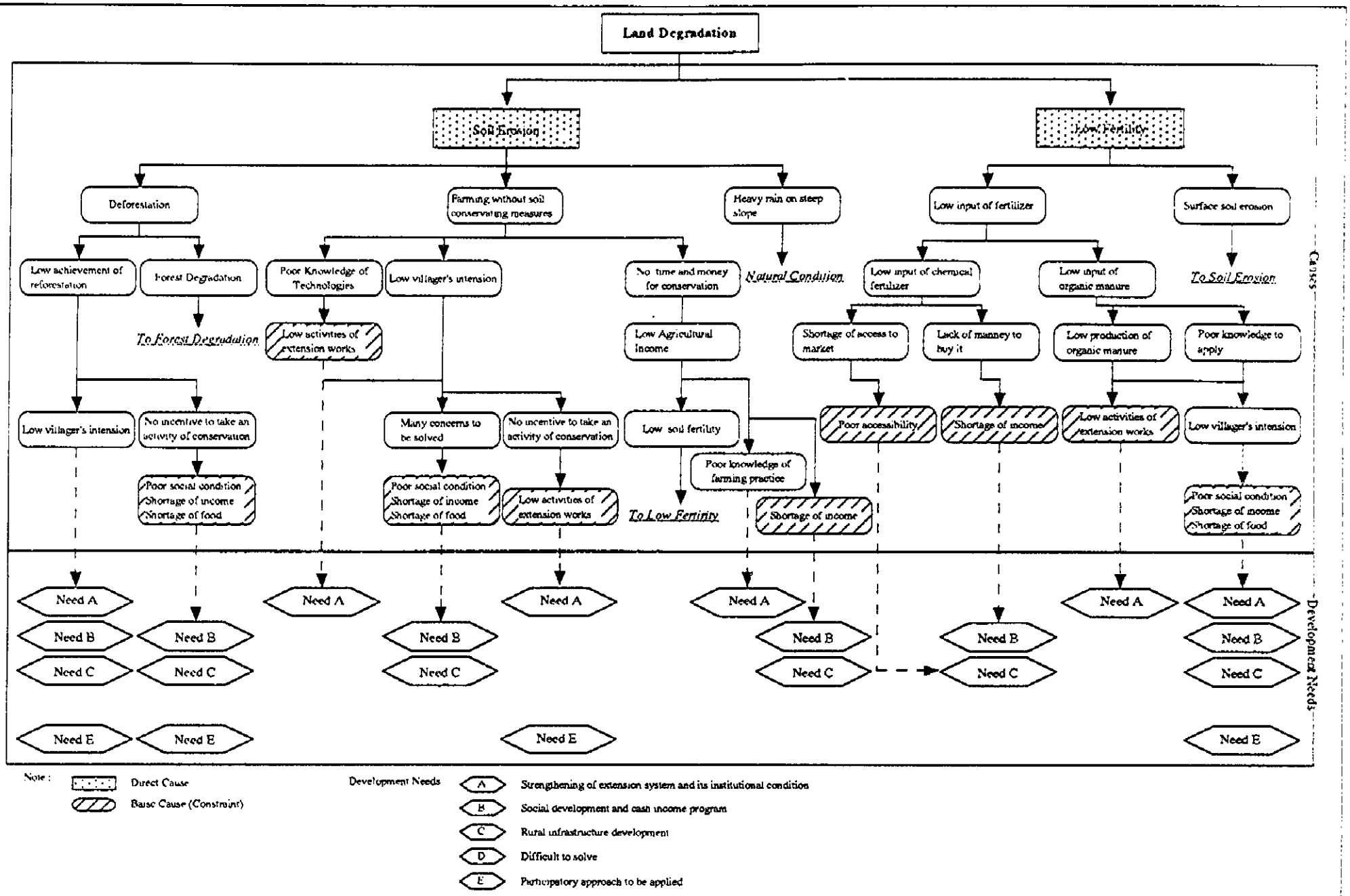


Figure H.3.1 (2/2) Causes of Watershed Degradation and Development Needs (Land Degradation)

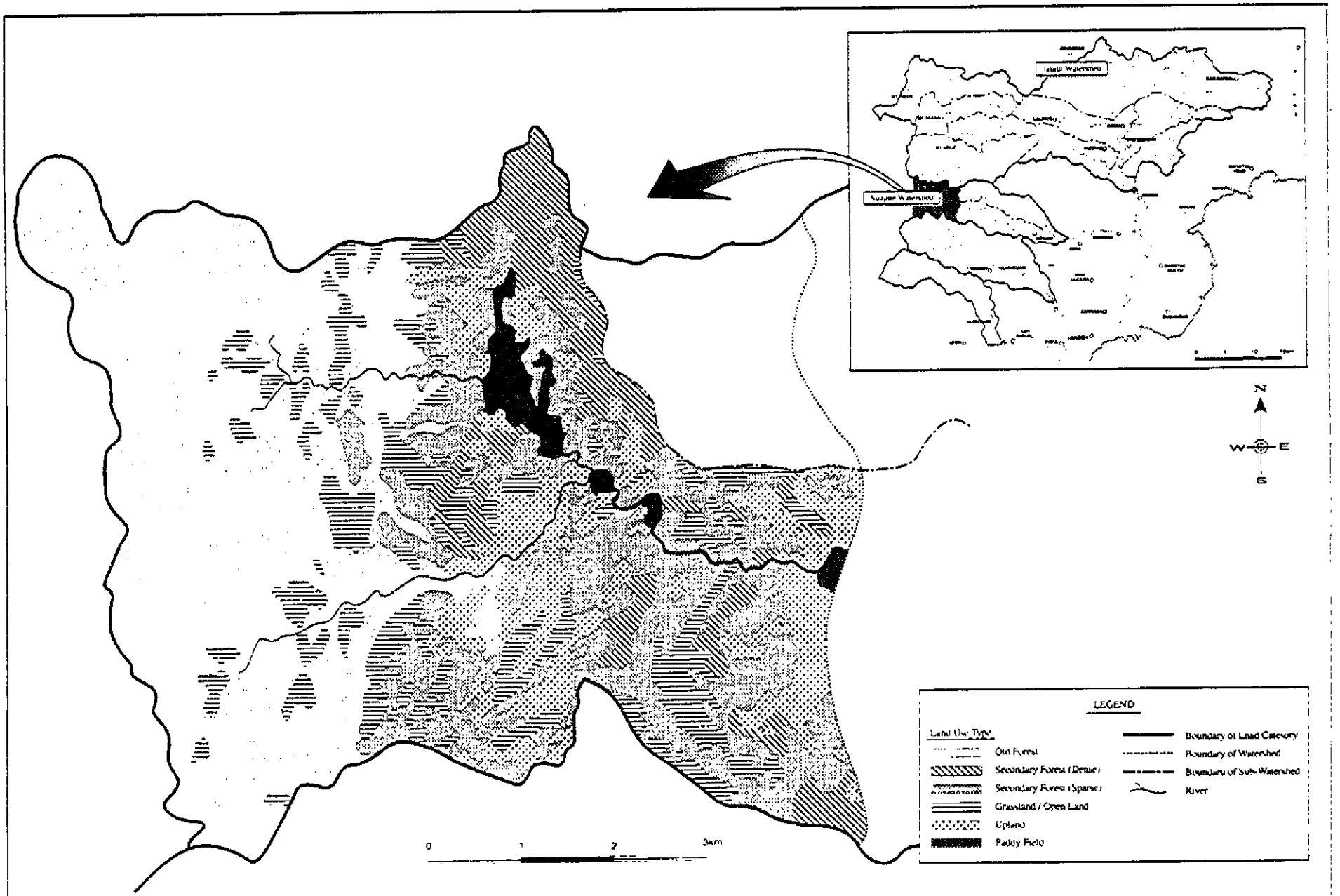


Figure H.5.1 Land Use Map of Model Site in Suague Sub-watershed

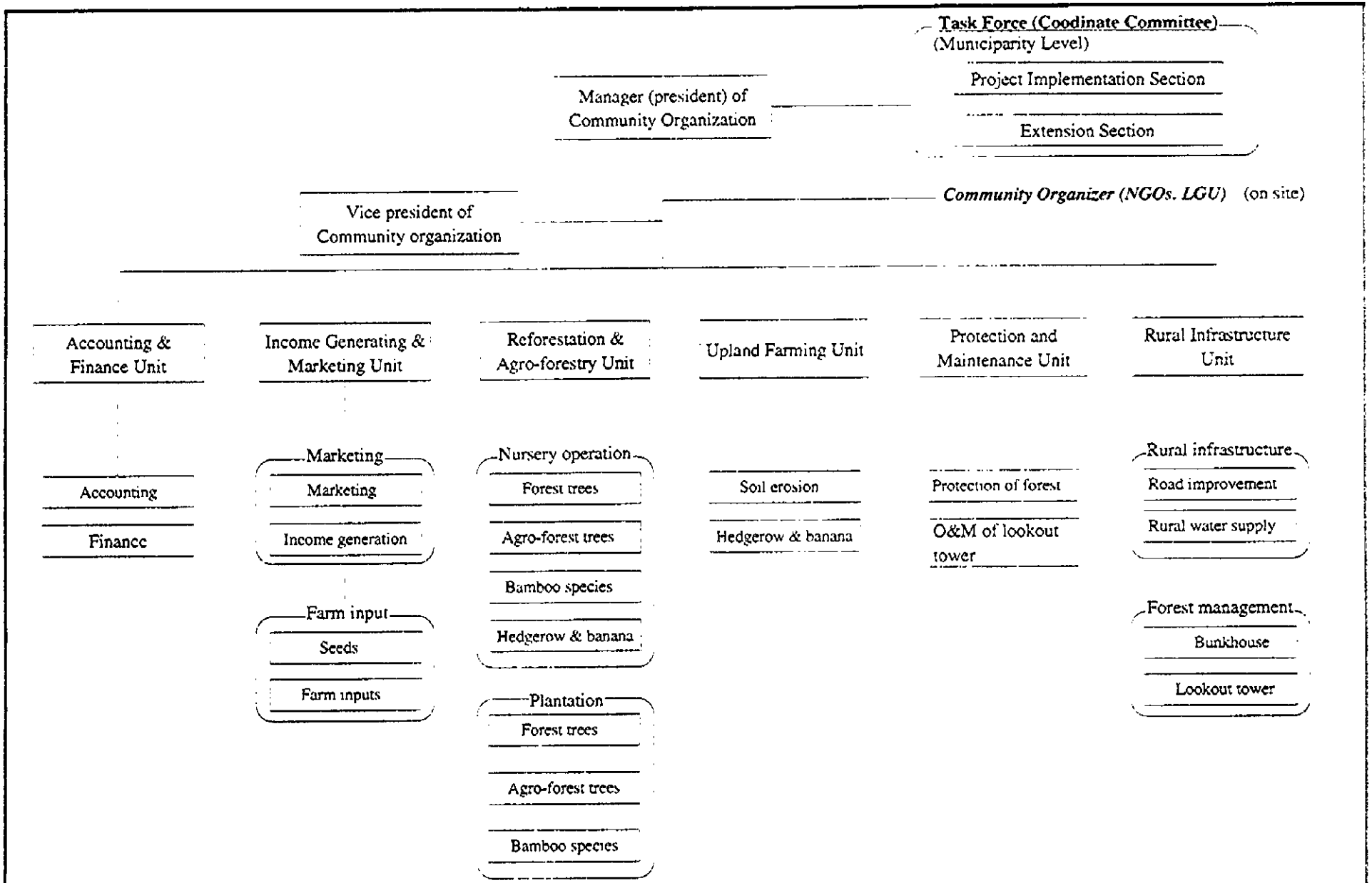
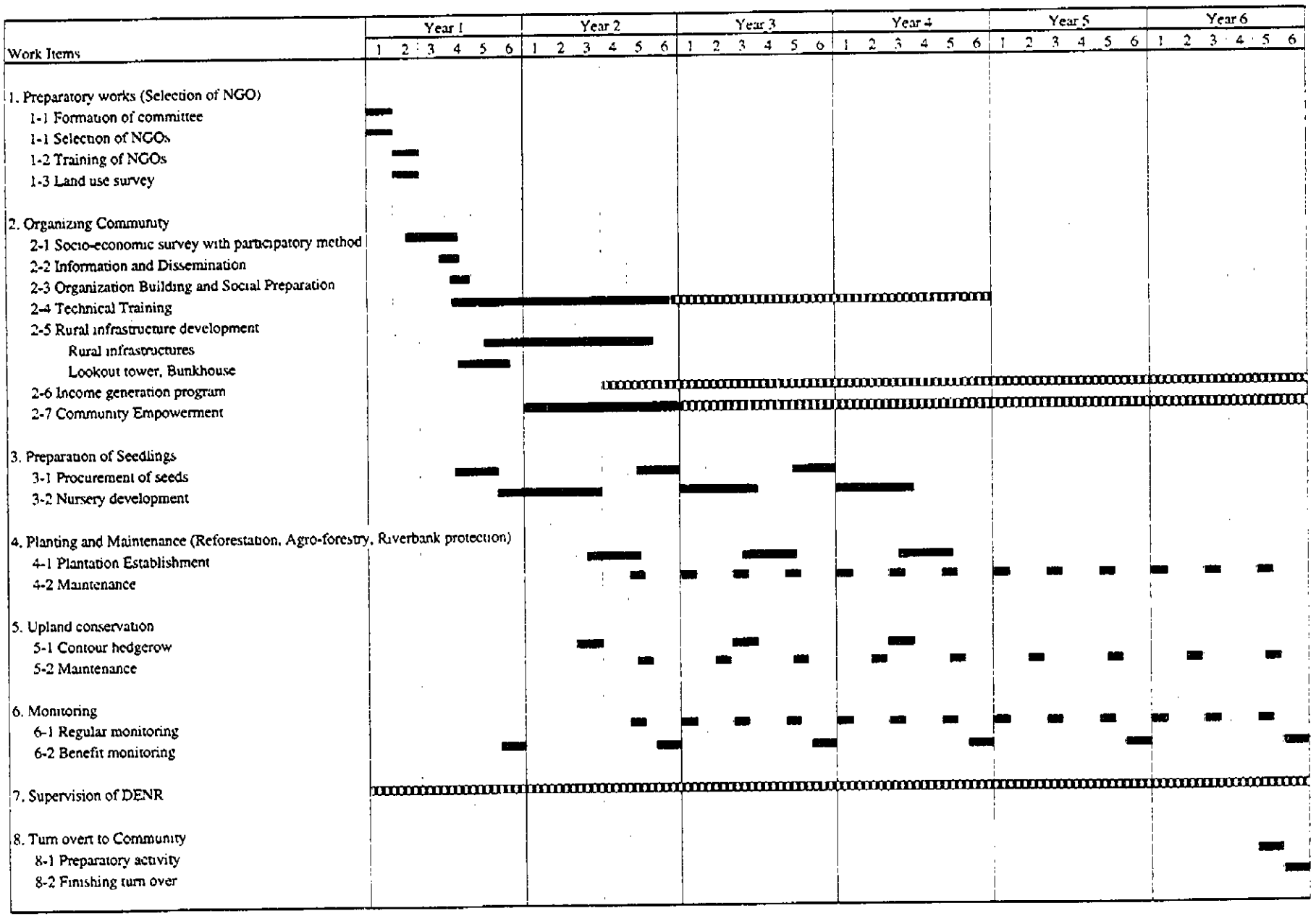


Figure H.5.2 Proposed Organization Structure of Community Organization

Figure H. 5.3 Tentative Implementation Schedule for Model Development of Watershed Management Plan



ANNEX I

Environment

THE STUDY ON JALAUR IRRIGATION SYSTEMS AND RURAL AREA DEVELOPMENT PROJECT

ANNEX I
Environment

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1. INTORODUCTION

1.1 General

This annex describes the environmental impact assessment system in the Philippine, the present environmental condition, results of the environmental assessment study, and the environmental monitoring plan of the priority project areas. It largely relies on the secondary data collected during the field survey period. Field survey was conducted to grasp the natural condition, particularly those of the proposed project sites. The assessment of the probable environmental impact was carried out considering the present condition of the project sites and the proposed features of each project. A detailed survey to make quantitative and qualitative projection of the impacts was not fully undertaken because of no impact that require such survey was identified. It shall be noted that in the feasibility study, an emphasis has been placed on to minimize the probable adverse environmental impacts from the beginning of the plan formulation process.

1.2 EIA System in Philippines

(1) Department of environment and natural resources (DENR)

The DENR was established in 1987 by reorganizing the Department of Natural Resources (DNR) and transferring to it the environment units from other national government agencies. Its mandate is to ensure the sustainable use, development, management, renewal and conservation of country's forest, mineral lands, offshore areas and other natural resources, including the protection and enhancement of the quality of the environment. The DENR is composed of eight Staff Offices, six Staff Bureaus, and the Field Offices which are composed of the regional, provincial (PENRO) and community natural resources offices (CENRO). The six Staff Bureaus and their major functions are:

(i) Forest Management Bureau
Reforestation, range management, watershed rehabilitation, forest protection, timber management, and implementation of ISF program

(ii) Land Management Bureau
Land disposition, land surveys, and land record management

(iii) Mines and Geo-Sciences Bureau
Geological surveys and mining rights application and processing

(iv) Environmental Management Bureau
EIA processing and environmental quality monitoring

(v) Ecosystem Research and Development Bureau
Technology generation and verification on the restoration, development and rehabilitation of deteriorating ecosystems and natural resources

(vi) Protected Areas and Wildlife Bureau
Management of protected areas, preservation of biological diversity, and maintenance of recreational sites

The organization chart of the DENR is shown in Figure I.1.1.

(2) Environmental impact assessment system

The legal framework for environmental impact assessment (EIA) in the Philippines originated in the enactment of Presidential Degree No.1151 of 1977. A system for the preparation of environmental impact statement (EIS) was subsequently adopted pursuant to P.D.

No. 1586 of 1978. Further, Presidential Proclamation No. 2146 of 1981 declared a number of environmentally critical projects and areas for which environmental impact documents must be prepared. Under the laws project proponents are required to submit an EIS or Project Description (PD) when the projects fall within the following criteria:

(a) Environmentally Critical Projects (ECP)

A. Heavy Industries
   1. Non-Ferrous Metal Industries (the capacity > 3,000 ton/year)
   2. Iron and Steel Mills (the capacity > 30,000 ton/year)
   3. Petroleum and Petrochemical Industries (the capacity > 30,000 barrels/year)
   4. Smelting Plants (the capacity > 15,000 ton/year)

B. Resource Extracting Industries
   1. Major Mining and Quarrying Projects
   2. Forestry Projects (only for commercial-scale logging and wood processing project)
   3. Dikes for/and Fishpond Development Projects

C. Infrastructure Projects
   1. Major Dams (the storage volume > 20 million m^3)
   2. Major Power Plants (the capacity > 10 MW, the capacity > 6 MW for hydro-power only)
   3. Major Reclamation Projects (> 1.0 ha)
   4. Major Roads and Bridges

(b) Environmentally Critical Areas (ECA)

A. All areas declared by law as national parks, watershed reserves, wildlife preserves and sanctuaries
B. Areas set aside as aesthetic potential tourist spots
C. Areas which constitute the habitat for any endangered or threatened species of indigenous Philippine wildlife (flora and fauna)
D. Areas of unique historic, archeological, or scientific interests
E. Areas which are traditionally occupied by cultural communities or tribes
F. Areas frequently visited and or hard-hit by natural calamities (geologic hazards, floods, typhoons, volcanic activities, etc.)
G. Areas with Critical slope (>40%)
H. Areas classified as prime agricultural lands
I. Recharged areas of aquifers
J. Waterbodies (for domestic purposes and wildlife and fisheries activities)
K. Mangrove areas
L. Coral Reefs

For projects that fall within Environmentally Critical Project (ECP), project proponents must submit an EIS to Environmental Management Bureau (EMB) of DENR. For projects that are located in Environmentally Critical Area (ECA), project proponents must submit Project Description (PD) to DENR Regional Offices. The project proponents who submitted PD may be required later to submit an EIS if deemed necessary. The PD is a brief and inconclusive description of the project and its environmental impacts. On the contrary, the EIS is more comprehensive and includes the detailed description of the project, the prediction and assessment of impacts and

project alternatives.

The EIS Unit of EMB is responsible for processing the EIS. Meanwhile, the EIS Unit of DENR Regional offices is responsible for the processing of the PD. During the evaluation process, an ocular inspection and further review by the EIS Review Committee may be carried out if necessary. Public hearing may also be conducted when the project would affect a large number of people or when public opposition against the project is great. An Environmental Compliance Certificate (ECC) is issued by the DENR Secretary or Regional Executive Directors to projects after having satisfied the process. Compliance monitoring will be conducted for all ECPs by the EMB and all other projects by the DENR Regional Offices.

As for the proposed project, the Project does not fall into ECP, but the project area is located in the ECA. The proponent (NIA) should submit the PD to the regional office (Region IV) of DENR.

2. PRESENT ENVIRONMENTAL CONDITION OF THE FIVE (5) RISs

2.1 Physical Environment

2.1.1 Location and Topography

The Study area is located on alluvial plain of two river systems of Jaro and Jalaur rivers in Iloilo province and lies within the coordinates 10°37'50" and 11°00" east longitude and 122°38" and 122°45" north latitude. The Study area consists of five (5) existing RISs, namely Jalaur Proper, Jalaur Extension, Suague, St. Barbara and Aganan . The gross land area of the Study area are shown below.

i)	Jalaur proper	12,930
ii)	Jalaur extension	5,670
iii)	Suague	4,280
iv)	Aganan	6,520
v)	Sta. Barbara	4,820
Total		34,220

The Study area covers 13 municipalities and 10 barangays of Iloilo city, and its watershed area covers 12 municipalities. The elevation of the Study area ranges from 25 - 50 m above sea level at each dam site to near sea level at the mouth of rivers.

2.1.2 Climate and Hydrology

(1) Climate

Meteorological data for the study area were collected from PAGASA Iloilo. The data of Iloilo station is represented for the 5 RISs. Climatological conditions such as rainfall, temperatures are shown below :

Project areas	Jan	Feb.	Mar	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
Rainfall (mm)	39.4	23.9	29.6	50.9	118.2	303.8	340.4	383.6	285.6	268.3	176.2	84.6	2104.5
Rain days (days)	8	5	5	5	10	19	20	20	19	18	14	11	154
Temperature (°C)													
Max.	29.8	30.4	31.7	33.1	33.2	31.6	30.7	30.5	30.8	31.1	30.9	30.2	31.2
Min.	22.7	22.8	23.4	24.6	25.1	24.7	24.4	24.5	24.3	24.2	24.0	23.3	24.0
Mean	26.2	26.6	27.6	28.9	29.1	28.2	27.6	27.5	27.6	27.6	27.5	26.8	27.6

Remarks :Available period for data are for 30 years of 1961 to 1995.

About 90 % of annual rainfall is observed during wet season (May to November). Even during the driest month, the study area receives a few days of rainfall which facilitates crop cultivation to a large extent. It is notable that annual rain fall days total to over 150 days, i.e., more that 40 % of the year.

(2) Hydrology

The catchment areas of each river at the dam site range from 104 to 1,065 km². The mean monthly flows of each river vary from an occasional peak of 4.0 - 78.6 m³/sec during monsoon to 0.2 - 20.2 m³/sec in dry season (February - April). The mean annual runoffs of each river at the dam site are as shown below :

Project	River Basin	Mean Runoff	Catchment Area
Aganan	Aganan	1.7 m^3/sec	101 km^2
St. Barbara	Tigum	5.4 m^3/sec	193 km^2
Suague	Suague	6.4 m^3/sec	181 km^2
Jalaur Prop. & Ext.	Jalaur	49.4 m^3/sec	1,065 km^2

2.1.3 Ground Water

Ground water is widely utilized for drinking water supply for households in the rural area as well as supplementary irrigation to surface irrigation from the RISs. The shallow tube wells are mostly utilized during the dry season from December to April, when irrigation water supply from the RISs is limited. During this season, reduction of ground water level was reported in some area due to excessive pumping of ground water, resulting in the abandonment of some shallow tube wells.

2.1.4 Water Quality

To evaluate the suitability for irrigation use and to assess drainage water quality, a water quality test which consists of 28 items was carried out in mid.- to late-February 1997. Therefore, the results of the analysis is the ones of the water quality in the dry season only when the river flow is low. A total of 30 samples was taken at dam sites of upstream of each river and the drainage channels, etc. The location of sampling points are shown in Figure I.2.1 and the results of analysis are presented in Table I.2.1. The following table shows the average values of main parameters concerned with water use among 28 items.

River name	pH	TDS mg/l	DO mg/l	BOD mg/l	EC S/cm	TSS mg/l	Nitrogen mg/l	Or.- P mg/l	Cl mg/l	Boron mg/l	SAR
Irrigation water at dam site											
Aganan	8.0	180	2.6	2.0	0.8	173	0.0	NIL	20	<0.01	2.8
Sta. Barbara	7.5	210	2.7	1.3	0.5	520	0.2	2.7	14	<0.01	1.3
Suague	7.8	180	2.8	22.0	0.4	581	0.1	NIL	9	<0.01	1.1
Jalaur	7.0	190	1.5	128.0	0.3	39	0.0	NIL	12	<0.01	0.4
Irrigation water on upstream											
Aganan	7.6	180	2.0	1.6	0.7	35	0.1	NIL	16	<0.01	1.9
Sta. Barbara	6.9	190	3.8	3.0	0.4	822	0.0	1.9	13	<0.01	1.0
Suague	7.7	170	3.0	17.5	0.3	3,084	0.3	2.9	11	<0.01	1.0
Jalaur	7.7	87	5.2	22.2	0.2	980	0.3	0.8	8	<0.01	0.4
Drainage water											
Aganan	7.5	180	1.1	4.8	0.7	86	0.6	2.2	22	<0.01	1.3
Sta. Barbara	7.2	410	3.7	5.3	0.9	41	0.3	NIL	10	<0.01	2.7
Suague	7.4	230	3.5	3.5	0.6	44	0.3	NIL	35	<0.01	1.0
Jalaur prop.	7.6	123	2.5	3.1	0.3	304	0.1	NIL	10	<0.01	0.8
Jalaur ext.	7.5	107	2.1	6.1	0.3	138	0.1	0.5	76	<0.01	0.6
Ground water											
Aganan	7.4	345	2.0	8.3	1.6	348	0.1	NIL	53	<0.01	0.6
Sta. Barbara	8.2	500	-	29.0	0.2	26	0.1	NIL	99	<0.01	2.4

Source : JICA Study Team (1997)

The following paragraphs explain the evaluation results based on the water quality criteria of Philippines ("Water Quality Criteria", DENR Order No. 34), FAO (I&D Paper 29) and Japan (Water quality criteria for irrigation, MAFF, 1970; Criteria for conservation of river surface water, Department of Environment, 1971). The detailed criteria for agricultural use and for the fishery water are presented in Table I.2.2.

(1) Irrigation water

(a) The BOD (Biochemical Oxygen Demand) values of water at the dam site in the Suague and Jalaur RISs are on a high level which exceed the criteria. This is assumed to be attributed to the sampling period when the river flow is relatively low in the dry season. There are two sources for the high BOD values. One source is the domestic waste water from the populated area, and another is the waste water from the sugarcane mills in the upstream. The water in the Jalaur intake dam site is believed to be affected by two sugar milling factories, Passi Sugar Central and New Frontier, located in Passi. However, the Passi Sugar Central operates waste water treatment facilities and treated water is utilized for its operation. This factory is not considered as the main source of high BOD. New frontier has not been surveyed on its waste water.

The data on water quality in rainy season is quite low according the results of the water quality analysis carried out by DENR on 1996, as shown below.

Month	1	2	3	4	5	6	7	8	9	10	11	12
BOD (mg/lit)	n.a.	90	66	18.8	0.8	n.a.	0	3.6	n.a.	1.4	n.a.	2

Source : DENR, Region IV

The crop damages caused by the poor water quality of irrigation water have not occurred at all. Thus, this is basically considered as a minor environmental problem. However, since the values of DO (Dissolved Oxygen) are relatively low, the deoxidization might occur and it might affect the root growth of paddy in dry season. It is recommended to promote a proper drainage management for the oxidation from the agronomic aspect, and to continuously monitor the water quality to previously prevent the occurrence of environmental problems.

b) The values of TSS (Total Suspended Solid) are also significantly high, although the values vary from 39 to 581 ppm at the dam sites. It indicates the high sedimentation loads at three (3) dam sites such as Aganan, Sta Barbara and Suague.

c) Organic-phosphate was occasionally detected from the water sources. It should be analyzed to clarify the type of org.-phosphate. If its source is from agrochemical such as parathion, ENP, etc. and its contamination is stably continued, the water source may not be suitable for irrigation use.

(2) Drainage water (for fishery)

a) In the downstream of the Study area, drainage water is only used for water source of fish culture. Therefore, the quality is evaluated on the basis of the criteria of fish pond water. While DO in samples from all drainage channels is insufficient in comparison with the criteria, it will not be a severe limitation for fish culture since most of the ponds are brackish type and the drainage water is mixed with sea water by a tidal effect.

b) Organic-phosphate was also detected from the drainage water. As mentioned above, it should be classified as to the type of org.-phosphate and determine its stability.

2.1.5 Soils

The soils of the project areas consist of three (3) soil series based on the USDA Soil Taxonomy system. The soil units identified in the areas are shown below :

Project		Soil Taxonomy Classification
1	Aganan	Typic Epiaquerts
2	St. Barbara	Typic Epiaquerts
3	Suague	Typic Epiaquerts
4	Jalaur Proper	Typic Epiaquerts, Typic Hapludalfs, Fluventic Eutropepts
5	Jalaur Extension	Typic Epiaquerts, Typic Hapludalfs, Fluventic Eutropepts

Typic Epiaquerts are generally silty to clayey soil and have a hydrogenetic features under poor drainability. Typic Hapludalfs are weathered clay soils but have a well drained condition. Fluventic Eutropepts are relatively young fine loamy soils on the recent flood plain which are seasonally subjected to flooding.

2.2 Biological Environment

2.2.1 Land Use

The present land use in the Study area is classified into (a) paddy field, (b) sugarcane fields, (c) orchard fields, and (d) non-agricultural land including urban, village, rivers, grazing land, etc.. The area of each category is given below. Out of the total area of 34,220 ha, gross agricultural land occupies about 75 % or 25,630 ha.

(Unit : ha)

Land Use	Aganan	St. Barbara	Suague	Jalaur Prop.	Jalaur Ext.	Total
1. Agricultural Land	(4,840)	(3,330)	(3,340)	(10,280)	(3,840)	(25,630)
(1) Paddy fields	4,840	3,330	3,290	9,800	2,910	24,170
(2) Sugarcane fields	0	0	50	440	850	1,340
(3) Orchard fields	0	0	0	40	80	120
2. Non-agricultural Land <1	(1,680)	(1,490)	(940)	(2,650)	(1,830)	(8,590)
Total	6,520	4,820	4,280	12,930	5,670	34,220

Remarks : Area is identified by gross area
<1 : Non-agricultural land includes urban and village area, roads, rivers / creaks, etc.

2.2.2 Wild life (Flora and Fauna)

Forest with certain ecological and commercial values does not exist in the project area. No endangered wildlife are also reported within the project area. Since crop cultivation has been conducted for long periods, all the lands within the project area are classified as Alienable and Disposable Lands owned by individuals.

Natural vegetation and wildlife are noticeable outside, but are near the project area. In the steep mountains extending over the highest part of the watersheds, old and virgin forest is existing in a limited area. This is now protected under the classified public forest land. In this forest area, considerable species of wildlife are assumed to be available, such as wild pig (Suscelebenesis), palm civet (Paradoxurushermaphroditus), deer (Cervus sp.), birds (eagles, hawks, falcons, fly catchers). Along the seashore located outside of the project area, the mangrove colonies have existed until 1970s or early 1980s. Most of the mangrove colonies have already been converted to fish ponds, and only a small area remains along the rivers and creeks at present. Wildlife species associated with the nearby mangrove vegetation include shellfishes, lizards, fishes and birds such as waders, migratory birds, kingfishers.

2.2.3 Historical and Cultural Assets, National Parks and Reserved Area

There are no historical and cultural assets, national parks and reserved area in the Study area (in the five RISs). Near the Study area, several reserved areas and national parks are located, as listed below, and Figure I.2.2 shows the location of each environmental sensitive site.

Reserved area	Name	Location	Area (ha)
National Park	Bulabog-Puti-An National Park	Dingle, Pototan, Duenas, San Enrique	845
	Panay Mountain National Park (to be proclaimed in December 1997)	Calinog, Lambuano	6,000
Watershed Reserved Area	Maasin Watershed Area	Maasin	5,800
	Jalaur Watershed Area	Calinog	9,228
Reserved Forest	Military Reserved Forest	Calinog	20
	Primary Forest	Lambuano	758
Reservation Area	Western Visaya State University Reservation	Calinog, Lambuano	3,464

Source : Department of Environment & Natural Resources, Region VI

2.2.4 Fish Ponds Located in the Downstream of the Study Area

Many fish ponds were found in the downstream of the Study area, especially in the coastal area of Dumangas, Zarraga and Barotac Nuevo municipalities located in the downstream of Jalaur proper and extension areas. Total area and number of fish ponds in the downstream are shown below, and the location of the fish pond is shown in Figure I.2.2.

Irri. Scheme	Area of fish pond	No of operator	Products
Aganan	3	2	undeveloped
Jalaur Proper	2,670	152	Milk fish, tilapia, shrimp, prawns
Jalaur Extension	4,360	273	Milk fish, tilapia, shrimp, seabass, mud crab

Source : Department of Agriculture (DA), Region VI

The ponds are brackish type which use water from the creek, shallow well and sea water. Under the existing condition, drainage water from the Jalaur proper and extension RISs flows into the creeks, and fish pond operators utilize water from the creeks. While the drainage water might contain the residual fertilizers and agro-chemicals, damage on fish production has not been observed.

2.3 Social Environment

2.3.1 Population

A total of 217 barangays are located in the Study area. The population and the number of households as of 1995 are estimated at about 392.2 thousand persons in 75.4 thousand households. The average family size is estimated at 5.2. Population density in the Study area is 4.2 persons/ha, which is higher than the average of Iloilo province (3.5 persons/ha).

2.3.2 Socio-economic Situation

Other social indicators in Iloilo province and in the Study area are summarized as the following table on the basis of the statistical data on 1996.

Indicators	Unit	Study area	Province	Country
Labor force	(1000 persons)	239	1,200	28,057
Employed population	(1000 persons)	104	666	25,700
Employment rate of Agriculture	(%)	64	43	44
Unemployment rate	(%)	17	22	8

Source : NSCB (National Statistical Coordination Board), 1996 Philippine Statistical Yearbook, and NSCB, 1995 Regional Social and Economic Trends

Remark : Data of Study area is represented by the municipal level data.

It should be noted that the areas of Aganan and Sta. Barbara RISs has been under rapid urbanization due to expansion of the Iloilo city. Therefore, the irrigation service areas of both NISs are being reduced year after year. The following table shows differences of the irrigation service area (net area) between present and original ones.

(Unit : ha)

	Aganan	Sta. Barbara	Suague	Jalaur Proper	Jalaur Extension
Original	5,500	4,600	2,900	9,000	2,700
Present	4,360	3,000	2,960	8,820	2,620

2.3.3 Health

According to the provincial health office in Iloilo province, there is no incidence of vector born diseases, such as malaria, schistosomiasis. It is also obvious from the results of socio-economic survey. The common diseases in the study area are diarrhea and stomach upset, pneumonia, bronchitis, influenza, and occasionally tuberculosis (TB).

Total eight (8) district / municipality hospitals are in the Study area. Aside from these, Department of Health (DOH) has field offices and also their staff for each municipality. Total 557 staff are working as physician, nurse, midwife and nutritionist in field of whole province.

2.4 Agricultural Condition

2.4.1 Land Tenure and Farmers Structure

According to the interview survey with the IA presidents in the Study area, the beneficial area is classified into six (6) categories of land tenant situation, i.e. i) absentee landowners, ii) owner non-cultivators, iii) owner cultivators, iv) leaseholders, v) tenant farmers and vi) others (non-member of IAs). The distribution of the categories in the irrigation area are summarized as follows :

(Unit : %)

RIS	LO	OC	LH	TF	Others	Total
Aganan	19	21	35	14	11	100
Sta. Barbara	10	32	41	2	15	100
Suague	9	14	41	32	4	100
Jalaur Proper	12	22	31	18	17	100
Jalaur Extension	20	20	27	12	21	100
Total	14	22	34	16	14	100

Remarks : LO includes "absentee land owner" and "owner non-cultivator", OC means "owner cultivator", LH is "leaseholder", and TF is "tenant farmer". Others consists of non member of IAs

Source : Interview survey with IA presidents, JICA Study Team

These indicate that about 50 % of the Study area is occupied by the lands of owner cultivator and leaseholders and about 16 % still remains as a tenant farmer. According to the results of socio-economic survey, the average cropping areas of owner cultivators and tenant farmers in the Study area are 2.2 and 2.3 ha, respectively.

2.4.2 Yields and Production

Iloilo province is one of the largest production area of several agricultural products such as rice, fruits and root crops in the country. Paddy production in Iloilo province was, on average, about 608,900 tons in 1996. Out of 608,900 tons, about 23 % (138,120 tons) of product was produced from the Study area.

The average unit yield of rice under rainfed condition is lower by about 2.2 ton/ha. Under irrigated condition, average yield ranges from 3.4 to 3.9 ton/ha in wet season and 3.3 - 3.6 ton/ha in dry season. The agricultural production and the yield in the Study area are as follows :

Crops	Cropped area (ha)	Yields (ton/ha)	Production (ton)
Irrigated Paddy	31,320	3.4	106,920
Rainfed Paddy	8,070	2.2	31,720
Mungbean	1,450	0.4	580
Watermelons	780	4.0	3,120

Remark : Data is for 1996.

2.4.3 Farming Practices

(1) Farming practice

The farming practices for the main crops of paddy, mungbean and watermelon are similar in the Study area. The common farming practice, especially application of fertilizer and agrochemical, are summarized as follows:

Farming Practice	Paddy	Mungbean	Watermelon
Irrigation	irrigated	rainfed	irrigated (dugwell)
Seeding	direct	broadcasting	row seeding
Fertilizer	apply	not apply	apply
N (kg/ha)	93	-	50
P (kg/ha)	28	-	14
K (kg/ha)	13	-	14
Agrochemical	apply	not apply	apply
Herbicide (lit/ha)	1.0	-	1.0
Insecticide (lit/ha)	1.5	-	1.0
Pesticide (lit/ha)	0.5	-	1.0
Harvesting	by hand	by hand	by hand

(2) Type of agro-chemicals (in Suague and Jalaur Proper RISs)

According to the interview survey conducted in the Suague and Jalaur proper RISs, agro-chemicals applied in the said RIS areas are listed in Table I.2.3. The average dosage of agro-chemicals is 3.3 lit./per ha in the dry season and 2.8 lit./ha in the rainy season. Insecticides and herbicides are utilized by 81% and 53% of the farm households, respectively. Molluscicides chemicals to prevent snail damage on rice plant, are also applied by 24% of farmers. Some agro-chemicals, which were banned due to its toxicity, are still being use in the project area. Those banned agro-chemicals are Meptox and Thiodan for insecticide, Pond snail for molluscicide, Ratoxin for rodenticide and Clencher for herbicide.

2.5 Present Environmental Issues

The present environmental issues are identified for each project, based on the information obtained from the IEE survey. Some of issues, i.e. sedimentation in Sluice, soil erosion in hill area, etc. were commonly observed between the projects. The present issues are summarized below, and their causes, significance and countermeasures to be considered are shown in Table I.2.4. By the application of proper countermeasures through out the project stage, the issues could be minimized in terms of the magnitude and the extent. In addition, the

formulated plan in the Study also aims to improve the following environmental issues.

Present Issues	Aganan	Sta. Barbara	Suague	Jalaur prop.	Jalaur ext.
1. Siltation in irrigation system	+++	++	+++	++	++
2. Watershed degradation	+++	++	+++	++	++
3. Inequity of water distribution	+++	++	++ - +++	++ - +++	++ - +++
4. Seasonal inundation	-	-	+	+	-
5. Deterioration of water quality	-	-	+	+	+
6. Urbanization in the area	+++	+++	-	-	-
7. Sinking the riverbed	-	-	+ - ++	-	-

Remarks : +++: major, ++ : moderate, + : minor, - : none

The following paragraphs explain about the present environmental issues in the areas.

2.5.1 Siltation in Scouring Sluice and Canals (in all schemes)

This is a major problem commonly observed not only in the study area but also in other national irrigation systems. Because of siltation, the scouring sluice and canals have substantially reduced their storage and flow capacities, and consequently resulted in unequal water distribution in the service area. For the maintenance of the facilities, a significant amount of money and time have been spent for the regular desilting works for the last decade.

Since the main cause of siltation in the service area is mass waste in the upstream area (watershed areas) due to land degradation, the watershed management such as reforestation and soil conservation is essential for avoiding it. In addition to the land degradation in the watershed areas, quarrying activities also were found just upstream of the Aganan diversion dam. In this quarry area, no preventive measures are made on the flow of silt into the river system.

At present, all RISs have no settling basin for reduction of sedimentation effect. Therefore, the installation of the settling basin in each RIS is a main mitigation measure in the short term. In addition, the conducting of a comprehensive watershed management program is also an essential measure in long term aspect.

2.5.2 Fluctuation of River Flow (Watershed Degradation) (in all schemes)

River flow has fluctuated due to the degradation of watershed area. Sever flood and / or lowering base flow of the river have often occurred in the Study area. As described in Annex H, due to the disordered timber logging and fuelwood logging (for sugarcane factory), the forest area had been destroyed before 1970s. The condition of watershed area has been improving gradually since the government took into consideration the forest management in the mid. 70s However, watershed degradation still occurs due to shifting cultivation and upland farming without conservation measures in addition to the logging activities. A watershed management plan formulated in Annex H shall be implemented.

2.5.3 Inequity of Water Distribution (in all schemes)

Inequitable water distribution is observed between water users upstream and downstream of canal systems, due to 1) deterioration of irrigation facilities, 2) overuse of water in the area upstream of canal systems, 3) out-of-schedule cropping in the upstream area, and 4) water use without obtaining water right for the irrigation areas in upper river basins. This, inequality of water distribution, causes social conflict among farmers and results in low productivity of crops where water does not reach sufficiently. The following table shows distribution of benefited area in the service area of each RIS.

(Unit : %)

Cropping intensity	Aganan	Sta. Barbara	Suague	Jalaur prop.	Jalaur ext.
Over 150%	8	72	55	46	23
100 - 150%	56	0	45	9	48
less than 100%	36	28	0	45	29

Source : Aganan - Sta. Barbara and Jalaur - Suague Office, NIA

2.5.4 Seasonal Inundation of Service Area (in Jalaur proper RIS area)

Water logging and/or flooding in the service area during the typhoon season is an issue, though it is not a major one. It impairs farming operation and often results in lower crop yields. The flooding of the Jalaur proper RIS occurs along the middle reach of the Jalaur river near Barotac Nuevo municipality, and it is affecting the tail portion of the RIS. It is reported that about 860 ha in Jalaur proper RIS is often inundated. The inundation of the Suague RIS occurs in the tail portion of the RIS area due to the poor drainage system at the crossing point with highway. In order to improve the present condition, the strengthening of the drainage system is essential in the development plan.

2.5.5 Deterioration of Water Quality (in Jalaur proper and extension RIS)

Although the present water quality of the irrigation water source is not the impact derived from the project, the river water showing high BOD values are not the best quality for irrigation purpose. The data on water quality samples during the rainy season, however, show the lower values. In addition, damage or adverse effect on crop growth caused by high BOD have not been reported at this moment. Further, the volume of irrigation water requirement in February to April is not expected to be high according to the proposed cropping pattern. As such, the river flow in Jalaur and Suague rivers can be utilized for irrigation purpose under the project.

It is recommended that the water quality of rivers as well as irrigation water in canals, particularly on BOD, will be periodically monitored, so that the effects on paddy will be properly assessed. If it is confirmed that the BOD values are far higher than the criteria throughout the year, the proper drainage management and suitable farming practice such as deep plowing should be conducted to promote the oxidation since deoxidization will occur and it will affect the root growth of paddy.

2.5.6 Urbanization in the RIS Area (in Aganan and Sta. Barbara RIS)

As described before, the service areas of Aganan and Sta. Barbara RISs has decreased due to expansion of Iloilo city, and it would undergo great progress and industrial development. Considering the large amount of money to be spent to make the service area more productive by irrigation development, it is also assumed to be a serious issue. So far, about 1,200 ha of the area in Aganan and 1,500 ha in Sta. Barbara has been converted into residential area or office sites. In order to reduce the progress of the urbanization, a certain incentives such as i) promotion of modern and suburban type farming, ii) strengthening of agricultural support system, iii) strengthening of marketing system, etc. shall be considered and incorporated into the development plan.

2.5.7 Quarry Activity in the Downstream of Intake Dam Site (in Suague RIS)

Presently, quarry activities are conducted by several individuals and private companies on the downstream of Suague intake site. Although the size in most of them is small less than 1 ha, the number of operators is large. Thus, these, in total, may induce the environmental impact such as sinking of riverbed. It may affect the sustainability of Suague intake dam in future. Although it may be needed to carry out a certain conservation measures in the long term aspect, it is required to identify a relevance between the quarry activities and the sinking of riverbed through monitoring works from short term aspect.

3. ENVIRONMENTAL ASSESSMENT FOR THE PRIORITY DEVELOPMENT PROJECT

3.1 Outlines of the Projects

The main objectives for the priority projects are to establish a pilot project for rehabilitation / improvement of existing irrigation systems under NIA and to revitalize the systems by increasing agricultural production and farmers' income through the project works. The general outlines of the priority development projects are summarized as shown bellow.

Outline of Project	Suague	Jalaur Prop.
1. Irrigation and Drainage Development		
(1) Water source	Suague river	Jalaur river
(2) Irrigation system	gravity	gravity
(3) Existing area	2,900 ha	8,820 ha
(4) Rehabilitation area	- do -	- do -
(5) Main crop	paddy	paddy
2. Institutional Development	for IAs and NIA	for IAs and NIA
3. Rural Development	road improvement	road improvement
4. No. of beneficiaries (Households)	1,950	5,900

The project components are divided into two (2) works such as i) physical works and ii) project management works. The proposed component of the projects are summarized as follows :

(1) Physical works

Rehabilitation and improvement of the irrigation and drainage system in both RISs with an area of 11,720 ha

i) Restoration and construction of irrigation and drainage canals from main to lateral systems
ii) Improvement and construction of related structures of irrigation system
iii) Restoration and construction of farm roads and barangay road
iv) Construction of farm ponds

(2) Project management works

i) Institutional strengthening of IAs (Irrigation Associators) in both RISs
ii) Training of farmers on water management system
iii) Agricultural support system, in collaboration with DA, DAR, LGUs and NGOs, which includes (1) training of extension workers, (2) demonstration of farming practices, (3) introduction of certified seeds, and (4) strengthening of rural credit system.

3.2 Future Environmental Issues with the Project

The environmental screening and scoping were carried out to identify and assess the potential adverse impacts of both projects on the environment by using of environmental checklist as shown in Table I.3.1 and 3.2. In the process of screening and scoping, the project areas of both RIS were assumed to be one irrigation project, because these systems are adjacent with each other and closely contain the same features and components. As the results of the screening / scoping, the following six (6) future environmental issues caused by the project works are identified in the project areas.

(i) Health hazard from agrochemical use

(ii) Deterioration of downstream water quality (adverse effects on the fish culture)
(iii) Loss of farm land
(iv) Beneficial impacts on farm economy
(v) Beneficial impacts on the local and regional economy
(vi) Reduction of excessive use of ground water

The probable issues and their significance with and without mitigation measures are summarized in Table I.3.3 and explained in the following sections.

3.2.1 Health Hazard from Agrochemical

The use of agrochemical will be increased in the future due to the increase of crop intensity. Since the direct seeding is a dominant procedure for the paddy cultivation in the area, dosages of herbicide will continue in the future. Although most of farmers have experience of use of agrochemical, it is likely that mishandling of agrochemical and improper disposal of used containers will cause health hazards. However, its effect might be reduced, if the instructions of proper handling and usage of agrochemical to the farmers are conducted through extension services during the development stage.

In addition, DA (PAO and MAO) has carried out a extension work to introduce the transplanting practice and the Integrated Pest Management (IPM) system in and around the project area. The farmers who adapt the system are scarcely found, especially for the IPM. However, these systems are the one of beneficial and ecological practice. If the extension work be continued efficiently and the benefit from these systems be clearly appeared, these might be expanded across the province. It will minimize the adverse impact caused by usage of agrochemical.

3.2.2 Deterioration of Downstream Water Quality

(1) Projection of increase of farm inputs

Presently, the environmental issues from agro-chemical contamination was not evident in the project area, even under a high level of utilization. The dosage of agro-chemical under the project will slightly increase in the future. Therefore, it is recommended that proper chemicals should be applied through appropriate manners in order to minimize water pollution.

The level of fertilizer use will increase under the proposed intensive agriculture to obtain higher yields. This might result in nutrient load in drainage water and/or groundwater, and affect the downstream aquatic ecology, especially fish culture. Total quantities of the farm inputs used in the project areas were estimated based on the present and proposed farm input application, and summarized below. Generally, paddy culture causes more serious nutrient load in downstream water than upland crop farming since it has a medium as the field water to carry inputs to outside. In this projection, therefore, the focus is put on the farm input on paddy culture.

(Unit : ton)

Input	Without Project Condition			With Project Condition			Balance		
	Rainy season	Dry season	Total	Rainy season	Dry season	Total	Rainy season	Dry season	Total
N	805	456	1,261	1,172	992	2,164	367	535	902
P	242	172	414	410	347	757	168	175	343

(2) Required works to minimize the risk

The risk to water quality pollution can be minimized by applying the proper and ecological farming practices, such as i) proper water management, ii) proper application of farm inputs, iii) increased use of compost and green manure, iv) changing farming system from

direct seeding to transplanting, and v) introduction of IPM system. Especially, the proper water management is essential for reduction of farm input contamination in paddy culture. The concentration of the chemicals in irrigation water in paddy field is substantially reduced at 1 week after the application, because of resolution of chemical, adsorption to soil, etc.

(3) Projection on the downstream water quality

The possibility and degree of the loading are examined on the basis of the calculated result of the mass balance of farm inputs between present condition and future with project condition, and the following assumption. The results of projection is presented in Table 1.3.4.

(a) Runoff of farm inputs

There is no available data concerning the runoff rate of chemical fertilizer and agrochemical in Philippine. Therefore, the runoff rate of farm input on paddy field under proper water management was set based on the research results at USA and Japan. The rates used in the assumption are 1% for nitrogen, 0.2% for phosphorous, respectively. The estimated runoff quantity of the farm inputs per crop season are shown below.

(Unit : ton)

Input	Without Project Condition			With Project Condition			Balance		
	Wet season	Dry season	Total	Wet season	Dry season	Total	Wet season	Dry season	Total
N	8.05	4.56	12.61	11.72	9.92	21.64	3.67	5.35	9.02
P	0.48	0.34	0.82	0.82	0.69	1.51	0.34	0.35	0.69

(b) Runoff discharge

The runoff discharge (return flow) is assumed to be 25% of net irrigated water including effective rainfall to the fields. Based on the water balance estimation, the runoff discharge from irrigated fields are calculated at 26.1 MCM in rainy season and 10.4 MCM in dray season without consideration of original flow of drainage. Therefore, these figures will be a minimum value of runoff discharge form irrigated fields.

(c) Projection of runoff water quality

The increased nutrient load into the runoff water under proper water management is estimated at 0.25 mg/lit of nitrogen and 0.02 mg/lit of phosphorus, as shown below.

(Unit : mg/lit.)

Input	Present Condition			With Project Condition			Balance		
	Wet season	Dry season	Average	Wet season	Dry season	Average	Wet season	Dry season	Average
N	0.31	0.44	0.35	0.45	0.95	0.59	0.14	0.51	0.25
P	0.02	0.03	0.02	0.03	0.07	0.04	0.01	0.03	0.02

(d) Projection of downstream water quality

The water quality of downstream water is therefore estimated based on the above results and data of present condition (results of water quality). The contents of nitrogen and phosphate will be less than the criteria of fishery use (Class C) according to Water Quality Criteria.

(Unit : mg/lit)

Input	Present Condition <1			With Project Condition			Future Contamination		
	Wet season	Dry season	Average	Wet season	Dry season	Average	Wet season	Dry season	Average
N	0.11	0.11	0.11	0.45	0.95	0.59	0.56	1.06	0.70
P	n.d.	n.d.	n.d.	0.03	0.07	0.04	0.03	0.07	0.04

Remark : Figure in wet season of present condition is set at the same as one in dry season, considering conservative aspect.

Of course, the downstream has a original discharge, especially Jalaur river. In addition, the downstream water are mostly used for dilution water into sea water. Therefore, it is considered that the water quality will be in safety level for fishery use under proper water management and proper use of farm input.

3.2.3 Loss of Farm Land

Total 20 farm ponds which consist of 7 ponds in Suague and 13 in Jalaur are planned to be constructed under the project. The loss on farm land (or total land) is not expected to be large as 10 ha (12.9 ha) in Jalaur and 4 ha (4.8 ha) in Suague. The impact of the issue will be minor since the loss area is too small. Furthermore, the construction of the pond is meant to supplement irrigation water during the dry season, and thus ensures stable crop production. Therefore, it is considered as an optimum trade-off between negative and positive impacts. It is, however, necessary to fully compensate a loss of farm lands for the owners and / or the tenant farmers in the land and to get their consensus before the project implementation.

3.2.4 Beneficial Impacts on Farm Economy

The biggest beneficial effect of the Project is the uplift of farm economy as a result of the increase in crop production. The following results of the farm economic analysis indicates that a substantial increase in income will be attained by every farm types in the Jalaur proper and Suague RISs at full development of the Project.

(Unit : peso/year)

Item	Suague RIS			Jalaur RIS		
	OC	LH	TF	OC	LH	TF
Net farm income without project	32,630	16,420	6,960	28,050	11,830	6,500
Net farm income with project	62,410	46,810	31,200	71,960	53,970	35,980
Balance (increase)	29,780	30,390	24,240	43,910	42,140	29,480

Remarks : OC means 'owner cultivator', LH is 'leaseholder', and TF is 'tenant farmer'.

Farm incomes in Suague RIS are estimated to increase by 191%, 285%, 448% on owner cultivator (OC), lease holder (LH), and tenant farmer (TF), respectively, and 257%, 456%, 534% in Jalaur RIS.

3.2.5 Beneficial Impacts on the Local and Regional Economy

The priority project works will generate incremental employment of a casual labor at the construction stage, though not permanently. In addition, the intensive agriculture is expected to generate additional farm labor as the annual farm employment will be about 1.8 million man-day per year at full development stage. The increase in agricultural production will induce economic activities in other sectors through linkage effect. The secondary tertiary benefits will accrue in any sectors related to agriculture such as farm inputs suppliers, traders, and millers. The initial construction investment would also expand effective demand increasing regional and national incomes.

3.2.6 Reduction of Excessive Use of Ground Water

Ground water from shallow tube wells are widely used in the project area, and excessive use of ground water is reported in some places, particularly in the dry season. The number of shallow tube wells and pumps are still increasing at this time. If this situation continues, the ground water table will further decline, resulting in shortage of domestic water supply in the dry season and saline water intrusion near the sea shore.

During the implementation of the project, the irrigation water will be supplied from the Jalaur proper and Suague RISs on the basis of the proposed cropping pattern and water management. The proper supply of irrigation water from both RISs will prevent the excessive pumping of ground water.

The potential and available amount of ground water has not been investigated in the lower reaches of the Jalaur river basin including the Suague river basin. Thus, it is recommended that a study on the potentials and present use of ground water will be conducted to have a better perspective on ground water utilization. The study should include the establishment of water right, registration and monitoring system.

4. MONITORING PLAN OF DOWNSTREAM WATER QUALITY

Even conducting extension services for proper water management and farm input use, the contamination might be occurred due to accidental mishandling of farm inputs. Therefore, the periodical monitoring is required to be carried out to notice an irreversible effects previously. For this purpose, the following monitoring survey should be conducted in cooperation with DENR.

(1) Existing monitoring work

Presently, DENR carries out a water quality analysis test for the sample taken at the mouse of Jalaur river just near fish ponds, as shown the location map of sampling point attached in Annex A. The monitoring period is monthly basis and items of analysis are ; i) Color, ii) Temperature, iii) pH, iv) DO, v) BOD, vi) TSS and vii) TDS. The work is presently conducted by the Environmental Management Bureau, DENR, Region VI.

(2) Additional survey items

In addition to the above items, it is recommended to include the items of total nitrogen and total phosphate in the monthly analysis items. Furthermore, the degree of agrochemical contamination should be analyzed twice a year, such as July (wet season) and December (dry season).

(3) Additional sampling points

The fish ponds related with Jalaur proper RIS are generally divided into three groups such as Barotac Nuevo, Dumangas, Zarraga by the location as mentioned before. In addition to the sampling at Jalaur river (Dumangas), it is recommended that additional sampling works on the creeks in Barotac Nuevo and Zarraga used for water source of fish ponds shall be carried out and the proposed monitoring works shall also be conducted for the additional two sampling sites.

(4) Implementing agency of monitoring

The monitoring works will be carried out by DENR along the monthly monitoring works, generally. However, the additional cost born from the additional works shall be shared by NIA.

5. RECOMMENDATION

It was assessed that the proposed rehabilitation and improvement projects on the existing RISs (Suague and Jalaur Proper RISs) would have minor to moderate potentialities to occur adverse impacts on the environment. However, they could be minimized or mitigated by adopting proper conservation measures. Recommendations drawn from the assessment results are as follows :

(a) Monitoring works on the downstream of river shall be carried out for reduction of fish culture damages by the unexpected farm input contamination.

(b) Watershed management activities shall be conducted to maintain the project sustainablity.

(c) The quarry activity shall be restricted in the downstream To prevent the sinking degradation of the Suague riverbed in downstream of the diversion dam and also to sustain the project viability of Suague RIS. It is recommended to shift from the present site to the upstream of the dam as an alternative in the future. It is also recommended that a monitoring on the riverbed fluctuation and the quarry activities will be conducted finally to ensure the sustainability of project life.

Tables

Table I.2.1 Result of Water Quality Test

Description					Parameters											
Sample No.	Sampled river	Related BIS	Barangay	Municipality	Temp	pH	DO mg/l	TDS ppm	EC uS/cm	Turbidity ppm	BOD mg/l	Hardness ppm	Cl ppm	N NH	Org -P ppm	TSS ppm
1	Jalaur	Jalaur P&E	Poblacion	Calinog	27.0	7.70	3.77	60	1.56	500	2.7	224	5	0.63	1.53	745
2	Jalaur	Jalaur P&E	Gines	Passi	27.5	7.60	6.26	100	0.21	200	30.0	200	9	0.08	nil	672
3	Jagdoob	Jalaur P&E	Mubong	Calinog	29.2	7.73	5.43	100	0.21	500	34.0	128	10	0.24	0.98	1524
4	Jalaur	Jalaur P&E	Dam site	Dingle	29.0	7.02	1.46	190	0.33	10	126.0	108	12	0.03	nil	32
5	Magapa	Suague	Magappa	Janiuay	32.0	7.59	3.01	160	0.34	500	2.9	78	11	0.43	1.71	5792
6	Suague	Suague	Bongolon	Janiuay	31.0	7.76	3.01	180	0.35	200	32.0	101	10	0.16	4.13	375
7	Suague	Suague	Tclaruscan	Janiuay	32.0	7.80	2.81	180	0.37	100	22.0	65	9	0.1	nil	581
8	Jalaur	Jalaur P	Potolan	Potolan	29.5	7.56	4.25	200	0.29	10	6.2	46	12	0.09	nil	138
9	creak	Jalaur P	Dongsol	Zarraga	30.0	7.68	1.58	100	0.35	150	1.6	18	9	0.18	nil	595
10	creak		Cabilawan	New Iucena	29.0	7.59	1.92	150	0.62	20	3.0	22	48	0.12	nil	22
11	Tigum	St. Barbara	Dasa	Massin	26.0	6.92	3.60	190	0.32	500	3.0	96	13	0.02	1.85	822
12	Tigum	St. Barbara	Dam site	Sta. Barbara	32.5	7.54	2.73	210	0.45	500	1.3	74	14	0.18	2.71	520
13	Aganan	Aganan	Cagay	Ahmedian	26.0	7.59	1.99	180	0.68	10	1.6	24	16	0.12	nil	35
14	canal	St Barbara	Cabugao	Sta Barbara	30.0	7.86	1.80	160	0.57	10	2.2	2	15	0.17	nil	65
15	creak	St. Barbara		Leganes	29.0	7.18	3.70	410	0.87	20	5.3	48	10	0.26	nil	41
16	canal	Aganan	Cadelona	San Miguel	27.5	7.50	2.40	180	0.68	500	1.0	14	19	0.21	1.04	438
17	Aganan	Aganan	Dam site	San Miguel	27.0	8.02	2.56	180	0.75	50	2.0	24	20	0.03	nil	173
18	creak	Aganan	Mambog	Oton	31.0	7.45	1.05	180	0.69	20	4.8	20	22	0.64	2.22	56
19	canal	Suague	Tclaruscan	Janiuay	31.0	7.50	2.64	150	0.30	500	0.5	44	9	0.24	0.11	5850
20	canal	Suague	Casalsagan	Potolan	27.0	7.27	1.30	240	0.66	500	5.4	32	15	0.04	1.08	1160
21	creak	Suague	Casalsagan	Potolan	27.0	7.30	5.07	280	0.57	10	4.0	36	21	0.55	nil	65
22	canal	Jalaur P	Tanghawan	Dingle	29.0	7.22	1.04	160	0.35	10	5.2	9	9	0.03	1.43	69
23	canal	Jalaur P	Rombang	Potolan	29.0	7.32	2.25	280	0.34	10	5.4	38	11	0.05	1.71	117
24	Jalaur	Jalaur P	Banga Bante	Zarraga	29.6	7.68	1.74	70	0.26	20	1.6	16	9	0.05	nil	179
25	canal	Jalaur E	Acuit	B. Nuevo	30.0	7.36	1.60	60	0.24	10	9.0	5	119	0.08	0.46	121
26	canal	Jalaur E.	San Jose	Dingle	30.0	7.25	1.59	160	0.34	10	2.8	74	10	0.06	0.94	199
27	canal	Jalaur E.	Bunca	B. Nuevo	32.0	8.01	3.20	100	0.39	20	6.5	22	99	0.01	nil	93
28	well	St. Barbara	E. School	Sta. Barbara	29.0	8.18	-	500	0.18	20	29.6	12	99	0.08	nil	26
29	well	Aganan	Cagbang	Oton	29.5	7.10	2.00	310	1.10	10	1.5	26	45	0.05	nil	45
30	well	Aganan	Abilay	Oton	27.0	7.71	-	590	2.00	20	15.0	314	61	0.03	nil	650

	Trace Element										SAR				Microbiological test	
Sample No	Al mg/l	As mg/l	B mg/l	Cd mg/l	Cu mg/l	Pb mg/l	Mo mg/l	Zn mg/l	Cr mg/l	Hg ug/l	Na meq/l	Ca meq/l	Mg meq/l	SAR	Org No. colon /ml	Fecal colon /ml
1	3.3	ND	<0.01	<0.004	<0.020	<0.050	ND	0.232	<0.001	<0.500	0.3	4.35	0.21	0.21	197	Negative
2	ND	ND	<0.01	<0.004	<0.020	<0.050	ND	0.800	<0.001	<0.500	0.6	1.85	0.22	0.59	173	Negative
3	ND	ND	<0.01	<0.004	<0.032	<0.050	ND	0.120	<0.001	<0.500	0.6	4.25	0.22	0.40	333	Negative
4	ND	ND	<0.01	<0.004	<0.020	<0.050	ND	0.028	<0.001	<0.500	0.6	4.3	0.23	0.42	156	Negative
5	ND	ND	<0.01	<0.004	<0.032	<0.050	ND	0.060	<0.001	<0.500	0.9	0.875	0.23	1.02	207	Negative
6	ND	ND	<0.01	<0.004	<0.020	<0.050	ND	0.022	<0.001	<0.500	0.7	1.05	0.16	0.95	249	Negative
7	ND	ND	<0.01	<0.004	<0.020	<0.050	ND	0.022	<0.001	<0.500	0.8	0.55	0.41	1.13	292	Negative
8	ND	ND	<0.01	<0.004	<0.020	<0.050	ND	<0.010	<0.001	<0.500	0.5	0.5	0.39	0.81	213	Negative
9	ND	ND	<0.01	<0.004	<0.020	<0.050	ND	<0.010	<0.001	<0.500	0.9	1.32	0.42	0.97	228	Negative
10	ND	ND	<0.01	<0.004	<0.020	<0.050	ND	<0.010	<0.001	<0.500	2.8	4.2	0.23	1.82	292	Negative
11	ND	ND	<0.01	<0.004	<0.020	<0.050	ND	<0.010	<0.001	<0.500	0.9	1.25	0.39	1.01	234	Negative
12	ND	ND	<0.01	<0.004	<0.020	<0.050	ND	<0.010	<0.001	<0.500	1.1	1.125	0.41	1.29	232	Negative
13	ND	ND	<0.01	<0.004	<0.020	<0.050	ND	<0.010	<0.001	<0.500	2.5	3.15	0.24	1.89	200	Negative
14	ND	ND	<0.01	<0.004	<0.020	<0.050	ND	<0.010	<0.001	<0.500	1.7	1.35	0.24	1.87	219	Negative
15	ND	ND	<0.01	<0.004	<0.020	<0.050	ND	<0.010	<0.001	<0.500	2.9	2.2	0.24	2.66	302	Negative
16	ND	ND	<0.01	<0.004	<0.020	<0.050	ND	<0.010	<0.001	<0.500	2.3	2.2	0.24	2.10	266	Negative
17	ND	ND	<0.01	<0.004	<0.020	<0.050	ND	<0.010	<0.001	<0.500	2.4	1.15	0.23	2.83	266	Negative
18	ND	ND	<0.01	<0.004	<0.020	<0.050	ND	<0.010	<0.001	<0.500	1.7	3.15	0.23	1.31	240	Negative
19	ND	ND	<0.01	<0.004	<0.078	<0.050	ND	0.070	<0.001	<0.500	0.6	0.55	0.39	0.92	248	Negative
20	ND	ND	<0.01	<0.004	<0.020	<0.050	ND	0.042	<0.001	<0.500	1.0	1.1	0.43	1.11	235	Negative
21	ND	ND	<0.01	<0.004	<0.020	<0.050	ND	0.015	<0.001	<0.500	1.1	0.75	0.41	1.50	240	Negative
22	ND	ND	<0.01	<0.004	<0.020	<0.050	ND	0.025	<0.001	<0.500	0.5	1	0.40	0.63	223	Negative
23	0.8	ND	<0.01	<0.004	<0.020	<0.050	ND	0.022	<0.001	<0.500	0.6	1.35	0.39	0.60	243	Negative
24	ND	ND	<0.01	<0.004	<0.020	<0.050	ND	<0.010	<0.001	<0.500	0.6	1.65	0.39	0.59	314	Negative
25	ND	ND	<0.01	<0.004	<0.020	<0.050	ND	<0.010	<0.001	<0.500	0.5	1.4	0.37	0.52	400	Negative
26	ND	ND	<0.01	<0.004	<0.020	<0.050	ND	<0.010	<0.001	<0.500	0.6	0.625	0.40	0.88	251	Negative
27	ND	ND	<0.01	<0.004	<0.020	<0.050	ND	<0.010	<0.001	<0.500	0.8	3.65	0.39	0.55	223	Negative
28	ND	ND	<0.01	<0.004	<0.020	<0.050	ND	0.240	<0.001	<0.500	0.5	1.175	0.21	0.66	46	Negative
29	ND	ND	<0.01	<0.004	<0.020	<0.050	ND	<0.010	<0.001	<0.500	2.8	2.3	0.24	2.47	10	Negative
30	1.2	ND	<0.01	<0.004	<0.019	<0.050	ND	<0.010	<0.001	<0.500	1.7	0.6	0.39	2.35	118	Negative

Table I.2.2 Water Quality Criteria in Philippines

(1) for conventional items

	Parameter	Unit	Class C (for Fishery)	Class D (for Irrigation)
1.	Color		no abnormal color	no abnormal color
2.	Temprature (max. rise in deg. Celsius) *1	rise	3	3
3.	pH (range)		6.5-8.5	6.0-9.0
4.	SAR		-	8.0-18.0
5.	Dissolved Oxygen (Min.) *2	% satn.	60	40
6.	Dissolved Oxygen (Min.) *2	mg/l	5.0	3.0
7.	BOD	mg/l	7	10
8.	Total Suspended Solids (TSS)	mg/l	< 30% increase	< 60% increase
9.	Total Dissolved Solids (TDS)	mg/l	-	1000
10.	Surfactants (MBAS)	mg/l	0.5	-
11.	Oil / Grease	mg/l	2	5
12.	Nitrogen	mg/l	10	-
13.	Phosporus *3	mg/l	0.4	-
14.	Phenolic Substances as Phenols	mg/l	0.02	-
15.	Total Coliforms	MPN/100ml	5000	-
16.	Chloride	mg/l	350	-
17.	Copper	mg/l	0.05	-

Remarks :

*1 The allowable temprature increase over the average ambient temprature for each month. This rise shall be based on the average of the maximum daily temprature readings recorded at the site but upstream of the mixing zone over a period of one (1) month.

*2 Sampling taken between 9.00AM and 4:00 PM

*3 For the water of Lakes or Reservoir, the Phosphate should not exceed an average of 0.05 mg/l nor a maximum of 0.1 mg/l.

(2) for toxic items

	Parameter	Unit	Class C (for Fishery)	Class D (for Irrigation)
1.	Arsenic	mg/l	0.05	0.1
2.	Cadmium	mg/l	0.01	0.05
3.	Chromium	mg/l	0.05	0.1
4.	Cyanide	mg/l	0.05	-
5.	Lead	mg/l	0.05	0.5
6.	Total Mercury	mg/l	0.002	0.02
7.	Organophosphate	mg/l	nil	nil

Source : DENR ADMINISTRATIVE ORDER NO.34

Table I.2.3 Agro-chemicals Utilized in the Study Area (1/2)

Use	Name (Products)	Type	Common Name	Concentration	Remarks
nsecticide:	Applaud 10 WP	WP	Buprofesin	100 g/kg	
	Ascend 50 SC	SC	Fipronil	50 g/lit.	
	Attack 5R	EC	Cypermethrin	50 g/lit.	
	Azodrin 202R	EC	Monochrotophos	285 g/lit.	Restricted for beanfly
	Basudin 40 WP	WP	Diazinon	400 g/kg	
	Basudin 400 EC	EC	Diazinon	400 g/lit.	
	Basudin 5 G	G	Diazinon	50 g/kg	
	Basudin 600 EC	EC	Diazinon	600 g/lit.	
	Blaster	EC	Cypermethrin	50 g/lit.	
	Brodan 31.5 EC	EC	Chlorpyrifos + BPMC	210+105 g/lit.	
	Cymbush 5 EC	EC	Cypermethrin	50 g/lit.	
	Decis R	EC	Deltamethrin	10 g/lit.	
	Etrofolan 50 WP	WP	Isoprocarb	500 g/kg	
	Fenom D 225 EC	EC	Diazinon+Cypermethrin	200+25 g/kg	
	Furadan 10 G	G	Carbofuran	100 g/kg	
	Furadan 3 G	G	Carbofuran	30 g/kg	
	Furadan 5 G	G	Carbofuran	50 g/kg	
	Hostathion 20 EC	EC	Triazophos	200 g/lit.	
	Hostathion 40 EC	EC	Triazophos	400 g/lit.	
	Hopcin 50 EC	EC	BPMC	500 g/lit.	
	Karate 2.5 EC	EC	Lambdacyhalothrin	25 g/lit.	
	Lorsban 3 E	EC	Chlorpyrifos	300 g/lit.	
	Lorsban 40 EC	EC	Chlorprifos	400 g/lit.	
	Lorsban IPE	IP	Chlorpyrifos	10 g/kg	
	Magnum 5 EC	EC	Cypermethrin	50 g/lit.	
	Meptox				Banned
	Mipcin 50 WP	WP	MIPC	500 g/kg	
	Nurelle D	EC	Chlorpyrifos+Cypermethrin	250+25 g/lit.	
	Nuvacron SCW	SC	Monocrotophos	300 g/lit.	Restricted for beanfly
	Regent 0.3 GR	G	Fipronil	30 g/kg	
	Sherpa 5 EC	EC	Cypermethrin	50 g/lit.	
	Tamaron 600 SL	SL	Methamidophos	600 g/lit.	
	Thiodan				Banned
	Trebon 10 EC	EC	Ethofenprox	100 g/lit.	
	Vindex plus	EC	Phentoafe+BPMC	250+100 g/lit.	
	Vexter 300 EC	EC	Chlorpyrifos	300 g/lit.	

Table I.2.3 Agro-chemicals Utilized in the Study Area (2/2)

Use	Name (Products)	Type	Common Name	Concentration	Remarks
Molluscicide:	Bayluscide 250 EC	EC	Niclosamide	250 g/lit.	
	Bayluscide 70 WP	WP	Niclosamide	700 g/kg	
	Pond snail				Banned
Fungicide:	Benlate 50 WP/OD	WP	Benomyl	500 g/kg	
	Champion WP	WP	Cupric Hydroxide	770 g/kg	
Rodenticide:	Racumin Dust	D	Coumatetralyl	7.5 g/kg	
	Ratoxin				Banned
Herbicide:	Advance EC	EC	Butachlor + Propinil	300+500 g/lit.	
	Lead Corp, 2,4-D Amine	SC	2,4-D Amine	400 g/lit.	
	Miracle 2,4-D Amine	SC	2,4-D Amine	400 g/lit.	
	2,4-D Granules	G	2,4-D Isobytyl	30 g/kg	
	2-4 D Ester	EC	2,4-D Ester	400 g/lit.	
	Clencher				Banned
	Direk 800	EC	Butachlor+Safener	800 g/lit.	
	Lambast 5G	G	Butachlor	60 g/kg	
	Lambast EC	EC	Butachlor	600 g/lit.	
	Londax WP	WP	Bensulfuron	100 g/kg	
	Machete 60	EC	Butachlor	600 g/lit.	
	Machete EN	EN	Butachlor	600 g/lit.	
	Relof-H 500 EC	EC	Piperophos+2,4-D IBE	330+170 g/lit.	
	Rogue EC	EC	Butachlor+2,4-D	360+240 g/lit.	
	Rogue G	G	Butachlor+2,4-D	37.5+25 g/kg	
	Ronstar 25 EC	EC	Oxadiazon	250 g/lit.	
	Ronstar 2 G	G	Oxadiazon	20 g/kg	
	Sofit 300 EC	EC	Pretilachlor	300 g/lit.	
	Thunder EW	EW	Butachlor	600 g/lit.	2-3 table spoons/lit.
	Weedkill 2,4-D	WP	Ibe of 2,4-D	400 g/lit.	
Foliar Fertilizer:	Agro Well	C	compound fertilizer	N15-P7-K7 %	
	Byfolan	C	compound fertilizer	N11-P8-K6 %	
	Crop Giant	C	compound fertilizer	N15-P15-K30 %	
	Crop Giant	C	compound fertilizer	N19-P19-K19 %	

Source; Farm Household Survey made by the JICA Study Team.
List of Registered Agricultural PesticideProducts, Fertilizer and Pesticide Authority DA, June 1997.

Type: WP: Wettable Powder, L: Liquid, SC: Soluble Concentrate, EC: Emulsifiable Concentrate, P: Powder, G: Granule, EW: Emulsion in Water, F: Flowable, D: Dust, SL Souluble Liquid.

Table I.2.4 Present Environmental Issues and Tentative Mitigation Measures

Environmental Issues	Main Causes	Significance at present	Remedial Measures to be considered	Significance in future	Relating project
1. Silt deposition in the sluice and canal	• Soil erosion from watershed, due to improper land use	sever	• Applying proper watershed management • Installation of settling basin at dam site	moderate	all project
2. Watershed degradation	• Disordering logging, improper land use	sever - moderate	• Reforestation and introduction of soil conservation measures to watershed area with settlers involvement	moderate	all project
3. Inequality of water distribution	• Deterioration of inigation facilities, • Overuse of water canal upstream • Out-of-schedule cropping • Water use without water right river upstream	sever - moderate	• Improvement of facility • Making a consensus among RIS by using participatory approach • Applying social supports to fill their economical gaps up	moderate - minor	all project
4. Seasonal inundation in RIS	• Flood at conjunction of river • Poor drainability at the cross of highway due to small capacity of culvert • High tide water	moderate - minor (occasional occurrence)	• Improvement of the structures	minor - moderate	Jalaur Pro. Suague
5. Deterioration of irrigation water quality	• Effluent from sugarcane milling factory • Contamination of domestic waste water from populated area	minor	• Investigation to identify the source of polluted water • Installation of the water treatment facility to the factory	minor	Jalaur Pro Jalaur Ext. Suague
6. Urbanization in RIS areas	• Expansion of Iloilo city	sever - moderate	• Promotion of modern and suburban type farming • Strengthening of agricultural support system • Strengthening of marketing system	minor	Aganan Sta Barbara
7. Sinking of riverbed on intake dam site	• Quarry activities in downstream of intake dam site by several individuals and private companies	minor	• Investigation to identify the relevance between quarry activity and the sinking of riverbed • Limiting the quarry activity in downstream of intake dam site	minor	Suague

Table I.3.1 Result of Environmental Screening

Environmental Issues	Potential SEI	Evaluation	Evaluation Bases
1. Social Environment			
1.1 Socio economic Issues	1. Planned agricultural settlement 2. Involuntary resettlement 3. Substantial changes in way of life 4. Conflict among communities or peoples 5. Impact on indigenous peoples, ethnic minorities, nomads 6. Population increase 7. Drastic change in population composition 8. Relocation of bases of economic activities 9. Occupational change, loss of labor opportunity 10. Increase in income disparities 11. Adjustment and regulation of riparian rights 12. Changes in social and institutional structures 13. Changes in existing institutions and customs	Yes	3 and 4
1.2 Health and Sanitary Issues	1. Increased use of agrochemicals 2. Outbreak of endemic diseases 3. Prevalence of epidemic diseases 4. Residual toxicity of agrochemicals 5. Increase in domestic and other human waste	Yes	1 and 4
1.3 Cultural Issues	1. Impairment of historic remains and cultural assets 2. Damage to aesthetic sites 3. Impediment of mineral resources exploitation	No	-
2. Natural Environment			
2.1 Biological and Ecological Issues	1. Deterioration or degradation of vegetation 2. Negative impacts on important or indigenous fauna and flora 3. Degradation of ecosystem with biological diversity 4. Proliferation of exotic and/or hazardous species 5. Encroachment on wetland and peat swamp 6. Encroachment on tropical forests 7. Destruction or degradation of mangrove forests 8. Degradation of coral reef	No	-
2.2 Soil and Land Resources	1. Soil erosion 2. Soil salinization 3. Deterioration of soil fertility 4. Soil contamination by agrochemicals 5. Devastation or desertification of land 6. Devastation of hinterland 7. Ground subsidence	Yes	4
2.3 Hydrology and Air and Water Quality Issues	1. Changes in surface water hydrology 2. Changes in groundwater hydrology 3. Inundation and flood 4. Soil sedimentation 5. Riverbed degradation 6. Impediment of inland navigation 7. Water contamination and deterioration of water quality 8. Water eutrophication 9. Sea water intrusion 10. Low irrigation water temperature 11. Atmospheric pollution	Yes	7 and 8

Table I.3.2 Result of Environmental Scoping (1/2)

(1) Applicable development activites : Irrigation and Drainage Development
(2) Applicable development type : Rehabilitation
(3) Applicable environmental sensitive area : None

I. Social Enviroment

Category of environmental impact	Evaluation of SEI <1				Evaluation Bases
	A	B	C	D	
I.1 Socio economic Issues					
(1) Social Apects					
1. Planned agricultural settlement			x		
2. Involuntary resettlement			x		
3. Substantial changes in way of life		x			with increase of farm economy
4. Conflict among communities or peoples		x			due to inequitable water distribution
5. Impact on indigenous peoples, ethnic minorities, nomads			x		
6. Others			x		
(2) Demographic Issues					
1. Population increase				x	
2. Drastic change in population composition			x		
3. Others			x		
(3) Economic activities					
1. Relocation of bases of economic activities			x		
2. Occupational change, loss of labor opportunity			x		
3. Increase in income disparities			x		
4. Others			x		
(4) Institutional and custom related issues					
1. Adjustment and regulation of riparian rights			x		
2. Changes in social and institutional structures			x		
3. Changes in existing institutions and customs			x		
4. Others			x		
I.2 Health and Sanitary Issues					
1. Increased use of agrochemicals		x			misuse and mishandle of chemicals
2. Outbreak of endemic diseases			x		
3. Prevalence of epidemic diseases			x		
4. Residual toxicity of agrochemicals		x			misuse and mishandle of chemicals
5. Increase in domestic and other human waste			x		
6. Others			x		
I.3 Cultural Issues					
1. Impairment of historic remains and cultural assets			x		
2. Damage to aesthetic sites			x		
3. Impediment of mineral resources exploitation			x		
4. Others			x		

Note :
<1 A : The subject SEI is unquestionably induced by the project
B : The subject SEI is likely to be induced by the Project
C : Theere is no possibility of the subject SEI being induced by the Project
D : The SEI is unknown

Table I.3.2 Result of Environmental Scoping (2/2)

(1) Applicable development activites : Irrigation and Drainage Development
(2) Appheable development type : Rehabilitation
(3) Applicable environmental sensitive area : None

II. Natural Environment

Category of environmental impact	Evaluation of SEI <1				Evaluation Bases
	A	B	C	D	
2.1 Biological and Ecological Issues					
1. Deterioration or degradation of vegetation			x		
2. Negative impacts on important or indigenous fauna and flora			x		
3. Degradation of ecosystem with biological diversity			x		
4. Prohferation of exotic and/or hazardous species				x	
5. Encroachment on wetland and peat swamp			x		
6. Encroachment on tropical forests			x		
7. Destruction or degradation of mangrove forests			x		
8. Degradation of coral reef			x		
9. Others		x			effect to fishpond in downstream
2 2 Soil and Land Resources					
(1) Soil Resources					
1. Soil erosion			x		
2. Soil salinization			x		
3. Deterioration of soil fertility				x	in case of inproper land management
4. Soil contamination by agrochemicals		x			misuse and mishandle of chemicals
5. Others			x		
(2) Land Resources					
1. Devastation or desertification of land			x		
2. Devastation of hinterland			x		
3. Ground subsidence			x		
4. Others			x		
2.3 Hydrology and Air and Water Quality Issues					
(1) Hydrology					
1. Changes in surface water hydrology			x		
2. Changes in groundwater hydrology			x		
3. Inundation and flood				x	present environmental issues
4. Soil sedimentation				x	present environmental issues
5. Riverbed degradation				x	
6. Impediment of inland navigation			x		
7. Others			x		
(2) Water quality and temperature					
1. Water contamination and deterioration of water quality		x			pollution from farm input
2. Water eutrophication		x			pollution from farm input
3. Sea water intrusion			x		
4. Others			x		
(3) Atmosphere					
1. Low irrigation water temperature			x		
2. Atmospheric pollution			x		
3. Others			x		

Note :

<1 A : The subject SEI is unquestionably induced by the project
B : The subject SEI is likely to be induced by the Project
C : Theere is no possibility of the subject SEI being induced by the Project
D : The SEI is unknown

Table I.3.3 Assessment of Probable Environmental Impacts

Probable / Potential Impacts	Stage				Comments / recommended mitigation measures
	Construction		Operation		
	Without	With	Without	With	
1. Health hazard from mishandling of agrochemical use	-	-	2-3N d-s-r	3N	• The hazard will be minimized by proper handling of chemical under proposed extension works • IPM or proper use of agrochemicals will be included in the improved farming practices (plan) and extension program
2. Deterioration of water quality in downstream					
(1) Pollution of agrochemical and Eutrification of fertilizer	-	-	2N d-s-r	3N	• Proper water management taking agro-input use into consideration will be undertaking • IPM or proper use of agro-input including use of organic matter will be included in the improved farming practices (plan) and extension program.
(2) Pollution of construction materials	3N	-	-	-	• Proper disposal of construction waste shall be enforced thoroughly.
3. Loss of farm land due to construction of farm pond	2-3N d-l-ir	3N	2-3N d-l-ir	3N	• Full compensate for farm land shall be taken to the owner and tenant farmer under enough discussion with them.
4. Reduction of downstream flows that affect downstream ecology and users of water	3N	-	-	-	• Unlikely
5. Reduction of excessive water use of ground water	-	-	-	1-2P d-l	• The ground water table will stabilize due to reduction of excessive use of ground water in dry season.
6. Conflicts over inequalities in water distribution throughout service area	-	-	3N	-	• Crop intensity will be 200% and cropping pattern will be rotated in the area under the plan. • Proper water management by IAs could utilize water efficiently and minimize such conflict.
7. Increase of construction-related employment opportunity	1P d-s	1P d-s	-	-	• The construction works will provide temporary job opportunity to the villagers nearby.
8. Increase of crop production (which results in the increase of farm income)	-	-	1P d-l	1P d-l	• The biggest positive effect of the project. Â@This • will lead to higher living standard of the population.
9. Increase of agricultural-related employment opportunity	-	-	1P d-l	1P d-l	• Employment opportunity in marketing of inputs and outputs, processing, etc. will be increased substantially.

Remarks : <1 "with" indicates future condition with mitigation measures

Significance of impact
1 : Significant
2 : Moderate
3 : Minor

Feature of impact
P : Positive
N : Negative

Characteristics of impact
D : Direct
ID : Indirect
S : Short term
L : Long term
R : Reversible
IR : Ineversible

The feature of impacts is indicated as follow:

1P d-s-r meaning that the positive impact would be significant, direct, short term, and reversible.

2N d-s-r meaning that the negative impact would be significant, direct, long term, and reversible.

Table I.3.4 Projection of Water Quality on the Run Off Water

	Unit	Without Project Condition <1							With Project Condition <2							Balance						
		Jalaur		Suague		Total			Jalaur		Suague		Total			Jalaur		Suague		Total		
		Wet	Dry	Wet	Dry	Wet	Dry	Ave./ Total	Wet	Dry	Wet	Dry	Wet	Dry	Ave./ Total	Wet	Dry	Wet	Dry	Wet	Dry	Ave./ Total
1. Land use condition <3																						
1.1 Paddy	ha	6,120	4,910	2,540	0	8,660	4,910	-	8,820	8,820	2,900	1,100	11,720	9,920	-	2,700	3,910	360	1,100	3,060	5,010	-
2. Application of farm input																					902	
2.1 Nitrogen	ton	569	457	236	0	805	457	1,262	882	882	290	110	1,172	992	2,164	313	425	54	110	367	535	902
2.2 Phosphate	ton	171	172	71	0	242	172	414	309	309	102	39	410	347	757	137	137	30	39	168	175	343
3. Run off amount <4																						
2.1 Nitrogen	ton	5.69	4.57	2.36	0.00	8.05	4.57	12.62	8.82	8.82	2.90	1.10	11.72	9.92	21.64	3.13	4.25	0.54	1.10	3.67	5.35	9.02
2.2 Phosphate	ton	0.34	0.34	0.14	0.00	0.48	0.34	0.83	0.62	0.62	0.20	0.08	0.82	0.69	1.51	0.27	0.27	0.06	0.08	0.34	0.35	0.69
Return flow from irrigated fields	MCM	22	9	5	1	26	10	37	22	9	5	1	26	10	37	22	9	5	1	26	10	37
4. Concentration in the water <5																						
2.1 Nitrogen	mg/l	0.26	0.49	0.52	0.00	0.31	0.44	0.35	0.41	0.95	0.64	0.99	0.45	0.95	0.59	0.15	0.46	0.12	0.99	0.14	0.51	0.25
2.2 Phosphate	mg/l	0.02	0.04	0.03	0.00	0.02	0.03	0.02	0.03	0.07	0.04	0.07	0.03	0.07	0.04	0.01	0.03	0.01	0.07	0.01	0.03	0.02

Remarks :

<1 Farm inputs application without project condition is estimated based on the present farming practice

<2 Farm inputs application with project condition is estimated based on the proposed farming practice

<3 Paddy field is considered as a main contamination source for water pollution in this estimation, due to the hyfrological feature.

<4 As the run off rates of farm inputs, 1% of nitrogen and 0.2% of phosphate and agrochemical are appled, respectively.

<5 Run off discharges in wet season on both areas are set at 21.6 MCM in Jalaur and 9.3 MCM in Suague. Ones in dry seasons are 4.6 MCM in Jalaur and 1.1 MCM in Suague.

Figures

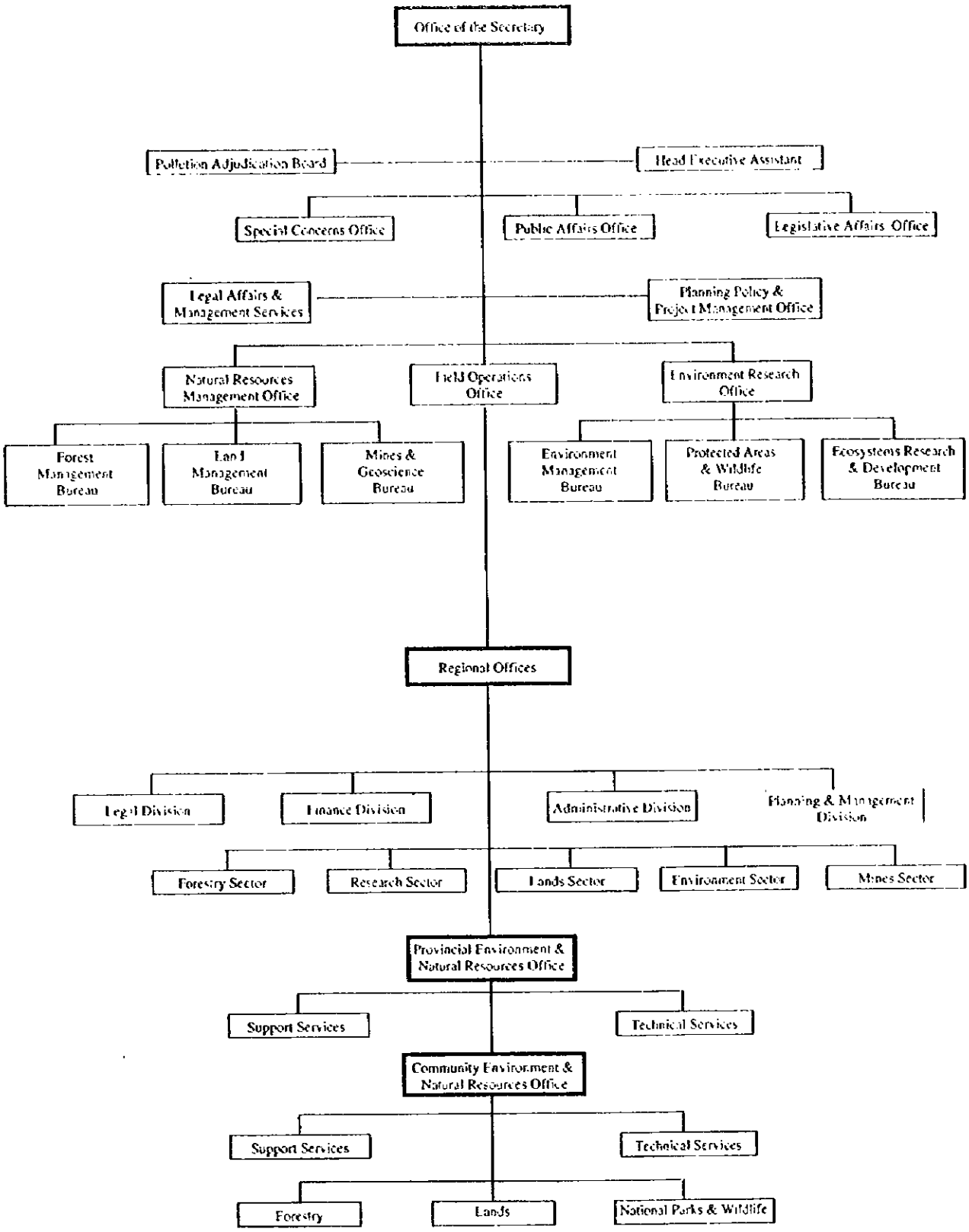

Figure I.1.1 Organization Chart of Department of Environment and Natural Resources

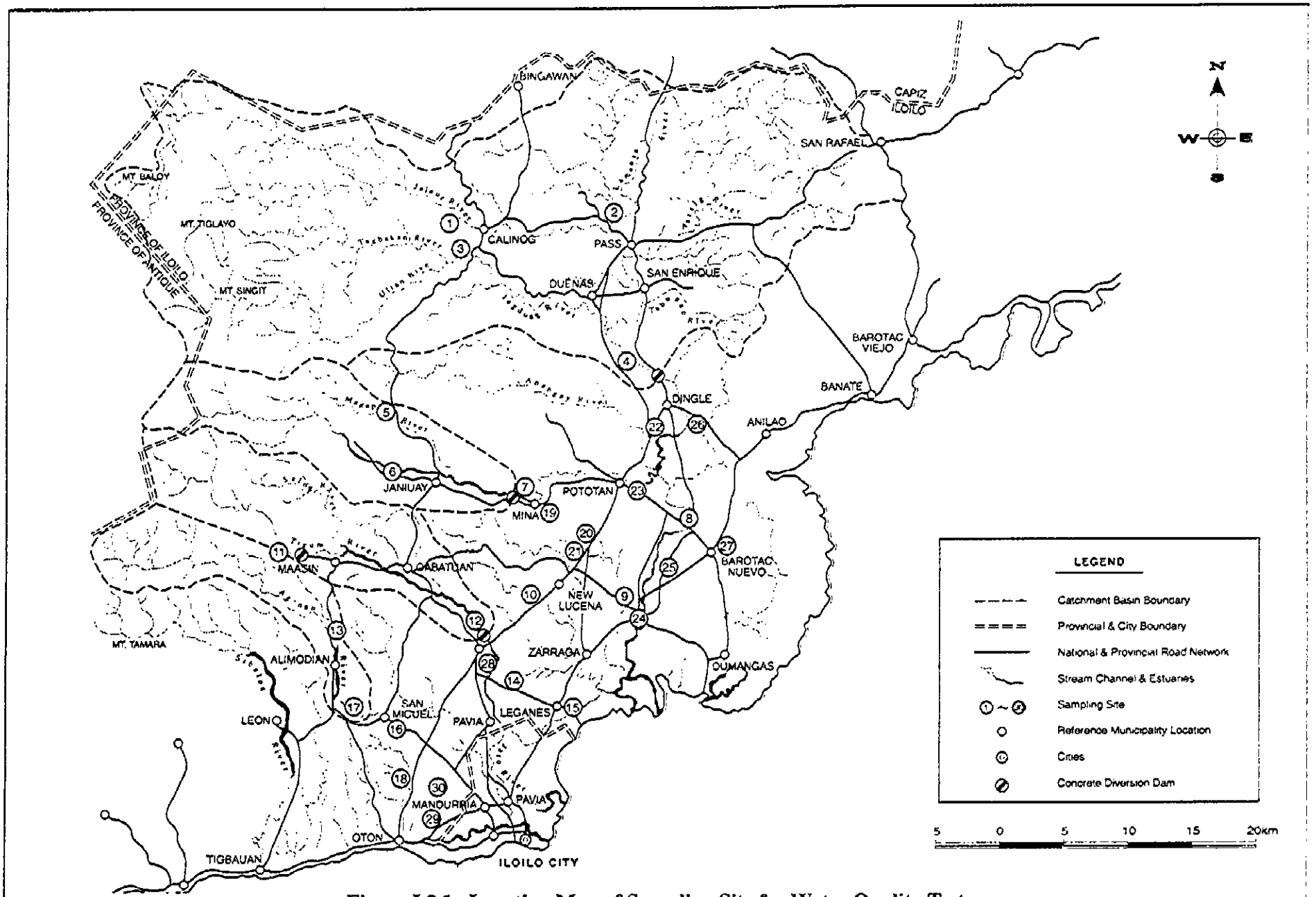

Figure I.2.1 Location Map of Sampling Site for Water Quality Test

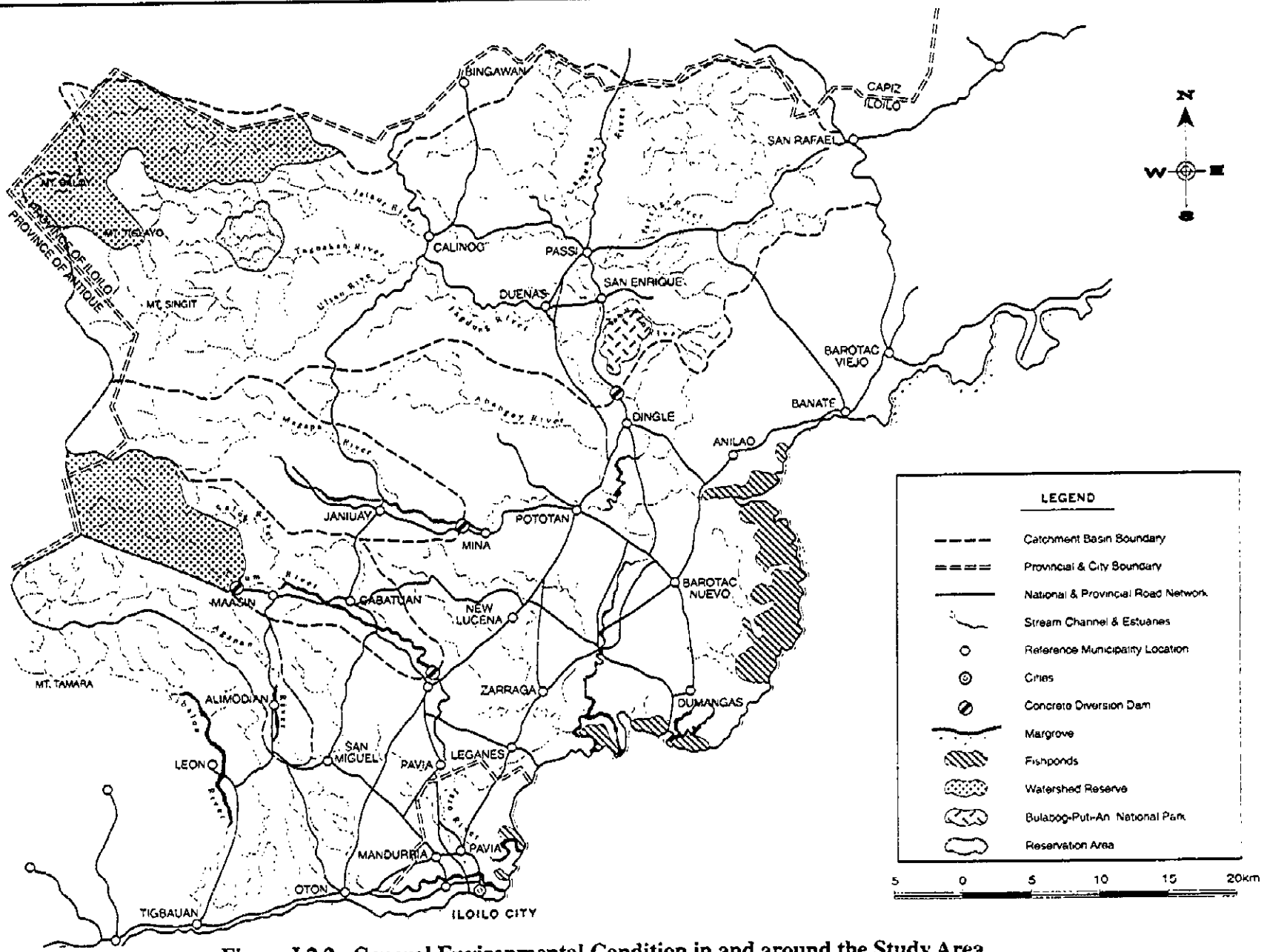

Figure I.2.2 General Environmental Condition in and around the Study Area

ANNEX J

Cost Estimate and Construction Time Schedule

THE STUDY ON JALAUR IRRIGATION SYSTEMS
AND RURAL AREA DEVELOPMENT PROJECT

ANNEX J

Cost Estimate and Construction Time Schedule

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1. WORK QUANTITY AND COST ESTIMATE

1.1 Work Quantity

Work quantities of the Project are estimated in accordance with the designed drawings and are summarized in Table J.1.1.

1.2 Construction Method

All earthworks shall be carried out by mechanical construction method in principle for efficient execution, and proper compaction to be specified in the technical specifications shall be provided for embankment and backfill. Excavation and box cutting shall be carried out by backhoe in principle and trimming shall be made manually. Embankment shall be generally carried out using fair and adequate excavated materials and additional materials if required shall be hauled from the approved borrow areas around 9.4 km far from the site. Final trimming of embankment shall be made manually.

For the gravel roads, suitable materials shall be collected from approved quarry sites and hauled to the site. They shall be properly compacted with vibrating roller. Boulders for gabion shall be collected from the approved quarry areas around 30 km far from the site and hauled to the site, as well.

Excavation for structures shall be carried out as shown on the relevant drawings in order to avoid unnecessary excavation. Backfill shall be carefully made using the approved materials and proper compaction shall be provided by portable compactor so as not to give any damages to structures.

Canal lining shall be cast-in-situ concrete and concrete shall be properly placed in accordance with the specifications to be made. Before placing concrete, the surface of soil shall be fairly trimmed by manual.

1.3 Basic Conditions and Assumption for Cost Estimate

Construction costs comprise direct construction costs, administration costs, engineering services costs and physical & price contingencies. Following basic conditions and assumption are made for the estimate of the construction costs.

(a) Unit prices are based on the December 1997 prices for the cost estimate.

(b) The unit prices of labor, construction materials and equipment are composed of foreign and local currency components. The ration of foreign and local currency components is estimated as shown below, referring to the NEDA's criteria.

Item	Foreign Currency	Local Currency
1. Cement	80	20
2. Steel	90	10
3. Lumber	40	60
4. Aggregate	30	70
5. Labor	0	100
6. Fuel and Oil	80	20
7. Equipment	80	20
8. Steel Gate	80	20

(e) Construction material costs are assumed to be of site price including transportation costs.

(d) Working ratio and work capabilities of equipment are estimated based on the present prevailing conditions in NIA's projects around the Study area.

(e) Construction works will be executed by full contract basis through competitive bidding. The construction materials and equipment required for the construction shall be provided by the contractor himself.

(f) Land acquisition costs are estimated as shown below, based on the provincial tax ordinance around the study area.

Type of Land	(peso/ha)
Irrigated Paddy Field	124,300
Rainfed Paddy Field	89,700
Sugarcane Field	117,300
Home Garden	150,000

(g) Overhead and profit of the contractor are assumed at 30% of the unit price. Engineering services costs are assumed at 10% of the sum of direct construction costs and procurement costs. Administration costs are estimated at 2% of the sum of direct construction costs, engineering services costs and procurement costs. Physical contingency is assumed at 10% of the sum of direct construction costs, engineering services costs, procurement costs, administration costs and land acquisition costs.

(h) Price contingency is assumed at 1.8% per annum for foreign currency portion and 5.3% per annum for local portion.

(i) Exchange rate used in the cost estimate is US$1.00 = peso35.10

Unit prices of labors, basic construction materials and equipment used in the estimate are summarized in Tables J.1.2, J.1.3 and J.1.4 Unit rates developed for major construction works including foreign and local currency portions are summarized in Table J.1.5.

1.4 Project Cost

Project cost is estimated based on the work quantities estimated and the unit rates developed, and is 1,573.3 million peso (1,186. 2 million peso for the Jalaur proper RIS and 387.1 million peso for the Suague RIS) as shown below. The detailed costs and work quantities are shown in Tables J.1.6, J.1.7, J.1.8 and J.1.9.

Summary of Project Cost

(Unit: 1,000 pesos)

Description	L/C	F/C	Total
1. Construction Costs	436,954	492,382	929,336
1.1 Improvement of Diversion Dam	27,468	45,894	73,362
1.2 Irrigation Canal and Related Structures	329,196	357,568	686,765
1.3 Drainage Canal and Related Structures	19,451	40,651	60,102
1.4 Service Road	33,233	14,185	47,418
1.5 Rural Raod and Related Structures	23,192	29,672	52,864
1.6 IA Office	3,500	3,500	7,000
1.7 Training Center	913	913	1,825
2. Procurement Cost	0	60,050	60,050
2.1 O & M Equipment	0	50,371	50,371
2.2 Institutional Dev. & Agr. Extension	0	9,680	9,680
3. Cost & Expenditure of Training Materials	6,672	6,672	13,344
4. Engineering Services Costs	78,975	115,543	194,519
4.1 Civil Works	43,695	49,238	92,934
4.2 Training	35,280	66,305	101,585
5. Irrigators' Association Development Fund	0	8,200	8,200
6. Administration Costs	8,873	11,182	20,055
7. Land Acquisition Costs	44,375	0	44,375
8. Physical Contingency	57,585	68,583	126,168
9. Price Contingency	128,139	49,149	177,288
Grand Total	761,572	811,762	1,573,334

Summary of Project Cost (Jalaur proper RIS)

(Unit: 1,000 pesos)

Description	L/C	F/C	Total
1. Construction Costs	325,390	374,169	699,560
1.1 Improvement of Diversion Dam	1,443	5,773	7,216
1.2 Irrigation Canal and Related Structures	262,343	296,227	558,570
1.3 Drainage Canal and Related Structures	18,375	39,616	57,992
1.4 Service Road	25,807	11,015	36,821
1.5 Rural Raod and Related Structures	13,885	18,000	31,885
1.6 IA Office	2,625	2,625	5,250
1.7 Training Center	913	913	1,825
2. Procurement Cost	0	56,053	56,053
2.1 O & M Equipment	0	48,793	48,793
2.2 Institutional Dev. & Agr. Extension	0	7,260	7,260
3. Cost & Expenditure of Training Materials	5,004	5,004	10,008
4. Engineering Services Costs	58,999	73,172	132,171
4.1 Civil Works	32,539	37,417	69,956
4.2 Training	26,460	35,755	62,215
5. Irrigators' Association Development Fund	0	6,150	6,150
6. Administration Costs	6,608	8,705	15,312
7. Land Acquisition Costs	37,174	0	37,174
8. Physical Contingency	43,318	51,710	95,028
9. Price Contingency	97,714	37,054	134,767
	574,207	612,016	1,186,223

Summary of Project Cost

(Suague RIS)

(Unit: 1,000 pesos)

	Description	L/C	F/C	Total
1.	Construction Costs	111,563	118,213	229,776
	1.1 Improvement of Diversion Dam	26,025	40,121	66,146
	1.2 Irrigation Canal and Related Structures	66,854	61,341	128,195
	1.3 Drainage Canal and Related Structures	1,076	1,035	2,110
	1.4 Service Road	7,426	3,170	10,596
	1.5 Rural Road and Related Structures	9,307	11,672	20,979
	1.6 IA Office	875	875	1,750
	1.7 Training Center	0	0	0
2.	Procurement Cost	0	3,998	3,998
	2.1 O & M Equipment	0	1,578	1,578
	2.2 Institutional Dev. & Agr. Extension	0	2,420	2,420
3.	Cost & Expenditure of Training Materials	1,668	1,668	3,336
4.	Engineering Services Costs	19,976	42,371	62,347
	4.1 Civil Works	11,156	11,821	22,978
	4.2 Training	8,820	30,550	39,370
5.	Irrigators' Association Development Fund	0	2,050	2,050
6.	Administration Costs	2,265	2,478	4,742
7.	Land Acquisition Costs	7,201	0	7,201
8.	Physical Contingency	14,267	16,873	31,140
9.	Price Contingency	30,425	12,095	42,520
	Grand Total	187,365	199,746	387,111

1.5 O&M Cost

O&M cost for the project operating facilities broadly consists of (1) personal services such as salary of project staff concerned, (2) maintenance & other operating expenses and (3) rehabilitation and maintenance cost for system facilities. Annual O&M cost is 16,926 thousand peso for the first two years (13,009 thousand peso for the Jalaur proper RIS and 3,917 thousand peso for the Suague RIS), 13,564 thousand peso for the third to fifth year (10,175 thousand peso for the Jalaur proper RIS and 3,389 thousand peso for the Suague RIS) and 10,223 thousand peso after the sixth year (7,708 thousand peso for the Jalaur proper RIS and 2,515 thousand peso for the Suague RIS). Detailed O&M cost is shown in Table J.1.10.

1.6 Replacement Cost

Replacement cost is accounted to be the metal works such as gates, trash racks, etc. and equipment and facilities for operation and maintenance works such as sand pump, communication facilities, O&M equipment, etc. Because, the project facilities mentioned above have a shorter useful life than the project life and require replacement during the Project life which is 50 years. The summary of the replacement cost is shown below and details are shown in Table J. 1. 9 and J. 1. 11.

(Unit: peso)

	Jalaur proper RIS	Suague RIS	Whole Project	Useful Life
Metal Works	27,521,284	8,606,912	36,128,196	15 years
Stop-log	1,698,923	561,847	2,260,770	10 years
O&M Equipment	34,975,472	9,424,528	44,400,000	15 years

2. CONSTRUCTION PROGRAM

2.1 Workable Days

Workable days for the construction are very limited as this Project is a rehabilitation project and the irrigation activities shall be sustained during the construction.

Main construction works such as earth works and canal lining of main canals and big lateral canals, settling basins and other related structures shall be carried out only the idle time of irrigation. The irrigation is supposed to be entirely halted for 4 months from January to April based on the information of the Jalaur-Suague RIS office, and during this period, the above-mentioned main construction works shall be carried out.

For other 8 months, the irrigation is supposed to be partly suspended depending on the rotational water distribution, and during this period, the construction works of the other lateral canals and their related structures shall be carried out.

Average days with rainfall of less than 5 mm of these 4 months in recent twelve years are 114 days as shown in Table J. 2. 1. Therefore, provided that working days are 6 days par week, the workable days in this period are estimated to be 97 days.

2.2 Construction Works

Main construction works are concrete works of settling basins, canal lining and related structures, and earth works of canal excavation and embankment. The quantities of the main works are roughly estimated as shown below. The details are shown in Table J.1.1.

			Jalaur proper RIS	Suague RIS
Settling Basin	Concrete works		1,937 m^3	274 m^3
	Earth works	Excavation	16,712 m^3	350 m^3
		Backfill	8,878 m^3	740 m^3
Irrigation Canals	Concrete works		37,114 m^3	3,398 m^3
	Earth works	Excavation	228,561 m^3	113,512 m^3
		Backfill	634,358 m^3	93,956 m^3
Related Structures	Concrete works		3,957 m^3	840 m^3
	Earth works	Excavation	86,831 m^3	32,189 m^3
		Backfill	69,006 m^3	25,687 m^3
		Embankment	91,217 m^3	32,145 m^3

2.3 Construction Time Schedule

Construction time schedule is made based on the estimated quantity of main works mentioned above, workable days in the site, construction method and program, anticipated capacities of construction equipment and physical site condition,

The working capacities of the main works are assumed to be 300 m^3/day/team for excavation by mechanical method, 200 m^3/day/team for embankment by mechanical method and 56 m^3/day/team for concrete work. Workable days in the site are 97 days in the critical period as mentioned before.

In Jalaur proper RIS, the most critical path of the schedule is supposed to be construction of settling basin and this construction shall be executed in 4 months from January to April in the first construction year. The other critical path is supposed to be earth works and concrete lining works of main canals, and these works with construction of related structures shall be divided into 3 divisions and executed in 4 months from January to April in 3 construction years.

In Suague RIS, the most critical path of the schedule is supposed to be earth works and concrete lining works of main canals, and these works with construction of related structures shall be divided into 2 divisions and executed in 4 months from January to April in the first 2 construction years.

The construction time schedule is shown in Figure J.2.1.

Tables

Table J. 1. 1 Summary of Work Quantities (1/3)

Work Item	Unit	Quantities		
		Jalaur	Suagac	Total
1. Improvement of Diversion Dam				
(1) Replacement of the gates				
(a) Main gates	no.	8	0	8
(b) Scouring gates	no.	0	2	2
(c) Intake gates	no.	12	2	14
(2) Trash rack	m^2	64	5	69
(3) River treatment				
(a) Excavation	m^3	0	120,120	120,120
(b) Embankment	m^3	0	120,120	120,120
(c) Gabion	m^3	0	9,720	9,720
(d) Wooden pile	lin m	0	1,800	1,800
(4) Dam improvement				
(a) Excavation	m^3	0	4,327	4,327
(b) Reinforced concrete	m^3	0	819	819
(c) Plain conrete	m^3	0	2,750	2,750
(d) Reinforcement bar	kg	0	164	164
(e) Concrete block	m^2	0	4,074	4,074
(g) Form	m^2	0	3,560	3,560
(h) S. P.	lin m	0	1,250	1,250
2. Irrigation Canal and Related Structures				
(1) Main canal				
(a) Clearing and grubbing	m^2	188,495	50,800	239,296
(b) Excavation	m^3	137,526	58,070	195,596
(c) Embankment	m^3	356,432	18,077	374,509
(d) Earth finishing	m^2	487,488	131,380	618,868
(e) Reinforced concrete	m^3	28,856	2,198	31,054
(f) Reinforcement bar	kg	283,465	17,748	301,213
(g) Form	m^2	722	81	802
(h) Lining filter	m^3	14,567	1,207	15,774
(2) Lateral canal				
(a) Clearing and grubbing	m^2	337,482	131,205	468,687
(b) Excavation	m^3	91,035	55,442	146,477
(c) Embankment	m^3	277,926	75,879	353,805
(d) Earth finishing	m^2	872,798	339,323	1,212,121
(e) Reinforced concrete	m^3	8,258	1,200	9,458
(f) Reinforcement bar	kg	80,962	6,002	86,964
(g) Form	m^2	207	92	299
(h) Lining filter	m^3	4,173	398	4,571

Table J. 1. 1 Summary of Work Quantities (2/3)

Work Item	Unit	Quantities		
		Jalaur	Suague	Total
(3) Feeder canal				
(a) Clearing and grubbing	m^2	2,746	823	3,569
(b) Excavation	m^3	4,191	1,190	5,381
(c) Backfill	m^3	935	230	1,165
(d) Embankment	m^3	13,731	4,116	17,847
(e) Earth finishing	m^2	4,119	1,235	5,354
(f) Reinforced concrete	m^3	738	168	906
(g) Reinforcement bar	kg	36,936	7,797	44,733
(h) Form	m^2	1,380	231	1,611
(i) Gravel blanket	m^3	581	153	734
(j) Gates for HG	m^2	9	0	9
(k) Gates for TO	no.	24	7	31
(l) Stop log	m^3	10	2	12
(m) Grouted riprap	m^3	655	150	805
(4) Settling basin				
(a) Clearing and grubbing	m^2	2,610	310	2,920
(b) Excavation	m^3	16,712	350	17,062
(c) Backfill	m^3	8,878	740	9,618
(d) Reinforced concrete	m^3	1,588	194	1,782
(e) Plain concrete	m^3	349	80	429
(f) Reinforcement bar	kg	121,490	15,486	136,976
(g) Form	m^2	4,068	605	4,673
(h) Gravel blanket	m^3	783	93	876
(i) Gates	no.	16	2	18
(5) Related structures				
(a) Clearing and grubbing	m^2	6,163	1,513	7,677
(b) Excavation	m^3	86,831	32,189	119,020
(c) Backfill	m^3	69,006	25,687	94,693
(d) Embankment	m^3	91,217	32,145	123,362
(e) Earth finishing	m^3	89,294	38,784	128,078
(f) Reinforced concrete	m^3	3,201	600	3,801
(g) Plain concrete	m^3	756	240	996
(h) Reinforcement bar	kg	189,120	35,093	224,213
(i) Form	m^2	16,082	3,718	19,800
(j) Gravel blanket	m^3	1,849	454	2,303
(k) Gates for HG	m^2	548	161	709
(l) Gates for TO	no.	361	111	472
(m) Stop log	m^3	54	19	73
(n) Demolition	m^3	708	235	943
(o) Grouted riprap	m^3	3,850	1,491	5,341
(6) On-farm facilities				
(a) Excavation	m^3	195,970	30,058	226,028
(b) Backfill	m^3	2,220	775	2,995
(c) Embankment	m^3	185,317	19,867	205,184
(d) Reinforced concrete	m^3	3,196	937	4,133
(e) Reinforcement bar	kg	133,751	46,687	180,438
(f) Form	m^2	17,172	5,994	23,166
(g) Gravel blanket	m^3	1,345	470	1,815

Table J. 1. 1 Summary of Work Quantities (3/3)

Work Item	Unit	Quantities		
		Jalaur	Suague	Total
3. Drainage Canal and Related Structures				
(1) Improvement of Abangay				
(a) Excavation	m^3	415,449	0	415,449
(b) Spoiled embankment	m^3	61,445	0	61,445
(2) Secondry drain				
(a) Excavation	m^3	94,738	7,530	102,268
(3) Bridge				
(a) Clearing and grubbing	m^2	2	0	2
(b) Excavation	m^3	531	0	531
(c) Backfill	m^3	292	0	292
(d) Reinforced concrete	m^3	39	0	39
(e) Plain conrete	m^3	181	0	181
(f) PC concrete	m^3	130	0	130
(g) Reinforcement bar	kg	4,128	0	4,128
(h) PCSW	kg	4,736	0	4,736
(i) Form	m^2	1,069	0	1,069
(j) Gravel blanket	m^3	13	0	13
(k) PHC Pile	lm	330	0	330
(l) Demolition	m^3	964	0	964
(4) Related structures				
(a) Clearing and grubbing	m^2	297	133	430
(b) Excavation	m^3	771	73	844
(c) Backfill	m^3	506	77	583
(d) Embankment	m^3	331	148	479
(e) Reinforced concrete	m^3	421	114	535
(f) Plain concrete	m^3	15	7	22
(g) Reinforcement bar	kg	27,823	7,962	35,785
(h) Form	m^2	2,035	514	2,549
(i) Gravel blanket	m^3	89	40	129
(j) RCPC, dia 61 cm	lin.m	70	0	70
4. Service Road				
Gravel pavement	m^3	78,884	20,020	98,904
5. Rural Raod and Related Structures				
(1) Barangay road				
(a) Clearing and grubbing	m^2	8,700	3,600	12,300
(b) Excavation	m^3	35,784	22,624	58,408
(c) Disposal	m^3	35,784	22,624	58,408
(d) Embankmeot	m^3	56,992	36,184	93,176
(e) Earth finishing	m^3	18,970	11,137	30,107
(f) Gravel pavement	m^3	5,903	3,712	9,615
(2) Related structures				
(a) Excavation	m^3	2,064	1,517	3,581
(b) Backfill	m^3	1,139	837	1,976
(c) Reinforced concrete	m^3	567	417	984
(d) Plain concrete	m^3	7	5	12
(e) Reinforcement bar	kg	34,027	25,020	59,047
(f) Form	m^2	3,013	2,215	5,228
(g) RCPC, dia 61 cm	lin.m	238	175	413

Table J. 1. 2 Labor Wages at Pototan

Unit : Pesos

		Daily Rate	Hourly Rate
1	Foreman	582.88	72.86
2	Skilled labor	391.85	48.98
3	Common laborer	361.86	45.23
4	Mason	409.04	51.13
5	Carpenter	409.04	51.13
6	Steelman	409.04	51.13
7	Painter	487.65	60.96
8	Welder	487.65	60.96
9	Electrician	516.32	64.54
10	Operator (Dozer)	487.63	60.95
11	Operator (Backhoe)	487.63	60.95
12	Driver (Dumptruck)	516.33	64.54
13	Driver (Stake truck)	516.33	64.54
14	Leadman	487.66	60.96
15	Rigger	409.04	51.13

Table J. 1. 3 Unit Price of Construction Materials at Pototan

Unit: Pesos

	Item	Unit	Unit Price
1	Portland Cement	bag	149.81
2	Gravel (Coarse Aggregate)	m^3	352.63
3	Sand (Fine Aggregate)	m^3	352.63
4	R.S.B.	kg	25.51
5	PCSW	kg	178.57
6	Form Lumber	bd.ft.	37.12
7	Plywood	pcs.	764.24
8	C.W.Nails	kg	33.51
9	Tie Wire	kg	31.51
10	Boulder	m^3	486.26

Table J. 1. 4 Rental Price of Equipment

Unit : Pesos

	Equipment	Hourly Rate	Daily Rate
1	Bulldozer, 12 T	1,006.50	8,052.00
2	Bulldozer, 24 T	1,845.80	14,766.40
3	Dozer Shovel, 1.4 cu.m	854.70	6,837.60
4	Dozer Shovel, 2.2 cu.m	1,043.90	8,351.20
5	Wheel Loader, 1.22 cu.m	573.10	4,584.80
6	Wheel Loader, 2.68 cu.m	1,406.90	11,255.20
7	Backhoe, 0.70 cu.m	875.60	7,004.80
8	Backhoe, 2.2 cu.m	2,140.60	17,124.80
9	Crane, 31-35T w/Dragline 1 cu.m	1,518.00	12,144.00
10	Motor Grader, 3.66 m	862.40	6,899.20
11	Dumptruck, 4.59-6.87 cu.m	552.20	4,417.60
12	Dumptruck, 9.18-11.47 cu.m	799.70	6,397.60
13	Single Smooth Drum Vibrator Roller, 15 T	825.00	6,600.00
14	Tire Roller, 12-13 T	367.40	2,939.20
15	Vibrating Roller, 5 T	797.50	6,380.00
16	Tamper, 60 kg	27.64	221.12
17	Tamping Foot Drum, Vib., 12 T	1,487.20	11,897.60
18	Macadam Roller, 9-11 T	462.00	3,696.00
19	Truck Crane, 21-25 T	1,010.90	8,087.20
20	Cargo Truck, 9-10 T	663.30	5,306.40
21	Generator Set, 41-50 kW	128.57	1,028.56
22	Macadam Roller, 9-11 T	462.00	3,696.00
23	Truck Crane, 6-10 T	404.80	3,238.40
24	Welding Machine, 400 Amp	54.32	434.56
25	Air Compressor, 186-250 cfm	413.60	3,308.80
26	Aggregate Washing System	375.00	3,000.00
27	Concrete Mixer (2.5-3 Bagger)	69.27	554.16
28	Water Pump (Diesel), 3 1/2"-4"	15.69	125.52
29	Water Pump (Electric), 5 1/2"-6"	28.27	226.16
30	Grinder	4.94	39.52
31	Chainsaw	8.93	71.44
32	Compressor, 4.50 cu.m	203.50	1,628.00

Table J. 1. 5 Unit Cost of Construction Works

Unit: Peso

Item	Unit	Unit Price			Remarks
		L/C	F/C	Total	
1. Earth Work					
Clearing & Grubbing	sq.m	1.57	5.81	10.30	
Excavation	cu.m	6.56	14.60	21.15	
Embankment	cu.m	8.30	29.44	37.74	
Conveyance	cu.m	13.16	48.33	61.49	
Backfill	cu.m	59.15	24.21	83.36	
Borrow+Cnovey	cu.m	119.83	183.83	303.66	
Demolition	cu.m	646.84	681.46	1,328.30	
Disposal	cu.m	38.87	141.45	180.32	
Earth Finishing	sq.m	20.51	0.00	20.51	
2. Concrete and Reinforcement					
Concrete-400 kg/sq.cm	cu.m	1,754.98	2,147.20	3,902.18	
Concrete-211 kg/sq.cm	cu.m	1,462.48	1,789.33	3,251.82	
Concrete-168 kg/sq.cm	cu.m	1,429.11	1,498.12	2,927.23	
Form	sq.m	1,081.66	174.89	1,256.56	
RSB	kg	19.53	27.88	47.42	
PCSW	kg	147.13	210.01	357.14	
3. Others					
Wooden Stoplog	cu.m	18,569.28	8,185.43	26,754.71	
Gabion	cu.m	1,178.15	1,846.83	3,024.98	
Grouted Riprap	cu.m	1,232.94	998.41	2,231.36	
Gravel Blanket	cu.m	577.75	246.59	824.34	
Sand Filter	cu.m	849.29	182.75	1,032.04	
Road Surfacing Gravel	cu.m	370.95	158.33	529.28	
RCPC, dia 61 cm	lin.m	1,837.05	534.29	2,371.34	
RCPC, dia 76 cm	lin.m	2,335.58	790.94	3,126.51	
RCPC, dia 91 cm	lin.m	3,644.70	1,108.93	4,753.63	
RCPC, dia 107 cm	lin.m	4,502.41	1,301.16	5,803.57	
RCPC, dia 122 cm	lin.m	5,121.19	1,469.52	6,590.71	
Gates for Turnout (610 x 610)	unit	2,860.00	11,440.00	14,300.00	including installation
Sluice Gates for Jalaur (4.27 x 1.83)	unit	138,788.00	555,152.00	693,940.00	" (mechanized)
Intake Gates for Jalaur (2.13 x 1.83)	unit	27,352.00	109,408.00	136,760.00	" (mechanized)
Sluice Gates for Suague (4.57 x 2.59)	unit	201,552.00	806,208.00	1,007,760.00	" (mechanized)
Intake Gates for Suague (1.52 x 1.22)	unit	17,784.00	71,136.00	88,920.00	" (mechanized)
Gates for Jalaur S. Basin (2.5 x 1.2)	unit	26,700.00	106,800.00	133,500.00	" (mechanized)
Gates for Suague S. Basin (3.0 x 1.0)	unit	26,700.00	106,800.00	133,500.00	" (mechanized)
Head Gate & Check	sq.m	5,400.00	21,600.00	27,000.00	including installation
PHC Pile	lin.m	662.98	994.48	1,657.46	
Trush Rack	sq.m	74.45	297.80	372.25	
Concrete Block (1.5 x 1.5 x 1.0)	sq.m	21.20	20.21	41.41	
S. P.	lin.m	499.12	1,996.48	2,495.60	

Table J. 1. 6 Breakdown of Direct Construction Costs (Jalaur proper RIS) (1/3)

(Unit: pesos)

Work Item	Unit	Q'ty	Unit Rate		Total Amount		
			L/C	F/C	L/C	F/C	Total
1. Improvement of Diversion Dam							
(1) Replacement of the gates							
(a) Main gates	no.	8	138,788	555,152	1,110,304	4,441,216	5,551,520
(b) Intake gates	no.	12	27,352	109,408	328,224	1,312,896	1,641,120
Sub-total					1,438,528	5,754,112	7,192,640
(2) Trash rack	m²	64	74	298	4,717	18,997	23,714
Total					1,443,245	5,773,109	7,216,354
2. Irrigation Canal and Related Structures							
(1) Main canal							
(a) Clearing and grubbing	m²	188,495	6	22	1,137,946	4,202,504	5,340,450
(b) Excavation	m³	137,526	20	63	2,712,016	8,654,523	11,366,539
(c) Embankment	m³	356,432	68	121	24,314,035	43,254,853	67,568,888
(d) Earth finishing	m²	487,488	21	0	10,000,044	0	10,000,044
(e) Reinforced concrete	m³	28,856	1,462	1,789	42,201,440	51,632,993	93,834,433
(f) Reinforcement bar	kg	283,465	20	28	5,537,415	7,903,946	13,441,361
(g) Form	m²	722	1,082	175	780,418	126,186	906,604
(h) Lining filter	m³	14,567	849	183	12,371,607	2,662,119	15,033,726
(i) Others					167,136	376,056	543,192
Sub-total					99,222,057	118,813,180	218,035,237
(2) Lateral canal							
(a) Clearing and grubbing	m²	337,482	6	22	2,037,378	7,524,158	9,561,536
(b) Excavation	m³	91,035	20	63	1,795,205	5,728,816	7,524,021
(c) Embankment	m³	277,926	68	121	18,958,730	33,727,723	52,686,453
(d) Earth finishing	m²	872,798	21	0	17,904,069	0	17,904,069
(e) Reinforced concrete	m³	8,258	1,462	1,789	12,077,193	14,776,311	26,853,504
(f) Reinforcement bar	kg	80,962	20	28	1,581,571	2,257,489	3,839,060
(g) Form	m²	207	1,082	175	223,363	36,115	259,478
(h) Lining filter	m³	4,173	849	183	3,544,087	762,615	4,306,702
(i) Others					66,672	150,012	216,684
Sub-total					58,188,268	64,963,239	123,151,507
(3) Feeder canal							
(a) Clearing and grubbing	m²	2,746	6	22	16,578	61,226	77,804
(b) Excavation	m³	4,191	20	63	82,646	263,739	346,385
(c) Backfill	m³	935	59	24	55,305	22,636	77,941
(d) Embankment	m³	13,731	68	121	936,660	1,666,325	2,602,985
(e) Earth finishing	m²	4,119	21	0	84,500	0	84,500
(f) Reinforced concrete	m³	738	1,462	1,789	1,079,313	1,320,527	2,399,840
(g) Reinforcement bar	kg	36,936	20	28	721,535	1,029,898	1,751,433
(h) Form	m²	1,380	1,082	175	1,492,692	241,354	1,734,046
(i) Gravel blanket	m³	581	578	247	335,672	143,268	478,940
(j) Gates for HG	m³	9	5,400	21,600	47,466	189,864	237,330
(k) Gates for TO	no.	24	2,860	11,440	68,640	274,560	343,200
(l) Stop log	m³	10	18,569	8,185	176,408	77,761	254,169
(m) Grouted riprap	m³	655	1,233	998	807,549	653,958	1,461,507
(n) Others					0	0	0
Sub-total					5,904,964	5,945,116	11,850,080
(4) Settling basin							
(a) Clearing and grubbing	m²	2,610	6	22	15,756	58,189	73,945
(b) Excavation	m³	16,712	20	63	329,560	1,051,686	1,381,246
(c) Backfill	m³	8,878	59	24	525,133	214,936	740,069
(d) Reinforced concrete	m³	1,588	1,462	1,789	2,322,424	2,841,460	5,163,884
(e) Plain concrete	m³	349	1,429	1,498	498,759	522,842	1,021,601
(f) Reinforcement bar	kg	121,490	20	28	2,373,275	3,387,544	5,760,819
(g) Form	m²	4,068	1,082	175	4,400,199	711,471	5,111,670
(h) Gravel blanket	m³	783	578	247	452,378	193,079	645,457
(i) Gates	no.	16	26,700	106,800	427,200	1,708,800	2,136,000
(j) Others					0	0	0
Sub-total					11,344,684	10,690,007	22,034,691

Table J. 1. 6 Breakdown of Direct Construction Costs (Jalaur proper RIS) (2/3)

(Unit: pesos)

Work Item	Unit	Q'ty	Unit Rate		Total Amount		
			L/C	F/C	L/C	F/C	Total
(5) Related structures							
(a) Clearing and grubbing	m²	6,163	2	6	9,648	35,833	45,481
(b) Excavation	m³	86,831	20	63	1,712,307	5,464,274	7,176,581
(c) Backfill	m³	69,006	59	24	4,081,701	1,670,635	5,752,339
(d) Embankment	m³	91,217	68	121	6,222,367	11,069,639	17,292,006
(e) Earth finishing	m²	89,294	21	0	1,831,725	0	1,831,725
(f) Reinforced concrete	m³	3,201	1,462	1,789	4,681,411	5,727,654	10,409,065
(g) Plain concrete	m³	756	1,429	1,498	1,080,406	1,132,576	2,212,982
(h) Reinforcement bar	kg	189,120	20	28	3,694,405	5,273,287	8,967,692
(i) Form	m²	16,082	1,082	175	17,395,392	2,812,672	20,208,064
(j) Gravel blanket	m³	1,849	578	247	1,068,259	455,944	1,524,203
(k) Gates for HG	m²	548	5,400	21,600	2,957,437	11,829,751	14,787,188
(l) Gates for TO	no.	361	2,860	11,440	1,031,259	4,125,037	5,156,296
(m) Stop log	m²	54	18,569	8,185	1,002,741	442,013	1,444,754
(n) Demolition	m³	708	647	681	457,962	482,473	940,435
(o) Grouted riprap	m³	3,850	1,233	998	4,746,160	3,843,469	8,589,629
(p) Others					2,148,622	8,546,792	10,695,414
Sub-total					54,121,805	62,912,049	117,033,854
(6) On-farm facilities							
(a) Excavation	m³	195,970	20	63	3,864,528	12,332,392	16,196,920
(b) Backfill	m³	2,220	59	24	131,313	53,746	185,059
(c) Embankment	m³	185,317	68	121	12,641,399	22,489,144	35,130,543
(d) Reinforced concrete	m³	3,196	1,462	1,789	4,674,099	5,718,708	10,392,807
(e) Reinforcement bar	kg	133,751	20	28	2,612,791	3,729,422	6,342,213
(f) Form	m²	17,172	1,082	175	18,574,291	3,003,289	21,577,580
(g) Gravel blanket	m³	1,345	578	247	777,073	331,663	1,108,736
(h) Others					0	0	0
Sub-total					43,275,494	47,658,364	90,933,858
Total					272,057,272	310,981,955	583,039,227
3. Drainage Canal and Related Structures							
(1) Improvement of Abangay							
(a) Excavation	m³	415,449	20	63	8,192,654	26,144,205	34,336,859
(b) Spoiled embankment	m³	61,445	8	29	509,993	1,808,940	2,318,933
(c) Others					0	0	0
Sub-total					8,702,647	27,953,145	36,655,792
(2) Secondary drain							
(a) Excavation	m³	94,738	20	63	1,868,233	5,961,862	7,830,095
(b) Others					0	0	0
Sub-total					1,868,233	5,961,862	7,830,095
(3) Bridge							
(a) Clearing and grubbing	m²	2	2	6	3	12	15
(b) Excavation	m³	531	20	63	10,467	33,403	43,870
(c) Backfill	m³	292	59	24	17,259	7,064	24,323
(d) Reinforced concrete	m³	39	1,462	1,789	57,183	69,962	127,145
(e) Plain concrete	m³	181	1,429	1,498	259,121	271,633	530,754
(f) PC concrete	m³	130	1,755	2,147	227,445	278,277	505,722
(g) Reinforcement bar	kg	4,128	20	28	80,647	115,113	195,760
(h) PCSW	kg	4,736	147	210	696,809	994,605	1,691,414
(i) Form	m²	1,069	1,082	175	1,156,296	186,962	1,343,258
(j) Gravel blanket	m³	13	578	247	7,684	3,279	10,963
(k) PHC Pile	lin.m	330	663	994	218,784	328,176	546,960
(l) Demolition	m³	964	647	681	623,553	656,927	1,280,480
(m) Others					819,509	686,545	1,506,054
Sub-total					4,174,760	3,631,958	7,806,718

Table J. 1. 6 Breakdown of Direct Construction Costs (Jalaur proper RIS) (V3)

(Unit: pesos)

Work Item	Unit	Q'ty	Unit Rate		Total Amount		
			L/C	F/C	L/C	F/C	Total
(4) Related structures							
(a) Clearing and grubbing	m²	297	2	6	464	1,724	2,188
(b) Excavation	m³	771	20	63	15,204	48,519	63,723
(c) Backfill	m³	506	59	24	29,929	12,250	42,179
(d) Embankment	m³	331	68	121	22,579	40,168	62,747
(e) Reinforced concrete	m³	421	1,462	1,789	615,705	753,309	1,369,014
(f) Plain concrete	m³	15	1,429	1,498	21,198	22,222	43,420
(g) Reinforcement bar	kg	27,823	20	28	543,515	775,797	1,319,312
(h) Form	m²	2,035	1,082	175	2,201,181	355,910	2,557,091
(i) Gravel blanket	m³	89	578	247	51,419	21,946	73,365
(j) RCPC, dia 61 cm	lin.m	70	1,837	534	128,590	37,401	165,991
(k) Others					0	0	0
Sub-total					3,629,784	2,009,246	5,699,030
Total					18,375,424	39,616,211	57,991,635
4. Service Road							
Gravel pavement	m³	78,884	371	158	29,262,127	12,489,749	41,751,876
Total					29,262,127	12,489,749	41,751,876
5. Rural Road and Related Structures							
(1) Barangay road							
(a) Clearing and grubbing	m²	8,700	2	6	13,619	50,581	64,200
(b) Excavation	m³	35,784	20	63	705,660	2,251,887	2,957,547
(c) Disposal	m³	35,784	39	141	1,390,924	5,061,646	6,452,570
(d) Embankment	m³	56,992	68	121	3,887,709	6,916,264	10,803,973
(e) Earth finishing	m²	18,970	21	0	389,139	0	389,139
(f) Gravel pavement	m³	5,903	371	158	2,189,717	934,621	3,124,338
(g) Others					0	0	0
Sub-total					8,576,768	15,214,999	23,791,767
(2) Related structures							
(a) Excavation	m³	2,064	20	63	40,702	129,887	170,589
(b) Backfill	m³	1,139	59	24	67,371	27,575	94,946
(c) Reinforced concrete	m³	567	1,462	1,789	829,228	1,014,551	1,843,779
(d) Plain concrete	m³	7	1,429	1,498	10,003	10,486	20,489
(e) Reinforcement bar	kg	34,027	20	28	664,708	948,785	1,613,493
(f) Form	m²	3,013	1,082	175	3,259,046	526,957	3,786,003
(g) RCPC, dia 61 cm	lin.m	238	1,837	534	437,206	127,163	564,369
(h) Others					0	0	0
Sub-total					5,308,264	2,785,404	8,093,668
Total					13,885,032	18,000,403	31,885,435
5. WRDP							
Total					-15,170,170	-14,229,830	-29,400,000
Grand Total					319,852,930	372,631,597	692,484,527

Table J. 1. 7 Breakdown of Direct Construction Costs (Suague RIS) (1/3)

(Unit: pesos)

Work Item	Unit	Q'ty	Unit Rate		Total Amount		
			L/C	F/C	L/C	F/C	Total
1. Improvement of Diversion Dam							
(1) Replacement of the gates							
(a) Scouring gates	no.	2	201,552	806,208	403,104	1,612,416	2,015,520
(b) Intake gates	no.	2	17,784	71,136	35,568	142,272	177,840
Sub-total					438,672	1,754,688	2,193,360
(2) Trash rack	m²	5	74	298	388	1,564	1,952
(3) River treatment							
(a) Excavation	m³	120,120	20	63	2,368,766	7,559,151	9,927,917
(b) Embankment	m³	120,120	8	29	996,996	3,536,332	4,533,328
(c) Gabion	m³	9,720	1,178	1,847	11,450,160	17,952,840	29,403,000
(d) Wooden pile	lin.m	1,800	583	257	1,049,535	462,640	1,512,175
Sub-total					15,865,457	29,510,963	45,376,420
(4) Dam improvement							
(a) Excavation	m³	4,327	7	15	28,385	63,174	91,559
(b) Reinforced concrete	m³	819	1,462	1,789	1,197,774	1,465,463	2,663,237
(c) Plain concrete	m³	2,750	1,429	1,498	3,930,049	4,119,822	8,049,871
(d) Reinforcement bar	kg	164	20	28	3,199	4,567	7,766
(e) Concrete block	m²	4,074	21	20	86,382	82,325	168,707
(g) Form	m²	3,560	1,082	175	3,850,714	622,624	4,473,338
(h) S. P.	lin.m	1,250	499	1,996	623,900	2,495,600	3,119,500
Sub-total					9,720,403	8,853,575	18,573,978
Total					26,024,920	40,120,790	66,145,710
2. Irrigation Canal and Related Structures							
(1) Main canal							
(a) Clearing and grubbing	m²	50,800	2	6	79,528	295,353	374,881
(b) Excavation	m³	58,070	20	63	1,145,140	3,654,345	4,799,485
(c) Embankment	m³	18,077	68	121	1,233,122	2,193,734	3,426,856
(d) Earth finishing	m²	131,380	21	0	2,695,052	0	2,695,052
(e) Reinforced concrete	m³	2,198	1,462	1,789	3,214,539	3,932,953	7,147,492
(f) Reinforcement bar	kg	17,748	20	28	346,702	494,873	841,575
(g) Form	m²	81	1,082	175	87,073	14,079	101,152
(h) Lining filter	m³	1,207	849	183	1,025,093	220,579	1,245,672
(i) Others					25,720	57,870	83,590
Sub-total					9,851,969	10,863,786	20,715,755
(2) Lateral canal							
(a) Clearing and grubbing	m²	131,205	2	6	205,403	762,827	968,230
(b) Excavation	m³	55,442	20	63	1,093,316	3,488,965	4,582,281
(c) Embankment	m³	75,879	68	121	5,176,085	9,208,296	14,384,381
(d) Earth finishing	m²	339,323	21	0	6,960,674	0	6,960,674
(e) Reinforced concrete	m³	1,200	1,462	1,789	1,754,980	2,147,199	3,902,179
(f) Reinforcement bar	kg	6,002	20	28	117,247	167,355	284,602
(g) Form	m²	92	1,082	175	99,783	16,134	115,917
(h) Lining filter	m³	12,984	849	183	11,027,181	2,372,826	13,400,007
(i) Others					24,088	54,198	78,286
Sub-total					26,458,757	18,217,800	44,676,557
(3) Feeder canal							
(a) Clearing and grubbing	m²	20,580	2	6	32,218	119,652	151,870
(b) Excavation	m³	1,190	20	63	23,466	74,886	98,352
(c) Backfill	m³	230	59	24	13,604	5,568	19,172
(d) Embankment	m³	4,116	68	121	280,772	499,497	780,269
(e) Earth finishing	m²	30,870	21	0	633,249	0	633,249
(f) Reinforced concrete	m³	168	1,462	1,789	245,697	300,607	546,304
(g) Reinforcement bar	kg	7,797	20	28	152,312	217,406	369,718
(h) Form	m²	231	1,082	175	249,863	40,400	290,263
(i) Gravel blanket	m³	153	578	247	88,395	37,728	126,123
(j) Gates for TO	no.	7	2,860	11,440	20,020	80,080	100,100
(k) Stop log	m³	2	18,569	8,185	37,138	16,370	53,508
(l) Grouted riprap	m³	150	1,233	998	184,935	149,761	334,696
(m) Others					0	0	0
Sub-total					1,961,669	1,543,955	3,503,624

Table 8.1.7 Breakdown of Direct Construction Costs (Suague RIS) (2/3)

(Unit: pesos)

Work Item	Unit	Q'ty	Unit Rate		Total Amount		
			L/C	F/C	L/C	F/C	Total
(4) Settling basin							
(a) Clearing and grubbing	m²	310	2	6	485	1,802	2,287
(b) Excavation	m³	350	20	63	6,902	22,025	28,927
(c) Backfill	m³	740	59	24	43,771	17,915	61,686
(d) Reinforced concrete	m³	194	1,462	1,789	283,721	347,130	630,851
(e) Plain concrete	m³	80	1,429	1,498	114,328	119,849	234,177
(f) Reinforcement bar	kg	15,486	20	28	302,514	431,801	734,315
(g) Form	m²	605	1,082	175	654,405	105,811	760,216
(h) Gravel blanket	m³	93	578	247	53,730	22,932	76,662
(i) Gates	no.	2	26,700	106,800	53,400	213,600	267,000
(j) Others					22,040	88,160	110,200
Sub-total					1,535,296	1,371,025	2,906,321
(5) Related structures							
(a) Clearing and grubbing	m²	1,513	2	6	2,369	8,798	11,167
(b) Excavation	m³	32,189	20	63	634,767	2,025,653	2,660,420
(c) Backfill	m³	25,687	59	24	1,519,386	621,882	2,141,268
(d) Embankment	m³	32,145	68	121	2,192,771	3,900,956	6,093,727
(e) Earth finishing	m²	38,784	21	0	795,592	0	795,592
(f) Reinforced concrete	m³	600	1,462	1,789	877,490	1,073,599	1,951,089
(g) Plain concrete	m³	240	1,429	1,498	342,986	359,548	702,534
(h) Reinforcement bar	kg	35,093	20	28	685,532	978,509	1,664,041
(i) Form	m²	3,718	1,082	175	4,021,617	650,257	4,671,874
(j) Gravel blanket	m³	454	578	247	262,298	111,951	374,249
(k) Gates for HG	m²	161	5,400	21,600	869,400	3,477,600	4,347,000
(l) Gates for TO	no.	111	2,860	11,440	317,460	1,269,840	1,587,300
(m) Stop log	m²	19	18,569	8,185	352,816	155,523	508,339
(n) Demolition	m³	235	647	681	152,007	160,143	312,150
(o) Grouted riprap	m³	1,491	1,233	998	1,838,253	1,488,629	3,326,882
(p) Others					1,150,026	4,600,104	5,750,130
Sub-total					16,014,770	20,882,992	36,897,762
(6) On-farm facilities							
(a) Excavation	m³	30,058	20	63	592,743	1,891,549	2,484,292
(b) Backfill	m³	775	59	24	45,841	18,762	64,603
(c) Embankment	m³	19,867	68	121	1,355,227	2,410,959	3,766,186
(d) Reinforced concrete	m³	937	1,462	1,789	1,370,347	1,676,605	3,046,952
(e) Reinforcement bar	kg	46,687	20	28	912,018	1,301,788	2,213,806
(f) Form	m²	5,994	1,082	175	6,483,479	1,048,317	7,531,796
(g) Gravel blanket	m³	470	578	247	271,542	115,897	387,439
(h) Others					0	0	0
Sub-total					11,031,197	8,463,877	19,495,074
Total					66,853,658	61,341,435	128,195,093
3. Drainage Canal and Related Structures							
(1) Secondary drain							
(a) Excavation	m³	7,530	20	63	148,491	473,862	622,353
(a) Others					0	0	0
Sub-total					148,491	473,862	622,353
(2) Related structures							
(a) Clearing and grubbing	m²	133	2	6	208	775	983
(b) Excavation	m³	73	20	63	1,439	4,593	6,032
(c) Backfill	m³	77	59	24	4,554	1,864	6,418
(d) Embankment	m³	148	68	121	10,095	17,960	28,055
(e) Reinforced concrete	m³	114	1,462	1,789	166,723	203,983	370,706
(f) Plain concrete	m³	7	1,429	1,498	9,527	9,987	19,514
(g) Reinforcement bar	kg	7,962	20	28	155,535	222,007	377,542
(h) Form	m²	514	1,082	175	555,974	89,895	645,869
(i) Gravel blanket	m³	40	578	247	23,110	9,863	32,973
(j) Others					0	0	0
Sub-total					927,165	560,927	1,488,092
Total					1,075,656	1,034,789	2,110,445

Table J. 1. 7 Breakdown of Direct Construction Costs (Suague RIS) (V3)

(Unit: peso)

Work Item	Unit	Q'ty	Unit Rate		Total Amount		
			L/C	F/C	L/C	F/C	Total
4. Service Road							
Gravel pavement	m³	20,020	371	158	7,426,419	3,169,767	10,596,186
Total					7,426,419	3,169,767	10,596,186
5. Rural Road and Related Structures							
(1) Barangay road							
(a) Clearing and grubbing	m²	3,600	2	6	5,635	20,930	26,565
(b) Excavation	m³	22,624	20	63	446,145	1,423,728	1,869,873
(c) Disposal	m³	22,624	39	141	879,394	3,200,164	4,079,558
(d) Embankment	m³	36,184	68	121	2,468,291	4,391,109	6,859,400
(e) Earth finishing	m³	11,137	21	0	228,457	0	228,457
(f) Gravel pavement	m³	3,712	371	158	1,376,966	587,720	1,964,686
(g) Others					0	0	0
Sub-total					5,404,888	9,623,651	15,028,539
(2) Related structures							
(a) Excavation	m³	1,517	20	63	29,915	95,464	125,379
(b) Backfill	m³	837	59	24	49,508	20,263	69,771
(c) Reinforced concrete	m³	417	1,462	1,789	609,855	746,151	1,356,006
(d) Plain concrete	m³	5	1,429	1,498	7,145	7,490	14,635
(e) Reinforcement bar	kg	25,020	20	28	488,759	697,640	1,186,399
(f) Form	m²	2,215	1,082	175	2,395,880	387,391	2,783,271
(g) RCPC, dia 61 cm	lin m	175	1,837	534	321,475	93,502	414,977
(h) Others					0	0	0
Sub-total					3,902,537	2,047,901	5,950,438
Total					9,307,425	11,671,552	20,978,977
Grand Total					110,688,078	117,338,333	228,026,411

Table J. 1. 8 Cost Estimated for the Proposed Institutional Development Plan Implementation

Items	Unit	Quantity	Unit Cost (pesos)	Year 1	2	3	4	5	Total (pesos)
1. NIA Training Center and IA Office									
1.1 Renovation of NIA Regional Training Center, Pototan	m2	730	2,500	1,825,000					1,825,000
1.2 Construction of IA Office 70 m2 x20 IAs	m2	1,400	5,000	7,000,000					7,000,000
2. Procurement of Equipment/Furniture									
2.1 Training and communication									995,000
a) NIA		1 L. S.	995,000	995,000					210,000
b) IA		1 L. S.	210,000	210,000					575,000
c) MAO		1 L. S.	575,000	575,000					
2.2 Office equipment & furniture									200,000
a) NIA		1 L. S.	200,000	200,000					310,000
b) IA		1 L. S.	310,000	310,000					
2.3 Transport facilities									7,580,000
a) NIA		1 L. S.	7,580,000	7,580,000					2,800,000
b) MAO		1 L. S.	2,800,000	2,800,000					
2.4 Techno-demo farms									2,980,000
a) IA		1 L. S.	2,980,000	264,000	528,000	528,000	528,000	528,000	
3. Training*1									61,500
3.1 Training of IDOs/Region VI-IDD staff & MAO staff	trainee-days*2	1,640	50	18,000	18,000	18,000	7,500		12,999,500
3.2 Training of IA/ISC Officers & Members	trainee-days*3	458,780	50	2,042,500	2,042,500	2,971,500	2,971,500	2,971,500	202,300
3.3 Training of Farmers' Cooperatives	trainee-days*2	5,400	50	101,150	101,150				81,000
3.4 Training of Women Services Cooperatives	trainee-days*2	2,160	50	40,500	40,500				
4. Technical Assistance									20,880,000
4.1 Consultants	man-months	174	120,000	4,560,000	4,800,000	5,280,000	3,840,000	2,400,000	60,300,000
4.2 Engineering Services	man-months	90	670,000	12,730,000	13,400,000	12,730,000	10,720,000	10,720,000	14,400,000
4.2 NGOs*4	man-months	1,440	10,000*5	2,880,000	2,880,000	2,880,000	2,880,000	2,880,000	8,200,000
5. IADF				8,200,000					
Total				52,331,150	23,810,150	24,407,500	20,947,000	19,499,500	141,599,300

Notes: *1 Cost required for training materials.
*2 25% of the training devoted to on-the-job/field application of skills acquired from classroom training; no cost on-the-job training.
*3 25% of the officers' training devoted to on-the-job/field application and 50% of the members' training; no cost for on-the-job training.
*4 Each of the four NGOs to be contracted by the project will assign 4 community organizers and 2 cooperative development officers.
*5 Includes monthly salary and daily subsistence allowance in the project area.

		mm		1	2	3	4	5	
insdevt	local	48	1,440,000	1,440,000	1,440,000	1,440,000			5,760,000
agri	local	60	1,440,000	1,440,000	1,440,000	1,440,000	1,440,000		7,200,000
cr/enter	foreign	10	2,010,000	2,680,000	2,010,000				6,700,000
	local	26	720,000	960,000	1,440,000				3,120,000
water	foreign	40	5,360,000	5,360,000	5,360,000	5,360,000	5,360,000		26,800,000
	local	20	480,000	480,000	480,000	480,000	480,000		2,400,000
O&M	foreign	40	5,360,000	5,360,000	5,360,000	5,360,000	5,360,000		26,800,000
	local	20	480,000	480,000	480,000	480,000	480,000		2,400,000
		264	17,290,000	18,200,000	18,010,000	14,560,000	13,120,000		81,180,000

Table J. 1. 9 Procurement Cost of O&M Equipment

	Name of Equipment		Proposed No.	*1 Unit Price (P 1,000)	Amount (P 1,000)
A. Construction Equipment					
1.	Crane-Dragline, Crawler	16 - 25 t	1	9,370	9,370
2.	Bulldozer	9 t	1	3,460	3,460
3.	Backhoe	0.4 m3	1	3,580	3,580
4.	Backhoe	0.8 m3	2	6,820	13,640
5.	Dump Truck	6 t	4	2,350	9,400
6.	Roller, Vibration	3 - 5 tons	1	1,650	1,650
7.	Tamper	60 -100 kg	4	80	320
8.	Concrete Mixer	0.2 m3	2	190	380
B. Vehicles					
1.	Pick-up Truck	Double Cabin, 1.25 t	3	700	2100
2.	Motorcycle	100 cc	41	80	3280
C. Office Equipment					
1.	Computer w/Printer		2	80	160
2.	Handheld radio		41	10.5	430.5
3.	Grass Cutter for each IA (Canal Maintenance)		20	130	2600
	Total				50,370.5

Note: *1 : Unit price includes spare parts, transportation cost and other miscellaneous costs.

Table J. 1. 10 Proposed O&M Budget for Jalaur proper & Suague RISs

Necessary Annual O&M budget (Unit : Pesos 1,000)

Description	Phase I		Phase II			
			Implementation Stage		Sustainability Stage	
1. Jalaur proper RIS						
A. Personal Services	9,266	(71%)*1	6,432	(63%)*1	3,965	(51%)*1
1. Salaries/Wages	5,791		4,020		2,478	
2. Other personal services	3,475		2,412		1,487	
B. Maintenance & Other Operating Expenses	246	(2%)*1	246	(2%)*1	246	(3%)*1
C. Rehabilitation and maintenance cost for system facilities	3,497	(27%)*1	3,497	(35%)*1	3,497	(46%)*1
Total	13,009		10,175		7,708	
2. Suague RIS						
A. Personal Services	2,686	(69%)*1	2,158	(64%)*1	1,285	(51%)*1
1. Salaries/Wages	1,679		1,349		803	
2. Other personal services	1,007		809		482	
B. Maintenance & Other Operating Expenses	81	(2%)*1	81	(2%)*1	81	(3%)*1
C. Rehabilitation and maintenance cost for system facilities	1,150	(29%)*1	1,150	(34%)*1	1,150	(46%)*1
Total	3,917		3,389		2,515	
Grand Total	16,926		13,564		10,223	

Note : *1 : (%) : Ratio of the respective budget to the total necessary O&M budget.

Table J. 1. 11 Replacement Cost for Jalaur proper RIS (1/2)

(Unit: pesos)

Work Item	Unit	Q'ty	Unit Rate		Total Amount		
			L/C	F/C	L/C	F/C	Total
1. Improvement of Diversion Dam							
(1) Replacement of the gates							
(a) Main gates	no.	8	138,788	555,152	1,110,304	4,441,216	5,551,520
(b) Intake gates	no.	12	27,352	109,408	328,224	1,312,896	1,641,120
Sub-total					1,438,528	5,754,112	7,192,640
(2) Trash rack	m²	64	74	298	4,717	18,997	23,714
Toral					1,443,245	5,773,109	7,216,354
2. Irrigation Canal and Related Structures							
(3) Feeder canal							
(j) Gates for HG	m²	9	5,400	21,600	47,466	189,864	237,330
(k) Gates for TO	no.	24	2,860	11,440	68,640	274,560	343,200
(l) Stop-log	m³	10	18,569	8,185	176,408	77,761	254,169
Sub-total					292,514	542,185	834,699
(4) Settling basin							
(i) Gates	no.	16	26,700	106,800	427,200	1,708,800	2,136,000
Sub-total					427,200	1,708,800	2,136,000
(5) Related structures							
(k) Gates for HG	m²	483	5,400	21,600	2,608,200	10,432,800	13,041,000
(l) Gates for TO	no.	318	2,860	11,440	909,480	3,637,920	4,547,400
(m) Stop-log	m³	54	18,569	8,185	1,002,741	442,013	1,444,754
Sub-total					4,520,421	14,512,733	19,033,154
Total					5,240,135	16,763,718	22,003,853
Grand Total					6,683,380	22,536,827	29,220,207

Table J. 1. 11 Replacement Cost for Suague RIS (2/2)

(Unit: pesos)

Work Item	Unit	Q'ty	Unit Rate		Total Amount		
			L/C	F/C	L/C	F/C	Total
1. Improvement of Diversion Dam							
(1) Replacement of the gates							
(a) Scouring gates	no.	2	201,552	806,208	403,104	1,612,416	2,015,520
(b) Intake gates	no.	2	17,784	71,136	35,568	142,272	177,840
Sub-total					438,672	1,754,688	2,193,360
(2) Trash rack	m²	5	74	298	388	1,564	1,952
Toral					439,060	1,756,252	2,195,312
2. Irrigation Canal and Related Structures							
(3) Feeder canal							
(j) Gates for TO	no.	7	2,860	11,440	20,020	80,080	100,100
(k) Stop-log	m³	2	18,569	8,185	37,138	16,370	53,508
Sub-total					57,158	96,450	153,608
(4) Settling basin							
(i) Gates	no.	2	26,700	106,800	53,400	213,600	267,000
(j) Sand pump	no.	2	22,040	88,160	44,080	176,320	220,400
Sub-total					53,400	213,600	267,000
(5) Related structures							
(k) Gates for HG	m²	161	5,400	21,600	869,400	3,477,600	4,347,000
(l) Gates for TO	no.	111	2,860	11,440	317,460	1,269,840	1,587,300
(m) Stop-log	m³	19	18,569	8,185	352,816	155,523	508,339
Sub-total					1,539,676	4,902,963	6,442,639
Total					1,694,314	5,389,333	7,083,647
Grand Total					2,133,374	7,145,585	9,278,959

Table J. 2. 1 Workable Days and Suspension Period of Water Distribution

Workable Day

Condition : Rd< 5mm at Pototan Station

Unit : days

Year	JAN.	FEB.	MAR.	APR.	MAY.	JUN.	JUL.	AUG.	SEPT.	OCT.	NOV.	DEC.
1974			27	24	29	20	21	18	24			
1977	24	21	27	30	28	18	17	23	12	21	20	26
1978	26	28	31	25	26	22	23	14	13	15	21	22
1979	26	23	29	24	28	25	18	18	25	19	25	28
1980	29	26	28	30	30	15	20	17	20	19	20	28
1981	28	26	31	27	26	14	23	20	19	18	22	27
1982	29	28	28	28	25	17	24	17	18	18	26	29
1983	28	26	31	30	31	24	19	17	17	23	16	23
1984	28	26	29	26	26	18	23	19	20	20	20	27
1985	25	26	28	26	23			27	21	20	28	27
1986			31	30	31	22	19	20	22	18	22	27
1987	25	28	31	30	30	23	18	19	18	23	18	26
Workable Days	27	26	29	28	28	20	20	19	19	19	22	26

Average 114 days

← Proposed Suspension Period of Water Distribution

NIA's O & M Period

Construction Condition	Full suspension of water distribution	Rotational water distribution on division area base
Works	Earth works and canal lining of main canal and lateral canals concerned & related structures	Earth works of lateral canals & related structures

Figures

Figure J. 2. 1 Implementation Schedule