THE REPUBLIC OF PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION

Sector Loan on Rehabilitation of Irrigation Facilities

NIS SUMMARY REPORT

0403
Malatgao RIS
Region 4
Palawan Province

July 2009

Survey Team for
Japan International Cooperation Agency
(JICA)

Sector Loan on Rehabilitation of Irrigation Facilities (SLRIF)

Features of NIS for Rehabilitation Project

1. General

Item	*Description*		
1) Name of NIS	**Malatgao RIS**		Code: 0403
2) Location	Region	Region 4	
	Province	Palawan	
	Municipality	Aborlan, Narra	
	Distance	94 km from (Capital of Province) PUERTO PRINCESA CITY	
3) Type of Water Source	Water Source	MALATGAO, MANAILI, TIGMAN, ESTRELLA river	
	Type	Diversion Dam (162.20 m wide, 2.80 m high)	
4) Area	Service Area	6,837 ha	
	FUSA	3,014 ha	
5) Beneficiary Farmers	1,970 farmers	Average paddy field cultivating size = 1.53 ha per farmer	
6) Irrigator's Association	IAs established = 22 FIA established = 1 in 2008		
7) Features of NIS and Necessity of the project	Malatgao RIS started its operation on July 2, 1988, it is one of the two Irrigation System in the province of Palawan specifically irrigating the area of the municipality of Narra and Aborlan. The design service area is 6,837 hectares, this were not irrigated due to some area needs land development covered with second growth forest tress. The system has not undergone major rehabilitation works for the past twenty one (21) years. Generally, irrigation and drainage facilities are deteriorated due to siltation, collapse of earth embankment works, and shallow canal bottom. The restored area and conversion of timberland to rice land will increase production thus, will also help stabilize domestic rice supply. Aside from these, the system will generate additional employment opportunities and promote more economic activities particularly in linked industries. The project will help increase rice production in the area and help also self sufficiency the region		
8) Outline of the Proposed Project	A. Engineering 1. Repair of diversion dam 2. Repair and improvement of irrigation canal and structures 3. Repair and improvement of drainage canal and structures 4. Repair and improvement of service roads 5. Repair and improvement of on-farm facilities 6. Repair and construction of IMT support facilities-IA Bldg solar drier, warehouse with IA building 7. Development and establishment of IMT GIS database B. Institutional Strengthening Program B. 1 Basic Program 1. Reactivation of FIA/IA and Strengthening of Irrigation System Management Committee (ISMC) of NIS including construction of IMT support facilities 2. Strengthening of NIA – IA – LGUs Partnership 3. Strengthening NIA Institutional Capacity		

	B.2 Specific Program to strengthen institutional mechanism together with LGUs 1. Improvement of watershed management 2. Monitoring and control on illegal quarrying
9) Proposed Project Component	A. Engineering Construction of civil works for rehabilitation of diversion works, canal system, drainage system, roads, and IMT support facilities. B. Institutional 1. Reactivation of FIAs/IAs including reformation of TSGA / IA / FIA areas, construction of IMT support facilities (demand base) 2. Strengthening NIA-IA- LGUs Partnership, especially coordination RDC, RAFC/PAFC with FIAs/IAs and ISMC 3. Institutional development program to strengthen management capacity of NIA field offices and IAs
10) Project Cost (Direct cost only, excluding escalation, contingency, tax)	1. Direct cost — PHP 228.26 Million - *Civil Works* — *PHP 210.49 Million* - *Institutional Development* — *PHP 13.20 Million* - *Engineering Services* — *PHP 4.57 Million* 2. Indirect cost — PHP 20.42 Million Total Project Cost (1+2) — PHP 248.68 Million Cost per ha — PHP 82,508.00 per ha.
11) Project Benefit	1. To increase paddy production by 6,354 tons/year 2. To increase farmers' net income to PHP54,434.00 /ha/year 3. To establish functional and self-reliant IAs 4. To improve performance of NIS
12) Project Justification	EIRR = 23.7 %, B/C = 1.55 (discount rate 15%)

2. Project History (Construction/Rehabilitation)

Year	*Description*
1980-1988	PHILIPPINE MEDIUM SCALE IRRIGATION PROJECT
	FUNDED BY WORLD BANK
2004	Repair and Rehabilitation of irrigation facilities funds from GOP
2005	Repair and Rehabilitation of irrigation facilities funds from GOP
2006	Repair and Rehabilitation of irrigation facilities funds from GOP
2007	Repair and Rehabilitation of irrigation facilities funds from GOP
2008	Repair and Rehabilitation of irrigation facilities funds from GOP

3. Present Condition

3.1 Natural Conditions

Item	*Description*
1) Annual Rainfall	1,697.10 mm
2) Seasons	Wet season: May to September Dry season: October to April
3) Dominant Soil in NIS Area	Clay loam
4) Topography	Undulated with maximum slope of 5% down to flat area

3.2 Socio-economy (Region/Province)

Item	*Description*
1) GRDP	PHP 137,756 million (Year 2007), Per Capita GRDP = PHP 49,331 per year
2) Population	682,152 (province)
3) Population Growth Rate	1.94 % per year (province)
4) Labor Force	1,672,000 (region)
5) Poverty Population	49.3 % to total population (province)

3.3 Present Agriculture in NIS

Item	*Description*			
1) Farm Household in NIS	Total beneficiaries	1,546 households		
	Land owners	1,122 households	(72.6 %)	
	Tenant farmers	424 households	(27.4 %)	
2) Paddy Field Size in NIS	1.53 ha per household (FUSA/Total beneficiaries as of 2008)			
3) Present Land Use in NIS	Paddy field planted	2,289 ha	66.0 %	As of 2008
	Paddy field not planted	725 ha	20.9 %	As of 2008
	Upland crop field	0 ha	0.0 %	
	Permanent crop field	27 ha	0.8 %	
	Undeveloped area	4 ha	0.1 %	
	Build-up area	186 ha	5.4 %	
	High ground	151 ha	4.3 %	
	Grassland	45 ha	1.3 %	
	Swamp	38 ha	1.1 %	
	Fallow area	3 ha	0.1 %	
4) Paddy Field in FUSA (ha)	3,014			

5) Paddy Cropped Area (ha)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Wet Season	2,324	2,317	2,809	2,647	2,289	2,477
Dry Season	1,910	2,089	1,281	1,666	1,720	1,733
6) Cropping Intensity (%)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
(per year)	140	146	136	143	133	140
7) Unit Yield of Paddy (ton/ha)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Wet Season	3.95	3.55	3.95	4.10	3.90	3.90
Dry Season	2.85	3.45	3.95	3.90	3.10	3.41
8) Paddy Production (ton)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Wet Season	9,180	8,225	11,096	10,853	8,927	9,656
Dry Season	5,444	7,207	5,060	6,497	5,332	5,908

3.4 Water Resources

Item	*Description*
1) Name of Rivers	Malatgao River
2) Catchment Area at Dam	386km^2
3) Ave. River Discharge	5.88 m^3/s
4) Ave. Dry Season Discharge	5.30 m^3/s
5) Diverted Intake Discharge	3.95 m^3/s
6) Water Requirement	5.43 m^3/s
7) Sedimentation	Medium

3.5 Existing Irrigation System

Item	Description
1) Diversion Dam	Overflow crest width 137.00 m, Dam height 2.80 m Dam width 162.20 m
2) Main Canal	Total length 33.932 km (Lined portion 7.716 km)
3) Lateral Canals	Total length 46.28 km (Lined portion 5.248 km)
4) On-farm facilities	Total length 100 km (Lined portion 10.40 km) Turn-outs = 100 units
5) Drainage Canal	Total length 39.00 kms.
6) Canal Structures	No. = 225 units (Damaged = 17 units)
7) Drainage Structures	No. = 41 units
8) Farm roads	Total length 80.212 km (pavement= 80.21 kms.)

3.6 Institutions for O&M of NIS

Item	Description					
1) Regional Irrigation Office	Name: Region 4 – Southern Tagalog					
2) IMO	Name: Palawan IMO					
Staff in 2009	Total number of staff: 41					
3) Irrigator' Association (IA)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Number of FIA (nos)					1	
Number of IA (nos)					22	
Number of TSAG (nos)	219	219	219	219	219	219
Functionality of IA	-	82.70	74.51	75.36	89.65	80.56
Collection of ISF (wet, %)	91	87	86	94	91	90
Collection of ISF (dry, %)	48	77	81	82	91	79
4) NIS Category based on IA 2008 O&M Contract (NIA-IA)	No. of IA					
Category A	3					
Category B	19					
Category C	0					

3.7 Existing Problems

Item	Description
1) Diversion Works	1. Quarrying of sand and gravel at the downstream of the Dam 2. Damaged rubber seal of the sluice gate 3. Eroded downstream side slope protection works 4. Dilapidated water masters quarter 5. Slow lifting of gate at sluiceway due to manual operation 6. Unprotected intake gates from weather 7. San Miguel Check, bridge slab has no railing protection from commuters and transport vehicles 8. Un-improved 300m roadway from highway to Kulaman Check/Dam 9. rusted foundation frame of lifting mechanism of sluice gate
2) Canal and Structures	1. Siltation of canal due run-off from outside hill slope erosion 2. Uncontrolled water flowing to main canal from excess water of communal irrigation located at the adjacent area 3. Embankment collapse along roadway right side due to erosion at outlet of drainage structure 4.Damaged canal due to overflow of uncontrolled water from the canal and due to wallowing of carabao 5. Entering of sewer, domestic water, and rainfall runoff from highway mixed with oil, gasoline crude, residue and dust 6. Damaged and leaking siphon manhole and no provision of bridge to access the other side of the bank at Taganibong Creek

Item	Description
3) Drainage Canal	1. Silted drainage canal and collapsed of side slope berm 2. Sugar cane are blocking the inlet culvert the causes drain water to overflow roadways 3. Domestic waste and garbage are thrown in the drainage canal and drainage water is "re-used" for irrigation 4.Wallowing of carabao in the canal causes the side slope to collapse
4) Other Project Facilities (road, bridge, flood dike, building, etc)	1. Service roads along canal needs grading, crown formation, and gravel surfacing 2. Access roads or roads linking from one canal to another should be constructed or repaired
5) Water Management and O&M Activities	1. Lack of staff gages at diversion dam, intake, head gates of lateral and turnout level 2. No water management instruments like current meter, rain gages, and evaporation pan 3. Lack of technical basis or geodetic ground survey on the actual area for Land Classification (e.g. rice area, permanent crops, high ground, built-up area, swamp area, undeveloped area, etc)
6) Status of NIS and IA Management	Status Type Aa evaluated by Radar Graph Specific problems are: 1. Low cropping intensity during dry season at 55% 2. Medium paddy yield during dry season at 69 cavans/ha
7) Watershed Management	1. Lack of support from LGU on watershed conservation
8) Coordination with LGU and Agencies concerned	1. Poor coordination by NIA's field offices and IA with concerned municipal LGUs on specific problems such as watershed management and monitoring and control of illegal quarrying
9) Agriculture	1. Inadequate supply of quality seeds. Some farmers are using traditional rice varieties which give lower yield. 2. Insufficient number of post harvest facilities particularly dryer. 3. Lack of credit institution to serve the need of farmers

4. Proposed Rehabilitation Plan

4.1 Agricultural Development Plan

Item	Description			
Cropping schedule	Wet Season	Dry Season-1	Dry Season-2	Annual
1) Type of Crops	Paddy	Paddy	-	-
2) Cropping Area (ha)	3,014	2,090	-	-
3) Target Unit Yield (ton/ha)	4.10	3.95	-	-
3) Total Production (ton)	12,357	8,256	-	20,613

4.2 Civil Works

Item	Description
1) Diversion Works	1. Desilting of upstream of Sluiceway
2) Canal Structures	1. Repair and construction of scour protection works - 17 units
3) Canalization	1. Restoration of embankment of canal – 19.2 kms 2. Concrete canal lining and CHB Lining 3. Realignment of canal 4. Construction of new canal
4) Drainage Structures	1. Construction of additional drainage structures and repair of existing drainage structures – 20 units
5) Drainage Canalization	1. Improvement and desilting of drainage canals – 15 kms
6) Service Roads	1. Gravel surfacing on canal service road – 16.9 kms
7) On-Farm Facilities	1. Repair /replacement of dilapidated turn out steel gates 2.Construction of new turn outs and farm ditches

8) IMT Support Facilities	1. Construction of post-harvest facilities—warehouses, IA buildings, solar driers with shed – 3 sets
9) IMT GIS Database	1. Development and establishment of GIS database

4.3 Institutional Strengthening Program

Item	*Description*
1) Reactivation Program of FIAs/IAs and System Management Committee (ISMC)	1. Executing body : Project Management Office with assistance of Consultant 2. Schedule: 34 months / NIS 3. Counter body for execution: NIA Regional Office and IMO office 4. Attendant / Trainee: President of FIAs/IAs and secretary group, staff of NIA RIO/IMO, Chairmen of ISMC and Secretary group and LGUs officers, 5. Contents: a) Survey & Study by Consultant b) Workshops on coordination activities with and dissemination on reformation plan to FIAs/IAs c) Workshop on coordination activities with LGUs d) Organization and Legal Registration of FIAs/IAs to be re-active and reactivation of SMC e) Construction of IMT support facilities for FIAs/CIA f) Workshop and Training of FIAs/IAs members on management under the IMT g) Assessment/Evaluation for and Negotiation of Contracting under IMT h) Assistance of reactivated IAs/FIAs in organizational and management activities
2) Strengthening Program of NIA - IA - LGU Partnership	1. Executing body : Project Management Office with assistance of Consultant, & Management System Committee (MSC) of NIS 2. Schedule: 7 months / NIS 3. Counter body for execution: Regional Development Council with Secretary of NEDA Regional Office 4. Attendant / Trainee: Secretaries of Regional Organizations, LGUs officers, President of FIAs/IAs and secretary group, staff of NIA RIO/IMO, Chairmen of ISMC and Secretary group 5. Contents: a) Workshop on Trouble Shooting of NIS and FIAs/ISs' Management b) Provision of work space for ISMC including office facilities
3) NIA Institutional Strengthening Program	1. Executing body : Institutional Development Division of CO, NIA 2. Schedule: 7 months / NIS 3. Counter body for execution: NIA Regional Office and IMO office 4. Attendant / Trainee: NIA personnel at CO, RIO and IMO 5. Contents: a. Capability built-up program (Central and Regional NIA Offices) b. Improvement program on management mechanism of NIA c. Support program for IMT implementation d. Strengthening program of Integrated Management information System
4) Specific Program on watershed management plan and monitoring and control of illegal quarrying	1. Strengthening coordination with RDC, RAFC/PAFC and LGUs concerned through works shop on dissemination of the SLRIF to these organizations. 2. Strengthening coordination with RDC, RAFC/PAFC and LGUs on training program of watershed management 3. Strengthening coordination with RDC, RAFC/PAFC and LGUs on monitoring and control of illegal quarrying

4.4 Proposed Counter Schemes

Item	*Description*
1) DENR	1. Technical assistance to concerned Provincial/municipal LGUs on watershed rehabilitation and management, such as establishment of nurseries, community-based livelihood for upland dwellers, including control of illegal quarrying
2) LGU	1. LGU assists the federation of IA to improve O& M capacity through attendance in systems management training using LGU fund. 2. LGUs identify farmer-cooperators as seed producers. 3. Strong representation by Provincial Development Council members to support the rehabilitation of Malatgao RIS

5. Cost Estimate for Initial Investment

Item	*Description*		
1) Direct Cost for Civil Works	A. Mobilization	Php	4.57 Million
	B. Protection Dikes		-
	C. Diversion Works	Php	2.13 Million
	D. Canal Structures	Php	16.23 Million
	E. Canalization	Php	145.95 Million
	F. Drainage Structures	Php	6.03 Million
	G. Drainage Canalization	Php	9.04 Million
	H. Roads	Php	10.22 Million
	I. On-Farm Facilities/T.O. Gates	Php	3.32 Million
	J. IMT Support Facilities	Php	10.00 Million
	K. IMT GIS Database	Php	3.01 Million
	L. Institutional Development (5% of Direct Cost)	Php	13.20 Million
	M. Feasibility Studies & Detailed Engineering (2% of Direct Cost)	Php	4.57 Million
	Sub-total (Direct Cost)	Php	228.26 Million
2) Indirect Cost	A. General Engineering Supervision and Administration (3.5% of Direct Cost)	Php	7.99 Million
	B. NIA Management Fee (5% of Total Project Cost)	Php	12.43 Million
	Sub-total (Indirect Cost)	Php	20.42 Million
3) Total Project Cost	= 1+2	Php	248.68 Million
Cost per ha.		Php	82,508.00 /ha.

6. Implementation Plan

Item	*Description*
1) Contract package	1 - Local Competitive Bidding (LCB)
2) Implementation Schedule	
a) Civil Works	
1) Survey, F/S, Design	15 months
2) Tendering	6 months
3) Construction	30 months
b) Institutional Improvement Works	
1) Reactivation Program of FIAs/IAs and Irrigation System Management Committee	34 months
2) NIA-IA-LGU Partnership	7 months
3) Strengthening of NIA staff	7 months

7. Project Evaluation

Item		*Description*	
1) Economic evaluation			
EIRR (Base)		EIRR = 23.7%	: Project life 50 years
Sensitivity	Case-1	EIRR = 21.4 %	: Cost 10% up
	Case-2	EIRR = 21.2 %	: Benefit 10% down
	Case-3	EIRR = 19.2 %	: Cost 10% up + Benefit 10% down
B/C		1.55	: discount rate 15% p.a.
NPV		PHP 81 million	: discount rate 15% p.a.
2) Financial evaluation		Farmer's net income increase = PHP 24,666 per ha per year	
3) Expected Impacts		1. Increased farmers' income 2. Increased rice self sufficiency of the country 3. Increased job opportunities in rural areas	

8. Environmental Aspects

Item	*Description*
1) Environmental aspect	1. Collaboration with DENR, DA, LGU, IA on the following: a) Conservation of Watersheds Programs b) Slope protection for reduction of siltation c) Municipal ordinance on prohibition of illegal domestic disposal d) Moratorium on quarry of sand and gravel at downstream of the Dam regardless of distance
2) Relocation of houses	None
3) Land acquisition	None

Table 0403 - Malatgao Economic Evaluation (EIRR)

Basic Case

Name of NIS 0403 - Malatgao | Region : 4 | IMO RIO Palawan

EIRR : 23.7%	Net Present Value (Million PHP) (15 % discount rate)	Benefit	Cost	B/C Ratio	NPV
		228	147	1.55	81

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011			1.09		1.09		1.42	1.42	0.33
2	2012			1.09		1.09		2.84	2.84	1.75
3	2013	60.35	2.15	1.09		63.59		4.26	4.26	-59.33
4	2014	80.47	2.87	1.09	1.83	86.26	10.15	5.68	15.83	-70.43
5	2015	60.35	2.15	1.09	4.28	67.87	24.95	7.10	32.05	-35.82
6	2016				6.11	6.11	38.05	8.52	46.57	40.46
7	2017				6.11	6.11	41.01	9.94	50.95	44.84
8	2018				6.11	6.11	42.28	11.36	53.64	47.53
9	2019				6.11	6.11	42.28	12.78	55.06	48.95
10	2020				6.11	6.11	42.28	14.20	56.48	50.37
11	2021				6.11	6.11	42.28	15.62	57.90	51.79
12	2022				6.11	6.11	42.28	17.04	59.32	53.21
13	2023				6.11	6.11	42.28	18.46	60.74	54.63
14	2024				6.11	6.11	42.28	19.88	62.16	56.05
15	2025				6.11	6.11	42.28	21.30	63.58	57.47
16	2026				6.11	6.11	42.28	22.72	65.00	58.89
17	2027				6.11	6.11	42.28	24.14	66.42	60.31
18	2028				6.11	6.11	42.28	25.56	67.84	61.73
19	2029				6.11	6.11	42.28	26.98	69.26	63.15
20	2030				6.11	6.11	42.28	28.40	70.68	64.57
21	2031				6.11	6.11	42.28	29.82	72.10	65.99
22	2032				6.11	6.11	42.28	31.24	73.52	67.41
23	2033				6.11	6.11	42.28	32.66	74.94	68.83
24	2034				6.11	6.11	42.28	34.08	76.36	70.25
25	2035				6.11	6.11	42.28	35.50	77.78	71.67
26	2036				6.11	6.11	42.28	36.92	79.20	73.09
27	2037				6.11	6.11	42.28	38.34	80.62	74.51
28	2038				6.11	6.11	42.28	39.76	82.04	75.93
29	2039				6.11	6.11	42.28	41.18	83.46	77.35
30	2040				6.11	6.11	42.28	42.60	84.88	78.77
31	2041				6.11	6.11	42.28	44.02	86.30	80.19
32	2042				6.11	6.11	42.28	45.44	87.72	81.61
33	2043				6.11	6.11	42.28	46.86	89.14	83.03
34	2044				6.11	6.11	42.28	48.28	90.56	84.45
35	2045				6.11	6.11	42.28	49.70	91.98	85.87
36	2046				6.11	6.11	42.28	51.12	93.40	87.29
37	2047				6.11	6.11	42.28	52.54	94.82	88.71
38	2048				6.11	6.11	42.28	53.96	96.24	90.13
39	2049				6.11	6.11	42.28	55.38	97.66	91.55
40	2050				6.11	6.11	42.28	56.80	99.08	92.97
41	2051				6.11	6.11	42.28	58.22	100.50	94.39
42	2052				6.11	6.11	42.28	59.64	101.92	95.81
43	2053				6.11	6.11	42.28	61.06	103.34	97.23
44	2054				6.11	6.11	42.28	62.48	104.76	98.65
45	2055				6.11	6.11	42.28	63.90	106.18	100.07
46	2056				6.11	6.11	42.28	65.32	107.60	101.49
47	2057				6.11	6.11	42.28	66.74	109.02	102.91
48	2058				6.11	6.11	42.28	68.16	110.44	104.33
49	2059				6.11	6.11	42.28	69.58	111.86	105.75
50	2060				6.11	6.11	42.28	71.00	113.28	107.17

Case-1 (Cost 10% up)

Name of NIS 0403 - Malatgao | Region : 4 | IMO RIO Palawan

EIRR : 21.4%	Net Present Value (Million PHP) (15 % discount rate)	Benefit	Cost	B/C Ratio	NPV
		228	162	1.41	66

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	1.19	-	1.19	-	1.42	1.42	0.23
2	2012	-	-	1.19	-	1.19	-	2.84	2.84	1.65
3	2013	66.39	2.37	1.19	-	69.95	-	4.26	4.26	-65.69
4	2014	88.51	3.15	1.19	2.02	94.88	10.15	5.68	15.83	-79.05
5	2015	66.39	2.37	1.19	4.70	74.65	24.95	7.10	32.05	-42.61
6	2016	-	-	-	6.72	6.72	38.05	8.52	46.57	39.85
7	2017	-	-	-	6.72	6.72	41.01	9.94	50.95	44.23
8	2018	-	-	-	6.72	6.72	42.28	11.36	53.64	46.92
9	2019	-	-	-	6.72	6.72	42.28	12.78	55.06	48.34
10	2020	-	-	-	6.72	6.72	42.28	14.20	56.48	49.76
11	2021	-	-	-	6.72	6.72	42.28	15.62	57.90	51.18
12	2022	-	-	-	6.72	6.72	42.28	17.04	59.32	52.60
13	2023	-	-	-	6.72	6.72	42.28	18.46	60.74	54.02
14	2024	-	-	-	6.72	6.72	42.28	19.88	62.16	55.44
15	2025	-	-	-	6.72	6.72	42.28	21.30	63.58	56.86
16	2026	-	-	-	6.72	6.72	42.28	22.72	65.00	58.28
17	2027	-	-	-	6.72	6.72	42.28	24.14	66.42	59.70
18	2028	-	-	-	6.72	6.72	42.28	25.56	67.84	61.12
19	2029	-	-	-	6.72	6.72	42.28	26.98	69.26	62.54
20	2030	-	-	-	6.72	6.72	42.28	28.40	70.68	63.96
21	2031	-	-	-	6.72	6.72	42.28	29.82	72.10	65.38
22	2032	-	-	-	6.72	6.72	42.28	31.24	73.52	66.80
23	2033	-	-	-	6.72	6.72	42.28	32.66	74.94	68.22
24	2034	-	-	-	6.72	6.72	42.28	34.08	76.36	69.64
25	2035	-	-	-	6.72	6.72	42.28	35.50	77.78	71.06
26	2036	-	-	-	6.72	6.72	42.28	36.92	79.20	72.48
27	2037	-	-	-	6.72	6.72	42.28	38.34	80.62	73.90
28	2038	-	-	-	6.72	6.72	42.28	39.76	82.04	75.32
29	2039	-	-	-	6.72	6.72	42.28	41.18	83.46	76.74
30	2040	-	-	-	6.72	6.72	42.28	42.60	84.88	78.16
31	2041	-	-	-	6.72	6.72	42.28	44.02	86.30	79.58
32	2042	-	-	-	6.72	6.72	42.28	45.44	87.72	81.00
33	2043	-	-	-	6.72	6.72	42.28	46.86	89.14	82.42
34	2044	-	-	-	6.72	6.72	42.28	48.28	90.56	83.84
35	2045	-	-	-	6.72	6.72	42.28	49.70	91.98	85.26
36	2046	-	-	-	6.72	6.72	42.28	51.12	93.40	86.68
37	2047	-	-	-	6.72	6.72	42.28	52.54	94.82	88.10
38	2048	-	-	-	6.72	6.72	42.28	53.96	96.24	89.52
39	2049	-	-	-	6.72	6.72	42.28	55.38	97.66	90.94
40	2050	-	-	-	6.72	6.72	42.28	56.80	99.08	92.36
41	2051	-	-	-	6.72	6.72	42.28	58.22	100.50	93.78
42	2052	-	-	-	6.72	6.72	42.28	59.64	101.92	95.20
43	2053	-	-	-	6.72	6.72	42.28	61.06	103.34	96.62
44	2054	-	-	-	6.72	6.72	42.28	62.48	104.76	98.04
45	2055	-	-	-	6.72	6.72	42.28	63.90	106.18	99.46
46	2056	-	-	-	6.72	6.72	42.28	65.32	107.60	100.88
47	2057	-	-	-	6.72	6.72	42.28	66.74	109.02	102.30
48	2058	-	-	-	6.72	6.72	42.28	68.16	110.44	103.72
49	2059	-	-	-	6.72	6.72	42.28	69.58	111.86	105.14
50	2060	-	-	-	6.72	6.72	42.28	71.00	113.28	106.56

Table 0403 - Malatgao Economic Evaluation (EIRR)

Case-2 (Benefit 10% down)

Name of NIS: 0403 - Malatgao | Region : 4 IMO,RIO Palawan

EIRR : 21.2%	Net Present Value (Million PHP) (15 % discount rate)	Benefit	Cost	B/C Ratio	NPV
		205	147	1.40	58

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	1.09	-	1.09	-	1.28	1.28	0.19
2	2012	-	-	1.09	-	1.09	-	2.56	2.56	1.47
3	2013	60.35	2.15	1.09	-	63.59	-	3.83	3.83	-59.75
4	2014	80.47	2.87	1.09	1.83	86.26	9.13	5.11	14.24	-72.01
5	2015	60.35	2.15	1.09	4.28	67.87	22.45	6.39	28.84	-39.02
6	2016	-	-	-	6.11	6.11	34.25	7.67	41.91	35.80
7	2017	-	-	-	6.11	6.11	36.91	8.95	45.86	39.75
8	2018	-	-	-	6.11	6.11	38.05	10.22	48.28	42.17
9	2019	-	-	-	6.11	6.11	38.05	11.50	49.55	43.44
10	2020	-	-	-	6.11	6.11	38.05	12.78	50.83	44.72
11	2021	-	-	-	6.11	6.11	38.05	14.06	52.11	46.00
12	2022	-	-	-	6.11	6.11	38.05	15.34	53.39	47.28
13	2023	-	-	-	6.11	6.11	38.05	16.61	54.67	48.56
14	2024	-	-	-	6.11	6.11	38.05	17.89	55.94	49.83
15	2025	-	-	-	6.11	6.11	38.05	19.17	57.22	51.11
16	2026	-	-	-	6.11	6.11	38.05	20.45	58.50	52.39
17	2027	-	-	-	6.11	6.11	38.05	21.73	59.78	53.67
18	2028	-	-	-	6.11	6.11	38.05	23.00	61.06	54.95
19	2029	-	-	-	6.11	6.11	38.05	24.28	62.33	56.22
20	2030	-	-	-	6.11	6.11	38.05	25.56	63.61	57.50
21	2031	-	-	-	6.11	6.11	38.05	26.84	64.89	58.78
22	2032	-	-	-	6.11	6.11	38.05	28.12	66.17	60.06
23	2033	-	-	-	6.11	6.11	38.05	29.39	67.45	61.34
24	2034	-	-	-	6.11	6.11	38.05	30.67	68.72	62.61
25	2035	-	-	-	6.11	6.11	38.05	31.95	70.00	63.89
26	2036	-	-	-	6.11	6.11	38.05	33.23	71.28	65.17
27	2037	-	-	-	6.11	6.11	38.05	34.51	72.56	66.45
28	2038	-	-	-	6.11	6.11	38.05	35.78	73.84	67.73
29	2039	-	-	-	6.11	6.11	38.05	37.06	75.11	69.00
30	2040	-	-	-	6.11	6.11	38.05	38.34	76.39	70.28
31	2041	-	-	-	6.11	6.11	38.05	39.62	77.67	71.56
32	2042	-	-	-	6.11	6.11	38.05	40.90	78.95	72.84
33	2043	-	-	-	6.11	6.11	38.05	42.17	80.23	74.12
34	2044	-	-	-	6.11	6.11	38.05	43.45	81.50	75.39
35	2045	-	-	-	6.11	6.11	38.05	44.73	82.78	76.67
36	2046	-	-	-	6.11	6.11	38.05	46.01	84.06	77.95
37	2047	-	-	-	6.11	6.11	38.05	47.29	85.34	79.23
38	2048	-	-	-	6.11	6.11	38.05	48.56	86.62	80.51
39	2049	-	-	-	6.11	6.11	38.05	49.84	87.89	81.78
40	2050	-	-	-	6.11	6.11	38.05	51.12	89.17	83.06
41	2051	-	-	-	6.11	6.11	38.05	52.40	90.45	84.34
42	2052	-	-	-	6.11	6.11	38.05	53.68	91.73	85.62
43	2053	-	-	-	6.11	6.11	38.05	54.95	93.01	86.90
44	2054	-	-	-	6.11	6.11	38.05	56.23	94.28	88.17
45	2055	-	-	-	6.11	6.11	38.05	57.51	95.56	89.45
46	2056	-	-	-	6.11	6.11	38.05	58.79	96.84	90.73
47	2057	-	-	-	6.11	6.11	38.05	60.07	98.12	92.01
48	2058	-	-	-	6.11	6.11	38.05	61.34	99.40	93.29
49	2059	-	-	-	6.11	6.11	38.05	62.62	100.67	94.56
50	2060	-	-	-	6.11	6.11	38.05	63.90	101.95	95.84

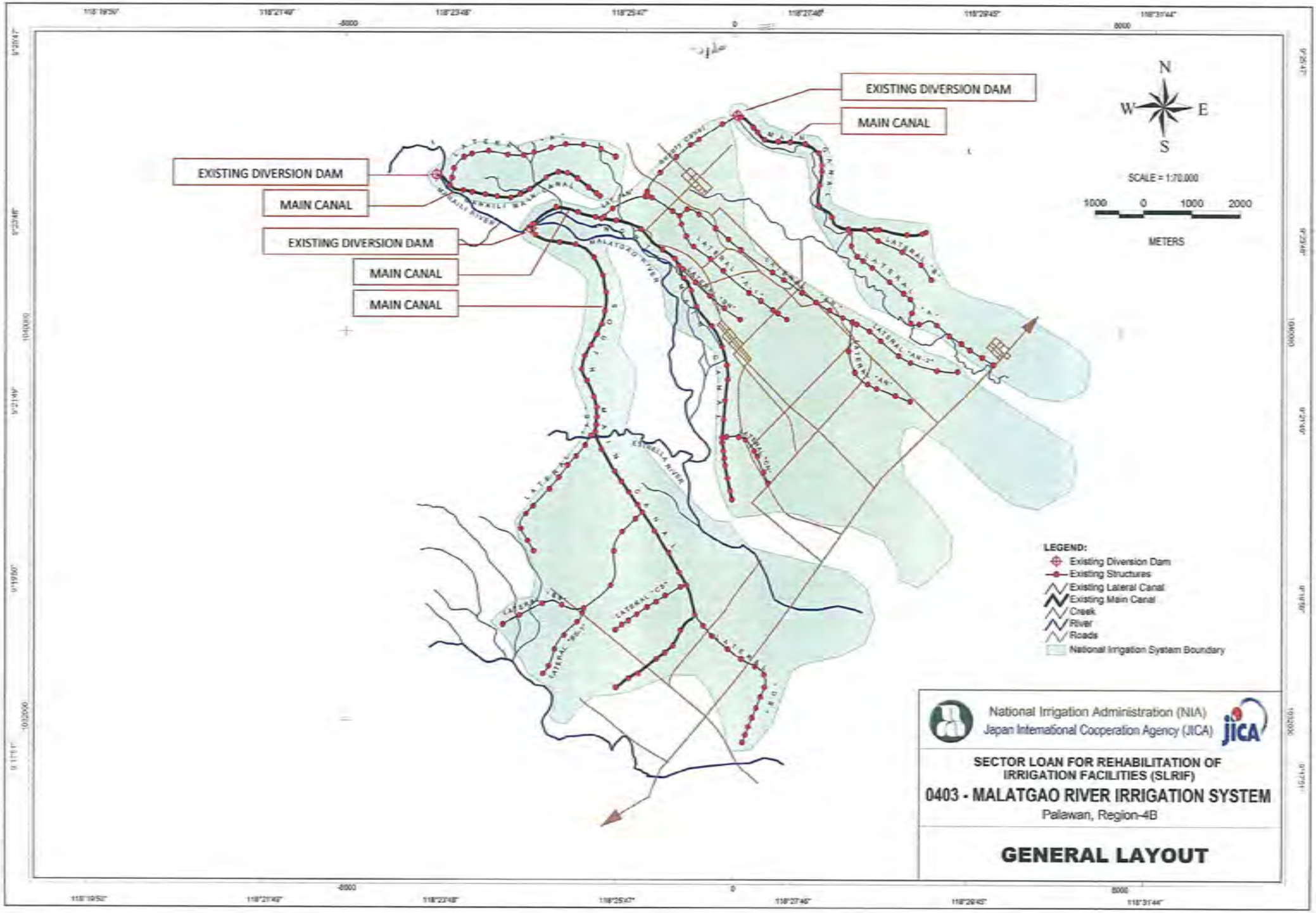
Case-3 (Cost 10% up and Benefit 10% down)

Name of NIS: 0403 - Malatgao | Region : 4 IMO,RIO Palawan

EIRR : 19.2%	Net Present Value (Million PHP) (15 % discount rate)	Benefit	Cost	B/C Ratio	NPV
		205	162	1.27	44

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	1.19	-	1.19	-	1.28	1.28	0.08
2	2012	-	-	1.19	-	1.19	-	2.56	2.56	1.36
3	2013	66.39	2.37	1.19	-	69.95	-	3.83	3.83	-66.11
4	2014	88.51	3.15	1.19	2.02	94.88	9.13	5.11	14.24	-80.64
5	2015	66.39	2.37	1.19	4.70	74.65	22.45	6.39	28.84	-45.81
6	2016	-	-	-	6.72	6.72	34.25	7.67	41.91	35.19
7	2017	-	-	-	6.72	6.72	36.91	8.95	45.86	39.14
8	2018	-	-	-	6.72	6.72	38.05	10.22	48.28	41.56
9	2019	-	-	-	6.72	6.72	38.05	11.50	49.55	42.83
10	2020	-	-	-	6.72	6.72	38.05	12.78	50.83	44.11
11	2021	-	-	-	6.72	6.72	38.05	14.06	52.11	45.39
12	2022	-	-	-	6.72	6.72	38.05	15.34	53.39	46.67
13	2023	-	-	-	6.72	6.72	38.05	16.61	54.67	47.95
14	2024	-	-	-	6.72	6.72	38.05	17.89	55.94	49.22
15	2025	-	-	-	6.72	6.72	38.05	19.17	57.22	50.50
16	2026	-	-	-	6.72	6.72	38.05	20.45	58.50	51.78
17	2027	-	-	-	6.72	6.72	38.05	21.73	59.78	53.06
18	2028	-	-	-	6.72	6.72	38.05	23.00	61.06	54.34
19	2029	-	-	-	6.72	6.72	38.05	24.28	62.33	55.61
20	2030	-	-	-	6.72	6.72	38.05	25.56	63.61	56.89
21	2031	-	-	-	6.72	6.72	38.05	26.84	64.89	58.17
22	2032	-	-	-	6.72	6.72	38.05	28.12	66.17	59.45
23	2033	-	-	-	6.72	6.72	38.05	29.39	67.45	60.73
24	2034	-	-	-	6.72	6.72	38.05	30.67	68.72	62.00
25	2035	-	-	-	6.72	6.72	38.05	31.95	70.00	63.28
26	2036	-	-	-	6.72	6.72	38.05	33.23	71.28	64.56
27	2037	-	-	-	6.72	6.72	38.05	34.51	72.56	65.84
28	2038	-	-	-	6.72	6.72	38.05	35.78	73.84	67.12
29	2039	-	-	-	6.72	6.72	38.05	37.06	75.11	68.39
30	2040	-	-	-	6.72	6.72	38.05	38.34	76.39	69.67
31	2041	-	-	-	6.72	6.72	38.05	39.62	77.67	70.95
32	2042	-	-	-	6.72	6.72	38.05	40.90	78.95	72.23
33	2043	-	-	-	6.72	6.72	38.05	42.17	80.23	73.51
34	2044	-	-	-	6.72	6.72	38.05	43.45	81.50	74.78
35	2045	-	-	-	6.72	6.72	38.05	44.73	82.78	76.06
36	2046	-	-	-	6.72	6.72	38.05	46.01	84.06	77.34
37	2047	-	-	-	6.72	6.72	38.05	47.29	85.34	78.62
38	2048	-	-	-	6.72	6.72	38.05	48.56	86.62	79.90
39	2049	-	-	-	6.72	6.72	38.05	49.84	87.89	81.17
40	2050	-	-	-	6.72	6.72	38.05	51.12	89.17	82.45
41	2051	-	-	-	6.72	6.72	38.05	52.40	90.45	83.73
42	2052	-	-	-	6.72	6.72	38.05	53.68	91.73	85.01
43	2053	-	-	-	6.72	6.72	38.05	54.95	93.01	86.29
44	2054	-	-	-	6.72	6.72	38.05	56.23	94.28	87.56
45	2055	-	-	-	6.72	6.72	38.05	57.51	95.56	88.84
46	2056	-	-	-	6.72	6.72	38.05	58.79	96.84	90.12
47	2057	-	-	-	6.72	6.72	38.05	60.07	98.12	91.40
48	2058	-	-	-	6.72	6.72	38.05	61.34	99.40	92.68
49	2059	-	-	-	6.72	6.72	38.05	62.62	100.67	93.95
50	2060	-	-	-	6.72	6.72	38.05	63.90	101.95	95.23


EXISTING DIVERSION DAM
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LEGEND:
Existing Diversion Dam
Existing Structures
Existing Lateral Canal
Existing Main Canal
Creek
River
Roads
National Irrigation System Boundary
National Irrigation Administration (NIA)
Japan International Cooperation Agency (JICA)
JICA
SECTOR LOAN FOR REHABILITATION OF IRRIGATION FACILITIES (SLRIF)
0403 - MALATGAO RIVER IRRIGATION SYSTEM
Palawan, Region-4B
GENERAL LAYOUT

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities
Photograph of Irrigation Facilities

NIS name: Malatgao NIS (Region 4) Date: June 1, 2009

Location / Facility	*Photograph*	*Comments*
01.Malatgao Dam N-9d 23m 43s E-118d 25m 56s		Rust damaged steel foundation frame of sluice gate lifting mechanism
02. Malatgao Dam N-9d 23m 43s E-118d 25m 56s		Dilapidated /damaged gatekeeper's quarter
03. Main Canal N-9d 23m 35s E-118d 25m 50s		Damage canal due to weight of the flume. The flume is used to convey irrigation water for communal irrigation project in adjacent areas of the NIS, which cannot be irrigated using the diversion dam.

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities
Photograph of Irrigation Facilities

NIS name: Malatgao NIS (Region 4) Date: June 1, 2009

Location / Facility	*Photograph*	*Comments*
04. Main Canal Sta 1+820		Damaged canal due to unauthorized extraction of irrigation water and building stone dams/check
05. South Main Canal N-9d 20m 31s E-118d 24m 51s		Scoured and eroded structure backfill Scoured and eroded inlet and outlet transition Damaged concrete lined canal
06. South Main Canal N-9d 20m 31s E-118d 26m 05s		Collapsed, scoured, and eroded canal embankment

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities
Photograph of Irrigation Facilities

NIS name: Malatgao NIS (Region 4) Date: June 1, 2009

Location / Facility	*Photograph*	*Comments*
07. Tigman Check Dam N-9d 24m 23s E-118d 27m 52s		Need Roofing and perimeter fences Stolen lifting cable wire No access road No maintenance ladder or ramp
08. South Main Canal Sta 0+500		50 meters damage canal Heavily silted canal, Silted side drain no inlet drainage structure
09. Manaili Dam N-9d 25m 23s E-118d 25m 23s		Dilapidated gate keeper's quarter

THE REPUBLIC OF PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION

Sector Loan on Rehabilitation of Irrigation Facilities

NIS SUMMARY REPORT

0601
Suague RIS
Region 6
Iloilo Province

July 2009

Survey Team for
Japan International Cooperation Agency
(JICA)

Sector Loan on Rehabilitation of Irrigation Facilities (SLRIF)

Features of NIS for Rehabilitation Project

1. General

Item	*Description*		
1) Name of NIS	**SUAGUE RIS**		Code: 0601
2) Location	Region	6	
	Province	Iloilo	
	Municipalities	Mina, Pototan, New Lucena	
	Distance	40 kms from Iloilo City	
3) Type of Water Source	Water Source	Suage River	
	Type	Diversion Dam (204.50 m wide,2.44 m high)	
4) Area	Service Area	2,935 has	
	FUSA	2,454 has.	
5) Beneficiary Farmers	1,455 farmers	Average paddy field cultivating size = 1.69 ha per farmer	
6) Irrigator's Association	IAs established = 7 FIA established = 0		
7) Features of NIS and Necessity of the project	Suague RIS was completed in 1960. It has a design service area of 2,935 has. but a firmed-up service area of only 2,453 has. due to lack of water. It has one (1) main canal with a total length of 10.27 kms.; ten (10) lateral canals with a total length of 35.50 kms. and 32.70 kms. of service roads. It also has 29.31 kilometers of drainage canals, 103 canal structures, 6 drainage structures, 160 turn-outs and 157 kms. of farm ditches. During the last five (5) years it had an average cropping intensity of 192% and average yields of 88 cavans/ha. during the wet season and 90 cavans/ha. during the dry season. A rehabilitation of the system is necessary to secure the long-term stability of the dam and to increase the efficiency of water delivery of the irrigation facilities.		
8) Outline of the Proposed Project	A. Engineering 1. a)Repair of diversion dam b)Rechanneling and dredging of the river upstream of the dam 2. Repair and improvement of irrigation canal and structures 3. Repair and improvement of drainage canal and structures 4. Repair and improvement of service roads 5. Repair and improvement of on-farm facilities 6. Repair and construction of IMT support facilities-IA Bldg solar drier, warehouse with IA building 7. Development and establishment of IMT GIS database B. Institutional Strengthening Program B. 1 Basic Program 1. Reactivation of FIA/IA and Strengthening of Irrigation System Management Committee (ISMC) of NIS including construction of IMT support facilities 2. Strengthening of NIA – IA – LGUs Partnership 3. Strengthening NIA Institutional Capacity B.2 Specific Program to strengthen institutional mechanism together with LGUs 1. Improvement of watershed management		

9) Proposed Project Component	A. Engineering 1. Construction of civil works for rehabilitation of diversion works, canal system, drainage system, roads, and IMT support facilities. B. Institutional 1. Reactivation of FIAs/IAs including reformation of TSGA / IA / FIA areas, construction of IMT support facilities (demand base) 2. Strengthening NIA-IA- LGUs Partnership, especially coordination RDC, RAFC/PAFC with FIAs/IAs and ISMC 3. Institutional development program to strengthen management capacity of NIA field offices and IAs.					
10) Project Cost (Direct cost only, excluding escalation, contingency, tax)	1. Direct cost			PHP	205.59	Million
	- *Civil Works*	*PHP*	*196.68*	*Million*		
	- *Institutional Development*	*PHP*	*4.80*	*Million*		
	- *Engineering Services*	*PHP*	*4.11*	*Million*		
	2. Indirect cost			PHP	18.39	Million
	Total Project Cost (1+2)			PHP	223.98	Million
	Cost per ha			PHP	91,272.00	per ha
11) Project Benefit	1. To increase paddy production by 5,271tons/year 2. To increase farmers' net income to PHP67,620.00 /ha/year 3. To establish functional and self-reliant IAs 4. To improve performance of NIS					
12) Project Justification	EIRR = 26.3 %, B/C = 1.74 (discount rate 15%)					

2. Project History (Construction/Rehabilitation)

Year	*Description*
1960	Project Completion
1978-1982	Major rehabilitation of irrigation facilities
20072008	Rehabilitation of irrigation canals

3. Present Condition

3.1 Natural Conditions

Item	*Description*
1) Annual Rainfall	1,900 mm
2) Seasons	Wet: April - September Dry: October – March
3) Dominant Soil in NIS Area	Sta. Rita loam
4) Topography	Relatively flat

3.2 Socio-economy (Region/Province)

Item	*Description*
1) GRDP	PHP 438,864 million (Year 2007), Per Capita GRDP = PHP 61,382 per year
2) Population	1,691,878 (province)
3) Population Growth Rate	1.13 % per year (province)
4) Labor Force	4,649,000 (region)
5) Poverty Population	30.4% to total population (province)

3.3 Present Agriculture in NIS

Item	Description					
1) Farm Household in NIS	Total beneficiaries	1,455 households				
	Land owners	852 households (58.5 %)				
	Tenant farmers	603 households (41.5 %)				
2) Paddy Field Size in NIS	1.69 ha per household (FUSA/Total beneficiaries as of 2008)					
3) Present Land Use in NIS	Paddy field planted	2,437 ha	83.0 %	As of 2008		
	Paddy field not planted	17 ha	0.6 %	As of 2008		
	Upland crop field	0 ha	0.0 %			
	Permanent crop field	13 ha	0.4 %			
	Undeveloped area	121 ha	4.1 %			
	Built-up area	0 ha	0.0 %			
	High ground	244 ha	8.3 %			
	Grassland	103 ha	3.5 %			
	Swamp	1 ha	0.1 %			
	Unspecified area	0 ha	0.0 %			
4) Paddy Field in FUSA (ha)	2,454					

5) Paddy Cropped Area (ha)	2004	2005	2006	2007	2008	Average
Wet Season	2,407	2,453	2,453	2,411	2,437	2,432
Dry Season	2,454	2,408	2,271	2,000	2,324	2,291
6) Cropping Intensity (%)	2004	2005	2006	2007	2008	Average
(per year)	198	198	193	180	194	192
7) Unit Yield of Paddy (ton/ha)	2004	2005	2006	2007	2008	Average
Wet Season	4.16	4.17	5.22	4.37	4.03	4.39
Dry Season	4.22	4.46	4.52	5.34	4.05	4.49
8) Paddy Production (ton)	2004	2005	2006	2007	2008	Average
Wet Season	10,008	10,239	12,813	10,541	9,832	10,687
Dry Season	10,813	10,730	10,259	10,686	9,417	10,292

3.4 Water Resources

Item	Description
1) Name of Rivers	Suague River
2) Catchment Area at Dam	1065 km^2
3) Ave. River Discharge	6.84 m^3/s
4) Ave. Dry Season Discharge	5.60 m^3/s
5) Diverted Intake Discharge	3.02 m^3/s
6) Water Requirement	4.42 m^3/s
7) Sedimentation	Moderate

3.5 Existing Irrigation System

Item	Description
1) Diversion Dam	Overflow crest width 204.50 m, Dam height 2.44 m
2) Main Canal	Total length 10.273 km (Lined portion 0.10 km)
3) Lateral Canals	Total length 35.503 km (Lined portion 1.50 km)
4) On-farm facilities	Total length 81.00 km (Lined portion 0.00 km)
	Turn-outs = 91 units
5) Drainage Canal	Total length 29.32 kms.
6) Canal Structures	No. = 73 units
7) Drainage Structures	No. = 32 units
8) Farm roads	Total length 25.12 km (pavement= 0.00 kms.)
9) Flood Protection Dike	Total length 102.00 m

3.6 Institutions for O&M of NIS

Item	Description					
1) Regional Irrigation Office	Name: Region 6 – Western Visayas					
2) IMO	Name: Iloilo – Guimaras IMO					
Staff in 2009	Total number of staff: 82					
3) Irrigator' Association (IA)	2004	2005	2006	2007	2008	Average
Number of FIA (nos)						
Number of IA (nos)					7	
Number of TSAG (nos)	45	45	45	50	61	49
Functionality of IA	-	-	-	-	-	-
Collection of ISF (wet, %)	30	0	0	0	41	-
Collection of ISF (dry, %)	30	0	46	0	0	-
4) NIS Category based on IA 2008 O&M Contract (NIA-IA)	No. of IA					
Category A	7					
Category B	0					
Category C	0					

3.7 Existing Problems

Item	Description
1) Diversion Works	1. River upstream of the dam is now shaped like a letter S, thus putting the stability of the dam at risk. 2. Flood scouring protection works at the downstream of the dam are heavily damaged. 3. Need to convert the lifting mechanism from manual to mechanized.
2) Canal and Structures	1. High sediment load in the canals 2. Some structures have dilapidated steel gates. 3. Some structures still have wooden flush boards.
3) Drainage Canal	1. Need to improve the drainage system.
4) Other Project Facilities (road, bridge, flood dike, building, etc)	1. Roads become muddy during rainy days – need re-gravelling. 2. Lack of rice drying and storage facilities.
5) Water Management and O&M Activities	1. Illegal checking in some places. 2. Lack of control in water intake in some turn-outs result in over supply in some areas in the upstream reaches of the canals but lack of supply in the downstream farms. 3. The heavy silt load in the water makes water management more difficult and less efficient.
6) Status of NIS and IA Management	Status Type G evaluated by Radar Graph. Specific problems are: 1. Low ISF collection efficiency during dry and wet seasons at 0 and 41%, respectively 2. Low functionality at 0
7) Watershed Management	Rampant illegal logging and slash-and-burn farming method
8) Coordination with LGU and Agencies concerned	1. Poor coordination y NIA's field offices and IAs with concerned LGUs on specific problem such as watershed management
9) Agriculture	1. Insufficient post harvest facilities particularly drying. 2. Inadequate number of credit institution to serve the farmers need. 3. Inadequate technical support on extension services and marketing.

4. Proposed Rehabilitation Plan

4.1 Agricultural Development Plan

Item	Description			
Cropping schedule	Wet Season	Dry Season-1	Dry Season-2	Annual
1) Type of Crops	Rice	Rice	-	-
2) Cropping Area (ha)	2,454	2,454	-	-
3) Target Unit Yield (ton/ha)	5.00	5.00	-	-
3) Total Production (ton)	12,270	12,250	-	24,520

4.2 Civil Works

Item	Description
1) Diversion Works	1. Straightening/rechanneling of river upstream of dam. 2. Reconstruction of flood scouring protection. 3. Conversion of lifting mechanism from manual to mechanized.
2) Canal Structures	1. Repair/rehabilitation of old dilapidated steel gates – 5 units 2. Installation of new steel gates to replace wooden flush boards – 10 units
3) Canalization	1. Concrete lining of selected existing canal sections – 3.3 kms 2. Re-shaping and de-silting of some canal sections 3. Realignment of canals 4. Construction of new canals
4) Drainage Structures	1. Repair of drainage structures – 16 units
5) Drainage Canalization	1. Repair of existing drainage canals and construction of new ones – 10 kms
6) Service Roads	1. Re-gravelling of selected road sections – 20 kms 2. Construction of side drainage canals – 20 kms 3. Construction of road drainage structures.
7) On-Farm Facilities	1. Repair /replacement of dilapidated turn out steel gates 2.Construction of new turn outs and farm ditches
8) IMT Support Facilities	1. Construction of post-harvest facilities—warehouses, IA buildings, solar driers with shed – 2 sets
9) IMT GIS Database	1. Development and establishment of GIS database

4.3 Institutional Strengthening Program

Item	Description
1) Reactivation Program of FIAs/IAs and System Management Committee (ISMC)	1. Executing body : Project Management Office with assistance of Consultant 2. Schedule:34 months / NIS 3. Counter body for execution: NIA Regional Office and IMO office 4. Attendant / Trainee: President of FIAs/IAs and secretary group, staff of NIA RIO/IMO, Chairmen of ISMC and Secretary group and LGUs officers, 5. Contents: a) Survey & Study by Consultant b) Workshops on coordination activities with and dissemination on reformation plan to FIAs/IAs c) Workshop on coordination activities with LGUs d) Organization and Legal Registration of FIAs/IAs to be re-active and reactivation of SMC e) Construction of IMT support facilities for FIAs/CIA f) Workshop and Training of FIAs/IAs members on management under the IMT g) Assessment/Evaluation for and Negotiation of Contracting under IMT h) Assistance of reactivated IAs/FIAs in organizational and management activities
2) Strengthening Program of NIA - IA - LGU Partnership	1. Executing body : Project Management Office with assistance of Consultant, & Management System Committee (MSC) of NIS 2. Schedule: 7 months / NIS 3. Counter body for execution: Regional Development Council with Secretary of NEDA Regional Office

Item	Description
	4. Attendant / Trainee: Secretaries of Regional Organizations, LGUs officers, President of FIAs/IAs and secretary group, staff of NIA RIO/IMO, Chairmen of ISMC and Secretary group 5. Contents: a) Workshop on Trouble Shooting of NIS and FIAs/ISs' Management b) Provision of work space for ISMC including office facilities
3) NIA Institutional Strengthening Program	1. Executing body : Institutional Development Division of CO, NIA 2. Schedule: 7 months / NIS 3. Counter body for execution: NIA Regional Office and IMO office 4. Attendant / Trainee: NIA personnel at CO, RIO and IMO 5. Contents: a) Capability built-up program (Central and Regional NIA Offices) b) Improvement program on management mechanism of NIA c) Support program for IMT implementation d) Strengthening program of Integrated Management information System
4) Specific Program on watershed management plan	1. Strengthening coordination with RDC, RAFC/PAFC and LGUs concerned through works shop on dissemination of the SLRIF to these organizations. 2. Strengthening coordination with RDC, RAFC/PAFC and LGUs on training program of watershed management

4.4 Proposed Counter Schemes

Item	Description
1) DENR	1. Technical assistance to concerned Provincial/municipal LGUs on watershed rehabilitation and management such as establishment of nurseries, community-based livelihood for upland dwellers
2) LGU	1. Provincial LGUs intend to enhance co-mentoring of municipal and barangay LGUs to improve their skills in project preparation and sourcing of development fund 2. Executing agency defines clearly the roles and responsibilities of the LGUs by including the latter as member of project steering committee 3. LGU provides initial paddy seed for mass production 4. LGU expands information campaign through local media to create awareness among planning officers to give support to rehabilitation of NISs

5. Cost Estimate for Initial Investment

Item	*Description*		
1) Direct Cost for Civil Works	A. Mobilization	Php	4.11 Million
	B. Protection Dikes		-
	C. Diversion Works	Php	71.00 Million
	D. Canal Structures	Php	3.83 Million
	E. Canalization	Php	83.52 Million
	F. Drainage Structures	Php	4.91 Million
	G. Drainage Canalization	Php	7.36 Million
	H. Roads	Php	2.81 Million
	I. On-Farm Facilities/T.O. Gates	Php	1.68 Million
	J. IMT Support Facilities	Php	15.00 Million
	K. IMT GIS Database	Php	2.45 Million
	L. Institutional Development (5% of Direct Cost)	Php	4.80 Million
	M. Feasibility Studies & Detailed Engineering (2% of Direct Cost)	Php	4.11 Million
	Sub-total (Direct Cost)	Php	205.59 Million
2) Indirect Cost	A. General Engineering Supervision and Administration (3.5% of Direct Cost)	Php	7.20 Million
	B. NIA Management Fee (5% of Total Project Cost)	Php	11.20 Million
	Sub-total (Indirect Cost)	Php	18.39 Million
3) Total Project Cost	= 1+2	Php	223.98 Million
Cost per ha.		Php	91.272.00 /ha.

6. Implementation Plan

Item	*Description*
1) Contract package	1 - Local Competitive Bidding (LCB)
2) Implementation Schedule	
a) Civil Works	
1) Survey, F/S, Design	21 months
2) Tendering	6 months
3) Construction	36 months
b) Institutional Improvement Works	
1) Reactivation Program of FIAs/IAs and Irrigation System Management Committee	34 months
2) NIA-IA-LGU Partnership	7 months
3) Strengthening of NIA staff	7 months

7. Project Evaluation

Item		*Description*	
1) Economic evaluation			
EIRR (Base)		EIRR = 26.3 %	: Project life 50 years
Sensitivity	Case-1	EIRR = 23.8 %	: Cost 10% up
	Case-2	EIRR = 23.6 %	: Benefit 10% down
	Case-3	EIRR = 21.4 %	: Cost 10% up + Benefit 10% down
B/C		1.74	: discount rate 15% p.a.
NPV		PHP 96 million	: discount rate 15% p.a.
2) Financial evaluation		Farmer's net income increase = PHP 31,728 per ha per year	
3) Expected Impacts		1. Increased farmers' income 2. Increased rice self sufficiency of the country 3. Increased job opportunities in rural areas	

8. Environmental Aspects

Item	*Description*
1) Environmental aspect	Need to address problems in illegal extraction of sand and gravel in the river
2) Relocation of houses	none
3) Land acquisition	none

Table 0601 - Suague Economic Evaluation (EIRR)

Basic Case

Name of NIS: 0601 - Suague | Region: 6 | IMO RIO: Iloilo-Guimaras

EIRR : 26.3%	Net Present Value (Million PHP) (15 % discount rate)	Benefit	Cost	B/C Ratio	NPV
		226	130	1.74	96

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011			1.02		1.02		1.92	1.92	0.90
2	2012			1.02		1.02		3.84	3.84	2.82
3	2013	55.40	0.78	1.02		57.19		5.76	5.76	-51.43
4	2014	73.86	1.04	1.02	1.49	77.41	8.37	7.68	16.05	-61.37
5	2015	55.40	0.78	1.02	3.49	60.68	20.57	9.60	30.17	-30.51
6	2016				4.98	4.98	31.37	11.52	42.89	37.91
7	2017				4.98	4.98	33.81	13.44	47.25	42.27
8	2018				4.98	4.98	34.86	15.36	50.22	45.24
9	2019				4.98	4.98	34.86	17.28	52.14	47.16
10	2020				4.98	4.98	34.86	19.20	54.06	49.08
11	2021				4.98	4.98	34.86	21.12	55.98	51.00
12	2022				4.98	4.98	34.86	23.04	57.90	52.92
13	2023				4.98	4.98	34.86	24.96	59.82	54.84
14	2024				4.98	4.98	34.86	26.88	61.74	56.76
15	2025				4.98	4.98	34.86	28.80	63.66	58.68
16	2026				4.98	4.98	34.86	30.72	65.58	60.60
17	2027				4.98	4.98	34.86	32.64	67.50	62.52
18	2028				4.98	4.98	34.86	34.56	69.42	64.44
19	2029				4.98	4.98	34.86	36.48	71.34	66.36
20	2030				4.98	4.98	34.86	38.40	73.26	68.28
21	2031				4.98	4.98	34.86	40.32	75.18	70.20
22	2032				4.98	4.98	34.86	42.24	77.10	72.12
23	2033				4.98	4.98	34.86	44.16	79.02	74.04
24	2034				4.98	4.98	34.86	46.08	80.94	75.96
25	2035				4.98	4.98	34.86	48.00	82.86	77.88
26	2036				4.98	4.98	34.86	49.92	84.78	79.80
27	2037				4.98	4.98	34.86	51.84	86.70	81.72
28	2038				4.98	4.98	34.86	53.76	88.62	83.64
29	2039				4.98	4.98	34.86	55.68	90.54	85.56
30	2040				4.98	4.98	34.86	57.60	92.46	87.48
31	2041				4.98	4.98	34.86	59.52	94.38	89.40
32	2042				4.98	4.98	34.86	61.44	96.30	91.32
33	2043				4.98	4.98	34.86	63.36	98.22	93.24
34	2044				4.98	4.98	34.86	65.28	100.14	95.16
35	2045				4.98	4.98	34.86	67.20	102.06	97.08
36	2046				4.98	4.98	34.86	69.12	103.98	99.00
37	2047				4.98	4.98	34.86	71.04	105.90	100.92
38	2048				4.98	4.98	34.86	72.96	107.82	102.84
39	2049				4.98	4.98	34.86	74.88	109.74	104.76
40	2050				4.98	4.98	34.86	76.80	111.66	106.68
41	2051				4.98	4.98	34.86	78.72	113.58	108.60
42	2052				4.98	4.98	34.86	80.64	115.50	110.52
43	2053				4.98	4.98	34.86	82.56	117.42	112.44
44	2054				4.98	4.98	34.86	84.48	119.34	114.36
45	2055				4.98	4.98	34.86	86.40	121.26	116.28
46	2056				4.98	4.98	34.86	88.32	123.18	118.20
47	2057				4.98	4.98	34.86	90.24	125.10	120.12
48	2058				4.98	4.98	34.86	92.16	127.02	122.04
49	2059				4.98	4.98	34.86	94.08	128.94	123.96
50	2060				4.98	4.98	34.86	96.00	130.86	125.88

Case-1 (Cost 10% up)

Name of NIS: 0601 - Suague | Region: 6 | IMO RIO: Iloilo-Guimaras

EIRR : 23.8%	Net Present Value (Million PHP) (15 % discount rate)	Benefit	Cost	B/C Ratio	NPV
		226	143	1.58	83

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	1.12	-	1.12	-	1.92	1.92	0.80
2	2012	-	-	1.12	-	1.12	-	3.84	3.84	2.72
3	2013	60.94	0.86	1.12	-	62.91	-	5.76	5.76	-57.15
4	2014	81.25	1.14	1.12	1.64	85.16	8.37	7.68	16.05	-69.11
5	2015	60.94	0.86	1.12	3.83	66.75	20.57	9.60	30.17	-36.58
6	2016	-	-	-	5.48	5.48	31.37	11.52	42.89	37.42
7	2017	-	-	-	5.48	5.48	33.81	13.44	47.25	41.78
8	2018	-	-	-	5.48	5.48	34.86	15.36	50.22	44.74
9	2019	-	-	-	5.48	5.48	34.86	17.28	52.14	46.66
10	2020	-	-	-	5.48	5.48	34.86	19.20	54.06	48.58
11	2021	-	-	-	5.48	5.48	34.86	21.12	55.98	50.50
12	2022	-	-	-	5.48	5.48	34.86	23.04	57.90	52.42
13	2023	-	-	-	5.48	5.48	34.86	24.96	59.82	54.34
14	2024	-	-	-	5.48	5.48	34.86	26.88	61.74	56.26
15	2025	-	-	-	5.48	5.48	34.86	28.80	63.66	58.18
16	2026	-	-	-	5.48	5.48	34.86	30.72	65.58	60.10
17	2027	-	-	-	5.48	5.48	34.86	32.64	67.50	62.02
18	2028	-	-	-	5.48	5.48	34.86	34.56	69.42	63.94
19	2029	-	-	-	5.48	5.48	34.86	36.48	71.34	65.86
20	2030	-	-	-	5.48	5.48	34.86	38.40	73.26	67.78
21	2031	-	-	-	5.48	5.48	34.86	40.32	75.18	69.70
22	2032	-	-	-	5.48	5.48	34.86	42.24	77.10	71.62
23	2033	-	-	-	5.48	5.48	34.86	44.16	79.02	73.54
24	2034	-	-	-	5.48	5.48	34.86	46.08	80.94	75.46
25	2035	-	-	-	5.48	5.48	34.86	48.00	82.86	77.38
26	2036	-	-	-	5.48	5.48	34.86	49.92	84.78	79.30
27	2037	-	-	-	5.48	5.48	34.86	51.84	86.70	81.22
28	2038	-	-	-	5.48	5.48	34.86	53.76	88.62	83.14
29	2039	-	-	-	5.48	5.48	34.86	55.68	90.54	85.06
30	2040	-	-	-	5.48	5.48	34.86	57.60	92.46	86.98
31	2041	-	-	-	5.48	5.48	34.86	59.52	94.38	88.90
32	2042	-	-	-	5.48	5.48	34.86	61.44	96.30	90.82
33	2043	-	-	-	5.48	5.48	34.86	63.36	98.22	92.74
34	2044	-	-	-	5.48	5.48	34.86	65.28	100.14	94.66
35	2045	-	-	-	5.48	5.48	34.86	67.20	102.06	96.58
36	2046	-	-	-	5.48	5.48	34.86	69.12	103.98	98.50
37	2047	-	-	-	5.48	5.48	34.86	71.04	105.90	100.42
38	2048	-	-	-	5.48	5.48	34.86	72.96	107.82	102.34
39	2049	-	-	-	5.48	5.48	34.86	74.88	109.74	104.26
40	2050	-	-	-	5.48	5.48	34.86	76.80	111.66	106.18
41	2051	-	-	-	5.48	5.48	34.86	78.72	113.58	108.10
42	2052	-	-	-	5.48	5.48	34.86	80.64	115.50	110.02
43	2053	-	-	-	5.48	5.48	34.86	82.56	117.42	111.94
44	2054	-	-	-	5.48	5.48	34.86	84.48	119.34	113.86
45	2055	-	-	-	5.48	5.48	34.86	86.40	121.26	115.78
46	2056	-	-	-	5.48	5.48	34.86	88.32	123.18	117.70
47	2057	-	-	-	5.48	5.48	34.86	90.24	125.10	119.62
48	2058	-	-	-	5.48	5.48	34.86	92.16	127.02	121.54
49	2059	-	-	-	5.48	5.48	34.86	94.08	128.94	123.46
50	2060	-	-	-	5.48	5.48	34.86	96.00	130.86	125.38

Table 0601 - Suague Economic Evaluation (EIRR)

Case-2 (Benefit 10% down)

Name of NIS 0601 - Suaque **Region** 6 IMO RIO Iloilo-Guimaras

EIRR : 23.5%	Net Present Value (Million PHP) (15 % discount rate)	Benefit	Cost	B/C Ratio	NPV
		203	130	1.56	73

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	1.02	-	1.02	-	1.73	1.73	0.71
2	2012	-	-	1.02	-	1.02	-	3.46	3.46	2.44
3	2013	55.40	0.78	1.02	-	57.19	-	5.18	5.18	-52.01
4	2014	73.86	1.04	1.02	1.49	77.41	7.53	6.91	14.44	-62.97
5	2015	55.40	0.78	1.02	3.49	60.68	18.51	8.64	27.15	-33.53
6	2016	-	-	-	4.98	4.98	28.24	10.37	38.60	33.62
7	2017	-	-	-	4.98	4.98	30.43	12.10	42.53	37.55
8	2018	-	-	-	4.98	4.98	31.37	13.82	45.20	40.22
9	2019	-	-	-	4.98	4.98	31.37	15.55	46.93	41.95
10	2020	-	-	-	4.98	4.98	31.37	17.28	48.65	43.67
11	2021	-	-	-	4.98	4.98	31.37	19.01	50.38	45.40
12	2022	-	-	-	4.98	4.98	31.37	20.74	52.11	47.13
13	2023	-	-	-	4.98	4.98	31.37	22.46	53.84	48.86
14	2024	-	-	-	4.98	4.98	31.37	24.19	55.57	50.59
15	2025	-	-	-	4.98	4.98	31.37	25.92	57.29	52.31
16	2026	-	-	-	4.98	4.98	31.37	27.65	59.02	54.04
17	2027	-	-	-	4.98	4.98	31.37	29.38	60.75	55.77
18	2028	-	-	-	4.98	4.98	31.37	31.10	62.48	57.50
19	2029	-	-	-	4.98	4.98	31.37	32.83	64.21	59.23
20	2030	-	-	-	4.98	4.98	31.37	34.56	65.93	60.95
21	2031	-	-	-	4.98	4.98	31.37	36.29	67.66	62.68
22	2032	-	-	-	4.98	4.98	31.37	38.02	69.39	64.41
23	2033	-	-	-	4.98	4.98	31.37	39.74	71.12	66.14
24	2034	-	-	-	4.98	4.98	31.37	41.47	72.85	67.87
25	2035	-	-	-	4.98	4.98	31.37	43.20	74.57	69.59
26	2036	-	-	-	4.98	4.98	31.37	44.93	76.30	71.32
27	2037	-	-	-	4.98	4.98	31.37	46.66	78.03	73.05
28	2038	-	-	-	4.98	4.98	31.37	48.38	79.76	74.78
29	2039	-	-	-	4.98	4.98	31.37	50.11	81.49	76.51
30	2040	-	-	-	4.98	4.98	31.37	51.84	83.21	78.23
31	2041	-	-	-	4.98	4.98	31.37	53.57	84.94	79.96
32	2042	-	-	-	4.98	4.98	31.37	55.30	86.67	81.69
33	2043	-	-	-	4.98	4.98	31.37	57.02	88.40	83.42
34	2044	-	-	-	4.98	4.98	31.37	58.75	90.13	85.15
35	2045	-	-	-	4.98	4.98	31.37	60.48	91.85	86.87
36	2046	-	-	-	4.98	4.98	31.37	62.21	93.58	88.60
37	2047	-	-	-	4.98	4.98	31.37	63.94	95.31	90.33
38	2048	-	-	-	4.98	4.98	31.37	65.66	97.04	92.06
39	2049	-	-	-	4.98	4.98	31.37	67.39	98.77	93.79
40	2050	-	-	-	4.98	4.98	31.37	69.12	100.49	95.51
41	2051	-	-	-	4.98	4.98	31.37	70.85	102.22	97.24
42	2052	-	-	-	4.98	4.98	31.37	72.58	103.95	98.97
43	2053	-	-	-	4.98	4.98	31.37	74.30	105.68	100.70
44	2054	-	-	-	4.98	4.98	31.37	76.03	107.41	102.43
45	2055	-	-	-	4.98	4.98	31.37	77.76	109.13	104.15
46	2056	-	-	-	4.98	4.98	31.37	79.49	110.86	105.88
47	2057	-	-	-	4.98	4.98	31.37	81.22	112.59	107.61
48	2058	-	-	-	4.98	4.98	31.37	82.94	114.32	109.34
49	2059	-	-	-	4.98	4.98	31.37	84.67	116.05	111.07
50	2060	-	-	-	4.98	4.98	31.37	86.40	117.77	112.79

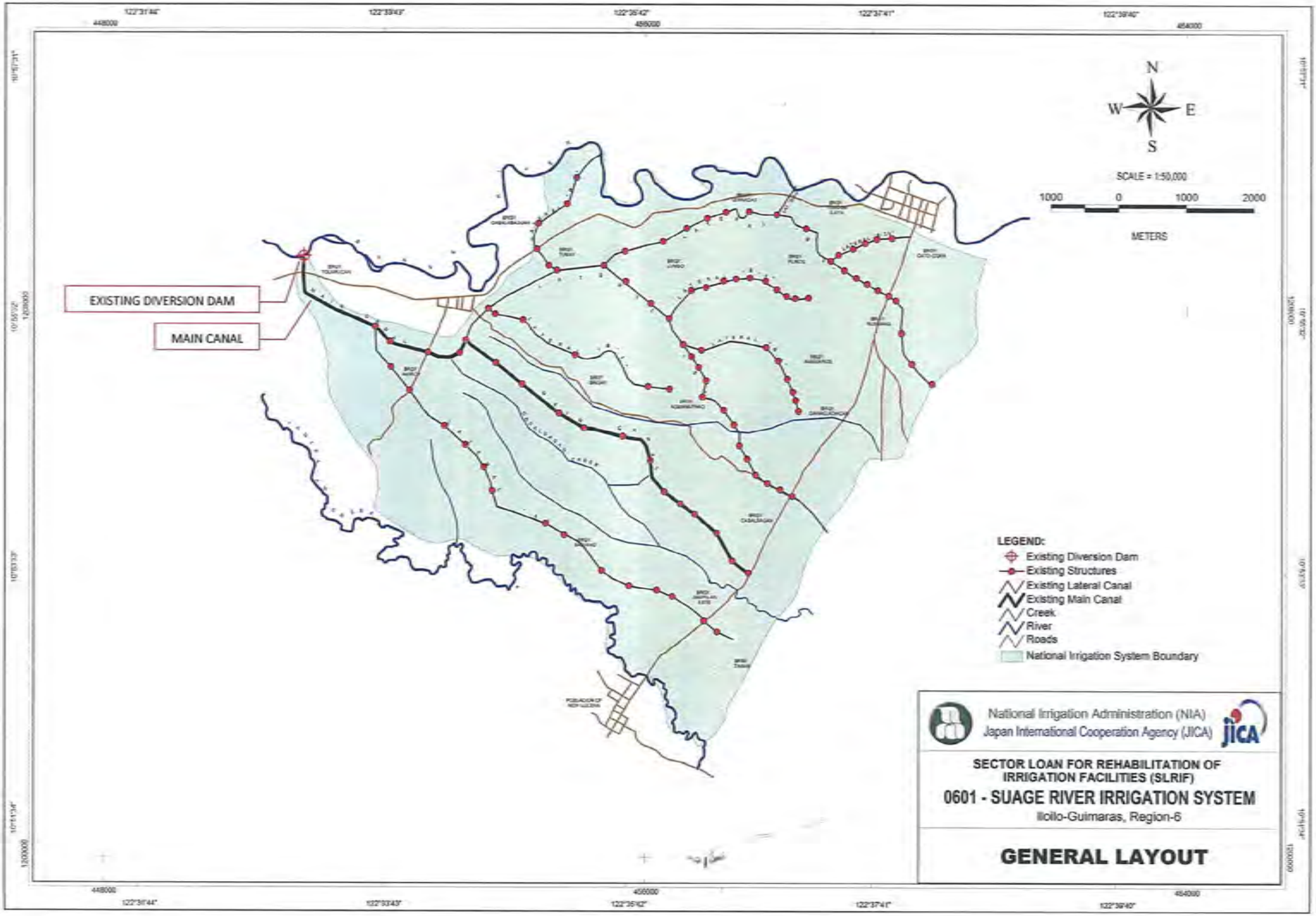
Case-3 (Cost 10% up and Benefit 10% down)

Name of NIS 0601 - Suaque **Region** 6 IMO RIO Iloilo-Guimaras

EIRR : 21.3%	Net Present Value (Million PHP) (15 % discount rate)	Benefit	Cost	B/C Ratio	NPV
		203	143	1.42	60

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	1.12	-	1.12	-	1.73	1.73	0.61
2	2012	-	-	1.12	-	1.12	-	3.46	3.46	2.34
3	2013	60.94	0.86	1.12	-	62.91	-	5.18	5.18	-57.73
4	2014	81.25	1.14	1.12	1.64	85.16	7.53	6.91	14.44	-70.71
5	2015	60.94	0.86	1.12	3.83	66.75	18.51	8.64	27.15	-39.60
6	2016	-	-	-	5.48	5.48	28.24	10.37	38.60	33.13
7	2017	-	-	-	5.48	5.48	30.43	12.10	42.53	37.05
8	2018	-	-	-	5.48	5.48	31.37	13.82	45.20	39.72
9	2019	-	-	-	5.48	5.48	31.37	15.55	46.93	41.45
10	2020	-	-	-	5.48	5.48	31.37	17.28	48.65	43.18
11	2021	-	-	-	5.48	5.48	31.37	19.01	50.38	44.90
12	2022	-	-	-	5.48	5.48	31.37	20.74	52.11	46.63
13	2023	-	-	-	5.48	5.48	31.37	22.46	53.84	48.36
14	2024	-	-	-	5.48	5.48	31.37	24.19	55.57	50.09
15	2025	-	-	-	5.48	5.48	31.37	25.92	57.29	51.82
16	2026	-	-	-	5.48	5.48	31.37	27.65	59.02	53.54
17	2027	-	-	-	5.48	5.48	31.37	29.38	60.75	55.27
18	2028	-	-	-	5.48	5.48	31.37	31.10	62.48	57.00
19	2029	-	-	-	5.48	5.48	31.37	32.83	64.21	58.73
20	2030	-	-	-	5.48	5.48	31.37	34.56	65.93	60.46
21	2031	-	-	-	5.48	5.48	31.37	36.29	67.66	62.18
22	2032	-	-	-	5.48	5.48	31.37	38.02	69.39	63.91
23	2033	-	-	-	5.48	5.48	31.37	39.74	71.12	65.64
24	2034	-	-	-	5.48	5.48	31.37	41.47	72.85	67.37
25	2035	-	-	-	5.48	5.48	31.37	43.20	74.57	69.10
26	2036	-	-	-	5.48	5.48	31.37	44.93	76.30	70.82
27	2037	-	-	-	5.48	5.48	31.37	46.66	78.03	72.55
28	2038	-	-	-	5.48	5.48	31.37	48.38	79.76	74.28
29	2039	-	-	-	5.48	5.48	31.37	50.11	81.49	76.01
30	2040	-	-	-	5.48	5.48	31.37	51.84	83.21	77.74
31	2041	-	-	-	5.48	5.48	31.37	53.57	84.94	79.46
32	2042	-	-	-	5.48	5.48	31.37	55.30	86.67	81.19
33	2043	-	-	-	5.48	5.48	31.37	57.02	88.40	82.92
34	2044	-	-	-	5.48	5.48	31.37	58.75	90.13	84.65
35	2045	-	-	-	5.48	5.48	31.37	60.48	91.85	86.38
36	2046	-	-	-	5.48	5.48	31.37	62.21	93.58	88.10
37	2047	-	-	-	5.48	5.48	31.37	63.94	95.31	89.83
38	2048	-	-	-	5.48	5.48	31.37	65.66	97.04	91.56
39	2049	-	-	-	5.48	5.48	31.37	67.39	98.77	93.29
40	2050	-	-	-	5.48	5.48	31.37	69.12	100.49	95.02
41	2051	-	-	-	5.48	5.48	31.37	70.85	102.22	96.74
42	2052	-	-	-	5.48	5.48	31.37	72.58	103.95	98.47
43	2053	-	-	-	5.48	5.48	31.37	74.30	105.68	100.20
44	2054	-	-	-	5.48	5.48	31.37	76.03	107.41	101.93
45	2055	-	-	-	5.48	5.48	31.37	77.76	109.13	103.66
46	2056	-	-	-	5.48	5.48	31.37	79.49	110.86	105.38
47	2057	-	-	-	5.48	5.48	31.37	81.22	112.59	107.11
48	2058	-	-	-	5.48	5.48	31.37	82.94	114.32	108.84
49	2059	-	-	-	5.48	5.48	31.37	84.67	116.05	110.57
50	2060	-	-	-	5.48	5.48	31.37	86.40	117.77	112.30


EXISTING DIVERSION DAM
MAIN CANAL
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METERS
LEGEND:
Existing Diversion Dam
Existing Structures
Existing Lateral Canal
Existing Main Canal
Creek
River
Roads
National Irrigation System Boundary
National Irrigation Administration (NIA)
Japan International Cooperation Agency (JICA)
JICA
SECTOR LOAN FOR REHABILITATION OF IRRIGATION FACILITIES (SLRIF)
0601 - SUAGE RIVER IRRIGATION SYSTEM
Iloilo-Guimaras, Region-6
GENERAL LAYOUT

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities

Photograph of Irrigation Facilities

NIS name: Suage (Region 6)

Location / Facility	*Photograph*	*Comments*
01. Diversion dam. View taken from the right bank facing downstream. Longitude: 10°56'50"E Latitude: 122°33'12"N		Notice the lower level of the river downstream of the dam apron.
02. Diversion dam. Downstream apron. Longitude: 10°56'50"E Latitude: 122°33'12"N		Take note of the broken concrete and the concrete blocks downstream of the apron that have been damaged by floods.
03. River upstream of the dam. Longitude: 10°56'50"E Latitude: 122°33'12"N		The river is now S-shaped (meandering) and needs to be straightened and rechanneled to secure the stability of the dam during floods.

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities

Photograph of Irrigation Facilities

NIS name: Suage (Region 6)

Location / Facility	*Photograph*	*Comments*
05. Main canal at the headgate of Lateral B. Longitude: 10°55'52"E Latitude: 122°34'41"N		Canal bank needs re-shaping and canal to be concrete-lined.
06. Headgate of Lat. B-1 (Sta. 0+399 of Lat. B). Longitude: 10°55'52"E Latitude: 122°34'41"N		Steel gates are dilapidated and need to be replaced.
07. Road beside the headgate of Lateral A. Longitude: 10o55'50"E Latitude: 122o33'46"N		Road needs re-graveling and side drains.

THE REPUBLIC OF PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION

Sector Loan on Rehabilitation of Irrigation Facilities

NIS SUMMARY REPORT

0602
Aganan RIS
Region 6
Iloilo Province

July 2009

Survey Team for
Japan International Cooperation Agency
(JICA)

Sector Loan on Rehabilitation of Irrigation Facilities (SLRIF)

Features of NIS for Rehabilitation Project

1. General

Item		Description	
1)	Name of NIS	**AGANAN RIS**	Code: 0602
2)	Location	Region	6
		Province	Iloilo
		Municipality	San Miguel, Sta. Barbara, Pavia, Oton, Jaro, Mandurriao
		Distance	18 kms from Iloilo City
3)	Type of Water Source	Water Source	Aganan River
		Type	Diversion Dam (81.50 m wide, 2.70 m high)
4)	Area	Service Area	5,500 has.
		FUSA	4,467 has.
5)	Beneficiary Farmers	2,280 farmers	Average paddy field cultivating size = 1.96 ha per farmer
6)	Irrigator's Association	IAs established = 8 FIA established = 1 in 2008	
7)	Features of NIS and Necessity of the project	Aganan RIS is a very old irrigation system, originally completed in 1925. Originally designed to irrigate 4,467 has., it can irrigate almost 100% of the service area during the wet season but only 2,005 has. during the dry season due to lack of water from the source. It has one (1) main canal with a total length of 14.40 kms.; twelve (12) lateral canals with a total length of 45.27 kms. and 46 kms. of service roads. It also has 43 kilometers of drainage canals, 197 canal structures, 201 turn-outs and 133 kms. of farm ditches. During the last five (5) years it had an average cropping intensity of 134% and average yields of 83 cavans/ha. during the wet season and 77 cavans/ha. during the dry season. The rehabilitation work is necessary to stabilize the diversion works and to improve the efficiency of water delivery in the canals and distribution in the farms.	
8)	Outline of the Proposed Project	A. Engineering 1. Repair of diversion dam 2. Repair and improvement of irrigation canal and structures 3. Repair and improvement of drainage canal and structures 4. Repair and improvement of service roads 5. Repair and improvement of on-farm facilities 6. Repair and construction of IMT support facilities-IA Bldg solar drier, warehouse with IA building 7. Development and establishment of IMT GIS database B. Institutional Strengthening Program B. 1 Basic Program 1. Reactivation of FIA/IA and Strengthening of Irrigation System Management Committee (ISMC) of NIS including construction of IMT support facilities 2. Strengthening of NIA – IA – LGUs Partnership 3. Strengthening NIA Institutional Capacity	

	B.2 Specific Program to strengthen institutional mechanism together with LGUs 1. Improvement of watershed management
9) Proposed Project Component	A. Engineering 1. Construction of civil works for rehabilitation of diversion works, canal system, drainage system, roads, and IMT support facilities. B. Institutional 1. Reactivation of FIAs/IAs including reformation of TSGA / IA / FIA areas, construction of IMT support facilities (demand base) 2. Strengthening NIA-IA- LGUs Partnership, especially coordination RDC, RAFC/PAFC with FIAs/IAs and ISMC 3. Institutional development program to strengthen management capacity of NIA field offices and IAs.
10) Project Cost (Direct cost only, excluding escalation, contingency, tax)	1. Direct cost — PHP 359.18 Million - *Civil Works* — *PHP 346.00 Million* - *Institutional Development* — *PHP 6.00 Million* - *Engineering Services* — *PHP 7.18 Million* 2. Indirect cost — PHP 32.14 Million Total Project Cost (1+2) — PHP 391.32 Million Cost per ha — PHP 87,603.00 per ha
11) Project Benefit	1. To increase paddy production by 5,159 tons/year 2. To increase farmers' net income to PHP58,829.00/ha/year 3. To establish functional and self-reliant IAs 4. To improve performance of NIS
12) Project Justification	EIRR = 17.3 %, B/C = 1.16 (discount rate 12%)

2. Project History (Construction/Rehabilitation)

Year	*Description*
1925	Project completion
2004-2008	Annual resurfacing and regravelling of roads and desilting of canals

3. Present Condition

3.1 Natural Conditions

Item	*Description*
1) Annual Rainfall	2,086.30 mm
2) Seasons	Wet: April- September Dry: October -March
3) Dominant Soil in NIS Area	Sta. Rita loam
4) Topography	Relatively flat, gently sloping

3.2 Socio-economy (Region/Province)

Item	*Description*
1) GRDP	PHP 438,864 million (Year 2007), Per Capita GRDP = PHP 61,382 per year
2) Population	1,691,878 (province)
3) Population Growth Rate	1.13 % per year (province)
4) Labor Force	4,649,000 (region)
5) Poverty Population	30.4% to total population (province)

3.3 Present Agriculture in NIS

Item	Description					
1) Farm Household in NIS	Total beneficiaries	1,280 households				
	Land owners	512 households (40.0 %)				
	Tenant farmers	768 households (60.0 %)				
2) Paddy Field Size in NIS	1.96 ha per household (FUSA/Total beneficiaries as of 2008)					
3) Present Land Use in NIS	Paddy field planted	4,461 ha	81.0 %	As of 2008		
	Paddy field not planted	6 ha	0.1 %	As of 2008		
	Upland crop field	0 ha	0.0 %			
	Permanent crop field	0 ha	0.0 %			
	Undeveloped area	0 ha	0.0 %			
	Built-up area	0 ha	0.0 %			
	High ground	0 ha	0.0 %			
	Grassland	0 ha	0.0 %			
	Swamp	0 ha	0.0 %			
	Unspecified area	1,039 ha	18.9 %			
4) Paddy Field in FUSA (ha)	4,467					

5) Paddy Cropped Area (ha)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Wet Season	3,941	3,913	3,589	3,725	4,461	3,926
Dry Season	2,211	1,481	1,472	3,107	2,000	2,050
6) Cropping Intensity (%)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
(per year)	138	120	113	153	145	134
7) Unit Yield of Paddy (ton/ha)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Wet Season	4.47	3.22	4.46	4.28	4.42	4.17
Dry Season	3.95	3.83	3.23	4.18	4.15	3.94
8) Paddy Production (ton)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Wet Season	17,602	12,586	16,000	15,937	19,713	16,368
Dry Season	8,740	5,596	4,758	12,989	8,292	8,075

3.4 Water Resources

Item	Description
1) Name of Rivers	Aganan River
2) Catchment Area at Dam	104 km2
3) Ave. River Discharge	3.00 m^3/s
4) Ave. Dry Season Discharge	2.38 m^3/s
5) Diverted Intake Discharge	2.40 m^3/s
6) Water Requirement	8.04m^3/s
7) Sedimentation	Moderate

3.5 Existing Irrigation System

Item	Description
1) Diversion Dam	Overflow crest width 81.50 m, Dam height 2.70 m
2) Main Canal	Total length 11.85 km (Lined portion 11.20 km)
3) Lateral Canals	Total length 45.27 km (Lined portion 1.40 km)
4) On-farm facilities	Total length 108.00 km (Lined portion 0.00 km) Turn-outs = 201 units
5) Drainage Canal	Total length 42.43 kms.
6) Canal Structures	No. = 181 units
7) Drainage Structures	No. = 59 units
8) Farm roads	Total length 48.77 km (pavement= 0.00 kms.)
9) Flood Protection Dike	Total length 175.00 m

3.6 Institutions for O&M of NIS

Item	*Description*					
1) Regional Irrigation Office	Name: Region 6 – Western Visayas					
2) IMO	Name: Iloilo – Guimaras					
Staff in 2009	Total number of staff: 82					
3) Irrigator' Association (IA)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Number of FIA (nos)					1	
Number of IA (nos)					8	
Number of TSAG (nos)	57	53	49	46	45	50
Functionality of IA	70.1	75.9	83.7	80.5	82.9	81.50
Collection of ISF (wet, %)	31	21	38	31	43	33
Collection of ISF (dry, %)	12	36	25	24	30	26
4) NIS Category based on IA 2008 O&M Contract (NIA-IA)	No. of IA					
Category A	2					
Category B	6					
Category C	0					

3.7 Existing Problems

Item	*Description*
1) Diversion Works	1. The river upstream of the dam has significantly changed course due to floods over the decades. It is now in a U-shape which puts the stability of the dam at risk. 2. The training wall has been damaged by logs during floods.
2) Canal and Structures	1. Some steel gates of structures are already dilapidated while some structures have only wooden flush boards. 2. Some canal sections are prone to bank erosion and percolation/seepage problems.
3) Drainage Canal	1. Some areas have drainage problems.
4) Other Project Facilities (road, bridge, flood dike, building, etc)	1. Many stretches of roads are very muddy and difficult to traverse during rainy days. 2. Lack of rice drying and storage facilities.
5) Water Management and O&M Activities	1. Illegal checking in some places. 2. Lack of control in water intake in some turn-outs result in over supply in some areas in the upstream reaches of the canals but lack of supply in the downstream farms.1. 3. Heavy silt load of water entering the canals.
6) Status of NIS and IA Management	Status Type C evaluated by Radar Graph. Specific problems are: 1. Low ISF collection efficiency during wet and dry seasons at 33% and 26%, respectively 2. Medium ratio of tenancy at 39%
7) Watershed Management	Watershed significantly denuded
8) Coordination with LGU and Agencies concerned	1. Poor coordination by NIA's field offices and IAs with concerned municipal and city LGUs on specific problem such as watershed management
9) Agriculture	1. High price of farm inputs and low price of outputs. 2. Poor condition of farm to market roads that causes higher transport cost for farm inputs and output. 3. Individualistic attitude among the farmer members of IA

4. Proposed Rehabilitation Plan

4.1 Agricultural Development Plan

Item	Description			
Cropping schedule	Wet Season	Dry Season-1	Dry Season-2	Annual
1) Type of Crops	Paddy	Paddy	-	-
2) Cropping Area (ha)	4,467	3,110	-	-
3) Target Unit Yield (ton/ha)	4.50	4.2	-	-
3) Total Production (ton)	20,102	13,062	-	33,164

4.2 Civil Works

Item	Description
1) Diversion Works	1. Straightening/rechanneling of the river upstream of the dam. 2. Repair of the dam training wall.
2) Canal Structures	1. Repair/rehabilitation of old dilapidated steel gates – 81 units 2. Installation of new steel gates to replace wooden flush boards – 40 units
3) Canalization	1. Concrete lining of selected existing canal sections – 3.2 kms 2. Re-shaping and desilting of some canal sections – 15 kms 3. Realignment of canals 4. Construction of new canals
4) Drainage Structures	1. Repair of drainage structures – 29 units
5) Drainage Canalization	1. Repair of existing drainage canals and construction of new ones – 25 kms
6) Service Roads	1. Regravelling of selected road sections – 30.6 kms 2. Construction of side drainage canals – 30.6 kms 3. Construction of road drainage structures – 10 units
7) On-Farm Facilities	1. Repair /replacement of dilapidated turn out steel gates 2.Construction of new turn outs and farm ditches
8) IMT Support Facilities	1. Construction of post-harvest facilities—warehouses, IA buildings, solar driers with shed – 4 sets
9) IMT GIS Database	1. Development and establishment of GIS database

4.3 Institutional Strengthening Program

Item	Description
1) Reactivation Program of FIAs/IAs and System Management Committee (ISMC)	1. Executing body : Project Management Office with assistance of Consultant 2. Schedule:34 months / NIS 3. Counter body for execution: NIA Regional Office and IMO office 4. Attendant / Trainee: President of FIAs/IAs and secretary group, staff of NIA RIO/IMO, Chairmen of ISMC and Secretary group and LGUs officers, 5. Contents: a) Survey & Study by Consultant b) Workshops on coordination activities with and dissemination on reformation plan to FIAs/IAs c) Workshop on coordination activities with LGUs d) Organization and Legal Registration of FIAs/IAs to be re-active and reactivation of SMC e) Construction of IMT support facilities for FIAs/CIA f) Workshop and Training of FIAs/IAs members on management under the IMT g) Assessment/Evaluation for and Negotiation of Contracting under IMT h) Assistance of reactivated IAs/FIAs in organizational and management activities
2) Strengthening Program of NIA - IA - LGU Partnership	1. Executing body : Project Management Office with assistance of Consultant, & Management System Committee (MSC) of NIS 2. Schedule: 7 months / NIS 3. Counter body for execution: Regional Development Council with Secretary of NEDA Regional Office

Item	Description
	4. Attendant / Trainee: Secretaries of Regional Organizations, LGUs officers, President of FIAs/IAs and secretary group, staff of NIA RIO/IMO, Chairmen of ISMC and Secretary group 5. Contents: a) Workshop on Trouble Shooting of NIS and FIAs/ISs' Management b) Provision of work space for ISMC including office facilities
3) NIA Institutional Strengthening Program	1. Executing body : Institutional Development Division of CO, NIA 2. Schedule: 7 months / NIS 3. Counter body for execution: NIA Regional Office and IMO office 4. Attendant / Trainee: NIA personnel at CO, RIO and IMO 5. Contents: a) Capability built-up program (Central and Regional NIA Offices) b) Improvement program on management mechanism of NIA c) Support program for IMT implementation d) Strengthening program of Integrated Management information System
4) Specific Program on watershed management plan	1. Strengthening coordination with RDC, RAFC/PAFC and LGUs concerned through works shop on dissemination of the SLRIF to these organizations. 2. Strengthening coordination with RDC, RAFC/PAFC and LGUs on training program of watershed management

4.4 Proposed Counter Schemes

Item	Description
1) DENR	1. Technical assistance to concerned Provincial/municipal LGUs on watershed rehabilitation and management such as establishment of nurseries, community-based livelihood for upland dwellers
2) LGU	1. Provincial LGUs intend to enhance co-mentoring of municipal and barangay LGUs to improve their skills in project preparation and sourcing of development fund 2. Executing agency defines clearly the roles and responsibilities of the LGUs by including the latter as member of project steering committee 3. LGU provides initial paddy seed for mass production 4. LGU expands information campaign through local media to create awareness among planning officers to give support to rehabilitation of NISs

5. Cost Estimate for Initial Investment

Item	Description			
1) Direct Cost for Civil Works	A. Mobilization	Php	7.18	Million
	B. Protection Dikes		-	
	C. Diversion Works	Php	20.00	Million
	D. Canal Structures	Php	32.66	Million
	E. Canalization	Php	232.93	Million
	F. Drainage Structures	Php	8.93	Million
	G. Drainage Canalization	Php	13.40	Million
	H. Roads	Php	3.44	Million
	I. On-Farm Facilities/T.O. Gates	Php	2.99	Million
	J. IMT Support Facilities	Php	20.00	Million
	K. IMT GIS Database	Php	4.47	Million
	L. Institutional Development (5% of Direct Cost)	Php	6.00	Million
	M. Feasibility Studies & Detailed Engineering (2% of Direct Cost)	Php	7.18	Million
	Sub-total (Direct Cost)	Php	359.18	Million
2) Indirect Cost	A. General Engineering Supervision and Administration (3.5% of Direct Cost)	Php	12.57	Million
	B. NIA Management Fee (5% of Total Project Cost)	Php	19.57	Million
	Sub-total (Indirect Cost)	Php	32.14	Million
3) Total Project Cost	= 1+2	Php	391.32	Million
Cost per ha.		Php	87,603.00	/ha.

6. Implementation Plan

Item	Description
1) Contract package	1 - Local Competitive Bidding (LCB)
2) Implementation Schedule	
a) Civil Works	
1) Survey, F/S, Design	21 months
2) Tendering	6 months
3) Construction	36 months
b) Institutional Improvement Works	
1) Reactivation Program of FIAs/IAs and Irrigation System Management Committee	34 months
2) NIA-IA-LGU Partnership	7 months
3) Strengthening of NIA staff	7 months

7. Project Evaluation

Item		Description	
1) Economic evaluation			
EIRR (Base)		EIRR = 17.3 %	: Project life 50 years
Sensitivity	Case-1	EIRR = 15.8 %	: Cost 10% up
	Case-2	EIRR = 15. 6 %	: Benefit 10% down
	Case-3	EIRR = 14.3 %	: Cost 10% up + Benefit 10% down
B/C		1.16	: discount rate 15% p.a.
NPV		PHP 37 million	: discount rate 15% p.a.

2) Financial evaluation	Farmer's net income increase = PHP 13,114/ ha/year
3) Expected Impacts	1. Increased farmers' income 2. Increased rice self sufficiency of the country 3. Increased job opportunities in rural areas

8. Environmental Aspects

Item	*Description*
1) Environmental aspect	Need to address problems in siltation, water quality and drainage insufficiency
2) Relocation of houses	None
3) Land acquisition	None

Table 0602 - Aganan Economic Evaluation (EIRR)

Basic Case

Name of NIS 0602 - Aganan | Region : 6 | IMO RIO Iloilo-Guimaras

EIRR : 17.3%	Net Present Value (Million PHP)	Benefit	Cost	B/C Ratio	NPV
	(15 % discount rate)	270	233	1.16	37

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011			1.79		1.79		2.79	2.79	1.00
2	2012			1.79		1.79		5.58	5.58	3.79
3	2013	99.30	0.98	1.79		102.06		8.37	8.37	-93.69
4	2014	132.40	1.30	1.79	2.72	138.20	8.36	11.16	19.52	-118.68
5	2015	99.30	0.98	1.79	6.34	108.40	20.55	13.95	34.50	-73.90
6	2016				9.06	9.06	31.35	16.74	48.09	39.03
7	2017				9.06	9.06	33.79	19.53	53.32	44.26
8	2018				9.06	9.06	34.83	22.32	57.15	48.09
9	2019				9.06	9.06	34.83	25.11	59.94	50.88
10	2020				9.06	9.06	34.83	27.90	62.73	53.67
11	2021				9.06	9.06	34.83	30.69	65.52	56.46
12	2022				9.06	9.06	34.83	33.48	68.31	59.25
13	2023				9.06	9.06	34.83	36.27	71.10	62.04
14	2024				9.06	9.06	34.83	39.06	73.89	64.83
15	2025				9.06	9.06	34.83	41.85	76.68	67.62
16	2026				9.06	9.06	34.83	44.64	79.47	70.41
17	2027				9.06	9.06	34.83	47.43	82.26	73.20
18	2028				9.06	9.06	34.83	50.22	85.05	75.99
19	2029				9.06	9.06	34.83	53.01	87.84	78.78
20	2030				9.06	9.06	34.83	55.80	90.63	81.57
21	2031				9.06	9.06	34.83	58.59	93.42	84.36
22	2032				9.06	9.06	34.83	61.38	96.21	87.15
23	2033				9.06	9.06	34.83	64.17	99.00	89.94
24	2034				9.06	9.06	34.83	66.96	101.79	92.73
25	2035				9.06	9.06	34.83	69.75	104.58	95.52
26	2036				9.06	9.06	34.83	72.54	107.37	98.31
27	2037				9.06	9.06	34.83	75.33	110.16	101.10
28	2038				9.06	9.06	34.83	78.12	112.95	103.89
29	2039				9.06	9.06	34.83	80.91	115.74	106.68
30	2040				9.06	9.06	34.83	83.70	118.53	109.47
31	2041				9.06	9.06	34.83	86.49	121.32	112.26
32	2042				9.06	9.06	34.83	89.28	124.11	115.05
33	2043				9.06	9.06	34.83	92.07	126.90	117.84
34	2044				9.06	9.06	34.83	94.86	129.69	120.63
35	2045				9.06	9.06	34.83	97.65	132.48	123.42
36	2046				9.06	9.06	34.83	100.44	135.27	126.21
37	2047				9.06	9.06	34.83	103.23	138.06	129.00
38	2048				9.06	9.06	34.83	106.02	140.85	131.79
39	2049				9.06	9.06	34.83	108.81	143.64	134.58
40	2050				9.06	9.06	34.83	111.60	146.43	137.37
41	2051				9.06	9.06	34.83	114.39	149.22	140.16
42	2052				9.06	9.06	34.83	117.18	152.01	142.95
43	2053				9.06	9.06	34.83	119.97	154.80	145.74
44	2054				9.06	9.06	34.83	122.76	157.59	148.53
45	2055				9.06	9.06	34.83	125.55	160.38	151.32
46	2056				9.06	9.06	34.83	128.34	163.17	154.11
47	2057				9.06	9.06	34.83	131.13	165.96	156.90
48	2058				9.06	9.06	34.83	133.92	168.75	159.69
49	2059				9.06	9.06	34.83	136.71	171.54	162.48
50	2060				9.06	9.06	34.83	139.50	174.33	165.27

Case-1 (Cost 10% up)

Name of NIS 0602 - Aganan | Region : 6 | IMO RIO Iloilo-Guimaras

EIRR : 15.8%	Net Present Value (Million PHP)	Benefit	Cost	B/C Ratio	NPV
	(15 % discount rate)	270	256	1.05	14

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	1.97	-	1.97	-	2.79	2.79	0.82
2	2012	-	-	1.97	-	1.97	-	5.58	5.58	3.61
3	2013	109.23	1.07	1.97	-	112.27	-	8.37	8.37	-103.90
4	2014	145.64	1.43	1.97	2.99	152.02	8.36	11.16	19.52	-132.50
5	2015	109.23	1.07	1.97	6.98	119.24	20.55	13.95	34.50	-84.74
6	2016	-	-	-	9.97	9.97	31.35	16.74	48.09	38.12
7	2017	-	-	-	9.97	9.97	33.79	19.53	53.32	43.35
8	2018	-	-	-	9.97	9.97	34.83	22.32	57.15	47.18
9	2019	-	-	-	9.97	9.97	34.83	25.11	59.94	49.97
10	2020	-	-	-	9.97	9.97	34.83	27.90	62.73	52.76
11	2021	-	-	-	9.97	9.97	34.83	30.69	65.52	55.55
12	2022	-	-	-	9.97	9.97	34.83	33.48	68.31	58.34
13	2023	-	-	-	9.97	9.97	34.83	36.27	71.10	61.13
14	2024	-	-	-	9.97	9.97	34.83	39.06	73.89	63.92
15	2025	-	-	-	9.97	9.97	34.83	41.85	76.68	66.71
16	2026	-	-	-	9.97	9.97	34.83	44.64	79.47	69.50
17	2027	-	-	-	9.97	9.97	34.83	47.43	82.26	72.29
18	2028	-	-	-	9.97	9.97	34.83	50.22	85.05	75.08
19	2029	-	-	-	9.97	9.97	34.83	53.01	87.84	77.87
20	2030	-	-	-	9.97	9.97	34.83	55.80	90.63	80.66
21	2031	-	-	-	9.97	9.97	34.83	58.59	93.42	83.45
22	2032	-	-	-	9.97	9.97	34.83	61.38	96.21	86.24
23	2033	-	-	-	9.97	9.97	34.83	64.17	99.00	89.03
24	2034	-	-	-	9.97	9.97	34.83	66.96	101.79	91.82
25	2035	-	-	-	9.97	9.97	34.83	69.75	104.58	94.61
26	2036	-	-	-	9.97	9.97	34.83	72.54	107.37	97.40
27	2037	-	-	-	9.97	9.97	34.83	75.33	110.16	100.19
28	2038	-	-	-	9.97	9.97	34.83	78.12	112.95	102.98
29	2039	-	-	-	9.97	9.97	34.83	80.91	115.74	105.77
30	2040	-	-	-	9.97	9.97	34.83	83.70	118.53	108.56
31	2041	-	-	-	9.97	9.97	34.83	86.49	121.32	111.35
32	2042	-	-	-	9.97	9.97	34.83	89.28	124.11	114.14
33	2043	-	-	-	9.97	9.97	34.83	92.07	126.90	116.93
34	2044	-	-	-	9.97	9.97	34.83	94.86	129.69	119.72
35	2045	-	-	-	9.97	9.97	34.83	97.65	132.48	122.51
36	2046	-	-	-	9.97	9.97	34.83	100.44	135.27	125.30
37	2047	-	-	-	9.97	9.97	34.83	103.23	138.06	128.09
38	2048	-	-	-	9.97	9.97	34.83	106.02	140.85	130.88
39	2049	-	-	-	9.97	9.97	34.83	108.81	143.64	133.67
40	2050	-	-	-	9.97	9.97	34.83	111.60	146.43	136.46
41	2051	-	-	-	9.97	9.97	34.83	114.39	149.22	139.25
42	2052	-	-	-	9.97	9.97	34.83	117.18	152.01	142.04
43	2053	-	-	-	9.97	9.97	34.83	119.97	154.80	144.83
44	2054	-	-	-	9.97	9.97	34.83	122.76	157.59	147.62
45	2055	-	-	-	9.97	9.97	34.83	125.55	160.38	150.41
46	2056	-	-	-	9.97	9.97	34.83	128.34	163.17	153.20
47	2057	-	-	-	9.97	9.97	34.83	131.13	165.96	155.99
48	2058	-	-	-	9.97	9.97	34.83	133.92	168.75	158.78
49	2059	-	-	-	9.97	9.97	34.83	136.71	171.54	161.57
50	2060	-	-	-	9.97	9.97	34.83	139.50	174.33	164.36

Table 0602 - Aganan Economic Evaluation (EIRR)

Case-2 (Benefit 10% down)

Name of NIS 0602 - Aganan | Region 6 | IMO,RIO Iloilo-Guimaras

EIRR : 15.6%	Net Present Value (Million PHP) (15 % discount rate)	Benefit	Cost	B/C Ratio	NPV
		243	233	1.04	10

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	1.79	-	1.79	-	2.51	2.51	0.72
2	2012	-	-	1.79	-	1.79	-	5.02	5.02	3.23
3	2013	99.30	0.98	1.79	-	102.06	-	7.53	7.53	-94.53
4	2014	132.40	1.30	1.79	2.72	138.20	7.52	10.04	17.57	-120.63
5	2015	99.30	0.98	1.79	6.34	108.40	18.49	12.56	31.05	-77.35
6	2016	-	-	-	9.06	9.06	28.21	15.07	43.28	34.22
7	2017	-	-	-	9.06	9.06	30.41	17.58	47.98	38.92
8	2018	-	-	-	9.06	9.06	31.35	20.09	51.44	42.38
9	2019	-	-	-	9.06	9.06	31.35	22.60	53.95	44.89
10	2020	-	-	-	9.06	9.06	31.35	25.11	56.46	47.40
11	2021	-	-	-	9.06	9.06	31.35	27.62	58.97	49.91
12	2022	-	-	-	9.06	9.06	31.35	30.13	61.48	52.42
13	2023	-	-	-	9.06	9.06	31.35	32.64	63.99	54.93
14	2024	-	-	-	9.06	9.06	31.35	35.15	66.50	57.44
15	2025	-	-	-	9.06	9.06	31.35	37.67	69.01	59.95
16	2026	-	-	-	9.06	9.06	31.35	40.18	71.52	62.46
17	2027	-	-	-	9.06	9.06	31.35	42.69	74.03	64.97
18	2028	-	-	-	9.06	9.06	31.35	45.20	76.55	67.49
19	2029	-	-	-	9.06	9.06	31.35	47.71	79.06	70.00
20	2030	-	-	-	9.06	9.06	31.35	50.22	81.57	72.51
21	2031	-	-	-	9.06	9.06	31.35	52.73	84.08	75.02
22	2032	-	-	-	9.06	9.06	31.35	55.24	86.59	77.53
23	2033	-	-	-	9.06	9.06	31.35	57.75	89.10	80.04
24	2034	-	-	-	9.06	9.06	31.35	60.26	91.61	82.55
25	2035	-	-	-	9.06	9.06	31.35	62.78	94.12	85.06
26	2036	-	-	-	9.06	9.06	31.35	65.29	96.63	87.57
27	2037	-	-	-	9.06	9.06	31.35	67.80	99.14	90.08
28	2038	-	-	-	9.06	9.06	31.35	70.31	101.66	92.60
29	2039	-	-	-	9.06	9.06	31.35	72.82	104.17	95.11
30	2040	-	-	-	9.06	9.06	31.35	75.33	106.68	97.62
31	2041	-	-	-	9.06	9.06	31.35	77.84	109.19	100.13
32	2042	-	-	-	9.06	9.06	31.35	80.35	111.70	102.64
33	2043	-	-	-	9.06	9.06	31.35	82.86	114.21	105.15
34	2044	-	-	-	9.06	9.06	31.35	85.37	116.72	107.66
35	2045	-	-	-	9.06	9.06	31.35	87.89	119.23	110.17
36	2046	-	-	-	9.06	9.06	31.35	90.40	121.74	112.68
37	2047	-	-	-	9.06	9.06	31.35	92.91	124.25	115.19
38	2048	-	-	-	9.06	9.06	31.35	95.42	126.77	117.71
39	2049	-	-	-	9.06	9.06	31.35	97.93	129.28	120.22
40	2050	-	-	-	9.06	9.06	31.35	100.44	131.79	122.73
41	2051	-	-	-	9.06	9.06	31.35	102.95	134.30	125.24
42	2052	-	-	-	9.06	9.06	31.35	105.46	136.81	127.75
43	2053	-	-	-	9.06	9.06	31.35	107.97	139.32	130.26
44	2054	-	-	-	9.06	9.06	31.35	110.48	141.83	132.77
45	2055	-	-	-	9.06	9.06	31.35	113.00	144.34	135.28
46	2056	-	-	-	9.06	9.06	31.35	115.51	146.85	137.79
47	2057	-	-	-	9.06	9.06	31.35	118.02	149.36	140.30
48	2058	-	-	-	9.06	9.06	31.35	120.53	151.88	142.82
49	2059	-	-	-	9.06	9.06	31.35	123.04	154.39	145.33
50	2060	-	-	-	9.06	9.06	31.35	125.55	156.90	147.84

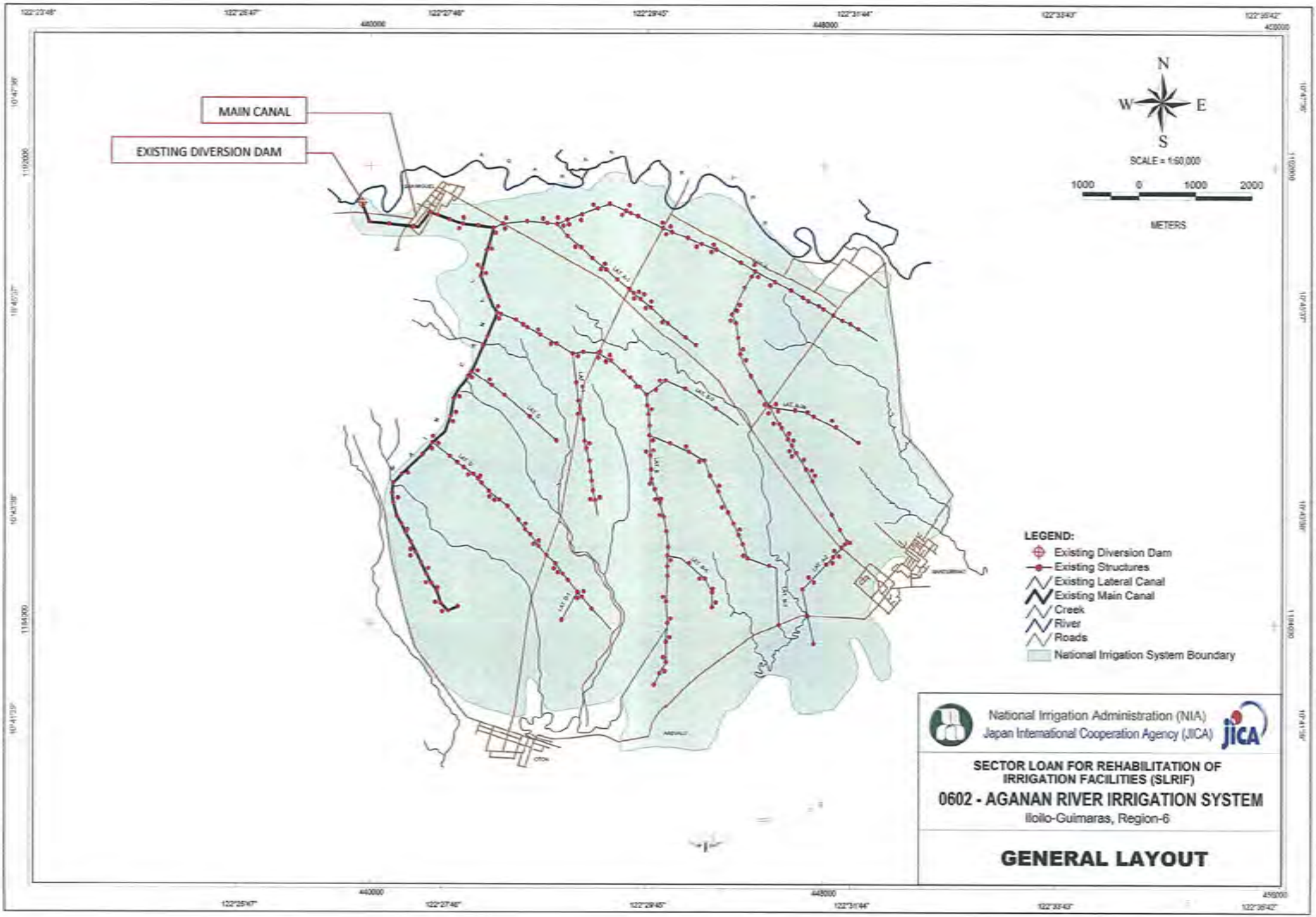
Case-3 (Cost 10% up and Benefit 10% down)

Name of NIS 0602 - Aganan | Region 6 | IMO,RIO Iloilo-Guimaras

EIRR : 14.3%	Net Present Value (Million PHP) (15 % discount rate)	Benefit	Cost	B/C Ratio	NPV
		243	256	0.95	-13

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	1.97	-	1.97	-	2.51	2.51	0.54
2	2012	-	-	1.97	-	1.97	-	5.02	5.02	3.06
3	2013	109.23	1.07	1.97	-	112.27	-	7.53	7.53	-104.73
4	2014	145.64	1.43	1.97	2.99	152.02	7.52	10.04	17.57	-134.45
5	2015	109.23	1.07	1.97	6.98	119.24	18.49	12.56	31.05	-88.19
6	2016	-	-	-	9.97	9.97	28.21	15.07	43.28	33.31
7	2017	-	-	-	9.97	9.97	30.41	17.58	47.98	38.02
8	2018	-	-	-	9.97	9.97	31.35	20.09	51.44	41.47
9	2019	-	-	-	9.97	9.97	31.35	22.60	53.95	43.98
10	2020	-	-	-	9.97	9.97	31.35	25.11	56.46	46.49
11	2021	-	-	-	9.97	9.97	31.35	27.62	58.97	49.00
12	2022	-	-	-	9.97	9.97	31.35	30.13	61.48	51.51
13	2023	-	-	-	9.97	9.97	31.35	32.64	63.99	54.02
14	2024	-	-	-	9.97	9.97	31.35	35.15	66.50	56.54
15	2025	-	-	-	9.97	9.97	31.35	37.67	69.01	59.05
16	2026	-	-	-	9.97	9.97	31.35	40.18	71.52	61.56
17	2027	-	-	-	9.97	9.97	31.35	42.69	74.03	64.07
18	2028	-	-	-	9.97	9.97	31.35	45.20	76.55	66.58
19	2029	-	-	-	9.97	9.97	31.35	47.71	79.06	69.09
20	2030	-	-	-	9.97	9.97	31.35	50.22	81.57	71.60
21	2031	-	-	-	9.97	9.97	31.35	52.73	84.08	74.11
22	2032	-	-	-	9.97	9.97	31.35	55.24	86.59	76.62
23	2033	-	-	-	9.97	9.97	31.35	57.75	89.10	79.13
24	2034	-	-	-	9.97	9.97	31.35	60.26	91.61	81.65
25	2035	-	-	-	9.97	9.97	31.35	62.78	94.12	84.16
26	2036	-	-	-	9.97	9.97	31.35	65.29	96.63	86.67
27	2037	-	-	-	9.97	9.97	31.35	67.80	99.14	89.18
28	2038	-	-	-	9.97	9.97	31.35	70.31	101.66	91.69
29	2039	-	-	-	9.97	9.97	31.35	72.82	104.17	94.20
30	2040	-	-	-	9.97	9.97	31.35	75.33	106.68	96.71
31	2041	-	-	-	9.97	9.97	31.35	77.84	109.19	99.22
32	2042	-	-	-	9.97	9.97	31.35	80.35	111.70	101.73
33	2043	-	-	-	9.97	9.97	31.35	82.86	114.21	104.24
34	2044	-	-	-	9.97	9.97	31.35	85.37	116.72	106.76
35	2045	-	-	-	9.97	9.97	31.35	87.89	119.23	109.27
36	2046	-	-	-	9.97	9.97	31.35	90.40	121.74	111.78
37	2047	-	-	-	9.97	9.97	31.35	92.91	124.25	114.29
38	2048	-	-	-	9.97	9.97	31.35	95.42	126.77	116.80
39	2049	-	-	-	9.97	9.97	31.35	97.93	129.28	119.31
40	2050	-	-	-	9.97	9.97	31.35	100.44	131.79	121.82
41	2051	-	-	-	9.97	9.97	31.35	102.95	134.30	124.33
42	2052	-	-	-	9.97	9.97	31.35	105.46	136.81	126.84
43	2053	-	-	-	9.97	9.97	31.35	107.97	139.32	129.35
44	2054	-	-	-	9.97	9.97	31.35	110.48	141.83	131.87
45	2055	-	-	-	9.97	9.97	31.35	113.00	144.34	134.38
46	2056	-	-	-	9.97	9.97	31.35	115.51	146.85	136.89
47	2057	-	-	-	9.97	9.97	31.35	118.02	149.36	139.40
48	2058	-	-	-	9.97	9.97	31.35	120.53	151.88	141.91
49	2059	-	-	-	9.97	9.97	31.35	123.04	154.39	144.42
50	2060	-	-	-	9.97	9.97	31.35	125.55	156.90	146.93


MAIN CANAL
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National Irrigation System Boundary
National Irrigation Administration (NIA)
Japan International Cooperation Agency (JICA)
JICA
SECTOR LOAN FOR REHABILITATION OF IRRIGATION FACILITIES (SLRIF)
0602 - AGANAN RIVER IRRIGATION SYSTEM
Iloilo-Guimaras, Region-6
GENERAL LAYOUT

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities
Photograph of Irrigation Facilities

NIS name: Aganan (Region 6)

Location / Facility	*Photograph*	*Comments*
01. Diversion dam. View taken from the right bank. Longitude: 10°46'51"E Latitude: 122°27'00"N		River upstream of dam needs re-channeling to straighten the course.
02. Diversion dam. Intake gates & main canal. Longitude: 10°46'51"E Latitude: 122°27'00"N		Notice the water with heavy silt load.
03. Mambog dam. Supplementary water source. Longitude: 10°43'49"E Latitude: 122°28'57"N		Built about 50 years ago, it is now needing major rehabilitation in its concrete and steel parts.

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities
Photograph of Irrigation Facilities

NIS name: Aganan (Region 6)

Location / Facility	*Photograph*	*Comments*
04. Silting basin and silt ejector gate at the main canal. Longitude: 10°46'51"E Latitude: 122°27'00"N		Water with heavy silt load.
05. Main canal right after the dam intake. Longitude: 10°46'51"E Latitude: 122°27'00"N		Water with heavy silt load.
06. Service road beside the main canal, Station 3+040. Longitude: 10°46'28"E Latitude: 122°28'15"N		Road needs re-graveling and side drains.

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities
Photograph of Irrigation Facilities

NIS name: Aganan (Region 6)

Location / Facility	*Photograph*	*Comments*
07. Check and drop structure at Sta. 3+622 of Main Canal. Longitude: 10°46'08"E Latitude: 122°28'08"N		New steel gates need to be installed. Old gate needs to be replaced.
08. Headgate of Lat. A-2. Longitude: 10°46'11"E Latitude: 122°30'50"N		The canals need to be concrete-lined.
09. Lateral A Station 4+500 Longitude: 10 □ 46' 19"E Latitude: 122 □ 30' 36" N		Canal for concrete lining.

THE REPUBLIC OF PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION

Sector Loan on Rehabilitation of Irrigation Facilities

NIS SUMMARY REPORT

0603
Sta. Barbara RIS
Region 6
Iloilo Province

July 2009

Survey Team for
Japan International Cooperation Agency
(JICA)

Features of NIS for Rehabilitation Project

1. General

Item		*Description*		
1)	Name of NIS	**STA. BARBARA RIS**		Code: 0603
2)	Location	Region	Region 6	
		Province	Iloilo	
		Municipality	Leganes, Pavia, Sta Barbarra, Iloilo City	
		Distance	16 km from Iloilo (Capital of Province)	
3)	Type of Water Source	Water Source	Tigum river	
		Type	Diversion Dam (69 m wide, 1.40 m high)	
4)	Area	Service Area	4,600 ha	
		FUSA	3,062 ha	
5)	Beneficiary Farmers	1,136 farmers	Average paddy field size = 2.70 ha per farmer	
6)	Irrigator's Association	IAs established = 4 FIA established = 1in 2008		
7)	Features of NIS and Necessity of the project	The NIS was completed in December 1922, reportedly the oldest NIS in the Philippines. Its original design area was 4,600 hectares but for the last five (5) years (2004-2008) the average irrigated area was only 2,643.60 hectares (wet season) and 2,272 hectares (dry season) due to insufficient water from the source. The firmed-up service area is 3,063 hectares; the difference is due to built-up areas – residential, commercial and other non-farm uses. It has one (1) main canal with a total length of 4.93 kms.; eleven (11) lateral canals with a total length of 46.16 kms. and 40.13 kms. of service roads. It also has 28 kilometers of drainage canals, 236 canal structures, 20 drainage structures, 118 turn-outs and 88 kms. of farm ditches. During the last five (5) years it had an average cropping intensity of 161% and average yields of 86 cavans/ha. during the wet season and 80 cavans/ha. during the dry season. The rehabilitation work is deemed necessary to stabilize the dam and the river channel and introduce improvements in the canals and canal structures. This will ensure the long-term structural stability of the diversion works and enhance the efficiency of delivery of water in the canals and distribution of the same to the rice fields.		
8)	Outline of the Proposed Project	A. Engineering 1. Repair of diversion dam 2. Repair and improvement of irrigation canal and structures 3. Repair and improvement of drainage canal and structures 4. Repair and improvement of service roads 5. Repair and improvement of on-farm facilities 6. Repair and construction of IMT support facilities-IA Bldg solar drier, warehouse with IA building 7. Development and establishment of IMT GIS database		

	B. Institutional Strengthening Program B. 1 Basic Program 1. Reactivation of FIA/IA and Strengthening of Irrigation System Management Committee (ISMC) of NIS including construction of IMT support facilities 2. Strengthening of NIA – IA – LGUs Partnership 3. Strengthening NIA Institutional Capacity B.2 Specific Program to strengthen institutional mechanism together with LGUs 1. Improvement of watershed management
9) Proposed Project Component	A. Engineering 1. Construction of civil works for rehabilitation of diversion works, canal system, drainage system, roads, and IMT support facilities. B. Institutional 1. Reactivation of FIAs/IAs including reformation of TSGA / IA / FIA areas, construction of IMT support facilities (demand base) 2. Strengthening NIA-IA- LGUs Partnership, especially coordination RDC, RAFC/PAFC with FIAs/IAs and ISMC 3. Institutional development program to strengthen management capacity of NIA field offices and IAs.
10) Project Cost (Direct cost only, excluding escalation, contingency, tax)	1. Direct cost — PHP 181.27 Million - *Civil Works* — *PHP 173.24 Million* - *Institutional Development* — *PHP 4.40 Million* - *Engineering Services* — *PHP 3.63 Million* 2. Indirect cost — 16.22 Million **Total Project Cost (1+2)** — **197.49 Million** **Cost per ha** — **64,496.00 per ha**
11) Project Benefit	1. To increase paddy production by 2,985 tons/year 2. To increase farmers' net income to PHP61,196.00 /ha/year 3. To establish functional and self-reliant IAs 4. To improve performance of NIS
9) Project Justification	EIRR = 23.2 %, B/C = 1.54 (discount rate 15%)

2. Project History (Construction/Rehabilitation)

Year	*Description*
1922	Completion of Rehabilitation
1977-1983	Repair and rehabilitation of dam and irrigation facilities undertaken, funded by the WB

3. Present Condition

3.1 Natural Conditions

Item	*Description*
1) Annual Rainfall	2,086.30 mm
2) Seasons	Wet season: April – September Dry season: October – March
3) Dominant Soil in NIS Area	Sta. Rita loam
4) Topography	Relatively flat

3.2 Socio-economy (Region/Province)

Item	*Description*
1) GRDP	PHP 438,864 million (Year 2007), Per Capita GRDP = PHP 61,382 per year
2) Population	1,691,878 (province)
3) Population Growth Rate	1.13 % per year (province)
4) Labor Force	4,649,000 (region)
5) Poverty Population	30.4 % to total population (province)

3.3 Present Agriculture in NIS

Item	*Description*			
1) Farm Household in NIS	Total beneficiaries	1,136 households		
	Land owners	505 households	(44.4 %)	
	Tenant farmers	631 households	(55.6 %)	
2) Paddy Field Size in NIS	2.70 ha per household (FUSA/Total beneficiaries as of 2008)			
3) Present Land Use in NIS	Paddy field planted	2,659 ha	57.8 %	As of 2008
	Paddy field not planted	404 ha	8.8 %	As of 2008
	Upland crop field	0 ha	0.0 %	
	Permanent crop field	0 ha	0.0 %	
	Undeveloped area	0 ha	0.0 %	
	Built-up area	0 ha	0.0 %	
	High ground	0 ha	0.0 %	
	Grassland	0 ha	0.0 %	
	Swamp	0 ha	0.0 %	
	Unspecified area	1,537 ha	33.4 %	No data in response
4) Paddy Field in FUSA (ha)	3,062			

5) Paddy Cropped Area (ha)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Wet Season	2,957	2,699	2,387	2,516	2,659	2,644
Dry Season	2,579	2,047	1,841	2,393	2,500	2,272
6) Cropping Intensity	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
(per year)	181	155	138	160	168	160
7) Unit Yield of Paddy (ton/ha)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Wet Season	2.03	3.41	4.54	4.46	4.54	3.73
Dry Season	4.47	3.85	3.34	4.27	4.19	4.07
8) Paddy Production (ton)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Wet Season	5,988	9,210	10,830	11,214	12,077	9,864
Dry Season	11,519	7,882	6,152	10,218	10,480	9,250

3.4 Water Resources

Item	*Description*
1) Name of Rivers	Tigum River
2) Catchment Area at Dam	193 km^2
3) Ave. River Discharge	4.48 m^3/s
4) Ave. Dry Season Discharge	3.69 m^3/s
5) Diverted Intake Discharge	3.03 m^3/s
6) Water Requirement	5.51 m^3/s
7) Sedimentation	High

3.5 Existing Irrigation System

Item	*Description*
1) Diversion Dam	Overflow crest width 69 m, Dam height 1.40 m
2) Main Canal	Total length 4.93 km (Lined portion: 0.00)
3) Lateral Canals	Total length 46.165 km (Lined portion 2.815 km)
4) On-farm facilities	Total length 102.00 km (Lined portion 0 km) Turn-outs = 118 units
5) Drainage Canal	Total length 28.00 km
6) Canal Structures	No. = 236 units
7) Drainage Structure	No. = 40 units
8) Farm roads	Total length 44.89 km (pavement = 0.00 km)
9) Flood Protection Dike	Total length 125.00 m

3.6 Institutions for O&M of NIS

Item	*Description*					
1) Regional Irrigation Office	Name: Region 6 – Western Visayas					
2) IMO	Name: Iloilo-Guimaras IMO					
Staff in 2009	Total number of staff: 82					
3) Irrigator' Association (IA)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Number of FIA (nos)					1	
Number of IA (nos)					4	
Number of TSAG (nos)	56	56	56	56	55	56
Functionality of IA	93.9	73.6	85.3	77.8	85.4	83.2
Collection of ISF (wet, %)	47	38	52	49	53	48
Collection of ISF (dry, %)	49	28	45	34	30	37
4) NIS Category based on IA 2008 O&M Contract (NIA-IA)	No. of IA					
Category A	2					
Category B	2					
Category C	0					

3.7 Existing Problems

Item	*Description*
1) Diversion Works	1. The river upstream of the diversion works has changed course over the decades and it is now snaking up, resulting in restricted and slower flow during floods. This puts the stability of the dam in peril. There is a need to straighten the river by rechanneling. 2. The river downstream of the dam is now scoured; there is a need to construct flood scouring protection.
2) Canal and Structures	1. Some canal sections are prone to erosion and seepage problems and need to be concrete-lined. 2. Many canal structures have damaged steel gates and need to be replaced and/or repaired. Quite a number also have only wooden flush boards and they have to be provided with steel gates.
3) Drainage Canal	1. Some irrigation canals serve as drainage canals during heavy rains and consequently get clogged up at the structures due to too much water and debris from banana plantations and household wastes in populated areas.
4) Other Project Facilities (road, bridge, flood dike, building, etc)	1. Some road sections are heavily damaged and need regravelling. All roads need to be constructed with side ditches to avoid stagnant water.
5) Water Management and O&M Activities	1. Lack of water during the dry season due to denuded watershed and the fact that the local water district is tapping its water at the upstream of the dam.

Item	Description
	2. Illegal checking in some places. 3. Lack of control in water intake in some turn-outs result in over supply in some areas in the upstream reaches of the canals but lack of supply in the downstream farms.
6) Status of NIS and IA Management	Status Type Ba evaluated by Radar Graph. Specific problems are: 1. Low ISF collection efficiency during dry and wet seasons at 37% and 58%, respectively 2. Medium ratio of membership at 66%
7) Watershed Management	Watershed significantly denuded
8) Coordination with LGU and Agencies concerned	1. Poor coordination by NIA's field offices and IAs with concerned municipal LGUs on specific problem such as watershed management
5) Agriculture	1. High prices of agricultural farm inputs while prices for outputs are low that causes the farmers to apply minimum quantity of farm inputs. 2. Non-cooperation of some farmers in the activities of the IA.

4. Proposed Rehabilitation Plan

4.1 Agricultural Development Plan

Item	Description			
Cropping schedule	*Wet Season*	*Dry Season-1*	*Dry Season-2*	*Annual*
1) Type of Crops	Paddy	Paddy	-	-
2) Cropping Area (ha)	3,063	2,580	-	-
3) Target Unit Yield (ton/ha)	4.55	4.50	-	-
3) Total Production (ton)	13,937	11,610	-	25,547

4.2 Civil Works

Item	Description
1) Diversion Works	1. Straightening/rechanneling of the river upstream of the dam to straighten the course and widen the channel. 2. Construction of flood protection works downstream of the dam
2) Canal Structures	1. Repair/rehabilitation of old dilapidated steel gates – 81 units 2. Installation of new steel gates to replace wooden flush boards – 29 units
3) Canalization	1. Concrete lining of selected existing canal sections – 48.9 kms 2. Re-shaping and de-silting of some canal sections – 2 kms 3. Realignment of canals 4. Construction of new canals
4) Drainage Structures	1. Repair of drainage structures – 20 units
5) Drainage Canalization	1. Repair of existing drainage canals and construction of new ones – 19.20 kms
6) Service Roads	1. Regravelling of selected road sections – 30.8 kms 2. Construction of side drainage canals – 30.8 kms 3. Construction of road drainage structures.
7) On-Farm Facilities	1. Repair /replacement of dilapidated turn out steel gates 2.Construction of new turn outs and farm ditches
8) IMT Support Facilities	1. Construction of post-harvest facilities—warehouses, IA buildings, solar driers with shed – 3 sets
9) IMT GIS Database	1. Development and establishment of GIS database

4.3 Institutional Strengthening Program

Item	*Description*
1) Reactivation Program of FIAs/IAs and System Management Committee (ISMC)	1. Executing body : Project Management Office with assistance of Consultant 2. Schedule:34 months / NIS 3. Counter body for execution: NIA Regional Office and IMO office 4. Attendant / Trainee: President of FIAs/IAs and secretary group, staff of NIA RIO/IMO, Chairmen of ISMC and Secretary group and LGUs officers, 5. Contents: a) Survey & Study by Consultant b) Workshops on coordination activities with and dissemination on reformation plan to FIAs/IAs c) Workshop on coordination activities with LGUs d) Organization and Legal Registration of FIAs/IAs to be re-active and reactivation of SMC e) Construction of IMT support facilities for FIAs/CIA f) Workshop and Training of FIAs/IAs members on management under the IMT g) Assessment/Evaluation for and Negotiation of Contracting under IMT h) Assistance of reactivated IAs/FIAs in organizational and management activities
2) Strengthening Program of NIA - IA - LGU Partnership	1. Executing body : Project Management Office with assistance of Consultant, & Management System Committee (MSC) of NIS 2. Schedule: 7 months / NIS 3. Counter body for execution: Regional Development Council with Secretary of NEDA Regional Office 4. Attendant / Trainee: Secretaries of Regional Organizations, LGUs officers, President of FIAs/IAs and secretary group, staff of NIA RIO/IMO, Chairmen of ISMC and Secretary group 5. Contents: a) Workshop on Trouble Shooting of NIS and FIAs/ISs' Management b) Provision of work space for ISMC including office facilities
3) NIA Institutional Strengthening Program	1. Executing body : Institutional Development Division of CO, NIA 2. Schedule: 7 months / NIS 3. Counter body for execution: NIA Regional Office and IMO office 4. Attendant / Trainee: NIA personnel at CO, RIO and IMO 5. Contents: a) Capability built-up program (Central and Regional NIA Offices) b) Improvement program on management mechanism of NIA c) Support program for IMT implementation d) Strengthening program of Integrated Management information System
4) Specific Program on watershed management plan	1. Strengthening coordination with RDC, RAFC/PAFC and LGUs concerned through works shop on dissemination of the SLRIF to these organizations. 2. Strengthening coordination with RDC, RAFC/PAFC and LGUs on training program of watershed management

4.4 Proposed Counter Schemes

Item	*Description*
1) DENR	1. Technical assistance to concerned Provincial/municipal LGUs on watershed rehabilitation and management such as establishment of nurseries, community-based livelihood for upland dwellers
2) LGU	1. Provincial LGUs intend to enhance co-mentoring of municipal and barangay LGUs to improve their skills in project preparation and sourcing of development fund 2. Executing agency defines clearly the roles and responsibilities of the LGUs by including the latter as member of project steering committee 3. LGU provides initial paddy seed for mass production 4. LGU expands information campaign through local media to create awareness among planning officers to give support to rehabilitation of NISs

5. Cost Estimate for Initial Investment

Item	*Description*			
1) Direct Cost for Civil Works	A. Mobilization	Php	3.63	Million
	B. Protection Dikes		-	
	C. Diversion Works	Php	91.13	Million
	D. Canal Structures	Php	3.96	Million
	E. Canalization	Php	31.96	Million
	F. Drainage Structures	Php	6.12	Million
	G. Drainage Canalization	Php	9.19	Million
	H. Road	Php	2.10	Million
	I. On-Farm Facilities/T.O. Gates	Php	2.10	Million
	J. IMT Support Facilities	Php	20.00	Million
	K. IMT GIS Database	Php	3.06	Million
	L. Institutional Development (5% of Direct Cost)	Php	4.40	Million
	M. Feasibility Studies & Detailed Engineering (2% of Direct Cost)	Php	3.63	Million
	Sub-total (Direct Cost)	Php	181.27	Million
2) Indirect Cost	A. General Engineering Supervision and Administration (3.5% of Direct Cost)	Php	6.34	Million
	B. NIA Management Fee (5% of Total Project Cost)	Php	9.87	Million
	Sub-total (Indirect Cost)	Php	16.22	Million
3) Total Project Cost	= 1+2	Php	197.49	Million
Cost per ha.		Php	64,496.00	/ha.

6. Implementation Plan

Item	*Description*
1) Contract package	1 - Local Competitive Bidding (LCB)
2) Implementation Schedule	
a) Civil Works	
1) Survey, F/S, Design	21 months
2) Tendering	6 months
3) Construction	36 months
b) Institutional Improvement Works	
1) Reactivation Program of FIAs/IAs and Irrigation System Management Committee	34 months
2) NIA-IA-LGU Partnership	7 months
3) Strengthening of NIA staff	7 months

8. Project Evaluation

Item		*Description*	
1) Economic evaluation			
EIRR (Base)		EIRR = 23.2 %	: Project life 50 years
Sensitivity	Case-1	EIRR = 21.0 %	: Cost 10% up
	Case-2	EIRR = 20.8 %	: Benefit 10% down
	Case-3	EIRR = 18.9 %	: Cost 10% up + Benefit 10% down
B/C		1.54	: discount rate 15 % p.a.
NPV		PHP 65 million	: discount rate 15 % p.a.
2) Financial evaluation		Farmer's net income increase = PHP 11,370 per ha per year	
3) Expected Impacts		1. Increased farmers' income 2. Increased rice self sufficiency of the country 3. Increased job opportunities in rural areas	

9. Environmental Aspects

Item	*Description*
1) Environmental aspect	Need to address problems of siltation, water quality and insufficiency of drainage
2) Relocation of houses	None
3) Land acquisition	None

Table 0603 - Sta. Barbara Economic Evaluation (EIRR)

Basic Case

Name of NIS 0603 - Sta. Barbara | Region : 6 IMO RIO Iloilo-Guimaras

EIRR : 23.2%	Net Present Value (Million PHP)	Benefit	Cost	B/C Ratio	NPV
	(15 % discount rate)	187	122	1.54	65

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011			0.89		0.89		2.26	2.26	1.37
2	2012			0.89		0.89		4.52	4.52	3.63
3	2013	48.80	0.71	0.89		50.41		6.78	6.78	-43.63
4	2014	65.06	0.95	0.89	1.86	68.77	4.70	9.04	13.74	-55.03
5	2015	48.80	0.71	0.89	4.35	54.75	11.56	11.30	22.86	-31.89
6	2016				6.21	6.21	17.63	13.56	31.19	24.98
7	2017				6.21	6.21	19.00	15.82	34.82	28.61
8	2018				6.21	6.21	19.59	18.08	37.67	31.46
9	2019				6.21	6.21	19.59	20.34	39.93	33.72
10	2020				6.21	6.21	19.59	22.60	42.19	35.98
11	2021				6.21	6.21	19.59	24.86	44.45	38.24
12	2022				6.21	6.21	19.59	27.12	46.71	40.50
13	2023				6.21	6.21	19.59	29.38	48.97	42.76
14	2024				6.21	6.21	19.59	31.64	51.23	45.02
15	2025				6.21	6.21	19.59	33.90	53.49	47.28
16	2026				6.21	6.21	19.59	36.16	55.75	49.54
17	2027				6.21	6.21	19.59	38.42	58.01	51.80
18	2028				6.21	6.21	19.59	40.68	60.27	54.06
19	2029				6.21	6.21	19.59	42.94	62.53	56.32
20	2030				6.21	6.21	19.59	45.20	64.79	58.58
21	2031				6.21	6.21	19.59	47.46	67.05	60.84
22	2032				6.21	6.21	19.59	49.72	69.31	63.10
23	2033				6.21	6.21	19.59	51.98	71.57	65.36
24	2034				6.21	6.21	19.59	54.24	73.83	67.62
25	2035				6.21	6.21	19.59	56.50	76.09	69.88
26	2036				6.21	6.21	19.59	58.76	78.35	72.14
27	2037				6.21	6.21	19.59	61.02	80.61	74.40
28	2038				6.21	6.21	19.59	63.28	82.87	76.66
29	2039				6.21	6.21	19.59	65.54	85.13	78.92
30	2040				6.21	6.21	19.59	67.80	87.39	81.18
31	2041				6.21	6.21	19.59	70.06	89.65	83.44
32	2042				6.21	6.21	19.59	72.32	91.91	85.70
33	2043				6.21	6.21	19.59	74.58	94.17	87.96
34	2044				6.21	6.21	19.59	76.84	96.43	90.22
35	2045				6.21	6.21	19.59	79.10	98.69	92.48
36	2046				6.21	6.21	19.59	81.36	100.95	94.74
37	2047				6.21	6.21	19.59	83.62	103.21	97.00
38	2048				6.21	6.21	19.59	85.88	105.47	99.26
39	2049				6.21	6.21	19.59	88.14	107.73	101.52
40	2050				6.21	6.21	19.59	90.40	109.99	103.78
41	2051				6.21	6.21	19.59	92.66	112.25	106.04
42	2052				6.21	6.21	19.59	94.92	114.51	108.30
43	2053				6.21	6.21	19.59	97.18	116.77	110.56
44	2054				6.21	6.21	19.59	99.44	119.03	112.82
45	2055				6.21	6.21	19.59	101.70	121.29	115.08
46	2056				6.21	6.21	19.59	103.96	123.55	117.34
47	2057				6.21	6.21	19.59	106.22	125.81	119.60
48	2058				6.21	6.21	19.59	108.48	128.07	121.86
49	2059				6.21	6.21	19.59	110.74	130.33	124.12
50	2060				6.21	6.21	19.59	113.00	132.59	126.38

Case-1 (Cost 10% up)

Name of NIS 0603 - Sta. Barbara | Region : 6 IMO RIO Iloilo-Guimaras

EIRR : 21.0%	Net Present Value (Million PHP)	Benefit	Cost	B/C Ratio	NPV
	(15 % discount rate)	187	134	1.40	53

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	0.98	-	0.98	-	2.26	2.26	1.28
2	2012	-	-	0.98	-	0.98	-	4.52	4.52	3.54
3	2013	53.68	0.79	0.98	-	55.45	-	6.78	6.78	-48.67
4	2014	71.57	1.05	0.98	2.05	75.65	4.70	9.04	13.74	-61.91
5	2015	53.68	0.79	0.98	4.78	60.23	11.56	11.30	22.86	-37.37
6	2016	-	-	-	6.83	6.83	17.63	13.56	31.19	24.36
7	2017	-	-	-	6.83	6.83	19.00	15.82	34.82	27.99
8	2018	-	-	-	6.83	6.83	19.59	18.08	37.67	30.84
9	2019	-	-	-	6.83	6.83	19.59	20.34	39.93	33.10
10	2020	-	-	-	6.83	6.83	19.59	22.60	42.19	35.36
11	2021	-	-	-	6.83	6.83	19.59	24.86	44.45	37.62
12	2022	-	-	-	6.83	6.83	19.59	27.12	46.71	39.88
13	2023	-	-	-	6.83	6.83	19.59	29.38	48.97	42.14
14	2024	-	-	-	6.83	6.83	19.59	31.64	51.23	44.40
15	2025	-	-	-	6.83	6.83	19.59	33.90	53.49	46.66
16	2026	-	-	-	6.83	6.83	19.59	36.16	55.75	48.92
17	2027	-	-	-	6.83	6.83	19.59	38.42	58.01	51.18
18	2028	-	-	-	6.83	6.83	19.59	40.68	60.27	53.44
19	2029	-	-	-	6.83	6.83	19.59	42.94	62.53	55.70
20	2030	-	-	-	6.83	6.83	19.59	45.20	64.79	57.96
21	2031	-	-	-	6.83	6.83	19.59	47.46	67.05	60.22
22	2032	-	-	-	6.83	6.83	19.59	49.72	69.31	62.48
23	2033	-	-	-	6.83	6.83	19.59	51.98	71.57	64.74
24	2034	-	-	-	6.83	6.83	19.59	54.24	73.83	67.00
25	2035	-	-	-	6.83	6.83	19.59	56.50	76.09	69.26
26	2036	-	-	-	6.83	6.83	19.59	58.76	78.35	71.52
27	2037	-	-	-	6.83	6.83	19.59	61.02	80.61	73.78
28	2038	-	-	-	6.83	6.83	19.59	63.28	82.87	76.04
29	2039	-	-	-	6.83	6.83	19.59	65.54	85.13	78.30
30	2040	-	-	-	6.83	6.83	19.59	67.80	87.39	80.56
31	2041	-	-	-	6.83	6.83	19.59	70.06	89.65	82.82
32	2042	-	-	-	6.83	6.83	19.59	72.32	91.91	85.08
33	2043	-	-	-	6.83	6.83	19.59	74.58	94.17	87.34
34	2044	-	-	-	6.83	6.83	19.59	76.84	96.43	89.60
35	2045	-	-	-	6.83	6.83	19.59	79.10	98.69	91.86
36	2046	-	-	-	6.83	6.83	19.59	81.36	100.95	94.12
37	2047	-	-	-	6.83	6.83	19.59	83.62	103.21	96.38
38	2048	-	-	-	6.83	6.83	19.59	85.88	105.47	98.64
39	2049	-	-	-	6.83	6.83	19.59	88.14	107.73	100.90
40	2050	-	-	-	6.83	6.83	19.59	90.40	109.99	103.16
41	2051	-	-	-	6.83	6.83	19.59	92.66	112.25	105.42
42	2052	-	-	-	6.83	6.83	19.59	94.92	114.51	107.68
43	2053	-	-	-	6.83	6.83	19.59	97.18	116.77	109.94
44	2054	-	-	-	6.83	6.83	19.59	99.44	119.03	112.20
45	2055	-	-	-	6.83	6.83	19.59	101.70	121.29	114.46
46	2056	-	-	-	6.83	6.83	19.59	103.96	123.55	116.72
47	2057	-	-	-	6.83	6.83	19.59	106.22	125.81	118.98
48	2058	-	-	-	6.83	6.83	19.59	108.48	128.07	121.24
49	2059	-	-	-	6.83	6.83	19.59	110.74	130.33	123.50
50	2060	-	-	-	6.83	6.83	19.59	113.00	132.59	125.76

Table 0603 - Sta. Barbara Economic Evaluation (EIRR)

Case-2 (Benefit 10% down)

Name of NIS 0603 - Sta. Barbara Region : 6 IMO,RIO Iloilo-Guimaras

EIRR : 20.8%	Net Present Value (Million PHP)	Benefit	Cost	B/C Ratio	NPV
	(15 % discount rate)	168	122	1.38	47

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	0.89	-	0.89	-	2.03	2.03	1.14
2	2012	-	-	0.89	-	0.89	-	4.07	4.07	3.17
3	2013	48.80	0.71	0.89	-	50.41	-	6.10	6.10	-44.30
4	2014	65.06	0.95	0.89	1.86	68.77	4.23	8.14	12.37	-56.41
5	2015	48.80	0.71	0.89	4.35	54.75	10.40	10.17	20.57	-34.18
6	2016	-	-	-	6.21	6.21	15.87	12.20	28.07	21.86
7	2017	-	-	-	6.21	6.21	17.10	14.24	31.34	25.13
8	2018	-	-	-	6.21	6.21	17.63	16.27	33.90	27.69
9	2019	-	-	-	6.21	6.21	17.63	18.31	35.94	29.73
10	2020	-	-	-	6.21	6.21	17.63	20.34	37.97	31.76
11	2021	-	-	-	6.21	6.21	17.63	22.37	40.01	33.80
12	2022	-	-	-	6.21	6.21	17.63	24.41	42.04	35.83
13	2023	-	-	-	6.21	6.21	17.63	26.44	44.07	37.86
14	2024	-	-	-	6.21	6.21	17.63	28.48	46.11	39.90
15	2025	-	-	-	6.21	6.21	17.63	30.51	48.14	41.93
16	2026	-	-	-	6.21	6.21	17.63	32.54	50.18	43.97
17	2027	-	-	-	6.21	6.21	17.63	34.58	52.21	46.00
18	2028	-	-	-	6.21	6.21	17.63	36.61	54.24	48.03
19	2029	-	-	-	6.21	6.21	17.63	38.65	56.28	50.07
20	2030	-	-	-	6.21	6.21	17.63	40.68	58.31	52.10
21	2031	-	-	-	6.21	6.21	17.63	42.71	60.35	54.14
22	2032	-	-	-	6.21	6.21	17.63	44.75	62.38	56.17
23	2033	-	-	-	6.21	6.21	17.63	46.78	64.41	58.20
24	2034	-	-	-	6.21	6.21	17.63	48.82	66.45	60.24
25	2035	-	-	-	6.21	6.21	17.63	50.85	68.48	62.27
26	2036	-	-	-	6.21	6.21	17.63	52.88	70.52	64.31
27	2037	-	-	-	6.21	6.21	17.63	54.92	72.55	66.34
28	2038	-	-	-	6.21	6.21	17.63	56.95	74.58	68.37
29	2039	-	-	-	6.21	6.21	17.63	58.99	76.62	70.41
30	2040	-	-	-	6.21	6.21	17.63	61.02	78.65	72.44
31	2041	-	-	-	6.21	6.21	17.63	63.05	80.69	74.48
32	2042	-	-	-	6.21	6.21	17.63	65.09	82.72	76.51
33	2043	-	-	-	6.21	6.21	17.63	67.12	84.75	78.54
34	2044	-	-	-	6.21	6.21	17.63	69.16	86.79	80.58
35	2045	-	-	-	6.21	6.21	17.63	71.19	88.82	82.61
36	2046	-	-	-	6.21	6.21	17.63	73.22	90.86	84.65
37	2047	-	-	-	6.21	6.21	17.63	75.26	92.89	86.68
38	2048	-	-	-	6.21	6.21	17.63	77.29	94.92	88.71
39	2049	-	-	-	6.21	6.21	17.63	79.33	96.96	90.75
40	2050	-	-	-	6.21	6.21	17.63	81.36	98.99	92.78
41	2051	-	-	-	6.21	6.21	17.63	83.39	101.03	94.82
42	2052	-	-	-	6.21	6.21	17.63	85.43	103.06	96.85
43	2053	-	-	-	6.21	6.21	17.63	87.46	105.09	98.88
44	2054	-	-	-	6.21	6.21	17.63	89.50	107.13	100.92
45	2055	-	-	-	6.21	6.21	17.63	91.53	109.16	102.95
46	2056	-	-	-	6.21	6.21	17.63	93.56	111.20	104.99
47	2057	-	-	-	6.21	6.21	17.63	95.60	113.23	107.02
48	2058	-	-	-	6.21	6.21	17.63	97.63	115.26	109.05
49	2059	-	-	-	6.21	6.21	17.63	99.67	117.30	111.09
50	2060	-	-	-	6.21	6.21	17.63	101.70	119.33	113.12

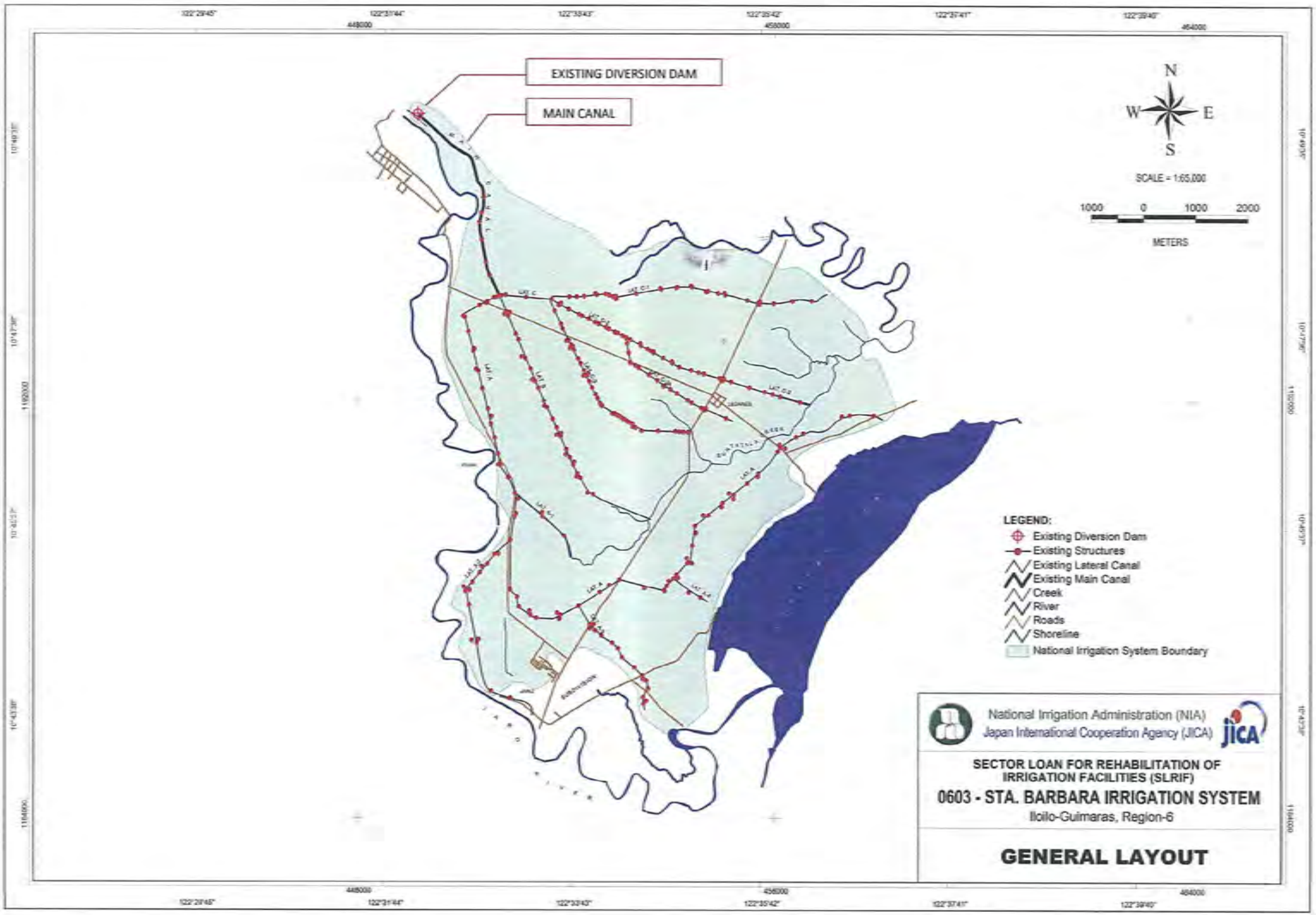
Case-3 (Cost 10% up and Benefit 10% down)

Name of NIS 0603 - Sta. Barbara Region : 6 IMO,RIO Iloilo-Guimaras

EIRR : 18.8%	Net Present Value (Million PHP)	Benefit	Cost	B/C Ratio	NPV
	(15 % discount rate)	168	134	1.26	34

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	0.98	-	0.98	-	2.03	2.03	1.05
2	2012	-	-	0.98	-	0.98	-	4.07	4.07	3.08
3	2013	53.68	0.79	0.98	-	55.45	-	6.10	6.10	-49.34
4	2014	71.57	1.05	0.98	2.05	75.65	4.23	8.14	12.37	-63.28
5	2015	53.68	0.79	0.98	4.78	60.23	10.40	10.17	20.57	-39.66
6	2016	-	-	-	6.83	6.83	15.87	12.20	28.07	21.24
7	2017	-	-	-	6.83	6.83	17.10	14.24	31.34	24.51
8	2018	-	-	-	6.83	6.83	17.63	16.27	33.90	27.07
9	2019	-	-	-	6.83	6.83	17.63	18.31	35.94	29.11
10	2020	-	-	-	6.83	6.83	17.63	20.34	37.97	31.14
11	2021	-	-	-	6.83	6.83	17.63	22.37	40.01	33.17
12	2022	-	-	-	6.83	6.83	17.63	24.41	42.04	35.21
13	2023	-	-	-	6.83	6.83	17.63	26.44	44.07	37.24
14	2024	-	-	-	6.83	6.83	17.63	28.48	46.11	39.28
15	2025	-	-	-	6.83	6.83	17.63	30.51	48.14	41.31
16	2026	-	-	-	6.83	6.83	17.63	32.54	50.18	43.34
17	2027	-	-	-	6.83	6.83	17.63	34.58	52.21	45.38
18	2028	-	-	-	6.83	6.83	17.63	36.61	54.24	47.41
19	2029	-	-	-	6.83	6.83	17.63	38.65	56.28	49.45
20	2030	-	-	-	6.83	6.83	17.63	40.68	58.31	51.48
21	2031	-	-	-	6.83	6.83	17.63	42.71	60.35	53.51
22	2032	-	-	-	6.83	6.83	17.63	44.75	62.38	55.55
23	2033	-	-	-	6.83	6.83	17.63	46.78	64.41	57.58
24	2034	-	-	-	6.83	6.83	17.63	48.82	66.45	59.62
25	2035	-	-	-	6.83	6.83	17.63	50.85	68.48	61.65
26	2036	-	-	-	6.83	6.83	17.63	52.88	70.52	63.68
27	2037	-	-	-	6.83	6.83	17.63	54.92	72.55	65.72
28	2038	-	-	-	6.83	6.83	17.63	56.95	74.58	67.75
29	2039	-	-	-	6.83	6.83	17.63	58.99	76.62	69.79
30	2040	-	-	-	6.83	6.83	17.63	61.02	78.65	71.82
31	2041	-	-	-	6.83	6.83	17.63	63.05	80.69	73.85
32	2042	-	-	-	6.83	6.83	17.63	65.09	82.72	75.89
33	2043	-	-	-	6.83	6.83	17.63	67.12	84.75	77.92
34	2044	-	-	-	6.83	6.83	17.63	69.16	86.79	79.96
35	2045	-	-	-	6.83	6.83	17.63	71.19	88.82	81.99
36	2046	-	-	-	6.83	6.83	17.63	73.22	90.86	84.02
37	2047	-	-	-	6.83	6.83	17.63	75.26	92.89	86.06
38	2048	-	-	-	6.83	6.83	17.63	77.29	94.92	88.09
39	2049	-	-	-	6.83	6.83	17.63	79.33	96.96	90.13
40	2050	-	-	-	6.83	6.83	17.63	81.36	98.99	92.16
41	2051	-	-	-	6.83	6.83	17.63	83.39	101.03	94.19
42	2052	-	-	-	6.83	6.83	17.63	85.43	103.06	96.23
43	2053	-	-	-	6.83	6.83	17.63	87.46	105.09	98.26
44	2054	-	-	-	6.83	6.83	17.63	89.50	107.13	100.30
45	2055	-	-	-	6.83	6.83	17.63	91.53	109.16	102.33
46	2056	-	-	-	6.83	6.83	17.63	93.56	111.20	104.36
47	2057	-	-	-	6.83	6.83	17.63	95.60	113.23	106.40
48	2058	-	-	-	6.83	6.83	17.63	97.63	115.26	108.43
49	2059	-	-	-	6.83	6.83	17.63	99.67	117.30	110.47
50	2060	-	-	-	6.83	6.83	17.63	101.70	119.33	112.50


EXISTING DIVERSION DAM
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METERS
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Existing Diversion Dam
Existing Structures
Existing Lateral Canal
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Creek
River
Roads
Shoreline
National Irrigation System Boundary
National Irrigation Administration (NIA)
Japan International Cooperation Agency (JICA)
JICA
SECTOR LOAN FOR REHABILITATION OF IRRIGATION FACILITIES (SLRIF)
0603 - STA. BARBARA IRRIGATION SYSTEM
Iloilo-Guimaras, Region-6
GENERAL LAYOUT

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities
Photograph of Irrigation Facilities

NIS name: Sta. Barbara (Region 6)

Location / Facility	*Photograph*	*Comments*
01. Diversion dam. View taken from the left bank facing upstream. Longitude: 10□ 50' 17" E Latitude:122□ 31' 44" N		River upstream of the dam is now meandering and needs to be re-channeled to straighten the course.
02. Diversion dam downstream apron. Longitude: 10□ 50' 17" E Latitude:122□ 31' 44" N		Notice the scoured flood protection works and lower level of river bed vis-à-vis the downstream apron.
03. Lateral A station 5+879. Longitude: 10□ 45' 30"E Latitude: 122□ 33' 06"N		Site of proposed new trash rack structure.

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities
Photograph of Irrigation Facilities

NIS name: Sta. Barbara (Region 6)

Location / Facility	*Photograph*	*Comments*
04. Lateral A Station 6+079 Longitude: 10□ 45' 19"E Latitude: 122□ 33' 07"N		Household garbage clogging the canal.
06. Road beside Lateral C station 0+200. Longitude:10 □ 48' 17"E Latitude: 122□ 33' 06"N		Road needs re-gravelling and side drains.
07. Lateral C-1 station 2+202. Longitude:10 □ 48' 15"E Latitude: 122□ 34' 19"N		Canal needs concrete lining.

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities
Photograph of Irrigation Facilities

NIS name: Sta. Barbara (Region 6)

Location / Facility	*Photograph*	*Comments*
08. Lateral C-1 station 2+202, bullcart crossing. Longitude:10 □ 48' 15"E Latitude: 122□ 34' 19"N		Needs new steel gate.
09. Lateral C-2A station 2+252. Longitude:10 □ 47' 07"E Latitude:122 □ 35' 10" N		Canal outlet of road crossing. Needs concrete lining.
07. Canal RC Pipe Siphon 604		Exposed Reinforced Concrete Pipe Siphon due to scouring, erosion, and creek bed degradation. Expected to collapsed if not urgent protection works constructed

THE REPUBLIC OF PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION

Sector Loan on Rehabilitation of Irrigation Facilities

NIS SUMMARY REPORT

0604
Pangiplan RIS
Region 6
Negros Occidental Province

July 2009

Survey Team for
Japan International Cooperation Agency
(JICA)

Features of NIS for Rehabilitation Project

1. General

Item		*Description*	
1) Name of NIS	**PANGIPLAN RIS**		Code: 0604
2) Location	Region	6	
	Province	Negros Occidental	
	Municipality	Binalbagan, Himamaylan	
	Distance	72 kms from Bacolod City	
3) Type of Water Source	Water Source	Pangiplan River	
	Type	Diversion Dam (80.00 m wide, 3.00 m high)	
4) Area	Service Area	1,840 has.	
	FUSA	1,169 has.	
5) Beneficiary Farmers	1,071 farmers	Average paddy field cultivating size = 1.09 ha per farmer	
6) Irrigator's Association	IAs established = 6 FIA established = 1 in 2008		
7) Features of NIS and Necessity of the project	The system was originally completed in 1959. Its design area is 1,840 has. but the firmed-up service area is only 1,169 has. due to lack of water. It has one (1) main canal with a total length of 4.5 kms.; five (5) lateral canals with a total length of 23.73 kms. and 28 kms. of service roads. It also has 13.87 kilometers of drainage canals, 99 canal structures, 52 drainage structures and 105 turn-outs. During the last five (5) years it had an average cropping intensity of 181% and average yields of 85 cavans/ha. during the wet season and 80 cavans/ha. during the dry season. Rehabilitation work is necessary to ensure the long-term stability of the dam, improve the control of water releases to the farms and enhance the efficiency of water delivery in the canals.		
8) Outline of the Proposed Project	A. Engineering 1. a.Repair of diversion dam b.Construction of river bank protection works upstream of the dam 2. Repair and improvement of irrigation canal and structures 3. Repair and improvement of drainage canal and structures 4. Repair and improvement of service roads 5. Repair and improvement of on-farm facilities 6. Repair and construction of IMT support facilities-IA Bldg solar drier, warehouse with IA building 7. Development and establishment of IMT GIS database B. Institutional Strengthening Program B. 1 Basic Program 1. Reactivation of FIA/IA and Strengthening of Irrigation System Management Committee (ISMC) of NIS including construction of IMT support facilities 2. Strengthening of NIA – IA – LGUs Partnership 3. Strengthening NIA Institutional Capacity		

	B.2 Specific Program to strengthen institutional mechanism together with LGUs 1. Improvement of watershed management
9) Proposed Project Component	A. Engineering 1. Construction of civil works for rehabilitation of diversion works, canal system, drainage system, roads, and IMT support facilities. B. Institutional 1. Reactivation of FIAs/IAs including reformation of TSGA / IA / FIA areas, construction of IMT support facilities (demand base) 2. Strengthening NIA-IA- LGUs Partnership, especially coordination RDC, RAFC/PAFC with FIAs/IAs and ISMC 3. Institutional development program to strengthen management capacity of NIA field offices and IAs
10) Project Cost (Direct cost only, excluding escalation, contingency, tax)	1. Direct cost — PHP 80.72 Million - *Civil Works* — *PHP 74.71* Million - *Institutional Development* — *PHP 4.40* Million - *Engineering Services* — *PHP 1.61* Million 2. Indirect cost — PHP 7.22 Million Total Project Cost (1+2) — PHP 87.95 Million Cost per ha — PHP 75,231.00 per ha
11) Project Benefit	1. To increase paddy production by 959 tons/year 2. To increase farmers' net income to PHP65,252.00 /ha/year 3. To establish functional and self-reliant IAs 4. To improve performance of NIS
12) Project Justification	EIRR = 21.1 %, B/C = 1.42 (discount rate 15%)

2. Project History (Construction/Rehabilitation)

Year	*Description*
1959	Project Completion
2006-2008	Concreting of lateral canals

3. Present Condition

3.1 Natural Conditions

Item	*Description*
1) Annual Rainfall	1,693.90 mm
2) Seasons	Wet: May – October Dry: November – April
3) Dominant Soil in NIS Area	San Manuel Loam
4) Topography	Relatively flat, gently sloping

3.2 Socio-economy (Region/Province)

Item	*Description*
1) GRDP	PHP 438,864 million Year 2007), Per Capita GRDP = PHP 61,382 per year
2) Population	2,370,269 (province)
3) Population Growth Rate	1.44 % per year (province)
4) Labor Force	4,649,000 (region)
5) Poverty Population	42 % to total population (province)

3.3 Present Agriculture in NIS

Item	*Description*						
1) Farm Household in NIS	Total beneficiaries	1,071 households					
	Land owners	650 households (60.7 %)					
	Tenant farmers	421 households (39.3 %)					
2) Paddy Field Size in NIS	1.09 ha per household (FUSA/Total beneficiaries as of 2008)						
3) Present Land Use in NIS	Paddy field planted	1,012 ha	55.0 %	As of 2008			
	Paddy field not planted	157 ha	8.5 %	As of 2008			
	Upland crop field	0 ha	0.0 %				
	Permanent crop field	671 ha	36.5 %				
	Undeveloped area	0 ha	0.0 %				
	Built-up area	0 ha	0.0 %				
	High ground	0 ha	0.0 %				
	Grassland	0 ha	0.0 %				
	Swamp	0 ha	0.0 %				
	Unspecified area	0 ha	0.0 %				
4) Paddy Field in FUSA (ha)	1,169						
5) Paddy Cropped Area (ha)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*	
Wet Season	1,012	1,012	1,012	1,012	1,012	1,012	
Dry Season	1,012	1,012	1,012	1,012	1,012	1,012	
6) Cropping Intensity (%)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*	
(per year)	173	173	173	173	173	173	
7) Unit Yield of Paddy (ton/ha)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*	
Wet Season	2.25	4.50	4.90	4.75	4.75	4.23	
Dry Season	4.45	2.75	3.30	4.65	4.75	3.98	
8) Paddy Production (ton)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*	
Wet Season	2,277	4,554	4,959	4,807	4,807	4,281	
Dry Season	4,503	2,783	3,340	4,706	4,807	4,028	

3.4 Water Resources

Item	*Description*
1) Name of Rivers	Pangiplan River
2) Catchment Area at Dam	80.3 km^2
3) Ave. River Discharge	1.78 m^3/s
4) Ave. Dry Season Discharge	1.78 m^3/s
5) Diverted Intake Discharge	1.42 m^3/s
6) Water Requirement	2.10 m^3/s
7) Sedimentation	Minimal

3.5 Existing Irrigation System

Item	*Description*
1) Diversion Dam	Overflow crest width 80 m, Dam height 3.00 m
2) Main Canal	Total length 4.502 km (Lined portion none)
3) Lateral Canals	Total length 23.729 km (Lined portion 8.00 km)
4) On-farm facilities	Total length 38.00 km (Lined portion no data km) Turn-outs = 105 units
5) Drainage Canal	Total length 17.60 kms.
6) Canal Structures	No. = 99 units For new construction = 6 units
7) Drainage Structures	No. = 52 units
8) Farm roads	Total length 28.00 km (pavement= none kms.)
9) Flood Protection Dike	Total length 100.00 m For new construction = 80.00 m

3.6 Institutions for O&M of NIS

Item	*Description*					
1) Regional Irrigation Office	Name: Region 6 – Western Visayas					
2) IMO	Name: Negros Occidental IMO					
Staff in 2009	Total number of staff: 51					
3) Irrigator' Association (IA)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Number of FIA (nos)					1	
Number of IA (nos)					6	
Number of TSAG (nos)	0	0	0	19	50	-
Functionality of IA	0	0	0	0	0	-
Collection of ISF (wet, %)	0	0	0	0	0	-
Collection of ISF (dry, %)	0	0	0	0	0	-
4) NIS Category based on IA 2008 O&M Contract (NIA-IA)	No. of IA					
Category A	5					
Category B	1					
Category C	0					

3.7 Existing Problems

Item	*Description*
1) Diversion Works	1.The river banks upstream of the dam are slowly widening due to bank erosion during floods. 2. The lifting mechanisms of the sluice ways are still manually-operated. 3. The sluice way gates are already dilapidated. 4. Dam ogee is damaged.
2) Canal and Structures	1. Some structures have dilapidated steel gates. 2. Many structures have only wooden flush boards. 3. Some canal sections are prone to bank erosion and percolation.
3) Drainage Canal	1. Lack of drainage canals in some areas.
4) Other Project Facilities (road, bridge, flood dike, building, etc)	1. Some farm-to-market road sections are heavily damaged during rainy days.
5) Water Management and O&M Activities	1. Illegal checking in some places. 2. Lack of control in water intake in some turn-outs result in over supply in some areas in the upstream reaches of the canals but lack of supply in the downstream farms.
6) Status of NIS and IA Management	Status Type Ba evaluated by Radar Graph Specific problems are: 1. Low ISF collection efficiency during wet and dry seasons at 31% and 60%, respectively 2. Medium membership ratio at 86%
7) Watershed Management	Watershed significantly denuded
8) Coordination with LGU and Agencies concerned	1. Poor coordination by NIA's field offices and IAs with concerned municipal LGUs on specific problem such as watershed management
5) Agriculture	1. Poor condition of farm to market roads. 2. Inadequate number of post harvest facilities particularly dryer. 3. Insufficient technical support on credit and marketing services.

4. Proposed Rehabilitation Plan

4.1 Agricultural Development Plan

Item	*Description*			
Cropping schedule	*Wet Season*	*Dry Season-1*	*Dry Season-2*	*Annual*
1) Type of Crops	Paddy	Paddy		
2) Cropping Area (ha)	1,169	1,020		
3) Target Unit Yield (ton/ha)	4.90	4.75		
3) Total Production (ton)	5,728	4,845		

4.2 Civil Works

Item	*Description*
1) Diversion Works	1. Construction of bank protection works in the river upstream of the dam 2. Conversion of the lifting mechanism of the dam sluice ways from manual to mechanized. 3. Replacement of the old steel gates with new ones. 4. Repair of dam ogee.
2) Canal Structures	1. Repair/rehabilitation of old dilapidated steel gates - 33 units 2. Installation of new steel gates to replace wooden flush boards – 6 units
3) Canalization	1. Concrete lining of selected existing canal sections -9 kms 2. Re-shaping and de-silting of some canal sections – 5 kms 3. Realignment of canals 4. Construction of new canals
4) Drainage Structures	1. Repair of drainage structures – 7 units
5) Drainage Canalization	1. Repair of existing drainage canals and construction of new ones – 13.8 kms
6) Service Roads	1. Regravelling of selected road sections – 15 kms 2. Construction of side drainage canals – 15 kms 3. Construction of road drainage structures -10 units
7) On-Farm Facilities	1. Repair /replacement of dilapidated turn out steel gates 2.Construction of new turn outs and farm ditches
8) IMT Support Facilities	1. Construction of post-harvest facilities—warehouses, IA buildings, solar driers with shed – 1 set
9) IMT GIS Database	1. Development and establishment of GIS database

4.3 Institutional Strengthening Program

Item	*Description*
1) Reactivation Program of FIAs/IAs and System Management Committee (ISMC)	1. Executing body : Project Management Office with assistance of Consultant 2. Schedule:34 months / NIS 3. Counter body for execution: NIA Regional Office and IMO office 4. Attendant / Trainee: President of FIAs/IAs and secretary group, staff of NIA RIO/IMO, Chairmen of ISMC and Secretary group and LGUs officers, 5. Contents: a) Survey & Study by Consultant b) Workshops on coordination activities with and dissemination on reformation plan to FIAs/IAs Workshop on coordination activities with LGUs c) Organization and Legal Registration of FIAs/IAs to be re-active and reactivation of SMC d) Construction of IMT support facilities for FIAs/CIA e) Workshop and Training of FIAs/IAs members on management under the IMT f) Assessment/Evaluation for and Negotiation of Contracting under IMT g) Assistance of reactivated IAs/FIAs in organizational and management activities

Item	*Description*
2) Strengthening Program of NIA - IA - LGU Partnership	1. Executing body : Project Management Office with assistance of Consultant, & Management System Committee (MSC) of NIS 2. Schedule: 7 months / NIS 3. Counter body for execution: Regional Development Council with Secretary of NEDA Regional Office 4. Attendant / Trainee: Secretaries of Regional Organizations, LGUs officers, President of FIAs/IAs and secretary group, staff of NIA RIO/IMO, Chairmen of ISMC and Secretary group 5. Contents: a) Workshop on Trouble Shooting of NIS and FIAs/ISs' Management b) Provision of work space for ISMC including office facilities
3) NIA Institutional Strengthening Program	1. Executing body : Institutional Development Division of CO, NIA 2. Schedule: 7 months / NIS 3. Counter body for execution: NIA Regional Office and IMO office 4. Attendant / Trainee: NIA personnel at CO, RIO and IMO 5. Contents: a) Capability built-up program (Central and Regional NIA Offices) b) Improvement program on management mechanism of NIA c) Support program for IMT implementation d) Strengthening program of Integrated Management information System
4) Specific Program on watershed management plan	1. Strengthening coordination with RDC, RAFC/PAFC and LGUs concerned through works shop on dissemination of the SLRIF to these organizations. 2. Strengthening coordination with RDC, RAFC/PAFC and LGUs on training program of watershed management

4.4 Proposed Counter Schemes

Item	*Description*
1) DENR	1. Technical assistance to concerned Provincial/municipal LGUs on watershed rehabilitation and management such as establishment of nurseries and community-based livelihood for upland dwellers
2) LGU	1. Provincial LGUs intend to enhance co-mentoring of municipal and barangay LGUs to improve their skills in project preparation and sourcing of development fund 2. Executing agency defines clearly the roles and responsibilities of the LGUs by including the latter as member of project steering committee 3. LGU provides initial paddy seed for mass production 4. LGU expands information campaign through local media to create awareness among planning officers to give support to rehabilitation of NISs

5. Cost Estimate for Initial Investment

Item	*Description*		
1) Direct Cost for Civil Works	A. Mobilization	Php	1.61 Million
	B. Protection Dikes		-
	C. Diversion Works	Php	3.14 Million
	D. Canal Structures	Php	3.01 Million
	E. Canalization	Php	40.11 Million
	F. Drainage Structures	Php	2.34 Million
	G. Drainage Canalization	Php	3.51 Million
	H. Roads	Php	3.51 Million
	I. On-Farm Facilities/T.O. Gates	Php	1.31 Million
	J. IMT Support Facilities	Php	15.00 Million
	K. IMT GIS Database	Php	1.17 Million
	L. Institutional Development (5% of Direct Cost)	Php	4.40 Million
	M. Feasibility Studies & Detailed Engineering (2% of Direct Cost)	Php	1.61 Million
	Sub-total (Direct Cost)	Php	80.72 Million
2) Indirect Cost	A. General Engineering Supervision and Administration (3.5% of Direct Cost)	Php	2.83 Million
	B. NIA Management Fee (5% of Total Project Cost)	Php	4.40 Million
	Sub-total (Indirect Cost)	Php	7.22 Million
3) Total Project Cost	= 1+2	Php	87.95 Million
Cost per ha.		Php	75,231.00 /ha.

6. Implementation Plan

Item	*Description*
1) Contract package	1 - Local Competitive Bidding (LCB)
2) Implementation Schedule	
a) Civil Works	
1) Survey, F/S, Design	21 months
2) Tendering	6 months
3) Construction	36 months
b) Institutional Improvement Works	
1) Reactivation Program of FIAs/IAs and Irrigation System Management Committee	34 months
2) NIA-IA-LGU Partnership	7 months
3) Strengthening of NIA staff	7 months

7. Project Evaluation

Item		*Description*	
1) Economic evaluation			
EIRR (Base)		EIRR = 21.1 %	: Project life 50 years
Sensitivity	Case-1	EIRR = 19.2 %	: Cost 10% up
	Case-2	EIRR = 19.0 %	: Benefit 10% down
	Case-3	EIRR = 17.3%	: Cost 10% up + Benefit 10% down
B/C		1.42	: discount rate 15% p.a.
NPV		PHP 21 million	: discount rate 15% p.a.
2) Financial evaluation		Farmer's net income increase = PHP 11,850/ ha/year	
3) Expected Impacts		1. Increased farmers' income 2. Increased rice self sufficiency of the country 3. Increased job opportunities in rural areas	

8. Environmental Aspects

Item	*Description*
1) Environmental aspect	Need to address bank erosion problem of river upstream of the dam
2) Relocation of houses	none
3) Land acquisition	none

Table 0604 - Pangiplan Economic Evaluation (EIRR)

Basic Case

Name of NIS 0604 - Pangiplan **Region : 6 IMO RIO Negros Occidental**

EIRR : 21.1%	Net Present Value (Million PHP)	*Benefit*	*Cost*	B/C Ratio	NPV
	(15 % discount rate)	72	51	1.42	21

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011			0.38		0.38		0.96	0.96	0.58
2	2012			0.38		0.38		1.92	1.92	1.54
3	2013	20.45	0.71	0.38		21.54		2.88	2.88	-18.66
4	2014	27.27	0.95	0.38	0.71	29.31	1.53	3.84	5.37	-23.94
5	2015	20.45	0.71	0.38	1.66	23.20	3.77	4.80	8.57	-14.63
6	2016				2.37	2.37	5.75	5.76	11.51	9.14
7	2017				2.37	2.37	6.20	6.72	12.92	10.55
8	2018				2.37	2.37	6.39	7.68	14.07	11.70
9	2019				2.37	2.37	6.39	8.64	15.03	12.66
10	2020				2.37	2.37	6.39	9.60	15.99	13.62
11	2021				2.37	2.37	6.39	10.56	16.95	14.58
12	2022				2.37	2.37	6.39	11.52	17.91	15.54
13	2023				2.37	2.37	6.39	12.48	18.87	16.50
14	2024				2.37	2.37	6.39	13.44	19.83	17.46
15	2025				2.37	2.37	6.39	14.40	20.79	18.42
16	2026				2.37	2.37	6.39	15.36	21.75	19.38
17	2027				2.37	2.37	6.39	16.32	22.71	20.34
18	2028				2.37	2.37	6.39	17.28	23.67	21.30
19	2029				2.37	2.37	6.39	18.24	24.63	22.26
20	2030				2.37	2.37	6.39	19.20	25.59	23.22
21	2031				2.37	2.37	6.39	20.16	26.55	24.18
22	2032				2.37	2.37	6.39	21.12	27.51	25.14
23	2033				2.37	2.37	6.39	22.08	28.47	26.10
24	2034				2.37	2.37	6.39	23.04	29.43	27.06
25	2035				2.37	2.37	6.39	24.00	30.39	28.02
26	2036				2.37	2.37	6.39	24.96	31.35	28.98
27	2037				2.37	2.37	6.39	25.92	32.31	29.94
28	2038				2.37	2.37	6.39	26.88	33.27	30.90
29	2039				2.37	2.37	6.39	27.84	34.23	31.86
30	2040				2.37	2.37	6.39	28.80	35.19	32.82
31	2041				2.37	2.37	6.39	29.76	36.15	33.78
32	2042				2.37	2.37	6.39	30.72	37.11	34.74
33	2043				2.37	2.37	6.39	31.68	38.07	35.70
34	2044				2.37	2.37	6.39	32.64	39.03	36.66
35	2045				2.37	2.37	6.39	33.60	39.99	37.62
36	2046				2.37	2.37	6.39	34.56	40.95	38.58
37	2047				2.37	2.37	6.39	35.52	41.91	39.54
38	2048				2.37	2.37	6.39	36.48	42.87	40.50
39	2049				2.37	2.37	6.39	37.44	43.83	41.46
40	2050				2.37	2.37	6.39	38.40	44.79	42.42
41	2051				2.37	2.37	6.39	39.36	45.75	43.38
42	2052				2.37	2.37	6.39	40.32	46.71	44.34
43	2053				2.37	2.37	6.39	41.28	47.67	45.30
44	2054				2.37	2.37	6.39	42.24	48.63	46.26
45	2055				2.37	2.37	6.39	43.20	49.59	47.22
46	2056				2.37	2.37	6.39	44.16	50.55	48.18
47	2057				2.37	2.37	6.39	45.12	51.51	49.14
48	2058				2.37	2.37	6.39	46.08	52.47	50.10
49	2059				2.37	2.37	6.39	47.04	53.43	51.06
50	2060				2.37	2.37	6.39	48.00	54.39	52.02

Case-1 (Cost 10% up)

Name of NIS 0604 - Pangiplan **Region : 6 IMO RIO Negros Occidental**

EIRR : 19.2%	Net Present Value (Million PHP)	*Benefit*	*Cost*	B/C Ratio	NPV
	(15 % discount rate)	72	56	1.29	16

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	0.41	-	0.41	-	0.96	0.96	0.55
2	2012	-	-	0.41	-	0.41	-	1.92	1.92	1.51
3	2013	22.50	0.79	0.41	-	23.70	-	2.88	2.88	-20.82
4	2014	30.00	1.05	0.41	0.78	32.24	1.53	3.84	5.37	-26.87
5	2015	22.50	0.79	0.41	1.82	25.52	3.77	4.80	8.57	-16.95
6	2016	-	-	-	2.61	2.61	5.75	5.76	11.51	8.90
7	2017	-	-	-	2.61	2.61	6.20	6.72	12.92	10.31
8	2018	-	-	-	2.61	2.61	6.39	7.68	14.07	11.46
9	2019	-	-	-	2.61	2.61	6.39	8.64	15.03	12.42
10	2020	-	-	-	2.61	2.61	6.39	9.60	15.99	13.38
11	2021	-	-	-	2.61	2.61	6.39	10.56	16.95	14.34
12	2022	-	-	-	2.61	2.61	6.39	11.52	17.91	15.30
13	2023	-	-	-	2.61	2.61	6.39	12.48	18.87	16.26
14	2024	-	-	-	2.61	2.61	6.39	13.44	19.83	17.22
15	2025	-	-	-	2.61	2.61	6.39	14.40	20.79	18.18
16	2026	-	-	-	2.61	2.61	6.39	15.36	21.75	19.14
17	2027	-	-	-	2.61	2.61	6.39	16.32	22.71	20.10
18	2028	-	-	-	2.61	2.61	6.39	17.28	23.67	21.06
19	2029	-	-	-	2.61	2.61	6.39	18.24	24.63	22.02
20	2030	-	-	-	2.61	2.61	6.39	19.20	25.59	22.98
21	2031	-	-	-	2.61	2.61	6.39	20.16	26.55	23.94
22	2032	-	-	-	2.61	2.61	6.39	21.12	27.51	24.90
23	2033	-	-	-	2.61	2.61	6.39	22.08	28.47	25.86
24	2034	-	-	-	2.61	2.61	6.39	23.04	29.43	26.82
25	2035	-	-	-	2.61	2.61	6.39	24.00	30.39	27.78
26	2036	-	-	-	2.61	2.61	6.39	24.96	31.35	28.74
27	2037	-	-	-	2.61	2.61	6.39	25.92	32.31	29.70
28	2038	-	-	-	2.61	2.61	6.39	26.88	33.27	30.66
29	2039	-	-	-	2.61	2.61	6.39	27.84	34.23	31.62
30	2040	-	-	-	2.61	2.61	6.39	28.80	35.19	32.58
31	2041	-	-	-	2.61	2.61	6.39	29.76	36.15	33.54
32	2042	-	-	-	2.61	2.61	6.39	30.72	37.11	34.50
33	2043	-	-	-	2.61	2.61	6.39	31.68	38.07	35.46
34	2044	-	-	-	2.61	2.61	6.39	32.64	39.03	36.42
35	2045	-	-	-	2.61	2.61	6.39	33.60	39.99	37.38
36	2046	-	-	-	2.61	2.61	6.39	34.56	40.95	38.34
37	2047	-	-	-	2.61	2.61	6.39	35.52	41.91	39.30
38	2048	-	-	-	2.61	2.61	6.39	36.48	42.87	40.26
39	2049	-	-	-	2.61	2.61	6.39	37.44	43.83	41.22
40	2050	-	-	-	2.61	2.61	6.39	38.40	44.79	42.18
41	2051	-	-	-	2.61	2.61	6.39	39.36	45.75	43.14
42	2052	-	-	-	2.61	2.61	6.39	40.32	46.71	44.10
43	2053	-	-	-	2.61	2.61	6.39	41.28	47.67	45.06
44	2054	-	-	-	2.61	2.61	6.39	42.24	48.63	46.02
45	2055	-	-	-	2.61	2.61	6.39	43.20	49.59	46.98
46	2056	-	-	-	2.61	2.61	6.39	44.16	50.55	47.94
47	2057	-	-	-	2.61	2.61	6.39	45.12	51.51	48.90
48	2058	-	-	-	2.61	2.61	6.39	46.08	52.47	49.86
49	2059	-	-	-	2.61	2.61	6.39	47.04	53.43	50.82
50	2060	-	-	-	2.61	2.61	6.39	48.00	54.39	51.78

Table 0604 - Pangiplan Economic Evaluation (EIRR)

Case-2 (Benefit 10% down)

Name of NIS 0604 - Pangiplan | Region 6 | IMO RIO Negros Occidental

EIRR : 19.0%	Net Present Value (Million PHP)	Benefit	Cost	B/C Ratio	NPV
	(15 % discount rate)	65	51	1.28	14

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	0.38	-	0.38	-	0.86	0.86	0.49
2	2012	-	-	0.38	-	0.38	-	1.73	1.73	1.35
3	2013	20.45	0.71	0.38	-	21.54	-	2.59	2.59	-18.95
4	2014	27.27	0.95	0.38	0.71	29.31	1.38	3.46	4.84	-24.47
5	2015	20.45	0.71	0.38	1.66	23.20	3.39	4.32	7.71	-15.49
6	2016	-	-	-	2.37	2.37	5.18	5.18	10.36	7.99
7	2017	-	-	-	2.37	2.37	5.58	6.05	11.63	9.26
8	2018	-	-	-	2.37	2.37	5.75	6.91	12.66	10.29
9	2019	-	-	-	2.37	2.37	5.75	7.78	13.53	11.16
10	2020	-	-	-	2.37	2.37	5.75	8.64	14.39	12.02
11	2021	-	-	-	2.37	2.37	5.75	9.50	15.26	12.89
12	2022	-	-	-	2.37	2.37	5.75	10.37	16.12	13.75
13	2023	-	-	-	2.37	2.37	5.75	11.23	16.98	14.61
14	2024	-	-	-	2.37	2.37	5.75	12.10	17.85	15.48
15	2025	-	-	-	2.37	2.37	5.75	12.96	18.71	16.34
16	2026	-	-	-	2.37	2.37	5.75	13.82	19.58	17.21
17	2027	-	-	-	2.37	2.37	5.75	14.69	20.44	18.07
18	2028	-	-	-	2.37	2.37	5.75	15.55	21.30	18.93
19	2029	-	-	-	2.37	2.37	5.75	16.42	22.17	19.80
20	2030	-	-	-	2.37	2.37	5.75	17.28	23.03	20.66
21	2031	-	-	-	2.37	2.37	5.75	18.14	23.90	21.53
22	2032	-	-	-	2.37	2.37	5.75	19.01	24.76	22.39
23	2033	-	-	-	2.37	2.37	5.75	19.87	25.62	23.25
24	2034	-	-	-	2.37	2.37	5.75	20.74	26.49	24.12
25	2035	-	-	-	2.37	2.37	5.75	21.60	27.35	24.98
26	2036	-	-	-	2.37	2.37	5.75	22.46	28.22	25.85
27	2037	-	-	-	2.37	2.37	5.75	23.33	29.08	26.71
28	2038	-	-	-	2.37	2.37	5.75	24.19	29.94	27.57
29	2039	-	-	-	2.37	2.37	5.75	25.06	30.81	28.44
30	2040	-	-	-	2.37	2.37	5.75	25.92	31.67	29.30
31	2041	-	-	-	2.37	2.37	5.75	26.78	32.54	30.17
32	2042	-	-	-	2.37	2.37	5.75	27.65	33.40	31.03
33	2043	-	-	-	2.37	2.37	5.75	28.51	34.26	31.89
34	2044	-	-	-	2.37	2.37	5.75	29.38	35.13	32.76
35	2045	-	-	-	2.37	2.37	5.75	30.24	35.99	33.62
36	2046	-	-	-	2.37	2.37	5.75	31.10	36.86	34.49
37	2047	-	-	-	2.37	2.37	5.75	31.97	37.72	35.35
38	2048	-	-	-	2.37	2.37	5.75	32.83	38.58	36.21
39	2049	-	-	-	2.37	2.37	5.75	33.70	39.45	37.08
40	2050	-	-	-	2.37	2.37	5.75	34.56	40.31	37.94
41	2051	-	-	-	2.37	2.37	5.75	35.42	41.18	38.81
42	2052	-	-	-	2.37	2.37	5.75	36.29	42.04	39.67
43	2053	-	-	-	2.37	2.37	5.75	37.15	42.90	40.53
44	2054	-	-	-	2.37	2.37	5.75	38.02	43.77	41.40
45	2055	-	-	-	2.37	2.37	5.75	38.88	44.63	42.26
46	2056	-	-	-	2.37	2.37	5.75	39.74	45.50	43.13
47	2057	-	-	-	2.37	2.37	5.75	40.61	46.36	43.99
48	2058	-	-	-	2.37	2.37	5.75	41.47	47.22	44.85
49	2059	-	-	-	2.37	2.37	5.75	42.34	48.09	45.72
50	2060	-	-	-	2.37	2.37	5.75	43.20	48.95	46.58

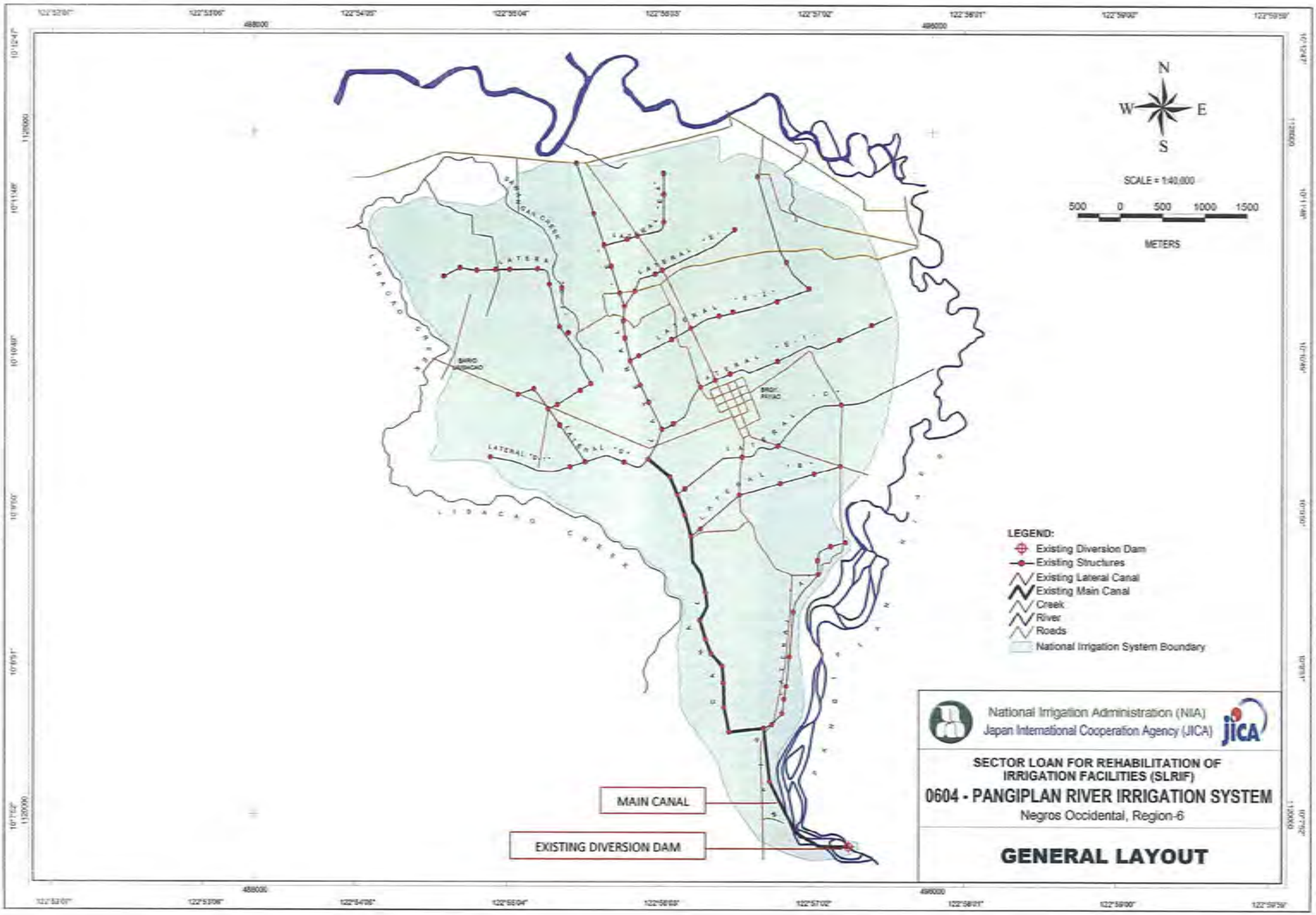
Case-3 (Cost 10% up and Benefit 10% down)

Name of NIS 0604 - Pangiplan | Region 6 | IMO RIO Negros Occidental

EIRR : 17.3%	Net Present Value (Million PHP)	Benefit	Cost	B/C Ratio	NPV
	(15 % discount rate)	65	56	1.16	9

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	0.41	-	0.41	-	0.86	0.86	0.45
2	2012	-	-	0.41	-	0.41	-	1.73	1.73	1.31
3	2013	22.50	0.79	0.41	-	23.70	-	2.59	2.59	-21.11
4	2014	30.00	1.05	0.41	0.78	32.24	1.38	3.46	4.84	-27.41
5	2015	22.50	0.79	0.41	1.82	25.52	3.39	4.32	7.71	-17.81
6	2016	-	-	-	2.61	2.61	5.18	5.18	10.36	7.75
7	2017	-	-	-	2.61	2.61	5.58	6.05	11.63	9.02
8	2018	-	-	-	2.61	2.61	5.75	6.91	12.66	10.06
9	2019	-	-	-	2.61	2.61	5.75	7.78	13.53	10.92
10	2020	-	-	-	2.61	2.61	5.75	8.64	14.39	11.78
11	2021	-	-	-	2.61	2.61	5.75	9.50	15.26	12.65
12	2022	-	-	-	2.61	2.61	5.75	10.37	16.12	13.51
13	2023	-	-	-	2.61	2.61	5.75	11.23	16.98	14.38
14	2024	-	-	-	2.61	2.61	5.75	12.10	17.85	15.24
15	2025	-	-	-	2.61	2.61	5.75	12.96	18.71	16.10
16	2026	-	-	-	2.61	2.61	5.75	13.82	19.58	16.97
17	2027	-	-	-	2.61	2.61	5.75	14.69	20.44	17.83
18	2028	-	-	-	2.61	2.61	5.75	15.55	21.30	18.70
19	2029	-	-	-	2.61	2.61	5.75	16.42	22.17	19.56
20	2030	-	-	-	2.61	2.61	5.75	17.28	23.03	20.42
21	2031	-	-	-	2.61	2.61	5.75	18.14	23.90	21.29
22	2032	-	-	-	2.61	2.61	5.75	19.01	24.76	22.15
23	2033	-	-	-	2.61	2.61	5.75	19.87	25.62	23.02
24	2034	-	-	-	2.61	2.61	5.75	20.74	26.49	23.88
25	2035	-	-	-	2.61	2.61	5.75	21.60	27.35	24.74
26	2036	-	-	-	2.61	2.61	5.75	22.46	28.22	25.61
27	2037	-	-	-	2.61	2.61	5.75	23.33	29.08	26.47
28	2038	-	-	-	2.61	2.61	5.75	24.19	29.94	27.34
29	2039	-	-	-	2.61	2.61	5.75	25.06	30.81	28.20
30	2040	-	-	-	2.61	2.61	5.75	25.92	31.67	29.06
31	2041	-	-	-	2.61	2.61	5.75	26.78	32.54	29.93
32	2042	-	-	-	2.61	2.61	5.75	27.65	33.40	30.79
33	2043	-	-	-	2.61	2.61	5.75	28.51	34.26	31.66
34	2044	-	-	-	2.61	2.61	5.75	29.38	35.13	32.52
35	2045	-	-	-	2.61	2.61	5.75	30.24	35.99	33.38
36	2046	-	-	-	2.61	2.61	5.75	31.10	36.86	34.25
37	2047	-	-	-	2.61	2.61	5.75	31.97	37.72	35.11
38	2048	-	-	-	2.61	2.61	5.75	32.83	38.58	35.98
39	2049	-	-	-	2.61	2.61	5.75	33.70	39.45	36.84
40	2050	-	-	-	2.61	2.61	5.75	34.56	40.31	37.70
41	2051	-	-	-	2.61	2.61	5.75	35.42	41.18	38.57
42	2052	-	-	-	2.61	2.61	5.75	36.29	42.04	39.43
43	2053	-	-	-	2.61	2.61	5.75	37.15	42.90	40.30
44	2054	-	-	-	2.61	2.61	5.75	38.02	43.77	41.16
45	2055	-	-	-	2.61	2.61	5.75	38.88	44.63	42.02
46	2056	-	-	-	2.61	2.61	5.75	39.74	45.50	42.89
47	2057	-	-	-	2.61	2.61	5.75	40.61	46.36	43.75
48	2058	-	-	-	2.61	2.61	5.75	41.47	47.22	44.62
49	2059	-	-	-	2.61	2.61	5.75	42.34	48.09	45.48
50	2060	-	-	-	2.61	2.61	5.75	43.20	48.95	46.34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METERS
LEGEND:
Existing Diversion Dam
Existing Structures
Existing Lateral Canal
Existing Main Canal
Creek
River
Roads
National Irrigation System Boundary
MAIN CANAL
EXISTING DIVERSION DAM
National Irrigation Administration (NIA)
Japan International Cooperation Agency (JICA)
JICA
SECTOR LOAN FOR REHABILITATION OF IRRIGATION FACILITIES (SLRIIF)
0604 - PANGIPLAN RIVER IRRIGATION SYSTEM
Negros Occidental, Region-6
GENERAL LAYOUT

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities
Photograph of Irrigation Facilities

NIS name: Pangiplan (Region 6)

Location / Facility	*Photograph*	*Comments*
01. Diversion dam. View taken from the left bank facing downstream. Longitude: 10° 08' 12"E Latitude: 122° 56" 54"N		Ogee needs re-surfacing.
02. River upstream of diversion dam. Longitude: 10° 08' 12"E Latitude: 122° 56" 54"N		Banks need rubble masonry to prevent further erosion.
03. Diversion dam. Sluice gate tower. Longitude: 10° 08' 12"E Latitude: 122° 56" 54"N		Sluice gates need to be replaced, lifting mechanism needs to be converted from manual to mechanized.

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities
Photograph of Irrigation Facilities

NIS name: Pangiplan (Region 6)

Location / Facility	*Photograph*	*Comments*
04. Road crossing. Lateral C Station 1+281 Longitude: 10° 10' 24"E Latitude: 122° 56' 52"N		New steel gates needed.
05. Lateral C Station 1+260 Longitude: 10° 10' 24"E Latitude: 122° 56' 52"N		Canal needs concrete lining.
06. Lateral C Station 1+100 Longitude: 10° 10' 23"E Latitude: 122° 56' 47"N		Concrete lining partially completed due to lack of funds. Additional lining needed.

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities
Photograph of Irrigation Facilities

NIS name: Pangiplan (Region 6)

Location / Facility	*Photograph*	*Comments*
07. Lateral E-3 Station 1+406 Drainage Structure Longitude: 10° 11' 42"E Latitude: 122° 56' 30"N		Canal and structure needs major repair.
08. Main Canal Station 0+853 Headgate Lateral A Longitude: 10° 08' 37"E Latitude: 122° 56' 47"N		New steel gates needed.
09. Main Canal Station 1+960 Longitude: 10° 09' 09"E Latitude: 122° 56' 42"N		Illegal turnout at the check and drop structure.

THE REPUBLIC OF PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION

Sector Loan on Rehabilitation of Irrigation Facilities

NIS SUMMARY REPORT

1001
Manupali RIS
Region 10
Bukidnon Province

July 2009

Survey Team for
Japan International Cooperation Agency
(JICA)

Features of NIS for Rehabilitation Project

1. General

Item	*Description*		
1) Name of NIS	**Manupali RIS**		Code: 1001
2) Location	Region	Region 10	
	Province	Bukidnon	
	Municipality	Lantapan, Malaybalay City, Valencia City	
	Distance	70 km from Malaybalay City	
3) Type of Water Source	Water Source	Manupali River	
	Type	Diversion Dam (5.5 high, 50m wide, ogee-crested weir) overflow type	
4) Area	Service Area	4,395 ha	
	FUSA	1,800 ha	
5) Beneficiary Farmers	1,187 farmers	Average paddy field cultivating size = 1.52 ha per farmer	
6) Irrigator's Association	IAs established = 8 FIA established = 1 in 2008		
7) Features of NIS and Necessity of the project	Manupali NIS was operated on 1987, all canals are concrete lined. Since the start of the operation, there are no major rehabilitation works introduced to the system. Despite of the all concrete lined canal, still it cannot close to irrigate the 4,395 hectares due to following reasons: a) Irrigable areas which are part of the service are not generated with irrigation facilities, b) Almost half of the irrigable areas need land development or leveling due to undulating terrain of the topography of the area c) Water supply shortage due remarkable watershed denudation d) Farmers divert crop cultivation from rice to other crops Before, some farmers diverted its cultivation from rice to corn, sugar cane, and banana due to high market compared to rice. At present, there are promising increase in rice cultivation in the area due to increase in price of rice palay at farm level. Further, based on interaction with farmers and inhabitants, they are willing to cultivate rice again if there is sustainable water supply. NIA office proposed the construction of two (2) small diversion works to augment the irrigation water supply requirement, and the utilization of drainage water for "RE-USE". The rehabilitation project is necessary for restoring the 1,700 hectares to boost rice production in the region and also increase potential production of banana, corn, and sugar cane. As to environmental aspect, involvement of the IA, BLGU, and MLGU is not strong on the protection of irrigation and drainage facilities and conservation of watersheds. This project shall strategize collaboration with the beneficiaries and local governments to promote environment awareness and build strong policy for smooth implementation.		
8) Outline of the Proposed Project	A. Engineering 1. Repair of diversion dam 2. Repair and improvement of irrigation canal and structures 3. Repair and improvement of drainage canal and structures 4. Repair and improvement of service roads 5. Repair and improvement of on-farm facilities		

	6. Repair and construction of IMT support facilities-IA Bldg solar drier, warehouse with IA building 7. Development and establishment of IMT GIS database B. Institutional Strengthening Program B. 1 Basic Program 1. Reactivation of FIA/IA and Strengthening of Irrigation System Management Committee (ISMC) of NIS including construction of IMT support facilities 2. Strengthening of NIA – IA – LGUs Partnership 3. Strengthening NIA Institutional Capacity B.2 Specific Program to strengthen institutional mechanism together with LGUs 1. Improvement of watershed management
9) Proposed Project Component	A. Engineering 1. Construction of civil works for rehabilitation of diversion works, canal system, drainage system, roads, and IMT support facilities. B. Institutional Strengthening Program 1. Reactivation of FIAs/IAs including reformation of TSGA / IA / FIA areas, construction of IMT support facilities (demand base) 2. Strengthening NIA-IA- LGUs Partnership, especially coordination RDC, RAFC/PAFC with FIAs/IAs and ISMC 3. Institutional development program to strengthen management capacity of NIA field offices and IAs.
10) Project Cost (Direct cost only, excluding escalation, contingency, tax)	1. Direct cost — PHP 116.40 Million - *Civil Works* — *PHP 107.58 Million* - *Institutional Development* — *PHP 6.50 Million* - *Engineering Services* — *PHP 2.33 Million* 2. Indirect cost — PHP 10.42 Million Total Project Cost (1+2) — PHP 126.82 Million Cost per ha — PHP 70,455.00 per ha.
11) Project Benefit	1. To increase paddy production by 1,698 tons/year 2. To increase farmers' net income to PHP55,448.00 /ha/year 3. To establish functional and self-reliant IAs 4. To improve performance of NIS
12) Project Justification	EIRR = 20.6 %, B/C = 1.38 (discount rate 15%)

2. **Project History** (Construction/Rehabilitation)

Year	*Description*
2004	Canal desilting works and Drainage Improvement
2007	Minor Repair and Rehabilitation Works
2008	Construction of Matin-ao Water Turbine Pump Project as augmentation of irrigable area

3. Present Condition

3.1 Natural Conditions

Item	*Description*
1) Annual Rainfall	1,912.30 mm
2) Seasons	Wet season: from May to October , Dry season: from November to April
3) Dominant Soil in NIS Area	Clay loam
4) Topography	Undulating with slope ranging from 5% to 8% in Northern part and relatively flat at the Southern area

3.2 Socio-economy (Region/Province)

Item	
1) GRDP	PHP 310,186 million (Year 2007), Per Capita GRDP = PHP 75,883 per year
2) Population	1,190,284 (province)
3) Population Growth Rate	1.61 % per year (province)
4) Labor Force	2,622 ,000 (region)
5) Poverty Population	37.2 % to total population (province)

3.3 Present Agriculture in NIS

Item	*Description*					
1) Farm Household in NIS	Total beneficiaries	594 households				
	Land owners	246 households (41.4 %)				
	Tenant farmers	348 households (58.6 %)				
2) Paddy Field Size in NIS	3.03 ha per household (FUSA/Total beneficiaries as of 2008)					
3) Present Land Use in NIS	Paddy field planted	1,573 ha	35.8 %	As of 2008		
	Paddy field not planted	227 ha	5.2 %	As of 2008		
	Upland crop field	0 ha	0.0 %			
	Permanent crop field	0 ha	0.0 %			
	Undeveloped area	0 ha	0.0 %			
	Built-up area	0 ha	0.0 %			
	High ground	0 ha	0.0 %			
	Grassland	0 ha	0.0 %			
	Swamp	0 ha	0.0 %			
	Unspecified area	2,595 ha	59.0 %	No data in response		
4) Paddy Field in FUSA (ha)	1,800					
5) Paddy Cropped Area (ha)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Wet Season	1,115	1,287	1,543	1,621	1,537	1,421
Dry Season	1,381	1,356	1,607	1,649	1,573	1,513
6) Cropping Intensity (%)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
(per year)	139	147	175	182	173	163
7) Unit Yield of Paddy (ton/ha)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Wet Season	3.70	4.03	4.06	3.50	4.00	3.86
Dry Season	3.95	4.09	4.15	3.50	4.00	3.93
8) Paddy Production (ton)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Wet Season	4,126	5,181	6,261	5,674	6,148	5,478
Dry Season	5,455	5,550	6,666	5,772	6,292	5,947

3.4 Water Resources

Item	*Description*
1) Name of Rivers	Manupali River
2) Catchment Area at Dam	454.3 km^2
3) Ave. River Discharge	8.08 m^3/s
4) Ave. Dry Season Discharge	7.17 m^3/s
5) Diverted Intake Discharge	2.67 m^3/s
6) Water Requirement	3.24 m^3/s
7) Sedimentation	High

3.5 Existing Irrigation System

Item	*Description*
1) Diversion Dam	Overflow crest width 40.00 m, Dam height 5.50 m Dam width 50.00 m
2) Main Canal	Total length 26.792 km (Lined portion 26.79 km
3) Lateral Canals	Total length 55.98 km (Lined portion 55.98 km
4) On-farm facilities	Total length 60.00 km (Lined portion 85.17 km) Turn-outs = 90 units
5) Drainage Canal	Total length 23.00 kms.
6) Canal Structures	No. = 135 units (Damaged = 12 units)
7) Drainage Structures	No. = 30 units (Damaged = 18 units)
8) Farm roads	Total length 82.70 km
9) Flood Protection Dike	Total length 0.80 km
10) Water Master Quarters	No. = 3 units
11) Gate Keepers Quarters	No. = 1 unit

3.6 Institutions for O&M of NIS

Item	*Description*					
1) Regional Irrigation Office	Name: Region 10 – Northern Mindanao					
2) IMO	Name: Bukidnon IMO					
Staff in 2009	Total number of staff: 89					
3) Irrigator' Association (IA)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Number of FIA (nos)						
Number of IA (nos)	8	8	8	8	8	8
Number of TSAG (nos)	68	69	40	39	39	51
Functionality of IA	-	45.9	55.4	56.2	57.7	53.8
Collection of ISF (wet, %)	-	86	76	80	85	68
Collection of ISF (dry, %)	-	58	14	64	57	45
4) NIS Category based on IA 2008 O&M Contract (NIA-IA)	No. of IA					
Category A	5					
Category B	3					
Category C	0					

3.7 Existing Problems

Item	*Description*
1) Diversion Works	1. Rusted lifting mechanism of intake steel gates due to weather exposure 2. Slow control of lifting mechanism particularly during heavy rainfall and flood 3. Deteriorated rubber seal of sluiceway gates 4. Dilapidated gatekeepers quarter
2) Canal and Structures	1. Heavy siltation along north main canal due to erosion of hills caused by cultivation along hills and slopes of the mountain, 2. 500 meters embankment collapsed, 4. Encroachment of houses and building structures along canals 5. Scoured inlet and outlet transition protection works due to wallowing of carabao/water buffalo,

Item	*Description*
	6. Growing population and houses along canals needing footbridges and structure crossings 7. Uncontrolled gate operation during irrigation period which water overflows the canal and erode gravel surfacing and soil embankment s
3) Drainage Canal	1. Heavy silted drainage canals due to frequent cultivation along hills and side slope of the mountain 2. Lack of crossings along drainage canals 3. Drainage structure block by debris which causes to flood the area during heavy rainfall
4) Other Project Facilities (road, bridge, flood dike, building, etc)	1. Dilapidated water master quarter and gate keeper's quarter 2. Deteriorated canal service roads, access roads, and intrasite roads
5) Water Management and O&M Activities	1. Lack of staff gages at diversion dam, intake, headgates of lateral and turnout level 2. No water management instruments like current meter, rain gages, and evaporation pan 3. Lack of technical basis or geodetic ground survey on the actual area for Land Classification (e.g. rice area, permanent crops, high ground, built-up area, swamp area, undeveloped area, etc) 4. Lack of maintenance equipments
6) Status of NIS and IA Management	Status Type F evaluated by Radar Graph (no matured status). Specific problems are: 1. Low cropping intensity during dry and wet seasons at 31% and 44%, respectively 2. Low ISF collection efficiency during dry and wet seasons at 45% and 68%, respectively
7) Watershed Management	1. Resolution was made by IA on watershed conservation but lack of support from the Local Government Unit
8) Coordination with LGU and Agencies concerned	1. Poor coordination by NIA's field offices and IAs with concerned LGUs on specific problem such as watershed management
9) Agriculture	1. Poor condition of the farm to market roads. 2. Lack of credit facilities. Most of the farmers get their loans from the private traders charging very high interest rates. 3. Insufficient post harvest facilities particularly dryer.

4. Proposed Rehabilitation Plan

4.1 Agricultural Development Plan

Item	*Description*			
Cropping schedule	*Wet Season*	*Dry Season-1*	*Dry Season-2*	*Annual*
1) Type of Crops	Paddy	Paddy	-	-
2) Cropping Area (ha)	1,800	1650	-	-
3) Target Unit Yield (ton/ha)	4.05	4.15	-	-
3) Total Production (ton)	7,290	6,848	-	-

4.2 Civil Works

Item	*Description*
1. Diversion Works	1. Construction of Canopy/Roofing for Intake Lifting Mechanism and fence, 2. Installation of engine to drive Lifting Mechanism of Intake Gate, 3. Replacement of Rubber Seal for Sluiceway Gates, 4. Minor rehabilitation of Gatekeepers Quarter
2. Canal Structures	1. Installation of Wasteway along the junction of South Main Canal and North Main Canal – 12 units 2. Overflowing the embankment at the inlet of siphon due to shrinkage of soil embankment 3. Construction of 99 foot bridges and 80 canal crossing structure
3. Canalization	1. Installation of Wasteway along the junction of South Main Canal and North Main Canal – 9 kms 2. overflowing the embankment at the inlet of siphon due to shrinkage of soil embankment 3. Realignment of canals 4. Construction of new canals
4. Drainage Structures	1. Construction of two (2) small check structure at Bagontaas Creek and Malingon Creek including supply canal – 18 units
5. Drainage Canalization	1. Excavation and desilting of 16 kilometers main canal and 38 kilometers lateral canal – 18 kms
6. Service Roads	1.Rehabilitation of 58km service roads, access roads and intrasite roads – 71 kms
7. On-Farm Facilities	1.Concrete lining of main farm ditch for an average length of 1kilometer per turnout.
8. IMT Support Facilities	1. Construction of post-harvest facilities—warehouses, IA buildings, solar driers with shed – 1 set
9. IMT GIS Database	1. Development and establishment of GIS database

4.3 Institutional Strengthening Program

Item	*Description*
1) Reactivation Program of FIAs/IAs and System Management Committee (ISMC)	1. Executing body : Project Management Office with assistance of Consultant 2. Schedule: 34 months / NIS 3. Counter body for execution: NIA Regional Office and IMO office 4. Attendant / Trainee: President of FIAs/IAs and secretary group, staff of NIA RIO/IMO, Chairmen of ISMC and Secretary group and LGUs officers, 5. Contents: a) Survey & Study by Consultant b) Workshops on coordination activities with and dissemination on reformation plan to FIAs/IAs c) Workshop on coordination activities with LGUs d) Organization and Legal Registration of FIAs/IAs to be re-active and reactivation of SMC e) Construction of IMT support facilities for FIAs/CIA f) Workshop and Training of FIAs/IAs members on management under the IMT g) Assessment/Evaluation for and Negotiation of Contracting under IMT h) Assistance of reactivated IAs/FIAs in organizational and management activities
2) Strengthening Program of NIA - IA - LGU Partnership	1. Executing body : Project Management Office with assistance of Consultant, & Management System Committee (MSC) of NIS 2. Schedule: 7 months / NIS 3. Counter body for execution: Regional Development Council with Secretary of NEDA Regional Office 4. Attendant / Trainee: Secretaries of Regional Organizations, LGUs officers, President of FIAs/IAs and secretary group, staff of NIA RIO/IMO, Chairmen of ISMC and Secretary group

Item	*Description*
	5. Contents: a) Workshop on Trouble Shooting of NIS and FIAs/ISs' Management b) Provision of work space for ISMC including office facilities
3) NIA Institutional Strengthening Program	1. Executing body : Institutional Development Division of CO, NIA 2. Schedule: 7 months / NIS 3. Counter body for execution: NIA Regional Office and IMO office 4. Attendant / Trainee: NIA personnel at CO, RIO and IMO 5. Contents: a. Capability built-up program (Central and Regional NIA Offices) b. Improvement program on management mechanism of NIA c. Support program for IMT implementation d. Strengthening program of Integrated Management information System
4) Specific Program on watershed management plan	1. Strengthening coordination with RDC, RAFC/PAFC and LGUs concerned through works shop on dissemination of the SLRIF to these organizations. 2. Strengthening coordination with RDC, RAFC/PAFC and LGUs on training program of watershed management

4.4 Proposed Counter Schemes

Item	*Description*
1) DENR	Technical assistance to concerned Provincial/municipal LGUs on watershed rehabilitation and management such as establishment of nurseries, community-based livelihood, and relocation plan for informal settlers
2) LGU	-

5. Cost Estimate for Initial Investment

Item	*Description*		
1) Direct Cost for Civil Works	A. Mobilization	Php	2.33 Million
	B. Protection Dikes		-
	C. Diversion Works	Php	10.95 Million
	D. Canal Structures	Php	9.48 Million
	E. Canalization	Php	14.07 Million
	F. Drainage Structures	Php	3.60 Million
	G. Drainage Canalization	Php	5.40 Million
	H. Roads	Php	17.20 Million
	I. On-Farm Facilities/T.O. Gates	Php	27.76 Million
	J. IMT Support Facilities	Php	15.00 Million
	K. IMT GIS Database	Php	1.80 Million
	L. Institutional Development (5% of Direct Cost)	Php	6.50 Million
	M. Feasibility Studies & Detailed Engineering (2% of Direct Cost)	Php	2.33 Million
	Sub-total (Direct Cost)	Php	116.40 Million
2) Indirect Cost	A. General Engineering Supervision and Administration (3.5% of Direct Cost)	Php	4.07 Million
	B. NIA Management Fee (5% of Total Project Cost)	Php	6.34 Million
	Sub-total (Indirect Cost)	Php	10.42 Million
3) Total Project Cost	= 1+2	Php	126.82 Million
Cost per ha.		Php	70,455.00 /ha.

6. Implementation Plan

Item	*Description*
1) Contract package	1 - Local Competitive Bidding (LCB)
2) Implementation Schedule	
a) Civil Works	
1) Survey, F/S, Design	21 months
2) Tendering	6 months
3) Construction	36 months
b) Institutional Improvement Works	
1) Reactivation Program of FIAs/IAs and Irrigation System Management Committee	34 months
2) NIA-IA-LGU Partnership	7 months
3) Strengthening of NIA staff	7 months

7. Project Evaluation

Item		*Description*	
1) Economic evaluation			
EIRR (Base)		EIRR = 20.6 %	: Project life 50 years
Sensitivity	Case-1	EIRR = 18.7 %	: Cost 10% up
	Case-2	EIRR = 18.5 %	: Benefit 10% down
	Case-3	EIRR = 16.9 %	: Cost 10% up + Benefit 10% down
B/C		1.38	: discount rate 15% p.a.
NPV		PHP 29 million	: discount rate 15% p.a.
2) Financial evaluation		Farmer's net income increase = PHP 16,748/ ha/ year	
3) Expected Impacts		1. Increased farmers' income 2. Increased rice self sufficiency of the country 3. Increased job opportunities in rural areas	

8. Environmental Aspects

Item	*Description*
1) Environmental aspect	1. Collaboration with DENR, DA, LGU, IA on the following: a) Conservation of Watersheds Programs b) Slope protection for reduction of siltation c) Municipal ordinance on prohibition of illegal domestic disposal d) Moratorium on quarry of sand and gravel at downstream of the Dam regardless of distance
2) Relocation of houses	None
3) Land acquisition	None

Table 1001 - Manupali Economic Evaluation (EIRR)

Basic Case

Name of NIS 1001 - Manupali | Region - 10 - IMO RIO Bukidnon

EIRR : 20.6%	Net Present Value (Million PHP)	Benefit	Cost	B/C Ratio	NPV
	(15 % discount rate)	105	76	1.38	29

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011			0.56		0.56		1.24	1.24	0.68
2	2012			0.56		0.56		2.48	2.48	1.92
3	2013	30.30	1.06	0.56		31.92		3.72	3.72	-28.20
4	2014	40.40	1.41	0.56	1.10	43.47	2.71	4.96	7.67	-35.80
5	2015	30.30	1.06	0.56	2.56	34.47	6.66	6.20	12.86	-21.61
6	2016				3.65	3.65	10.16	7.44	17.60	13.95
7	2017				3.65	3.65	10.95	8.68	19.63	15.98
8	2018				3.65	3.65	11.29	9.92	21.21	17.56
9	2019				3.65	3.65	11.29	11.16	22.45	18.80
10	2020				3.65	3.65	11.29	12.40	23.69	20.04
11	2021				3.65	3.65	11.29	13.64	24.93	21.28
12	2022				3.65	3.65	11.29	14.88	26.17	22.52
13	2023				3.65	3.65	11.29	16.12	27.41	23.76
14	2024				3.65	3.65	11.29	17.36	28.65	25.00
15	2025				3.65	3.65	11.29	18.60	29.89	26.24
16	2026				3.65	3.65	11.29	19.84	31.13	27.48
17	2027				3.65	3.65	11.29	21.08	32.37	28.72
18	2028				3.65	3.65	11.29	22.32	33.61	29.96
19	2029				3.65	3.65	11.29	23.56	34.85	31.20
20	2030				3.65	3.65	11.29	24.80	36.09	32.44
21	2031				3.65	3.65	11.29	26.04	37.33	33.68
22	2032				3.65	3.65	11.29	27.28	38.57	34.92
23	2033				3.65	3.65	11.29	28.52	39.81	36.16
24	2034				3.65	3.65	11.29	29.76	41.05	37.40
25	2035				3.65	3.65	11.29	31.00	42.29	38.64
26	2036				3.65	3.65	11.29	32.24	43.53	39.88
27	2037				3.65	3.65	11.29	33.48	44.77	41.12
28	2038				3.65	3.65	11.29	34.72	46.01	42.36
29	2039				3.65	3.65	11.29	35.96	47.25	43.60
30	2040				3.65	3.65	11.29	37.20	48.49	44.84
31	2041				3.65	3.65	11.29	38.44	49.73	46.08
32	2042				3.65	3.65	11.29	39.68	50.97	47.32
33	2043				3.65	3.65	11.29	40.92	52.21	48.56
34	2044				3.65	3.65	11.29	42.16	53.45	49.80
35	2045				3.65	3.65	11.29	43.40	54.69	51.04
36	2046				3.65	3.65	11.29	44.64	55.93	52.28
37	2047				3.65	3.65	11.29	45.88	57.17	53.52
38	2048				3.65	3.65	11.29	47.12	58.41	54.76
39	2049				3.65	3.65	11.29	48.36	59.65	56.00
40	2050				3.65	3.65	11.29	49.60	60.89	57.24
41	2051				3.65	3.65	11.29	50.84	62.13	58.48
42	2052				3.65	3.65	11.29	52.08	63.37	59.72
43	2053				3.65	3.65	11.29	53.32	64.61	60.96
44	2054				3.65	3.65	11.29	54.56	65.85	62.20
45	2055				3.65	3.65	11.29	55.80	67.09	63.44
46	2056				3.65	3.65	11.29	57.04	68.33	64.68
47	2057				3.65	3.65	11.29	58.28	69.57	65.92
48	2058				3.65	3.65	11.29	59.52	70.81	67.16
49	2059				3.65	3.65	11.29	60.76	72.05	68.40
50	2060				3.65	3.65	11.29	62.00	73.29	69.64

Case-1 (Cost 10% up)

Name of NIS 1001 - Manupali | Region - 10 - IMO RIO Bukidnon

EIRR : 18.7%	Net Present Value (Million PHP)	Benefit	Cost	B/C Ratio	NPV
	(15 % discount rate)	105	84	1.25	21

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	0.61	-	0.61	-	1.24	1.24	0.63
2	2012	-	-	0.61	-	0.61	-	2.48	2.48	1.87
3	2013	33.33	1.16	0.61	-	35.11	-	3.72	3.72	-31.39
4	2014	44.44	1.55	0.61	1.20	47.81	2.71	4.96	7.67	-40.14
5	2015	33.33	1.16	0.61	2.81	37.92	6.66	6.20	12.86	-25.06
6	2016	-	-	-	4.02	4.02	10.16	7.44	17.60	13.59
7	2017	-	-	-	4.02	4.02	10.95	8.68	19.63	15.62
8	2018	-	-	-	4.02	4.02	11.29	9.92	21.21	17.20
9	2019	-	-	-	4.02	4.02	11.29	11.16	22.45	18.44
10	2020	-	-	-	4.02	4.02	11.29	12.40	23.69	19.68
11	2021	-	-	-	4.02	4.02	11.29	13.64	24.93	20.92
12	2022	-	-	-	4.02	4.02	11.29	14.88	26.17	22.16
13	2023	-	-	-	4.02	4.02	11.29	16.12	27.41	23.40
14	2024	-	-	-	4.02	4.02	11.29	17.36	28.65	24.64
15	2025	-	-	-	4.02	4.02	11.29	18.60	29.89	25.88
16	2026	-	-	-	4.02	4.02	11.29	19.84	31.13	27.12
17	2027	-	-	-	4.02	4.02	11.29	21.08	32.37	28.36
18	2028	-	-	-	4.02	4.02	11.29	22.32	33.61	29.60
19	2029	-	-	-	4.02	4.02	11.29	23.56	34.85	30.84
20	2030	-	-	-	4.02	4.02	11.29	24.80	36.09	32.08
21	2031	-	-	-	4.02	4.02	11.29	26.04	37.33	33.32
22	2032	-	-	-	4.02	4.02	11.29	27.28	38.57	34.56
23	2033	-	-	-	4.02	4.02	11.29	28.52	39.81	35.80
24	2034	-	-	-	4.02	4.02	11.29	29.76	41.05	37.04
25	2035	-	-	-	4.02	4.02	11.29	31.00	42.29	38.28
26	2036	-	-	-	4.02	4.02	11.29	32.24	43.53	39.52
27	2037	-	-	-	4.02	4.02	11.29	33.48	44.77	40.76
28	2038	-	-	-	4.02	4.02	11.29	34.72	46.01	42.00
29	2039	-	-	-	4.02	4.02	11.29	35.96	47.25	43.24
30	2040	-	-	-	4.02	4.02	11.29	37.20	48.49	44.48
31	2041	-	-	-	4.02	4.02	11.29	38.44	49.73	45.72
32	2042	-	-	-	4.02	4.02	11.29	39.68	50.97	46.96
33	2043	-	-	-	4.02	4.02	11.29	40.92	52.21	48.20
34	2044	-	-	-	4.02	4.02	11.29	42.16	53.45	49.44
35	2045	-	-	-	4.02	4.02	11.29	43.40	54.69	50.68
36	2046	-	-	-	4.02	4.02	11.29	44.64	55.93	51.92
37	2047	-	-	-	4.02	4.02	11.29	45.88	57.17	53.16
38	2048	-	-	-	4.02	4.02	11.29	47.12	58.41	54.40
39	2049	-	-	-	4.02	4.02	11.29	48.36	59.65	55.64
40	2050	-	-	-	4.02	4.02	11.29	49.60	60.89	56.88
41	2051	-	-	-	4.02	4.02	11.29	50.84	62.13	58.12
42	2052	-	-	-	4.02	4.02	11.29	52.08	63.37	59.36
43	2053	-	-	-	4.02	4.02	11.29	53.32	64.61	60.60
44	2054	-	-	-	4.02	4.02	11.29	54.56	65.85	61.84
45	2055	-	-	-	4.02	4.02	11.29	55.80	67.09	63.08
46	2056	-	-	-	4.02	4.02	11.29	57.04	68.33	64.32
47	2057	-	-	-	4.02	4.02	11.29	58.28	69.57	65.56
48	2058	-	-	-	4.02	4.02	11.29	59.52	70.81	66.80
49	2059	-	-	-	4.02	4.02	11.29	60.76	72.05	68.04
50	2060	-	-	-	4.02	4.02	11.29	62.00	73.29	69.28

Table 1001 - Manupali Economic Evaluation (EIRR)

Case-2 (Benefit 10% down)

Name of NIS 1001 - Manupali **Region : 10 - IMO RIO Bukidnon**

EIRR : 18.5%	Net Present Value (Million PHP) (15 % discount rate)	Benefit	Cost	B/C Ratio	NPV
		94	76	1.24	18

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	0.56	-	0.56	-	1.12	1.12	0.56
2	2012	-	-	0.56	-	0.56	-	2.23	2.23	1.68
3	2013	30.30	1.06	0.56	-	31.92	-	3.35	3.35	-28.57
4	2014	40.40	1.41	0.56	1.10	43.47	2.44	4.46	6.90	-36.56
5	2015	30.30	1.06	0.56	2.56	34.47	5.99	5.58	11.57	-22.90
6	2016	-	-	-	3.65	3.65	9.14	6.70	15.84	12.19
7	2017	-	-	-	3.65	3.65	9.86	7.81	17.67	14.02
8	2018	-	-	-	3.65	3.65	10.16	8.93	19.09	15.44
9	2019	-	-	-	3.65	3.65	10.16	10.04	20.21	16.56
10	2020	-	-	-	3.65	3.65	10.16	11.16	21.32	17.67
11	2021	-	-	-	3.65	3.65	10.16	12.28	22.44	18.79
12	2022	-	-	-	3.65	3.65	10.16	13.39	23.55	19.90
13	2023	-	-	-	3.65	3.65	10.16	14.51	24.67	21.02
14	2024	-	-	-	3.65	3.65	10.16	15.62	25.79	22.14
15	2025	-	-	-	3.65	3.65	10.16	16.74	26.90	23.25
16	2026	-	-	-	3.65	3.65	10.16	17.86	28.02	24.37
17	2027	-	-	-	3.65	3.65	10.16	18.97	29.13	25.48
18	2028	-	-	-	3.65	3.65	10.16	20.09	30.25	26.60
19	2029	-	-	-	3.65	3.65	10.16	21.20	31.37	27.72
20	2030	-	-	-	3.65	3.65	10.16	22.32	32.48	28.83
21	2031	-	-	-	3.65	3.65	10.16	23.44	33.60	29.95
22	2032	-	-	-	3.65	3.65	10.16	24.55	34.71	31.06
23	2033	-	-	-	3.65	3.65	10.16	25.67	35.83	32.18
24	2034	-	-	-	3.65	3.65	10.16	26.78	36.95	33.30
25	2035	-	-	-	3.65	3.65	10.16	27.90	38.06	34.41
26	2036	-	-	-	3.65	3.65	10.16	29.02	39.18	35.53
27	2037	-	-	-	3.65	3.65	10.16	30.13	40.29	36.64
28	2038	-	-	-	3.65	3.65	10.16	31.25	41.41	37.76
29	2039	-	-	-	3.65	3.65	10.16	32.36	42.53	38.88
30	2040	-	-	-	3.65	3.65	10.16	33.48	43.64	39.99
31	2041	-	-	-	3.65	3.65	10.16	34.60	44.76	41.11
32	2042	-	-	-	3.65	3.65	10.16	35.71	45.87	42.22
33	2043	-	-	-	3.65	3.65	10.16	36.83	46.99	43.34
34	2044	-	-	-	3.65	3.65	10.16	37.94	48.11	44.46
35	2045	-	-	-	3.65	3.65	10.16	39.06	49.22	45.57
36	2046	-	-	-	3.65	3.65	10.16	40.18	50.34	46.69
37	2047	-	-	-	3.65	3.65	10.16	41.29	51.45	47.80
38	2048	-	-	-	3.65	3.65	10.16	42.41	52.57	48.92
39	2049	-	-	-	3.65	3.65	10.16	43.52	53.69	50.04
40	2050	-	-	-	3.65	3.65	10.16	44.64	54.80	51.15
41	2051	-	-	-	3.65	3.65	10.16	45.76	55.92	52.27
42	2052	-	-	-	3.65	3.65	10.16	46.87	57.03	53.38
43	2053	-	-	-	3.65	3.65	10.16	47.99	58.15	54.50
44	2054	-	-	-	3.65	3.65	10.16	49.10	59.27	55.62
45	2055	-	-	-	3.65	3.65	10.16	50.22	60.38	56.73
46	2056	-	-	-	3.65	3.65	10.16	51.34	61.50	57.85
47	2057	-	-	-	3.65	3.65	10.16	52.45	62.61	58.96
48	2058	-	-	-	3.65	3.65	10.16	53.57	63.73	60.08
49	2059	-	-	-	3.65	3.65	10.16	54.68	64.85	61.20
50	2060	-	-	-	3.65	3.65	10.16	55.80	65.96	62.31

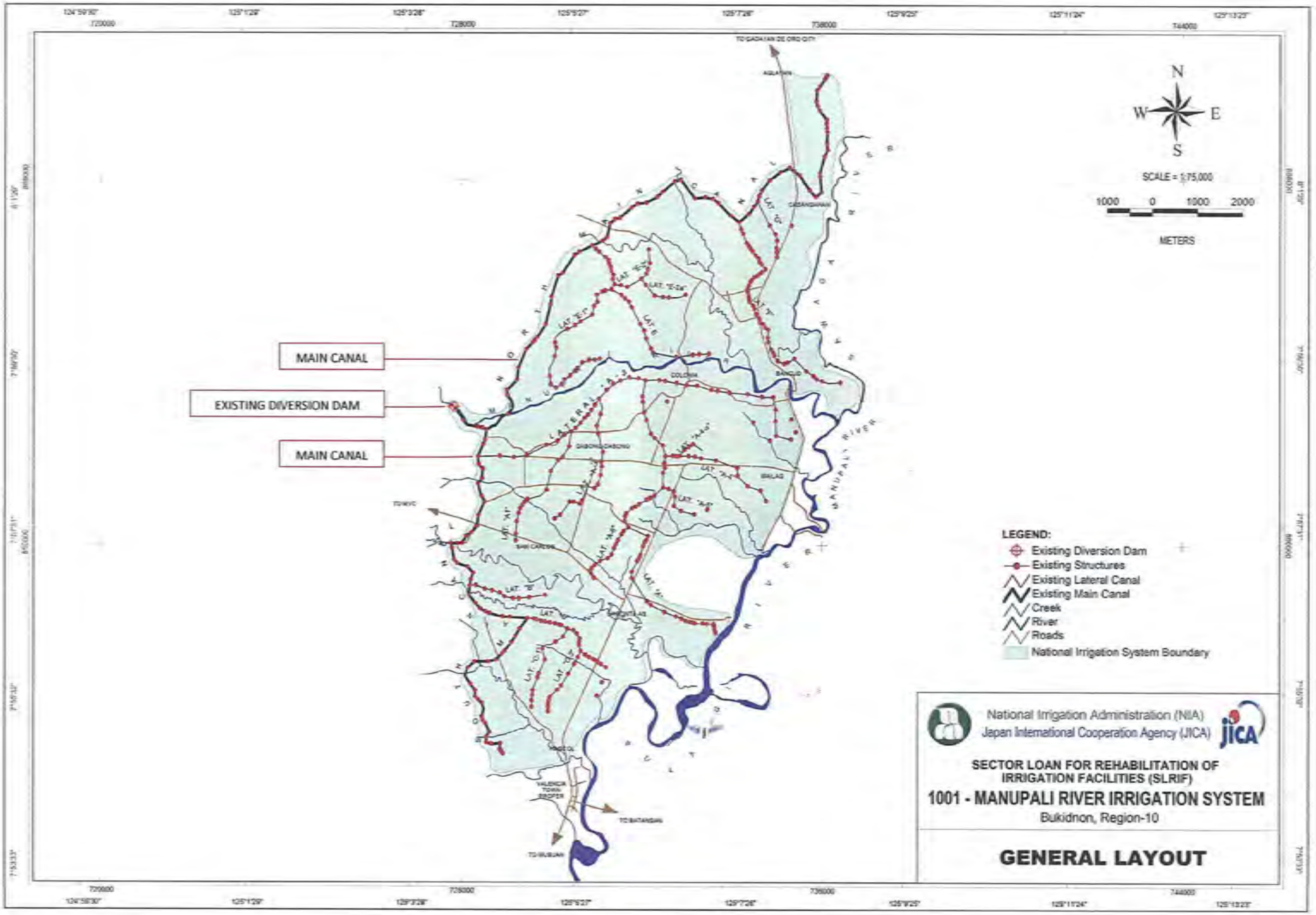
Case-3 (Cost 10% up and Benefit 10% down)

Name of NIS 1001 - Manupali **Region : 10 - IMO RIO Bukidnon**

EIRR : 16.9%	Net Present Value (Million PHP) (15 % discount rate)	Benefit	Cost	B/C Ratio	NPV
		94	84	1.13	11

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	0.61	-	0.61	-	1.12	1.12	0.50
2	2012	-	-	0.61	-	0.61	-	2.23	2.23	1.62
3	2013	33.33	1.16	0.61	-	35.11	-	3.35	3.35	-31.76
4	2014	44.44	1.55	0.61	1.20	47.81	2.44	4.46	6.90	-40.91
5	2015	33.33	1.16	0.61	2.81	37.92	5.99	5.58	11.57	-26.35
6	2016	-	-	-	4.02	4.02	9.14	6.70	15.84	11.83
7	2017	-	-	-	4.02	4.02	9.86	7.81	17.67	13.65
8	2018	-	-	-	4.02	4.02	10.16	8.93	19.09	15.07
9	2019	-	-	-	4.02	4.02	10.16	10.04	20.21	16.19
10	2020	-	-	-	4.02	4.02	10.16	11.16	21.32	17.31
11	2021	-	-	-	4.02	4.02	10.16	12.28	22.44	18.42
12	2022	-	-	-	4.02	4.02	10.16	13.39	23.55	19.54
13	2023	-	-	-	4.02	4.02	10.16	14.51	24.67	20.65
14	2024	-	-	-	4.02	4.02	10.16	15.62	25.79	21.77
15	2025	-	-	-	4.02	4.02	10.16	16.74	26.90	22.89
16	2026	-	-	-	4.02	4.02	10.16	17.86	28.02	24.00
17	2027	-	-	-	4.02	4.02	10.16	18.97	29.13	25.12
18	2028	-	-	-	4.02	4.02	10.16	20.09	30.25	26.23
19	2029	-	-	-	4.02	4.02	10.16	21.20	31.37	27.35
20	2030	-	-	-	4.02	4.02	10.16	22.32	32.48	28.47
21	2031	-	-	-	4.02	4.02	10.16	23.44	33.60	29.58
22	2032	-	-	-	4.02	4.02	10.16	24.55	34.71	30.70
23	2033	-	-	-	4.02	4.02	10.16	25.67	35.83	31.81
24	2034	-	-	-	4.02	4.02	10.16	26.78	36.95	32.93
25	2035	-	-	-	4.02	4.02	10.16	27.90	38.06	34.05
26	2036	-	-	-	4.02	4.02	10.16	29.02	39.18	35.16
27	2037	-	-	-	4.02	4.02	10.16	30.13	40.29	36.28
28	2038	-	-	-	4.02	4.02	10.16	31.25	41.41	37.39
29	2039	-	-	-	4.02	4.02	10.16	32.36	42.53	38.51
30	2040	-	-	-	4.02	4.02	10.16	33.48	43.64	39.63
31	2041	-	-	-	4.02	4.02	10.16	34.60	44.76	40.74
32	2042	-	-	-	4.02	4.02	10.16	35.71	45.87	41.86
33	2043	-	-	-	4.02	4.02	10.16	36.83	46.99	42.97
34	2044	-	-	-	4.02	4.02	10.16	37.94	48.11	44.09
35	2045	-	-	-	4.02	4.02	10.16	39.06	49.22	45.21
36	2046	-	-	-	4.02	4.02	10.16	40.18	50.34	46.32
37	2047	-	-	-	4.02	4.02	10.16	41.29	51.45	47.44
38	2048	-	-	-	4.02	4.02	10.16	42.41	52.57	48.55
39	2049	-	-	-	4.02	4.02	10.16	43.52	53.69	49.67
40	2050	-	-	-	4.02	4.02	10.16	44.64	54.80	50.79
41	2051	-	-	-	4.02	4.02	10.16	45.76	55.92	51.90
42	2052	-	-	-	4.02	4.02	10.16	46.87	57.03	53.02
43	2053	-	-	-	4.02	4.02	10.16	47.99	58.15	54.13
44	2054	-	-	-	4.02	4.02	10.16	49.10	59.27	55.25
45	2055	-	-	-	4.02	4.02	10.16	50.22	60.38	56.37
46	2056	-	-	-	4.02	4.02	10.16	51.34	61.50	57.48
47	2057	-	-	-	4.02	4.02	10.16	52.45	62.61	58.60
48	2058	-	-	-	4.02	4.02	10.16	53.57	63.73	59.71
49	2059	-	-	-	4.02	4.02	10.16	54.68	64.85	60.83
50	2060	-	-	-	4.02	4.02	10.16	55.80	65.96	61.95


MAIN CANAL
EXISTING DIVERSION DAM
MAIN CANAL
N
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SCALE = 1:75,000
1000 0 1000 2000
METERS
LEGEND:
Existing Diversion Dam
Existing Structures
Existing Lateral Canal
Existing Main Canal
Creek
River
Roads
National Irrigation System Boundary
National Irrigation Administration (NIA)
Japan International Cooperation Agency (JICA)
JICA
SECTOR LOAN FOR REHABILITATION OF IRRIGATION FACILITIES (SLRIF)
1001 - MANUPALI RIVER IRRIGATION SYSTEM
Bukidnon, Region-10
GENERAL LAYOUT

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities
Photograph of Irrigation Facilities

NIS name: Manupali NIS (Region 10) Date: May 26, 2009

Location / Facility	Photograph	Comments
01. Manupali Dam N-7d 59m 04s E-125d 04m 10s		Replacement of damaged top, side, and bottom rubber seals
02. Manupali Dam N-7d 59m 04s E-125d 04m 10s		Repair and improvement of dilapidated gatekeeper's quarter
03. Headgate of North Main Canal and South Main Canal N-7d 58m 52s E-125d 04m 28s		Construction of Wasteway Structure due to overflowing of canal water Repair and improvement of drainage structure

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities
Photograph of Irrigation Facilities

NIS name: Manupali NIS (Region 10) Date: May 26, 2009

Location / Facility	*Photograph*	*Comments*
04. North Main Canal Siphon Site		Additional road embankment and replacement of concrete side wall of the canal to increase depth of canal due to overflowing caused by backwater at inlet of siphon structure Construction of wasteway at inlet of the siphon so as to maintain the freeboard of the canal and avoid water overtopping the canal
05. North Main Canal		Repair of collapsed canal embankment due to erosion and scouring during "Typhoon Frank"
06. North Main Canal		Repair of damaged concrete canal lining about 300 meters

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities
Photograph of Irrigation Facilities

NIS name: Manupali NIS (Region 10) Date: May 26, 2009

Location / Facility	*Photograph*	*Comments*
07. Lateral Canal		Revision of trash rack from vertical to incline for easy lift and cleaning debis and garbage.
08. North Main Canal Access Road		Construction and repair of access road by Gravel surfacing, crown formation, and side drainage
09. North Main Canal On-Farm Canal		Rehabilitation of "main farm canal/ditch" by construction of lining.

THE REPUBLIC OF PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION

Sector Loan on Rehabilitation of Irrigation Facilities

NIS SUMMARY REPORT

1002
Pulangui RIS
Region 10
Bukidnon Province

July 2009

Survey Team for
Japan International Cooperation Agency
(JICA)

Features of NIS for Rehabilitation Project

1. General

Item	*Description*		
1) Name of NIS	**Pulangui RIS**		Code: 1002
2) Location	Region	Region 10	
	Province	Bukidnon	
	Municipality	Malaybalay City, Quezon, Valencia City	
	Distance	40 km from Malaybalay (Capital of Province)	
3) Type of Water Source	Water Source	Pulangui River	
	Type	Diversion Dam (137.00 m wide, 2.8 m high)	
4) Area	Service Area	11,415 ha	
	FUSA	10,557 ha	
5) Beneficiary Farmers	8,982 farmers	Average paddy field cultivating size = 1.18 ha per farmer	
6) Irrigator's Association	IAs established = 43 FIA established = 1 in 2008		
7) Features of NIS and Necessity of the project	Pulangui River Irrigation System has design service area (SA) 11,415 hectares, however, the firmed-up service area (FUSA) 10,557 hectares and the average irrigated area (AIG) for wet and dry season are 9,926 and 9,796 hectares, respectively. The gap between FUSA and AIG ranges from 600-700 hectares. This difference is attributed to land conversion from agricultural land to residential areas but mostly on temporary diversion of crop cultivation from rice to sugar cane, corn, and banana. Based on local interview with farmers during the IA Meeting, other crops cultivators are willing to cultivate rice again provided that water is readily available. Farmers claimed that irrigation water is not equally distributed and timely delivered particularly at the downstream part of the irrigable area, where upstream farmers cultivated twice a year and single cropping a year at the end part of the system. The NIA justified this dilemma as the some farmers are extracting irrigation water by boring holes and breaching auxiliary berm embankment thus water flows uncontrolled. The implementation of the project will correct water management problems and rehabilitate facilities of the system and optimize water utilization to boosts rice production in the Region.		
8) Outline of the Proposed Project	A. Engineering 1. Repair of diversion dam 2. Repair and improvement of irrigation canal and structures 3. Repair and improvement of drainage canal and structures 4. Repair and improvement of service roads 5. Repair and improvement of on-farm facilities 6. Repair and construction of IMT support facilities-IA Bldg solar drier, warehouse with IA building 7. Development and establishment of IMT GIS database B. Institutional Strengthening Program B. 1 Basic Program 1. Reactivation of FIA/IA and Strengthening of Irrigation System Management Committee (ISMC) of NIS including construction of IMT support facilities 2. Strengthening of NIA – IA – LGUs Partnership 3. Strengthening NIA Institutional Capacity		

	B.2 Specific Program to strengthen institutional mechanism together with LGUs 1. Improvement of watershed management				
9) Proposed Project Component	A. Engineering 1. Construction of civil works for rehabilitation of diversion works, canal system, drainage system, roads, and IMT support facilities. B. Institutional Strengthening Program 1. Reactivation of FIAs/IAs including reformation of TSGA / IA / FIA areas, construction of IMT support facilities (demand base) 2. Strengthening NIA-IA- LGUs Partnership, especially coordination RDC, RAFC/PAFC with FIAs/IAs and ISMC 3. Institutional development program to strengthen management capacity of NIA field offices and IAs.				
10) Project Cost (Direct cost only, excluding escalation, contingency, tax)	1. Direct cost			PHP 650.43	Million
	- *Civil Works*	*PHP*	*614.62*	*Million*	
	- *Institutional Development*	*PHP*	*22.80*	*Million*	
	- *Engineering Services*	*PHP*	*13.01*	*Million*	
	2. Indirect cost			PHP 58.20	Million
	Total Project Cost (1+2)			PHP 708.63	Million
	Cost per ha			PHP 67,124.00	per ha.
11) Project Benefit	1. To increase paddy production by 11,487 tons/year 2. To increase farmers' net income to PHP62,210.00 /ha/year 3. To establish functional and self-reliant IAs 4. To improve performance of NIS				
12) Project Justification	EIRR = 25.8 %, B/C = 1.69 (discount rate 15%)				

2. Project History (Construction/Rehabilitation)

Year	*Description*
2004	Repair and rehabilitation of existing system financed by GOP
2005	Repair and rehabilitation of existing system financed by GOP
2006	Repair and rehabilitation of existing system financed by GOP
2007	Repair and rehabilitation/restoration of existing system financed by GOP
2008	Repair and rehabilitation/restoration of existing system financed by GOP

3. Present Condition

3.1 Natural Conditions

Item	*Description*
1) Annual Rainfall	1,522.90 mm
2) Seasons	Wet season: from May to October , Dry season: from November to April
3) Dominant Soil in NIS Area	Clay loam
4) Topography	Undulating with slope ranging from 5% to 8% in Northern part and relatively flat at the Southern area

3.2 Socio-economy (Region/Province)

Item	*Description*
1) GRDP	PHP 310,186 million (Year 2007), Per Capita GRDP = PHP 75,883 per year
2) Population	1,190,284 (province)
3) Population Growth Rate	1.61 % per year (province)
4) Labor Force	2,622 ,000 (region)
5) Poverty Population	37.2% to total population (province)

3.3 Present Agriculture in NIS

Item	*Description*					
1) Farm Household in NIS	Total beneficiaries	8,982 households				
	Land owners	households (%)				
	Tenant farmers	households (%)				
2) paddy Field Size in NIS	1.27 ha per household (FUSA/Total beneficiaries as of 2008)					
3) Present Land Use in NIS	Paddy field planted	10,038 ha	83.6 %	As of 2008		
	Paddy field not planted	1,377 ha	11.5 %	As of 2008		
	Upland crop field	0 ha	0.0 %			
	Permanent crop field	0 ha	0.0 %			
	Undeveloped area	0 ha	0.0 %			
	Built-up area	0 ha	0.0 %			
	High ground	0 ha	0.0 %			
	Grassland	0 ha	0.0 %			
	Swamp	0 ha	0.0 %			
	Unspecified area	585 ha	4.9 %	No data in response		
5) Paddy Field in FUSA (ha)	10,557					

5) Paddy Cropped Area (ha)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Wet Season	10,063	9,810	9,819	9,902	10,038	9,926
Dry Season	9,814	9,812	9,782	9,601	9,971	9,796
6) Type of Crops Cultivated (per year)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
	174	172	172	171	175	173
7) Unit Yield of Paddy (ton/ha)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Wet Season	3.85	3.50	4.00	4.25	4.20	3.96
Dry Season	3.50	3.60	3.55	3.85	4.10	3.72
8) Paddy Production (ton)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Wet Season	38,743	34,335	39,276	42,084	42,160	39,319
Dry Season	34,349	35,323	34,726	36,964	40,881	36,449

3.4 Water Resources

Item	*Description*
1) Name of Rivers	Pulangui River
2) Catchment Area at Dam	1,340 km^2
3) Ave. River Discharge	47.66 m^3/s
4) Ave. Dry Season Discharge	49.62 m^3/s
5) Diverted Intake Discharge	18.21 m^3/s
6) Water Requirement	19.00 m^3/s
7) Sedimentation	Medium

3.5 Existing Irrigation System

Item	*Description*
1) Diversion Dam	Overflow crest width 127 m, Dam height 2.80 m Dam width 137 m
2) Main Canal	Total length 64.274 km (Lined portion 39.248 km)
3) Lateral Canals	Total length 160 km (Lined portion 4.00 km)
4) On-farm facilities	Total length 320.00 km (Lined portion 4.00 km) Turn-outs = 351 units
5) Drainage Canal	Total length 164.461 kms
6) Canal Structures	No. = 1,375 units (Damaged = 380 units)
7) Drainage Structures	No. = 119 units (Damaged = 35 units)
8) Farm roads	Total length 207.104 km (pavement= 0.00 kms.)
9) Flood Protection Dike	Total length 1.00 km (for rehab. = 1.00 kms
10) Water Masters Quarter	No. = 9 units
11) Gate Keepers Quarter	No. = 3 units

3.6 Institutions for O&M of NIS

Item	*Description*					
1) Regional Irrigation Office	Name: Region 10 – Northern Mindanao					
2) IMO	Name: Bukidnon IMO					
Staff in 2009	Total number of staff: 89					
3) Irrigator' Association (IA)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Number of FIA (nos)					1	
Number of IA (nos)					43	
Number of TSAG (nos)	376	376	385	429	499	413
Functionality of IA	59.8	73.9	71.8	72.7	74.9	70.6
Collection of ISF (wet, %)	63.8	49.6	45.0	66.2	40.6	55.5
Collection of ISF (dry, %)	47.7	45.1	45.7	46.4	45.8	45.5
4) NIS Category based on IA 2008 O&M Contract (NIA-IA)	No. of IA					
Category A	0					
Category B	43					
Category C	0					

3.7 Existing Problems

Item	*Description*
1) Diversion Works	1. Non-operational engine driver for sluice gate lifting mechanism 2. Slow control of lifting mechanism particularly during heavy rainfall and flood 3. Deteriorated rubber seal of sluiceway gates 4. Dilapidated gatekeepers quarter
2) Canal and Structures	1. Heavy siltation along north main canal due to erosion of hills caused by cultivation along hills and slopes of the mountain, 2. 500 meters embankment collapsed due to erosion, 4. Encroachment of houses and building structures along canals 5. Scoured inlet and outlet transition protection works due to wallowing of carabao/water buffalo, 6. Growing population and houses along canals needing footbridges and structure crossings, 7. Uncontrolled gate operation during irrigation period which water overflows the canal and erode gravel surfacing and soil embankment s 8. Non-operational and stolen turnout steel gates 9. Unauthorized extraction of irrigation water by boring canal auxiliary berm.
3) Drainage Canal	1. Heavy silted drainage canals due to frequent cultivation along hills and side slope of the mountain 2. Lack of crossings along drainage canals 3. Lack of drainage inlet structures for rainfall runoff flowing inside of irrigation canal 4. Drainage structure block by debris which causes to flood the area during heavy rainfall
4) Other Project Facilities (road, bridge, flood dike, building, etc)	1. Dilapidated water master quarter and gate keeper's quarter 2. Deteriorated canal service roads, access roads, and intrasite roads
5) Water Management and O&M Activities	1. Lack of staff gages at diversion dam, intake, headgates of lateral and turnout level 2. No water management instruments like current meter, rain gages, and evaporation pan 3. Lack of technical basis or geodetic ground survey on the actual area for Land Classification (e.g. rice area, permanent crops, high ground, built-up area, swamp area, undeveloped area, etc) 4. Lack of maintenance equipments
6) Status of NIS and IA	Status Type Ac evaluated by Radar Graph

Item	*Description*
Management	Specific problems are: 1. Low ISF collection efficiency during dry and wet seasons at 45% and 55%, respectively 2. Medium paddy yield during wet and dry seasons at 85 and 93 cavans/ha, respectively
7) Watershed Management	1. Resolution was made by IA on watershed conservation but no action by the Provincial Governors Office
8) Coordination with LGU and Agencies concerned	1. Minimum coordination by NIA's field offices and IAs with concerned LGUs on specific problem such as watershed management
9) Agriculture	1. Limited access to credit institutions so that the farmers resort to borrowing from the private traders with high interest rate. 2. Inadequate post harvest facilities particularly dryer. 3. High prices of agricultural inputs.

4. Proposed Rehabilitation Plan

4.1 Agricultural Development Plan

Item	*Description*			
Cropping schedule	*Wet Season*	*Dry Season-1*	*Dry Season-2*	*Annual*
1) Type of Crops	Paddy	Paddy	-	-
2) Cropping Area (ha)	10,557	9,980	-	-
3) Target Unit Yield (ton/ha)	4.50	4.30	-	-
3) Total Production (ton)	47,507	42,914	-	-

4.2 Civil Works

Item	*Description*
1) Diversion Works	1. Replacement of Engine Drive for sluice gate and intake gate lifting mechanism, scour protection repair, rubber seal replacement. Protection wall of Paitan Dam
2) Canal Structures	1. Construction of scour protection about inlet and outlet transition of structures, construction of additional structures and bench flumes
3) Canalization	1. Repair of canal embankment, construction of canal lining, repair of canal lining 2. Realignment of canal 3. Construction of new canal
4) Drainage Structures	1. Construction of check structure for "RE-USE" of drainage water
5) Drainage Canalization	1. Desiltting of drainage canal and disposal of silts – 97 kms
6) Service Roads	1. Rehabilitation of Access Road, embankment compaction and Gravel Surfacing – 126.46 kms
7) On-Farm Facilities	1. Repair /replacement of dilapidated turn out steel gates 2.Construction of new turn outs and farm ditches
8) IMT Support Facilities	1. Construction of post-harvest facilities—warehouses, IA buildings, solar driers with shed – 10 sets
9) IMT GIS Database	1. Development and establishment of GIS database

4.3 Institutional Strengthening Program

Item	*Description*
1) Reactivation Program of FIAs/IAs and System Management Committee (ISMC)	1. Executing body : Project Management Office with assistance of Consultant 2. Schedule: 34 months / NIS 3. Counter body for execution: NIA Regional Office and IMO office 4. Attendant / Trainee: President of FIAs/IAs and secretary group, staff of NIA RIO/IMO, Chairmen of ISMC and Secretary group and LGUs officers, 5. Contents: a) Survey & Study by Consultant b) Workshops on coordination activities with and dissemination on reformation plan to FIAs/IAs c) Workshop on coordination activities with LGUs d) Organization and Legal Registration of FIAs/IAs to be re-active and reactivation of SMC e) Construction of IMT support facilities for FIAs/CIA f) Workshop and Training of FIAs/IAs members on management under the IMT g) Assessment/Evaluation for and Negotiation of Contracting under IMT h) Assistance of reactivated IAs/FIAs in organizational and management activities
2) Strengthening Program of NIA - IA - LGU Partnership	1. Executing body : Project Management Office with assistance of Consultant, & Management System Committee (MSC) of NIS 2. Schedule: 7 months / NIS 3. Counter body for execution: Regional Development Council with Secretary of NEDA Regional Office 4. Attendant / Trainee: Secretaries of Regional Organizations, LGUs officers, President of FIAs/IAs and secretary group, staff of NIA RIO/IMO, Chairmen of ISMC and Secretary group 5. Contents: a) Workshop on Trouble Shooting of NIS and FIAs/ISs' Management b) Provision of work space for ISMC including office facilities
3) NIA Institutional Strengthening Program	1. Executing body : Institutional Development Division of CO, NIA 2. Schedule: 7 months / NIS 3. Counter body for execution: NIA Regional Office and IMO office 4. Attendant / Trainee: NIA personnel at CO, RIO and IMO 5. Contents: a. Capability built-up program (Central and Regional NIA Offices) b. Improvement program on management mechanism of NIA c. Support program for IMT implementation d. Strengthening program of Integrated Management information System
4) Specific Program on watershed management plan	1. Strengthening coordination with RDC, RAFC/PAFC and LGUs concerned through works shop on dissemination of the SLRIF to these organizations. 2. Strengthening coordination with RDC, RAFC/PAFC and LGUs on training program of watershed management

4.3 Proposed Counter Schemes

Item	*Description*
1) DENR	1. Technical assistance to concerned Provincial/municipal LGUs on watershed rehabilitation and management such as establishment of nurseries, community-based livelihood for upland dwellers and relocation plan for informal settlers.
2) LGU	

5. Cost Estimate for Initial Investment

Item	*Description*		
1) Direct Cost for Civil Works	A. Mobilization	Php	13.01 Million
	B. Protection Dikes		-
	C. Diversion Works	Php	3.51 Million
	D. Canal Structures	Php	36.41 Million
	E. Canalization	Php	385.47 Million
	F. Drainage Structures	Php	21.11 Million
	G. Drainage Canalization	Php	22.24 Million
	H. Roads	Php	60.23 Million
	I. On-Farm Facilities/T.O. Gates	Php	7.08 Million
	J. IMT Support Facilities	Php	55.00 Million
	K. IMT GIS Database	Php	10.56 Million
	L. Institutional Development (5% of Direct Cost)	Php	22.80 Million
	M. Feasibility Studies & Detailed Engineering (2% of Direct Cost)	Php	13.01 Million
	Sub-total (Direct Cost)	Php	650.43 Million
2) Indirect Cost	A. General Engineering Supervision and Administration (3.5% of Direct Cost)	Php	22.77 Million
	B. NIA Management Fee (5% of Total Project Cost)	Php	35.43 Million
	Sub-total (Indirect Cost)	Php	58.20 Million
3) Total Project Cost	= 1+2	Php	708.63 Million
Cost per ha.		Php	67,124.00 /ha.

6. Implementation Plan

Item	*Description*
1) Contract package	1 - Local Competitive Bidding (LCB)
2) Implementation Schedule	
a) Civil Works	
1) Survey, F/S, Design	21 months
2) Tendering	6 months
3) Construction	36 months
b) Institutional Improvement Works	
1) Reactivation Program of FIAs/IAs and Irrigation System Management Committee	34 months
2) NIA-IA-LGU Partnership	7 months
3) Strengthening of NIA staff	7 months

7. Project Evaluation

Item		*Description*	
1) Economic evaluation			
EIRR (Base)		EIRR = 25.8%	: Project life 50 years
Sensitivity	Case-1	EIRR = 23.3 %	: Cost 10% up
	Case-2	EIRR = 23.1%	: Benefit 10% down
	Case-3	EIRR = 20.9 %	: Cost 10% up + Benefit 10% down
B/C		1.69	: discount rate 15% p.a.
NPV		PHP 304 million	: discount rate 15% p.a.
2) Financial evaluation		Farmer's net income increase = PHP 12,782 per ha per year	
3) Expected Impacts		1. Increased farmers' income 2. Increased rice self sufficiency of the country 3. Increased job opportunities in rural areas	

8. Environmental Aspects

Item	*Description*
1) Environmental aspect	1. Collaboration with DENR, DA, LGU, IA on the following: a) Conservation of Watersheds Programs b) Slope protection for reduction of siltation c) Municipal ordinance on prohibition of illegal domestic disposal d) Moratorium on quarry of sand and gravel at downstream of the Dam regardless of distance
2) Relocation of houses	None
3) Land acquisition	None

Table 1002 - Pulangui Economic Evaluation (EIRR)

Basic Case

Name of NIS: 1002 - Pulangui | Region: 10 IMO RIO Bukidnon

EIRR : 25.8%	Net Present Value (Million PHP)	Benefit	Cost	B/C Ratio	NPV
	(15 % discount rate)	741	438	1.69	304

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011			3.17		3.17		8.09	8.09	4.92
2	2012			3.17		3.17		16.18	16.18	13.01
3	2013	176.32	3.72	3.17		183.21		24.27	24.27	-158.94
4	2014	235.09	4.96	3.17	6.42	249.65	21.54	32.36	53.90	-195.75
5	2015	176.32	3.72	3.17	14.99	198.20	52.95	40.45	93.40	-104.79
6	2016				21.41	21.41	80.78	48.54	129.32	107.91
7	2017				21.41	21.41	87.06	56.63	143.69	122.28
8	2018				21.41	21.41	89.75	64.72	154.47	133.06
9	2019				21.41	21.41	89.75	72.81	162.56	141.15
10	2020				21.41	21.41	89.75	80.90	170.65	149.24
11	2021				21.41	21.41	89.75	88.99	178.74	157.33
12	2022				21.41	21.41	89.75	97.08	186.83	165.42
13	2023				21.41	21.41	89.75	105.17	194.92	173.51
14	2024				21.41	21.41	89.75	113.26	203.01	181.60
15	2025				21.41	21.41	89.75	121.35	211.10	189.69
16	2026				21.41	21.41	89.75	129.44	219.19	197.78
17	2027				21.41	21.41	89.75	137.53	227.28	205.87
18	2028				21.41	21.41	89.75	145.62	235.37	213.96
19	2029				21.41	21.41	89.75	153.71	243.46	222.05
20	2030				21.41	21.41	89.75	161.80	251.55	230.14
21	2031				21.41	21.41	89.75	169.89	259.64	238.23
22	2032				21.41	21.41	89.75	177.98	267.73	246.32
23	2033				21.41	21.41	89.75	186.07	275.82	254.41
24	2034				21.41	21.41	89.75	194.16	283.91	262.50
25	2035				21.41	21.41	89.75	202.25	292.00	270.59
26	2036				21.41	21.41	89.75	210.34	300.09	278.68
27	2037				21.41	21.41	89.75	218.43	308.18	286.77
28	2038				21.41	21.41	89.75	226.52	316.27	294.86
29	2039				21.41	21.41	89.75	234.61	324.36	302.95
30	2040				21.41	21.41	89.75	242.70	332.45	311.04
31	2041				21.41	21.41	89.75	250.79	340.54	319.13
32	2042				21.41	21.41	89.75	258.88	348.63	327.22
33	2043				21.41	21.41	89.75	266.97	356.72	335.31
34	2044				21.41	21.41	89.75	275.06	364.81	343.40
35	2045				21.41	21.41	89.75	283.15	372.90	351.49
36	2046				21.41	21.41	89.75	291.24	380.99	359.58
37	2047				21.41	21.41	89.75	299.33	389.08	367.67
38	2048				21.41	21.41	89.75	307.42	397.17	375.76
39	2049				21.41	21.41	89.75	315.51	405.26	383.85
40	2050				21.41	21.41	89.75	323.60	413.35	391.94
41	2051				21.41	21.41	89.75	331.69	421.44	400.03
42	2052				21.41	21.41	89.75	339.78	429.53	408.12
43	2053				21.41	21.41	89.75	347.87	437.62	416.21
44	2054				21.41	21.41	89.75	355.96	445.71	424.30
45	2055				21.41	21.41	89.75	364.05	453.80	432.39
46	2056				21.41	21.41	89.75	372.14	461.89	440.48
47	2057				21.41	21.41	89.75	380.23	469.98	448.57
48	2058				21.41	21.41	89.75	388.32	478.07	456.66
49	2059				21.41	21.41	89.75	396.41	486.16	464.75
50	2060				21.41	21.41	89.75	404.50	494.25	472.84

Case-1 (Cost 10% up)

Name of NIS: 1002 - Pulangui | Region: 10 IMO RIO Bukidnon

EIRR : 23.3%	Net Present Value (Million PHP)	Benefit	Cost	B/C Ratio	NPV
	(15 % discount rate)	741	482	1.54	260

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	3.49	-	3.49	-	8.09	8.09	4.60
2	2012	-	-	3.49	-	3.49	-	16.18	16.18	12.69
3	2013	193.95	4.09	3.49	-	201.53	-	24.27	24.27	-177.26
4	2014	258.60	5.46	3.49	7.07	274.61	21.54	32.36	53.90	-220.71
5	2015	193.95	4.09	3.49	16.49	218.02	52.95	40.45	93.40	-124.61
6	2016	-	-	-	23.55	23.55	80.78	48.54	129.32	105.76
7	2017	-	-	-	23.55	23.55	87.06	56.63	143.69	120.14
8	2018	-	-	-	23.55	23.55	89.75	64.72	154.47	130.92
9	2019	-	-	-	23.55	23.55	89.75	72.81	162.56	139.01
10	2020	-	-	-	23.55	23.55	89.75	80.90	170.65	147.10
11	2021	-	-	-	23.55	23.55	89.75	88.99	178.74	155.19
12	2022	-	-	-	23.55	23.55	89.75	97.08	186.83	163.28
13	2023	-	-	-	23.55	23.55	89.75	105.17	194.92	171.37
14	2024	-	-	-	23.55	23.55	89.75	113.26	203.01	179.46
15	2025	-	-	-	23.55	23.55	89.75	121.35	211.10	187.55
16	2026	-	-	-	23.55	23.55	89.75	129.44	219.19	195.64
17	2027	-	-	-	23.55	23.55	89.75	137.53	227.28	203.73
18	2028	-	-	-	23.55	23.55	89.75	145.62	235.37	211.82
19	2029	-	-	-	23.55	23.55	89.75	153.71	243.46	219.91
20	2030	-	-	-	23.55	23.55	89.75	161.80	251.55	228.00
21	2031	-	-	-	23.55	23.55	89.75	169.89	259.64	236.09
22	2032	-	-	-	23.55	23.55	89.75	177.98	267.73	244.18
23	2033	-	-	-	23.55	23.55	89.75	186.07	275.82	252.27
24	2034	-	-	-	23.55	23.55	89.75	194.16	283.91	260.36
25	2035	-	-	-	23.55	23.55	89.75	202.25	292.00	268.45
26	2036	-	-	-	23.55	23.55	89.75	210.34	300.09	276.54
27	2037	-	-	-	23.55	23.55	89.75	218.43	308.18	284.63
28	2038	-	-	-	23.55	23.55	89.75	226.52	316.27	292.72
29	2039	-	-	-	23.55	23.55	89.75	234.61	324.36	300.81
30	2040	-	-	-	23.55	23.55	89.75	242.70	332.45	308.90
31	2041	-	-	-	23.55	23.55	89.75	250.79	340.54	316.99
32	2042	-	-	-	23.55	23.55	89.75	258.88	348.63	325.08
33	2043	-	-	-	23.55	23.55	89.75	266.97	356.72	333.17
34	2044	-	-	-	23.55	23.55	89.75	275.06	364.81	341.26
35	2045	-	-	-	23.55	23.55	89.75	283.15	372.90	349.35
36	2046	-	-	-	23.55	23.55	89.75	291.24	380.99	357.44
37	2047	-	-	-	23.55	23.55	89.75	299.33	389.08	365.53
38	2048	-	-	-	23.55	23.55	89.75	307.42	397.17	373.62
39	2049	-	-	-	23.55	23.55	89.75	315.51	405.26	381.71
40	2050	-	-	-	23.55	23.55	89.75	323.60	413.35	389.80
41	2051	-	-	-	23.55	23.55	89.75	331.69	421.44	397.89
42	2052	-	-	-	23.55	23.55	89.75	339.78	429.53	405.98
43	2053	-	-	-	23.55	23.55	89.75	347.87	437.62	414.07
44	2054	-	-	-	23.55	23.55	89.75	355.96	445.71	422.16
45	2055	-	-	-	23.55	23.55	89.75	364.05	453.80	430.25
46	2056	-	-	-	23.55	23.55	89.75	372.14	461.89	438.34
47	2057	-	-	-	23.55	23.55	89.75	380.23	469.98	446.43
48	2058	-	-	-	23.55	23.55	89.75	388.32	478.07	454.52
49	2059	-	-	-	23.55	23.55	89.75	396.41	486.16	462.61
50	2060	-	-	-	23.55	23.55	89.75	404.50	494.25	470.70

Table 1002 - Pulangui Economic Evaluation (EIRR)

Case-2 (Benefit 10% down)

Name of NIS 1002 - Pulangui | Region : 10 IMO RIO Bukidnon

EIRR : 23.1%	Net Present Value (Million PHP)	Benefit	Cost	B/C Ratio	NPV
	(15 % discount rate)	667	438	1.52	229

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	3.17	-	3.17	-	7.28	7.28	4.11
2	2012	-	-	3.17	-	3.17	-	14.56	14.56	11.39
3	2013	176.32	3.72	3.17	-	183.21	-	21.84	21.84	-161.37
4	2014	235.09	4.96	3.17	6.42	249.65	19.39	29.12	48.51	-201.14
5	2015	176.32	3.72	3.17	14.99	198.20	47.66	36.41	84.06	-114.13
6	2016	-	-	-	21.41	21.41	72.70	43.69	116.38	94.97
7	2017	-	-	-	21.41	21.41	78.35	50.97	129.32	107.91
8	2018	-	-	-	21.41	21.41	80.78	58.25	139.02	117.61
9	2019	-	-	-	21.41	21.41	80.78	65.53	146.30	124.89
10	2020	-	-	-	21.41	21.41	80.78	72.81	153.59	132.18
11	2021	-	-	-	21.41	21.41	80.78	80.09	160.87	139.46
12	2022	-	-	-	21.41	21.41	80.78	87.37	168.15	146.74
13	2023	-	-	-	21.41	21.41	80.78	94.65	175.43	154.02
14	2024	-	-	-	21.41	21.41	80.78	101.93	182.71	161.30
15	2025	-	-	-	21.41	21.41	80.78	109.22	189.99	168.58
16	2026	-	-	-	21.41	21.41	80.78	116.50	197.27	175.86
17	2027	-	-	-	21.41	21.41	80.78	123.78	204.55	183.14
18	2028	-	-	-	21.41	21.41	80.78	131.06	211.83	190.42
19	2029	-	-	-	21.41	21.41	80.78	138.34	219.11	197.70
20	2030	-	-	-	21.41	21.41	80.78	145.62	226.40	204.99
21	2031	-	-	-	21.41	21.41	80.78	152.90	233.68	212.27
22	2032	-	-	-	21.41	21.41	80.78	160.18	240.96	219.55
23	2033	-	-	-	21.41	21.41	80.78	167.46	248.24	226.83
24	2034	-	-	-	21.41	21.41	80.78	174.74	255.52	234.11
25	2035	-	-	-	21.41	21.41	80.78	182.03	262.80	241.39
26	2036	-	-	-	21.41	21.41	80.78	189.31	270.08	248.67
27	2037	-	-	-	21.41	21.41	80.78	196.59	277.36	255.95
28	2038	-	-	-	21.41	21.41	80.78	203.87	284.64	263.23
29	2039	-	-	-	21.41	21.41	80.78	211.15	291.92	270.51
30	2040	-	-	-	21.41	21.41	80.78	218.43	299.21	277.80
31	2041	-	-	-	21.41	21.41	80.78	225.71	306.49	285.08
32	2042	-	-	-	21.41	21.41	80.78	232.99	313.77	292.36
33	2043	-	-	-	21.41	21.41	80.78	240.27	321.05	299.64
34	2044	-	-	-	21.41	21.41	80.78	247.55	328.33	306.92
35	2045	-	-	-	21.41	21.41	80.78	254.84	335.61	314.20
36	2046	-	-	-	21.41	21.41	80.78	262.12	342.89	321.48
37	2047	-	-	-	21.41	21.41	80.78	269.40	350.17	328.76
38	2048	-	-	-	21.41	21.41	80.78	276.68	357.45	336.04
39	2049	-	-	-	21.41	21.41	80.78	283.96	364.73	343.32
40	2050	-	-	-	21.41	21.41	80.78	291.24	372.02	350.61
41	2051	-	-	-	21.41	21.41	80.78	298.52	379.30	357.89
42	2052	-	-	-	21.41	21.41	80.78	305.80	386.58	365.17
43	2053	-	-	-	21.41	21.41	80.78	313.08	393.86	372.45
44	2054	-	-	-	21.41	21.41	80.78	320.36	401.14	379.73
45	2055	-	-	-	21.41	21.41	80.78	327.65	408.42	387.01
46	2056	-	-	-	21.41	21.41	80.78	334.93	415.70	394.29
47	2057	-	-	-	21.41	21.41	80.78	342.21	422.98	401.57
48	2058	-	-	-	21.41	21.41	80.78	349.49	430.26	408.85
49	2059	-	-	-	21.41	21.41	80.78	356.77	437.54	416.13
50	2060	-	-	-	21.41	21.41	80.78	364.05	444.83	423.42

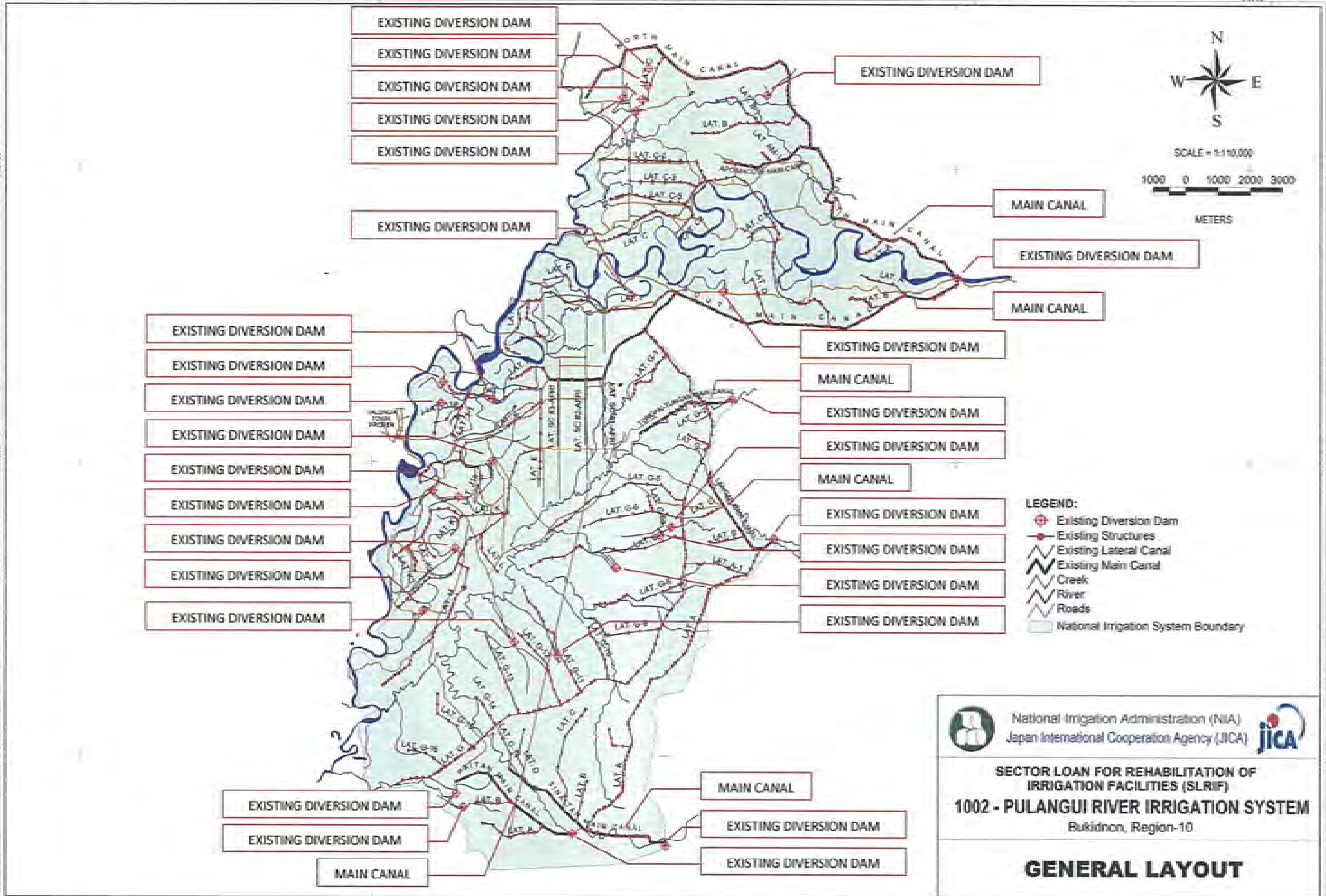
Case-3 (Cost 10% up and Benefit 10% down)

Name of NIS 1002 - Pulangui | Region : 10 IMO RIO Bukidnon

EIRR : 20.9%	Net Present Value (Million PHP)	Benefit	Cost	B/C Ratio	NPV
	(15 % discount rate)	667	482	1.39	186

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	3.49	-	3.49	-	7.28	7.28	3.79
2	2012	-	-	3.49	-	3.49	-	14.56	14.56	11.07
3	2013	193.95	4.09	3.49	-	201.53	-	21.84	21.84	-179.69
4	2014	258.60	5.46	3.49	7.07	274.61	19.39	29.12	48.51	-226.10
5	2015	193.95	4.09	3.49	16.49	218.02	47.66	36.41	84.06	-133.95
6	2016	-	-	-	23.55	23.55	72.70	43.69	116.38	92.83
7	2017	-	-	-	23.55	23.55	78.35	50.97	129.32	105.77
8	2018	-	-	-	23.55	23.55	80.78	58.25	139.02	115.47
9	2019	-	-	-	23.55	23.55	80.78	65.53	146.30	122.75
10	2020	-	-	-	23.55	23.55	80.78	72.81	153.59	130.03
11	2021	-	-	-	23.55	23.55	80.78	80.09	160.87	137.32
12	2022	-	-	-	23.55	23.55	80.78	87.37	168.15	144.60
13	2023	-	-	-	23.55	23.55	80.78	94.65	175.43	151.88
14	2024	-	-	-	23.55	23.55	80.78	101.93	182.71	159.16
15	2025	-	-	-	23.55	23.55	80.78	109.22	189.99	166.44
16	2026	-	-	-	23.55	23.55	80.78	116.50	197.27	173.72
17	2027	-	-	-	23.55	23.55	80.78	123.78	204.55	181.00
18	2028	-	-	-	23.55	23.55	80.78	131.06	211.83	188.28
19	2029	-	-	-	23.55	23.55	80.78	138.34	219.11	195.56
20	2030	-	-	-	23.55	23.55	80.78	145.62	226.40	202.84
21	2031	-	-	-	23.55	23.55	80.78	152.90	233.68	210.13
22	2032	-	-	-	23.55	23.55	80.78	160.18	240.96	217.41
23	2033	-	-	-	23.55	23.55	80.78	167.46	248.24	224.69
24	2034	-	-	-	23.55	23.55	80.78	174.74	255.52	231.97
25	2035	-	-	-	23.55	23.55	80.78	182.03	262.80	239.25
26	2036	-	-	-	23.55	23.55	80.78	189.31	270.08	246.53
27	2037	-	-	-	23.55	23.55	80.78	196.59	277.36	253.81
28	2038	-	-	-	23.55	23.55	80.78	203.87	284.64	261.09
29	2039	-	-	-	23.55	23.55	80.78	211.15	291.92	268.37
30	2040	-	-	-	23.55	23.55	80.78	218.43	299.21	275.65
31	2041	-	-	-	23.55	23.55	80.78	225.71	306.49	282.94
32	2042	-	-	-	23.55	23.55	80.78	232.99	313.77	290.22
33	2043	-	-	-	23.55	23.55	80.78	240.27	321.05	297.50
34	2044	-	-	-	23.55	23.55	80.78	247.55	328.33	304.78
35	2045	-	-	-	23.55	23.55	80.78	254.84	335.61	312.06
36	2046	-	-	-	23.55	23.55	80.78	262.12	342.89	319.34
37	2047	-	-	-	23.55	23.55	80.78	269.40	350.17	326.62
38	2048	-	-	-	23.55	23.55	80.78	276.68	357.45	333.90
39	2049	-	-	-	23.55	23.55	80.78	283.96	364.73	341.18
40	2050	-	-	-	23.55	23.55	80.78	291.24	372.02	348.46
41	2051	-	-	-	23.55	23.55	80.78	298.52	379.30	355.75
42	2052	-	-	-	23.55	23.55	80.78	305.80	386.58	363.03
43	2053	-	-	-	23.55	23.55	80.78	313.08	393.86	370.31
44	2054	-	-	-	23.55	23.55	80.78	320.36	401.14	377.59
45	2055	-	-	-	23.55	23.55	80.78	327.65	408.42	384.87
46	2056	-	-	-	23.55	23.55	80.78	334.93	415.70	392.15
47	2057	-	-	-	23.55	23.55	80.78	342.21	422.98	399.43
48	2058	-	-	-	23.55	23.55	80.78	349.49	430.26	406.71
49	2059	-	-	-	23.55	23.55	80.78	356.77	437.54	413.99
50	2060	-	-	-	23.55	23.55	80.78	364.05	444.83	421.27



National Irrigation Administration (NIA)
Japan International Cooperation Agency (JICA)

SECTOR LOAN FOR REHABILITATION OF IRRIGATION FACILITIES (SLRIF)

1002 - PULANGUI RIVER IRRIGATION SYSTEM

Bukidnon, Region-10

GENERAL LAYOUT

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities
Photograph of Irrigation Facilities

NIS name: Pulangui NIS (Region 10) Date: May 27, 2009

Location / Facility	*Photograph*	*Comments*
01. Lateral 11a N-N-7d 54m 30s E-125d 06m 08s		a) Land converted to corn due to lack of water b) replacement of steel gates, c) construction of canal embankment
02. Lateral 11a Main Farm Ditch or Canal		Construction of concrete line canal or flume to maintain canal elevation and dimension
03. Headgate of Lateral G N-7d 56m 08s E-125d 09m 28s		Rusted steel gate lifting mechanism Construction of canopy and perimeter fence Replacement of steel foundation frame, hinges pins

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities
Photograph of Irrigation Facilities

NIS name: Pulangui NIS (Region 10) Date: May 27, 2009

Location / Facility	*Photograph*	*Comments*
04 South Main Canal N-7d 56m 16s E-125d 12m 04s		a)Repair of damaged canal lining about 15m, b) Replacement of scoured inlet and outlet protection works
05. South Main Canal N-7d 56m 18s E-125d 12m 16s		a)Construction of drainage inlet structure, b) Repair of concrete canal lining c) Construction of Wasteway structure downstream and long drainage culvert beneath farmland (avoiding ROW problems) towards to
06. Headgate Lateral C N-7d 56m 15s E-125d 12m 32s		a)Repair of damaged downstream canal lining, b) Construction of additional embankment to protect from water backflow and overflowing c)Repair of steelgates

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities
Photograph of Irrigation Facilities

NIS name: Pulangui NIS (Region 10) Date: May 27, 2009

Location / Facility	Photograph	Comments
07. Lateral C Siphon Structure N-7d 58m 13s E-125d 11m 21s		a)Stop quarrying activities of sand and gravel downstream of the diversion dam, bridge, and siphon site regardless of distance
08. Lateral C Siphon Structure N-7d 58m 13s E-125d 11m 21s		a)Construction of wasteway at the inlet of the siphon as protective structure to avoid water overflowing the canal
09. Lateral C Siphon Structure Site N-7d 58m 13s E-125d 11m 21s		a)Construction of bank and bottom protection so as not to erode canal embankment due to quarrying activities b) Stop quarrying activities of sand and gravel downstream of the diversion dam, bridge, and siphon site regardless of distance

THE REPUBLIC OF PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION

Sector Loan on Rehabilitation of Irrigation Facilities

NIS SUMMARY REPORT

1003
Muleta RIS
Region 10
Bukidnon Province

July 2009

Survey Team for
Japan International Cooperation Agency
(JICA)

Features of NIS for Rehabilitation Project

1. General

Item		*Description*	
1) Name of NIS	**Muleta RIS**		Code: 1003
2) Location	Region	Region 10	
	Province	Bukidnon	
	Municipality	Maramag, Don Carlos	
	Distance	65 km from Malaybalay (Capital of Province)	
3) Type of Water Source	Water Source	Rivers and Creeks	
	Type	Diversion Dam (39.00 m wide, 3.5 m high)	
4) Area	Service Area	6,060 ha	
	FUSA	1,800 ha	
5) Beneficiary Farmers	983 farmers	Average paddy field cultivating size = 1.83 ha per farmer	
6) Irrigator's Association	IAs established = 8 FIA established = 1 in 2008		
7) Features of NIS and Necessity of the project	Muleta NIS was operated on 1990, almost all irrigation canals are concrete lined. Since the start of the operation, there are no major rehabilitation works introduced to the system. Despite of the all concrete lined canal, still it cannot close to irrigate the 6,060 hectares due to following reasons: 1. Irrigable areas which are part of the service are not generated with irrigation facilities, 2. Almost half of the irrigable areas need land development or leveling due to undulating terrain of the topography of the area 3. Water supply shortage due remarkable watershed denudation 4. Farmers divert crop cultivation from rice to other crops Before, some farmers diverted its cultivation from rice to corn, sugar cane, and banana due to high market compared to rice. At present, there are promising increases in rice cultivation in the area due to increase in price of rice palay at farm level. Further, based on interaction with farmers and inhabitants, they are willing to cultivate rice again if there is sustainable water supply. NIA constructed four (4) small diversion works to augment the irrigation water supply requirement, and the utilization of drainage water for "RE-USE", but still water supply is inadequate during long drought. Conversion of Dologon Check Dam to Small Reservoir could help sustain the water requirement. The rehabilitation project is necessary for restoring the 650 hectares to boost rice production in the region and also increase potential production of banana, corn, and sugar cane. As to environmental aspect, involvement of the IA, BLGU, and MLGU is not strong on the protection of irrigation and drainage facilities and conservation of watersheds. This project shall strategize collaboration with the beneficiaries and local governments to promote environment awareness and build strong policy for smooth implementation.		
8) Outline of the Proposed Project	A. Engineering 1. Repair of diversion dam 2. Repair and improvement of irrigation canal and structures 3. Repair and improvement of drainage canal and structures 4. Repair and improvement of service roads 5. Repair and improvement of on-farm facilities		

	6. Repair and construction of IMT support facilities-IA Bldg solar drier, warehouse with IA building 7. Development and establishment of IMT GIS database B. Institutional Strengthening Program B. 1 Basic Program 1. Reactivation of FIA/IA and Strengthening of Irrigation System Management Committee (ISMC) of NIS including construction of IMT support facilities 2. Strengthening of NIA – IA – LGUs Partnership 3. Strengthening NIA Institutional Capacity B.2 Specific Program to strengthen institutional mechanism together with LGUs 1. Improvement of watershed management
9) Proposed Project Component	A. Engineering 1. Construction of civil works for rehabilitation of diversion works, canal system, drainage system, roads, and IMT support facilities. B. Institutional Strengthening Program 1. Reactivation of FIAs/IAs including reformation of TSGA / IA / FIA areas, construction of IMT support facilities (demand base) 2. Strengthening NIA-IA- LGUs Partnership, especially coordination RDC, RAFC/PAFC with FIAs/IAs and ISMC 3. Institutional development program to strengthen management capacity of NIA field offices and IAs.
10) Project Cost (Direct cost only, excluding escalation, contingency, tax)	1. Direct cost — PHP 123.69 Million - *Civil Works* — *PHP 115.21 Million* - *Institutional Development* — *PHP 6.00 Million* - *Engineering Services* — *PHP 2.47 Million* 2. Indirect cost — PHP 11.07 Million **Total Project Cost (1+2) — PHP 134.75 Million** **Cost per ha — PHP 74,863.00 per ha.**
11) Project Benefit	1. To increase paddy production by 3,441 tons/year 2. To increase farmers' net income to PHP54,434.00 /ha/year 3. To establish functional and self-reliant IAs 4. To improve performance of NIS
12) Project Justification	EIRR = 25.6%, B/C = 1.67 (discount rate 15%)

2. **Project History** (Construction/Rehabilitation)

Year	*Description*
2004	Repair of the Irrigation System funded by GOP
2005	Repair of the Irrigation System funded by GOP
2006	No repair works due to no allocation for the system
2007	Repair and rehabilitation of the system funded by GOP loan to NDC
2008	Repair and rehabilitation of the system funded by GOP loan to NDC

3. Present Condition

3.1 Natural Conditions

Item	*Description*
1) Annual Rainfall	2,061.80 mm
2) Seasons	Wet season: from May to September , Dry season: from November to March
3) Dominant Soil in NIS Area	Clay loam
4) Topography	Undulating with slope ranging from 5% to 8% in Northern part and relatively flat at the Southern area

3.2 Socio-economy (Region/Province)

Item	*Description*
1) GRDP	PHP 310,186 million (Year 2007), Per Capita GRDP = PHP 75,883 per year
2) Population	1,190,284 (province)
3) Population Growth Rate	1.61 % per year (province)
4) Labor Force	2,622,000 (region)
5) Poverty Population	37.2 % to total population (region)

3.3 Present Agriculture in NIS

Item	*Description*					
1) Farmhousehold in NIS	Total (cultivating)	983 households				
	Land owners	900 households (91.6 %)				
	Tenant farmers	83 households (8.4 %)				
2) Paddy Field Size in NIS	1.83 ha per household (FUSA/Total beneficiaries as of 2008)					
3) Present Land Use in NIS	Paddy field planted	1,369 ha	22.8 %	As of 2008		
	Paddy field not planted	431 ha	7.2 %	As of 2008		
	Upland crop field	0 ha	0.0 %			
	Permanent crop field	0 ha	0.0 %			
	Undeveloped area	0 ha	0.0 %			
	Built-up area	0 ha	0.0 %			
	High ground	0 ha	0.0 %			
	Grassland	0 ha	0.0 %			
	Swamp	0 ha	0.0 %			
	Unspecified area	4,200 ha	70.0 %	No data in response		
4) Paddy Field in FUSA (ha)	1,800					
5) Paddy Cropped Area (ha)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Wet Season	1,419	1,630	1,485	1,430	1,369	1,467
Dry Season	1,401	1,431	1,646	1,558	1,354	1,478
6) Cropping Intensity (%)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
(per year)	157	170	174	166	151	164
7) Unit Yield of Paddy (ton/ha)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Wet Season	3.50	3.60	3.75	3.90	3.90	3.73
Dry Season	3.50	3.60	3.50	3.75	3.75	3.62
8) Paddy Production (ton)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Wet Season	4,967	5,868	5,569	5,577	5,339	5,464
Dry Season	4,904	5,152	5,761	5,843	5,078	5,347

3.4 Water Resources

Item	*Description*
1) Name of Rivers	Muleta River
2) Catchment Area at Dam	222 km^2
3) Ave. River Discharge	8.35 m^3/s
4) Ave. Dry Season Discharge	8.70 m^3/s
5) Diverted Intake Discharge	2.48 m^3/s
6) Water Requirement	3.24 m^3/s
7) Sedimentation	High

3.5 Existing Irrigation System

Item	*Description*
1) Diversion Dam	Overflow crest width 30 m, Dam height 3.5 m Dam width 39 m
2) Main Canal	Total length 52.13 km (Lined portion 52.13
3) Lateral Canals	Total length 38.49 km (Lined portion 38.49 km)
4) On-farm facilities	Total length 60.00 km (Lined portion 0.0 km Turn-outs = 60 units
5) Drainage Canal	Total length 15.00 kms.
6) Canal Structures	No. = 124 units (Damaged = 25 units)
7) Drainage Structures	No. = 50 units (Damaged = 25 units
8) Farm roads	Total length 91.52 km
9) Flood Protection Dike	Total length 0.50 km
10) Water Masters Quarter	No. 5 units
11) Gate Keepers Quarter	No. 5 units

3.6 Institutions for O&M of NIS

Item	*Description*					
1) Regional Irrigation Office	Name: Region 10- Northern Mindanao					
2) IMO	Name: Bukidnon IMO					
Staff in 2009	Total number of staff: 89					
3) Irrigator' Association (IA)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Number of FIA (nos)					1	
Number of IA (nos)					8	
Number of TSAG (nos)	21	21	21	20	20	21
Functionality of IA	75.8	79.1	74.7	77.0	79.1	77.1
Collection of ISF (wet, %)	76	52	61	73	70	67
Collection of ISF (dry, %)	45	64	57	63	61	58
4) NIS Category based on IA 2008 O&M Contract (NIA-IA)	No. of IA					
Category A	2					
Category B	6					
Category C	0					

3.7 Existing Problems

Item	*Description*
1) Diversion Works	1. Quarrying of sand and gravel at the downstream of the Dam 2. Damaged rubber seal of the sluice gate 3. Eroded downstream side slope protection works 4. Dilapidated water masters quarter 5. Slow lifting of gate at sluiceway due to manual operation 6. Unprotected intake gates from weather 7. San Miguel Check, bridge slab has no railing protection from commuters and transport vehicles

Item	*Description*
	8. Un-improved 300m roadway from highway to Kulaman Check/Dam 9. Rusted foundation frame of lifting mechanism of sluice gate.
2) Canal and Structures	1. Siltation of canal due run-off from outside hill slope erosion 2. Uncontrolled water flowing to main canal from excess water of communal irrigation located at the adjacent area 3. Embankment collapse along roadway right side due to erosion at outlet of drainage structure 4. Damaged canal due to overflow of uncontrolled water from the canal and due to wallowing of carabao 5. Entering of sewer, domestic wate, and rainfall runoff from highway mixed with oil, gasoline crude, residue and dust 6. Damaged and leaking siphon manhole and no provision of bridge to access the other side of the bank at Taganibong Creek
3) Drainage Canal	1. Silted drainage canal and collapsed of side slope berm 2. Sugar cane are blocking the inlet culvert the causes drain water to overflow roadways 3. Domestic waste and garbage are thrown in the drainage canal and drainage water is "re-used" for irrigation 4. Wallowing of carabao in the canal causes the side slope to collapse
4) Other Project Facilities (road, bridge, flood dike, building, etc)	1. Service roads along canal needs grading, crown formation, and gravel surfacing 2. Access roads or roads linking from one canal to another should be constructed or repaired
5) Water Management and O&M Activities	1. Lack of staff gages at diversion dam, intake, headgates of lateral and turnout level 2. No water management instruments like current meter, rain gages, and evaporation pan 3. Lack of technical basis or geodetic ground survey on the actual area for Land Classification (e.g. rice area, permanent crops, high ground, built-up area, swamp area, undeveloped area, etc)
6) Status of NIS and IA Management	Status Type Ac evaluated by Radar Graph. Specific problems are: 1. Low ISF collection efficiency during dry and wet seasons at 45% and 55%, respectively 2. Medium paddy yield during wet and dry seasons at 85 and 93 cavans/ha, respectively
7) Watershed Management	1. Lack of support from LGU on watershed conservation
8) Coordination with LGU and Agencies concerned	1. Minimum coordination by NIA's field offices and IAs with concerned LGUs on specific problem such as watershed management
9) Agriculture	1. Inadequate number post harvest facilities particularly dryers. 2. Insufficient number of credit facilities to service the farmer beneficiaries. 3. High prices of farm inputs while low price for farm products.

4. Proposed Rehabilitation Plan

4.1 Agricultural Development Plan

Item	*Description*			
Cropping schedule	*Wet Season*	*Dry Season-1*	*Dry Season-2*	*Annual*
1) Type of Crops	Paddy	Paddy	-	-
2) Cropping Area (ha)	1,800	1640	-	-
3) Target Unit Yield (ton/ha)	4.10	3.95	-	-
3) Total Production (ton)	7,380	6,478	-	-

4.2 Civil Works

Item	*Description*
1) Diversion Works	1. Construction of Canopy/Roofing for Intake Lifting Mechanism and fence, 2. Installation of engine to drive Lifting Mechanism of Intake Gate, 3. Replacement of Rubber Seal for Sluiceway Gates, 4. Minor rehabilitation of Gatekeepers Quarter
2) Canal Structures	1. Construction of slab bridge at siphon site - 25 units
3) Canalization	1. Restore top bank elevation of canal embankment both roadway and auxiliary berm – 1.7 kms 2. Repair of damaged canal lining 3. Realignment of canals 4. Construction of new canals
4) Drainage Structures	1. Restore and increase length of the inlet and outlet stone protection – 25 units 2. Provide silt interceptor drain
5) Drainage Canalization	1. Improve drainage by desilting drainage canal – 15 kms
6) Service Roads	1. Construct 300 m road pavement along the entrance of the Dam from national highway towards the Damsite – 91.5 kms
7) On-Farm Facilities	1. Concrete lining of main farm ditch – 60 kms 2. Repair of turnout scour protection works – 36 units 3. Construct additional turnout with steel gates 4. Replace stolen gates 5. Provide culvert farm crossing structure 6. Provide wallowing pond 7. Repair /replacement of dilapidated turn out steel gates 8. Construction of new turn outs and farm ditches
8) IMT Support Facilities	1. Construction of post-harvest facilities—warehouses, IA buildings, solar driers with shed – 1 set
9) IMT GIS Database	1. Development and establishment of GIS database

4.3 Institutional Strengthening Program

Item	*Description*
1) Reactivation Program of FIAs/IAs and System Management Committee (ISMC)	1. Executing body : Project Management Office with assistance of Consultant 2. Schedule: 34 months / NIS 3. Counter body for execution: NIA Regional Office and IMO office 4. Attendant / Trainee: President of FIAs/IAs and secretary group, staff of NIA RIO/IMO, Chairmen of ISMC and Secretary group and LGUs officers, 5. Contents: a) Survey & Study by Consultant b) Workshops on coordination activities with and dissemination on reformation plan to FIAs/IAs c) Workshop on coordination activities with LGUs d) Organization and Legal Registration of FIAs/IAs to be re-active and reactivation of SMC e) Construction of IMT support facilities for FIAs/CIA f) Workshop and Training of FIAs/IAs members on management under the IMT g) Assessment/Evaluation for and Negotiation of Contracting under IMT h) Assistance of reactivated IAs/FIAs in organizational and management activities
2) Strengthening Program of NIA - IA - LGU Partnership	1. Executing body : Project Management Office with assistance of Consultant, & Management System Committee (MSC) of NIS 2. Schedule: 7 months / NIS 3. Counter body for execution: Regional Development Council with Secretary of NEDA Regional Office 4. Attendant / Trainee: Secretaries of Regional Organizations, LGUs officers, President of FIAs/IAs and secretary group, staff of NIA RIO/IMO, Chairmen of ISMC and Secretary group

Item	*Description*
	5. Contents: a) Workshop on Trouble Shooting of NIS and FIAs/ISs' Management b) Provision of work space for ISMC including office facilities
3) NIA Institutional Strengthening Program	1. Executing body : Institutional Development Division of CO, NIA 2. Schedule: 7 months / NIS 3. Counter body for execution: NIA Regional Office and IMO office 4. Attendant / Trainee: NIA personnel at CO, RIO and IMO 5. Contents: a. Capability built-up program (Central and Regional NIA Offices) b. Improvement program on management mechanism of NIA c. Support program for IMT implementation d. Strengthening program of Integrated Management information System
4) Specific Program on watershed management plan	1. Strengthening coordination with RDC, RAFC/PAFC and LGUs concerned through works shop on dissemination of the SLRIF to these organizations. 2. Strengthening coordination with RDC, RAFC/PAFC and LGUs on training program of watershed management

4.4 Proposed Counter Schemes

Item	*Description*
1) DENR	1. Technical assistance to concerned Provincial/municipal LGUs on watershed rehabilitation and management such as establishment of nurseries, community-based livelihood for upland dwellers and relocation plan for informal settlers
2) LGU	-

5. Cost Estimate for Initial Investment

Item	*Description*		
1) Direct Cost for Civil Works	A. Mobilization	Php	2.47 Million
	B. Protection Dikes		-
	C. Diversion Works	Php	25.00 Million
	D. Canal Structures	Php	3.80 Million
	E. Canalization	Php	8.97 Million
	F. Drainage Structures	Php	3.60 Million
	G. Drainage Canalization	Php	10.53 Million
	H. Roads	Php	38.54 Million
	I. On-Farm Facilities/T.O. Gates	Php	5.50 Million
	J. IMT Support Facilities	Php	15.00 Million
	K. IMT GIS Database	Php	1.80 Million
	L. Institutional Development (5% of Direct Cost)	Php	6.00 Million
	M. Feasibility Studies & Detailed Engineering (2% of Direct Cost)	Php	2.47 Million
	Sub-total (Direct Cost)	Php	123.69 Million
2) Indirect Cost	A. General Engineering Supervision and Administration (3.5% of Direct Cost)	Php	4.33 Million
	B. NIA Management Fee (5% of Total Project Cost)	Php	6.74 Million
	Sub-total (Indirect Cost)	Php	11.07 Million
3) Total Project Cost	= 1+2	Php	134.75 Million
Cost per ha.		Php	74,863.00 /ha.

6. Implementation Plan

Item	*Description*
1) Contract package	1 - Local Competitive Bidding (LCB)
2) Implementation Schedule	
a) Civil Works	
1) Survey, F/S, Design	21 months
2) Tendering	6 months
3) Construction	36 months
b) Institutional Improvement Works	
1) Reactivation Program of FIAs/IAs and Irrigation System Management Committee	34 months
2) NIA-IA-LGU Partnership	7 months
3) Strengthening of NIA staff	7 months

7. Project Evaluation

Item		*Description*	
1) Economic evaluation			
EIRR (Base)		EIRR = 25.6 %	: Project life 50 years
Sensitivity	Case-1	EIRR = 23.2 %	: Cost 10% up
	Case-2	EIRR =22.9 %	: Benefit 10% down
	Case-3	EIRR = 20.7%	: Cost 10% up + Benefit 10% down
B/C		1.67	: discount rate 15% p.a.
NPV		PHP 55 million	: discount rate 15% p.a.
2) Financial evaluation		Farmer's net income increase = PHP 21,714 per ha per year	
3) Expected Impacts		1. Increased farmers' income 2. Increased rice self sufficiency of the country 3. Increased job opportunities in rural areas	

8. Environmental Aspects

Item	*Description*
1) Environmental aspect	1. Collaboration with DENR, DA, LGU, IA on the following: a) Conservation of Watersheds Programs b) Slope protection for reduction of siltation c) Municipal ordinance on prohibition of illegal domestic disposal d) Moratorium on quarry of sand and gravel at downstream of the Dam regardless of distance
2) Relocation of houses	none
3) Land acquisition	none

Table 1003 - Muleta Economic Evaluation (EIRR)

Basic Case

Name of NIS 1003 - Muleta | Region : 10 | IMO RIO Bukidnon

EIRR : 25.6%	Net Present Value (Million PHP) (15 % discount rate)	Benefit	Cost	B/C Ratio	NPV
		137	82	1.67	55

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011			0.59		0.59		1.04	1.04	0.45
2	2012			0.59		0.59		2.08	2.08	1.49
3	2013	33.48	0.98	0.59		35.06		3.12	3.12	-31.94
4	2014	44.64	1.31	0.59	1.10	47.64	5.50	4.16	9.66	-37.98
5	2015	33.48	0.98	0.59	2.56	37.61	13.52	5.20	18.72	-18.89
6	2016				3.65	3.65	20.62	6.24	26.86	23.21
7	2017				3.65	3.65	22.22	7.28	29.50	25.85
8	2018				3.65	3.65	22.91	8.32	31.23	27.58
9	2019				3.65	3.65	22.91	9.36	32.27	28.62
10	2020				3.65	3.65	22.91	10.40	33.31	29.66
11	2021				3.65	3.65	22.91	11.44	34.35	30.70
12	2022				3.65	3.65	22.91	12.48	35.39	31.74
13	2023				3.65	3.65	22.91	13.52	36.43	32.78
14	2024				3.65	3.65	22.91	14.56	37.47	33.82
15	2025				3.65	3.65	22.91	15.60	38.51	34.86
16	2026				3.65	3.65	22.91	16.64	39.55	35.90
17	2027				3.65	3.65	22.91	17.68	40.59	36.94
18	2028				3.65	3.65	22.91	18.72	41.63	37.98
19	2029				3.65	3.65	22.91	19.76	42.67	39.02
20	2030				3.65	3.65	22.91	20.80	43.71	40.06
21	2031				3.65	3.65	22.91	21.84	44.75	41.10
22	2032				3.65	3.65	22.91	22.88	45.79	42.14
23	2033				3.65	3.65	22.91	23.92	46.83	43.18
24	2034				3.65	3.65	22.91	24.96	47.87	44.22
25	2035				3.65	3.65	22.91	26.00	48.91	45.26
26	2036				3.65	3.65	22.91	27.04	49.95	46.30
27	2037				3.65	3.65	22.91	28.08	50.99	47.34
28	2038				3.65	3.65	22.91	29.12	52.03	48.38
29	2039				3.65	3.65	22.91	30.16	53.07	49.42
30	2040				3.65	3.65	22.91	31.20	54.11	50.46
31	2041				3.65	3.65	22.91	32.24	55.15	51.50
32	2042				3.65	3.65	22.91	33.28	56.19	52.54
33	2043				3.65	3.65	22.91	34.32	57.23	53.58
34	2044				3.65	3.65	22.91	35.36	58.27	54.62
35	2045				3.65	3.65	22.91	36.40	59.31	55.66
36	2046				3.65	3.65	22.91	37.44	60.35	56.70
37	2047				3.65	3.65	22.91	38.48	61.39	57.74
38	2048				3.65	3.65	22.91	39.52	62.43	58.78
39	2049				3.65	3.65	22.91	40.56	63.47	59.82
40	2050				3.65	3.65	22.91	41.60	64.51	60.86
41	2051				3.65	3.65	22.91	42.64	65.55	61.90
42	2052				3.65	3.65	22.91	43.68	66.59	62.94
43	2053				3.65	3.65	22.91	44.72	67.63	63.98
44	2054				3.65	3.65	22.91	45.76	68.67	65.02
45	2055				3.65	3.65	22.91	46.80	69.71	66.06
46	2056				3.65	3.65	22.91	47.84	70.75	67.10
47	2057				3.65	3.65	22.91	48.88	71.79	68.14
48	2058				3.65	3.65	22.91	49.92	72.83	69.18
49	2059				3.65	3.65	22.91	50.96	73.87	70.22
50	2060				3.65	3.65	22.91	52.00	74.91	71.26

Case-1 (Cost 10% up)

Name of NIS 1003 - Muleta | Region : 10 | IMO RIO Bukidnon

EIRR : 23.2%	Net Present Value (Million PHP) (15 % discount rate)	Benefit	Cost	B/C Ratio	NPV
		137	90	1.52	47

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	0.65	-	0.65	-	1.04	1.04	0.39
2	2012	-	-	0.65	-	0.65	-	2.08	2.08	1.43
3	2013	36.82	1.08	0.65	-	38.56	-	3.12	3.12	-35.44
4	2014	49.10	1.44	0.65	1.20	52.40	5.50	4.16	9.66	-42.74
5	2015	36.82	1.08	0.65	2.81	41.37	13.52	5.20	18.72	-22.65
6	2016	-	-	-	4.02	4.02	20.62	6.24	26.86	22.84
7	2017	-	-	-	4.02	4.02	22.22	7.28	29.50	25.49
8	2018	-	-	-	4.02	4.02	22.91	8.32	31.23	27.22
9	2019	-	-	-	4.02	4.02	22.91	9.36	32.27	28.26
10	2020	-	-	-	4.02	4.02	22.91	10.40	33.31	29.30
11	2021	-	-	-	4.02	4.02	22.91	11.44	34.35	30.34
12	2022	-	-	-	4.02	4.02	22.91	12.48	35.39	31.38
13	2023	-	-	-	4.02	4.02	22.91	13.52	36.43	32.42
14	2024	-	-	-	4.02	4.02	22.91	14.56	37.47	33.46
15	2025	-	-	-	4.02	4.02	22.91	15.60	38.51	34.50
16	2026	-	-	-	4.02	4.02	22.91	16.64	39.55	35.54
17	2027	-	-	-	4.02	4.02	22.91	17.68	40.59	36.58
18	2028	-	-	-	4.02	4.02	22.91	18.72	41.63	37.62
19	2029	-	-	-	4.02	4.02	22.91	19.76	42.67	38.66
20	2030	-	-	-	4.02	4.02	22.91	20.80	43.71	39.70
21	2031	-	-	-	4.02	4.02	22.91	21.84	44.75	40.74
22	2032	-	-	-	4.02	4.02	22.91	22.88	45.79	41.78
23	2033	-	-	-	4.02	4.02	22.91	23.92	46.83	42.82
24	2034	-	-	-	4.02	4.02	22.91	24.96	47.87	43.86
25	2035	-	-	-	4.02	4.02	22.91	26.00	48.91	44.90
26	2036	-	-	-	4.02	4.02	22.91	27.04	49.95	45.94
27	2037	-	-	-	4.02	4.02	22.91	28.08	50.99	46.98
28	2038	-	-	-	4.02	4.02	22.91	29.12	52.03	48.02
29	2039	-	-	-	4.02	4.02	22.91	30.16	53.07	49.06
30	2040	-	-	-	4.02	4.02	22.91	31.20	54.11	50.10
31	2041	-	-	-	4.02	4.02	22.91	32.24	55.15	51.14
32	2042	-	-	-	4.02	4.02	22.91	33.28	56.19	52.18
33	2043	-	-	-	4.02	4.02	22.91	34.32	57.23	53.22
34	2044	-	-	-	4.02	4.02	22.91	35.36	58.27	54.26
35	2045	-	-	-	4.02	4.02	22.91	36.40	59.31	55.30
36	2046	-	-	-	4.02	4.02	22.91	37.44	60.35	56.34
37	2047	-	-	-	4.02	4.02	22.91	38.48	61.39	57.38
38	2048	-	-	-	4.02	4.02	22.91	39.52	62.43	58.42
39	2049	-	-	-	4.02	4.02	22.91	40.56	63.47	59.46
40	2050	-	-	-	4.02	4.02	22.91	41.60	64.51	60.50
41	2051	-	-	-	4.02	4.02	22.91	42.64	65.55	61.54
42	2052	-	-	-	4.02	4.02	22.91	43.68	66.59	62.58
43	2053	-	-	-	4.02	4.02	22.91	44.72	67.63	63.62
44	2054	-	-	-	4.02	4.02	22.91	45.76	68.67	64.66
45	2055	-	-	-	4.02	4.02	22.91	46.80	69.71	65.70
46	2056	-	-	-	4.02	4.02	22.91	47.84	70.75	66.74
47	2057	-	-	-	4.02	4.02	22.91	48.88	71.79	67.78
48	2058	-	-	-	4.02	4.02	22.91	49.92	72.83	68.82
49	2059	-	-	-	4.02	4.02	22.91	50.96	73.87	69.86
50	2060	-	-	-	4.02	4.02	22.91	52.00	74.91	70.90

Table 1003 - Muleta Economic Evaluation (EIRR)

Case-2 (Benefit 10% down)

Name of NIS 1003 - Muleta | Region: 10 IMO,RIO Bukidnon

EIRR : 22.9%	Net Present Value (Million PHP)	Benefit	Cost	B/C Ratio	NPV
	(15 % discount rate)	123	82	1.51	41

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	0.59	-	0.59	-	0.94	0.94	0.34
2	2012	-	-	0.59	-	0.59	-	1.87	1.87	1.28
3	2013	33.48	0.98	0.59	-	35.06	-	2.81	2.81	-32.25
4	2014	44.64	1.31	0.59	1.10	47.64	4.95	3.74	8.69	-38.94
5	2015	33.48	0.98	0.59	2.56	37.61	12.17	4.68	16.85	-20.76
6	2016	-	-	-	3.65	3.65	18.56	5.62	24.17	20.52
7	2017	-	-	-	3.65	3.65	20.00	6.55	26.55	22.90
8	2018	-	-	-	3.65	3.65	20.62	7.49	28.11	24.46
9	2019	-	-	-	3.65	3.65	20.62	8.42	29.04	25.39
10	2020	-	-	-	3.65	3.65	20.62	9.36	29.98	26.33
11	2021	-	-	-	3.65	3.65	20.62	10.30	30.92	27.27
12	2022	-	-	-	3.65	3.65	20.62	11.23	31.85	28.20
13	2023	-	-	-	3.65	3.65	20.62	12.17	32.79	29.14
14	2024	-	-	-	3.65	3.65	20.62	13.10	33.72	30.07
15	2025	-	-	-	3.65	3.65	20.62	14.04	34.66	31.01
16	2026	-	-	-	3.65	3.65	20.62	14.98	35.60	31.95
17	2027	-	-	-	3.65	3.65	20.62	15.91	36.53	32.88
18	2028	-	-	-	3.65	3.65	20.62	16.85	37.47	33.82
19	2029	-	-	-	3.65	3.65	20.62	17.78	38.40	34.75
20	2030	-	-	-	3.65	3.65	20.62	18.72	39.34	35.69
21	2031	-	-	-	3.65	3.65	20.62	19.66	40.28	36.63
22	2032	-	-	-	3.65	3.65	20.62	20.59	41.21	37.56
23	2033	-	-	-	3.65	3.65	20.62	21.53	42.15	38.50
24	2034	-	-	-	3.65	3.65	20.62	22.46	43.08	39.43
25	2035	-	-	-	3.65	3.65	20.62	23.40	44.02	40.37
26	2036	-	-	-	3.65	3.65	20.62	24.34	44.96	41.31
27	2037	-	-	-	3.65	3.65	20.62	25.27	45.89	42.24
28	2038	-	-	-	3.65	3.65	20.62	26.21	46.83	43.18
29	2039	-	-	-	3.65	3.65	20.62	27.14	47.76	44.11
30	2040	-	-	-	3.65	3.65	20.62	28.08	48.70	45.05
31	2041	-	-	-	3.65	3.65	20.62	29.02	49.64	45.99
32	2042	-	-	-	3.65	3.65	20.62	29.95	50.57	46.92
33	2043	-	-	-	3.65	3.65	20.62	30.89	51.51	47.86
34	2044	-	-	-	3.65	3.65	20.62	31.82	52.44	48.79
35	2045	-	-	-	3.65	3.65	20.62	32.76	53.38	49.73
36	2046	-	-	-	3.65	3.65	20.62	33.70	54.32	50.67
37	2047	-	-	-	3.65	3.65	20.62	34.63	55.25	51.60
38	2048	-	-	-	3.65	3.65	20.62	35.57	56.19	52.54
39	2049	-	-	-	3.65	3.65	20.62	36.50	57.12	53.47
40	2050	-	-	-	3.65	3.65	20.62	37.44	58.06	54.41
41	2051	-	-	-	3.65	3.65	20.62	38.38	59.00	55.35
42	2052	-	-	-	3.65	3.65	20.62	39.31	59.93	56.28
43	2053	-	-	-	3.65	3.65	20.62	40.25	60.87	57.22
44	2054	-	-	-	3.65	3.65	20.62	41.18	61.80	58.15
45	2055	-	-	-	3.65	3.65	20.62	42.12	62.74	59.09
46	2056	-	-	-	3.65	3.65	20.62	43.06	63.68	60.03
47	2057	-	-	-	3.65	3.65	20.62	43.99	64.61	60.96
48	2058	-	-	-	3.65	3.65	20.62	44.93	65.55	61.90
49	2059	-	-	-	3.65	3.65	20.62	45.86	66.48	62.83
50	2060	-	-	-	3.65	3.65	20.62	46.80	67.42	63.77

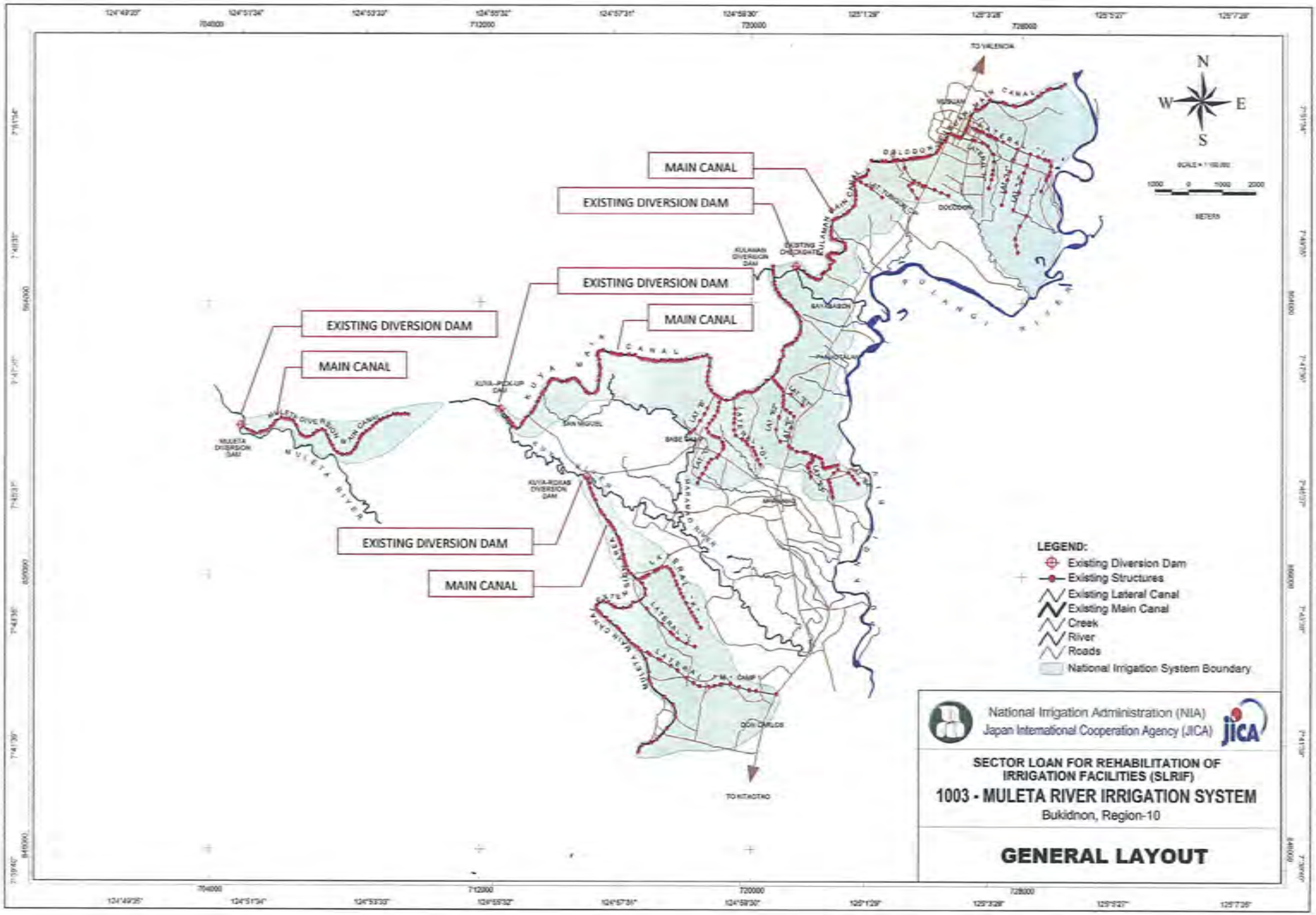
Case-3 (Cost 10% up and Benefit 10% down)

Name of NIS 1003 - Muleta | Region: 10 IMO,RIO Bukidnon

EIRR : 20.7%	Net Present Value (Million PHP)	Benefit	Cost	B/C Ratio	NPV
	(15 % discount rate)	123	90	1.37	33

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	0.65	-	0.65	-	0.94	0.94	0.28
2	2012	-	-	0.65	-	0.65	-	1.87	1.87	1.22
3	2013	36.82	1.08	0.65	-	38.56	-	2.81	2.81	-35.75
4	2014	49.10	1.44	0.65	1.20	52.40	4.95	3.74	8.69	-43.71
5	2015	36.82	1.08	0.65	2.81	41.37	12.17	4.68	16.85	-24.53
6	2016	-	-	-	4.02	4.02	18.56	5.62	24.17	20.16
7	2017	-	-	-	4.02	4.02	20.00	6.55	26.55	22.54
8	2018	-	-	-	4.02	4.02	20.62	7.49	28.11	24.09
9	2019	-	-	-	4.02	4.02	20.62	8.42	29.04	25.03
10	2020	-	-	-	4.02	4.02	20.62	9.36	29.98	25.96
11	2021	-	-	-	4.02	4.02	20.62	10.30	30.92	26.90
12	2022	-	-	-	4.02	4.02	20.62	11.23	31.85	27.84
13	2023	-	-	-	4.02	4.02	20.62	12.17	32.79	28.77
14	2024	-	-	-	4.02	4.02	20.62	13.10	33.72	29.71
15	2025	-	-	-	4.02	4.02	20.62	14.04	34.66	30.64
16	2026	-	-	-	4.02	4.02	20.62	14.98	35.60	31.58
17	2027	-	-	-	4.02	4.02	20.62	15.91	36.53	32.52
18	2028	-	-	-	4.02	4.02	20.62	16.85	37.47	33.45
19	2029	-	-	-	4.02	4.02	20.62	17.78	38.40	34.39
20	2030	-	-	-	4.02	4.02	20.62	18.72	39.34	35.32
21	2031	-	-	-	4.02	4.02	20.62	19.66	40.28	36.26
22	2032	-	-	-	4.02	4.02	20.62	20.59	41.21	37.20
23	2033	-	-	-	4.02	4.02	20.62	21.53	42.15	38.13
24	2034	-	-	-	4.02	4.02	20.62	22.46	43.08	39.07
25	2035	-	-	-	4.02	4.02	20.62	23.40	44.02	40.00
26	2036	-	-	-	4.02	4.02	20.62	24.34	44.96	40.94
27	2037	-	-	-	4.02	4.02	20.62	25.27	45.89	41.88
28	2038	-	-	-	4.02	4.02	20.62	26.21	46.83	42.81
29	2039	-	-	-	4.02	4.02	20.62	27.14	47.76	43.75
30	2040	-	-	-	4.02	4.02	20.62	28.08	48.70	44.68
31	2041	-	-	-	4.02	4.02	20.62	29.02	49.64	45.62
32	2042	-	-	-	4.02	4.02	20.62	29.95	50.57	46.56
33	2043	-	-	-	4.02	4.02	20.62	30.89	51.51	47.49
34	2044	-	-	-	4.02	4.02	20.62	31.82	52.44	48.43
35	2045	-	-	-	4.02	4.02	20.62	32.76	53.38	49.36
36	2046	-	-	-	4.02	4.02	20.62	33.70	54.32	50.30
37	2047	-	-	-	4.02	4.02	20.62	34.63	55.25	51.24
38	2048	-	-	-	4.02	4.02	20.62	35.57	56.19	52.17
39	2049	-	-	-	4.02	4.02	20.62	36.50	57.12	53.11
40	2050	-	-	-	4.02	4.02	20.62	37.44	58.06	54.04
41	2051	-	-	-	4.02	4.02	20.62	38.38	59.00	54.98
42	2052	-	-	-	4.02	4.02	20.62	39.31	59.93	55.92
43	2053	-	-	-	4.02	4.02	20.62	40.25	60.87	56.85
44	2054	-	-	-	4.02	4.02	20.62	41.18	61.80	57.79
45	2055	-	-	-	4.02	4.02	20.62	42.12	62.74	58.72
46	2056	-	-	-	4.02	4.02	20.62	43.06	63.68	59.66
47	2057	-	-	-	4.02	4.02	20.62	43.99	64.61	60.60
48	2058	-	-	-	4.02	4.02	20.62	44.93	65.55	61.53
49	2059	-	-	-	4.02	4.02	20.62	45.86	66.48	62.47
50	2060	-	-	-	4.02	4.02	20.62	46.80	67.42	63.40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National Irrigation System Boundary
National Irrigation Administration (NIA)
Japan International Cooperation Agency (JICA)
JICA
SECTOR LOAN FOR REHABILITATION OF IRRIGATION FACILITIES (SLRIIF)
1003 - MULETA RIVER IRRIGATION SYSTEM
Bukidnon, Region-10
GENERAL LAYOUT

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities
Photograph of Irrigation Facilities

NIS name: Muleta NIS (Region 10) Date: May 25, 2007

Location / Facility	*Photograph*	*Comments*
01. Muleta Dam N-7d 46m 50s E-124d 51m 36s		Installation of perimeter fence as protection from vandalism
02. Muleta Dam N-7d 46m 50s E-124d 51m 36s		Repair and improvement of dilapidated gatekeeper's quarter
03. Muleta Dam N-7d 46m 50s E-124d 51m 36s		Repair and replacement of rubber seals of sluiceway gates

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities
Photograph of Irrigation Facilities

NIS name: Muleta NIS (Region 10) Date: May 25, 2007

Location / Facility	*Photograph*	*Comments*
04. Kuya Pickup Dam N-7d 46m 56s E-124d 55m 52s		a)Installation of perimeter fence as protection from vandalism, b) Repair and improvement of dilapidated gatekeeper's quarter, c) Repair and replacement of rubber seals of sluiceway gates, d) moratorium of san and gravel quarry activities D/S of Dam
05. Sam Miguel Pick-up Dam N-7d 45m 59s E-124d 57m 10s		a) Installation of concrete railing as safety protection for vehicles passing the bridge, b) Install loading capacity sign
06.Dologon Main Canal Siphon Site N-7d 31m 44s E-125d 03m 26s		a) Construction of farm bridge for maintenance, b) relocation and repair of manhole, c) desilting of drainage canal

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities
Photograph of Irrigation Facilities

NIS name: Muleta NIS (Region 10) Date: May 25, 2007

Location / Facility	*Photograph*	*Comments*
07. Main Canal N-7d 46m 46s E-124d 52m 53s		a)Construction of drainage inlet from excess water of CIS, b) install foot bridge for maintenance, c) construction of wasteway few meters downstream near drainage culvert to maintain freeboard and avoid overtopping of water .
08. Lateral I Drainage Structure (Inside the compound of the Muswan University)		a) Replacement of trapezoidal concrete canal to concrete barrel (20meters) to avoid siltation and scouring of caused by overflowing drainage culvert
09. Lateral I Dologon Main Canal Siphon Site N-7d 31m 44s E-125d 03m 26s		Coordinate with LGU and IA in the construction of sewer tank by residents to avoid disposal of waste to irrigation canal

THE REPUBLIC OF PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION

Sector Loan on Rehabilitation of Irrigation Facilities

NIS SUMMARY REPORT

1101
Mal RIS
Region 11
Davao del Sur Province

July 2009

Survey Team for
Japan International Cooperation Agency
(JICA)

Features of NIS for Rehabilitation Project

1. General

Item	*Description*		
1) Name of NIS	**MAL RIS**		Code: 1101
2) Location	Region	11	
	Province	Davao del Sur	
	Municipalities	Matanao & Hagonoy	
	Distance	32 kms from Digos, Davao del Sur (Capital)	
3) Type of Water Source	Water Source	Mal River	
	Type	Diversion Dam (27.90 m wide, 2.00 m high)	
4) Area	Service Area	3,500 has.	
	FUSA	2,635 has.	
5) Beneficiary Farmers	2,754 farmers	Average paddy field cultivating size = 0.96 ha per farmer	
6) Irrigator's Association	IAs established = 13 FIA established = 1 in 2008		
7) Features of NIS and Necessity of the project	Mal RIS was completed in 1992 with a design service area of 3,500 has. but a firmed-up service area of only 2,635 has. due to lack of water. It has two (2) main canals with a total length of 18.54 kms.; eleven (11) lateral canals with a total length of 26.30 kms. and 49.43 kms. of service roads. It also has 26.95 kilometers of drainage canals, 163 canal structures, 28 drainage structures, 101 turn-outs and 265 kms. of farm ditches. During the last five (5) years it had an average cropping intensity of 183% and average yields of 89 cavans/ha. during the wet season and 89 cavans/ha. during the dry season. Rehabilitation works in the system is needed to arrest the high level of sediments going into the main canal and to repair badly-damaged concrete linings of canals.		
8) Outline of the Proposed Project	A. Engineering 1. Repair of diversion dam 2. Repair and improvement of irrigation canal and structures 3. Repair and improvement of drainage canal and structures 4. Repair and improvement of service roads 5. Repair and improvement of on-farm facilities 6. Repair and construction of IMT support facilities-IA Bldg solar drier, warehouse with IA building 7. Development and establishment of IMT GIS database B. Institutional Strengthening Program B. 1 Basic Program 1. Reactivation of FIA/IA and Strengthening of Irrigation System Management Committee (ISMC) of NIS including construction of IMT support facilities 2. Strengthening of NIA – IA – LGUs Partnership 3. Strengthening NIA Institutional Capacity B.2 Specific Program to strengthen institutional mechanism together with LGUs		

	1. Improvement of watershed management
9) Proposed Project Component	A. Engineering 1. Construction of civil works for rehabilitation of diversion works, canal system, drainage system, roads, and IMT support facilities. B. Institutional 1. Reactivation of FIAs/IAs including reformation of TSGA / IA / FIA areas, construction of IMT support facilities (demand base) 2. Strengthening NIA-IA- LGUs Partnership, especially coordination RDC, RAFC/PAFC with FIAs/IAs and ISMC 3. Institutional development program to strengthen management capacity of NIA field offices and IAs.

10) Project Cost (Direct cost only, excluding escalation, contingency, tax)	1. Direct cost		PHP	133.91	Million
	- *Civil Works*	*PHP 123.03*	Million		
	- *Institutional Development*	*PHP 8.20*	Million		
	- *Engineering Services*	*PHP 2.68*	Million		
	2. Indirect cost		PHP	11.98	Million
	Total Project Cost (1+2)		PHP	145.89	Million
	Cost per ha		PHP	53,365.00	per ha
11) Project Benefit	1. To increase paddy production by 571 tons/year 2. To increase farmers' net income to PHP56,800.00 /ha/year 3. To establish functional and self-reliant IAs 4. To improve performance of NIS				
12) Project Justification	EIRR = 19.5 %, B/C = 1.31(discount rate 15%)				

2. Project History (Construction/Rehabilitation)

Year	*Description*
1992	Project Completion
2004-2008	Minor repairs and rehabilitation works funded using local funds.

3. Present Condition

3.1 Natural Conditions

Item	*Description*
1) Annual Rainfall	1,508.00 mm
2) Seasons	Wet: May-October Dry: November – April
3) Dominant Soil in NIS Area	Cabantian Clay
4) Topography	Relatively flat, gently sloping

3.2 Socio-economy (Region/Province)

Item	*Description*
1) GRDP	PHP 295,371 million (Year 2007), Per Capita GRDP = PHP 71,100 per year
2) Population	822,406 (province)
3) Population Growth Rate	1.12 % per year (province)
4) Labor Force	1,702,000 (region)
5) Poverty Population	27.4 % to total population (region)

3.3 Present Agriculture in NIS

Item	*Description*					
1) Farm Household in NIS	Total beneficiaries	2,754 households				
	Land owners	976 households (35.4 %)				
	Tenant farmers	1,778 households (64.6 %)				
2) Paddy Field Size in NIS	0.96 ha per household (FUSA/Total beneficiaries as of 2008)					
3) Present Land Use in NIS	Paddy field planted	2,500 ha	71.4 %	As of 2008		
	Paddy field not planted	135 ha	3.9 %	As of 2008		
	Upland crop field	0 ha	0.0 %			
	Permanent crop field	255 ha	7.3 %			
	Undeveloped area	0 ha	0.0 %			
	Built-up area	178 ha	5.1 %			
	High ground	255 ha	7.3 %			
	Grassland	126 ha	3.6 %			
	Swamp	51 ha	1.4 %			
	Unspecified area	0 ha	0.0 %			
4) Paddy Field in FUSA (ha)	2,635					

5) Paddy Cropped Area (ha)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Wet Season	2,612	2,570	2,452	2,475	2,500	2,522
Dry Season	2,000	2,343	2,534	2,196	2,406	2,296
6) Cropping Intensity (%)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
(per year)	175	186	189	177	186	183
7) Unit Yield of Paddy (ton/ha)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Wet Season	4.50	5.45	3.85	4.25	4.10	4.44
Dry Season	4.70	5.00	3.90	4.35	4.30	4.43
8) Paddy Production (ton)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Wet Season	11,754	14,007	9,440	10,519	10,250	11,194
Dry Season	9,400	11,715	9,883	9,553	10,346	10,179

3.4 Water Resources

Item	*Description*
1) Name of Rivers	Mal River
2) Catchment Area at Dam	152 Km^2
3) Ave. River Discharge	3.98 m^3/s
4) Ave. Dry Season Discharge	3.33 m^3/s
5) Diverted Intake Discharge	2.99 m^3/s
6) Water Requirement	4.74 m^3/s
7) Sedimentation	Moderate

3.5 Existing Irrigation System

Item	*Description*
1) Diversion Dam	Overflow crest width 27.90 m, Dam height 2.00 m
2) Main Canal	Total length 18.54 km (Lined portion 18.54)
3) Lateral Canals	Total length 30.60 km (Lined portion 25.50 km)
4) On-farm facilities	Total length 87.00 km (Lined portion 0.00 km) Turn-outs = 101 units
5) Drainage Canal	Total length 26.95 kms.
6) Canal Structures	No. = 163 units
7) Drainage Structures	No. = 35 units
8) Farm roads	Total length 49.14 km (pavement= 0.00 kms.)

3.6 Institutions for O&M of NIS

Item	Description					
1) Regional Irrigation Office	Name: Region 11 – Southern Mindanao					
2) IMO	Name: Davao del Sur IMO					
Staff in 2009	Total number of staff: 45					
3) Irrigator' Association (IA)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Number of FIA (nos)					1	
Number of IA (nos)					13	
Number of TSAG(nos)	88	88	88	88	88	88
Functionality of IA	89.3	89.1	78.6	89.7	89.7	87.3
Collection of ISF (wet, %)	90	89	75	90	86	85
Collection of ISF (dry, %)	88	87	75	89	86	81
4) NIS Category based on IA 2008 O&M Contract (NIA-IA)	No. of IA					
Category A	13					
Category B	0					
Category C	0					

3.7 Existing Problems

Item	Description
1) Diversion Works	1. Sand and pebbles are carried into the canals during floods.
2) Canal and Structures	1. Long stretches of canal have badly broken trapezoidal concrete linings most likely caused by insufficiently-compacted earth-fill foundation and made worse by farmers plowing the fields too near to the concrete lining.
3) Drainage Canal	1. Need to improve the drainage system.
4) Other Project Facilities (road, bridge, flood dike, building, etc)	1. Some road sections are very muddy during rainy days.
5) Water Management and O&M Activities	1. Illegal checking in some places. 2. Lack of control in water intake in some turn-outs result in over supply in some areas in the upstream reaches of the canals but lack of supply in the downstream farms.
6) Status of NIS and IA Management	Status Type A evaluated by Radar Graph. 1. Minor problem such as medium paddy yield during dry and wet seasons at 84 and 85 cavans/ha, respectively.
7) Watershed Management	No significant watershed problem
8) Coordination with LGU and Agencies concerned	1. Poor coordination by NIA's field offices and IAs with concerned LGUs on specific problem such as watershed management

4. Proposed Rehabilitation Plan

4.1 Agricultural Development Plan

Item	Description			
Cropping schedule	*Wet Season*	*Dry Season-1*	*Dry Season-2*	*Annual*
1) Type of Crops	Paddy	Paddy	-	-
2) Cropping Area (ha)	2,635	2,410	-	-
3) Target Unit Yield (ton/ha)	4.10	4.30	-	-
3) Total Production (ton)	10,804	10,636	-	21,440

4.2 Civil Works

Item	*Description*
1) Diversion Works	1. Construction of skimmer wall in the dam intake
2) Canal Structures	1. Repair/rehabilitation of old dilapidated steel gates – 61 units 2. Installation of new steel gates to replace wooden flush boards – 30 units
3) Canalization	1. Concrete lining of selected existing canal sections – 10.82 kms 2. Re-shaping and de-silting of some canal sections – 5.1 kms 3. Construction of silting basin and silt ejection gate in the main canal. 4. Realignment of canals 5. Construction of new canals
4) Drainage Structures	1. Repair of drainage structures – 17 units
5) Drainage Canalization	1. Repair of existing drainage canals and construction of new ones – 12.2 kms
6) Service Roads	1. Re-gravelling of selected road sections – 31.4 kms 2. Construction of side drainage canals – 31.4 kms 3. Construction of road drainage structures.
7) On-Farm Facilities	1. Repair /replacement of dilapidated turn out steel gates 2.Construction of new turn outs and farm ditches
8) IMT Support Facilities	1. Construction of post-harvest facilities—warehouses, IA buildings, solar driers with shed – 2 sets
9) IMT GIS Database	1. Development and establishment of GIS database

4.3 Institutional Strengthening Program

Item	*Description*
1) Reactivation Program of FIAs/IAs and System Management Committee (ISMC)	1. Executing body : Project Management Office with assistance of Consultant 2. Schedule:34 months / NIS 3. Counter body for execution: NIA Regional Office and IMO office 4. Attendant / Trainee: President of FIAs/IAs and secretary group, staff of NIA RIO/IMO, Chairmen of ISMC and Secretary group and LGUs officers, 5. Contents: a) Survey & Study by Consultant b) Workshops on coordination activities with and dissemination on reformation plan to FIAs/IAs c) Workshop on coordination activities with LGUs d) Organization and Legal Registration of FIAs/IAs to be re-active and reactivation of SMC e) Construction of IMT support facilities for FIAs/CIA f) Workshop and Training of FIAs/IAs members on management under the IMT g) Assessment/Evaluation for and Negotiation of Contracting under IMT h) Assistance of reactivated IAs/FIAs in organizational and management activities
2) Strengthening Program of NIA - IA - LGU Partnership	1. Executing body : Project Management Office with assistance of Consultant, & Management System Committee (MSC) of NIS 2. Schedule: 7 months / NIS 3. Counter body for execution: Regional Development Council with Secretary of NEDA Regional Office 4. Attendant / Trainee: Secretaries of Regional Organizations, LGUs officers, President of FIAs/IAs and secretary group, staff of NIA RIO/IMO, Chairmen of ISMC and Secretary group 5. Contents: a) Workshop on Trouble Shooting of NIS and FIAs/ISs' Management b) Provision of work space for ISMC including office facilities
3) NIA Institutional Strengthening Program	1. Executing body : Institutional Development Division of CO, NIA 2. Schedule: 7 months / NIS 3. Counter body for execution: NIA Regional Office and IMO office

Item	*Description*
	4. Attendant / Trainee: NIA personnel at CO, RIO and IMO 5. Contents: a) Capability built-up program (Central and Regional NIA Offices) b) Improvement program on management mechanism of NIA c) Support program for IMT implementation d) Strengthening program of Integrated Management information System
4) Specific Program on watershed management plan	1. Strengthening coordination with RDC, RAFC/PAFC and LGUs concerned through works shop on dissemination of the SLRIF to these organizations. 2. Strengthening coordination with RDC, RAFC/PAFC and LGUs on training program of watershed management.

4.4 Proposed Counter Schemes

Item	*Description*
1) DENR	1. Technical assistance to concerned Provincial/municipal LGUs on watershed rehabilitation and management such as establishment of nurseries, community-based livelihood
3) LGU	1. LGUs improve coordination program with NIA to give priority of the projects in annual budgeting and funds programming 2. Provincial LGUs to extend training to municipal agricultural officers to improve skills on technology promotion 3. LGUs improve capacity of its personnel to prepare project proposals through a training by DILG to ensure project's fund access to municipal development fund 4. LGUs provide reliable post-harvest facilities to ensure optimal operation of the facilities

5. Cost Estimate for Initial Investment

Item	*Description*			
1) Direct Cost for Civil Works	A. Mobilization	Php	2.68	Million
	B. Protection Dikes		-	
	C. Diversion Works	Php	16.32	Million
	D. Canal Structures	Php	3.44	Million
	E. Canalization	Php	53.00	Million
	F. Drainage Structures	Php	5.27	Million
	G. Drainage Canalization	Php	7.91	Million
	H. Roads	Php	5.01	Million
	I. On-Farm Facilities/T.O. Gates	Php	1.77	Million
	J. IMT Support Facilities	Php	25.00	Million
	K. IMT GIS Database	Php	2.64	Million
	L. Institutional Development (5% of Direct Cost)	Php	8.20	Million
	M. Feasibility Studies & Detailed Engineering (2% of Direct Cost)	Php	2.68	Million
	Sub-total (Direct Cost)	Php	133.91	Million
2) Indirect Cost	A. General Engineering Supervision and Administration (3.5% of Direct Cost)	Php	4.69	Million
	B. NIA Management Fee (5% of Total Project Cost)	Php	7.29	Million
	Sub-total (Indirect Cost)	Php	11.98	Million
3) Total Project Cost	= 1+2	Php	145.89	Million
Cost per ha.		Php	55,365.00	/ha.

6. Implementation Plan

Item	*Description*
1) Contract package	1 - Local Competitive Bidding (LCB)
2) Implementation Schedule	
a) Civil Works	
1) Survey, F/S, Design	16 months
2) Tendering	6 months
3) Construction	27 months
b) Institutional Improvement Works	
1) Reactivation Program of FIAs/IAs and Irrigation System Management Committee	34 months
2) NIA-IA-LGU Partnership	7 months
3) Strengthening of NIA staff	7 months

7. Project Evaluation

Item		*Description*	
1) Economic evaluation			
EIRR (Base)		EIRR = 15 %	: Project life 50 years
Sensitivity	Case-1	EIRR = 13%	: Cost 10% up
	Case-2	EIRR = 13%	: Benefit 10% down
	Case-3	EIRR = 11	: Cost 10% up + Benefit 10% down
B/C		1.31	: discount rate 15% p.a.
NPV		PHP 0.84lion	: discount rate 15% p.a.
2) Financial evaluation		Farmer's net income increase = PHP 1,838 per ha per year	
3) Expected Impacts		1. Increased farmers' income 2. Increased rice self sufficiency of the country 3. Increased job opportunities in rural areas	

8. Environmental Aspects

Item	*Description*
1) Environmental aspect	Need to address potential problem of mining in the catchment area
2) Relocation of houses	None
3) Land acquisition	None

Table 1101 - Mal Economic Evaluation (EIRR)

Basic Case

Name of NIS 1101 - Mal | Region : 11 IMO,RIO Davao Del Sur

EIRR : 19.5%	Net Present Value (Million PHP)	Benefit	Cost	B/C Ratio	NPV
	(15 % discount rate)	118	90	1.31	28

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011			0.64		0.64		2.05	2.05	1.41
2	2012			0.64		0.64		4.10	4.10	3.46
3	2013	33.94	1.34	0.64		35.92		6.15	6.15	-29.77
4	2014	45.26	1.78	0.64	1.60	49.28	0.91	8.20	9.11	-40.17
5	2015	33.94	1.34	0.64	3.74	39.66	2.24	10.25	12.49	-27.17
6	2016				5.34	5.34	3.42	12.30	15.72	10.38
7	2017				5.34	5.34	3.69	14.35	18.04	12.70
8	2018				5.34	5.34	3.80	16.40	20.20	14.86
9	2019				5.34	5.34	3.80	18.45	22.25	16.91
10	2020				5.34	5.34	3.80	20.50	24.30	18.96
11	2021				5.34	5.34	3.80	22.55	26.35	21.01
12	2022				5.34	5.34	3.80	24.60	28.40	23.06
13	2023				5.34	5.34	3.80	26.65	30.45	25.11
14	2024				5.34	5.34	3.80	28.70	32.50	27.16
15	2025				5.34	5.34	3.80	30.75	34.55	29.21
16	2026				5.34	5.34	3.80	32.80	36.60	31.26
17	2027				5.34	5.34	3.80	34.85	38.65	33.31
18	2028				5.34	5.34	3.80	36.90	40.70	35.36
19	2029				5.34	5.34	3.80	38.95	42.75	37.41
20	2030				5.34	5.34	3.80	41.00	44.80	39.46
21	2031				5.34	5.34	3.80	43.05	46.85	41.51
22	2032				5.34	5.34	3.80	45.10	48.90	43.56
23	2033				5.34	5.34	3.80	47.15	50.95	45.61
24	2034				5.34	5.34	3.80	49.20	53.00	47.66
25	2035				5.34	5.34	3.80	51.25	55.05	49.71
26	2036				5.34	5.34	3.80	53.30	57.10	51.76
27	2037				5.34	5.34	3.80	55.35	59.15	53.81
28	2038				5.34	5.34	3.80	57.40	61.20	55.86
29	2039				5.34	5.34	3.80	59.45	63.25	57.91
30	2040				5.34	5.34	3.80	61.50	65.30	59.96
31	2041				5.34	5.34	3.80	63.55	67.35	62.01
32	2042				5.34	5.34	3.80	65.60	69.40	64.06
33	2043				5.34	5.34	3.80	67.65	71.45	66.11
34	2044				5.34	5.34	3.80	69.70	73.50	68.16
35	2045				5.34	5.34	3.80	71.75	75.55	70.21
36	2046				5.34	5.34	3.80	73.80	77.60	72.26
37	2047				5.34	5.34	3.80	75.85	79.65	74.31
38	2048				5.34	5.34	3.80	77.90	81.70	76.36
39	2049				5.34	5.34	3.80	79.95	83.75	78.41
40	2050				5.34	5.34	3.80	82.00	85.80	80.46
41	2051				5.34	5.34	3.80	84.05	87.85	82.51
42	2052				5.34	5.34	3.80	86.10	89.90	84.56
43	2053				5.34	5.34	3.80	88.15	91.95	86.61
44	2054				5.34	5.34	3.80	90.20	94.00	88.66
45	2055				5.34	5.34	3.80	92.25	96.05	90.71
46	2056				5.34	5.34	3.80	94.30	98.10	92.76
47	2057				5.34	5.34	3.80	96.35	100.15	94.81
48	2058				5.34	5.34	3.80	98.40	102.20	96.86
49	2059				5.34	5.34	3.80	100.45	104.25	98.91
50	2060				5.34	5.34	3.80	102.50	106.30	100.96

Case-1 (Cost 10% up)

Name of NIS 1101 - Mal | Region : 11 IMO,RIO Davao Del Sur

EIRR : 17.7%	Net Present Value (Million PHP)	Benefit	Cost	B/C Ratio	NPV
	(15 % discount rate)	118	99	1.19	19

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	0.71	-	0.71	-	2.05	2.05	1.34
2	2012	-	-	0.71	-	0.71	-	4.10	4.10	3.39
3	2013	37.34	1.47	0.71	-	39.51	-	6.15	6.15	-33.36
4	2014	49.78	1.96	0.71	1.76	54.21	0.91	8.20	9.11	-45.10
5	2015	37.34	1.47	0.71	4.11	43.63	2.24	10.25	12.49	-31.13
6	2016	-	-	-	5.87	5.87	3.42	12.30	15.72	9.85
7	2017	-	-	-	5.87	5.87	3.69	14.35	18.04	12.16
8	2018	-	-	-	5.87	5.87	3.80	16.40	20.20	14.33
9	2019	-	-	-	5.87	5.87	3.80	18.45	22.25	16.38
10	2020	-	-	-	5.87	5.87	3.80	20.50	24.30	18.43
11	2021	-	-	-	5.87	5.87	3.80	22.55	26.35	20.48
12	2022	-	-	-	5.87	5.87	3.80	24.60	28.40	22.53
13	2023	-	-	-	5.87	5.87	3.80	26.65	30.45	24.58
14	2024	-	-	-	5.87	5.87	3.80	28.70	32.50	26.63
15	2025	-	-	-	5.87	5.87	3.80	30.75	34.55	28.68
16	2026	-	-	-	5.87	5.87	3.80	32.80	36.60	30.73
17	2027	-	-	-	5.87	5.87	3.80	34.85	38.65	32.78
18	2028	-	-	-	5.87	5.87	3.80	36.90	40.70	34.83
19	2029	-	-	-	5.87	5.87	3.80	38.95	42.75	36.88
20	2030	-	-	-	5.87	5.87	3.80	41.00	44.80	38.93
21	2031	-	-	-	5.87	5.87	3.80	43.05	46.85	40.98
22	2032	-	-	-	5.87	5.87	3.80	45.10	48.90	43.03
23	2033	-	-	-	5.87	5.87	3.80	47.15	50.95	45.08
24	2034	-	-	-	5.87	5.87	3.80	49.20	53.00	47.13
25	2035	-	-	-	5.87	5.87	3.80	51.25	55.05	49.18
26	2036	-	-	-	5.87	5.87	3.80	53.30	57.10	51.23
27	2037	-	-	-	5.87	5.87	3.80	55.35	59.15	53.28
28	2038	-	-	-	5.87	5.87	3.80	57.40	61.20	55.33
29	2039	-	-	-	5.87	5.87	3.80	59.45	63.25	57.38
30	2040	-	-	-	5.87	5.87	3.80	61.50	65.30	59.43
31	2041	-	-	-	5.87	5.87	3.80	63.55	67.35	61.48
32	2042	-	-	-	5.87	5.87	3.80	65.60	69.40	63.53
33	2043	-	-	-	5.87	5.87	3.80	67.65	71.45	65.58
34	2044	-	-	-	5.87	5.87	3.80	69.70	73.50	67.63
35	2045	-	-	-	5.87	5.87	3.80	71.75	75.55	69.68
36	2046	-	-	-	5.87	5.87	3.80	73.80	77.60	71.73
37	2047	-	-	-	5.87	5.87	3.80	75.85	79.65	73.78
38	2048	-	-	-	5.87	5.87	3.80	77.90	81.70	75.83
39	2049	-	-	-	5.87	5.87	3.80	79.95	83.75	77.88
40	2050	-	-	-	5.87	5.87	3.80	82.00	85.80	79.93
41	2051	-	-	-	5.87	5.87	3.80	84.05	87.85	81.98
42	2052	-	-	-	5.87	5.87	3.80	86.10	89.90	84.03
43	2053	-	-	-	5.87	5.87	3.80	88.15	91.95	86.08
44	2054	-	-	-	5.87	5.87	3.80	90.20	94.00	88.13
45	2055	-	-	-	5.87	5.87	3.80	92.25	96.05	90.18
46	2056	-	-	-	5.87	5.87	3.80	94.30	98.10	92.23
47	2057	-	-	-	5.87	5.87	3.80	96.35	100.15	94.28
48	2058	-	-	-	5.87	5.87	3.80	98.40	102.20	96.33
49	2059	-	-	-	5.87	5.87	3.80	100.45	104.25	98.38
50	2060	-	-	-	5.87	5.87	3.80	102.50	106.30	100.43

Table 1101 - Mal Economic Evaluation (EIRR)

Case-2 (Benefit 10% down)

Name of NIS 1101 - Mal | Region 11 IMO RIO Davao Del Sur

EIRR : 17.5%	Net Present Value (Million PHP) (15 % discount rate)	Benefit	Cost	B/C Ratio	NPV
		106	90	1.18	16

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP) Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Economic Benefit (M. PHP) Benefit	without 1.5%	Total	Net Cash Flow (M. PHP)
1	2011	-	-	0.64	-	0.64	-	1.85	1.85	1.20
2	2012	-	-	0.64	-	0.64	-	3.69	3.69	3.05
3	2013	33.94	1.34	0.64	-	35.92	-	5.54	5.54	-30.39
4	2014	45.26	1.78	0.64	1.60	49.28	0.82	7.38	8.20	-41.08
5	2015	33.94	1.34	0.64	3.74	39.66	2.02	9.23	11.24	-28.42
6	2016	-	-	-	5.34	5.34	3.08	11.07	14.15	8.81
7	2017	-	-	-	5.34	5.34	3.32	12.92	16.23	10.89
8	2018	-	-	-	5.34	5.34	3.42	14.76	18.18	12.84
9	2019	-	-	-	5.34	5.34	3.42	16.61	20.03	14.69
10	2020	-	-	-	5.34	5.34	3.42	18.45	21.87	16.53
11	2021	-	-	-	5.34	5.34	3.42	20.30	23.72	18.38
12	2022	-	-	-	5.34	5.34	3.42	22.14	25.56	20.22
13	2023	-	-	-	5.34	5.34	3.42	23.99	27.41	22.07
14	2024	-	-	-	5.34	5.34	3.42	25.83	29.25	23.91
15	2025	-	-	-	5.34	5.34	3.42	27.68	31.10	25.76
16	2026	-	-	-	5.34	5.34	3.42	29.52	32.94	27.60
17	2027	-	-	-	5.34	5.34	3.42	31.37	34.79	29.45
18	2028	-	-	-	5.34	5.34	3.42	33.21	36.63	31.29
19	2029	-	-	-	5.34	5.34	3.42	35.06	38.48	33.14
20	2030	-	-	-	5.34	5.34	3.42	36.90	40.32	34.98
21	2031	-	-	-	5.34	5.34	3.42	38.75	42.17	36.83
22	2032	-	-	-	5.34	5.34	3.42	40.59	44.01	38.67
23	2033	-	-	-	5.34	5.34	3.42	42.44	45.86	40.52
24	2034	-	-	-	5.34	5.34	3.42	44.28	47.70	42.36
25	2035	-	-	-	5.34	5.34	3.42	46.13	49.55	44.21
26	2036	-	-	-	5.34	5.34	3.42	47.97	51.39	46.05
27	2037	-	-	-	5.34	5.34	3.42	49.82	53.24	47.90
28	2038	-	-	-	5.34	5.34	3.42	51.66	55.08	49.74
29	2039	-	-	-	5.34	5.34	3.42	53.51	56.93	51.59
30	2040	-	-	-	5.34	5.34	3.42	55.35	58.77	53.43
31	2041	-	-	-	5.34	5.34	3.42	57.20	60.62	55.28
32	2042	-	-	-	5.34	5.34	3.42	59.04	62.46	57.12
33	2043	-	-	-	5.34	5.34	3.42	60.89	64.31	58.97
34	2044	-	-	-	5.34	5.34	3.42	62.73	66.15	60.81
35	2045	-	-	-	5.34	5.34	3.42	64.58	68.00	62.66
36	2046	-	-	-	5.34	5.34	3.42	66.42	69.84	64.50
37	2047	-	-	-	5.34	5.34	3.42	68.27	71.69	66.35
38	2048	-	-	-	5.34	5.34	3.42	70.11	73.53	68.19
39	2049	-	-	-	5.34	5.34	3.42	71.96	75.38	70.04
40	2050	-	-	-	5.34	5.34	3.42	73.80	77.22	71.88
41	2051	-	-	-	5.34	5.34	3.42	75.65	79.07	73.73
42	2052	-	-	-	5.34	5.34	3.42	77.49	80.91	75.57
43	2053	-	-	-	5.34	5.34	3.42	79.33	82.76	77.41
44	2054	-	-	-	5.34	5.34	3.42	81.18	84.60	79.26
45	2055	-	-	-	5.34	5.34	3.42	83.02	86.45	81.10
46	2056	-	-	-	5.34	5.34	3.42	84.87	88.29	82.95
47	2057	-	-	-	5.34	5.34	3.42	86.71	90.13	84.79
48	2058	-	-	-	5.34	5.34	3.42	88.56	91.98	86.64
49	2059	-	-	-	5.34	5.34	3.42	90.40	93.82	88.48
50	2060	-	-	-	5.34	5.34	3.42	92.25	95.67	90.33

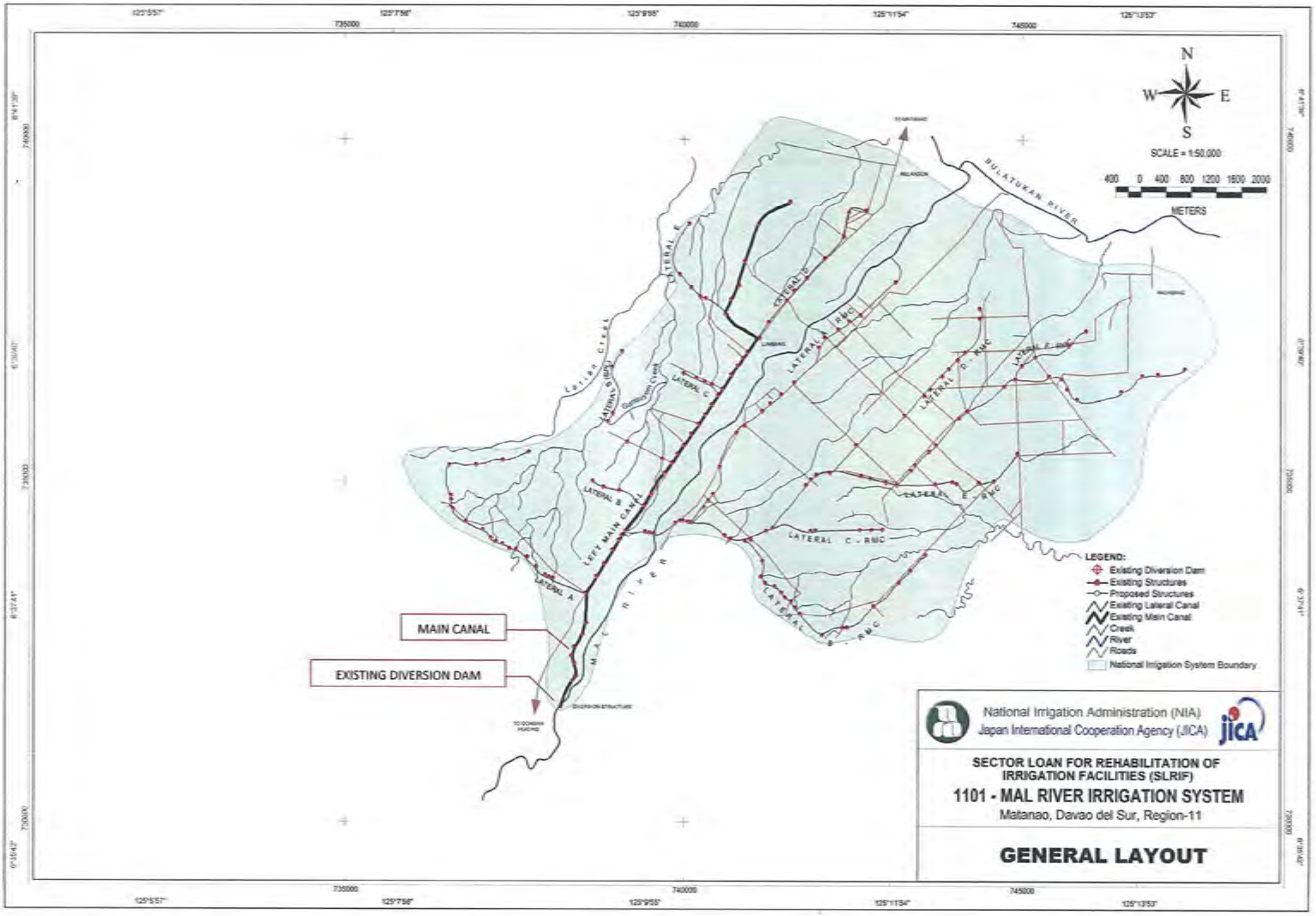
Case-3 (Cost 10% up and Benefit 10% down)

Name of NIS 1101 - Mal | Region 11 IMO RIO Davao Del Sur

EIRR : 16.0%	Net Present Value (Million PHP) (15 % discount rate)	Benefit	Cost	B/C Ratio	NPV
		106	99	1.07	7

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP) Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Economic Benefit (M. PHP) Benefit	without 1.5%	Total	Net Cash Flow (M. PHP)
1	2011	-	-	0.71	-	0.71	-	1.85	1.85	1.14
2	2012	-	-	0.71	-	0.71	-	3.69	3.69	2.98
3	2013	37.34	1.47	0.71	-	39.51	-	5.54	5.54	-33.98
4	2014	49.78	1.96	0.71	1.76	54.21	0.82	7.38	8.20	-46.01
5	2015	37.34	1.47	0.71	4.11	43.63	2.02	9.23	11.24	-32.38
6	2016	-	-	-	5.87	5.87	3.08	11.07	14.15	8.27
7	2017	-	-	-	5.87	5.87	3.32	12.92	16.23	10.36
8	2018	-	-	-	5.87	5.87	3.42	14.76	18.18	12.31
9	2019	-	-	-	5.87	5.87	3.42	16.61	20.03	14.15
10	2020	-	-	-	5.87	5.87	3.42	18.45	21.87	16.00
11	2021	-	-	-	5.87	5.87	3.42	20.30	23.72	17.84
12	2022	-	-	-	5.87	5.87	3.42	22.14	25.56	19.69
13	2023	-	-	-	5.87	5.87	3.42	23.99	27.41	21.53
14	2024	-	-	-	5.87	5.87	3.42	25.83	29.25	23.38
15	2025	-	-	-	5.87	5.87	3.42	27.68	31.10	25.22
16	2026	-	-	-	5.87	5.87	3.42	29.52	32.94	27.07
17	2027	-	-	-	5.87	5.87	3.42	31.37	34.79	28.91
18	2028	-	-	-	5.87	5.87	3.42	33.21	36.63	30.76
19	2029	-	-	-	5.87	5.87	3.42	35.06	38.48	32.60
20	2030	-	-	-	5.87	5.87	3.42	36.90	40.32	34.45
21	2031	-	-	-	5.87	5.87	3.42	38.75	42.17	36.29
22	2032	-	-	-	5.87	5.87	3.42	40.59	44.01	38.14
23	2033	-	-	-	5.87	5.87	3.42	42.44	45.86	39.98
24	2034	-	-	-	5.87	5.87	3.42	44.28	47.70	41.83
25	2035	-	-	-	5.87	5.87	3.42	46.13	49.55	43.67
26	2036	-	-	-	5.87	5.87	3.42	47.97	51.39	45.52
27	2037	-	-	-	5.87	5.87	3.42	49.82	53.24	47.36
28	2038	-	-	-	5.87	5.87	3.42	51.66	55.08	49.21
29	2039	-	-	-	5.87	5.87	3.42	53.51	56.93	51.05
30	2040	-	-	-	5.87	5.87	3.42	55.35	58.77	52.90
31	2041	-	-	-	5.87	5.87	3.42	57.20	60.62	54.74
32	2042	-	-	-	5.87	5.87	3.42	59.04	62.46	56.59
33	2043	-	-	-	5.87	5.87	3.42	60.89	64.31	58.43
34	2044	-	-	-	5.87	5.87	3.42	62.73	66.15	60.28
35	2045	-	-	-	5.87	5.87	3.42	64.58	68.00	62.12
36	2046	-	-	-	5.87	5.87	3.42	66.42	69.84	63.97
37	2047	-	-	-	5.87	5.87	3.42	68.27	71.69	65.81
38	2048	-	-	-	5.87	5.87	3.42	70.11	73.53	67.66
39	2049	-	-	-	5.87	5.87	3.42	71.96	75.38	69.50
40	2050	-	-	-	5.87	5.87	3.42	73.80	77.22	71.35
41	2051	-	-	-	5.87	5.87	3.42	75.65	79.07	73.19
42	2052	-	-	-	5.87	5.87	3.42	77.49	80.91	75.04
43	2053	-	-	-	5.87	5.87	3.42	79.33	82.76	76.88
44	2054	-	-	-	5.87	5.87	3.42	81.18	84.60	78.73
45	2055	-	-	-	5.87	5.87	3.42	83.02	86.45	80.57
46	2056	-	-	-	5.87	5.87	3.42	84.87	88.29	82.42
47	2057	-	-	-	5.87	5.87	3.42	86.71	90.13	84.26
48	2058	-	-	-	5.87	5.87	3.42	88.56	91.98	86.11
49	2059	-	-	-	5.87	5.87	3.42	90.40	93.82	87.95
50	2060	-	-	-	5.87	5.87	3.42	92.25	95.67	89.80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METERS
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LATERAL B
LATERAL A
LEFT MAIN CANAL
MAL RIVER
MAIN CANAL
EXISTING DIVERSION DAM
DIVERSION STRUCTURE
LEGEND:
Existing Diversion Dam
Existing Structures
Proposed Structures
Existing Lateral Canal
Existing Main Canal
Creek
River
Roads
National Irrigation System Boundary
National Irrigation Administration (NIA)
Japan International Cooperation Agency (JICA)
SECTOR LOAN FOR REHABILITATION OF IRRIGATION FACILITIES (SLRIF)
1101 - MAL RIVER IRRIGATION SYSTEM
Malalanao, Davao del Sur, Region-11
GENERAL LAYOUT

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities

Photograph of Irrigation Facilities

NIS name: Muleta NIS (Region 11)

Location / Facility	*Photograph*	*Comments*
01. Diversion dam. View facing upstream Longitude: 6° 37' 1"E Latitude: 125° 9' 30"N		Gravel deposit at the downstream apron need to be cleared.
02. Diversion works. View facing downstream. Longitude: 6° 37' 1"E Latitude: 125° 9' 30"N		Skimmer wall needed to be constructed to minimize entry of silt and sand to the canal.
03. Diversion works. Rubble masonry at the downstream. Longitude: 6° 37' 1"E Latitude: 125° 9' 30"N		Damaged rubble masonry need to be repaired.

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities

Photograph of Irrigation Facilities

NIS name: Muleta NIS (Region 11)

Location / Facility	*Photograph*	*Comments*
04. Main canal at the outlet of the dam. Longitude: 6° 37' 1"E Latitude: 125° 9' 30"N		Notice the heavy silt load. This canal section to be converted to settling basin with silt ejector.
05. Left main canal Station 4+892 Longitude: 6° 39' 5"E Latitude: 125° 10' 33"N		Broken linings due to embankment failure. Needs to be repaired.
06. Lateral D of left main canal. Station 1+890 to 1+914 Longitude: 6° 40' 39" E Latitude: 125° 59' 49" N		Broken linings due to embankment failure. Needs to be repaired.

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities

Photograph of Irrigation Facilities

NIS name: Muleta NIS (Region 11)

Location / Facility	*Photograph*	*Comments*
07. Road beside right main canal. Station 6+600 Longitude: 6° 39' 12"E Latitude: 125° 12' 44"N		Road needs re-gravelling.
08. Left main canal, station 3+074. Chute structure Longitude: 6° 38' 30"E Latitude:125° 10' 07" N		Canal needs to be repaired and concreted.
09. Lateral D of left main canal. Station 1+890 to 1+914 Longitude: 6° 40' 39" E Latitude: 125° 59' 49" N		Broken linings due to embankment failure. Needs to be repaired.

THE REPUBLIC OF PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION

Sector Loan on Rehabilitation of Irrigation Facilities

NIS SUMMARY REPORT

1102
Padada RIS
Region 11
Davao del Sur Province

July 2009

Survey Team for
Japan International Cooperation Agency
(JICA)

Features of NIS for Rehabilitation Project

1. General

Item	*Description*		
1) Name of NIS	**PADADA RIS**		Code: 1102
2) Location	Region	11	
	Province	Davao del Sur	
	Municipality	Hagonoy	
	Distance	14 kms from Digos, Davao del Sur (Capital)	
3) Type of Water Source	Water Source	Padada River	
	Type	Diversion Dam (95.00 m wide, 3.50 m high)	
4) Area	Service Area	3,000 has	
	FUSA	2,520 has.	
5) Beneficiary Farmers	2,267 farmers	Average paddy field cultivating size = 1.11 ha per farmer	
6) Irrigator's Association	IAs established = 6 FIA established = 1in 2008		
7) Features of NIS and Necessity of the project	Padada RIS was completed in 1956 with a design area of 3,000 has. but a firmed-up service area of only 2,520 has. due to lack of water. It has five (5) main canals with a total length of 12.68 kms.; ten (10) lateral canals with a total length of 41.49 kms. and 53.83 kms. of service roads. It also has 36.6 kilometers of drainage canals, 149 canal structures, 46 drainage structures, 140 turn-outs and 126 kms. of farm ditches. During the last five (5) years it had an average cropping intensity of 196% and average yields of 109 cavans/ha. during the wet season and 103 cavans/ha. during the dry season. A rehabilitation of the system is necessary due to the deteriorated condition of the diversion works and the need to improve the efficiency of water delivery of the irrigation canals.		
8) Outline of the Proposed Project	A. Engineering 1. a.Repair of diversion dam b.Rechanneling and dredging of the river upstream of the dam 2. Repair and improvement of irrigation canal and structures 3. Repair and improvement of drainage canal and structures 4. Repair and improvement of service roads 5. Repair and improvement of on-farm facilities 6. Repair and construction of IMT support facilities-IA Bldg solar drier, warehouse with IA building 7. Development and establishment of IMT GIS database B. Institutional Strengthening Program B. 1 Basic Program 1. Reactivation of FIA/IA and Strengthening of Irrigation System Management Committee (ISMC) of NIS including construction of IMT support facilities 2. Strengthening of NIA – IA – LGUs Partnership 3. Strengthening NIA Institutional Capacity B.2 Specific Program to strengthen institutional mechanism together with LGUs		

	1. Improvement of watershed management
9) Proposed Project Component	A. Engineering 1. Construction of civil works for rehabilitation of diversion works, canal system, drainage system, roads, and IMT support facilities. B. Institutional 1. Reactivation of FIAs/IAs including reformation of TSGA / IA / FIA areas, construction of IMT support facilities (demand base) 2. Strengthening NIA-IA- LGUs Partnership, especially coordination RDC, RAFC/PAFC with FIAs/IAs and ISMC 3. Institutional development program to strengthen management capacity of NIA field offices and IAs.
10) Project Cost (Direct cost only, excluding escalation, contingency, tax)	1. Direct cost — PHP 201.80 Million - *Civil Works* — *PHP 192.37* Million - *Institutional Development* — *PHP 5.40* Million - *Engineering Services* — *PHP 4.04* Million 2. Indirect cost — PHP 18.06 Million Total Project Cost (1+2) — PHP 219.86 Million Cost per ha — PHP 87,245.00 per ha
11) Project Benefit	1. To increase paddy production by 435 tons/year 2. To increase farmers' net income to PHP76,410.00 /ha/year 3. To establish functional and self-reliant IAs 4. To improve performance of NIS
12) Project Justification	EIRR = 17.4 %, B/C = 1.18 (discount rate 15%)

2. Project History (Construction/Rehabilitation)

Year	*Description*
1956	Project Completion
1979-1987	Repair of Diversion works, road network, drainage network, on-farm facilities, office building, gatekeeper quarter
2004-2008	Minor repair and rehabilitation works

3. Present Condition

3.1 Natural Conditions

Item	*Description*
1) Annual Rainfall	934.10 mm
2) Seasons	Wet: May – October Dry: November – April
3) Dominant Soil in NIS Area	Clay Loam
4) Topography	Relatively flat, gently sloping

3.2 Socio-economy (Region/Province)

Item	*Description*
1) GRDP	PHP 295,371 million (Year 2007), Per Capita GRDP = PHP 71,100 per year
2) Population	822,406 (province)
3) Population Growth Rate	1.12 % per year (province)
4) Labor Force	2,702,000 (region)
5) Poverty Population	27.4% to total population (province)

3.3 Present Agriculture in NIS

Item	*Description*						
1) Farm Household in NIS	Total beneficiaries	2,267 households					
	Land owners	844 households (37.2 %)					
	Tenant farmers	1,423 households (62.8 %)					
2) Paddy Field Size in NIS	1.25 ha per household (FUSA/Total beneficiaries as of 2008)						
3) Present Land Use in NIS	Paddy field planted	2,493 ha	83.1 %	As of 2008			
	Paddy field not planted	349 ha	11.6 %	As of 2008			
	Upland crop field	0 ha	0.0 %				
	Permanent crop field	158 ha	5.3 %				
	Undeveloped area	0 ha	0.0 %				
	Built-up area	0 ha	0.0 %				
	High ground	0 ha	0.0 %				
	Grassland	0 ha	0.0 %				
	Swamp	0 ha	0.0 %				
	Unspecified area	0 ha	0.0 %				
4) Paddy Field in FUSA (ha)	2,520						
5) Paddy Cropped Area (ha)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*	
Wet Season	2,509	2,470	2,437	2,429	2,492	2,467	
Dry Season	2,510	2,462	2,465	2,433	2,493	2,473	
6) Cropping Intensity (%)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*	
(per year)	177	174	172	171	175	174	
7) Unit Yield of Paddy (ton/ha)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*	
Wet Season	4.85	5.60	5.55	5.60	5.70	5.46	
Dry Season	5.05	4.75	4.80	5.65	5.55	5.16	
8) Paddy Production (ton)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*	
Wet Season	12,169	13,832	13,525	13,602	14,204	13,467	
Dry Season	12,676	11,695	11,832	13,746	13,836	12,757	

3.4 Water Resources

Item	*Description*
1) Name of Rivers	Padada River
2) Catchment Area at Dam	364 km^2
3) Ave. River Discharge	6.92 m^3/s
4) Ave. Dry Season Discharge	6.64 m^3/s
5) Diverted Intake Discharge	3.58 m^3/s
6) Water Requirement	4.54 m^3/s
7) Sedimentation	Moderate

3.5 Existing Irrigation System

Item	*Description*
1) Diversion Dam	Overflow crest width 95 m, Dam height 3.50 m
2) Main Canal	Total length 12.68 km (Lined portion 1.86)
3) Lateral Canals	Total length 41.49 km (Lined portion 8.31 km)
4) On-farm facilities	Total length 98.00 km (Lined portion 0.00 km) Turn-outs = 133 units
5) Drainage Canal	Total length 36.60 kms.
6) Canal Structures	No. = 149 units
7) Drainage Structures	No. = 46 units
8) Farm roads	Total length 53.83 km (pavement= 0.00 kms.)
9) Flood Protection Dike	Total length 0.10 km For new construction = 0.22 kms.

3.6 Institutions for O&M of NIS

Item	*Description*					
1) Regional Irrigation Office	Name: Region 11 – Southern Mindanao					
2) IMO	Name: Davao del Sur IMO					
Staff in 2009	Total number of staff: 45					
3) Irrigator' Association (IA)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Number of FIA (nos)					1	
Number of IA (nos)					6	
Number of TSAG (nos)	137	137	137	137	137	137
Functionality of IA	80.7	80.7	41.8	60.6	60.	64.9
Collection of ISF (wet, %)	65	71	74	82	73	77
Collection of ISF (dry, %)	60	68	61	51	82	64
4) NIS Category based on IA 2008 O&M Contract (NIA-IA)	No. of IA					
Category A	6					
Category B	0					
Category C	0					

3.7 Existing Problems

Item	*Description*
1) Diversion Works	1. The scour protection works downstream of the dam are damaged by floods through the decades. 2. The sluice way steel gates are leaking—water flows through the bottom of the gates even when fully closed. 3. The river upstream of the dam is not anymore straight as is ideal for a dam location.
2) Canal and Structures	1. Some canal sections are susceptible to bank erosion and percolation/seepage problems. 2. Many canal structures have dilapidated and inoperable steel gates. 3. Many canal structures have only wooden flush boards and need to be installed with steel gates.
3) Drainage Canal	1. Need to improve the drainage system.
4) Other Project Facilities (road, bridge, flood dike, building, etc)	1. Many road sections become muddy during rainy days. 2. Gatekeeper's and watermaster's quarters are already dilapidated. 3. Lack of rice drying and storing facilities.
5) Water Management and O&M Activities	1. Illegal checking in some places. 2. Lack of control in water intake in some turn-outs result in over supply in some areas in the upstream reaches of the canals but lack of supply in the downstream farms.
6) Status of NIS and IA Management	Status Type A evaluated by Radar Graph. 1. Minor problem such as medium ISF collection efficiency during dry and wet seasons at 64% and 77%, respectively
7) Watershed Management	Denuded watershed
8) Coordination with LGU and Agencies concerned	1. Poor coordination by NIA's field offices and IAs with concerned LGUs on specific problem such as watershed management
5) Agriculture	1. Inadequate post harvest facilities particularly for dryer. 2. Insufficient number of credit facilities to serve the farmers at low interest rate. 3. Poor cooperation among the farmer beneficiaries in IA activities.

4. Proposed Rehabilitation Plan

4.1 Agricultural Development Plan

Item	*Description*			
Cropping schedule	*Wet Season*	*Dry Season-1*	*Dry Season-2*	*Annual*
1) Type of Crops	Paddy	Paddy	-	-
2) Cropping Area (ha)	2520	2520	-	-
3) Target Unit Yield (ton/ha)	5.70	5.60	-	-
3) Total Production (ton)	14,364	14,112	-	28,476

4.2 Civil Works

Item	*Description*
1) Diversion Works	1. Dredging of the river upstream of the dam. 2. Repair and improvement of the scour protection works downstream of the dam. 3. Repair of the sluice steel gates.
2) Canal Structures	1. Repair/rehabilitation of old dilapidated steel gates – 20 units 2. Installation of new steel gates to replace wooden flush boards – 18 units
3) Canalization	1. Concrete lining of selected existing canal sections – 44 kms 2. Re-shaping and de-silting of some canal sections – 23 kms 3. Realignment of canals 4.Construction of new canals
4) Drainage Structures	1. Repair of drainage structures – 12 units
5) Drainage Canalization	1. Repair of existing drainage canals and construction of new ones – 14.2 kms
6) Service Roads	1. Re-gravelling of selected road sections - 37.7 kms 2. Construction of side drainage canals – 37.7 kms 3. Construction of road drainage structures
7) On-Farm Facilities	1. Repair /replacement of dilapidated turn out steel gates 2.Construction of new turn outs and farm ditches
8) IMT Support Facilities	1. Construction of post-harvest facilities—warehouses, IA buildings, solar driers with shed – 2 sets
9) IMT GIS Database	1. Development and establishment of GIS database

4.3 Institutional Strengthening Program

Item	*Description*
1) Reactivation Program of FIAs/IAs and System Management Committee (ISMC)	1. Executing body : Project Management Office with assistance of Consultant 2. Schedule:34 months / NIS 3. Counter body for execution: NIA Regional Office and IMO office 4. Attendant / Trainee: President of FIAs/IAs and secretary group, staff of NIA RIO/IMO, Chairmen of ISMC and Secretary group and LGUs officers, 5. Contents: a) Survey & Study by Consultant b) Workshops on coordination activities with and dissemination on reformation plan to FIAs/IAs c) Workshop on coordination activities with LGUs d) Organization and Legal Registration of FIAs/IAs to be re-active and reactivation of SMC e) Construction of IMT support facilities for FIAs/CIA f) Workshop and Training of FIAs/IAs members on management under the IMT g) Assessment/Evaluation for and Negotiation of Contracting under IMT h) Assistance of reactivated IAs/FIAs in organizational and management activities
2) Strengthening Program of NIA - IA - LGU Partnership	1. Executing body : Project Management Office with assistance of Consultant, & Management System Committee (MSC) of NIS 2. Schedule: 7 months / NIS 3. Counter body for execution: Regional Development Council with Secretary of NEDA Regional Office

Item	*Description*
	4. Attendant / Trainee: Secretaries of Regional Organizations, LGUs officers, President of FIAs/IAs and secretary group, staff of NIA RIO/IMO, Chairmen of ISMC and Secretary group 5. Contents: a) Workshop on Trouble Shooting of NIS and FIAs/ISs' Management b) Provision of work space for ISMC including office facilities
3) NIA Institutional Strengthening Program	1. Executing body : Institutional Development Division of CO, NIA 2. Schedule: 7 months / NIS 3. Counter body for execution: NIA Regional Office and IMO office 4. Attendant / Trainee: NIA personnel at CO, RIO and IMO 5. Contents: a) Capability built-up program (Central and Regional NIA Offices) b) Improvement program on management mechanism of NIA c) Support program for IMT implementation d) Strengthening program of Integrated Management information System
4) Specific Program on watershed management plan	1. Strengthening coordination with RDC, RAFC/PAFC and LGUs concerned through works shop on dissemination of the SLRIF to these organizations. 2. Strengthening coordination with RDC, RAFC/PAFC and LGUs on training program of watershed management

4.4 Proposed Counter Schemes

Item	*Description*
1) DENR	1. Technical assistance to concerned Provincial/municipal LGUs on watershed rehabilitation and management such as establishment of nurseries, community-based livelihood for upland dwellers
2) LGU	1. LGUs improve coordination program with NIA to give priority of the projects in annual budgeting and funds programming 2. Provincial LGUs to extend training to municipal agricultural officers to improve skills on technology promotion 3. LGUs improve capacity of its personnel to prepare project proposals through a training by DILG to ensure project's fund access to municipal development fund 4. 4. LGUs provide reliable post-harvest facilities to ensure optimal operation of the facilities

5. Cost Estimate for Initial Investment

Item	*Description*			
1) Direct Cost for Civil Works	A. Mobilization	Php	4.04	Million
	B. Protection Dikes		-	
	C. Diversion Works	Php	21.27	Million
	D. Canal Structures	Php	3.76	Million
	E. Canalization	Php	115.66	Million
	F. Drainage Structures	Php	5.04	Million
	G. Drainage Canalization	Php	7.56	Million
	H. Road	Php	15.81	Million
	I. On-Farm Facilities/T.O. Gates	Php	1.71	Million
	J. IMT Support Facilities	Php	15.00	Million
	K. IMT GIS Database	Php	2.52	Million
	L. Institutional Development (5% of Direct Cost)	Php	5.40	Million
	M. Feasibility Studies & Detailed Engineering (2% of Direct Cost)	Php	4.04	Million
	Sub-total (Direct Cost)	Php	201.80	Million

2) Indirect Cost	A. General Engineering Supervision and Administration (3.5% of Direct Cost)	Php	7.06	Million
	B. NIA Management Fee (5% of Total Project Cost)	Php	10.99	Million
	Sub-total (Indirect Cost)	Php	18.06	Million
3) Total Project Cost	= 1+2	Php	219.86	Million
Cost per ha.		Php	87,245.00	/ha.

6. Implementation Plan

Item	*Description*
1) Contract package	1 - Local Competitive Bidding (LCB)
2) Implementation Schedule	
a) Civil Works	
1) Survey, F/S, Design	16 months
2) Tendering	6 months
3) Construction	27 months
b) Institutional Improvement Works	
1) Reactivation Program of FIAs/IAs and Irrigation System Management Committee	34 months
2) NIA-IA-LGU Partnership	7 months
3) Strengthening of NIA staff	7 months

7. Project Evaluation

Item		*Description*	
1) Economic evaluation			
EIRR (Base)		EIRR = 17.4 %	: Project life 50 years
Sensitivity	Case-1	EIRR = 16.0 %	: Cost 10% up
	Case-2	EIRR = 15.8 %	: Benefit 10% down
	Case-3	EIRR = 14.6%	: Cost 10% up + Benefit 10% down
B/C		1.18	: discount rate 15% p.a.
NPV		PHP 23 million	: discount rate 15% p.a.
2) Financial evaluation		Farmer's net income increase = PHP 2,018 per ha per year	
3) Expected Impacts		1. Increased farmers' income 2. Increased rice self sufficiency of the country 3. Increased job opportunities in rural areas	

8. Environmental Aspects

Item	*Description*
1) Environmental aspect	Need to address siltation problem of the river upstream of the dam
2) Relocation of houses	None
3) Land acquisition	None

Table 1102 - Padada Economic Evaluation (EIRR)

Basic Case

Name of NIS 1102 - Padada | Region : 11 IMO RIO Davao Del Sur

EIRR : 17.4%	Net Present Value (Million PHP) (15 % discount rate)	Benefit	Cost	B/C Ratio	NPV
		153	129	1.18	23

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP) Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Economic Benefit (M. PHP) Benefit	without 1.5%	Total	Net Cash Flow (M. PHP)
1	2011			0.99		0.99		2.80	2.80	1.81
2	2012			0.99		0.99		5.60	5.60	4.61
3	2013	54.63	0.88	0.99		56.50		8.40	8.40	-48.10
4	2014	72.84	1.17	0.99	1.53	76.54	0.69	11.20	11.89	-64.65
5	2015	54.63	0.88	0.99	3.58	60.08	1.71	14.00	15.71	-44.37
6	2016				5.11	5.11	2.60	16.80	19.40	14.29
7	2017				5.11	5.11	2.80	19.60	22.40	17.29
8	2018				5.11	5.11	2.89	22.40	25.29	20.18
9	2019				5.11	5.11	2.89	25.20	28.09	22.98
10	2020				5.11	5.11	2.89	28.00	30.89	25.78
11	2021				5.11	5.11	2.89	30.80	33.69	28.58
12	2022				5.11	5.11	2.89	33.60	36.49	31.38
13	2023				5.11	5.11	2.89	36.40	39.29	34.18
14	2024				5.11	5.11	2.89	39.20	42.09	36.98
15	2025				5.11	5.11	2.89	42.00	44.89	39.78
16	2026				5.11	5.11	2.89	44.80	47.69	42.58
17	2027				5.11	5.11	2.89	47.60	50.49	45.38
18	2028				5.11	5.11	2.89	50.40	53.29	48.18
19	2029				5.11	5.11	2.89	53.20	56.09	50.98
20	2030				5.11	5.11	2.89	56.00	58.89	53.78
21	2031				5.11	5.11	2.89	58.80	61.69	56.58
22	2032				5.11	5.11	2.89	61.60	64.49	59.38
23	2033				5.11	5.11	2.89	64.40	67.29	62.18
24	2034				5.11	5.11	2.89	67.20	70.09	64.98
25	2035				5.11	5.11	2.89	70.00	72.89	67.78
26	2036				5.11	5.11	2.89	72.80	75.69	70.58
27	2037				5.11	5.11	2.89	75.60	78.49	73.38
28	2038				5.11	5.11	2.89	78.40	81.29	76.18
29	2039				5.11	5.11	2.89	81.20	84.09	78.98
30	2040				5.11	5.11	2.89	84.00	86.89	81.78
31	2041				5.11	5.11	2.89	86.80	89.69	84.58
32	2042				5.11	5.11	2.89	89.60	92.49	87.38
33	2043				5.11	5.11	2.89	92.40	95.29	90.18
34	2044				5.11	5.11	2.89	95.20	98.09	92.98
35	2045				5.11	5.11	2.89	98.00	100.89	95.78
36	2046				5.11	5.11	2.89	100.80	103.69	98.58
37	2047				5.11	5.11	2.89	103.60	106.49	101.38
38	2048				5.11	5.11	2.89	106.40	109.29	104.18
39	2049				5.11	5.11	2.89	109.20	112.09	106.98
40	2050				5.11	5.11	2.89	112.00	114.89	109.78
41	2051				5.11	5.11	2.89	114.80	117.69	112.58
42	2052				5.11	5.11	2.89	117.60	120.49	115.38
43	2053				5.11	5.11	2.89	120.40	123.29	118.18
44	2054				5.11	5.11	2.89	123.20	126.09	120.98
45	2055				5.11	5.11	2.89	126.00	128.89	123.78
46	2056				5.11	5.11	2.89	128.80	131.69	126.58
47	2057				5.11	5.11	2.89	131.60	134.49	129.38
48	2058				5.11	5.11	2.89	134.40	137.29	132.18
49	2059				5.11	5.11	2.89	137.20	140.09	134.98
50	2060				5.11	5.11	2.89	140.00	142.89	137.78

Case-1 (Cost 10% up)

Name of NIS 1102 - Padada | Region : 11 IMO RIO Davao Del Sur

EIRR : 16.0%	Net Present Value (Million PHP) (15 % discount rate)	Benefit	Cost	B/C Ratio	NPV
		153	142	1.07	11

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP) Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Economic Benefit (M. PHP) Benefit	without 1.5%	Total	Net Cash Flow (M. PHP)
1	2011	-	-	1.09	-	1.09	-	2.80	2.80	1.71
2	2012	-	-	1.09	-	1.09	-	5.60	5.60	4.51
3	2013	60.10	0.96	1.09	-	62.15	-	8.40	8.40	-53.75
4	2014	80.13	1.28	1.09	1.69	84.19	0.69	11.20	11.89	-72.30
5	2015	60.10	0.96	1.09	3.93	66.09	1.71	14.00	15.71	-50.38
6	2016	-	-	-	5.62	5.62	2.60	16.80	19.40	13.78
7	2017	-	-	-	5.62	5.62	2.80	19.60	22.40	16.78
8	2018	-	-	-	5.62	5.62	2.89	22.40	25.29	19.67
9	2019	-	-	-	5.62	5.62	2.89	25.20	28.09	22.47
10	2020	-	-	-	5.62	5.62	2.89	28.00	30.89	25.27
11	2021	-	-	-	5.62	5.62	2.89	30.80	33.69	28.07
12	2022	-	-	-	5.62	5.62	2.89	33.60	36.49	30.87
13	2023	-	-	-	5.62	5.62	2.89	36.40	39.29	33.67
14	2024	-	-	-	5.62	5.62	2.89	39.20	42.09	36.47
15	2025	-	-	-	5.62	5.62	2.89	42.00	44.89	39.27
16	2026	-	-	-	5.62	5.62	2.89	44.80	47.69	42.07
17	2027	-	-	-	5.62	5.62	2.89	47.60	50.49	44.87
18	2028	-	-	-	5.62	5.62	2.89	50.40	53.29	47.67
19	2029	-	-	-	5.62	5.62	2.89	53.20	56.09	50.47
20	2030	-	-	-	5.62	5.62	2.89	56.00	58.89	53.27
21	2031	-	-	-	5.62	5.62	2.89	58.80	61.69	56.07
22	2032	-	-	-	5.62	5.62	2.89	61.60	64.49	58.87
23	2033	-	-	-	5.62	5.62	2.89	64.40	67.29	61.67
24	2034	-	-	-	5.62	5.62	2.89	67.20	70.09	64.47
25	2035	-	-	-	5.62	5.62	2.89	70.00	72.89	67.27
26	2036	-	-	-	5.62	5.62	2.89	72.80	75.69	70.07
27	2037	-	-	-	5.62	5.62	2.89	75.60	78.49	72.87
28	2038	-	-	-	5.62	5.62	2.89	78.40	81.29	75.67
29	2039	-	-	-	5.62	5.62	2.89	81.20	84.09	78.47
30	2040	-	-	-	5.62	5.62	2.89	84.00	86.89	81.27
31	2041	-	-	-	5.62	5.62	2.89	86.80	89.69	84.07
32	2042	-	-	-	5.62	5.62	2.89	89.60	92.49	86.87
33	2043	-	-	-	5.62	5.62	2.89	92.40	95.29	89.67
34	2044	-	-	-	5.62	5.62	2.89	95.20	98.09	92.47
35	2045	-	-	-	5.62	5.62	2.89	98.00	100.89	95.27
36	2046	-	-	-	5.62	5.62	2.89	100.80	103.69	98.07
37	2047	-	-	-	5.62	5.62	2.89	103.60	106.49	100.87
38	2048	-	-	-	5.62	5.62	2.89	106.40	109.29	103.67
39	2049	-	-	-	5.62	5.62	2.89	109.20	112.09	106.47
40	2050	-	-	-	5.62	5.62	2.89	112.00	114.89	109.27
41	2051	-	-	-	5.62	5.62	2.89	114.80	117.69	112.07
42	2052	-	-	-	5.62	5.62	2.89	117.60	120.49	114.87
43	2053	-	-	-	5.62	5.62	2.89	120.40	123.29	117.67
44	2054	-	-	-	5.62	5.62	2.89	123.20	126.09	120.47
45	2055	-	-	-	5.62	5.62	2.89	126.00	128.89	123.27
46	2056	-	-	-	5.62	5.62	2.89	128.80	131.69	126.07
47	2057	-	-	-	5.62	5.62	2.89	131.60	134.49	128.87
48	2058	-	-	-	5.62	5.62	2.89	134.40	137.29	131.67
49	2059	-	-	-	5.62	5.62	2.89	137.20	140.09	134.47
50	2060	-	-	-	5.62	5.62	2.89	140.00	142.89	137.27

Table 1102 - Padada Economic Evaluation (EIRR)

Case-2 (Benefit 10% down)

Name of NIS 1102 - Padada | Region : 11 IMO,RIO Davao Del Sur

EIRR : 15.8%	Net Present Value (Million PHP) (15 % discount rate)	Benefit	Cost	B/C Ratio	NPV
		137	129	1.06	8

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	0.99	-	0.99	-	2.52	2.52	1.53
2	2012	-	-	0.99	-	0.99	-	5.04	5.04	4.05
3	2013	54.63	0.88	0.99	-	56.50	-	7.56	7.56	-48.94
4	2014	72.84	1.17	0.99	1.53	76.54	0.62	10.08	10.70	-65.83
5	2015	54.63	0.88	0.99	3.58	60.08	1.53	12.60	14.13	-45.95
6	2016	-	-	-	5.11	5.11	2.34	15.12	17.46	12.35
7	2017	-	-	-	5.11	5.11	2.52	17.64	20.16	15.05
8	2018	-	-	-	5.11	5.11	2.60	20.16	22.76	17.65
9	2019	-	-	-	5.11	5.11	2.60	22.68	25.28	20.17
10	2020	-	-	-	5.11	5.11	2.60	25.20	27.80	22.69
11	2021	-	-	-	5.11	5.11	2.60	27.72	30.32	25.21
12	2022	-	-	-	5.11	5.11	2.60	30.24	32.84	27.73
13	2023	-	-	-	5.11	5.11	2.60	32.76	35.36	30.25
14	2024	-	-	-	5.11	5.11	2.60	35.28	37.88	32.77
15	2025	-	-	-	5.11	5.11	2.60	37.80	40.40	35.29
16	2026	-	-	-	5.11	5.11	2.60	40.32	42.92	37.81
17	2027	-	-	-	5.11	5.11	2.60	42.84	45.44	40.33
18	2028	-	-	-	5.11	5.11	2.60	45.36	47.96	42.85
19	2029	-	-	-	5.11	5.11	2.60	47.88	50.48	45.37
20	2030	-	-	-	5.11	5.11	2.60	50.40	53.00	47.89
21	2031	-	-	-	5.11	5.11	2.60	52.92	55.52	50.41
22	2032	-	-	-	5.11	5.11	2.60	55.44	58.04	52.93
23	2033	-	-	-	5.11	5.11	2.60	57.96	60.56	55.45
24	2034	-	-	-	5.11	5.11	2.60	60.48	63.08	57.97
25	2035	-	-	-	5.11	5.11	2.60	63.00	65.60	60.49
26	2036	-	-	-	5.11	5.11	2.60	65.52	68.12	63.01
27	2037	-	-	-	5.11	5.11	2.60	68.04	70.64	65.53
28	2038	-	-	-	5.11	5.11	2.60	70.56	73.16	68.05
29	2039	-	-	-	5.11	5.11	2.60	73.08	75.68	70.57
30	2040	-	-	-	5.11	5.11	2.60	75.60	78.20	73.09
31	2041	-	-	-	5.11	5.11	2.60	78.12	80.72	75.61
32	2042	-	-	-	5.11	5.11	2.60	80.64	83.24	78.13
33	2043	-	-	-	5.11	5.11	2.60	83.16	85.76	80.65
34	2044	-	-	-	5.11	5.11	2.60	85.68	88.28	83.17
35	2045	-	-	-	5.11	5.11	2.60	88.20	90.80	85.69
36	2046	-	-	-	5.11	5.11	2.60	90.72	93.32	88.21
37	2047	-	-	-	5.11	5.11	2.60	93.24	95.84	90.73
38	2048	-	-	-	5.11	5.11	2.60	95.76	98.36	93.25
39	2049	-	-	-	5.11	5.11	2.60	98.28	100.88	95.77
40	2050	-	-	-	5.11	5.11	2.60	100.80	103.40	98.29
41	2051	-	-	-	5.11	5.11	2.60	103.32	105.92	100.81
42	2052	-	-	-	5.11	5.11	2.60	105.84	108.44	103.33
43	2053	-	-	-	5.11	5.11	2.60	108.36	110.96	105.85
44	2054	-	-	-	5.11	5.11	2.60	110.88	113.48	108.37
45	2055	-	-	-	5.11	5.11	2.60	113.40	116.00	110.89
46	2056	-	-	-	5.11	5.11	2.60	115.92	118.52	113.41
47	2057	-	-	-	5.11	5.11	2.60	118.44	121.04	115.93
48	2058	-	-	-	5.11	5.11	2.60	120.96	123.56	118.45
49	2059	-	-	-	5.11	5.11	2.60	123.48	126.08	120.97
50	2060	-	-	-	5.11	5.11	2.60	126.00	128.60	123.49

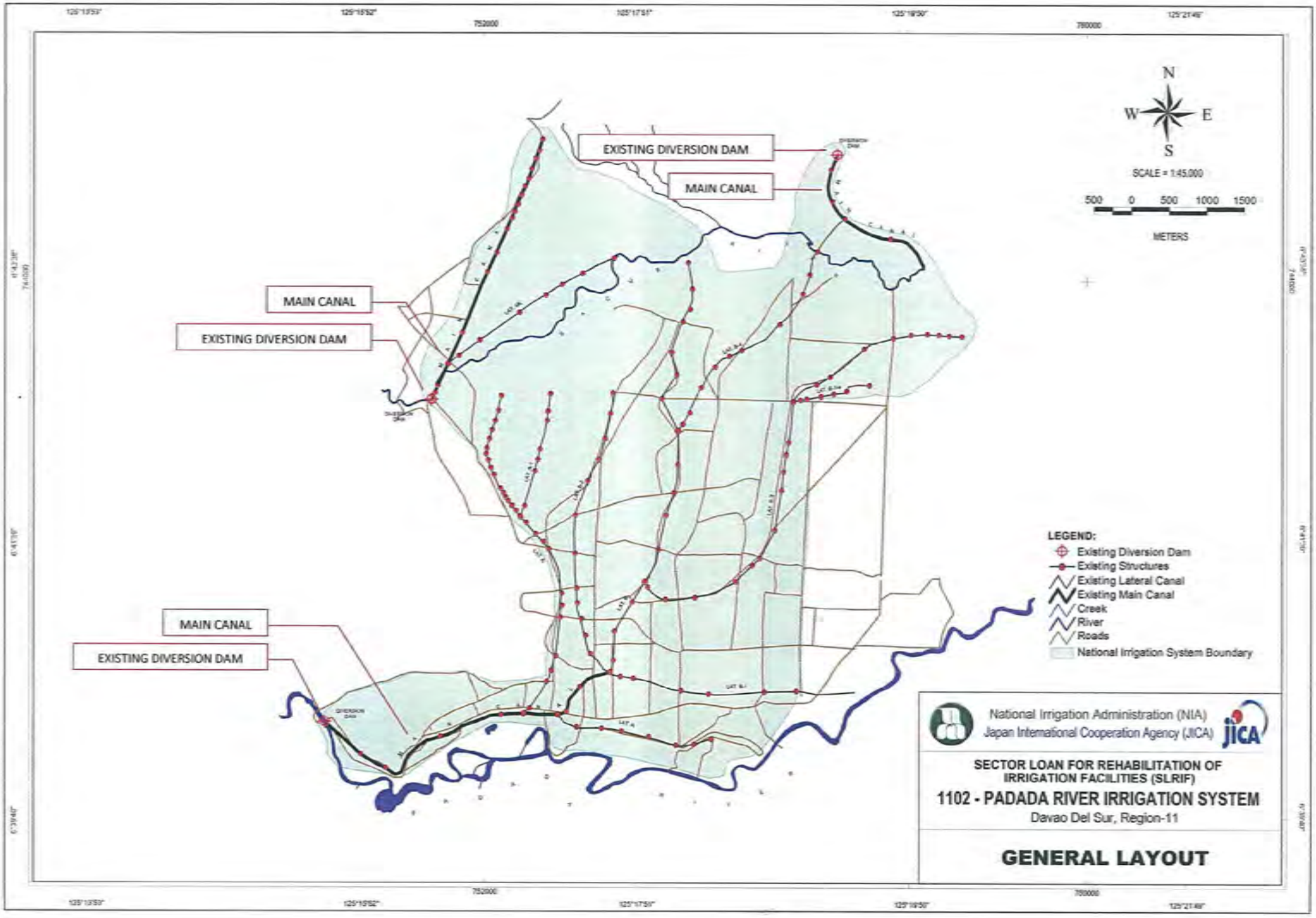
Case-3 (Cost 10% up and Benefit 10% down)

Name of NIS 1102 - Padada | Region : 11 IMO,RIO Davao Del Sur

EIRR : 14.6%	Net Present Value (Million PHP) (15 % discount rate)	Benefit	Cost	B/C Ratio	NPV
		137	142	0.97	-5

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	1.09	-	1.09	-	2.52	2.52	1.43
2	2012	-	-	1.09	-	1.09	-	5.04	5.04	3.95
3	2013	60.10	0.96	1.09	-	62.15	-	7.56	7.56	-54.59
4	2014	80.13	1.28	1.09	1.69	84.19	0.62	10.08	10.70	-73.49
5	2015	60.10	0.96	1.09	3.93	66.09	1.53	12.60	14.13	-51.95
6	2016	-	-	-	5.62	5.62	2.34	15.12	17.46	11.84
7	2017	-	-	-	5.62	5.62	2.52	17.64	20.16	14.54
8	2018	-	-	-	5.62	5.62	2.60	20.16	22.76	17.14
9	2019	-	-	-	5.62	5.62	2.60	22.68	25.28	19.66
10	2020	-	-	-	5.62	5.62	2.60	25.20	27.80	22.18
11	2021	-	-	-	5.62	5.62	2.60	27.72	30.32	24.70
12	2022	-	-	-	5.62	5.62	2.60	30.24	32.84	27.22
13	2023	-	-	-	5.62	5.62	2.60	32.76	35.36	29.74
14	2024	-	-	-	5.62	5.62	2.60	35.28	37.88	32.26
15	2025	-	-	-	5.62	5.62	2.60	37.80	40.40	34.78
16	2026	-	-	-	5.62	5.62	2.60	40.32	42.92	37.30
17	2027	-	-	-	5.62	5.62	2.60	42.84	45.44	39.82
18	2028	-	-	-	5.62	5.62	2.60	45.36	47.96	42.34
19	2029	-	-	-	5.62	5.62	2.60	47.88	50.48	44.86
20	2030	-	-	-	5.62	5.62	2.60	50.40	53.00	47.38
21	2031	-	-	-	5.62	5.62	2.60	52.92	55.52	49.90
22	2032	-	-	-	5.62	5.62	2.60	55.44	58.04	52.42
23	2033	-	-	-	5.62	5.62	2.60	57.96	60.56	54.94
24	2034	-	-	-	5.62	5.62	2.60	60.48	63.08	57.46
25	2035	-	-	-	5.62	5.62	2.60	63.00	65.60	59.98
26	2036	-	-	-	5.62	5.62	2.60	65.52	68.12	62.50
27	2037	-	-	-	5.62	5.62	2.60	68.04	70.64	65.02
28	2038	-	-	-	5.62	5.62	2.60	70.56	73.16	67.54
29	2039	-	-	-	5.62	5.62	2.60	73.08	75.68	70.06
30	2040	-	-	-	5.62	5.62	2.60	75.60	78.20	72.58
31	2041	-	-	-	5.62	5.62	2.60	78.12	80.72	75.10
32	2042	-	-	-	5.62	5.62	2.60	80.64	83.24	77.62
33	2043	-	-	-	5.62	5.62	2.60	83.16	85.76	80.14
34	2044	-	-	-	5.62	5.62	2.60	85.68	88.28	82.66
35	2045	-	-	-	5.62	5.62	2.60	88.20	90.80	85.18
36	2046	-	-	-	5.62	5.62	2.60	90.72	93.32	87.70
37	2047	-	-	-	5.62	5.62	2.60	93.24	95.84	90.22
38	2048	-	-	-	5.62	5.62	2.60	95.76	98.36	92.74
39	2049	-	-	-	5.62	5.62	2.60	98.28	100.88	95.26
40	2050	-	-	-	5.62	5.62	2.60	100.80	103.40	97.78
41	2051	-	-	-	5.62	5.62	2.60	103.32	105.92	100.30
42	2052	-	-	-	5.62	5.62	2.60	105.84	108.44	102.82
43	2053	-	-	-	5.62	5.62	2.60	108.36	110.96	105.34
44	2054	-	-	-	5.62	5.62	2.60	110.88	113.48	107.86
45	2055	-	-	-	5.62	5.62	2.60	113.40	116.00	110.38
46	2056	-	-	-	5.62	5.62	2.60	115.92	118.52	112.90
47	2057	-	-	-	5.62	5.62	2.60	118.44	121.04	115.42
48	2058	-	-	-	5.62	5.62	2.60	120.96	123.56	117.94
49	2059	-	-	-	5.62	5.62	2.60	123.48	126.08	120.46
50	2060	-	-	-	5.62	5.62	2.60	126.00	128.60	122.98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National Irrigation Administration (NIA)
Japan International Cooperation Agency (JICA)
JICA
SECTOR LOAN FOR REHABILITATION OF IRRIGATION FACILITIES (SLRIF)
1102 - PADADA RIVER IRRIGATION SYSTEM
Davao Del Sur, Region-11
GENERAL LAYOUT

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities
Photograph of Irrigation Facilities

NIS name: Padada NIS (Region 11)

Location / Facility	*Photograph*	*Comments*
01. Padada river diversion works. View taken from the left bank facing upstream. Longitude: 6° 40' 22"E Latitude: 125° 15' 53" N		Scour protection works downstream of the dam needs repair.
02. Padada river diversion works. View taken from the left bank facing downstream. Longitude: 6° 40' 22" E Latitude: 125° 15' 53" N		River upstream of the dam needs to be dredged.
03. Sacub dam. Supplemental water source. Longitude: 6° 42' 41" E Latitude: 125° 16' 38" N		Downstream flood protection works need to be repaired.

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities
Photograph of Irrigation Facilities

NIS name: Padada NIS (Region 11)

Location / Facility	*Photograph*	*Comments*
04. Sacub dam. Longitude: 6° 42' 41" E Latitude: 125° 16' 38" N		Downstream apron needs to be repaired.
05. Main canal right after the dam intake. Longitude: 6° 42' 41" E Latitude: 125° 16' 38" N		Canal needs concrete lining.
06. Headgate Lateral B. Main canal station 3+710. Longitude: 6° 40' 25" E Latitude: 125° 17' 31"N		Structure needs new steel gates.

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities
Photograph of Irrigation Facilities

NIS name: Padada NIS (Region 11)

Location / Facility	*Photograph*	*Comments*
07. Lateral B. Station 0+000. Longitude: 6□ 40' 25" E Latitude: 125□ 17' 31"N		Canal needs concrete lining.
08. Headgate Lateral B-1 & B-2. Lateral B station 0+890 Longitude: 6□ 40' 47" E Latitude: 125□ 17' 47"N		Steel gates need to be repaired.
09. Gatekeeper's quarter at headgate of Lateral B-1 & B-2. Longitude: 6□ 40' 47" E Latitude: 125□ 17' 47"N		Building needs major repair.

THE REPUBLIC OF PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION

Sector Loan on Rehabilitation of Irrigation Facilities

NIS SUMMARY REPORT

1201
Lambayaong RIS

Region 12,
Maguindanao & Sultan Kudarat Provinces

July 2009

Survey Team for
Japan International Cooperation Agency
(JICA)

Features of NIS for Rehabilitation Project

1. General

Item	*Description*		
1) Name of NIS	**LAMBAYONG RIS**		Code: 1201
2) Location	Region	12	
	Province	Sultan Kudarat	
	Municipalities	Tacurong, Lambayong & Quirino	
	Distance	7 kms. from Tacurong, Sultan Kudarat Province	
3) Type of Water Source	Water Source	Kapingkong River	
	Type	Diversion Dam (63.60 m wide, 2.83 m high)	
4) Area	Service Area	12,000 has.	
	FUSA	11,355 has.	
5) Beneficiary Farmers	6,874 farmers	Average paddy field cultivating size = 1.65 ha per farmer	
6) Irrigator's Association	IAs established = 39 FIA established = 1 in 2008		
7) Features of NIS and Necessity of the project	Lambayong RIS was completed in 1990. It has a design service area of 12,000 has. but a firmed-up service area of only 11,355 has. due to built up areas. It has one (1) main canal with a total length of 12.09 kms.; thirty three (33) lateral canals with a total length of 140 kms. and 110 kms. of service roads. It also has 130 kilometers of drainage canals, 560 canal structures, 93 drainage structures, 368 turn-outs and 647 kms. of farm ditches. During the last five (5) years it had an average cropping intensity of 153% and average yields of 83 cavans/ha. during the wet season and 65 cavans/ha. during the dry season. A rehabilitation of the system is necessary to restore irrigation service to 4,534 hectares of farms whose irrigation canals were cut-off and destroyed during the Typhoon Frank in June 2008.		
8) Outline of the Proposed Project	A. Engineering 1. a.Repair of diversion dam b.Construction of flood protection dikes at the banks of the river upstream of the dam 2. Repair and improvement of irrigation canal and structures 3. Repair and improvement of drainage canal and structures 4. Repair and improvement of service roads 5. Repair and improvement of on-farm facilities 6. Repair and construction of IMT support facilities-IA Bldg solar drier, warehouse with IA building 7. Development and establishment of IMT GIS database B. Institutional Strengthening Program B. 1 Basic Program 1. Reactivation of FIA/IA and Strengthening of Irrigation System Management Committee (ISMC) of NIS including construction of IMT support facilities 2. Strengthening of NIA – IA – LGUs Partnership 3. Strengthening NIA Institutional Capacity		

	B.2 Specific Program to strengthen institutional mechanism together with LGUs 1. Improvement of watershed management
9) Proposed Project Component	A. Engineering 1. Construction of civil works for rehabilitation of diversion works, canal system, drainage system, roads, and IMT support facilities. B. Institutional 1. Reactivation of FIAs/IAs including reformation of TSGA / IA / FIA areas, construction of IMT support facilities (demand base) 2. Strengthening NIA-IA- LGUs Partnership, especially coordination RDC, RAFC/PAFC with FIAs/IAs and ISMC 3. Institutional development program to strengthen management capacity of NIA field offices and IAs.
10) Project Cost (Direct cost only, excluding escalation, contingency, tax)	1. Direct cost — PHP 523.89 Million - *Civil Works* — *PHP 493.51 Million* - *Institutional Development* — *PHP 19.90 Million* - *Engineering Services* — *PHP 10.48 Million* 2. Indirect cost — PHP 46.87 Million Total Project Cost (1+2) — PHP 570.76 Million Cost per ha — PHP 50.265.00 per ha
11) Project Benefit	1. To increase paddy production by 15,954 tons/year 2. To increase farmers' net income to PHP50,714.00/ha/year 3. To establish functional and self-reliant IAs 4. To improve performance of NIS
12) Project Justification	EIRR = 28.7%, B/C = 1.8 (discount rate 15%)

2. Project History (Construction/Rehabilitation)

Year	*Description*
1990	Project Completion
2004-2008	Repair and rehabilitation of Dam

3. Present Condition

3.1 Natural Conditions

Item	*Description*
1) Annual Rainfall	1,413.60 mm
2) Seasons	Wet: March-September Dry: October - February
3) Dominant Soil in NIS Area	Sandy Loam
4) Topography	Relatively flat slope

3.2 Socio-economy (Region/Province)

Item	*Description*
1) GRDP	PHP 220,322 million (Year 2007), Per Capita GRDP = PHP 57,708 per year
2) Population	675,644 (province)
3) Population Growth Rate	1.97 % per year (province)
4) Labor Force	2,382,000 (region)
5) Poverty Population	47.4 % to total population (province)

3.3 Present Agriculture in NIS

Item	*Description*					
1) Farm Household in NIS	Total beneficiaries	6,874 households				
	Land owners	3,112 households (45.3 %)				
	Tenant farmers	3,672 households (54.7 %)				
2) Paddy Field Size in NIS	1.65 ha per household (FUSA/Total beneficiaries as of 2008)					
3) Present Land Use in NIS	Paddy field planted	7,615 ha	63.4 %			
	Paddy field not planted	3,740 ha	31.2 %			
	Upland crop field	74 ha	0.6 %			
	Permanent crop field	37 ha	0.3 %			
	Undeveloped area	0 ha	0.0 %			
	Built-up area	0 ha	0.0 %			
	High ground	0 ha	0.0 %			
	Grassland	200 ha	1.7 %			
	Swamp	334 ha	2.8 %			
	Unspecified area	0 ha	0.0 %			
5) Paddy Field in FUSA (ha)	11,355					
5) Paddy Cropped Area (ha)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Wet Season	9,582	9,819	10,251	10,181	7,615	9,490
Dry Season	7,201	7,168	7,052	6,855	7,182	7,092
6) Cropping Intensity (%)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
(per year)	148	150	152	150	130	146
7) Unit Yield of Paddy (ton/ha)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Wet Season	4.82	4.35	4.52	2.76	4.25	4.12
Dry Season	4.09	3.65	2.75	2.61	3.25	3.28
8) Paddy Production (ton)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Wet Season	46,137	42,713	46,365	28,135	32,364	39,143
Dry Season	29,452	26,163	19,356	17,912	23,342	23,245

3.4 Water Resources

Item	*Description*
1) Name of Rivers	Kapingkong River
2) Catchment Area at Dam	527.50 km^2
3) Ave. River Discharge	18.33 m^3/s
4) Ave. Dry Season Discharge	13.67 m^3/s
5) Diverted Intake Discharge	11.01 m^3/s
6) Water Requirement	20.44 m^3/s
7) Sedimentation	High

3.5 Existing Irrigation System

Item	*Description*
1) Diversion Dam	Overflow crest width 63.60 m, Dam height 2.83 m
2) Main Canal	Total length 12.09 km (Lined portion 12.09 km)
3) Lateral Canals	Total length 140.00 km (Lined portion 134.00 km)
4) On-farm facilities	Total length 378.00 km (Lined portion 0.00 km
	Turn-outs = 368 units Steel Gates = 47 units
5) Drainage Canal	Total length 129.97 kms.
6) Canal Structures	No. = 560 units Steel Gates = 72 units
7) Drainage Structures	No. = 150 units
8) Farm roads	Total length 145.29 km (pavement= 0.00 kms.)
9) Flood Protection Dike	Total length 24.50 km For new construction 1.96 km

3.6 Institutions for O&M of NIS

Item	*Description*					
1) Regional Irrigation Office	Name: Region 12 – South Central Mindanao					
2) IMO	Name: Sultan Kudarat IMO					
Staff in 2009	Total number of staff: 61					
3) Irrigator' Association (IA)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Number of FIA (nos)					1	
Number of IA (nos)					39	
Number of TSAG (nos)	297	297	293	299	299	297
Functionality of IA	63.2	81.4	75.6	71.4	79.9	74.3
Collection of ISF (wet, %)	61.1	49.7	45.9	42.6	53.8	49.9
Collection of ISF (dry, %)	47.3	40.1	36.5	43.2	37.3	40.1
4) NIS Category based on IA 2008 O&M Contract (NIA-IA)	No. of IA					
Category A	2					
Category B	37					
Category C	0					

3.7 Existing Problems

Item	*Description*
1) Diversion Works	1. Cables of barrage sluice gates are dilapidated.
2) Canal and Structures	1. Main and lateral canals were cut-off and destroyed by Typhoon Frank in 2008. 2. Need to repair/replace dilapidated steel gates of structures. 3. Need to install new steel gates in some structures with only wooden flush boards.
3) Drainage Canal	1. Need to repair drainage canals destroyed by the Typhoon Frank in 2008.
4) Other Project Facilities (road, bridge, flood dike, building, etc)	1. Some roads were destroyed by the typhoon. 2. Some road sections are very muddy during the rainy season.
5) Water Management and O&M Activities	1. Illegal checking in some places. 2. Lack of control in water intake in some turn-outs result in over supply in some areas in the upstream reaches of the canals but lack of supply in the downstream farms.
6) Status of NIS and IA Management	Status Type Bb evaluated by Radar Graph. Specific problems are: 1. Low ISF collection efficiency during dry and wet seasons at 40% and 50%, respectively 2. Low cropping intensity during dry season at 68% 3. Low paddy yield during dry season 53 cavans/ha

Item	*Description*
7) Watershed Management	1. Significant denudation of the watershed
8) Coordination with LGU and Agencies concerned	1. Lack of coordination by NIA's field offices and IAs with concerned LGUs and other line agencies on specific problem such as watershed management
9) Agriculture	1. No synchronize farming operation, cropping calendar is not followed. These conditions result to inefficient use of irrigation water. 2. Insufficient drying equipment particularly wet season crop. This condition force the farmers to sell their palay harvest just after the threshing with a lower price. 3. Inadequate lending institutions to provide credit to the farmers for their needs in their farming activities. Farmers are availing loans from the private traders with very high interest rates and to be paid immediately after the harvest. Traders are also the buyer of their produce at a low price.

4. Proposed Rehabilitation Plan

4.1 Agricultural Development Plan

Item	*Description*			
Cropping schedule	*Wet Season*	*Dry Season-1*	*Dry Season-2*	*Annual*
1) Type of Crops	Paddy	Paddy	-	-
2) Cropping Area (ha)	11,355	7200	-	-
3) Target Unit Yield (ton/ha)	4.25	3.25	-	-
3) Total Production (ton)	48,259	23,400	-	71,659

4.2 Civil Works

Item	*Description*
1) Diversion Works	1. Replacement of worn-out cables of sluice gates.
2) Canal Structures	1. Repair/reconstruction of destroyed structures – 26 units 2. Repair/rehabilitation of old dilapidated steel gates. 3. Installation of new steel gates to replace wooden flush boards
3) Canalization	1. Repair/reconstruction of destroyed canals - 9.7 kms 2. Concrete lining of selected existing canal sections. 3. Re-shaping and de-silting of some canal sections 4. Realignment of canals 5.Construction of new canals
4) Drainage Structures	1. Construction of new drainage structures – 75 units
5) Drainage Canalization	1. Repair of existing drainage canals and construction of new ones – 12.9 kms
6) Service Roads	1. Re-gravelling of selected road sections – 65.1 kms 2. Construction of side drainage canals. 3. Construction of road drainage structures
7) On-Farm Facilities	1. Repair /replacement of dilapidated turn out steel gates – 227 units 2.Construction of new turn outs and farm ditches
8) IMT Support Facilities	1. Construction of post-harvest facilities—warehouses, IA buildings, solar driers with shed – 11 sets
9) IMT GIS Database	1. Development and establishment of GIS database

4.3 Institutional Strengthening Program

Item	*Description*
1) Reactivation Program of FIAs/IAs and System Management Committee (ISMC)	1. Executing body : Project Management Office with assistance of Consultant 2. Schedule:34 months / NIS 3. Counter body for execution: NIA Regional Office and IMO office 4. Attendant / Trainee: President of FIAs/IAs and secretary group, staff of NIA RIO/IMO, Chairmen of ISMC and Secretary group and LGUs officers, 5. Contents: a) Survey & Study by Consultant b) Workshops on coordination activities with and dissemination on reformation plan to FIAs/IAs c) Workshop on coordination activities with LGUs d) Organization and Legal Registration of FIAs/IAs to be re-active and reactivation of SMC e) Construction of IMT support facilities for FIAs/CIA f) Workshop and Training of FIAs/IAs members on management under the IMT g) Assessment/Evaluation for and Negotiation of Contracting under IMT h) Assistance of reactivated IAs/FIAs in organizational and management activities
2) Strengthening Program of NIA - IA - LGU Partnership	1. Executing body : Project Management Office with assistance of Consultant, & Management System Committee (MSC) of NIS 2. Schedule: 7 months / NIS 3. Counter body for execution: Regional Development Council with Secretary of NEDA Regional Office 4. Attendant / Trainee: Secretaries of Regional Organizations, LGUs officers, President of FIAs/IAs and secretary group, staff of NIA RIO/IMO, Chairmen of ISMC and Secretary group 5. Contents: a) Workshop on Trouble Shooting of NIS and FIAs/ISs' Management b) Provision of work space for ISMC including office facilities
3) NIA Institutional Strengthening Program	1. Executing body : Institutional Development Division of CO, NIA 2. Schedule: 7 months / NIS 3. Counter body for execution: NIA Regional Office and IMO office 4. Attendant / Trainee: NIA personnel at CO, RIO and IMO 5. Contents: a) Capability built-up program (Central and Regional NIA Offices) b) Improvement program on management mechanism of NIA c) Support program for IMT implementation d) Strengthening program of Integrated Management information System
4) Specific Program on watershed management plan	1. Strengthening coordination with RDC, RAFC/PAFC and LGUs concerned through works shop on dissemination of the SLRIF to these organizations. 2. Strengthening coordination with RDC, RAFC/PAFC and LGUs on training program of watershed management

4.4 Proposed Counter Schemes

Item	*Description*
1) DENR	1. Technical assistance to concerned Provincial/municipal LGUs on watershed rehabilitation and management such as establishment of nurseries, community-based livelihood for upland dwellers
2) LGU	1. LGUs improve coordination program with NIA to give priority of the projects in annual budgeting and funds programming 2. Provincial LGUs to extend training to municipal agricultural officers to improve skills on technology promotion

Item	*Description*
	3. LGUs improve capacity of its personnel to prepare project proposals through a training by DILG to ensure project's fund access to municipal development fund 4. LGUs provide reliable post-harvest facilities to ensure optimal operation of the facilities

5. Cost Estimate for Initial Investment

Item	*Description*		
1) Direct Cost for Civil Works	A. Mobilization	Php	10.48 Million
	B. Protection Dikes	Php	36.22 Million
	C. Diversion Works	Php	0.50 Million
	D. Canal Structures	Php	64.85 Million
	E. Canalization	Php	175.11 Million
	F. Drainage Structures	Php	22.71 Million
	G. Drainage Canalization	Php	34.07 Million
	H. Roads	Php	68.52 Million
	I. On-Farm Facilities/T.O. Gates	Php	9.70 Million
	J. IMT Support Facilities	Php	60.00 Million
	K. IMT GIS Database	Php	11.36 Million
	L. Institutional Development (5% of Direct Cost)	Php	19.90 Million
	M. Feasibility Studies & Detailed Engineering (2% of Direct Cost)	Php	10.48 Million
	Sub-total (Direct Cost)	Php	523.89 Million
2) Indirect Cost	A. General Engineering Supervision and Administration (3.5% of Direct Cost)	Php	18.34 Million
	B. NIA Management Fee (5% of Total Project Cost)	Php	28.54 Million
	Sub-total (Indirect Cost)	Php	46.87 Million
3) Total Project Cost	= 1+2	Php	570.76 Million
Cost per ha.		Php	50,265.00 /ha.

6. Implementation Plan

Item	*Description*
1) Contract package	1 - Local Competitive Bidding (LCB)
2) Implementation Schedule	
a) Civil Works	
1) Survey, F/S, Design	21 months
2) Tendering	6 months
3) Construction	36 months
b) Institutional Improvement Works	
1) Reactivation Program of FIAs/IAs and Irrigation System Management Committee	34 months
2) NIA-IA-LGU Partnership	7 months
3) Strengthening of NIA staff	7 months

7. Project Evaluation

Item		*Description*	
1) Economic evaluation			
EIRR (Base)		EIRR = 28.7 %	: Project life 50 years
Sensitivity	Case-1	EIRR = 25.8 %	: Cost 10% up
	Case-2	EIRR = 25.5 %	: Benefit 10% down
	Case-3	EIRR = 22.9 %	: Cost 10% up + Benefit 10% down
B/C		1.8	: discount rate 15% p.a.
NPV		PHP 262 million	: discount rate 15% p.a.
2) Financial evaluation		Farmer's net income increase = PHP 14,608 per ha per year	
3) Expected Impacts		1. Increased farmers' income 2. Increased rice self sufficiency of the country 3. Increased job opportunities in rural areas	

8. Environmental Aspects

Item	*Description*
1) Environmental aspect	Need to address sedimentation/siltation problems
2) Relocation of houses	none
3) Land acquisition	none

Table 1201 - Lambayaong Economic Evaluation (EIRR)

Basic Case

Name of NIS: 1201 - Lambayaong | Region: 12 - IMO RIO Sultan Kudarat

EIRR : 28.7%	Net Present Value (Million PHP)	Benefit	Cost	B/C Ratio	NPV
	(15 % discount rate)	673	374	1.80	299

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011			2.55		2.55		5.56	5.56	3.01
2	2012			2.55		2.55		11.12	11.12	8.57
3	2013	141.56	3.24	2.55		147.35		16.68	16.68	-130.67
4	2014	188.75	4.32	2.55	6.91	202.52	25.48	22.24	47.72	-154.80
5	2015	141.56	3.24	2.55	16.12	163.47	62.65	27.80	90.45	-73.02
6	2016				23.03	23.03	95.56	33.36	128.92	105.89
7	2017				23.03	23.03	102.99	38.92	141.91	118.88
8	2018				23.03	23.03	106.18	44.48	150.66	127.63
9	2019				23.03	23.03	106.18	50.04	156.22	133.19
10	2020				23.03	23.03	106.18	55.60	161.78	138.75
11	2021				23.03	23.03	106.18	61.16	167.34	144.31
12	2022				23.03	23.03	106.18	66.72	172.90	149.87
13	2023				23.03	23.03	106.18	72.28	178.46	155.43
14	2024				23.03	23.03	106.18	77.84	184.02	160.99
15	2025				23.03	23.03	106.18	83.40	189.58	166.55
16	2026				23.03	23.03	106.18	88.96	195.14	172.11
17	2027				23.03	23.03	106.18	94.52	200.70	177.67
18	2028				23.03	23.03	106.18	100.08	206.26	183.23
19	2029				23.03	23.03	106.18	105.64	211.82	188.79
20	2030				23.03	23.03	106.18	111.20	217.38	194.35
21	2031				23.03	23.03	106.18	116.76	222.94	199.91
22	2032				23.03	23.03	106.18	122.32	228.50	205.47
23	2033				23.03	23.03	106.18	127.88	234.06	211.03
24	2034				23.03	23.03	106.18	133.44	239.62	216.59
25	2035				23.03	23.03	106.18	139.00	245.18	222.15
26	2036				23.03	23.03	106.18	144.56	250.74	227.71
27	2037				23.03	23.03	106.18	150.12	256.30	233.27
28	2038				23.03	23.03	106.18	155.68	261.86	238.83
29	2039				23.03	23.03	106.18	161.24	267.42	244.39
30	2040				23.03	23.03	106.18	166.80	272.98	249.95
31	2041				23.03	23.03	106.18	172.36	278.54	255.51
32	2042				23.03	23.03	106.18	177.92	284.10	261.07
33	2043				23.03	23.03	106.18	183.48	289.66	266.63
34	2044				23.03	23.03	106.18	189.04	295.22	272.19
35	2045				23.03	23.03	106.18	194.60	300.78	277.75
36	2046				23.03	23.03	106.18	200.16	306.34	283.31
37	2047				23.03	23.03	106.18	205.72	311.90	288.87
38	2048				23.03	23.03	106.18	211.28	317.46	294.43
39	2049				23.03	23.03	106.18	216.84	323.02	299.99
40	2050				23.03	23.03	106.18	222.40	328.58	305.55
41	2051				23.03	23.03	106.18	227.96	334.14	311.11
42	2052				23.03	23.03	106.18	233.52	339.70	316.67
43	2053				23.03	23.03	106.18	239.08	345.26	322.23
44	2054				23.03	23.03	106.18	244.64	350.82	327.79
45	2055				23.03	23.03	106.18	250.20	356.38	333.35
46	2056				23.03	23.03	106.18	255.76	361.94	338.91
47	2057				23.03	23.03	106.18	261.32	367.50	344.47
48	2058				23.03	23.03	106.18	266.88	373.06	350.03
49	2059				23.03	23.03	106.18	272.44	378.62	355.59
50	2060				23.03	23.03	106.18	278.00	384.18	361.15

Case-1 (Cost 10% up)

Name of NIS: 1201 - Lambayaong | Region: 12 - IMO RIO Sultan Kudarat

EIRR : 25.8%	Net Present Value (Million PHP)	Benefit	Cost	B/C Ratio	NPV
	(15 % discount rate)	673	412	1.64	262

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	2.80	-	2.80	-	5.56	5.56	2.76
2	2012	-	-	2.80	-	2.80	-	11.12	11.12	8.32
3	2013	155.72	3.56	2.80	-	162.08	-	16.68	16.68	-145.40
4	2014	207.62	4.75	2.80	7.60	222.77	25.48	22.24	47.72	-175.05
5	2015	155.72	3.56	2.80	17.73	179.81	62.65	27.80	90.45	-89.37
6	2016	-	-	-	25.33	25.33	95.56	33.36	128.92	103.59
7	2017	-	-	-	25.33	25.33	102.99	38.92	141.91	116.58
8	2018	-	-	-	25.33	25.33	106.18	44.48	150.66	125.33
9	2019	-	-	-	25.33	25.33	106.18	50.04	156.22	130.89
10	2020	-	-	-	25.33	25.33	106.18	55.60	161.78	136.45
11	2021	-	-	-	25.33	25.33	106.18	61.16	167.34	142.01
12	2022	-	-	-	25.33	25.33	106.18	66.72	172.90	147.57
13	2023	-	-	-	25.33	25.33	106.18	72.28	178.46	153.13
14	2024	-	-	-	25.33	25.33	106.18	77.84	184.02	158.69
15	2025	-	-	-	25.33	25.33	106.18	83.40	189.58	164.25
16	2026	-	-	-	25.33	25.33	106.18	88.96	195.14	169.81
17	2027	-	-	-	25.33	25.33	106.18	94.52	200.70	175.37
18	2028	-	-	-	25.33	25.33	106.18	100.08	206.26	180.93
19	2029	-	-	-	25.33	25.33	106.18	105.64	211.82	186.49
20	2030	-	-	-	25.33	25.33	106.18	111.20	217.38	192.05
21	2031	-	-	-	25.33	25.33	106.18	116.76	222.94	197.61
22	2032	-	-	-	25.33	25.33	106.18	122.32	228.50	203.17
23	2033	-	-	-	25.33	25.33	106.18	127.88	234.06	208.73
24	2034	-	-	-	25.33	25.33	106.18	133.44	239.62	214.29
25	2035	-	-	-	25.33	25.33	106.18	139.00	245.18	219.85
26	2036	-	-	-	25.33	25.33	106.18	144.56	250.74	225.41
27	2037	-	-	-	25.33	25.33	106.18	150.12	256.30	230.97
28	2038	-	-	-	25.33	25.33	106.18	155.68	261.86	236.53
29	2039	-	-	-	25.33	25.33	106.18	161.24	267.42	242.09
30	2040	-	-	-	25.33	25.33	106.18	166.80	272.98	247.65
31	2041	-	-	-	25.33	25.33	106.18	172.36	278.54	253.21
32	2042	-	-	-	25.33	25.33	106.18	177.92	284.10	258.77
33	2043	-	-	-	25.33	25.33	106.18	183.48	289.66	264.33
34	2044	-	-	-	25.33	25.33	106.18	189.04	295.22	269.89
35	2045	-	-	-	25.33	25.33	106.18	194.60	300.78	275.45
36	2046	-	-	-	25.33	25.33	106.18	200.16	306.34	281.01
37	2047	-	-	-	25.33	25.33	106.18	205.72	311.90	286.57
38	2048	-	-	-	25.33	25.33	106.18	211.28	317.46	292.13
39	2049	-	-	-	25.33	25.33	106.18	216.84	323.02	297.69
40	2050	-	-	-	25.33	25.33	106.18	222.40	328.58	303.25
41	2051	-	-	-	25.33	25.33	106.18	227.96	334.14	308.81
42	2052	-	-	-	25.33	25.33	106.18	233.52	339.70	314.37
43	2053	-	-	-	25.33	25.33	106.18	239.08	345.26	319.93
44	2054	-	-	-	25.33	25.33	106.18	244.64	350.82	325.49
45	2055	-	-	-	25.33	25.33	106.18	250.20	356.38	331.05
46	2056	-	-	-	25.33	25.33	106.18	255.76	361.94	336.61
47	2057	-	-	-	25.33	25.33	106.18	261.32	367.50	342.17
48	2058	-	-	-	25.33	25.33	106.18	266.88	373.06	347.73
49	2059	-	-	-	25.33	25.33	106.18	272.44	378.62	353.29
50	2060	-	-	-	25.33	25.33	106.18	278.00	384.18	358.85

Table 1201 - Lambayaong Economic Evaluation (EIRR)

Case-2 (Benefit 10% down)

Name of NIS: 1201 - Lambayaong | Region : 12 IMO RIO Sultan Kudarat

EIRR : 25.5%	Net Present Value (Million PHP)	Benefit	Cost	B/C Ratio	NPV
	(15 % discount rate)	606	374	1.62	232

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	2.55	-	2.55	-	5.00	5.00	2.46
2	2012	-	-	2.55	-	2.55	-	10.01	10.01	7.46
3	2013	141.56	3.24	2.55	-	147.35	-	15.01	15.01	-132.33
4	2014	188.75	4.32	2.55	6.91	202.52	22.93	20.02	42.95	-159.57
5	2015	141.56	3.24	2.55	16.12	163.47	56.38	25.02	81.40	-82.07
6	2016	-	-	-	23.03	23.03	86.01	30.02	116.03	93.00
7	2017	-	-	-	23.03	23.03	92.70	35.03	127.72	104.69
8	2018	-	-	-	23.03	23.03	95.56	40.03	135.59	112.56
9	2019	-	-	-	23.03	23.03	95.56	45.04	140.60	117.57
10	2020	-	-	-	23.03	23.03	95.56	50.04	145.60	122.57
11	2021	-	-	-	23.03	23.03	95.56	55.04	150.61	127.58
12	2022	-	-	-	23.03	23.03	95.56	60.05	155.61	132.58
13	2023	-	-	-	23.03	23.03	95.56	65.05	160.61	137.58
14	2024	-	-	-	23.03	23.03	95.56	70.06	165.62	142.59
15	2025	-	-	-	23.03	23.03	95.56	75.06	170.62	147.59
16	2026	-	-	-	23.03	23.03	95.56	80.06	175.63	152.60
17	2027	-	-	-	23.03	23.03	95.56	85.07	180.63	157.60
18	2028	-	-	-	23.03	23.03	95.56	90.07	185.63	162.60
19	2029	-	-	-	23.03	23.03	95.56	95.08	190.64	167.61
20	2030	-	-	-	23.03	23.03	95.56	100.08	195.64	172.61
21	2031	-	-	-	23.03	23.03	95.56	105.08	200.65	177.62
22	2032	-	-	-	23.03	23.03	95.56	110.09	205.65	182.62
23	2033	-	-	-	23.03	23.03	95.56	115.09	210.65	187.62
24	2034	-	-	-	23.03	23.03	95.56	120.10	215.66	192.63
25	2035	-	-	-	23.03	23.03	95.56	125.10	220.66	197.63
26	2036	-	-	-	23.03	23.03	95.56	130.10	225.67	202.64
27	2037	-	-	-	23.03	23.03	95.56	135.11	230.67	207.64
28	2038	-	-	-	23.03	23.03	95.56	140.11	235.67	212.64
29	2039	-	-	-	23.03	23.03	95.56	145.12	240.68	217.65
30	2040	-	-	-	23.03	23.03	95.56	150.12	245.68	222.65
31	2041	-	-	-	23.03	23.03	95.56	155.12	250.69	227.66
32	2042	-	-	-	23.03	23.03	95.56	160.13	255.69	232.66
33	2043	-	-	-	23.03	23.03	95.56	165.13	260.69	237.66
34	2044	-	-	-	23.03	23.03	95.56	170.14	265.70	242.67
35	2045	-	-	-	23.03	23.03	95.56	175.14	270.70	247.67
36	2046	-	-	-	23.03	23.03	95.56	180.14	275.71	252.68
37	2047	-	-	-	23.03	23.03	95.56	185.15	280.71	257.68
38	2048	-	-	-	23.03	23.03	95.56	190.15	285.71	262.68
39	2049	-	-	-	23.03	23.03	95.56	195.16	290.72	267.69
40	2050	-	-	-	23.03	23.03	95.56	200.16	295.72	272.69
41	2051	-	-	-	23.03	23.03	95.56	205.16	300.73	277.70
42	2052	-	-	-	23.03	23.03	95.56	210.17	305.73	282.70
43	2053	-	-	-	23.03	23.03	95.56	215.17	310.73	287.70
44	2054	-	-	-	23.03	23.03	95.56	220.18	315.74	292.71
45	2055	-	-	-	23.03	23.03	95.56	225.18	320.74	297.71
46	2056	-	-	-	23.03	23.03	95.56	230.18	325.75	302.72
47	2057	-	-	-	23.03	23.03	95.56	235.19	330.75	307.72
48	2058	-	-	-	23.03	23.03	95.56	240.19	335.75	312.72
49	2059	-	-	-	23.03	23.03	95.56	245.20	340.76	317.73
50	2060	-	-	-	23.03	23.03	95.56	250.20	345.76	322.73

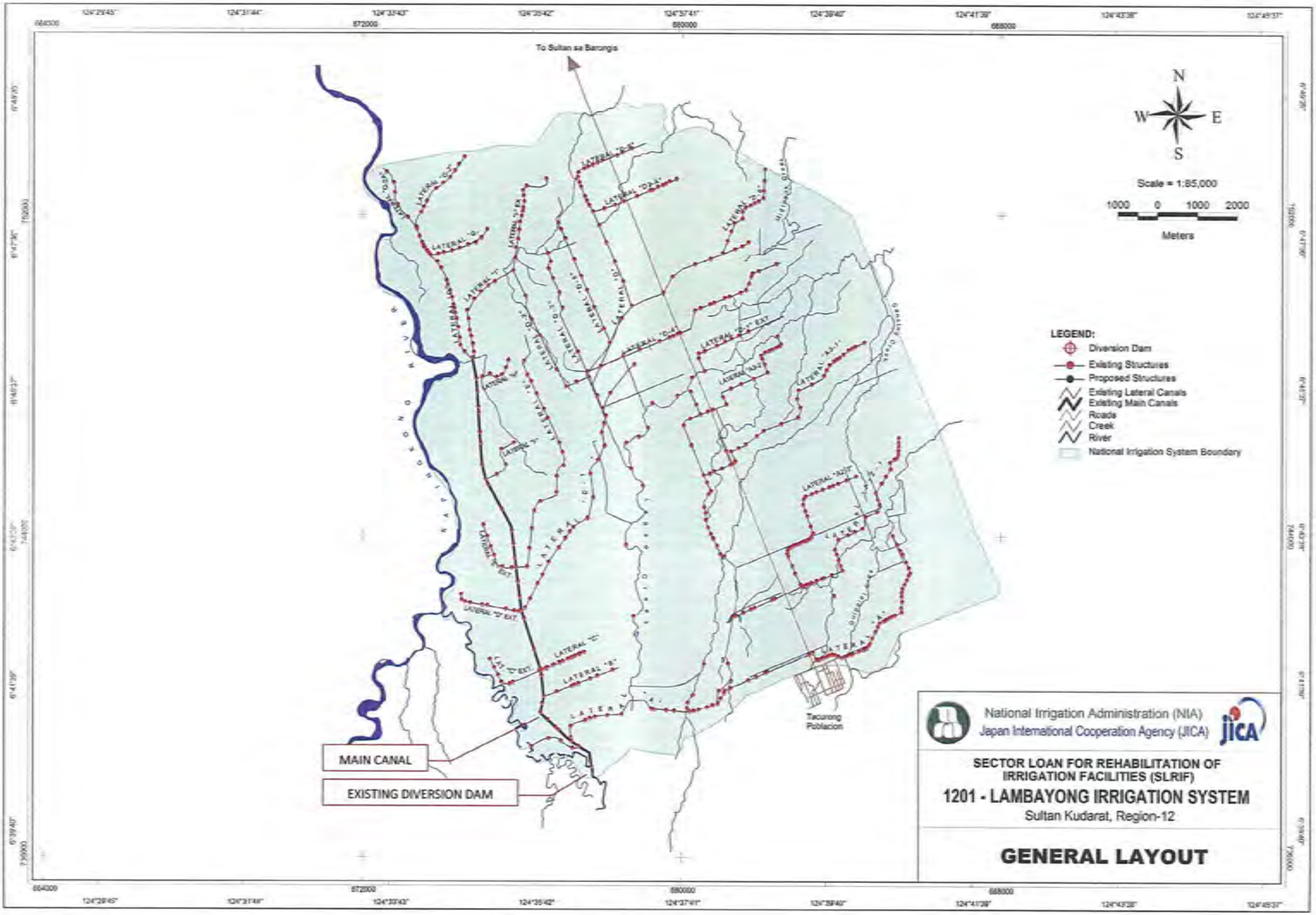
Case-3 (Cost 10% up and Benefit 10% down)

Name of NIS: 1201 - Lambayaong | Region : 12 IMO RIO Sultan Kudarat

EIRR : 22.9%	Net Present Value (Million PHP)	Benefit	Cost	B/C Ratio	NPV
	(15 % discount rate)	606	412	1.47	194

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	2.80	-	2.80	-	5.00	5.00	2.20
2	2012	-	-	2.80	-	2.80	-	10.01	10.01	7.21
3	2013	155.72	3.56	2.80	-	162.08	-	15.01	15.01	-147.07
4	2014	207.62	4.75	2.80	7.60	222.77	22.93	20.02	42.95	-179.82
5	2015	155.72	3.56	2.80	17.73	179.81	56.38	25.02	81.40	-98.41
6	2016	-	-	-	25.33	25.33	86.01	30.02	116.03	90.70
7	2017	-	-	-	25.33	25.33	92.70	35.03	127.72	102.39
8	2018	-	-	-	25.33	25.33	95.56	40.03	135.59	110.26
9	2019	-	-	-	25.33	25.33	95.56	45.04	140.60	115.27
10	2020	-	-	-	25.33	25.33	95.56	50.04	145.60	120.27
11	2021	-	-	-	25.33	25.33	95.56	55.04	150.61	125.27
12	2022	-	-	-	25.33	25.33	95.56	60.05	155.61	130.28
13	2023	-	-	-	25.33	25.33	95.56	65.05	160.61	135.28
14	2024	-	-	-	25.33	25.33	95.56	70.06	165.62	140.29
15	2025	-	-	-	25.33	25.33	95.56	75.06	170.62	145.29
16	2026	-	-	-	25.33	25.33	95.56	80.06	175.63	150.29
17	2027	-	-	-	25.33	25.33	95.56	85.07	180.63	155.30
18	2028	-	-	-	25.33	25.33	95.56	90.07	185.63	160.30
19	2029	-	-	-	25.33	25.33	95.56	95.08	190.64	165.31
20	2030	-	-	-	25.33	25.33	95.56	100.08	195.64	170.31
21	2031	-	-	-	25.33	25.33	95.56	105.08	200.65	175.31
22	2032	-	-	-	25.33	25.33	95.56	110.09	205.65	180.32
23	2033	-	-	-	25.33	25.33	95.56	115.09	210.65	185.32
24	2034	-	-	-	25.33	25.33	95.56	120.10	215.66	190.33
25	2035	-	-	-	25.33	25.33	95.56	125.10	220.66	195.33
26	2036	-	-	-	25.33	25.33	95.56	130.10	225.67	200.33
27	2037	-	-	-	25.33	25.33	95.56	135.11	230.67	205.34
28	2038	-	-	-	25.33	25.33	95.56	140.11	235.67	210.34
29	2039	-	-	-	25.33	25.33	95.56	145.12	240.68	215.35
30	2040	-	-	-	25.33	25.33	95.56	150.12	245.68	220.35
31	2041	-	-	-	25.33	25.33	95.56	155.12	250.69	225.35
32	2042	-	-	-	25.33	25.33	95.56	160.13	255.69	230.36
33	2043	-	-	-	25.33	25.33	95.56	165.13	260.69	235.36
34	2044	-	-	-	25.33	25.33	95.56	170.14	265.70	240.37
35	2045	-	-	-	25.33	25.33	95.56	175.14	270.70	245.37
36	2046	-	-	-	25.33	25.33	95.56	180.14	275.71	250.37
37	2047	-	-	-	25.33	25.33	95.56	185.15	280.71	255.38
38	2048	-	-	-	25.33	25.33	95.56	190.15	285.71	260.38
39	2049	-	-	-	25.33	25.33	95.56	195.16	290.72	265.39
40	2050	-	-	-	25.33	25.33	95.56	200.16	295.72	270.39
41	2051	-	-	-	25.33	25.33	95.56	205.16	300.73	275.39
42	2052	-	-	-	25.33	25.33	95.56	210.17	305.73	280.40
43	2053	-	-	-	25.33	25.33	95.56	215.17	310.73	285.40
44	2054	-	-	-	25.33	25.33	95.56	220.18	315.74	290.41
45	2055	-	-	-	25.33	25.33	95.56	225.18	320.74	295.41
46	2056	-	-	-	25.33	25.33	95.56	230.18	325.75	300.41
47	2057	-	-	-	25.33	25.33	95.56	235.19	330.75	305.42
48	2058	-	-	-	25.33	25.33	95.56	240.19	335.75	310.42
49	2059	-	-	-	25.33	25.33	95.56	245.20	340.76	315.43
50	2060	-	-	-	25.33	25.33	95.56	250.20	345.76	320.43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National Irrigation System Boundary
MAIN CANAL
EXISTING DIVERSION DAM
Tacurong Poblacion
National Irrigation Administration (NIA)
Japan International Cooperation Agency (JICA)
JICA
SECTOR LOAN FOR REHABILITATION OF IRRIGATION FACILITIES (SLRIF)
1201 - LAMBAYONG IRRIGATION SYSTEM
Sultan Kudarat, Region-12
GENERAL LAYOUT

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities
Photograph of Irrigation Facilities

NIS name: Lambayong (Region 12)

Location / Facility	*Photograph*	*Comments*
Diversion Works Facing upstream Longitude: 6° 40"26"E Latitude: 124° 37'35"N		Minor repairs in sluice gates and lifting mechanisms.
Main Canal Station 0+000 Longitude: 6° 40'26"E Latitude: 124° 37'35"N		Notice the water, relatively heavy silt load.
Headgate Lateral B Longitude: 6° 41'23"E Latitude: 124° 36' 52" N		Steel gates need repair. Notice the water with heavy silt load.

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities
Photograph of Irrigation Facilities

NIS name: Lambayong (Region 12)

Location / Facility	*Photograph*	*Comments*
Headgate Lateral B Longitude: 6° 41'23"E Latitude: 124° 36'52"N		Steel gates need repair.
Main canal station 6+934 Thresher crossing with check. Longitude: 6° 42'41"E Latitude: 124° 36'33"N		Steel gates need to be replaced.
Service road Longitude: 6° 45'45"E Latitude: 124° 35'47" N		Road needs re-gravelling and side drains.

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities
Photograph of Irrigation Facilities

NIS name: Lambayong (Region 12)

Location / Facility	*Photograph*	*Comments*
Flood protection dike under construction at the Allah-Kapingkong River at Bgy. Kabulakan, Lambayong Longitude: 6° 45'55"E Latitude: 124° 35'28" N		Being implemented by the DPWH
Station 0+970.7 Lateral D-7 Drainage structure Longitude: 6° 48'37" E Latitude: 124° 37'48"N		Structure totally damaged due to the river changing course caused by typhoon Frank in June 2008.
Lateral D station 11+360 Longitude: 6° 47'28"E Latitude: 124° 37'36"N		Heavily damaged canal due to typhoon Frank in June 2008

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities
Photograph of Irrigation Facilities

NIS name: Lambayong (Region 12)

Location / Facility	*Photograph*	*Comments*
Lateral D-7 Longitude: 6° 47'28"E Latitude: 124° 37'36"N		No irrigation water supply since June 2008 because Lateral D has been cut-off after Typhoon Frank.
Lateral D-2 station 3+181 Longitude: 6° 46'56"E Latitude: 124° 36'42"N		Canal needs concrete lining.

THE REPUBLIC OF PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION

Sector Loan on Rehabilitation of Irrigation Facilities

NIS SUMMARY REPORT

1202
Tacurong (Dumaguil) RIS

Region 12

South Cotabato & Sultan Kudarat Provinces

July 2009

Survey Team for
Japan International Cooperation Agency
(JICA)

Features of NIS for Rehabilitation Project

1. General

Item	*Description*		
1) Name of NIS	**TACURONG (Dumaguil) RIS**		Code:1202
2) Location	Region	12	
	Province	South Cotabato	
	Municipalities	Norala & Tacurong City	
	Distance	20 kms. from Tacurong City, Sultan Kudarat	
3) Type of Water Source	Water Source	Banga River	
	Type	Diversion Dam (52.00 m wide, 1.60 m high)	
4) Area	Service Area	2,300 has.	
	FUSA	1,761 has.	
5) Beneficiary Farmers	1,584 farmers	Average paddy field cultivating size = 1.2 ha per farmer	
6) Irrigator's Association	IAs established = 8 FIA established = 1in 2008		
7) Features of NIS and Necessity of the project	Tacurong (Dumaguil) RIS was completed in 1993. It has a design service area of 2,300 has. but a firmed-up service area of only 1,761 has. due to lack of water. It has one (1) main canal with a total length of 11.76 kms.; nine (9) lateral canals with a total length of 31.73 kms. and 110 kms. of service roads. It also has 67.23 kilometers of drainage canals, 70 canal structures, 67 drainage structures, 65 turn-outs and 172 kms. of farm ditches. During the last five (5) years it had an average cropping intensity of 162% and average yields of 80 cavans/ha. during the wet season and 63 cavans/ha. during the dry season. A rehabilitation of the system is needed to arrest the entry of too much sand into the canals, and to improve the efficiency of water delivery in the irrigation canals.		
8) Outline of the Proposed Project	A. Engineering 1. a.Repair of diversion dam b.Rechanneling and dredging of the river upstream of the dam 2. Repair and improvement of irrigation canal and structures 3. Repair and improvement of drainage canal and structures 4. Repair and improvement of service roads 5. Repair and improvement of on-farm facilities 6. Repair and construction of IMT support facilities-IA building solar drier, warehouse with IA building 7. Development and establishment of IMT GIS database B. Institutional Strengthening Program B. 1 Basic Program 1. Reactivation of FIA/IA and Strengthening of Irrigation System Management Committee (ISMC) of NIS including construction of IMT support facilities 2. Strengthening of NIA – IA – LGUs Partnership 3. Strengthening NIA Institutional Capacity B.2 Specific Program to strengthen institutional mechanism together with LGUs		

	1. Improvement of watershed management				
9) Proposed Project Component	A. Engineering 1. Construction of civil works for rehabilitation of diversion works, canal system, drainage system, roads, and IMT support facilities. B. Institutional 1. Reactivation of FIAs/IAs including reformation of TSGA / IA / FIA areas, construction of IMT support facilities (demand base) 2. Strengthening NIA-IA- LGUs Partnership, especially coordination RDC, RAFC/PAFC with FIAs/IAs and ISMC 3. Institutional development program to strengthen management capacity of NIA field offices and IAs.				
10) Project Cost (Direct cost only, excluding escalation, contingency, tax)	1. Direct cost			PHP 113.23	Million
	- *Civil Works*	*PHP*	*104.96*	Million	
	- *Institutional Development*	*PHP*	*6.00*	Million	
	- *Engineering Services*	*PHP*	*2.26*	Million	
	2. Indirect cost			PHP 10.13	Million
	Total Project Cost (1+2)			PHP 123.36	Million
	Cost per ha			PHP 70,050.00	per ha
11) Project Benefit	1. To increase paddy production by 1,745 tons/year 2. To increase farmers' net income to PHP51,390.00/ha/year 3. To establish functional and self-reliant IAs 4. To improve performance of NIS				
12) Project Justification	EIRR = 18.90 %, B/C = 1.26 (discount rate 15%)				

2. Project History (Construction/Rehabilitation)

Year	*Description*
1993	Project Completion
2004-2008	Regular repair and rehab. works

3. Present Condition

3.1 Natural Conditions

Item	*Description*
1) Annual Rainfall	1,394.80 mm
2) Seasons	Wet: March-September Dry: October-February
3) Dominant Soil in NIS Area	Sandy Loam
4) Topography	Relatively flat terrain

3.2 Socio-economy (Region/Province)

Item	*Description*
1) GRDP	PHP 220,322 million (Year 2007), Per Capita GRDP = PHP 57,708 per year
2) Population	675,644 (province)
3) Population Growth Rate	1.97 % per year (province)
4) Labor Force	2,382,000 (region)
5) Poverty Population	47.4 % to total population (province)

3.3 Present Agriculture in NIS

Item	*Description*					
1) Farm Household in NIS	Total beneficiaries	1,584 households				
	Land owners	499 households	(31.5 %)			
	Tenant farmers	1,085 households	(68.5 %)			
2) Paddy Field Size in NIS	1.20 ha per household (FUSA/Total beneficiaries as of 2008)					
3) Present Land Use in NIS	Paddy field planted	1,412 ha	61.4 %	As of 2008		
	Paddy field not planted	488 ha	21.2 %	As of 2008		
	Upland crop field	0 ha	0.0 %			
	Permanent crop field	0 ha	0.0 %			
	Undeveloped area	0 ha	0.0 %			
	Built-up area	0 ha	0.0 %			
	High ground	0 ha	0.0 %			
	Grassland	0 ha	0.0 %			
	Swamp	0 ha	0.0 %			
	Unspecified area	400 ha	17.4 %	No data in response		
4) Paddy Field in FUSA (ha)	1,761					

5) Paddy Cropped Area (ha)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Wet Season	1,495	1,512	1,511	1,524	1,412	1,491
Dry Season	1,422	1,402	1,455	1,458	1,368	1,421
6) Cropping Intensity (%)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
(per year)	154	153	156	157	146	153
7) Unit Yield of Paddy (ton/ha)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Wet Season	4.07	3.24	4.29	4.11	4.25	3.98
Dry Season	3.64	3.13	2.91	2.93	3.25	3.17
8) Paddy Production (ton)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Wet Season	6,088	4,903	6,481	6,264	6,001	5,948
Dry Season	5,176	4,386	4,227	4,272	4,446	4,501

3.4 Water Resources

Item	*Description*
1) Name of Rivers	Banga River/Kapikong River
2) Catchment Area at Dam	482.5 m^2
3) Ave. River Discharge	17.32 m^3/s
4) Ave. Dry Season Discharge	12.97 m^3/s
5) Diverted Intake Discharge	1.67 m^3/s
6) Water Requirement	3.17 m^3/s
7) Sedimentation	Moderate

3.5 Existing Irrigation System

Item	*Description*
1) Diversion Dam	Overflow crest width 52.00 m, Dam height 1.60 m
2) Main Canal	Total length 11.758 km (Lined portion 11.758)
3) Lateral Canals	Total length 31.73 km (Lined portion 31.73 km)
4) On-farm facilities	Total length 58.00 km (Lined portion 0.00 km)
	Turn-outs = 65 units Steel Gates = 10 units
5) Drainage Canal	Total length 22.00 kms.
6) Canal Structures	No. = 70 units Steel Gates = 34 units
7) Drainage Structures	No. = 67 units
8) Farm roads	Total length 43.488 km (pavement= 0.00 kms.)
9) Flood Protection Dike	Total length 1.5 km

3.6 Institutions for O&M of NIS

Item	*Description*					
1) Regional Irrigation Office	Name: Region 12 – South Central Mindanao					
2) IMO	Name: Sultan Kudarat IMO					
Staff in 2009	Total number of staff: 61					
3) Irrigator' Association (IA)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Number of FIA (nos)					1	
Number of IA (nos)					8	
Number of TSAG (nos)	64	64	64	64	64	64
Functionality of IA	71.9	84.8	82.5	84.2	78.9	65.26
Collection of ISF (wet, %)	75	63	70	62	68	68
Collection of ISF (dry, %)	49	50	42	57	51	50
4) NIS Category based on IA 2008 O&M Contract (NIA-IA)	No. of IA					
Category A	0					
Category B	8					
Category C	0					

3.7 Existing Problems

Item	*Description*
1) Diversion Works	1. The river upstream of the dam is not anymore straight and needs to be re-channeled. 2. Some sluice steel gates are dilapidated and need to be repaired/replaced. 3. The gate lifting mechanism is still manually operated
2) Canal and Structures	1. Heavy sedimentation in the canals. 2. Dilapidated steel gates in some structures.
3) Drainage Canal	1. Drainage system needs improvement.
4) Other Project Facilities (road, bridge, flood dike, building, etc)	1. Some road sections become very muddy during rainy days.
5) Water Management and O&M Activities	1. Illegal checking in some places. 2. Lack of control in water intake in some turn-outs result in over supply in some areas in the upstream reaches of the canals but lack of supply in the downstream farms.
6) Status of NIS and IA Management	Status Type B evaluated by Radar Graph. Specific problems are: 1. Medium ISF collection efficiency during dry and wet seasons at 50% and 68%, respectively 2. Medium ratio of tenancy at 60% 3. Medium paddy yield during wet season at 80 cavans/ha
7) Watershed Management	1. Significant denudation of the watershed
8) Coordination with LGU and Agencies concerned	1. Poor coordination by NIA's field offices and IAs with concerned LGUs on specific problem such as watershed management

Item	Description
5) Agriculture	1. Non coordination among the farmers with respect to cropping calendar and scheduling of farming activities. This condition results to inefficient use of irrigation water. In addition, crops are prune to attacks of rodents and birds and other pest and may result to crop damages and losses. There is a need to educate the farmers on the importance of coordination and cooperation in their farming activities to avoid water losses and crop damages. 2. Insufficient number of lending institutions to service the farmers financial needs in their farming activities. The farmers are at present dependent to the local traders on this aspect and high interest rates are being charge to them. 3. Inadequate post harvest and drying facilities. The farmers sell their produce just after the harvest with a lower price because of no drying facility. There is a need to provide them with such facilities.

4. Proposed Rehabilitation Plan

4.1 Agricultural Development Plan

Item	Description			
Cropping schedule	Wet Season	Dry Season-1	Dry Season-2	Annual
1) Type of Crops	Paddy	Paddy	-	-
2) Cropping Area (ha)	1,761	1,400	-	-
3) Target Unit Yield (ton/ha)	4.3	3.3	-	-
3) Total Production (ton)	7,572	4,620	-	12,192

4.2 Civil Works

Item	Description
1) Diversion Works	1. Straightening/rechanneling of the river upstream of the dam. 2.Conversion of the lifting mechanism of the sluice gates from manual to mechanized.
2) Canal Structures	1. Repair/rehabilitation of old dilapidated steel gates 30 units 2. Installation of new steel gates to replace wooden flush boards – 34 units
3) Canalization	1. Construction of sand settling basin and silt ejector at the main canal right after the dam. 2. Concrete lining of selected existing canal sections – 1.7 kms 3. Re-shaping and de-silting of some canal sections – 1 km 4. Realignment of canals 5. Construction of new canals
4) Drainage Structures	1. Repair of drainage structures – 15 units
5) Drainage Canalization	1. Repair of existing drainage canals and construction of new ones – 0.7 kms
6) Service Roads	1. Re-gravelling of selected road sections – 13.9 kms 2. Construction of side drainage canals – 13.9 kms. 3. Construction of road drainage structures
7) On-Farm Facilities	1. Repair /replacement of dilapidated turn out steel gates 2.Construction of new turn outs and farm ditches
8) IMT Support Facilities	1. Construction of post-harvest facilities—warehouses, IA buildings, solar driers with shed – 2 set
9) IMT GIS Database	1. Development and establishment of GIS database

4.3 Institutional Strengthening Program

Item	Description
1) Reactivation Program of FIAs/IAs and System Management Committee (ISMC)	1. Executing body : Project Management Office with assistance of Consultant 2. Schedule:34 months / NIS 3. Counter body for execution: NIA Regional Office and IMO office 4. Attendant / Trainee: President of FIAs/IAs and secretary group, staff of NIA RIO/IMO, Chairmen of ISMC and Secretary group and LGUs officers,

Item	*Description*
	5. Contents: a) Survey & Study by Consultant a) Workshops on coordination activities with and dissemination on reformation plan to FIAs/IAs b) Workshop on coordination activities with LGUs c) Organization and Legal Registration of FIAs/IAs to be re-active and reactivation of SMC d) Construction of IMT support facilities for FIAs/CIA e) Workshop and Training of FIAs/IAs members on management under the IMT f) Assessment/Evaluation for and Negotiation of Contracting under IMT g) Assistance of reactivated IAs/FIAs in organizational and management activities
2) Strengthening Program of NIA - IA - LGU Partnership	1. Executing body : Project Management Office with assistance of Consultant, & Management System Committee (MSC) of NIS 2. Schedule: 7 months / NIS 3. Counter body for execution: Regional Development Council with Secretary of NEDA Regional Office 4. Attendant / Trainee: Secretaries of Regional Organizations, LGUs officers, President of FIAs/IAs and secretary group, staff of NIA RIO/IMO, Chairmen of ISMC and Secretary group 5. Contents: a) Workshop on Trouble Shooting of NIS and FIAs/ISs' Management b) Provision of work space for ISMC including office facilities
3) NIA Institutional Strengthening Program	1. Executing body : Institutional Development Division of CO, NIA 2. Schedule: 7 months / NIS 3. Counter body for execution: NIA Regional Office and IMO office 4. Attendant / Trainee: NIA personnel at CO, RIO and IMO 5. Contents: a) Capability built-up program (Central and Regional NIA Offices) b) Improvement program on management mechanism of NIA c) Support program for IMT implementation d) Strengthening program of Integrated Management information System
4) Specific Program on watershed management plan	1. Strengthening coordination with RDC, RAFC/PAFC and LGUs concerned through works shop on dissemination of the SLRIF to these organizations. 2. Strengthening coordination with RDC, RAFC/PAFC and LGUs on training program of watershed management

4.4 Proposed Counter Schemes

Item	*Description*
1) DENR	1. Technical assistance to concerned Provincial/municipal LGUs on watershed rehabilitation and management such as establishment of nurseries, community-based livelihood for upland dwellers
2) LGU	1. LGUs improve coordination program with NIA to give priority of the projects in annual budgeting and funds programming 2. Provincial LGUs to extend training to municipal agricultural officers to improve skills on technology promotion 3. LGUs improve capacity of its personnel to prepare project proposals through a training by DILG to ensure project's fund access to municipal development fund 4. LGUs provide reliable post-harvest facilities to ensure optimal operation of the facilities

5. Cost Estimate for Initial Investment

Item	*Description*			
1) Direct Cost for Civil Works	A. Mobilization	Php	2.26	Million
	B. Protection Dikes		-	
	C. Diversion Works	Php	17.24	Million
	D. Canal Structures	Php	2.89	Million
	E. Canalization	Php	15.91	Million
	F. Drainage Structures	Php	3.52	Million
	G. Drainage Canalization	Php	20.40	Million
	H. Road	Php	24.79	Million
	I. On-Farm Facilities/T.O. Gates	Php	1.19	Million
	J. IMT Support Facilities	Php	15.00	Million
	K. IMT GIS Database	Php	1.76	Million
	L. Institutional Development (5% of Direct Cost)	Php	6.00	Million
	M. Feasibility Studies & Detailed Engineering (2% of Direct Cost)	Php	2.26	Million
	Sub-total (Direct Cost)	Php	113.23	Million
2) Indirect Cost	A. General Engineering Supervision and Administration (3.5% of Direct Cost)	Php	3.96	Million
	B. NIA Management Fee (5% of Total Project Cost)	Php	6.17	Million
	Sub-total (Indirect Cost)	Php	10.13	Million
3) Total Project Cost	= 1+2	Php	123.36	Million
Cost per ha.		Php	70,050.00	/ha.

6. Implementation Plan

Item	*Description*
1) Contract package	1 - Local Competitive Bidding (LCB)
2) Implementation Schedule	
a) Civil Works	
1) Survey, F/S, Design	21 months
2) Tendering	6 months
3) Construction	36 months
b) Institutional Improvement Works	
1) Reactivation Program of FIAs/IAs and Irrigation System Management Committee	34 months
2) NIA-IA-LGU Partnership	7months
3) Strengthening of NIA staff	7 months

7. Project Evaluation

Item		*Description*	
1) Economic evaluation			
EIRR (Base)		EIRR =18.9 %	: Project life 50 years
Sensitivity	Case-1	EIRR = 17.2 %	: Cost 10% up
	Case-2	EIRR = 17.0 %	: Benefit 10% down
	Case-3	EIRR = 15.5 %	: Cost 10% up + Benefit 10% down
B/C		1.26	: discount rate 15% p.a.
NPV		PHP 20 million	: discount rate 15% p.a.
2) Financial evaluation		Farmer's net income increase = PHP 10,595 per ha per year	
3) Expected Impacts		1. Increased farmers' income 2. Increased rice self sufficiency of the country 3. Increased job opportunities in rural areas	

8. Environmental Aspects

Item	*Description*
1) Environmental aspect	Need to address sedimentation/siltation problems
2) Relocation of houses	None
3) Land acquisition	None

Table 1202 - Tacurong (Dumaguil) Economic Evaluation (EIRR)

Basic Case

Name of NIS 1202 - Tacurong (Dumaguil) Region : 12 IMO RIO Sultan Kudarat

EIRR : 18.9%	Net Present Value (Million PHP)	Benefit	Cost	B/C Ratio	NPV
	(15 % discount rate)	95	75	1.26	20

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011			0.54		0.54		1.05	1.05	0.51
2	2012			0.54		0.54		2.10	2.10	1.56
3	2013	30.10	0.98	0.54		31.62		3.15	3.15	-28.47
4	2014	40.13	1.30	0.54	1.07	43.05	2.70	4.20	6.90	-36.15
5	2015	30.10	0.98	0.54	2.50	34.12	6.63	5.25	11.88	-22.24
6	2016				3.57	3.57	10.11	6.30	16.41	12.84
7	2017				3.57	3.57	10.89	7.35	18.24	14.67
8	2018				3.57	3.57	11.23	8.40	19.63	16.06
9	2019				3.57	3.57	11.23	9.45	20.68	17.11
10	2020				3.57	3.57	11.23	10.50	21.73	18.16
11	2021				3.57	3.57	11.23	11.55	22.78	19.21
12	2022				3.57	3.57	11.23	12.60	23.83	20.26
13	2023				3.57	3.57	11.23	13.65	24.88	21.31
14	2024				3.57	3.57	11.23	14.70	25.93	22.36
15	2025				3.57	3.57	11.23	15.75	26.98	23.41
16	2026				3.57	3.57	11.23	16.80	28.03	24.46
17	2027				3.57	3.57	11.23	17.85	29.08	25.51
18	2028				3.57	3.57	11.23	18.90	30.13	26.56
19	2029				3.57	3.57	11.23	19.95	31.18	27.61
20	2030				3.57	3.57	11.23	21.00	32.23	28.66
21	2031				3.57	3.57	11.23	22.05	33.28	29.71
22	2032				3.57	3.57	11.23	23.10	34.33	30.76
23	2033				3.57	3.57	11.23	24.15	35.38	31.81
24	2034				3.57	3.57	11.23	25.20	36.43	32.86
25	2035				3.57	3.57	11.23	26.25	37.48	33.91
26	2036				3.57	3.57	11.23	27.30	38.53	34.96
27	2037				3.57	3.57	11.23	28.35	39.58	36.01
28	2038				3.57	3.57	11.23	29.40	40.63	37.06
29	2039				3.57	3.57	11.23	30.45	41.68	38.11
30	2040				3.57	3.57	11.23	31.50	42.73	39.16
31	2041				3.57	3.57	11.23	32.55	43.78	40.21
32	2042				3.57	3.57	11.23	33.60	44.83	41.26
33	2043				3.57	3.57	11.23	34.65	45.88	42.31
34	2044				3.57	3.57	11.23	35.70	46.93	43.36
35	2045				3.57	3.57	11.23	36.75	47.98	44.41
36	2046				3.57	3.57	11.23	37.80	49.03	45.46
37	2047				3.57	3.57	11.23	38.85	50.08	46.51
38	2048				3.57	3.57	11.23	39.90	51.13	47.56
39	2049				3.57	3.57	11.23	40.95	52.18	48.61
40	2050				3.57	3.57	11.23	42.00	53.23	49.66
41	2051				3.57	3.57	11.23	43.05	54.28	50.71
42	2052				3.57	3.57	11.23	44.10	55.33	51.76
43	2053				3.57	3.57	11.23	45.15	56.38	52.81
44	2054				3.57	3.57	11.23	46.20	57.43	53.86
45	2055				3.57	3.57	11.23	47.25	58.48	54.91
46	2056				3.57	3.57	11.23	48.30	59.53	55.96
47	2057				3.57	3.57	11.23	49.35	60.58	57.01
48	2058				3.57	3.57	11.23	50.40	61.63	58.06
49	2059				3.57	3.57	11.23	51.45	62.68	59.11
50	2060				3.57	3.57	11.23	52.50	63.73	60.16

Case-1 (Cost 10% up)

Name of NIS 1202 - Tacurong (Dumaguil) Region : 12 IMO RIO Sultan Kudarat

EIRR : 17.2%	Net Present Value (Million PHP)	Benefit	Cost	B/C Ratio	NPV
	(15 % discount rate)	95	83	1.15	12

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	0.60	-	0.60	-	1.05	1.05	0.45
2	2012	-	-	0.60	-	0.60	-	2.10	2.10	1.50
3	2013	33.11	1.08	0.60	-	34.78	-	3.15	3.15	-31.63
4	2014	44.15	1.43	0.60	1.18	47.35	2.70	4.20	6.90	-40.46
5	2015	33.11	1.08	0.60	2.75	37.53	6.63	5.25	11.88	-25.65
6	2016	-	-	-	3.93	3.93	10.11	6.30	16.41	12.48
7	2017	-	-	-	3.93	3.93	10.89	7.35	18.24	14.32
8	2018	-	-	-	3.93	3.93	11.23	8.40	19.63	15.70
9	2019	-	-	-	3.93	3.93	11.23	9.45	20.68	16.75
10	2020	-	-	-	3.93	3.93	11.23	10.50	21.73	17.80
11	2021	-	-	-	3.93	3.93	11.23	11.55	22.78	18.85
12	2022	-	-	-	3.93	3.93	11.23	12.60	23.83	19.90
13	2023	-	-	-	3.93	3.93	11.23	13.65	24.88	20.95
14	2024	-	-	-	3.93	3.93	11.23	14.70	25.93	22.00
15	2025	-	-	-	3.93	3.93	11.23	15.75	26.98	23.05
16	2026	-	-	-	3.93	3.93	11.23	16.80	28.03	24.10
17	2027	-	-	-	3.93	3.93	11.23	17.85	29.08	25.15
18	2028	-	-	-	3.93	3.93	11.23	18.90	30.13	26.20
19	2029	-	-	-	3.93	3.93	11.23	19.95	31.18	27.25
20	2030	-	-	-	3.93	3.93	11.23	21.00	32.23	28.30
21	2031	-	-	-	3.93	3.93	11.23	22.05	33.28	29.35
22	2032	-	-	-	3.93	3.93	11.23	23.10	34.33	30.40
23	2033	-	-	-	3.93	3.93	11.23	24.15	35.38	31.45
24	2034	-	-	-	3.93	3.93	11.23	25.20	36.43	32.50
25	2035	-	-	-	3.93	3.93	11.23	26.25	37.48	33.55
26	2036	-	-	-	3.93	3.93	11.23	27.30	38.53	34.60
27	2037	-	-	-	3.93	3.93	11.23	28.35	39.58	35.65
28	2038	-	-	-	3.93	3.93	11.23	29.40	40.63	36.70
29	2039	-	-	-	3.93	3.93	11.23	30.45	41.68	37.75
30	2040	-	-	-	3.93	3.93	11.23	31.50	42.73	38.80
31	2041	-	-	-	3.93	3.93	11.23	32.55	43.78	39.85
32	2042	-	-	-	3.93	3.93	11.23	33.60	44.83	40.90
33	2043	-	-	-	3.93	3.93	11.23	34.65	45.88	41.95
34	2044	-	-	-	3.93	3.93	11.23	35.70	46.93	43.00
35	2045	-	-	-	3.93	3.93	11.23	36.75	47.98	44.05
36	2046	-	-	-	3.93	3.93	11.23	37.80	49.03	45.10
37	2047	-	-	-	3.93	3.93	11.23	38.85	50.08	46.15
38	2048	-	-	-	3.93	3.93	11.23	39.90	51.13	47.20
39	2049	-	-	-	3.93	3.93	11.23	40.95	52.18	48.25
40	2050	-	-	-	3.93	3.93	11.23	42.00	53.23	49.30
41	2051	-	-	-	3.93	3.93	11.23	43.05	54.28	50.35
42	2052	-	-	-	3.93	3.93	11.23	44.10	55.33	51.40
43	2053	-	-	-	3.93	3.93	11.23	45.15	56.38	52.45
44	2054	-	-	-	3.93	3.93	11.23	46.20	57.43	53.50
45	2055	-	-	-	3.93	3.93	11.23	47.25	58.48	54.55
46	2056	-	-	-	3.93	3.93	11.23	48.30	59.53	55.60
47	2057	-	-	-	3.93	3.93	11.23	49.35	60.58	56.65
48	2058	-	-	-	3.93	3.93	11.23	50.40	61.63	57.70
49	2059	-	-	-	3.93	3.93	11.23	51.45	62.68	58.75
50	2060	-	-	-	3.93	3.93	11.23	52.50	63.73	59.80

Table 1202 - Tacurong (Dumaguil) Economic Evaluation (EIRR)

Case-2 (Benefit 10% down)

Name of NIS 1202 - Tacurong (Dumaguil) **Region** 12 IMO,RIO,Sultan Kudarat

EIRR : 17.0%	Net Present Value (Million PHP)	Benefit	Cost	B/C Ratio	NPV
	(15 % discount rate)	85	75	1.14	10

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	0.54	-	0.54	-	0.95	0.95	0.40
2	2012	-	-	0.54	-	0.54	-	1.89	1.89	1.35
3	2013	30.10	0.98	0.54	-	31.62	-	2.84	2.84	-28.78
4	2014	40.13	1.30	0.54	1.07	43.05	2.43	3.78	6.21	-36.84
5	2015	30.10	0.98	0.54	2.50	34.12	5.96	4.73	10.69	-23.43
6	2016	-	-	-	3.57	3.57	9.10	5.67	14.77	11.20
7	2017	-	-	-	3.57	3.57	9.80	6.62	16.42	12.85
8	2018	-	-	-	3.57	3.57	10.11	7.56	17.67	14.10
9	2019	-	-	-	3.57	3.57	10.11	8.51	18.61	15.04
10	2020	-	-	-	3.57	3.57	10.11	9.45	19.56	15.99
11	2021	-	-	-	3.57	3.57	10.11	10.40	20.50	16.93
12	2022	-	-	-	3.57	3.57	10.11	11.34	21.45	17.88
13	2023	-	-	-	3.57	3.57	10.11	12.29	22.39	18.82
14	2024	-	-	-	3.57	3.57	10.11	13.23	23.34	19.77
15	2025	-	-	-	3.57	3.57	10.11	14.18	24.28	20.71
16	2026	-	-	-	3.57	3.57	10.11	15.12	25.23	21.66
17	2027	-	-	-	3.57	3.57	10.11	16.07	26.17	22.60
18	2028	-	-	-	3.57	3.57	10.11	17.01	27.12	23.55
19	2029	-	-	-	3.57	3.57	10.11	17.96	28.06	24.49
20	2030	-	-	-	3.57	3.57	10.11	18.90	29.01	25.44
21	2031	-	-	-	3.57	3.57	10.11	19.85	29.95	26.38
22	2032	-	-	-	3.57	3.57	10.11	20.79	30.90	27.33
23	2033	-	-	-	3.57	3.57	10.11	21.74	31.84	28.27
24	2034	-	-	-	3.57	3.57	10.11	22.68	32.79	29.22
25	2035	-	-	-	3.57	3.57	10.11	23.63	33.73	30.16
26	2036	-	-	-	3.57	3.57	10.11	24.57	34.68	31.11
27	2037	-	-	-	3.57	3.57	10.11	25.52	35.62	32.05
28	2038	-	-	-	3.57	3.57	10.11	26.46	36.57	33.00
29	2039	-	-	-	3.57	3.57	10.11	27.41	37.51	33.94
30	2040	-	-	-	3.57	3.57	10.11	28.35	38.46	34.89
31	2041	-	-	-	3.57	3.57	10.11	29.30	39.40	35.83
32	2042	-	-	-	3.57	3.57	10.11	30.24	40.35	36.78
33	2043	-	-	-	3.57	3.57	10.11	31.19	41.29	37.72
34	2044	-	-	-	3.57	3.57	10.11	32.13	42.24	38.67
35	2045	-	-	-	3.57	3.57	10.11	33.08	43.18	39.61
36	2046	-	-	-	3.57	3.57	10.11	34.02	44.13	40.56
37	2047	-	-	-	3.57	3.57	10.11	34.97	45.07	41.50
38	2048	-	-	-	3.57	3.57	10.11	35.91	46.02	42.45
39	2049	-	-	-	3.57	3.57	10.11	36.86	46.96	43.39
40	2050	-	-	-	3.57	3.57	10.11	37.80	47.91	44.34
41	2051	-	-	-	3.57	3.57	10.11	38.75	48.85	45.28
42	2052	-	-	-	3.57	3.57	10.11	39.69	49.80	46.23
43	2053	-	-	-	3.57	3.57	10.11	40.64	50.74	47.17
44	2054	-	-	-	3.57	3.57	10.11	41.58	51.69	48.12
45	2055	-	-	-	3.57	3.57	10.11	42.53	52.63	49.06
46	2056	-	-	-	3.57	3.57	10.11	43.47	53.58	50.01
47	2057	-	-	-	3.57	3.57	10.11	44.42	54.52	50.95
48	2058	-	-	-	3.57	3.57	10.11	45.36	55.47	51.90
49	2059	-	-	-	3.57	3.57	10.11	46.31	56.41	52.84
50	2060	-	-	-	3.57	3.57	10.11	47.25	57.36	53.79

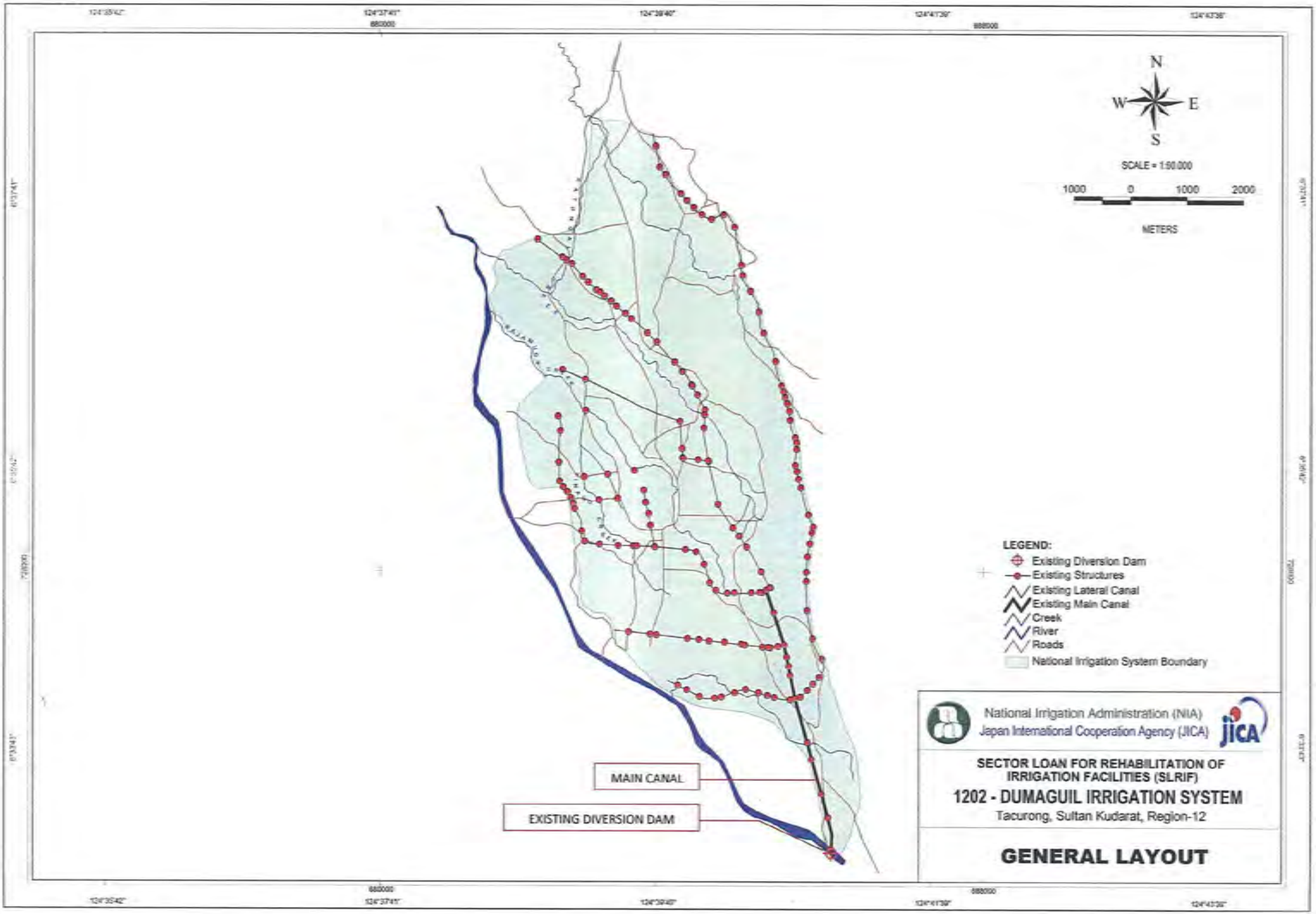
Case-3 (Cost 10% up and Benefit 10% down)

Name of NIS 1202 - Tacurong (Dumaguil) **Region** 12 IMO,RIO,Sultan Kudarat

EIRR : 15.5%	Net Present Value (Million PHP)	Benefit	Cost	B/C Ratio	NPV
	(15 % discount rate)	85	83	1.03	3

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	0.60	-	0.60	-	0.95	0.95	0.35
2	2012	-	-	0.60	-	0.60	-	1.89	1.89	1.29
3	2013	33.11	1.08	0.60	-	34.78	-	2.84	2.84	-31.95
4	2014	44.15	1.43	0.60	1.18	47.35	2.43	3.78	6.21	-41.15
5	2015	33.11	1.08	0.60	2.75	37.53	5.96	4.73	10.69	-26.84
6	2016	-	-	-	3.93	3.93	9.10	5.67	14.77	10.84
7	2017	-	-	-	3.93	3.93	9.80	6.62	16.42	12.49
8	2018	-	-	-	3.93	3.93	10.11	7.56	17.67	13.74
9	2019	-	-	-	3.93	3.93	10.11	8.51	18.61	14.69
10	2020	-	-	-	3.93	3.93	10.11	9.45	19.56	15.63
11	2021	-	-	-	3.93	3.93	10.11	10.40	20.50	16.58
12	2022	-	-	-	3.93	3.93	10.11	11.34	21.45	17.52
13	2023	-	-	-	3.93	3.93	10.11	12.29	22.39	18.47
14	2024	-	-	-	3.93	3.93	10.11	13.23	23.34	19.41
15	2025	-	-	-	3.93	3.93	10.11	14.18	24.28	20.36
16	2026	-	-	-	3.93	3.93	10.11	15.12	25.23	21.30
17	2027	-	-	-	3.93	3.93	10.11	16.07	26.17	22.25
18	2028	-	-	-	3.93	3.93	10.11	17.01	27.12	23.19
19	2029	-	-	-	3.93	3.93	10.11	17.96	28.06	24.14
20	2030	-	-	-	3.93	3.93	10.11	18.90	29.01	25.08
21	2031	-	-	-	3.93	3.93	10.11	19.85	29.95	26.03
22	2032	-	-	-	3.93	3.93	10.11	20.79	30.90	26.97
23	2033	-	-	-	3.93	3.93	10.11	21.74	31.84	27.92
24	2034	-	-	-	3.93	3.93	10.11	22.68	32.79	28.86
25	2035	-	-	-	3.93	3.93	10.11	23.63	33.73	29.81
26	2036	-	-	-	3.93	3.93	10.11	24.57	34.68	30.75
27	2037	-	-	-	3.93	3.93	10.11	25.52	35.62	31.70
28	2038	-	-	-	3.93	3.93	10.11	26.46	36.57	32.64
29	2039	-	-	-	3.93	3.93	10.11	27.41	37.51	33.59
30	2040	-	-	-	3.93	3.93	10.11	28.35	38.46	34.53
31	2041	-	-	-	3.93	3.93	10.11	29.30	39.40	35.48
32	2042	-	-	-	3.93	3.93	10.11	30.24	40.35	36.42
33	2043	-	-	-	3.93	3.93	10.11	31.19	41.29	37.37
34	2044	-	-	-	3.93	3.93	10.11	32.13	42.24	38.31
35	2045	-	-	-	3.93	3.93	10.11	33.08	43.18	39.26
36	2046	-	-	-	3.93	3.93	10.11	34.02	44.13	40.20
37	2047	-	-	-	3.93	3.93	10.11	34.97	45.07	41.15
38	2048	-	-	-	3.93	3.93	10.11	35.91	46.02	42.09
39	2049	-	-	-	3.93	3.93	10.11	36.86	46.96	43.04
40	2050	-	-	-	3.93	3.93	10.11	37.80	47.91	43.98
41	2051	-	-	-	3.93	3.93	10.11	38.75	48.85	44.93
42	2052	-	-	-	3.93	3.93	10.11	39.69	49.80	45.87
43	2053	-	-	-	3.93	3.93	10.11	40.64	50.74	46.82
44	2054	-	-	-	3.93	3.93	10.11	41.58	51.69	47.76
45	2055	-	-	-	3.93	3.93	10.11	42.53	52.63	48.71
46	2056	-	-	-	3.93	3.93	10.11	43.47	53.58	49.65
47	2057	-	-	-	3.93	3.93	10.11	44.42	54.52	50.60
48	2058	-	-	-	3.93	3.93	10.11	45.36	55.47	51.54
49	2059	-	-	-	3.93	3.93	10.11	46.31	56.41	52.49
50	2060	-	-	-	3.93	3.93	10.11	47.25	57.36	53.43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LEGEND:
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National Irrigation System Boundary
MAIN CANAL
EXISTING DIVERSION DAM
National Irrigation Administration (NIA)
Japan International Cooperation Agency (JICA)
JICA
SECTOR LOAN FOR REHABILITATION OF IRRIGATION FACILITIES (SLRIF)
1202 - DUMAGUIL IRRIGATION SYSTEM
Tacurong, Sultan Kudarat, Region-12
GENERAL LAYOUT

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities

Photograph of Irrigation Facilities

NIS name: Tacurong (Dumaguil) (Region 12)

Location / Facility	*Photograph*	*Comments*
Diversion works. View taken from bank facing downstream. Longitude: 6° 33'02"E Latitude: 124° 40'58"N		The river upstream of the dam needs to be dredged and rechanneled to straighten the course.
Diversion works. View taken from bank facing upstream. Longitude: 6° 33'02"E Latitude: 124° 40'58"N		The bamboos in the dam have nets for catching fish which jump as they fall from the dam.
Main canal. Right after the dam intake. Longitude: 6° 33'02"E Latitude: 124° 40'58"N		High sand load in the canal. This canal stretch can be converted to a settling basin with a silt ejector.

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities

Photograph of Irrigation Facilities

NIS name: Tacurong (Dumaguil) (Region 12)

Location / Facility	*Photograph*	*Comments*
Silt ejector structure. Main canal Station 0+456 Longitude: 6° 33'15"E Latitude: 124° 40'56"N		Non-functional structure. The structure, which has about 500 meters of reinforced concrete pipe was full of silt within one (1) month from operation and has never been cleared since then.
Road crossing with turn-out Main canal Station 0+724 Longitude: 6° 33'24"E Latitude: 124° 40'54"N		Steel gates need to be repaired/replaced.
Turn-out structure Main canal Station 1+324 Longitude: 6° 33'42"E Latitude: 124° 40'49"N		Improperly constructed turn-out with no control gates.

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities

Photograph of Irrigation Facilities

NIS name: Tacurong (Dumaguil) (Region 12)

Location / Facility	*Photograph*	*Comments*
Illegal checking Main Canal Station 1+680 Longitude: 6° 34'00"E Latitude: 124° 40'45"N		Too high checking caused the overflow of water in the concrete lined canals. The said act was done intentionally to irrigate the land adjoining the canal.
Service road along the main canal. Station 1+ 820		Notice the sand at the side road—these were excavated from the main canal.
Illegal checking in the main canal. Station 1 +985		This is the worst kind of illegal checking—the height of the check is such that the water will overflow to the adjoining farm. This is very destructive to the canal facilities.

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities

Photograph of Irrigation Facilities

NIS name: Tacurong (Dumaguil) (Region 12)

Location / Facility	*Photograph*	*Comments*
Combined road crossing, turn-out, drainage and head gates of Laterals A, B & C. MC Sta. 2 + 125 Longitude: 6° 34'07"E Latitude: 124° 40'43"N		The steel gates need to be repaired/ replaced. Notice the sand at the foreground—these were excavated from the structure.
Main canal Station 2+300 Longitude:6° 34'07" E Latitude: 124° 40'43"N		Broken concrete linings at the left bank. Notice the sand at the banks excavated from the canals.

THE REPUBLIC OF PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION

Sector Loan on Rehabilitation of Irrigation Facilities

NIS SUMMARY REPORT

1203
Banga RIS
Region 12
South Cotabato & Sultan Kudarat Provinces

July 2009

Survey Team for
Japan International Cooperation Agency
(JICA)

Features of NIS for Rehabilitation Project

1. General

Item	*Description*		
1) Name of NIS	**BANGA RIS**		Code: 1203
2) Location	Region	12	
	Province	South Cotabato	
	Municipalities	Banga, Norala, & Sto. Niño	
	Distance	16 kms from Koronadal, South Cotabato	
3) Type of Water Source	Water Source	Banga River	
	Type	Diversion Dam (38.00 m wide, 3.00 m high)	
4) Area	Service Area	3,360 has.	
	FUSA	2,546 has.	
5) Beneficiary Farmers	1,859 farmers	Average paddy field cultivating size = 1.37 ha per farmer	
6) Irrigator's Association	IAs established = 23 FIA established = 1 in 2008		
7) Features of NIS and Necessity of the project	Banga RIS was completed in 1972. It has a design service area of 3,360 has. but a firmed-up service area of only 2,546 has. due to lack of water. It has one (1) main canal with a total length of 17.27 kms.; fourteen (14) lateral canals with a total length of 44.41 kms. and 53 kms. of service roads. It also has 1.5 kilometers of drainage canals, 204 canal structures, 221 turn-outs and 148 kms. of farm ditches. During the last five (5) years it had an average cropping intensity of 196% and average yields of 82 cavans/ha. during the wet season and 77 cavans/ha. during the dry season. A rehabilitation of the system is needed to arrest the flooding of the upstream areas caused by the raising of the dam height a few years ago and to improve the efficiency of water delivery in the canals and distribution to the farms.		
8) Outline of the Proposed Project	A. Engineering 1. a.Repair of diversion dam b.Construction of flood protection dikes at the banks of the river upstream of the dam 2. Repair and improvement of irrigation canal and structures 3. Repair and improvement of drainage canal and structures 4. Repair and improvement of service roads 5. Repair and improvement of on-farm facilities 6. Repair and construction of IMT support facilities-IA building solar drier, warehouse with IA building 7. Development and establishment of IMT GIS database B. Institutional Strengthening Program 1. Reactivation of FIA/IA and Strengthening of Irrigation System Management Committee (ISMC) of NIS including construction of IMT support facilities 2. Strengthening of NIA – IA – LGUs Partnership 3. Strengthening NIA Institutional Capacity		

	B.2 Specific Program to strengthen institutional mechanism together with LGUs 1. Improvement of watershed management				
9) Proposed Project Component	A. Engineering 1. Construction of civil works for rehabilitation of diversion works, canal system, drainage system, roads, and IMT support facilities. B. Institutional 1. Reactivation of FIAs/IAs including reformation of TSGA / IA / FIA areas, construction of IMT support facilities (demand base) 2. Strengthening NIA-IA- LGUs Partnership, especially coordination RDC, RAFC/PAFC with 3. FIAs/IAs and ISMC 4. Institutional development program to strengthen management capacity of NIA field offices and IAs.				
10) Project Cost (Direct cost only, excluding escalation, contingency, tax)	1. Direct cost			PHP 249.36	million
	- *Civil Works*	*PHP*	*231.17*	Million	
	- *Institutional Development*	*PHP*	*13.20*	Million	
	- *Engineering Services*	*PHP*	*4.99*	Million	
	2. Indirect cost			PHP 22.31	million
	Total Project Cost (1+2)			PHP 271.67	million
	Cost per ha			PHP 106,705.00	per ha
11) Project Benefit	1. To increase paddy production by 3,489 tons/year 2. To increase farmers' net income to PHP58,152.00 /ha/year 3. To establish functional and self-reliant IAs 4. To improve performance of NIS				
12) Project Justification	EIRR = 17.1 %, B/C = 1.15 (discount rate 15%)				

2. Project History (Construction/Rehabilitation)

Year	*Description*
1972	Project Completion
1991	Rehabilitation of the Dam

3. Present Condition

3.1 Natural Conditions

Item	*Description*
1) Annual Rainfall	2,281.70 mm
2) Seasons	Wet: March – August Dry: September – February
3) Dominant Soil in NIS Area	Sandy Loam
4) Topography	Generally flat, gently sloping

3.2 Socio-economy (Region/Province)

Item	*Description*
1) GRDP	PHP 220,322 million (Year 2007), Per Capita GRDP = PHP 57,708 per year
2) Population	767,254 (province)
3) Population Growth Rate	5.68 % per year (province)
4) Labor Force	2,382,000 (region)
5) Poverty Population	47.4 % to total population (province)

3.3 Present Agriculture in NIS

Item	*Description*					
1) Farm Household in NIS	Total beneficiaries	1,859 households				
	Land owners	1,205 households	(64.8 %)			
	Tenant farmers	654 households	(35.2 %)			
2) Paddy Field Size in NIS	1.37 ha per household (FUSA/Total beneficiaries as of 2008)					
3) Present Land Use in NIS	Paddy field planted	2,508 ha	74.7 %	As of 2008		
	Paddy field not planted	38 ha	1.1 %	As of 2008		
	Upland crop field	0 ha	0.0 %			
	Permanent crop field	0 ha	0.0 %			
	Undeveloped area	0 ha	0.0 %			
	Built-up area	0 ha	0.0 %			
	High ground	0 ha	0.0 %			
	Grassland	0 ha	0.0 %			
	Swamp	0 ha	0.0 %			
	Unspecified area	814 ha	24.2 %	No data in response		
4) Paddy Field in FUSA (ha)	2,546					

5) Paddy Cropped Area (ha)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Wet Season	2,537	2,541	2,536	2,539	2,505	2,532
Dry Season	2,516	2,495	2,486	2,520	2,508	2,505
6) Cropping Intensity (%)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
(per year)	198	198	197	199	197	198
7) Unit Yield of Paddy (ton/ha)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Wet Season	4.10	3.80	4.45	4.35	3.85	4.11
Dry Season	3.50	4.10	4.15	4.20	3.45	3.88
8) Paddy Production (ton)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Wet Season	10,402	9,656	11,285	11,045	9,644	10,406
Dry Season	8,806	10,230	10,317	10,584	8,653	9,719

3.4 Water Resources

Item	*Description*
1) Name of Rivers	Banga River
2) Catchment Area at Dam	307 km2
3) Ave. River Discharge	4.93 m^3/s
4) Ave. Dry Season Discharge	4.64 m^3/s
5) Diverted Intake Discharge	3.21 m^3/s
6) Water Requirement	4.58 m^3/s
7) Sedimentation	Moderate

3.5 Existing Irrigation System

Item	*Description*
1) Diversion Dam	Overflow crest width 38.00 m, Dam height 3.00 m
2) Main Canal	Total length 17.27 km (Lined portion 2.00 km)
3) Lateral Canals	Total length 44.41 km (Lined portion 25.00 km)
4) On-farm facilities	Total length 84.00 km
	Turn-outs = 221 units
5) Drainage Canal	Total length 33.00 kms.
6) Canal Structures	No. = 204 units
7) Drainage Structures	No. = 29 units
8) Farm roads	Total length 42.62 km (pavement= 0.00 kms.)
9) Flood Protection Dike	Total length 1.80 km For new construction = 0.80 kms.

3.6 Institutions for O&M of NIS

Item	*Description*					
1) Regional Irrigation Office	Name: Region 12 – South Central Mindanao					
2) IMO	Name: South Cotabato – Saranggani IMO					
Staff in 2009	Total number of staff: 66 nos,					
3) Irrigator' Association (IA)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Number of FIA (nos)					1	
Number of IA (nos)					23	
Number of TSAG (nos)	107	107	107	115	115	110
Functionality of IA	82.3	78.4	85.5	88.4	84.3	83.8
Collection of ISF (wet, %)	85	93	99	99	86	94
Collection of ISF (dry, %)	81	84	92	95	88	88
4) NIS Category based on IA 2008 O&M Contract (NIA-IA)	No. of IA					
Category A	1					
Category B	22					
Category C	0					

3.7 Existing Problems

Item	*Description*
1) Diversion Works	1. Flooding of the farms upstream of the dam
2) Canal and Structures	1. Bank erosion and seepage in canals that lessen the efficiency of water delivery. 2. Dilapidated structure steel gates.
3) Drainage Canal	1. Need to improve the drainage system.
4) Other Project Facilities (road, bridge, flood dike, building, etc)	1. Some road sections become very muddy during the rainy season.
5) Water Management and O&M Activities	1. Illegal checking in some places. 2. Lack of control in water intake in some turn-outs result in over supply in some areas in the upstream reaches of the canals but lack of supply in the downstream farms.
6) Status of NIS and IA Management	Status Type A evaluated by Radar Graph. 1. Minor problem such as medium paddy yield during wet and dry seasons at 77 cavans/ha for both seasons
7) Watershed Management	1. Illegal checkings in some canal stretches. 2. Lack of control in the entry of water into the turn-outs sometimes resulting in over supply in water in the upper reaches of the canals. 3. Significant denudation of the watershed
8) Coordination with LGU and Agencies concerned	1. Poor coordination by NIA's field offices and IAs with concerned LGUs on specific problem such as watershed management
9) Agriculture	1. Individualistic attitude of the farmers with regards to their farming operations and activities. This results to inefficient use of irrigation water and water wastage. 2. Insufficiency of drying facilities. Farmers are forced to sell their produce immediately after harvest particularly during the wet season crop because of this problem. 3. Insufficient lending facilities to finance farming operations. Farmers are availing loans from the private trader with high interest rates at 8% per month.

4. Proposed Rehabilitation Plan

4.1 Agricultural Development Plan

Item	*Description*			
Cropping schedule	*Wet Season*	*Dry Season-1*	*Dry Season-2*	*Annual*
1) Type of Crops	Paddy	Paddy	-	-
2) Cropping Area (ha)	2546	2520	-	-
3) Target Unit Yield (ton/ha)	4.40	4.20	-	21,786
3) Total Production (ton)	11,202	10,584	-	

4.2 Civil Works

Item	*Description*
1) Diversion Works	1. Construction of flood protection dikes on both sides of the river bank upstream of the dam. 2. Construction of additional sluice tower and gates.
2) Canal Structures	1. Repair/rehabilitation of old dilapidated steel gates – 62 units 2. Installation of new steel gates to replace wooden flush boards – 39 units
3) Canalization	1. Concrete lining of selected existing canal sections – 37 kms 2. Re-shaping and de-silting of some canal sections – 21 kms 3. Realignment of canals 4. Construction of new canals
4) Drainage Structures	1. Repair of drainage structures – 15 units
5) Drainage Canalization	1. Repair of existing drainage canals and construction of new ones – 10 kms
6) Road	1. Regravelling of selected road sections – 38.4 kms 2. Construction of side drainage canals – 38.4 kms 3. Construction of road drainage structures.
1) On-Farm Facilities	1. Repair /replacement of dilapidated turn out steel gates 2.Construction of new turn outs and farm ditches
2) IMT Support Facilities	1. Construction of post-harvest facilities—warehouses, IA buildings, solar driers with shed – 2 sets
3) IMT GIS Database	1. Development and establishment of GIS database

4.3 Institutional Strengthening Program

Item	*Description*
1) Reactivation Program of FIAs/IAs and System Management Committee (ISMC)	1. Executing body : Project Management Office with assistance of Consultant 2. Schedule:34 months / NIS 3. Counter body for execution: NIA Regional Office and IMO office 4. Attendant / Trainee: President of FIAs/IAs and secretary group, staff of NIA RIO/IMO, Chairmen of ISMC and Secretary group and LGUs officers, 5. Contents: a) Survey & Study by Consultant a) Workshops on coordination activities with and dissemination on reformation plan to FIAs/IAs b) Workshop on coordination activities with LGUs c) Organization and Legal Registration of FIAs/IAs to be re-active and reactivation of SMC d) Construction of IMT support facilities for FIAs/CIA e) Workshop and Training of FIAs/IAs members on management under the IMT f) Assessment/Evaluation for and Negotiation of Contracting under IMT g) Assistance of reactivated IAs/FIAs in organizational and management activities
2) Strengthening Program of NIA - IA - LGU Partnership	1. Executing body : Project Management Office with assistance of Consultant, & Management System Committee (MSC) of NIS 2. Schedule: 7 months / NIS 3. Counter body for execution: Regional Development Council with Secretary of NEDA Regional Office

Item	*Description*
	4. Attendant / Trainee: Secretaries of Regional Organizations, LGUs officers, President of FIAs/IAs and secretary group, staff of NIA RIO/IMO, Chairmen of ISMC and Secretary group 5. Contents: a) Workshop on Trouble Shooting of NIS and FIAs/ISs' Management b) Provision of work space for ISMC including office facilities
3) NIA Institutional Strengthening Program	1. Executing body : Institutional Development Division of CO, NIA 2. Schedule: 7 months / NIS 3. Counter body for execution: NIA Regional Office and IMO office 4. Attendant / Trainee: NIA personnel at CO, RIO and IMO 5. Contents: a) Capability built-up program (Central and Regional NIA Offices) b) Improvement program on management mechanism of NIA c) Support program for IMT implementation d) Strengthening program of Integrated Management information System
4) Specific Program on watershed management plan	1. Strengthening coordination with RDC, RAFC/PAFC and LGUs concerned through works shop on dissemination of the SLRIF to these organizations. 2. Strengthening coordination with RDC, RAFC/PAFC and LGUs on training program of watershed management

4.4 Proposed Counter Schemes

Item	*Description*
1) DENR	1. Technical assistance to concerned Provincial/municipal LGUs on watershed rehabilitation and management such as establishment of nurseries and community-based livelihood for upland dwellers
2) LGU	1. LGUs improve coordination program with NIA to give priority of the projects in annual budgeting and funds programming 2. Provincial LGUs to extend training to municipal agricultural officers to improve skills on technology promotion 3. LGUs improve capacity of its personnel to prepare project proposals through a training by DILG to ensure project's fund access to municipal development fund 4. LGUs provide reliable post-harvest facilities to ensure optimal operation of the facilities

5. Cost Estimate for Initial Investment

Item	*Description*		
1) Direct Cost for Civil Works	A. Mobilization	Php	4.99 Million
	B. Protection Dikes	Php	80.00 Million
	C. Diversion Works	Php	26.64 Million
	D. Canal Structures	Php	5.12 Million
	E. Canalization	Php	75.30 Million
	F. Drainage Structures	Php	5.09 Million
	G. Drainage Canalization	Php	7.64 Million
	H. Roads	Php	4.20 Million
	I. On-Farm Facilities/T.O. Gates	Php	4.65 Million
	J. IMT Support Facilities	Php	15.00 Million
	K. IMT GIS Database	Php	2.55 Million
	L. Institutional Development (5% of Direct Cost)	Php	13.20 Million
	M. Feasibility Studies & Detailed Engineering (2% of Direct Cost)	Php	4.99 Million
	Sub-total (Direct Cost)	Php	249.36 Million

2) Indirect Cost	A. General Engineering Supervision and Administration (3.5% of Direct Cost)	Php	8.73 Million
	B. NIA Management Fee (5% of Total Project Cost)	Php	13.58 Million
	Sub-total (Indirect Cost)	Php	22.31 Million
3) Total Project Cost	= 1+ 2	Php	271.67 Million
Cost per ha.		Php	106,705.00 /ha.

6. Implementation Plan

Item	*Description*
1) Contract package	1 - Local Competitive Bidding (LCB)
2) Implementation Schedule	
a) Civil Works	
1) Survey, F/S, Design	21 months
2) Tendering	6 months
3) Construction	36 months
b) Institutional Improvement Works	
1) Reactivation Program of FIAs/IAs and Irrigation System Management Committee	34 months
2) NIA-IA-LGU Partnership	7 months
3) Strengthening of NIA staff	7 months

7. Project Evaluation

Item		*Description*	
1) Economic evaluation			
EIRR (Base)		EIRR = 17.1 %	: Project life 50 years
Sensitivity	Case-1	EIRR = 15.6 %	: Cost 10% up
	Case-2	EIRR = 15.5 %	: Benefit 10% down
	Case-3	EIRR = 14.1 %	: Cost 10% up + Benefit 10% down
B/C		1.15	: discount rate 15% p.a.
NPV		PHP 23 million	: discount rate 15% p.a.
2) Financial evaluation		Farmer's net income increase = PHP 20,602 per ha per year	
3) Expected Impacts		1. Increased farmers' income 2. Increased rice self sufficiency of the country 3. Increased job opportunities in rural areas	

8. Environmental Aspects

Item	*Description*
1) Environmental aspect	Need to address sedimentation/siltation problem
2) Relocation of houses	none
3) Land acquisition	none

Table 8.4.4 [1203 - Banga] Economic Evaluation (EIRR)

Basic Case

Name of NIS: 1203 - Banga | Region : 12 IMO RIO: Sultan Kudarat

EIRR : 17.1%	Net Present Value (Million PHP) (15 % discount rate)	Benefit	Cost	B/C Ratio	NPV
		178	155	1.15	23

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011			1.19		1.19		1.82	1.82	0.63
2	2012			1.19		1.19		3.64	3.64	2.45
3	2013	66.29	2.15	1.19		69.63		5.46	5.46	-64.17
4	2014	88.38	2.86	1.19	1.55	93.99	5.57	7.28	12.85	-81.14
5	2015	66.29	2.15	1.19	3.61	73.24	13.70	9.10	22.80	-50.44
6	2016				5.16	5.16	20.90	10.92	31.82	26.66
7	2017				5.16	5.16	22.52	12.74	35.26	30.10
8	2018				5.16	5.16	23.22	14.56	37.78	32.62
9	2019				5.16	5.16	23.22	16.38	39.60	34.44
10	2020				5.16	5.16	23.22	18.20	41.42	36.26
11	2021				5.16	5.16	23.22	20.02	43.24	38.08
12	2022				5.16	5.16	23.22	21.84	45.06	39.90
13	2023				5.16	5.16	23.22	23.66	46.88	41.72
14	2024				5.16	5.16	23.22	25.48	48.70	43.54
15	2025				5.16	5.16	23.22	27.30	50.52	45.36
16	2026				5.16	5.16	23.22	29.12	52.34	47.18
17	2027				5.16	5.16	23.22	30.94	54.16	49.00
18	2028				5.16	5.16	23.22	32.76	55.98	50.82
19	2029				5.16	5.16	23.22	34.58	57.80	52.64
20	2030				5.16	5.16	23.22	36.40	59.62	54.46
21	2031				5.16	5.16	23.22	38.22	61.44	56.28
22	2032				5.16	5.16	23.22	40.04	63.26	58.10
23	2033				5.16	5.16	23.22	41.86	65.08	59.92
24	2034				5.16	5.16	23.22	43.68	66.90	61.74
25	2035				5.16	5.16	23.22	45.50	68.72	63.56
26	2036				5.16	5.16	23.22	47.32	70.54	65.38
27	2037				5.16	5.16	23.22	49.14	72.36	67.20
28	2038				5.16	5.16	23.22	50.96	74.18	69.02
29	2039				5.16	5.16	23.22	52.78	76.00	70.84
30	2040				5.16	5.16	23.22	54.60	77.82	72.66
31	2041				5.16	5.16	23.22	56.42	79.64	74.48
32	2042				5.16	5.16	23.22	58.24	81.46	76.30
33	2043				5.16	5.16	23.22	60.06	83.28	78.12
34	2044				5.16	5.16	23.22	61.88	85.10	79.94
35	2045				5.16	5.16	23.22	63.70	86.92	81.76
36	2046				5.16	5.16	23.22	65.52	88.74	83.58
37	2047				5.16	5.16	23.22	67.34	90.56	85.40
38	2048				5.16	5.16	23.22	69.16	92.38	87.22
39	2049				5.16	5.16	23.22	70.98	94.20	89.04
40	2050				5.16	5.16	23.22	72.80	96.02	90.86
41	2051				5.16	5.16	23.22	74.62	97.84	92.68
42	2052				5.16	5.16	23.22	76.44	99.66	94.50
43	2053				5.16	5.16	23.22	78.26	101.48	96.32
44	2054				5.16	5.16	23.22	80.08	103.30	98.14
45	2055				5.16	5.16	23.22	81.90	105.12	99.96
46	2056				5.16	5.16	23.22	83.72	106.94	101.78
47	2057				5.16	5.16	23.22	85.54	108.76	103.60
48	2058				5.16	5.16	23.22	87.36	110.58	105.42
49	2059				5.16	5.16	23.22	89.18	112.40	107.24
50	2060				5.16	5.16	23.22	91.00	114.22	109.06

Case-1 (Cost 10% up)

Name of NIS: 1203 - Banga | Region : 12 IMO RIO: Sultan Kudarat

EIRR : 15.6%	Net Present Value (Million PHP) (15 % discount rate)	Benefit	Cost	B/C Ratio	NPV
		178	170	1.04	7

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	1.31	-	1.31	-	1.82	1.82	0.51
2	2012	-	-	1.31	-	1.31	-	3.64	3.64	2.33
3	2013	72.92	2.36	1.31	-	76.59	-	5.46	5.46	-71.13
4	2014	97.22	3.15	1.31	1.70	103.39	5.57	7.28	12.85	-90.54
5	2015	72.92	2.36	1.31	3.97	80.57	13.70	9.10	22.80	-57.77
6	2016	-	-	-	5.68	5.68	20.90	10.92	31.82	26.14
7	2017	-	-	-	5.68	5.68	22.52	12.74	35.26	29.59
8	2018	-	-	-	5.68	5.68	23.22	14.56	37.78	32.10
9	2019	-	-	-	5.68	5.68	23.22	16.38	39.60	33.92
10	2020	-	-	-	5.68	5.68	23.22	18.20	41.42	35.74
11	2021	-	-	-	5.68	5.68	23.22	20.02	43.24	37.56
12	2022	-	-	-	5.68	5.68	23.22	21.84	45.06	39.38
13	2023	-	-	-	5.68	5.68	23.22	23.66	46.88	41.20
14	2024	-	-	-	5.68	5.68	23.22	25.48	48.70	43.02
15	2025	-	-	-	5.68	5.68	23.22	27.30	50.52	44.84
16	2026	-	-	-	5.68	5.68	23.22	29.12	52.34	46.66
17	2027	-	-	-	5.68	5.68	23.22	30.94	54.16	48.48
18	2028	-	-	-	5.68	5.68	23.22	32.76	55.98	50.30
19	2029	-	-	-	5.68	5.68	23.22	34.58	57.80	52.12
20	2030	-	-	-	5.68	5.68	23.22	36.40	59.62	53.94
21	2031	-	-	-	5.68	5.68	23.22	38.22	61.44	55.76
22	2032	-	-	-	5.68	5.68	23.22	40.04	63.26	57.58
23	2033	-	-	-	5.68	5.68	23.22	41.86	65.08	59.40
24	2034	-	-	-	5.68	5.68	23.22	43.68	66.90	61.22
25	2035	-	-	-	5.68	5.68	23.22	45.50	68.72	63.04
26	2036	-	-	-	5.68	5.68	23.22	47.32	70.54	64.86
27	2037	-	-	-	5.68	5.68	23.22	49.14	72.36	66.68
28	2038	-	-	-	5.68	5.68	23.22	50.96	74.18	68.50
29	2039	-	-	-	5.68	5.68	23.22	52.78	76.00	70.32
30	2040	-	-	-	5.68	5.68	23.22	54.60	77.82	72.14
31	2041	-	-	-	5.68	5.68	23.22	56.42	79.64	73.96
32	2042	-	-	-	5.68	5.68	23.22	58.24	81.46	75.78
33	2043	-	-	-	5.68	5.68	23.22	60.06	83.28	77.60
34	2044	-	-	-	5.68	5.68	23.22	61.88	85.10	79.42
35	2045	-	-	-	5.68	5.68	23.22	63.70	86.92	81.24
36	2046	-	-	-	5.68	5.68	23.22	65.52	88.74	83.06
37	2047	-	-	-	5.68	5.68	23.22	67.34	90.56	84.88
38	2048	-	-	-	5.68	5.68	23.22	69.16	92.38	86.70
39	2049	-	-	-	5.68	5.68	23.22	70.98	94.20	88.52
40	2050	-	-	-	5.68	5.68	23.22	72.80	96.02	90.34
41	2051	-	-	-	5.68	5.68	23.22	74.62	97.84	92.16
42	2052	-	-	-	5.68	5.68	23.22	76.44	99.66	93.98
43	2053	-	-	-	5.68	5.68	23.22	78.26	101.48	95.80
44	2054	-	-	-	5.68	5.68	23.22	80.08	103.30	97.62
45	2055	-	-	-	5.68	5.68	23.22	81.90	105.12	99.44
46	2056	-	-	-	5.68	5.68	23.22	83.72	106.94	101.26
47	2057	-	-	-	5.68	5.68	23.22	85.54	108.76	103.08
48	2058	-	-	-	5.68	5.68	23.22	87.36	110.58	104.90
49	2059	-	-	-	5.68	5.68	23.22	89.18	112.40	106.72
50	2060	-	-	-	5.68	5.68	23.22	91.00	114.22	108.54

Table 8.4.4 [1203 - Banga] Economic Evaluation (EIRR)

Case-2 (Benefit 10% down)

Name of NIS 1203 - Banga Region : 12 IMO,RIO Sultan Kudarat

EIRR : 15.5%	Net Present Value (Million PHP) (15 % discount rate)	Benefit	Cost	B/C Ratio	NPV
		160	155	1.03	5

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	1.19	-	1.19	-	1.64	1.64	0.44
2	2012	-	-	1.19	-	1.19	-	3.28	3.28	2.08
3	2013	66.29	2.15	1.19	-	69.63	-	4.91	4.91	-64.72
4	2014	88.38	2.86	1.19	1.55	93.99	5.02	6.55	11.57	-82.42
5	2015	66.29	2.15	1.19	3.61	73.24	12.33	8.19	20.52	-52.72
6	2016	-	-	-	5.16	5.16	18.81	9.83	28.64	23.48
7	2017	-	-	-	5.16	5.16	20.27	11.47	31.74	26.58
8	2018	-	-	-	5.16	5.16	20.90	13.10	34.00	28.84
9	2019	-	-	-	5.16	5.16	20.90	14.74	35.64	30.48
10	2020	-	-	-	5.16	5.16	20.90	16.38	37.28	32.12
11	2021	-	-	-	5.16	5.16	20.90	18.02	38.92	33.76
12	2022	-	-	-	5.16	5.16	20.90	19.66	40.55	35.39
13	2023	-	-	-	5.16	5.16	20.90	21.29	42.19	37.03
14	2024	-	-	-	5.16	5.16	20.90	22.93	43.83	38.67
15	2025	-	-	-	5.16	5.16	20.90	24.57	45.47	40.31
16	2026	-	-	-	5.16	5.16	20.90	26.21	47.11	41.95
17	2027	-	-	-	5.16	5.16	20.90	27.85	48.74	43.58
18	2028	-	-	-	5.16	5.16	20.90	29.48	50.38	45.22
19	2029	-	-	-	5.16	5.16	20.90	31.12	52.02	46.86
20	2030	-	-	-	5.16	5.16	20.90	32.76	53.66	48.50
21	2031	-	-	-	5.16	5.16	20.90	34.40	55.30	50.14
22	2032	-	-	-	5.16	5.16	20.90	36.04	56.93	51.77
23	2033	-	-	-	5.16	5.16	20.90	37.67	58.57	53.41
24	2034	-	-	-	5.16	5.16	20.90	39.31	60.21	55.05
25	2035	-	-	-	5.16	5.16	20.90	40.95	61.85	56.69
26	2036	-	-	-	5.16	5.16	20.90	42.59	63.49	58.33
27	2037	-	-	-	5.16	5.16	20.90	44.23	65.12	59.96
28	2038	-	-	-	5.16	5.16	20.90	45.86	66.76	61.60
29	2039	-	-	-	5.16	5.16	20.90	47.50	68.40	63.24
30	2040	-	-	-	5.16	5.16	20.90	49.14	70.04	64.88
31	2041	-	-	-	5.16	5.16	20.90	50.78	71.68	66.52
32	2042	-	-	-	5.16	5.16	20.90	52.42	73.31	68.15
33	2043	-	-	-	5.16	5.16	20.90	54.05	74.95	69.79
34	2044	-	-	-	5.16	5.16	20.90	55.69	76.59	71.43
35	2045	-	-	-	5.16	5.16	20.90	57.33	78.23	73.07
36	2046	-	-	-	5.16	5.16	20.90	58.97	79.87	74.71
37	2047	-	-	-	5.16	5.16	20.90	60.61	81.50	76.34
38	2048	-	-	-	5.16	5.16	20.90	62.24	83.14	77.98
39	2049	-	-	-	5.16	5.16	20.90	63.88	84.78	79.62
40	2050	-	-	-	5.16	5.16	20.90	65.52	86.42	81.26
41	2051	-	-	-	5.16	5.16	20.90	67.16	88.06	82.90
42	2052	-	-	-	5.16	5.16	20.90	68.80	89.69	84.53
43	2053	-	-	-	5.16	5.16	20.90	70.43	91.33	86.17
44	2054	-	-	-	5.16	5.16	20.90	72.07	92.97	87.81
45	2055	-	-	-	5.16	5.16	20.90	73.71	94.61	89.45
46	2056	-	-	-	5.16	5.16	20.90	75.35	96.25	91.09
47	2057	-	-	-	5.16	5.16	20.90	76.99	97.88	92.72
48	2058	-	-	-	5.16	5.16	20.90	78.62	99.52	94.36
49	2059	-	-	-	5.16	5.16	20.90	80.26	101.16	96.00
50	2060	-	-	-	5.16	5.16	20.90	81.90	102.80	97.64

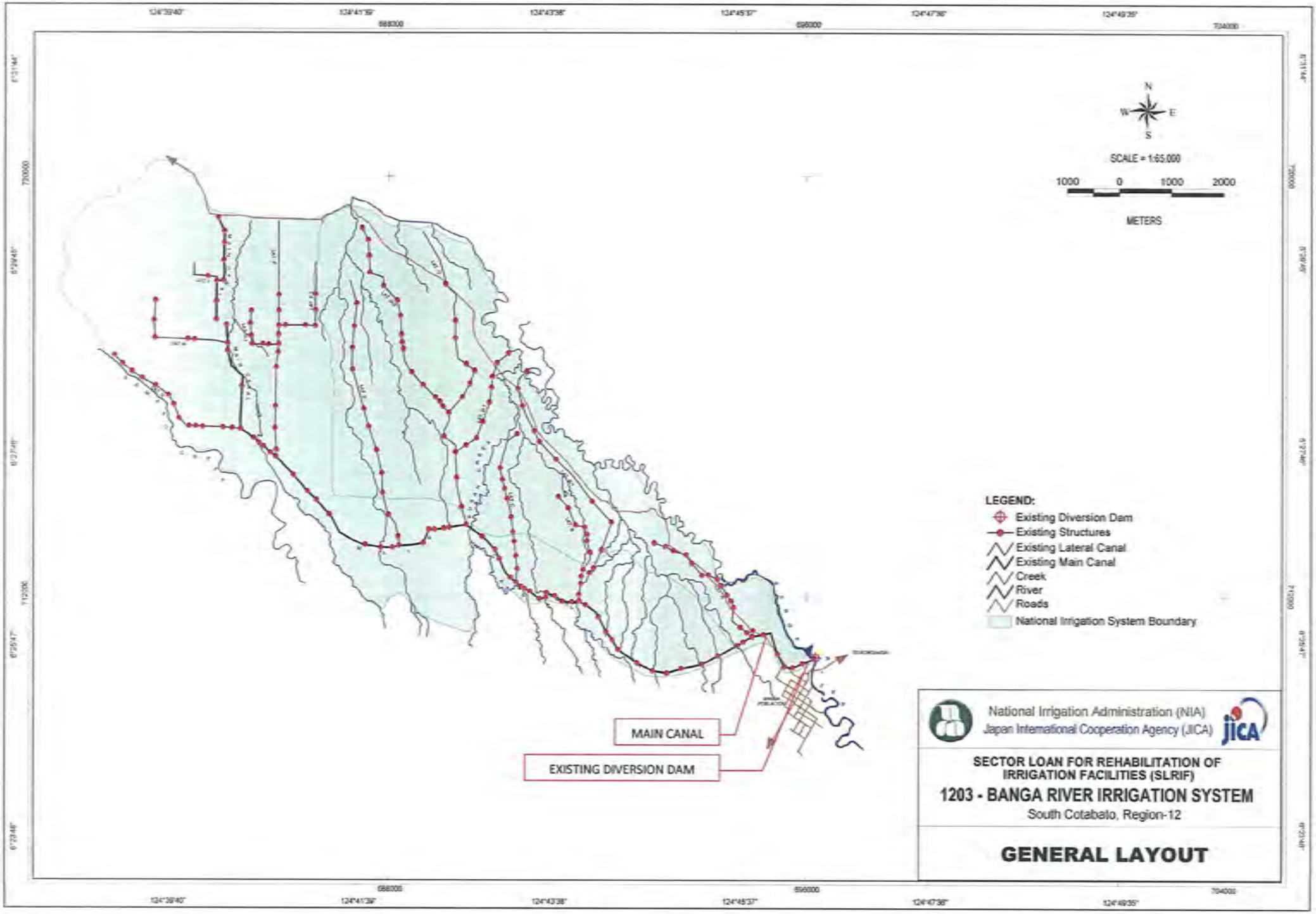
Case-3 (Cost 10% up and Benefit 10% down)

Name of NIS 1203 - Banga Region : 12 IMO,RIO Sultan Kudarat

EIRR : 14.1%	Net Present Value (Million PHP) (15 % discount rate)	Benefit	Cost	B/C Ratio	NPV
		160	170	0.94	-10

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	1.31	-	1.31	-	1.64	1.64	0.32
2	2012	-	-	1.31	-	1.31	-	3.28	3.28	1.96
3	2013	72.92	2.36	1.31	-	76.59	-	4.91	4.91	-71.68
4	2014	97.22	3.15	1.31	1.70	103.39	5.02	6.55	11.57	-91.82
5	2015	72.92	2.36	1.31	3.97	80.57	12.33	8.19	20.52	-60.05
6	2016	-	-	-	5.68	5.68	18.81	9.83	28.64	22.96
7	2017	-	-	-	5.68	5.68	20.27	11.47	31.74	26.06
8	2018	-	-	-	5.68	5.68	20.90	13.10	34.00	28.33
9	2019	-	-	-	5.68	5.68	20.90	14.74	35.64	29.96
10	2020	-	-	-	5.68	5.68	20.90	16.38	37.28	31.60
11	2021	-	-	-	5.68	5.68	20.90	18.02	38.92	33.24
12	2022	-	-	-	5.68	5.68	20.90	19.66	40.55	34.88
13	2023	-	-	-	5.68	5.68	20.90	21.29	42.19	36.52
14	2024	-	-	-	5.68	5.68	20.90	22.93	43.83	38.15
15	2025	-	-	-	5.68	5.68	20.90	24.57	45.47	39.79
16	2026	-	-	-	5.68	5.68	20.90	26.21	47.11	41.43
17	2027	-	-	-	5.68	5.68	20.90	27.85	48.74	43.07
18	2028	-	-	-	5.68	5.68	20.90	29.48	50.38	44.71
19	2029	-	-	-	5.68	5.68	20.90	31.12	52.02	46.34
20	2030	-	-	-	5.68	5.68	20.90	32.76	53.66	47.98
21	2031	-	-	-	5.68	5.68	20.90	34.40	55.30	49.62
22	2032	-	-	-	5.68	5.68	20.90	36.04	56.93	51.26
23	2033	-	-	-	5.68	5.68	20.90	37.67	58.57	52.90
24	2034	-	-	-	5.68	5.68	20.90	39.31	60.21	54.53
25	2035	-	-	-	5.68	5.68	20.90	40.95	61.85	56.17
26	2036	-	-	-	5.68	5.68	20.90	42.59	63.49	57.81
27	2037	-	-	-	5.68	5.68	20.90	44.23	65.12	59.45
28	2038	-	-	-	5.68	5.68	20.90	45.86	66.76	61.09
29	2039	-	-	-	5.68	5.68	20.90	47.50	68.40	62.72
30	2040	-	-	-	5.68	5.68	20.90	49.14	70.04	64.36
31	2041	-	-	-	5.68	5.68	20.90	50.78	71.68	66.00
32	2042	-	-	-	5.68	5.68	20.90	52.42	73.31	67.64
33	2043	-	-	-	5.68	5.68	20.90	54.05	74.95	69.28
34	2044	-	-	-	5.68	5.68	20.90	55.69	76.59	70.91
35	2045	-	-	-	5.68	5.68	20.90	57.33	78.23	72.55
36	2046	-	-	-	5.68	5.68	20.90	58.97	79.87	74.19
37	2047	-	-	-	5.68	5.68	20.90	60.61	81.50	75.83
38	2048	-	-	-	5.68	5.68	20.90	62.24	83.14	77.47
39	2049	-	-	-	5.68	5.68	20.90	63.88	84.78	79.10
40	2050	-	-	-	5.68	5.68	20.90	65.52	86.42	80.74
41	2051	-	-	-	5.68	5.68	20.90	67.16	88.06	82.38
42	2052	-	-	-	5.68	5.68	20.90	68.80	89.69	84.02
43	2053	-	-	-	5.68	5.68	20.90	70.43	91.33	85.66
44	2054	-	-	-	5.68	5.68	20.90	72.07	92.97	87.29
45	2055	-	-	-	5.68	5.68	20.90	73.71	94.61	88.93
46	2056	-	-	-	5.68	5.68	20.90	75.35	96.25	90.57
47	2057	-	-	-	5.68	5.68	20.90	76.99	97.88	92.21
48	2058	-	-	-	5.68	5.68	20.90	78.62	99.52	93.85
49	2059	-	-	-	5.68	5.68	20.90	80.26	101.16	95.48
50	2060	-	-	-	5.68	5.68	20.90	81.90	102.80	97.12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National Irrigation Administration (NIA)
Japan International Cooperation Agency (JICA)
JICA
SECTOR LOAN FOR REHABILITATION OF IRRIGATION FACILITIES (SLRIF)
1203 - BANGA RIVER IRRIGATION SYSTEM
South Cotabato, Region-12
GENERAL LAYOUT

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities
Photograph of Irrigation Facilities

NIS name: Banga (Region 12)

Location / Facility	*Photograph*	*Comments*
Diversion works. View taken facing downstream. Longitude: 6° 26'12"E Latitude: 124° 46'31"N		There is a need to add one sluice way to lower the level of flood waters upstream of the dam during heavy rainy days.
02. Panoramic view of the diversions works, facing downstream. Longitude: 6° 26'12"E Latitude: 124° 46'31"N		The height of the ogee was raised during the system rehabilitation done a few years ago.
River upstream of the dam. Longitude: 6° 26'12"E Latitude: 124° 46'31"N		Notice the very little free board from the water surface to the natural ground. This is caused by the raising of the dam height a few years back. As a result, the adjoining farms are now flooded during rainy days. Protection dikes need to be constructed.

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities
Photograph of Irrigation Facilities

NIS name: Banga (Region 12)

Location / Facility	*Photograph*	*Comments*
Main canal at the outlet of the dam intake. Longitude: 6° 26'12"E Latitude: 124° 46'31"N		Notice the murky waters due to sediment load from the river.
Service Road along Main Canal Station 3+510 Longitude: 6° 26'37"E Latitude: 124° 44'58"N		Road needs re-gravelling and side drains.
Headgate of Lateral B Main Canal Station 4 +936 Longitude: 6° 26'55"E Latitude: 124° 44'24"N		Steel gate needs to be replaced.

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities
Photograph of Irrigation Facilities

NIS name: Banga (Region 12)

Location / Facility	*Photograph*	*Comments*
Headgate of Lateral C Main Canal Station 6+414 Longitude: 6° 26'51"E Latitude: 124° 43'43"N		The old steel gate needs to be replaced and new ones need to be installed.
Service road along Main Canal Station 8+900 Longitude: 6° 27'18"E Latitude: 124° 42'32"N		Road needs re-gravelling.
Main Canal Station 10 +519 Longitude: 6° 27'20"E Latitude: 124° 41'36"N		The concrete lining in this canal stretch are now broken; need to reconstruct the linings.

THE REPUBLIC OF PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION

Sector Loan on Rehabilitation of Irrigation Facilities

NIS SUMMARY REPORT

1204

Marbel - 1 RIS

Region 12

South Cotabato Province

July 2009

Survey Team for
Japan International Cooperation Agency
(JICA)

Sector Loan on Rehabilitation of Irrigation Facilities (SLRIF)

Features of NIS for Rehabilitation Project

1. General

Item	*Description*		
1) Name of NIS	**MARBEL – 1 RIS**		Code: 1204
2) Location	Region	12	
	Province	South Cotabato	
	Municipalities	Koronadal & Tantangan	
	Distance	4 kms from Koronadal, South Cotabato	
3) Type of Water Source	Water Source	Palian and Kipalbig Rivers	
	Type	Diversion Dam (54.00 m wide, 4.80 m high)	
4) Area	Service Area	2,720 has.	
	FUSA	1,856 has.	
5) Beneficiary Farmers	1,568 farmers	Average paddy field cultivating size = 1.18 ha per farmer	
6) Irrigator's Association	IAs established = 17 FIA established = 1 in 2008		
7) Features of NIS and Necessity of the project	Marbel#1 was completed in 1972. It has a design service area of 2,720 has. but a firmed-up service area of only 1,856 has. due to lack of water and built-up areas. It has two (2) main canals with a total length of 19.65 kms.; nine (9) lateral canals with a total length of 24.90 kms. and 47.4 kms. of service roads. It also has 20 kilometers of drainage canals; 172 canal structures, 40 drainage structures, 178 turn-outs and 137 kms. of farm ditches. During the last five (5) years it had an average cropping intensity of 196% and average yields of 90 cavans/ha. during the wet season and 75 cavans/ha. during the dry season. A rehabilitation of the system is necessary improve the efficiency of water delivery in the canals and distribution to the rice fields.		
8) Outline of the Proposed Project	A. Engineering 1. Repair of diversion dam 2. Repair and improvement of irrigation canal and structures 3. Repair and improvement of drainage canal and structures 4. Repair and improvement of service roads 5. Repair and improvement of on-farm facilities 6. Repair and construction of IMT support facilities-IA Bldg solar drier, warehouse with IA building 7. Development and establishment of IMT GIS database B. Institutional Strengthening Program B. 1 Basic Program 1. Reactivation of FIA/IA and Strengthening of Irrigation System Management Committee (ISMC) of NIS including construction of IMT support facilities 2. Strengthening of NIA – IA – LGUs Partnership 3. Strengthening NIA Institutional Capacity B.2 Specific Program to strengthen institutional mechanism together with LGUs		

	1. Improvement of watershed management
9) Proposed Project Component	A. Engineering 1. Construction of civil works for rehabilitation of diversion works, canal system, drainage system, roads, and IMT support facilities. B. Institutional Strengthening Program 1. Reactivation of FIAs/IAs including reformation of TSGA / IA / FIA areas, construction of IMT support facilities (demand base) 2. Strengthening NIA-IA- LGUs Partnership, especially coordination RDC, RAFC/PAFC with FIAs/IAs and ISMC 3. Institutional development program to strengthen management capacity of NIA field offices and IAs.

10) Project Cost (Direct cost only, excluding escalation, contingency, tax)	1. Direct cost		PHP	158.51	Million
	- *Civil Works*	*PHP 145.04*	Million		
	- *Institutional Development*	*PHP 10.30*	Million		
	- *Engineering Services*	*PHP 3.17*	Million		
	2. Indirect cost		PHP	14.18	Million
	Total Project Cost (1+2)		PHP	172.69	Million
	Cost per ha		PHP	93,045.00	per ha
11) Project Benefit	1. To increase paddy production by 1,490 tons/year 2. To increase farmers' net income to PHP56,800.00 /ha/year 3. To establish functional and self-reliant IAs 4. To improve performance of NIS				
12) Project Justification	EIRR = 16.1 %, B/C = 1.08 (discount rate 15%)				

2. Project History (Construction/Rehabilitation)

Year	*Description*
1972	Project Completion
1991	Rehabilitation of the Dam

3. Present Condition

3.1 Natural Conditions

Item	*Description*
1) Annual Rainfall	1,218.30 mm
2) Seasons	Wet: April – September Dry: October - March
3) Dominant Soil in NIS Area	Sandy Loam
4) Topography	Generally Flat

3.2 Socio-economy (Region/Province)

Item	*Description*
1) GRDP	PHP 220,322 million (Year 2007), Per Capita GRDP = PHP 57,708 per year
2) Population	767,254 (province)
3) Population Growth Rate	5.68 % per year (province)
4) Labor Force	2,382,000 (region)
5) Poverty Population	47.4 % to total population (province)

3.3 Present Agriculture in NIS

Item	*Description*			
1) Farm Household in NIS	Total beneficiaries	1,568 households		
	Land owners	1,097 households	(70.0 %)	
	Tenant farmers	471 households	(30.0 %)	
2) Paddy Field Size in NIS	1.18 ha per household (FUSA/Total beneficiaries as of 2008)			
3) Present Land Use in NIS	Paddy field planted	1,835 ha	67.5 %	As of 2008
	Paddy field not planted	21 ha	0.8 %	As of 2008
	Upland crop field	0 ha	0.0 %	
	Permanent crop field	0 ha	0.0 %	
	Undeveloped area	0 ha	0.0 %	
	Built-up area	0 ha	0.0 %	
	High ground	0 ha	0.0 %	
	Grassland	0 ha	0.0 %	
	Swamp	0 ha	0.0 %	
	Unspecified area	864 ha	31.7 %	No data in response
4) Paddy Field in FUSA (ha)	1,856			

5) Paddy Cropped Area (ha)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Wet Season	1,797	1,807	1,810	1,844	1,812	1,814
Dry Season	1,787	1,798	1,786	1,801	1,835	1,803
6) Cropping Intensity (%)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
(per year)	193	194	194	196	196	195
7) Unit Yield of Paddy (ton/ha)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Wet Season	4.25	5.01	4.65	4.60	4.05	4.51
Dry Season	3.60	4.15	3.70	3.80	3.65	3.78
8) Paddy Production (ton)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Wet Season	7,637	9,053	8,417	8,482	7,339	8,186
Dry Season	6,433	7,462	6,645	6,844	6,698	6,816

3.4 Water Resources

Item	*Description*
1) Name of Rivers	Palian and Kipalbig Rivers
2) Catchment Area at Dam	203 km_2
3) Ave. River Discharge	2.80 m^3/s
4) Ave. Dry Season Discharge	2.66 m^3/s
5) Diverted Intake Discharge	1.95 m^3/s
6) Water Requirement	3.34 m^3/s
7) Sedimentation	Minimal

3.5 Existing Irrigation System

Item	*Description*
1) Diversion Dam	Overflow crest width 54.00 m, Dam height 4.80 m
2) Main Canal	Total length 19.65 km (Lined portion 19.65)
3) Lateral Canals	Total length 24.90 km (Lined portion 16.30 km)
4) On-farm facilities	Total length 61.00 km (Lined portion No data km) Turn-outs = 178 units
5) Drainage Canal	Total length 20.00 kms.
6) Canal Structures	No. = 172 units
7) Drainage Structures	No. = 40 units
8) Farm roads	Total length 44.50 km (pavement= 0.00 kms.)
9) Flood Protection Dike	Total length 0.50 km For new construction = 0.10 kms.

3.6 Institutions for O&M of NIS

Item	*Description*					
1) Regional Irrigation Office	Name: Region 12- South Central Mindanao					
2) IMO	Name: South Cotabao-Saranggani IMO					
Staff in 2009	Total number of staff: 66 nos.					
3) Irrigator' Association (IA)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Number of FIA (nos)					1	
Number of IA (nos)					17	
Number of TSAG (nos)	106	100	106	117	117	109
Functionality of IA	85.4	75.2	83.0	85.6	81	82
Collection of ISF (wet, %)	82	88	82	86	87	84
Collection of ISF (dry, %)	69	79	75	79	84	78
4) NIS Category based on IA 2008 O&M Contract (NIA-IA)	No. of IA					
Category A	0					
Category B	17					
Category C	0					

3.7 Existing Problems

Item	*Description*
1) Diversion Works	1. Some parts of the dam are worn out, including the downstream scour protection.
2) Canal and Structures	1. Bank erosion and high level of seepage in some canal sections. 2. Dilapidated steel gates in some structures. 3. Some canal structures are still having wooden flush boards.
3) Drainage Canal	1. Need to improve the drainage system.
4) Other Project Facilities (road, bridge, flood dike, building, etc)	1. Some road sections become very muddy during the rainy season.
5) Water Management and O&M Activities	1. Illegal checking in some places. 2. Lack of control in water intake in some turn-outs result in over supply in some areas in the upstream reaches of the canals but lack of supply in the downstream farms.
6) Status of NIS and IA Management	Status Type A evaluated by Radar Graph. Minor problems are: 1. Medium ISF collection efficiency during dry season at 78% 2. Medium paddy yield during wet season at 85 cavans/ha
7) Watershed Management	Significant denudation of the watershed
8) Coordination with LGU and Agencies concerned	1. Lack of coordination by NIA's field offices and IAs with concerned LGUs and other line agencies on specific problem such as watershed management
9) Agriculture	1. Insufficient lending institutions to serve the need of farmers. Local traders dominate the lending services to the farmers charging them high rate of interest. 2. Lack of drying facilities. The tendency is the farmers are forced to sell their produce just after the harvest at lower price because of high moisture content. 3. Non observance of the cropping calendar among the farmers.

4. Proposed Rehabilitation Plan

4.1 Agricultural Development Plan

Item	*Description*			
Cropping schedule	*Wet Season*	*Dry Season-1*	*Dry Season-2*	*Annual*
1) Type of Crops	Paddy	Paddy	-	-
2) Cropping Area (ha)	1,856	1,840	-	-
3) Target Unit Yield (ton/ha)	4.4	4.0	-	-
3) Total Production (ton)	8,166	7,360	-	-

4.2 Civil Works

Item	*Description*
1) Diversion Works	1. Repair of damaged or worn out parts of the dam, including the scour protection works downstream of the dam.
2) Canal Structures	1. Repair/rehabilitation of old dilapidated steel gates – 60 units 2. Installation of new steel gates to replace wooden flush boards.
3) Canalization	1. Concrete lining of selected existing canal sections – 35.9 kms 2. Re-shaping and de-silting of some canal sections. 3. Realignment of canals 4.Construction of new canals
4) Drainage Structures	1. Repair of drainage structures – 12 units
5) Drainage Canalization	1. Repair of existing drainage canals and construction of new ones -14 kms
6) Service Roads	1. Regravelling of selected road sections – 30 kms 2. Construction of side drainage canals. 3. Construction of road drainage structures.
7) On-Farm Facilities	1. Repair /replacement of dilapidated turn out steel gates 2.Construction of new turn outs and farm ditches
8) IMT Support Facilities	1. Construction of post-harvest facilities—warehouses, IA buildings, solar driers with shed – 1 set
9) IMT GIS Database	1. Development and establishment of GIS database

4.3 Institutional Strengthening Program

Item	*Description*
1) Reactivation Program of FIAs/IAs and System Management Committee (ISMC)	1. Executing body : Project Management Office with assistance of Consultant 2. Schedule: 34 months / NIS 3. Counter body for execution: NIA Regional Office and IMO office 4. Attendant / Trainee: President of FIAs/IAs and secretary group, staff of NIA RIO/IMO, Chairmen of ISMC and Secretary group and LGUs officers, 5. Contents: a) Survey & Study by Consultant b) Workshops on coordination activities with and dissemination on reformation plan to FIAs/IAs c) Workshop on coordination activities with LGUs d) Organization and Legal Registration of FIAs/IAs to be re-active and reactivation of SMC e) Construction of IMT support facilities for FIAs/CIA f) Workshop and Training of FIAs/IAs members on management under the IMT g) Assessment/Evaluation for and Negotiation of Contracting under IMT h) Assistance of reactivated IAs/FIAs in organizational and management activities
2) Strengthening Program of NIA - IA - LGU Partnership	1. Executing body : Project Management Office with assistance of Consultant, & Management System Committee (MSC) of NIS 2. Schedule: 7 months / NIS 3. Counter body for execution: Regional Development Council with Secretary of NEDA Regional Office

Item	*Description*
	4. Attendant / Trainee: Secretaries of Regional Organizations, LGUs officers, President of FIAs/IAs and secretary group, staff of NIA RIO/IMO, Chairmen of ISMC and Secretary group 5. Contents: a) Workshop on Trouble Shooting of NIS and FIAs/ISs' Management b) Provision of work space for ISMC including office facilities
3) NIA Institutional Strengthening Program	1. Executing body : Institutional Development Division of CO, NIA 2. Schedule: 7 months / NIS 3. Counter body for execution: NIA Regional Office and IMO office 4. Attendant / Trainee: NIA personnel at CO, RIO and IMO 5. Contents: a. Capability built-up program (Central and Regional NIA Offices) b. Improvement program on management mechanism of NIA c. Support program for IMT implementation d. Strengthening program of Integrated Management information System
4) Specific Program on watershed management plan	1. Strengthening coordination with RDC, RAFC/PAFC and LGUs concerned through works shop on dissemination of the SLRIF to these organizations. 2. Strengthening coordination with RDC, RAFC/PAFC and LGUs on training program of watershed management

4.4 Proposed Counter Schemes

Item	*Description*
1) DENR	Technical assistance to concerned Provincial/municipal LGUs on watershed rehabilitation and management such as establishment of nurseries and community-based livelihood fro upland dwellers
2) LGU	1. LGUs improve coordination program with NIA to give priority of the projects in annual budgeting and funds programming. 2. Provincial LGUs to extend training to municipal agricultural officers to improve skills on technology promotion. 3. LGUs improve capacity of its personnel to prepare project proposals through a training by DILG to ensure project's fund access to municipal development fund. 4. LGUs provide reliable post-harvest facilities to ensure optimal operation of the facilities.

5. Cost Estimate for Initial Investment

Item	*Description*		
1) Direct Cost for Civil Works	A. Mobilization	Php	3.17 Million
	B. Protection Dikes		-
	C. Diversion Works	Php	8.59 Million
	D. Canal Structures	Php	10.92 Million
	E. Canalization	Php	68.48 Million
	F. Drainage Structures	Php	3.71 Million
	G. Drainage Canalization	Php	7.95 Million
	H. Road	Php	25.30 Million
	I. On-Farm Facilities/T.O. Gates	Php	5.06 Million
	J. IMT Support Facilities	Php	10.00 Million
	K. IMT GIS Database	Php	1.86 Million
	L. Institutional Development (5% of Direct Cost)	Php	10.30 Million
	M. Feasibility Studies & Detailed Engineering (2% of Direct Cost)	Php	3.17 Million
	Sub-total (Direct Cost)	Php	158.51 Million

2) Indirect Cost	A. General Engineering Supervision and Administration (3.5% of Direct Cost)	Php	5.55 Million
	B. NIA Management Fee (5% of Total Project Cost)	Php	8.63 Million
	Sub-total (Indirect Cost)	Php	14.18 Million
3) Total Project Cost	= 1+2	Php	172.69 Million
Cost per ha.		Php	93,045.00 /ha.

6. Implementation Plan

Item	*Description*
1) Contract package	1 - Local Competitive Bidding (LCB)
2) Implementation Schedule	
a) Civil Works	
1) Survey, F/S, Design	21 months
2) Tendering	6 months
3) Construction	36 months
b) Institutional Improvement Works	
1) Reactivation Program of FIAs/IAs and Irrigation System Management Committee	34 months
2) NIA-IA-LGU Partnership	7 months
3) Strengthening of NIA staff	7 months

7. Project Evaluation

Item		*Description*	
1) Economic evaluation			
EIRR (Base)		EIRR = 16.1%	: Project life 50 years
Sensitivity	Case-1	EIRR = 14.7 %	: Cost 10% up
	Case-2	EIRR = 14.6 %	: Benefit 10% down
	Case-3	EIRR = 13.4 %	: Cost 10% up + Benefit 10% down
B/C		1.08	: discount rate 15% p.a.
NPV		PHP 8 million	: discount rate 15% p.a.
2) Financial evaluation		Farmer's net income increase = PHP12,122 per ha per year	
3) Expected Impacts		1. Increased farmers' income 2. Increased rice self sufficiency of the country 3. Increased job opportunities in rural areas	

8. Environmental Aspects

Item	*Description*
1) Environmental aspect	Need to address problems in siltation and quarrying of sand and gravel
2) Relocation of houses	none
3) Land acquisition	none

Table 1204 - Marbel - 1 Economic Evaluation (EIRR)

Basic Case

Name of NIS 1204 - Marbel - 1 | Region : 12 IMO RIO Sultan Kudarat

EIRR : 16.1%	Net Present Value (Million PHP)	Benefit	Cost	B/C Ratio	NPV
	(15 % discount rate)	108	100	1.08	8

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011			0.75		0.75		1.40	1.40	0.65
2	2012			0.75		0.75		2.80	2.80	2.05
3	2013	41.58	1.68	0.75		44.01		4.20	4.20	-39.81
4	2014	55.44	2.24	0.75	1.13	59.55	2.38	5.60	7.98	-51.57
5	2015	41.58	1.68	0.75	2.63	46.64	5.85	7.00	12.85	-33.79
6	2016				3.76	3.76	8.92	8.40	17.32	13.56
7	2017				3.76	3.76	9.61	9.80	19.41	15.65
8	2018				3.76	3.76	9.91	11.20	21.11	17.35
9	2019				3.76	3.76	9.91	12.60	22.51	18.75
10	2020				3.76	3.76	9.91	14.00	23.91	20.15
11	2021				3.76	3.76	9.91	15.40	25.31	21.55
12	2022				3.76	3.76	9.91	16.80	26.71	22.95
13	2023				3.76	3.76	9.91	18.20	28.11	24.35
14	2024				3.76	3.76	9.91	19.60	29.51	25.75
15	2025				3.76	3.76	9.91	21.00	30.91	27.15
16	2026				3.76	3.76	9.91	22.40	32.31	28.55
17	2027				3.76	3.76	9.91	23.80	33.71	29.95
18	2028				3.76	3.76	9.91	25.20	35.11	31.35
19	2029				3.76	3.76	9.91	26.60	36.51	32.75
20	2030				3.76	3.76	9.91	28.00	37.91	34.15
21	2031				3.76	3.76	9.91	29.40	39.31	35.55
22	2032				3.76	3.76	9.91	30.80	40.71	36.95
23	2033				3.76	3.76	9.91	32.20	42.11	38.35
24	2034				3.76	3.76	9.91	33.60	43.51	39.75
25	2035				3.76	3.76	9.91	35.00	44.91	41.15
26	2036				3.76	3.76	9.91	36.40	46.31	42.55
27	2037				3.76	3.76	9.91	37.80	47.71	43.95
28	2038				3.76	3.76	9.91	39.20	49.11	45.35
29	2039				3.76	3.76	9.91	40.60	50.51	46.75
30	2040				3.76	3.76	9.91	42.00	51.91	48.15
31	2041				3.76	3.76	9.91	43.40	53.31	49.55
32	2042				3.76	3.76	9.91	44.80	54.71	50.95
33	2043				3.76	3.76	9.91	46.20	56.11	52.35
34	2044				3.76	3.76	9.91	47.60	57.51	53.75
35	2045				3.76	3.76	9.91	49.00	58.91	55.15
36	2046				3.76	3.76	9.91	50.40	60.31	56.55
37	2047				3.76	3.76	9.91	51.80	61.71	57.95
38	2048				3.76	3.76	9.91	53.20	63.11	59.35
39	2049				3.76	3.76	9.91	54.60	64.51	60.75
40	2050				3.76	3.76	9.91	56.00	65.91	62.15
41	2051				3.76	3.76	9.91	57.40	67.31	63.55
42	2052				3.76	3.76	9.91	58.80	68.71	64.95
43	2053				3.76	3.76	9.91	60.20	70.11	66.35
44	2054				3.76	3.76	9.91	61.60	71.51	67.75
45	2055				3.76	3.76	9.91	63.00	72.91	69.15
46	2056				3.76	3.76	9.91	64.40	74.31	70.55
47	2057				3.76	3.76	9.91	65.80	75.71	71.95
48	2058				3.76	3.76	9.91	67.20	77.11	73.35
49	2059				3.76	3.76	9.91	68.60	78.51	74.75
50	2060				3.76	3.76	9.91	70.00	79.91	76.15

Case-1 (Cost 10% up)

Name of NIS 1204 - Marbel - 1 | Region : 12 IMO RIO Sultan Kudarat

EIRR : 14.7%	Net Present Value (Million PHP)	Benefit	Cost	B/C Ratio	NPV
	(15 % discount rate)	108	110	0.98	-2

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	0.82	-	0.82	-	1.40	1.40	0.58
2	2012	-	-	0.82	-	0.82	-	2.80	2.80	1.98
3	2013	45.73	1.85	0.82	-	48.41	-	4.20	4.20	-44.21
4	2014	60.98	2.46	0.82	1.24	65.51	2.38	5.60	7.98	-57.53
5	2015	45.73	1.85	0.82	2.90	51.30	5.85	7.00	12.85	-38.45
6	2016	-	-	-	4.14	4.14	8.92	8.40	17.32	13.18
7	2017	-	-	-	4.14	4.14	9.61	9.80	19.41	15.28
8	2018	-	-	-	4.14	4.14	9.91	11.20	21.11	16.97
9	2019	-	-	-	4.14	4.14	9.91	12.60	22.51	18.37
10	2020	-	-	-	4.14	4.14	9.91	14.00	23.91	19.77
11	2021	-	-	-	4.14	4.14	9.91	15.40	25.31	21.17
12	2022	-	-	-	4.14	4.14	9.91	16.80	26.71	22.57
13	2023	-	-	-	4.14	4.14	9.91	18.20	28.11	23.97
14	2024	-	-	-	4.14	4.14	9.91	19.60	29.51	25.37
15	2025	-	-	-	4.14	4.14	9.91	21.00	30.91	26.77
16	2026	-	-	-	4.14	4.14	9.91	22.40	32.31	28.17
17	2027	-	-	-	4.14	4.14	9.91	23.80	33.71	29.57
18	2028	-	-	-	4.14	4.14	9.91	25.20	35.11	30.97
19	2029	-	-	-	4.14	4.14	9.91	26.60	36.51	32.37
20	2030	-	-	-	4.14	4.14	9.91	28.00	37.91	33.77
21	2031	-	-	-	4.14	4.14	9.91	29.40	39.31	35.17
22	2032	-	-	-	4.14	4.14	9.91	30.80	40.71	36.57
23	2033	-	-	-	4.14	4.14	9.91	32.20	42.11	37.97
24	2034	-	-	-	4.14	4.14	9.91	33.60	43.51	39.37
25	2035	-	-	-	4.14	4.14	9.91	35.00	44.91	40.77
26	2036	-	-	-	4.14	4.14	9.91	36.40	46.31	42.17
27	2037	-	-	-	4.14	4.14	9.91	37.80	47.71	43.57
28	2038	-	-	-	4.14	4.14	9.91	39.20	49.11	44.97
29	2039	-	-	-	4.14	4.14	9.91	40.60	50.51	46.37
30	2040	-	-	-	4.14	4.14	9.91	42.00	51.91	47.77
31	2041	-	-	-	4.14	4.14	9.91	43.40	53.31	49.17
32	2042	-	-	-	4.14	4.14	9.91	44.80	54.71	50.57
33	2043	-	-	-	4.14	4.14	9.91	46.20	56.11	51.97
34	2044	-	-	-	4.14	4.14	9.91	47.60	57.51	53.37
35	2045	-	-	-	4.14	4.14	9.91	49.00	58.91	54.77
36	2046	-	-	-	4.14	4.14	9.91	50.40	60.31	56.17
37	2047	-	-	-	4.14	4.14	9.91	51.80	61.71	57.57
38	2048	-	-	-	4.14	4.14	9.91	53.20	63.11	58.97
39	2049	-	-	-	4.14	4.14	9.91	54.60	64.51	60.37
40	2050	-	-	-	4.14	4.14	9.91	56.00	65.91	61.77
41	2051	-	-	-	4.14	4.14	9.91	57.40	67.31	63.17
42	2052	-	-	-	4.14	4.14	9.91	58.80	68.71	64.57
43	2053	-	-	-	4.14	4.14	9.91	60.20	70.11	65.97
44	2054	-	-	-	4.14	4.14	9.91	61.60	71.51	67.37
45	2055	-	-	-	4.14	4.14	9.91	63.00	72.91	68.77
46	2056	-	-	-	4.14	4.14	9.91	64.40	74.31	70.17
47	2057	-	-	-	4.14	4.14	9.91	65.80	75.71	71.57
48	2058	-	-	-	4.14	4.14	9.91	67.20	77.11	72.97
49	2059	-	-	-	4.14	4.14	9.91	68.60	78.51	74.37
50	2060	-	-	-	4.14	4.14	9.91	70.00	79.91	75.77

Table 1204 - Marbel - 1 Economic Evaluation (EIRR)

Case-2 (Benefit 10% down)

Name of NIS 1204 - Marbel - 1 | Region : 12 IMO,RIO Sultan Kudarat

EIRR : 14.6%	Net Present Value (Million PHP)	Benefit	Cost	B/C Ratio	NPV
	(15 % discount rate)	97	100	0.97	-3

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	0.75	-	0.75	-	1.26	1.26	0.51
2	2012	-	-	0.75	-	0.75	-	2.52	2.52	1.77
3	2013	41.58	1.68	0.75	-	44.01	-	3.78	3.78	-40.23
4	2014	55.44	2.24	0.75	1.13	59.55	2.14	5.04	7.18	-52.37
5	2015	41.58	1.68	0.75	2.63	46.64	5.26	6.30	11.56	-35.07
6	2016	-	-	-	3.76	3.76	8.03	7.56	15.59	11.83
7	2017	-	-	-	3.76	3.76	8.65	8.82	17.47	13.71
8	2018	-	-	-	3.76	3.76	8.92	10.08	19.00	15.24
9	2019	-	-	-	3.76	3.76	8.92	11.34	20.26	16.50
10	2020	-	-	-	3.76	3.76	8.92	12.60	21.52	17.76
11	2021	-	-	-	3.76	3.76	8.92	13.86	22.78	19.02
12	2022	-	-	-	3.76	3.76	8.92	15.12	24.04	20.28
13	2023	-	-	-	3.76	3.76	8.92	16.38	25.30	21.54
14	2024	-	-	-	3.76	3.76	8.92	17.64	26.56	22.80
15	2025	-	-	-	3.76	3.76	8.92	18.90	27.82	24.06
16	2026	-	-	-	3.76	3.76	8.92	20.16	29.08	25.32
17	2027	-	-	-	3.76	3.76	8.92	21.42	30.34	26.58
18	2028	-	-	-	3.76	3.76	8.92	22.68	31.60	27.84
19	2029	-	-	-	3.76	3.76	8.92	23.94	32.86	29.10
20	2030	-	-	-	3.76	3.76	8.92	25.20	34.12	30.36
21	2031	-	-	-	3.76	3.76	8.92	26.46	35.38	31.62
22	2032	-	-	-	3.76	3.76	8.92	27.72	36.64	32.88
23	2033	-	-	-	3.76	3.76	8.92	28.98	37.90	34.14
24	2034	-	-	-	3.76	3.76	8.92	30.24	39.16	35.40
25	2035	-	-	-	3.76	3.76	8.92	31.50	40.42	36.66
26	2036	-	-	-	3.76	3.76	8.92	32.76	41.68	37.92
27	2037	-	-	-	3.76	3.76	8.92	34.02	42.94	39.18
28	2038	-	-	-	3.76	3.76	8.92	35.28	44.20	40.44
29	2039	-	-	-	3.76	3.76	8.92	36.54	45.46	41.70
30	2040	-	-	-	3.76	3.76	8.92	37.80	46.72	42.96
31	2041	-	-	-	3.76	3.76	8.92	39.06	47.98	44.22
32	2042	-	-	-	3.76	3.76	8.92	40.32	49.24	45.48
33	2043	-	-	-	3.76	3.76	8.92	41.58	50.50	46.74
34	2044	-	-	-	3.76	3.76	8.92	42.84	51.76	48.00
35	2045	-	-	-	3.76	3.76	8.92	44.10	53.02	49.26
36	2046	-	-	-	3.76	3.76	8.92	45.36	54.28	50.52
37	2047	-	-	-	3.76	3.76	8.92	46.62	55.54	51.78
38	2048	-	-	-	3.76	3.76	8.92	47.88	56.80	53.04
39	2049	-	-	-	3.76	3.76	8.92	49.14	58.06	54.30
40	2050	-	-	-	3.76	3.76	8.92	50.40	59.32	55.56
41	2051	-	-	-	3.76	3.76	8.92	51.66	60.58	56.82
42	2052	-	-	-	3.76	3.76	8.92	52.92	61.84	58.08
43	2053	-	-	-	3.76	3.76	8.92	54.18	63.10	59.34
44	2054	-	-	-	3.76	3.76	8.92	55.44	64.36	60.60
45	2055	-	-	-	3.76	3.76	8.92	56.70	65.62	61.86
46	2056	-	-	-	3.76	3.76	8.92	57.96	66.88	63.12
47	2057	-	-	-	3.76	3.76	8.92	59.22	68.14	64.38
48	2058	-	-	-	3.76	3.76	8.92	60.48	69.40	65.64
49	2059	-	-	-	3.76	3.76	8.92	61.74	70.66	66.90
50	2060	-	-	-	3.76	3.76	8.92	63.00	71.92	68.16

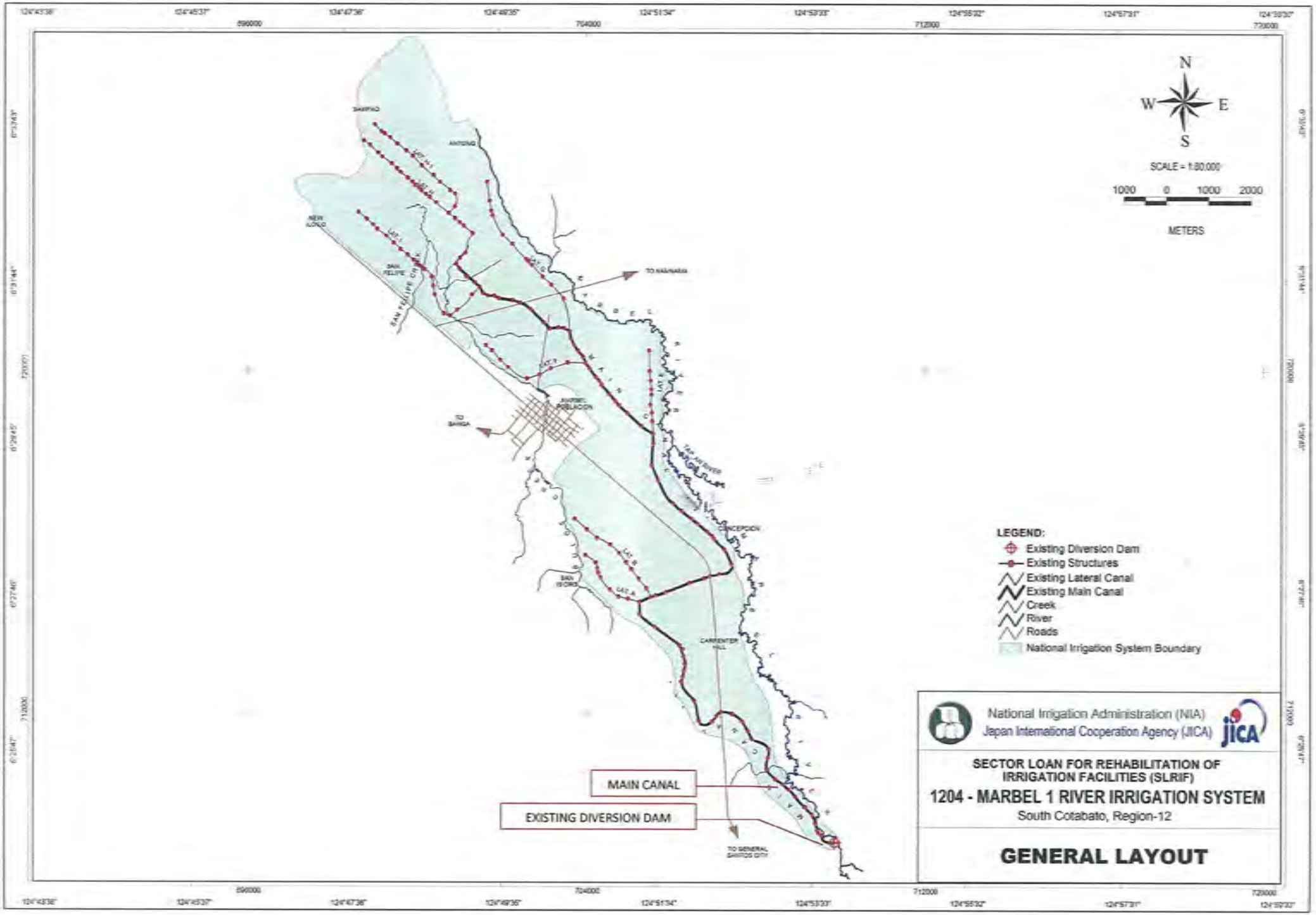
Case-3 (Cost 10% up and Benefit 10% down)

Name of NIS 1204 - Marbel - 1 | Region : 12 IMO,RIO Sultan Kudarat

EIRR : 13.4%	Net Present Value (Million PHP)	Benefit	Cost	B/C Ratio	NPV
	(15 % discount rate)	97	110	0.88	-13

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	0.82	-	0.82	-	1.26	1.26	0.44
2	2012	-	-	0.82	-	0.82	-	2.52	2.52	1.70
3	2013	45.73	1.85	0.82	-	48.41	-	3.78	3.78	-44.63
4	2014	60.98	2.46	0.82	1.24	65.51	2.14	5.04	7.18	-58.33
5	2015	45.73	1.85	0.82	2.90	51.30	5.26	6.30	11.56	-39.74
6	2016	-	-	-	4.14	4.14	8.03	7.56	15.59	11.45
7	2017	-	-	-	4.14	4.14	8.65	8.82	17.47	13.34
8	2018	-	-	-	4.14	4.14	8.92	10.08	19.00	14.86
9	2019	-	-	-	4.14	4.14	8.92	11.34	20.26	16.12
10	2020	-	-	-	4.14	4.14	8.92	12.60	21.52	17.38
11	2021	-	-	-	4.14	4.14	8.92	13.86	22.78	18.64
12	2022	-	-	-	4.14	4.14	8.92	15.12	24.04	19.90
13	2023	-	-	-	4.14	4.14	8.92	16.38	25.30	21.16
14	2024	-	-	-	4.14	4.14	8.92	17.64	26.56	22.42
15	2025	-	-	-	4.14	4.14	8.92	18.90	27.82	23.68
16	2026	-	-	-	4.14	4.14	8.92	20.16	29.08	24.94
17	2027	-	-	-	4.14	4.14	8.92	21.42	30.34	26.20
18	2028	-	-	-	4.14	4.14	8.92	22.68	31.60	27.46
19	2029	-	-	-	4.14	4.14	8.92	23.94	32.86	28.72
20	2030	-	-	-	4.14	4.14	8.92	25.20	34.12	29.98
21	2031	-	-	-	4.14	4.14	8.92	26.46	35.38	31.24
22	2032	-	-	-	4.14	4.14	8.92	27.72	36.64	32.50
23	2033	-	-	-	4.14	4.14	8.92	28.98	37.90	33.76
24	2034	-	-	-	4.14	4.14	8.92	30.24	39.16	35.02
25	2035	-	-	-	4.14	4.14	8.92	31.50	40.42	36.28
26	2036	-	-	-	4.14	4.14	8.92	32.76	41.68	37.54
27	2037	-	-	-	4.14	4.14	8.92	34.02	42.94	38.80
28	2038	-	-	-	4.14	4.14	8.92	35.28	44.20	40.06
29	2039	-	-	-	4.14	4.14	8.92	36.54	45.46	41.32
30	2040	-	-	-	4.14	4.14	8.92	37.80	46.72	42.58
31	2041	-	-	-	4.14	4.14	8.92	39.06	47.98	43.84
32	2042	-	-	-	4.14	4.14	8.92	40.32	49.24	45.10
33	2043	-	-	-	4.14	4.14	8.92	41.58	50.50	46.36
34	2044	-	-	-	4.14	4.14	8.92	42.84	51.76	47.62
35	2045	-	-	-	4.14	4.14	8.92	44.10	53.02	48.88
36	2046	-	-	-	4.14	4.14	8.92	45.36	54.28	50.14
37	2047	-	-	-	4.14	4.14	8.92	46.62	55.54	51.40
38	2048	-	-	-	4.14	4.14	8.92	47.88	56.80	52.66
39	2049	-	-	-	4.14	4.14	8.92	49.14	58.06	53.92
40	2050	-	-	-	4.14	4.14	8.92	50.40	59.32	55.18
41	2051	-	-	-	4.14	4.14	8.92	51.66	60.58	56.44
42	2052	-	-	-	4.14	4.14	8.92	52.92	61.84	57.70
43	2053	-	-	-	4.14	4.14	8.92	54.18	63.10	58.96
44	2054	-	-	-	4.14	4.14	8.92	55.44	64.36	60.22
45	2055	-	-	-	4.14	4.14	8.92	56.70	65.62	61.48
46	2056	-	-	-	4.14	4.14	8.92	57.96	66.88	62.74
47	2057	-	-	-	4.14	4.14	8.92	59.22	68.14	64.00
48	2058	-	-	-	4.14	4.14	8.92	60.48	69.40	65.26
49	2059	-	-	-	4.14	4.14	8.92	61.74	70.66	66.52
50	2060	-	-	-	4.14	4.14	8.92	63.00	71.92	67.78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National Irrigation Administration (NIA)
Japan International Cooperation Agency (JICA)
JICA
SECTOR LOAN FOR REHABILITATION OF IRRIGATION FACILITIES (SLRIF)
1204 - MARBEL 1 RIVER IRRIGATION SYSTEM
South Cotabato, Region-12
GENERAL LAYOUT

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities

Photograph of Irrigation Facilities

NIS name: Mabel 1 (Region 12)

Location / Facility	*Photograph*	*Comments*
Diversion Works View facing upstream. Longitude: 6° 24'26" E Latitude: 124° 54'23" N		Only minor defects in concrete parts of the dam.
Diversion Works View facing downstream. Longitude: 6° 24'26" E Latitude: 124° 54'23" N		Notice the skimmer wall constructed at the sluice area in recent years; it has largely solved the old sediment load problem in the canals.
Lateral G Station 0+050 Longitude: 6° 31'12" E Latitude: 124° 50'47" N		Canal needs to be concrete lined. Carabaos should not be allowed to wallow in the canals to avoid canal damage.

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities

Photograph of Irrigation Facilities

NIS name: Mabel 1 (Region 12)

Location / Facility	*Photograph*	*Comments*
Drainage Canal Near Main Canal Station 13+935 Longitude: 6° 31'35" E Latitude: 124° 49'30" N		Drainage canal needs to be widened and dredged.
Bulok Creek Longitude: 6° 31'45" E Latitude: 124° 49'18" N		This creek causes flooding in the rice fields during heavy rains. This creek needs to be straightened and re-channeled (cut-off channel) to minimize flooding.
Headgate of Lateral G Main Canal Station 11+314 Longitude: 6° 31'12" E Latitude: 124° 50'46" N		Structure needs new steel gate.

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities

Photograph of Irrigation Facilities

NIS name: Mabel 1 (Region 12)

Location / Facility	*Photograph*	*Comments*
Road Crossing with Turn-out Main Canal Station 13+935 Longitude: 6° 31'41" E Latitude: 124° 49'40" N		Structure needs new steel gates. The old ones also need to be replaced.
Wasteway Longitude: 6° 25'33" E Latitude: 124° 53'27" N		Steel gate needs repair.

THE REPUBLIC OF PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION

Sector Loan on Rehabilitation of Irrigation Facilities

NIS SUMMARY REPORT

1205
Marbel - 2 RIS

Region 12

South Cotabato & Sultan Kudarat Provinces

July 2009

Survey Team for
Japan International Cooperation Agency
(JICA)

Sector Loan on Rehabilitation of Irrigation Facilities (SLRIF)

Features of NIS for Rehabilitation Project

1. General

Item	*Description*		
1) Name of NIS	**MARBEL – 2 RIS**		Code: 1205
2) Location	Region	12	
	Province	South Cotabato	
	Municipalities	Koronadal & Lutayan	
	Distance	4 kms from Koronadal, South Cotabato	
3) Type of Water Source	Water Source	Marbel and Taplan Rivers	
	Type	Diversion Dam (52.00 m wide, 3.30 m high)	
4) Area	Service Area	2,700 has	
	FUSA	1,641 has.	
5) Beneficiary Farmers	1,268 farmers	Average paddy field cultivating size = 1.29 ha per farmer	
6) Irrigator's Association	IAs established = 13 FIA established = 1 in 2008		
7) Features of NIS and Necessity of the project	Marbel #2 RIS was completed in 1980. It has a design service area of 2,700 has. but a firmed-up service area of only 1,641 has. due to lack of water and built-up areas. It has one (1) main canal with a total length of 10.40 kms.; five (5) lateral canals with a total length of 22.88 kms. and 18.76 kms. of service roads. It also has 19 kilometers of drainage canals, 90 canal structures, 10 drainage structures, 58 turn-outs and 120 kms. of farm ditches. During the last five (5) years it had an average cropping intensity of 196% and average yields of 91 cavans/ha. during the wet season and 83 cavans/ha. during the dry season. A rehabilitation of the system is necessary to repair damaged portions of the dam and to improve the efficiency of water delivery in the canals and distribution to the farms.		
8) Outline of the Proposed Project	A. Engineering 1. Repair of diversion dam 2. Repair and improvement of irrigation canals and structures 3. Repair and improvement of drainage canals and structures 4. Repair and improvement of service roads 5. Repair and improvement of on-farm facilities 6. Repair and construction of IMT support facilities-IA Bldg solar drier, warehouse with IA building 7. Development and establishment of IMT GIS database B. Institutional Strengthening Program B.1 Basic Program 1. Reactivation of FIA/IA and Strengthening of Irrigation System Management Committee (ISMC) of NIS including construction of IMT support facilities 2. Strengthening of NIA – IA – LGUs Partnership 3. Strengthening NIA Institutional Capacity B.2 Specific Program to strengthen institutional mechanism together with LGUs		

	1. Improvement of watershed management
9) Proposed Project Component	A. Engineering 1. Construction of civil works for rehabilitation of diversion works, canal system, drainage system, roads, and IMT support facilities. B. Institutional Strengthening Program 1. Reactivation of FIAs/IAs including reformation of TSGA / IA / FIA areas, construction of IMT support facilities (demand base) 2. Strengthening NIA-IA- LGUs Partnership, especially coordination RDC, RAFC/PAFC with FIAs/IAs and ISMC 3. Institutional development program to strengthen management capacity of NIA field offices and IAs.
10) Project Cost (Direct cost only, excluding escalation, contingency, tax)	1. Direct cost — PHP 135.45 Million - *Civil Works* — PHP *124.34* Million - *Institutional Development* — PHP *8.40* Million - *Engineering Services* — PHP *2.71* Million 2. Indirect cost — PHP 12.12 Million Total Project Cost (1+2) — PHP 147.57 Million Cost per ha — PHP 89,927.00 per ha
11) Project Benefit	1. To increase paddy production by 833 tons/year 2. To increase farmers' net income to PHP58,829.00 /ha/year 3. To establish functional and self-reliant IAs 4. To improve performance of NIS
12) Project Justification	EIRR = 15.4 %, B/C = 1.03 (discount rate 15%)

2. Project History (Construction/Rehabilitation)

Year	*Description*
1980	Project Completion
1995	Repair of the Dam

3. Present Condition

3.1 Natural Conditions

Item	*Description*
1) Annual Rainfall	1,221.30 mm
2) Seasons	Wet: March – August Dry: September – February
3) Dominant Soil in NIS Area	Sandy Loam
4) Topography	Generally Flat

3.2 Socio-economy (Region/Province)

Item	*Description*
1) GRDP	PHP 220,322 million (Year 2007), Per Capita GRDP = PHP 57,708 per year
2) Population	767,254 (province)
3) Population Growth Rate	5.68 % per year (province)
4) Labor Force	2,382,000 (region)
5) Poverty Population	47.4% to total population (province)

3.3 Present Agriculture in NIS

Item	*Description*					
1) Farm Household in NIS	Total beneficiaries	1,268 households				
	Land owners	664 households	(52.4 %)			
	Tenant farmers	603 households	(47.6 %)			
2) Paddy Field Size in NIS	1.29 ha per household (FUSA/Total beneficiaries as of 2008)					
3) Present Land Use in NIS	Paddy field planted	1,630 ha	60.4 %	As of 2008		
	Paddy field not planted	11 ha	0.4 %	As of 2008		
	Upland crop field	172 ha	6.4 %			
	Permanent crop field	0 ha	0.0 %			
	Undeveloped area	0 ha	0.0 %			
	Built-up area	0 ha	0.0 %			
	High ground	0 ha	0.0 %			
	Grassland	0 ha	0.0 %			
	Swamp	0 ha	0.0 %			
	Unspecified area	887 ha	32.8 %	No data in response		
4) Paddy Field in FUSA (ha)	1,641					
5) Paddy Cropped Area (ha)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Wet Season	1,609	1,628	1,637	1,631	1,630	1,627
Dry Season	1,602	1,611	1,626	1,639	1,628	1,621
6) Cropping Intensity (%)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
(per year)	196	197	199	199	199	198
7) Unit Yield of Paddy (ton/ha)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Wet Season	4.70	4.55	4.35	4.80	4.45	4.57
Dry Season	3.95	4.20	4.65	4.20	3.80	4.16
8) Paddy Production (ton)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Wet Season	7,562	7,407	7,121	7,829	7,254	7,435
Dry Season	6,328	6,766	7,561	6,884	6,186	6,745

3.4 Water Resources

Item	*Description*
1) Name of Rivers	Marbel and Taplan Rivers
2) Catchment Area at Dam	265 km^2
3) Ave. River Discharge	3.60 m^3/s
4) Ave. Dry Season Discharge	3.25 m^3/s
5) Diverted Intake Discharge	1.68 m^3/s
6) Water Requirement	2.95 m^3/s
7) Sedimentation	Moderate

3.5 Existing Irrigation System

Item	*Description*
1) Diversion Dam	Overflow crest width 52.00 m, Dam height 3.30 m
2) Main Canal	Total length 10.40 km (Lined portion 2.38 km)
3) Lateral Canals	Total length 22.88 km (Lined portion 3.28 km)
4) On-farm facilities	Total length 54.00 km (Lined portion no data km) Turn-outs = 58 units
5) Drainage Canal	Total length 19.00 kms.
6) Canal Structures	No. = 90 units
7) Drainage Structures	No. = 10 units
8) Farm roads	Total length 18.76 km (pavement= 0.00 kms.)
9) Flood Protection Dike	Total length 0.00 km For new construction = 1.0 kms.

3.6 Institutions for O&M of NIS

Item	*Description*					
1) Regional Irrigation Office	Name: Region 12 – South Central Mindanao					
2) IMO	Name: South Cotabato-Saranggani IMO					
Staff in 2009	Total number of staff: 66 nos.					
3) Irrigator' Association (IA)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Number of FIA (nos)					1	
Number of IA (nos)					13	
Number of TSAG(nos)	115	115	115	98	98	108
Functionality of IA	78.2	83	96.6	85.4	82.5	85.14
Collection of ISF (wet, %)	91	92	87	95	92	92
Collection of ISF (dry, %)	85	84	93	85	92	88
4) NIS Category based on IA 2008 O&M Contract (NIA-IA)	No. of IA					
Category A	0					
Category B	13					
Category C	0					

3.7 Existing Problems

Item	*Description*
1) Diversion Works	1. Some parts of the dam are damaged and worn-out.
2) Canal and Structures	1. Erosion of earth canal banks. 2. Seepage problems in some earth canal sections 3. Dilapidated steel gates of structures. 4. Some structures still have wooden flush boards
3) Drainage Canal	1. Need to improve the drainage system
4) Other Project Facilities (road, bridge, flood dike, building, etc)	1. Some road sections become very muddy during the rainy season.
5) Water Management and O&M Activities	1. Illegal checking in some places. 2. Lack of control in water intake in some turn-outs result in over supply in some areas in the upstream reaches of the canals but lack of supply in the downstream farms.
6) Status of NIS and IA Management	Status Type A evaluated by Radar Graph Minor problem such as medium paddy yield during dry season at 83 cavans/ha
7) Watershed Management	Significant denudation of the watershed
8) Coordination with LGU and Agencies concerned	1. Lack of coordination by NIA's field offices and IAs with concerned LGUs and other line agencies on specific problem such as watershed management
9) Agriculture	1. High prices of agricultural inputs trigger the farmers to borrow from the local traders even with high interest rate. 2. Inadequate post harvest facilities compel the farmers to sell their produce right after the harvest at a lower price.

4. Proposed Rehabilitation Plan

4.1 Agricultural Development Plan

Item	*Description*			
Cropping schedule	*Wet Season*	*Dry Season-1*	*Dry Season-2*	*Annual*
1) Type of Crops	Paddy	Paddy	-	-
2) Cropping Area (ha)	1641	1640	-	-
3) Target Unit Yield (ton/ha)	4.5	4.2	-	-
3) Total Production (ton)	7,385	6,888	-	-

4.2 Civil Works

Item	*Description*
1) Diversion Works	1. Repair of sluice way. 2. Replacement of sluice gates. 3. Repair of lifting mechanism
2) Canal Structures	1. Repair/rehabilitation of old dilapidated steel gates – 24 units 2. Installation of new steel gates to replace wooden flush boards
3) Canalization	1. Concrete lining of selected existing canal sections – 27-6 kms 2. Re-shaping and de-silting of some canal sections 3. Realignment of canals 4. Construction of new canals
4) Drainage Structures	1. Repair of drainage structures – 6 units
5) Drainage Canalization	1. Repair of existing drainage canals and construction of new ones - 3 kms
6) Service Roads	1. Regravelling of selected road sections – 15 kms 2. Construction of side drainage canals. 3. Construction of road drainage structures
7) On-Farm Facilities	1. Repair /replacement of dilapidated turn out steel gates 2.Construction of new turn outs and farm ditches
8) IMT Support Facilities	1. Construction of post-harvest facilities—warehouses, IA buildings, solar driers with shed – 1 set
9) IMT GIS Database	1. Development and establishment of GIS database

4.3 Institutional Strengthening Program

Item	*Description*
1) Reactivation Program of FIAs/IAs and System Management Committee (ISMC)	1. Executing body : Project Management Office with assistance of Consultant 2. Schedule: 34 months / NIS 3. Counter body for execution: NIA Regional Office and IMO office 4. Attendant / Trainee: President of FIAs/IAs and secretary group, staff of NIA RIO/IMO, Chairmen of ISMC and Secretary group and LGUs officers, 5. Contents: a) Survey & Study by Consultant b) Workshops on coordination activities with and dissemination on reformation plan to FIAs/IAs c) Workshop on coordination activities with LGUs d) Organization and Legal Registration of FIAs/IAs to be re-active and reactivation of SMC e) Construction of IMT support facilities for FIAs/CIA f) Workshop and Training of FIAs/IAs members on management under the IMT g) Assessment/Evaluation for and Negotiation of Contracting under IMT h) Assistance of reactivated IAs/FIAs in organizational and management activities
2) Strengthening Program of NIA - IA - LGU Partnership	1. Executing body : Project Management Office with assistance of Consultant, & Management System Committee (MSC) of NIS 2. Schedule: 7 months / NIS 3. Counter body for execution: Regional Development Council with Secretary of NEDA Regional Office

Item	*Description*
	4. Attendant / Trainee: Secretaries of Regional Organizations, LGUs officers, President of FIAs/IAs and secretary group, staff of NIA RIO/IMO, Chairmen of ISMC and Secretary group 5. Contents: a) Workshop on Trouble Shooting of NIS and FIAs/ISs' Management b) Provision of work space for ISMC including office facilities
3) NIA Institutional Strengthening Program	1. Executing body : Institutional Development Division of CO, NIA 2. Schedule: 7 months / NIS 3. Counter body for execution: NIA Regional Office and IMO office 4. Attendant / Trainee: NIA personnel at CO, RIO and IMO 5. Contents: a. Capability built-up program (Central and Regional NIA Offices) b. Improvement program on management mechanism of NIA c. Support program for IMT implementation d. Strengthening program of Integrated Management information System
4) Specific Program on watershed management plan	1. Strengthening coordination with RDC, RAFC/PAFC and LGUs concerned through works shop on dissemination of the SLRIF to these organizations. 2. Strengthening coordination with RDC, RAFC/PAFC and LGUs on training program of watershed management

4.4 Proposed Counter Schemes

Item	*Description*
1) DENR	Technical assistance to concerned Provincial/municipal LGUs on watershed rehabilitation and management such as establishment of nurseries and community-based livelihood for upland dweller
2) LGU	1. LGUs improve coordination program with NIA to give priority of the projects in annual budgeting and funds programming 2. Provincial LGUs to extend training to municipal agricultural officers to improve skills on technology promotion 3. LGUs improve capacity of its personnel to prepare project proposals through a training by DILG to ensure project's fund access to municipal development fund 4. LGUs provide reliable post-harvest facilities to ensure optimal operation of the facilities

5. Cost Estimate for Initial Investment

Item	*Description*		
1) Direct Cost for Civil Works	A. Mobilization	Php	2.71 Million
	B. Protection Dikes		-
	C. Diversion Works	Php	4.43 Million
	D. Canal Structures	Php	4.00 Million
	E. Canalization	Php	69.84 Million
	F. Drainage Structures	Php	3.28 Million
	G. Drainage Canalization	Php	5.69 Million
	H. Roads	Php	20.75 Million
	I. On-Farm Facilities/T.O. Gates	Php	2.00 Million
	J. Project Facilities	Php	10.00 Million
	K. IMT GIS Database	Php	1.64 Million
	L. Institutional Development (5% of Direct Cost)	Php	8.40 Million
	M. Feasibility Studies & Detailed Engineering (2% of Direct Cost)	Php	2.71 Million
	Sub-total (Direct Cost)	Php	135.45 Million

2) Indirect Cost	A. General Engineering Supervision and Administration (3.5% of Direct Cost)	Php	4.74	Million
	B. NIA Management Fee (5% of Total Project Cost)	Php	7.38	Million
	Sub-total (Indirect Cost)	Php	12.12	Million
3) Total Project Cost	= 1+2	Php	147.57	Million
Cost per ha.		Php	89,927.00	/ha.

6. Implementation Plan

Item	*Description*
1) Contract package	1 - Local Competitive Bidding (LCB)
2) Implementation Schedule	
a) Civil Works	
1) Survey, F/S, Design	21 months
2) Tendering	6 months
3) Construction	36 months
b) Institutional Improvement Works	
1) Reactivation Program of FIAs/IAs and Irrigation System Management Committee	34 months
2) NIA-IA-LGU Partnership	7 months
3) Strengthening of NIA staff	7 months

7. Project Evaluation

Item		*Description*	
1) Economic evaluation			
EIRR (Base)		EIRR = 15.4 %	: Project life 50 years
Sensitivity	Case-1	EIRR = 14.1 %	: Cost 10% up
	Case-2	EIRR = 14.0%	: Benefit 10% down
	Case-3	EIRR = 12.90 %	: Cost 10% up + Benefit 10% down
B/C		1.03	: discount rate 15% p.a.
NPV		PHP 3 million	: discount rate 15% p.a.
2) Financial evaluation		Farmer's net income increase = PHP 7,680 per ha per year	
3) Expected Impacts		1. Increased farmers' income 2. Increased rice self sufficiency of the country 3. Increased job opportunities in rural areas	

8. Environmental Aspects

Item	*Description*
1) Environmental aspect	Need to address problems in siltation and quarrying of sand and gravel
2) Relocation of houses	None
3) Land acquisition	None

Table 1205 - Marbel - 2 Economic Evaluation (EIRR)

Basic Case

Name of NIS 1205 - Marbel - 2 | Region : 12 IMO,RIO Sultan Kudarat

EIRR : 15.4%	Net Present Value (Million PHP)	Benefit	Cost	B/C Ratio	NPV
	(15 % discount rate)	88	86	1.03	3

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011			0.64		0.64		1.34	1.34	0.70
2	2012			0.64		0.64		2.68	2.68	2.04
3	2013	35.65	1.37	0.64		37.66		4.02	4.02	-33.64
4	2014	47.53	1.82	0.64	1.00	50.99	1.33	5.36	6.69	-44.30
5	2015	35.65	1.37	0.64	2.33	39.99	3.27	6.70	9.97	-30.02
6	2016				3.33	3.33	4.99	8.04	13.03	9.70
7	2017				3.33	3.33	5.37	9.38	14.75	11.42
8	2018				3.33	3.33	5.54	10.72	16.26	12.93
9	2019				3.33	3.33	5.54	12.06	17.60	14.27
10	2020				3.33	3.33	5.54	13.40	18.94	15.61
11	2021				3.33	3.33	5.54	14.74	20.28	16.95
12	2022				3.33	3.33	5.54	16.08	21.62	18.29
13	2023				3.33	3.33	5.54	17.42	22.96	19.63
14	2024				3.33	3.33	5.54	18.76	24.30	20.97
15	2025				3.33	3.33	5.54	20.10	25.64	22.31
16	2026				3.33	3.33	5.54	21.44	26.98	23.65
17	2027				3.33	3.33	5.54	22.78	28.32	24.99
18	2028				3.33	3.33	5.54	24.12	29.66	26.33
19	2029				3.33	3.33	5.54	25.46	31.00	27.67
20	2030				3.33	3.33	5.54	26.80	32.34	29.01
21	2031				3.33	3.33	5.54	28.14	33.68	30.35
22	2032				3.33	3.33	5.54	29.48	35.02	31.69
23	2033				3.33	3.33	5.54	30.82	36.36	33.03
24	2034				3.33	3.33	5.54	32.16	37.70	34.37
25	2035				3.33	3.33	5.54	33.50	39.04	35.71
26	2036				3.33	3.33	5.54	34.84	40.38	37.05
27	2037				3.33	3.33	5.54	36.18	41.72	38.39
28	2038				3.33	3.33	5.54	37.52	43.06	39.73
29	2039				3.33	3.33	5.54	38.86	44.40	41.07
30	2040				3.33	3.33	5.54	40.20	45.74	42.41
31	2041				3.33	3.33	5.54	41.54	47.08	43.75
32	2042				3.33	3.33	5.54	42.88	48.42	45.09
33	2043				3.33	3.33	5.54	44.22	49.76	46.43
34	2044				3.33	3.33	5.54	45.56	51.10	47.77
35	2045				3.33	3.33	5.54	46.90	52.44	49.11
36	2046				3.33	3.33	5.54	48.24	53.78	50.45
37	2047				3.33	3.33	5.54	49.58	55.12	51.79
38	2048				3.33	3.33	5.54	50.92	56.46	53.13
39	2049				3.33	3.33	5.54	52.26	57.80	54.47
40	2050				3.33	3.33	5.54	53.60	59.14	55.81
41	2051				3.33	3.33	5.54	54.94	60.48	57.15
42	2052				3.33	3.33	5.54	56.28	61.82	58.49
43	2053				3.33	3.33	5.54	57.62	63.16	59.83
44	2054				3.33	3.33	5.54	58.96	64.50	61.17
45	2055				3.33	3.33	5.54	60.30	65.84	62.51
46	2056				3.33	3.33	5.54	61.64	67.18	63.85
47	2057				3.33	3.33	5.54	62.98	68.52	65.19
48	2058				3.33	3.33	5.54	64.32	69.86	66.53
49	2059				3.33	3.33	5.54	65.66	71.20	67.87
50	2060				3.33	3.33	5.54	67.00	72.54	69.21

Case-1 (Cost 10% up)

Name of NIS 1205 - Marbel - 2 | Region : 12 IMO,RIO Sultan Kudarat

EIRR : 14.1%	Net Present Value (Million PHP)	Benefit	Cost	B/C Ratio	NPV
	(15 % discount rate)	88	94	0.94	-6

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	0.71	-	0.71	-	1.34	1.34	0.63
2	2012	-	-	0.71	-	0.71	-	2.68	2.68	1.97
3	2013	39.21	1.50	0.71	-	41.42	-	4.02	4.02	-37.40
4	2014	52.28	2.01	0.71	1.10	56.09	1.33	5.36	6.69	-49.40
5	2015	39.21	1.50	0.71	2.56	43.99	3.27	6.70	9.97	-34.02
6	2016	-	-	-	3.66	3.66	4.99	8.04	13.03	9.36
7	2017	-	-	-	3.66	3.66	5.37	9.38	14.75	11.09
8	2018	-	-	-	3.66	3.66	5.54	10.72	16.26	12.60
9	2019	-	-	-	3.66	3.66	5.54	12.06	17.60	13.94
10	2020	-	-	-	3.66	3.66	5.54	13.40	18.94	15.28
11	2021	-	-	-	3.66	3.66	5.54	14.74	20.28	16.62
12	2022	-	-	-	3.66	3.66	5.54	16.08	21.62	17.96
13	2023	-	-	-	3.66	3.66	5.54	17.42	22.96	19.30
14	2024	-	-	-	3.66	3.66	5.54	18.76	24.30	20.64
15	2025	-	-	-	3.66	3.66	5.54	20.10	25.64	21.98
16	2026	-	-	-	3.66	3.66	5.54	21.44	26.98	23.32
17	2027	-	-	-	3.66	3.66	5.54	22.78	28.32	24.66
18	2028	-	-	-	3.66	3.66	5.54	24.12	29.66	26.00
19	2029	-	-	-	3.66	3.66	5.54	25.46	31.00	27.34
20	2030	-	-	-	3.66	3.66	5.54	26.80	32.34	28.68
21	2031	-	-	-	3.66	3.66	5.54	28.14	33.68	30.02
22	2032	-	-	-	3.66	3.66	5.54	29.48	35.02	31.36
23	2033	-	-	-	3.66	3.66	5.54	30.82	36.36	32.70
24	2034	-	-	-	3.66	3.66	5.54	32.16	37.70	34.04
25	2035	-	-	-	3.66	3.66	5.54	33.50	39.04	35.38
26	2036	-	-	-	3.66	3.66	5.54	34.84	40.38	36.72
27	2037	-	-	-	3.66	3.66	5.54	36.18	41.72	38.06
28	2038	-	-	-	3.66	3.66	5.54	37.52	43.06	39.40
29	2039	-	-	-	3.66	3.66	5.54	38.86	44.40	40.74
30	2040	-	-	-	3.66	3.66	5.54	40.20	45.74	42.08
31	2041	-	-	-	3.66	3.66	5.54	41.54	47.08	43.42
32	2042	-	-	-	3.66	3.66	5.54	42.88	48.42	44.76
33	2043	-	-	-	3.66	3.66	5.54	44.22	49.76	46.10
34	2044	-	-	-	3.66	3.66	5.54	45.56	51.10	47.44
35	2045	-	-	-	3.66	3.66	5.54	46.90	52.44	48.78
36	2046	-	-	-	3.66	3.66	5.54	48.24	53.78	50.12
37	2047	-	-	-	3.66	3.66	5.54	49.58	55.12	51.46
38	2048	-	-	-	3.66	3.66	5.54	50.92	56.46	52.80
39	2049	-	-	-	3.66	3.66	5.54	52.26	57.80	54.14
40	2050	-	-	-	3.66	3.66	5.54	53.60	59.14	55.48
41	2051	-	-	-	3.66	3.66	5.54	54.94	60.48	56.82
42	2052	-	-	-	3.66	3.66	5.54	56.28	61.82	58.16
43	2053	-	-	-	3.66	3.66	5.54	57.62	63.16	59.50
44	2054	-	-	-	3.66	3.66	5.54	58.96	64.50	60.84
45	2055	-	-	-	3.66	3.66	5.54	60.30	65.84	62.18
46	2056	-	-	-	3.66	3.66	5.54	61.64	67.18	63.52
47	2057	-	-	-	3.66	3.66	5.54	62.98	68.52	64.86
48	2058	-	-	-	3.66	3.66	5.54	64.32	69.86	66.20
49	2059	-	-	-	3.66	3.66	5.54	65.66	71.20	67.54
50	2060	-	-	-	3.66	3.66	5.54	67.00	72.54	68.88

Table 1205 - Marbel - 2 Economic Evaluation (EIRR)

Case-2 (Benefit 10% down)

Name of NIS 1205 - Marbel - 2 Region : 12 IMO RIO Sultan Kudarat

EIRR : 14.0%	Net Present Value (Million PHP) (15 % discount rate)	Benefit	Cost	B/C Ratio	NPV
		80	86	0.93	-6

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	0.64	-	0.64	-	1.21	1.21	0.56
2	2012	-	-	0.64	-	0.64	-	2.41	2.41	1.77
3	2013	35.65	1.37	0.64	-	37.66	-	3.62	3.62	-34.04
4	2014	47.53	1.82	0.64	1.00	50.99	1.20	4.82	6.02	-44.97
5	2015	35.65	1.37	0.64	2.33	39.99	2.94	6.03	8.97	-31.02
6	2016	-	-	-	3.33	3.33	4.49	7.24	11.72	8.39
7	2017	-	-	-	3.33	3.33	4.84	8.44	13.28	9.95
8	2018	-	-	-	3.33	3.33	4.99	9.65	14.63	11.30
9	2019	-	-	-	3.33	3.33	4.99	10.85	15.84	12.51
10	2020	-	-	-	3.33	3.33	4.99	12.06	17.05	13.72
11	2021	-	-	-	3.33	3.33	4.99	13.27	18.25	14.92
12	2022	-	-	-	3.33	3.33	4.99	14.47	19.46	16.13
13	2023	-	-	-	3.33	3.33	4.99	15.68	20.66	17.33
14	2024	-	-	-	3.33	3.33	4.99	16.88	21.87	18.54
15	2025	-	-	-	3.33	3.33	4.99	18.09	23.08	19.75
16	2026	-	-	-	3.33	3.33	4.99	19.30	24.28	20.95
17	2027	-	-	-	3.33	3.33	4.99	20.50	25.49	22.16
18	2028	-	-	-	3.33	3.33	4.99	21.71	26.69	23.36
19	2029	-	-	-	3.33	3.33	4.99	22.91	27.90	24.57
20	2030	-	-	-	3.33	3.33	4.99	24.12	29.11	25.78
21	2031	-	-	-	3.33	3.33	4.99	25.33	30.31	26.98
22	2032	-	-	-	3.33	3.33	4.99	26.53	31.52	28.19
23	2033	-	-	-	3.33	3.33	4.99	27.74	32.72	29.39
24	2034	-	-	-	3.33	3.33	4.99	28.94	33.93	30.60
25	2035	-	-	-	3.33	3.33	4.99	30.15	35.14	31.81
26	2036	-	-	-	3.33	3.33	4.99	31.36	36.34	33.01
27	2037	-	-	-	3.33	3.33	4.99	32.56	37.55	34.22
28	2038	-	-	-	3.33	3.33	4.99	33.77	38.75	35.42
29	2039	-	-	-	3.33	3.33	4.99	34.97	39.96	36.63
30	2040	-	-	-	3.33	3.33	4.99	36.18	41.17	37.84
31	2041	-	-	-	3.33	3.33	4.99	37.39	42.37	39.04
32	2042	-	-	-	3.33	3.33	4.99	38.59	43.58	40.25
33	2043	-	-	-	3.33	3.33	4.99	39.80	44.78	41.45
34	2044	-	-	-	3.33	3.33	4.99	41.00	45.99	42.66
35	2045	-	-	-	3.33	3.33	4.99	42.21	47.20	43.87
36	2046	-	-	-	3.33	3.33	4.99	43.42	48.40	45.07
37	2047	-	-	-	3.33	3.33	4.99	44.62	49.61	46.28
38	2048	-	-	-	3.33	3.33	4.99	45.83	50.81	47.48
39	2049	-	-	-	3.33	3.33	4.99	47.03	52.02	48.69
40	2050	-	-	-	3.33	3.33	4.99	48.24	53.23	49.90
41	2051	-	-	-	3.33	3.33	4.99	49.45	54.43	51.10
42	2052	-	-	-	3.33	3.33	4.99	50.65	55.64	52.31
43	2053	-	-	-	3.33	3.33	4.99	51.86	56.84	53.51
44	2054	-	-	-	3.33	3.33	4.99	53.06	58.05	54.72
45	2055	-	-	-	3.33	3.33	4.99	54.27	59.26	55.93
46	2056	-	-	-	3.33	3.33	4.99	55.48	60.46	57.13
47	2057	-	-	-	3.33	3.33	4.99	56.68	61.67	58.34
48	2058	-	-	-	3.33	3.33	4.99	57.89	62.87	59.54
49	2059	-	-	-	3.33	3.33	4.99	59.09	64.08	60.75
50	2060	-	-	-	3.33	3.33	4.99	60.30	65.29	61.96

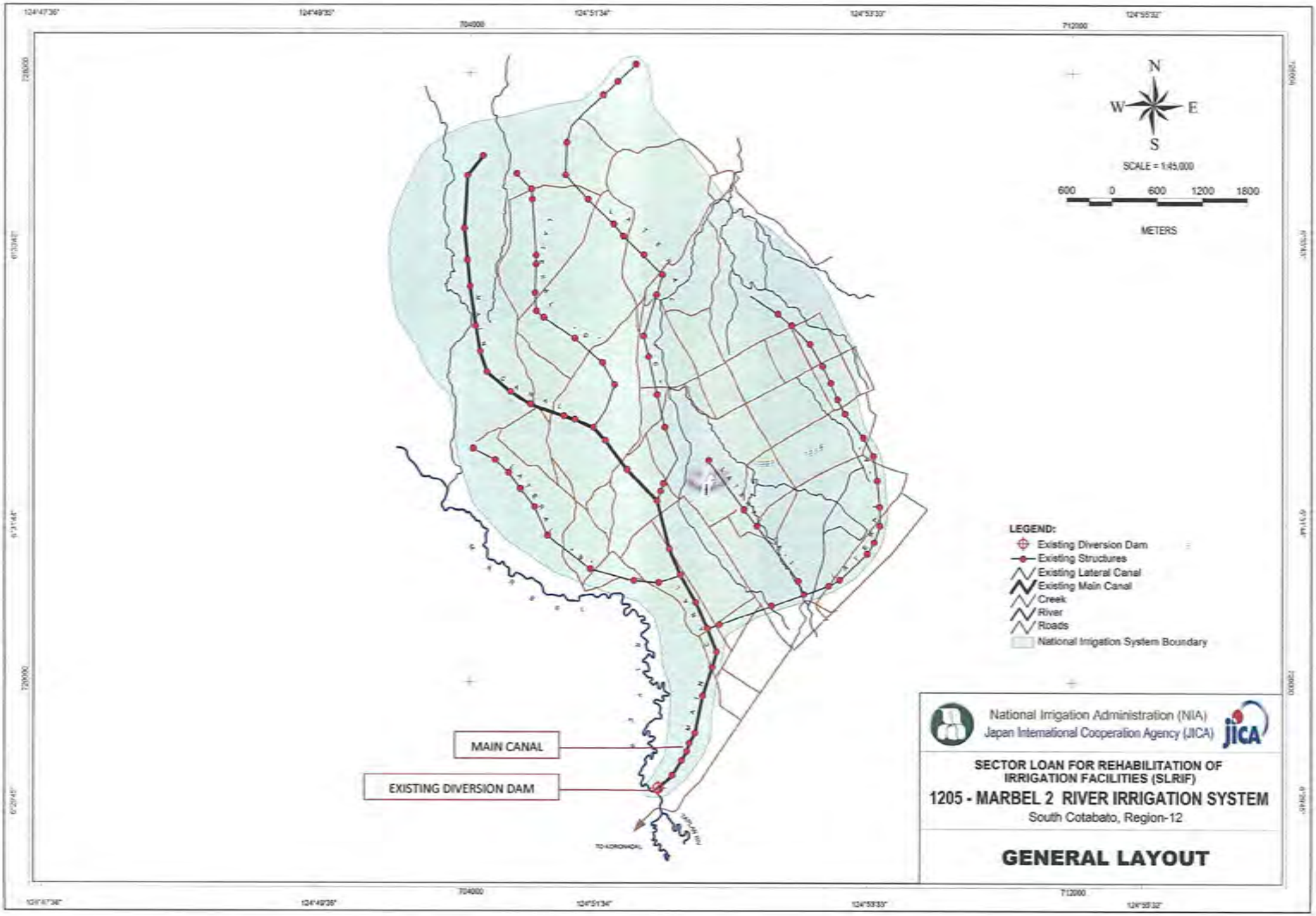
Case-3 (Cost 10% up and Benefit 10% down)

Name of NIS 1205 - Marbel - 2 Region : 12 IMO RIO Sultan Kudarat

EIRR : 12.9%	Net Present Value (Million PHP) (15 % discount rate)	Benefit	Cost	B/C Ratio	NPV
		80	94	0.84	-15

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	0.71	-	0.71	-	1.21	1.21	0.50
2	2012	-	-	0.71	-	0.71	-	2.41	2.41	1.71
3	2013	39.21	1.50	0.71	-	41.42	-	3.62	3.62	-37.80
4	2014	52.28	2.01	0.71	1.10	56.09	1.20	4.82	6.02	-50.07
5	2015	39.21	1.50	0.71	2.56	43.99	2.94	6.03	8.97	-35.01
6	2016	-	-	-	3.66	3.66	4.49	7.24	11.72	8.06
7	2017	-	-	-	3.66	3.66	4.84	8.44	13.28	9.62
8	2018	-	-	-	3.66	3.66	4.99	9.65	14.63	10.97
9	2019	-	-	-	3.66	3.66	4.99	10.85	15.84	12.18
10	2020	-	-	-	3.66	3.66	4.99	12.06	17.05	13.38
11	2021	-	-	-	3.66	3.66	4.99	13.27	18.25	14.59
12	2022	-	-	-	3.66	3.66	4.99	14.47	19.46	15.80
13	2023	-	-	-	3.66	3.66	4.99	15.68	20.66	17.00
14	2024	-	-	-	3.66	3.66	4.99	16.88	21.87	18.21
15	2025	-	-	-	3.66	3.66	4.99	18.09	23.08	19.41
16	2026	-	-	-	3.66	3.66	4.99	19.30	24.28	20.62
17	2027	-	-	-	3.66	3.66	4.99	20.50	25.49	21.83
18	2028	-	-	-	3.66	3.66	4.99	21.71	26.69	23.03
19	2029	-	-	-	3.66	3.66	4.99	22.91	27.90	24.24
20	2030	-	-	-	3.66	3.66	4.99	24.12	29.11	25.44
21	2031	-	-	-	3.66	3.66	4.99	25.33	30.31	26.65
22	2032	-	-	-	3.66	3.66	4.99	26.53	31.52	27.86
23	2033	-	-	-	3.66	3.66	4.99	27.74	32.72	29.06
24	2034	-	-	-	3.66	3.66	4.99	28.94	33.93	30.27
25	2035	-	-	-	3.66	3.66	4.99	30.15	35.14	31.47
26	2036	-	-	-	3.66	3.66	4.99	31.36	36.34	32.68
27	2037	-	-	-	3.66	3.66	4.99	32.56	37.55	33.89
28	2038	-	-	-	3.66	3.66	4.99	33.77	38.75	35.09
29	2039	-	-	-	3.66	3.66	4.99	34.97	39.96	36.30
30	2040	-	-	-	3.66	3.66	4.99	36.18	41.17	37.50
31	2041	-	-	-	3.66	3.66	4.99	37.39	42.37	38.71
32	2042	-	-	-	3.66	3.66	4.99	38.59	43.58	39.92
33	2043	-	-	-	3.66	3.66	4.99	39.80	44.78	41.12
34	2044	-	-	-	3.66	3.66	4.99	41.00	45.99	42.33
35	2045	-	-	-	3.66	3.66	4.99	42.21	47.20	43.53
36	2046	-	-	-	3.66	3.66	4.99	43.42	48.40	44.74
37	2047	-	-	-	3.66	3.66	4.99	44.62	49.61	45.95
38	2048	-	-	-	3.66	3.66	4.99	45.83	50.81	47.15
39	2049	-	-	-	3.66	3.66	4.99	47.03	52.02	48.36
40	2050	-	-	-	3.66	3.66	4.99	48.24	53.23	49.56
41	2051	-	-	-	3.66	3.66	4.99	49.45	54.43	50.77
42	2052	-	-	-	3.66	3.66	4.99	50.65	55.64	51.98
43	2053	-	-	-	3.66	3.66	4.99	51.86	56.84	53.18
44	2054	-	-	-	3.66	3.66	4.99	53.06	58.05	54.39
45	2055	-	-	-	3.66	3.66	4.99	54.27	59.26	55.59
46	2056	-	-	-	3.66	3.66	4.99	55.48	60.46	56.80
47	2057	-	-	-	3.66	3.66	4.99	56.68	61.67	58.01
48	2058	-	-	-	3.66	3.66	4.99	57.89	62.87	59.21
49	2059	-	-	-	3.66	3.66	4.99	59.09	64.08	60.42
50	2060	-	-	-	3.66	3.66	4.99	60.30	65.29	61.62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National Irrigation System Boundary
MAIN CANAL
EXISTING DIVERSION DAM
National Irrigation Administration (NIA)
Japan International Cooperation Agency (JICA)
JICA
SECTOR LOAN FOR REHABILITATION OF IRRIGATION FACILITIES (SLRIF)
1205 - MARBEL 2 RIVER IRRIGATION SYSTEM
South Cotabato, Region-12
GENERAL LAYOUT

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities

Photograph of Irrigation Facilities

NIS name: Marbel 2 (Region 12)

Location / Facility	*Photograph*	*Comments*
Diversion works. View taken facing upstream Longitude: 6° 29'44"E Latitude: 124° 51'02" N		Sluice way and sluice gates need to be repaired
Diversion works. View taken facing downstream. Longitude: 6° 29'44"E Latitude: 124° 51'02" N		Same as above.
Main Canal at the dam outlet Longitude: 6° 29'44"E Latitude: 124° 51'02" N		Canal needs to be concrete lined.

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities
Photograph of Irrigation Facilities

NIS name: Marbel 2 (Region 12)

Location / Facility	*Photograph*	*Comments*
Headgate Lat A Longitude: 6° 30'55"E Latitude: 124° 52'34" N		Steel gates need to be repaired.
Main Canal Sta. 3+100 Longitude: 6° 31'12"E Latitude: 124° 52'22" N		Canal needs to be re-shaped and concrete-lined.
Main Canal Sta. 7+210 Longitude: 6° 32'10"E Latitude: 124° 50'49" N		Canal being used as wallowing pond for carabaos. The canal needs to be concrete lined.

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities

Photograph of Irrigation Facilities

NIS name: Marbel 2 (Region 12)

Location / Facility	*Photograph*	*Comments*
Road Crossing Main Canal Sta. 7+475 Longitude: 6° 32'40"E Latitude: 124° 50'32" N		Structure is badly damaged; needs major repair.
Main Canal Sta. 7+756 Longitude: 6° 32'47"E Latitude: 124° 50'29" N		Canal needs to be concrete lined.
Lateral D Sta. 2+153 Longitude: 6° 33'00"E Latitude: 124° 50'58" N		Structure needs steel gate.

THE REPUBLIC OF PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION

Sector Loan on Rehabilitation of Irrigation Facilities

NIS SUMMARY REPORT

1206
Siluay-Buayan RIS
Region 12
South Cotabato Province

July 2009

Survey Team for
Japan International Cooperation Agency
(JICA)

Features of NIS for Rehabilitation Project

1. General

Item		*Description*	
1) Name of NIS	**SILUAY – BUAYAN RIS**		Code: 1206
2) Location	Region	12	
	Province	South Cotabato	
	City	General Santos	
	Distance	60 kms from Koronadal, South Cotabato	
3) Type of Water Source	Water Source	Klinan, Siluay, Buayan & Tinagacan Rivers	
	Type	Siluay Diversion Dam (92.00 m wide, 6.00 m high) Buayan Diversion Dam (45.00 m wide, 9.50 m high)	
4) Area	Service Area	3,253.98 has.	
	FUSA	1,420 has.	
5) Beneficiary Farmers	851 farmers	Average paddy field cultivating size = 1.67 ha per farmer	
6) Irrigator's Association	IAs established = 10 FIA established = 1 in 2008		
7) Features of NIS and Necessity of the project	Siluay-Buayan sub-project is composed of two (2) adjoining RISs managed by only one (1) NISO. It has a combined design service area of 3,253 has. but a firmed-up service area of only 1,420 has. due to lack of water and a lot of build-up areas. It has two (2) main canals with a total length of 20.93 kms.; ten (10) lateral canals with a total length of 75 kms. and 24.65 kms. of service roads. It also has 12.71 kilometers of drainage canals, 297 canal structures, 2 drainage structures, 190 turn-outs and 224 kms. of farm ditches. During the last five (5) years it had an average cropping intensity of 177% and average yields of 97 cavans/ha. during the wet season and 86 cavans/ha. during the dry season. A rehabilitation of the system is needed to improve the efficiency of water delivery in the canals and distribution of water to the farms.		
8) Outline of the Proposed Project	A. Engineering 1. Repair of diversion dam 2. Repair and improvement of irrigation canal and structures 3. Repair and improvement of drainage canal and structures 4. Repair and improvement of service roads 5. Repair and improvement of on-farm facilities 6. Repair and construction of IMT support facilities-IA Bldg solar drier, warehouse with IA building 7. Development and establishment of IMT GIS database B. Institutional Strengthening Program B.1 Basic Program 1. Reactivation of FIA/IA and Strengthening of Irrigation System Management Committee (ISMC) of NIS including construction of IMT support facilities 2. Strengthening of NIA – IA – LGUs Partnership 3. Strengthening NIA Institutional Capacity B.2 Specific Program to strengthen institutional mechanism together with LGUs		

	1. Improvement of watershed management					
9) Proposed Project Component	A. Engineering 1. Construction of civil works for rehabilitation of diversion works, canal system, drainage system, roads, and IMT support facilities. B. Institutional Strengthening Program 1. Reactivation of FIAs/IAs including reformation of TSGA / IA / FIA areas, construction of IMT support facilities (demand base) 2. Strengthening NIA-IA- LGUs Partnership, especially coordination RDC, RAFC/PAFC with FIAs/IAs and ISMC 3. Institutional development program to strengthen management capacity of NIA field offices and IAs					
10) Project Cost (Direct cost only, excluding escalation, contingency, tax)	1. Direct cost			PHP	126.83	million
	- *Civil Works*	*PHP*	*117.80*	*Million*		
	- *Institutional Development*	*PHP*	*6.50*	*Million*		
	- *Engineering Services*	*PHP*	*2.54*	*Million*		
	2. Indirect cost			PHP	11.35	million
	Total Project Cost (1+2)			PHP	138.18	million
	Cost per ha			PHP	97,311.00	per ha
11) Project Benefit	1. To increase paddy production by 1,028 tons/year 2. To increase farmers' net income to PHP65,591.00/ha/year 3. To establish functional and self-reliant IAs 4. To improve performance of NIS					
12) Project Justification	EIRR = 15.7 %, B/C = 1.05 (discount rate 15%)					

2. Project History (Construction/Rehabilitation)

Year	*Description*
1965	Project Completion (Siluay)
1978	Project Completion (Buayan)

3. Present Condition

3.1 Natural Conditions

Item	*Description*
1) Annual Rainfall	1,292.70 mm
2) Seasons	Wet: May – October Dry: November – April
3) Dominant Soil in NIS Area	Sandy Loam
4) Topography	Relatively flat, gently sloping

3.2 Socio-economy (Region/Province)

Item	*Description*
1) GRDP	PHP 220,322 million (Year 2007), Per Capita GRDP = PHP 57,708 per year
2) Population	767,254 (province)
3) Population Growth Rate	5.68 % per year (province)
4) Labor Force	2,382,000 (region)
5) Poverty Population	47.4 % to total population (province)

3.3 Present Agriculture in NIS

Item	*Description*			
1) Farm Household in NIS	Total beneficiaries	851 households		
	Land owners	260 households	(30.6 %)	
	Tenant farmers	591 households	(69.4 %)	
2) Paddy Field Size in NIS	1.67 ha per household (FUSA/Total beneficiaries as of 2008)			
3) Present Land Use in NIS	Paddy field planted	1,399 ha	43.0 %	As of 2008
	Paddy field not planted	21 ha	0.6 %	As of 2008
	Upland crop field	443 ha	13.6 %	
	Permanent crop field	48 ha	1.5 %	
	Undeveloped area	67 ha	2.1 %	
	Built-up area	0 ha	0.0 %	
	High ground	0 ha	0.0 %	
	Grassland	0 ha	0.0 %	
	Swamp	0 ha	0.0 %	
	Unspecified area	1,276 ha	39.2 %	No data in response
4) Paddy Field in FUSA (ha)	1,420			

5) Paddy Cropped Area (ha)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Wet Season	1,224	1,305	1,296	1,360	1,353	1,308
Dry Season	935	1,232	1,208	1,236	1,399	1,202
6) Cropping Intensity (%)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
(per year)	152	179	176	183	194	177
7) Unit Yield of Paddy (ton/ha)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Wet Season	4.50	5.25	5.35	4.30	4.75	4.83
Dry Season	3.75	4.10	4.55	4.85	4.45	4.37
8) Paddy Production (ton)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Wet Season	5,508	6,851	6,934	5,848	6,427	6,314
Dry Season	3,506	5,051	5,496	5,995	6,226	5,255

3.4 Water Resources

Item	*Description*
1) Name of Rivers	Klinan, Siluay, Buayan & Tinagacan Rivers
2) Catchment Area at Dam	553 km^2
3) Ave. River Discharge	4.22 m^3/s
4) Ave. Dry Season Discharge	3.92 m^3/s
5) Diverted Intake Discharge	2.25 m^3/s
6) Water Requirement	2.56 m^3/s
7) Sedimentation	Minimal

3.5 Existing Irrigation System

Item	*Description*
1) Diversion Dam	Siluay: Overflow crest width 92 m, Dam height 6.00 m Buayan: Overflow crest width 45 m, Dam height 9.50 m
2) Main Canal	Total length 20.928 km (Lined portion 12.486 km)
3) Lateral Canals	Total length 75.00 km (Lined portion 15.726 km)
4) On-farm facilities	Total length 47.00 km (Lined portion 0.00 km)
	Turn-outs = 190 units
5) Drainage Canal	Total length 12.709 kms.
6) Canal Structures	No. = 107 units
7) Drainage Structures	No. = 2 units
8) Farm roads	Total length 24.648 km (pavement= 0.00 kms.)

3.6 Institutions for O&M of NIS

Item	*Description*					
1) Regional Irrigation Office	Name: Region 12 – South Central Mindanao					
2) IMO	Name: South Cotabato-Saranggani IMO					
Staff in 2009	Total number of staff: 66 nos					
3) Irrigator' Association (IA)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Number of FIA (nos)					1	
Number of IA (nos)					10	
Number of TSAG (nos)	66	66	66	64	64	65
Functionality of IA	80.4	89.6	82.5	76.9	78	81.48
Collection of ISF (wet, %)	83	78	97	78	100	87.2
Collection of ISF (dry, %)	67	57	55	69	71	61
4) NIS Category based on IA 2008 O&M Contract (NIA-IA)	No. of IA					
Category A	0					
Category B	10					
Category C	0					

3.7 Existing Problems

Item	*Description*
1) Diversion Works	1. Damaged steel gates. 2. River upstream of the dam is heavily silted and not anymore straight in alignment as is ideal. 3. Scour protection works downstream of the dam have been partly washed away by floods.
2) Canal and Structures	1. Bank erosion and seepage in some earth canal sections. 2. Dilapidated steel gates of structures. 3. Some structures still have wooden flush boards
3) Drainage Canal	1. Need to improve the drainage system.
4) Other Project Facilities (road, bridge, flood dike, building, etc)	1. Some roads become very muddy during the rainy season.
5) Water Management and O&M Activities	1. Illegal checking in some places. 2. Lack of control in water intake in some turn-outs result in over supply in some areas in the upstream reaches of the canals but lack of supply in the downstream farms.
6) Status of NIS and IA Management	Status Type B evaluated by Radar Graph. Specific problems are: 1. Medium ISF collection efficiency during dry season at 61% 2. Medium ratio of tenancy at 62%
7) Watershed Management	Denuded watershed
8) Coordination with LGU and Agencies concerned	1. Minimum coordination by NIA's field offices and IAs with concerned LGUs on specific problem such as watershed management
9) Agriculture	1. The service area is relatively getting smaller due to land conversion from agriculture to build- up areas and or industrial area. 2. Inadequate credit institution to serve the farmers with low interest rates. 3. Poor cooperation among the farmers.

4. Proposed Rehabilitation Plan

4.1 Agricultural Development Plan

Item	*Description*			
Cropping schedule	*Wet Season*	*Dry Season-1*	*Dry Season-2*	*Annual*
1) Type of Crops	Paddy	Paddy	-	-
2) Cropping Area (ha)	1420	1400	-	-
3) Target Unit Yield (ton/ha)	5.00	4.70	-	-
3) Total Production (ton)	7,100	6,580	-	-

4.2 Civil Works

Item	*Description*
1) Diversion Works	1. Straightening and dredging of the river upstream of the dam. 2. Repair of the downstream scour protection works. 3. Repair of steel gates
2) Canal Structures	1. Repair/replacement of old dilapidated steel gates – 30 units 2. Installation of new steel gates to replace wooden flush boards
3) Canalization	1. Concrete lining of selected existing canal sections – 67.6 kms 2. Re-shaping and de-silting of some canal sections. 3. Realignment of canals 4. Construction of new canals
4) Drainage Structures	1. Repair of drainage structures – 2 units
5) Drainage Canalization	1. Repair of existing drainage canals and construction of new ones - 12.7 kms
6) Service Roads	1. Re-gravelling of selected road sections – 3.9 kms 2. Construction of side drainage canals. 3. Construction of road drainage structures.
7) On-Farm Facilities	1. Repair /replacement of dilapidated turn out steel gates 2.Construction of new turn outs and farm ditches
8) IMT Support Facilities	1. Construction of post-harvest facilities—warehouses, IA buildings, solar driers with shed – 1 set
9) IMT GIS Database	1. Development and establishment of GIS database

4.3 Institutional Strengthening Program

Item	*Description*
1) Reactivation Program of FIAs/IAs and System Management Committee (ISMC)	1. Executing body : Project Management Office with assistance of Consultant 2. Schedule: 34 months / NIS 3. Counter body for execution: NIA Regional Office and IMO office 4. Attendant / Trainee: President of FIAs/IAs and secretary group, staff of NIA RIO/IMO, Chairmen of ISMC and Secretary group and LGUs officers, 5. Contents: a) Survey & Study by Consultant b) Workshops on coordination activities with and dissemination on reformation plan to FIAs/IAs c) Workshop on coordination activities with LGUs d) Organization and Legal Registration of FIAs/IAs to be re-active and reactivation of SMC e) Construction of IMT support facilities for FIAs/CIA

Item	*Description*
	f) Workshop and Training of FIAs/IAs members on management under the IMT g) Assessment/Evaluation for and Negotiation of Contracting under IMT h) Assistance of reactivated IAs/FIAs in organizational and management activities
2) Strengthening Program of NIA - IA - LGU Partnership	1. Executing body : Project Management Office with assistance of Consultant, & Management System Committee (MSC) of NIS 2. Schedule: 7 months / NIS 3. Counter body for execution: Regional Development Council with Secretary of NEDA Regional Office 4. Attendant / Trainee: Secretaries of Regional Organizations, LGUs officers, President of FIAs/IAs and secretary group, staff of NIA RIO/IMO, Chairmen of ISMC and Secretary group 5. Contents: a) Workshop on Trouble Shooting of NIS and FIAs/ISs' Management b) Provision of work space for ISMC including office facilities
3) NIA Institutional Strengthening Program	1. Executing body : Institutional Development Division of CO, NIA 2. Schedule: 7 months / NIS 3. Counter body for execution: NIA Regional Office and IMO office 4. Attendant / Trainee: NIA personnel at CO, RIO and IMO 5. Contents: a. Capability built-up program (Central and Regional NIA Offices) b. Improvement program on management mechanism of NIA c. Support program for IMT implementation d. Strengthening program of Integrated Management information System
4) Specific Program on watershed management plan	1. Strengthening coordination with RDC, RAFC/PAFC and LGUs concerned through works shop on dissemination of the SLRIF to these organizations. 2. Strengthening coordination with RDC, RAFC/PAFC and LGUs on training program of watershed management

4.4 Proposed Counter Schemes

Item	*Description*
1) DENR	1. Technical assistance to concerned Provincial/municipal LGUs on watershed rehabilitation and management such as establishment of nurseries, community-based livelihood.
2) LGU	1. LGUs improve coordination program with NIA to give priority of the projects in annual budgeting and funds programming 2. Provincial LGUs to extend training to municipal agricultural officers to improve skills on technology promotion 3. LGUs improve capacity of its personnel to prepare project proposals through a training by DILG to ensure project's fund access to municipal development fund 4. LGUs provide reliable post-harvest facilities to ensure optimal operation of the facilities

5. Cost Estimate for Initial Investment

Item	*Description*		
1) Direct Cost for Civil Works	A. Mobilization	Php	2.54 Million
	B. Protection Dikes		-
	C. Diversion Works	Php	3.50 Million
	D. Canal Structures	Php	5.46 Million
	E. Canalization	Php	84.75 Million
	F. Drainage Structures	Php	2.84 Million
	G. Drainage Canalization	Php	4.26 Million
	H. Roads	Php	2.06 Million
	I. On-Farm Facilities/T.O. Gates	Php	0.97 Million
	J. IMT Support Facilities	Php	10.00 Million
	K. IMT GIS Database	Php	1.42 Million
	L. Institutional Development (5% of Direct Cost)	Php	6.50 Million
	M. Feasibility Studies & Detailed Engineering (2% of Direct Cost)	Php	2.54 Million
	Sub-total (Direct Cost)	Php	126.83 Million
2) Indirect Cost	A. General Engineering Supervision and Administration (3.5% of Direct Cost)	Php	4.44 Million
	B. NIA Management Fee (5% of Total Project Cost)	Php	6.91 Million
	Sub-total (Indirect Cost)	Php	11.35 Million
3) Total Project Cost	= 1+2	Php	138.18 Million
Cost per ha.		Php	97,311.00 /ha.

6. Implementation Plan

Item	*Description*
1) Contract package	1 - Local Competitive Bidding (LCB)
2) Implementation Schedule	
a) Civil Works	
1) Survey, F/S, Design	21 months
2) Tendering	6 months
3) Construction	36 months
b) Institutional Improvement Works	
1) Reactivation Program of FIAs/IAs and Irrigation System Management Committee	34 months
2) NIA-IA-LGU Partnership	7 months
3) Strengthening of NIA staff	7 months

7. Project Evaluation

Item		*Description*	
1) Economic evaluation			
EIRR (Base)		EIRR = 15.7 %	: Project life 50 years
Sensitivity	Case-1	EIRR = 14.4 %	: Cost 10% up
	Case-2	EIRR = 14.3 %	: Benefit 10% down
	Case-3	EIRR = 13.1%	: Cost 10% up + Benefit 10% down
B/C		1.05	: discount rate 15 % p.a.
NPV		PHP 4 million	: discount rate 15 % p.a.
2) Financial evaluation		Farmer's net income increase = PHP 10,279 per ha per year	
3) Expected Impacts		1. Increased farmers' income 2. Increased rice self sufficiency of the country 3. Increased job opportunities in rural areas	

8. Environmental Aspects

Item	*Description*
1) Environmental aspect	Need to address problem of urban waste being thrown in the canals
2) Relocation of houses	None
3) Land acquisition	None

Table 1206 - Siluay-Buayan Economic Evaluation (EIRR)

Basic Case

Name of NIS 1206 - Siluay-Buayan | Region 12 IMO RIO Sultan Kudarat

EIRR : 15.7%	Net Present Value (Million PHP)	Benefit	Cost	B/C Ratio	NPV
	(15 % discount rate)	89	85	1.05	4

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011			0.61		0.61		1.26	1.26	0.65
2	2012			0.61		0.61		2.52	2.52	1.91
3	2013	36.30	1.06	0.61		37.96		3.78	3.78	-34.18
4	2014	48.40	1.41	0.61	0.86	51.28	1.64	5.04	6.68	-44.59
5	2015	36.30	1.06	0.61	2.02	39.98	4.04	6.30	10.34	-29.64
6	2016				2.88	2.88	6.16	7.56	13.72	10.84
7	2017				2.88	2.88	6.63	8.82	15.45	12.57
8	2018				2.88	2.88	6.84	10.08	16.92	14.04
9	2019				2.88	2.88	6.84	11.34	18.18	15.30
10	2020				2.88	2.88	6.84	12.60	19.44	16.56
11	2021				2.88	2.88	6.84	13.86	20.70	17.82
12	2022				2.88	2.88	6.84	15.12	21.96	19.08
13	2023				2.88	2.88	6.84	16.38	23.22	20.34
14	2024				2.88	2.88	6.84	17.64	24.48	21.60
15	2025				2.88	2.88	6.84	18.90	25.74	22.86
16	2026				2.88	2.88	6.84	20.16	27.00	24.12
17	2027				2.88	2.88	6.84	21.42	28.26	25.38
18	2028				2.88	2.88	6.84	22.68	29.52	26.64
19	2029				2.88	2.88	6.84	23.94	30.78	27.90
20	2030				2.88	2.88	6.84	25.20	32.04	29.16
21	2031				2.88	2.88	6.84	26.46	33.30	30.42
22	2032				2.88	2.88	6.84	27.72	34.56	31.68
23	2033				2.88	2.88	6.84	28.98	35.82	32.94
24	2034				2.88	2.88	6.84	30.24	37.08	34.20
25	2035				2.88	2.88	6.84	31.50	38.34	35.46
26	2036				2.88	2.88	6.84	32.76	39.60	36.72
27	2037				2.88	2.88	6.84	34.02	40.86	37.98
28	2038				2.88	2.88	6.84	35.28	42.12	39.24
29	2039				2.88	2.88	6.84	36.54	43.38	40.50
30	2040				2.88	2.88	6.84	37.80	44.64	41.76
31	2041				2.88	2.88	6.84	39.06	45.90	43.02
32	2042				2.88	2.88	6.84	40.32	47.16	44.28
33	2043				2.88	2.88	6.84	41.58	48.42	45.54
34	2044				2.88	2.88	6.84	42.84	49.68	46.80
35	2045				2.88	2.88	6.84	44.10	50.94	48.06
36	2046				2.88	2.88	6.84	45.36	52.20	49.32
37	2047				2.88	2.88	6.84	46.62	53.46	50.58
38	2048				2.88	2.88	6.84	47.88	54.72	51.84
39	2049				2.88	2.88	6.84	49.14	55.98	53.10
40	2050				2.88	2.88	6.84	50.40	57.24	54.36
41	2051				2.88	2.88	6.84	51.66	58.50	55.62
42	2052				2.88	2.88	6.84	52.92	59.76	56.88
43	2053				2.88	2.88	6.84	54.18	61.02	58.14
44	2054				2.88	2.88	6.84	55.44	62.28	59.40
45	2055				2.88	2.88	6.84	56.70	63.54	60.66
46	2056				2.88	2.88	6.84	57.96	64.80	61.92
47	2057				2.88	2.88	6.84	59.22	66.06	63.18
48	2058				2.88	2.88	6.84	60.48	67.32	64.44
49	2059				2.88	2.88	6.84	61.74	68.58	65.70
50	2060				2.88	2.88	6.84	63.00	69.84	66.96

Case-1 (Cost 10% up)

Name of NIS 1206 - Siluay-Buayan | Region 12 IMO RIO Sultan Kudarat

EIRR : 14.4%	Net Present Value (Million PHP)	Benefit	Cost	B/C Ratio	NPV
	(15 % discount rate)	89	93	0.96	-4

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	0.67	-	0.67	-	1.26	1.26	0.59
2	2012	-	-	0.67	-	0.67	-	2.52	2.52	1.85
3	2013	39.93	1.16	0.67	-	41.76	-	3.78	3.78	-37.98
4	2014	53.24	1.55	0.67	0.95	56.40	1.64	5.04	6.68	-49.72
5	2015	39.93	1.16	0.67	2.22	43.97	4.04	6.30	10.34	-33.64
6	2016	-	-	-	3.17	3.17	6.16	7.56	13.72	10.55
7	2017	-	-	-	3.17	3.17	6.63	8.82	15.45	12.29
8	2018	-	-	-	3.17	3.17	6.84	10.08	16.92	13.75
9	2019	-	-	-	3.17	3.17	6.84	11.34	18.18	15.01
10	2020	-	-	-	3.17	3.17	6.84	12.60	19.44	16.27
11	2021	-	-	-	3.17	3.17	6.84	13.86	20.70	17.53
12	2022	-	-	-	3.17	3.17	6.84	15.12	21.96	18.79
13	2023	-	-	-	3.17	3.17	6.84	16.38	23.22	20.05
14	2024	-	-	-	3.17	3.17	6.84	17.64	24.48	21.31
15	2025	-	-	-	3.17	3.17	6.84	18.90	25.74	22.57
16	2026	-	-	-	3.17	3.17	6.84	20.16	27.00	23.83
17	2027	-	-	-	3.17	3.17	6.84	21.42	28.26	25.09
18	2028	-	-	-	3.17	3.17	6.84	22.68	29.52	26.35
19	2029	-	-	-	3.17	3.17	6.84	23.94	30.78	27.61
20	2030	-	-	-	3.17	3.17	6.84	25.20	32.04	28.87
21	2031	-	-	-	3.17	3.17	6.84	26.46	33.30	30.13
22	2032	-	-	-	3.17	3.17	6.84	27.72	34.56	31.39
23	2033	-	-	-	3.17	3.17	6.84	28.98	35.82	32.65
24	2034	-	-	-	3.17	3.17	6.84	30.24	37.08	33.91
25	2035	-	-	-	3.17	3.17	6.84	31.50	38.34	35.17
26	2036	-	-	-	3.17	3.17	6.84	32.76	39.60	36.43
27	2037	-	-	-	3.17	3.17	6.84	34.02	40.86	37.69
28	2038	-	-	-	3.17	3.17	6.84	35.28	42.12	38.95
29	2039	-	-	-	3.17	3.17	6.84	36.54	43.38	40.21
30	2040	-	-	-	3.17	3.17	6.84	37.80	44.64	41.47
31	2041	-	-	-	3.17	3.17	6.84	39.06	45.90	42.73
32	2042	-	-	-	3.17	3.17	6.84	40.32	47.16	43.99
33	2043	-	-	-	3.17	3.17	6.84	41.58	48.42	45.25
34	2044	-	-	-	3.17	3.17	6.84	42.84	49.68	46.51
35	2045	-	-	-	3.17	3.17	6.84	44.10	50.94	47.77
36	2046	-	-	-	3.17	3.17	6.84	45.36	52.20	49.03
37	2047	-	-	-	3.17	3.17	6.84	46.62	53.46	50.29
38	2048	-	-	-	3.17	3.17	6.84	47.88	54.72	51.55
39	2049	-	-	-	3.17	3.17	6.84	49.14	55.98	52.81
40	2050	-	-	-	3.17	3.17	6.84	50.40	57.24	54.07
41	2051	-	-	-	3.17	3.17	6.84	51.66	58.50	55.33
42	2052	-	-	-	3.17	3.17	6.84	52.92	59.76	56.59
43	2053	-	-	-	3.17	3.17	6.84	54.18	61.02	57.85
44	2054	-	-	-	3.17	3.17	6.84	55.44	62.28	59.11
45	2055	-	-	-	3.17	3.17	6.84	56.70	63.54	60.37
46	2056	-	-	-	3.17	3.17	6.84	57.96	64.80	61.63
47	2057	-	-	-	3.17	3.17	6.84	59.22	66.06	62.89
48	2058	-	-	-	3.17	3.17	6.84	60.48	67.32	64.15
49	2059	-	-	-	3.17	3.17	6.84	61.74	68.58	65.41
50	2060	-	-	-	3.17	3.17	6.84	63.00	69.84	66.67

Table 1206 - Siluay-Buayan Economic Evaluation (EIRR)

Case-2 (Benefit 10% down)

Name of NIS: 1206 - Siluay-Buayan | Region: 12 IMO,RIO Sultan Kudarat

EIRR : 14.3%	Net Present Value (Million PHP) (15 % discount rate)	Benefit	Cost	B/C Ratio	NPV
		80	85	0.95	-4

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	0.61	-	0.61	-	1.13	1.13	0.53
2	2012	-	-	0.61	-	0.61	-	2.27	2.27	1.66
3	2013	36.30	1.06	0.61	-	37.96	-	3.40	3.40	-34.56
4	2014	48.40	1.41	0.61	0.86	51.28	1.48	4.54	6.01	-45.26
5	2015	36.30	1.06	0.61	2.02	39.98	3.63	5.67	9.30	-30.67
6	2016	-	-	-	2.88	2.88	5.54	6.80	12.34	9.46
7	2017	-	-	-	2.88	2.88	5.97	7.94	13.91	11.03
8	2018	-	-	-	2.88	2.88	6.16	9.07	15.23	12.35
9	2019	-	-	-	2.88	2.88	6.16	10.21	16.36	13.48
10	2020	-	-	-	2.88	2.88	6.16	11.34	17.50	14.62
11	2021	-	-	-	2.88	2.88	6.16	12.47	18.63	15.75
12	2022	-	-	-	2.88	2.88	6.16	13.61	19.76	16.88
13	2023	-	-	-	2.88	2.88	6.16	14.74	20.90	18.02
14	2024	-	-	-	2.88	2.88	6.16	15.88	22.03	19.15
15	2025	-	-	-	2.88	2.88	6.16	17.01	23.17	20.29
16	2026	-	-	-	2.88	2.88	6.16	18.14	24.30	21.42
17	2027	-	-	-	2.88	2.88	6.16	19.28	25.43	22.55
18	2028	-	-	-	2.88	2.88	6.16	20.41	26.57	23.69
19	2029	-	-	-	2.88	2.88	6.16	21.55	27.70	24.82
20	2030	-	-	-	2.88	2.88	6.16	22.68	28.84	25.96
21	2031	-	-	-	2.88	2.88	6.16	23.81	29.97	27.09
22	2032	-	-	-	2.88	2.88	6.16	24.95	31.10	28.22
23	2033	-	-	-	2.88	2.88	6.16	26.08	32.24	29.36
24	2034	-	-	-	2.88	2.88	6.16	27.22	33.37	30.49
25	2035	-	-	-	2.88	2.88	6.16	28.35	34.51	31.63
26	2036	-	-	-	2.88	2.88	6.16	29.48	35.64	32.76
27	2037	-	-	-	2.88	2.88	6.16	30.62	36.77	33.89
28	2038	-	-	-	2.88	2.88	6.16	31.75	37.91	35.03
29	2039	-	-	-	2.88	2.88	6.16	32.89	39.04	36.16
30	2040	-	-	-	2.88	2.88	6.16	34.02	40.18	37.30
31	2041	-	-	-	2.88	2.88	6.16	35.15	41.31	38.43
32	2042	-	-	-	2.88	2.88	6.16	36.29	42.44	39.56
33	2043	-	-	-	2.88	2.88	6.16	37.42	43.58	40.70
34	2044	-	-	-	2.88	2.88	6.16	38.56	44.71	41.83
35	2045	-	-	-	2.88	2.88	6.16	39.69	45.85	42.97
36	2046	-	-	-	2.88	2.88	6.16	40.82	46.98	44.10
37	2047	-	-	-	2.88	2.88	6.16	41.96	48.11	45.23
38	2048	-	-	-	2.88	2.88	6.16	43.09	49.25	46.37
39	2049	-	-	-	2.88	2.88	6.16	44.23	50.38	47.50
40	2050	-	-	-	2.88	2.88	6.16	45.36	51.52	48.64
41	2051	-	-	-	2.88	2.88	6.16	46.49	52.65	49.77
42	2052	-	-	-	2.88	2.88	6.16	47.63	53.78	50.90
43	2053	-	-	-	2.88	2.88	6.16	48.76	54.92	52.04
44	2054	-	-	-	2.88	2.88	6.16	49.90	56.05	53.17
45	2055	-	-	-	2.88	2.88	6.16	51.03	57.19	54.31
46	2056	-	-	-	2.88	2.88	6.16	52.16	58.32	55.44
47	2057	-	-	-	2.88	2.88	6.16	53.30	59.45	56.57
48	2058	-	-	-	2.88	2.88	6.16	54.43	60.59	57.71
49	2059	-	-	-	2.88	2.88	6.16	55.57	61.72	58.84
50	2060	-	-	-	2.88	2.88	6.16	56.70	62.86	59.98

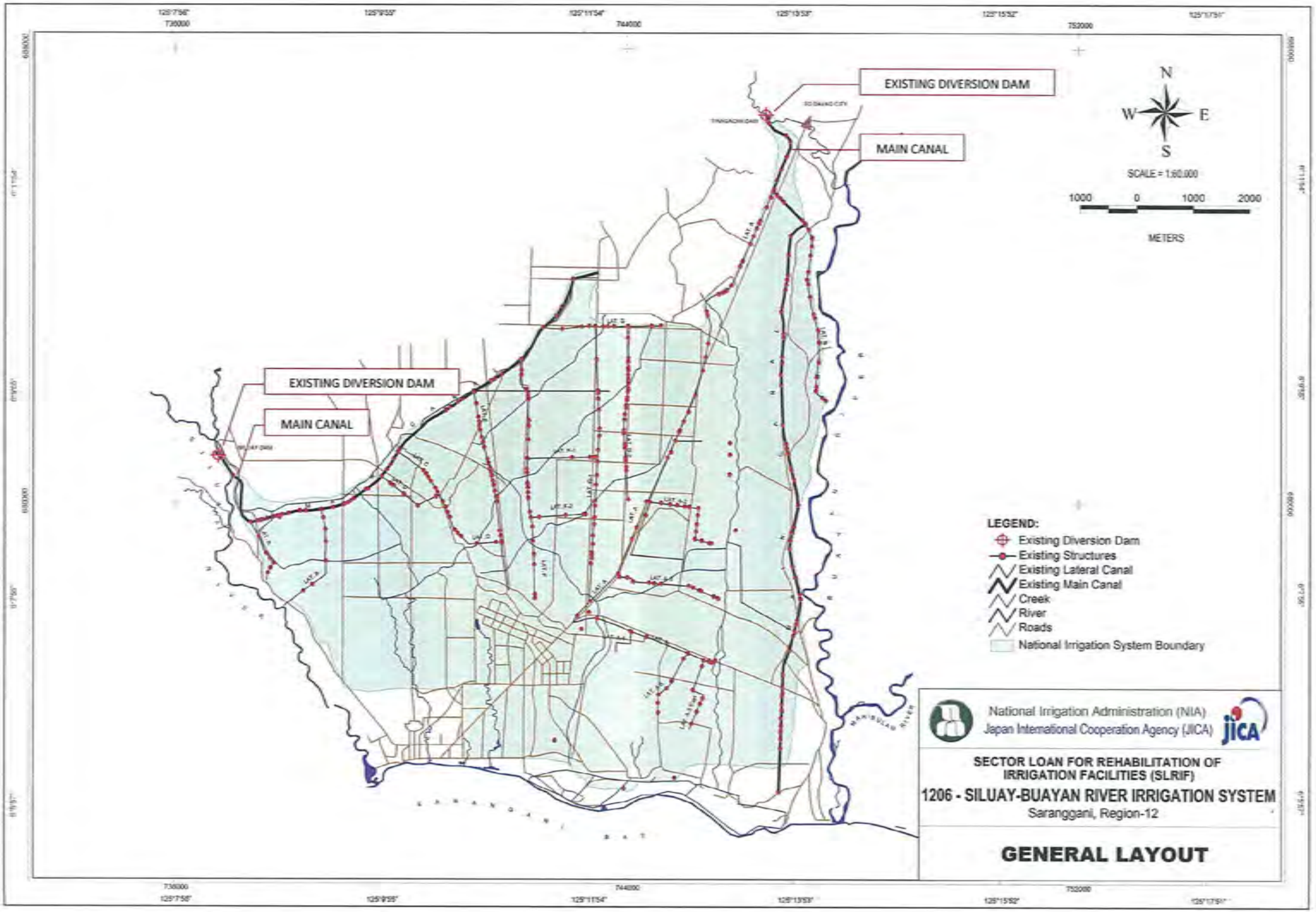
Case-3 (Cost 10% up and Benefit 10% down)

Name of NIS: 1206 - Siluay-Buayan | Region: 12 IMO,RIO Sultan Kudarat

EIRR : 13.1%	Net Present Value (Million PHP) (15 % discount rate)	Benefit	Cost	B/C Ratio	NPV
		80	93	0.86	-13

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	0.67	-	0.67	-	1.13	1.13	0.47
2	2012	-	-	0.67	-	0.67	-	2.27	2.27	1.60
3	2013	39.93	1.16	0.67	-	41.76	-	3.40	3.40	-38.36
4	2014	53.24	1.55	0.67	0.95	56.40	1.48	4.54	6.01	-50.39
5	2015	39.93	1.16	0.67	2.22	43.97	3.63	5.67	9.30	-34.67
6	2016	-	-	-	3.17	3.17	5.54	6.80	12.34	9.18
7	2017	-	-	-	3.17	3.17	5.97	7.94	13.91	10.74
8	2018	-	-	-	3.17	3.17	6.16	9.07	15.23	12.06
9	2019	-	-	-	3.17	3.17	6.16	10.21	16.36	13.19
10	2020	-	-	-	3.17	3.17	6.16	11.34	17.50	14.33
11	2021	-	-	-	3.17	3.17	6.16	12.47	18.63	15.46
12	2022	-	-	-	3.17	3.17	6.16	13.61	19.76	16.60
13	2023	-	-	-	3.17	3.17	6.16	14.74	20.90	17.73
14	2024	-	-	-	3.17	3.17	6.16	15.88	22.03	18.86
15	2025	-	-	-	3.17	3.17	6.16	17.01	23.17	20.00
16	2026	-	-	-	3.17	3.17	6.16	18.14	24.30	21.13
17	2027	-	-	-	3.17	3.17	6.16	19.28	25.43	22.27
18	2028	-	-	-	3.17	3.17	6.16	20.41	26.57	23.40
19	2029	-	-	-	3.17	3.17	6.16	21.55	27.70	24.53
20	2030	-	-	-	3.17	3.17	6.16	22.68	28.84	25.67
21	2031	-	-	-	3.17	3.17	6.16	23.81	29.97	26.80
22	2032	-	-	-	3.17	3.17	6.16	24.95	31.10	27.94
23	2033	-	-	-	3.17	3.17	6.16	26.08	32.24	29.07
24	2034	-	-	-	3.17	3.17	6.16	27.22	33.37	30.20
25	2035	-	-	-	3.17	3.17	6.16	28.35	34.51	31.34
26	2036	-	-	-	3.17	3.17	6.16	29.48	35.64	32.47
27	2037	-	-	-	3.17	3.17	6.16	30.62	36.77	33.61
28	2038	-	-	-	3.17	3.17	6.16	31.75	37.91	34.74
29	2039	-	-	-	3.17	3.17	6.16	32.89	39.04	35.87
30	2040	-	-	-	3.17	3.17	6.16	34.02	40.18	37.01
31	2041	-	-	-	3.17	3.17	6.16	35.15	41.31	38.14
32	2042	-	-	-	3.17	3.17	6.16	36.29	42.44	39.28
33	2043	-	-	-	3.17	3.17	6.16	37.42	43.58	40.41
34	2044	-	-	-	3.17	3.17	6.16	38.56	44.71	41.54
35	2045	-	-	-	3.17	3.17	6.16	39.69	45.85	42.68
36	2046	-	-	-	3.17	3.17	6.16	40.82	46.98	43.81
37	2047	-	-	-	3.17	3.17	6.16	41.96	48.11	44.95
38	2048	-	-	-	3.17	3.17	6.16	43.09	49.25	46.08
39	2049	-	-	-	3.17	3.17	6.16	44.23	50.38	47.21
40	2050	-	-	-	3.17	3.17	6.16	45.36	51.52	48.35
41	2051	-	-	-	3.17	3.17	6.16	46.49	52.65	49.48
42	2052	-	-	-	3.17	3.17	6.16	47.63	53.78	50.62
43	2053	-	-	-	3.17	3.17	6.16	48.76	54.92	51.75
44	2054	-	-	-	3.17	3.17	6.16	49.90	56.05	52.88
45	2055	-	-	-	3.17	3.17	6.16	51.03	57.19	54.02
46	2056	-	-	-	3.17	3.17	6.16	52.16	58.32	55.15
47	2057	-	-	-	3.17	3.17	6.16	53.30	59.45	56.29
48	2058	-	-	-	3.17	3.17	6.16	54.43	60.59	57.42
49	2059	-	-	-	3.17	3.17	6.16	55.57	61.72	58.55
50	2060	-	-	-	3.17	3.17	6.16	56.70	62.86	59.69


EXISTING DIVERSION DAM
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Creek
River
Roads
National Irrigation System Boundary
National Irrigation Administration (NIA)
Japan International Cooperation Agency (JICA)
SECTOR LOAN FOR REHABILITATION OF IRRIGATION FACILITIES (SLRIF)
1206 - SILUAY-BUAYAN RIVER IRRIGATION SYSTEM
Sarangganí, Region-12
GENERAL LAYOUT

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities
Photograph of Irrigation Facilities

NIS name: Buayan (Region 12)

Location / Facility	*Photograph*	*Comments*
01. Siluay Diversion Works. Longitude: 6° 09'24"E Latitude: 124° 08'29"N		View taken facing downstream. Repair of the downstream scour protection works.
02. Siluay Diversion Works Longitude: 6° 09'24"E Latitude: 124° 08'29"N		View taken facing upstream.
03. Main Canal Sta. 3+200 Longitude: 6° 08'51"E Latitude: 124° 06'22"N		Canal needs to be concrete lined.

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities
Photograph of Irrigation Facilities

NIS name: Buayan (Region 12)

Location / Facility	*Photograph*	*Comments*
Headgate Lateral A Sta. 6+327 Longitude: 6° 09'24"E Latitude: 124° 08'29"N		Steel gates need to be repaired.
Lateral E Sta. 0+400 Longitude: 6° 09'56"E Latitude: 124° 11'03"N		Canal needs re-shaping and concrete-lining.
Headgate Lateral F MC Sta. 7+000 Longitude: 6° 10'15"E Latitude: 125° 11'27"N		Structure needs concrete wing walls and cut-off walls and steel gates.

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities
Photograph of Irrigation Facilities

NIS name: Buayan (Region 12)

Location / Facility	*Photograph*	*Comments*
Main Canal Longitude: 6° 10'16"E Latitude: 125° 11' 27"N		Canal needs to be concrete lined.
Headgate Lateral G Sta. 8+418 Longitude: 6° 10'31"E Latitude: 125° 11'38"N		Agricultural debris from nearby banana farms clogging up the headgate.
Road crossing. Main Canal Sta. 7+015 Longitude: 6° 10'16"E Latitude: 125° 11'27"N		Inlet transition needs to be repaired.

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities

Photograph of Irrigation Facilities

NIS name: Buayan (Region 12)

Location / Facility	*Photograph*	*Comments*
Buayan Diversion Works Longitudinal view along the dam axis. Longitude: 6° 12'32"E Latitude: 125° 13'43"N		Downstream scour protection works (concrete blocks) need to be restored. River upstream of the dam needs to be dredged and straightened.
Buayan Diversion Works. View facing upstream. Longitude: 6° 12'32"E Latitude: 125° 13'43"N		Same as above.
Buayan Diversion Works View facing downstream. Longitude: 6° 12'32"E Latitude: 125° 13'43"N		Same as above.

THE REPUBLIC OF PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION

Sector Loan on Rehabilitation of Irrigation Facilities

NIS SUMMARY REPORT

1301
Cabadbaran-Taguibo RIS

Region 13

Agusan del Norte Province

July 2009

Survey Team for
Japan International Cooperation Agency
(JICA)

Features of NIS for Rehabilitation Project

1. General

Item	*Description*		
1) Name of NIS	**Cabadbaran-Taguibo RIS**		Code: 1301
2) Location	Region	Region 13	
	Province	Agusan del Norte	
	Municipality	Cabadbaran, Romualdez, Ampayon	
	Distance	22km (Capital of Province Butuan City)	
3) Type of Water Source	Water Source	Cabadbaran River and Taguibo River	
	Type Ogee/Weir	Diversion Dam (65.00 m wide, 1.50 m high)	
4) Area	Service Area	3,212 ha	
	FUSA	2,500 ha	
5) Beneficiary Farmers	2,200 farmers	Average paddy field cultivating size = 1.14 ha per farmer	
6) Irrigator's Association	IAs established = 15 FIA established = 1 in 2008		
7) Features of NIS and Necessity of the project	There are two water sources for the irrigation system, namely; Cabadbaran River and Taguibo River, that will be irrigating 3,000 ha and 700 ha, respectively, totaling to 3,700 has. The system started its operation on January 1, 1990. Cabadbaran River has more than enough supply of water for the whole year of its irrigation requirement, while Taguibo River has critical water supply during drought. Cabadbaran Dam is frequently experiencing damages on its right protection dike. Until today, dike breached for the fourth times. On the other hand, Taguibo River has encountered another problem where at the upstream area, the Local Water District extract water for domestic use. Shortage of water supply is the problem of the system added by damage canal lining, scoured structures along main canal, collapsed auxiliary berm due to erosion and wallowing of carabao in the canal. Thus irrigated and planted area has reduced to 600 hectares. In the above problems of the two diversion dam, the management adopted the "RE-USE" of water from the drainage canal to supplement and sustain water requirement of the irrigable area. Rehabilitation project is every important in order to recover the 600 hectares to boast rice production.		
8) Outline of the Proposed Project	A. Engineering 1. Repair of diversion dam 2. Repair and improvement of irrigation canal and structures 3. Repair and improvement of drainage canal and structures 4. Repair and improvement of service roads 5. Repair and improvement of on-farm facilities 6. Repair and construction of IMT support facilities-IA Bldg solar drier, warehouse with IA building 7. Development and establishment of IMT GIS database B. Institutional Strengthening Program B. 1 Basic Program 1. Reactivation of FIA/IA and Strengthening of Irrigation System Management Committee (ISMC) of NIS including construction of IMT support facilities 2. Strengthening of NIA-IA-LGUs Partnership 3. Strengthening NIA Institutional Capacity		

	B.2 Specific Program to strengthen institutional mechanism together with LGUs 1. Improvement of watershed management
9) Proposed Project Component	A. Engineering 1. Construction of civil works for rehabilitation of diversion works, canal system, drainage system, roads, and IMT support facilities. B. Institutional Strengthening Program 1. Reactivation of FIAs/IAs including reformation of TSGA / IA / FIA areas, construction of IMT support facilities (demand base) 2. Strengthening NIA-IA- LGUs Partnership, especially coordination RDC, RAFC/PAFC with FIAs/IAs and ISMC 3. Institutional development program to strengthen management capacity of NIA field offices and IAs.
10) Project Cost (Direct cost only, excluding escalation, contingency, tax)	1. Direct cost PHP 301.38 Million - *Civil Works* *PHP* *285.55* *Million* - *Institutional Development* *PHP* *9.80* *Million* - *Engineering Services* *PHP* *6.03* *Million* 2. Indirect cost PHP 26.97 Million Total Project Cost (1+2) PHP 328.34 Million Cost per ha PHP 131,338.00 per ha.
11) Project Benefit	1. To increase paddy production by 4,209 tons/year 2. To increase farmers' net income to PHP58,491.00/ha/year 3. To establish functional and self-reliant IAs 4. To improve performance of NIS
12) Project Justification	EIRR = 18.5 %, B/C = 1.24 (discount rate 15%)

2. Project History (Construction/Rehabilitation)

Year	*Description*
1991	Cabadbaran Dam Repair under IOSP assisted by World Bank
1993	Cabadbaran Dam Repair under IOSP assisted by World Bank
1995	Cabadbaran Dam Repair under IOSP assisted by World Bank
1996	Cabadbaran Dam Repair under IOSP assisted by World Bank
1996	Repair of Main Canal and desilting works under GOP Funds
2006-2008	Repair of main canal, access road under GOP Funds
2007	Repair of selected structures and irrigation facilities under GOP Funds
2008	Drainage improvement along Lateral A under GOP Funds

3. Present Condition

3.1 Natural Conditions

Item	*Description*
1) Annual Rainfall	1,876.10 mm
2) Seasons	Wet season: May-October Dry season: November-April
3) Dominant Soil in NIS Area	Sandy Clay Loam/ Silty Clay/ Silty Loam
4) Topography	Generally Flat / Plain

3.2 Socio-economy (Region/Province)

Item	*Description*
1) GRDP	PHP 96,364 million (Year 2007), Per Capita GRDP = PHP 40,012 per year
2) Population	314,027 (province)
3) Population Growth Rate	1.32 % per year (province)
4) Labor Force	1,504,000 (region)
5) Poverty Population	40 % to total population (province)

3.3 Present Agriculture in NIS

Item	*Description*					
1) Farm Household in NIS	Total beneficiaries	2,200 households				
	Land owners	910 households (41.3 %)				
	Tenant farmers	1,290 households (58.7 %)				
2) Paddy Field Size in NIS	1.14 ha per household (FUSA/Total beneficiaries as of 2008)					
3) Present Land Use in NIS	Paddy field planted	2,300 ha	71.6 %	As of 2008		
	Paddy field not planted	200 ha	6.2 %	As of 2008		
	Upland crop field	0 ha	0.0 %			
	Permanent crop field	72 ha	2.2 %			
	Undeveloped area	0 ha	0.0 %			
	Build-up area	384 ha	12.0 %			
	High ground	256 ha	8.0 %			
	Grassland	0 ha	0.0 %			
	Swamp	0 ha	0.0 %			
	Unspecified	0 ha	0.0 %			
4) Paddy Field in FUSA (ha)	2,500					

5) Paddy Cropped Area (ha)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Wet Season	2,500	2,500	2,200	2,287	2,287	2,355
Dry Season	2,336	2,212	1,750	2,287	2,300	2,177

6) Cropping Intensity (%)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
(per year)	193	188	158	183	183	181

7) Unit Yield of Paddy (ton/ha)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Wet Season	4.00	4.25	4.00	4.25	3.55	4.01
Dry Season	3.90	4.00	3.90	4.00	3.75	3.91

8) Paddy Production (ton)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Wet Season	10,000	10,625	8,800	9,720	8,119	9,453
Dry Season	9,110	8,848	6,825	9,148	8,625	8,511

3.4 Water Resources

Item	*Description*
1) Name of Rivers	Cabadbaran River, Taguibo River
2) Catchment Area at Dam	213 km^2
3) Ave. River Discharge	6.10 m^3/s
4) Ave. Dry Season Discharge	7.85 m^3/s
5) Diverted Intake Discharge	2.62 m^3/s
6) Water Requirement	4.50 m^3/s
7) Sedimentation	Medium

3.5 Existing Irrigation System

Item	*Description*
1) Diversion Dam	Overflow crest width 55.00 m, Dam height 1.50 m Dam width 65.0 m
2) Main Canal	Total length 21.749 km (Lined portion 21.749 km)
3) Lateral Canals	Total length 48.360 km (Lined portion 41.25 km)
4) On-farm facilities	Total length 76.92 km (Lined portion 0.0 km) Turn-outs = 120 units
5) Drainage Canal	Total length 15.89 kms.
6) Canal Structures	No. = 249 units
7) Drainage Structures	No. = 52 units
8) Farm roads	Total length 60.89 km (pavement= 0.00 kms.)
9) Flood Protection Dike	Total length 135.70 m

3.6 Institutions for O&M of NIS

Item	*Description*					
1) Regional Irrigation Office	Name: Region 13 - CARAGA					
2) IMO	Name: Agusan del Norte – Surigao del Norte IMO					
Staff in 2009	Total number of staff: 52					
3) Irrigator' Association (IA)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Number of FIA (nos)					1	
Number of IA (nos)					15	
Number of TSAG(nos)	105	105	105	105	105	105
Functionality of IA	80.8	83.8	82.9	83.2	82.4	82.62
Collection of ISF (wet, %)	-	-	-	-	-	-
Collection of ISF (dry, %)	-	-	-	-	-	-
4) NIS Category based on IA 2008 O&M Contract (NIA-IA)	No. of IA					
Category A	1					
Category B	13					
Category C	1					

3.7 Existing Problems

Item	*Description*
1) Diversion Works	1. Recurrence breach on right protection dike every occurrence of maximum flood discharge of the river, 2. Displaced and eroded side slope protection works, 3. Scoured and displaced loose protection works at downstream of concrete apron, 4. Rusted steel frame support of the lifting mechanism of sluiceway gates
2) Canal and Structures	1. Inefficient side drainage along right main canal making run-off water enters the canal bringing silts, sand, and gravel inside the canal. 2. Wallowing of carabao in the irrigation canal that damages embankment, side slopes, scoured protection works at the inlet and outlet transition of the structure. 3. Trees are planted and grown along auxiliary berm of the canal believing it would help stabilized embankment but rather soften the compaction of soil due to root penetration thus makes vulnerable to erosion. 4. Encroachment of houses and building structures along canal, 5. Damping of garbage and effluents in the canal 6. Uncontrolled opening and closure of gates during delivery that makes water overflows the canal and erode berm embankment. 7. Rampant stealing of steel gates 8. Unauthorized extraction water by boring holes of the concrete canal lining and embankment
3) Drainage Canal	1. Debris, cut banana trunks, and branches are blocking the culvert that results to overflowing of water from the canal and eroded road gravel surfacing and embankment of canal

Item	*Description*
	2. Wallowing of carabao in the drainage canal that scours the side slope embankment and auxiliary berm of the canal 3. Construction of check structures along drainage canal hampers efficient drainages of the irrigation system
4) Other Project Facilities (road, bridge, flood dike, building, etc)	1. Gate keepers quarter and NIS building facilities are dilapidated and deteriorated in time, there were no rehabilitation work after the 20years since it was turnover. 2. Lacking of Access roads connecting service roads from one canal to the other. Service roads fast deterioration due to heavy loads of transport from commuters other than farmers
5) Water Management and O&M Activities	1. Lacking of water measuring device like staff gages at the diversion dam, junctions of main canal and laterals, turnouts and farm ditches. 2. Lack of control on water delivery, 3. Lacking of water measurement database 4. Lack of rainfall gage instrument and evaporation pan
6) Status of NIS and IA Management	Status Type G evaluated by Radar Graph. Specific problems are: 1. ISF collection efficiency at 0 for both seasons 2. Low paddy yield during wet and dry seasons at 65 cavans/ha and 75 cavans/ha, respectively.
7) Watershed Management	1. Lack of will on implementation of policy for watershed conservation, 2. Lack of local program on watershed preservations
8) Coordination with LGU and Agencies concerned	1. Lack of coordination by NIA's field offices and IAs with concerned LGUs and other line agencies on specific problem such as watershed management.

4. Proposed Rehabilitation Plan

4.1 Agricultural Development Plan

Item	*Description*			
Cropping schedule	*Wet Season*	*Dry Season-1*	*Dry Season-2*	*Annual*
1) Type of Crops	Rice	Rice	-	-
2) Cropping Area (ha)	2,500	2,340	-	-
3) Target Unit Yield (ton/ha)	4.45	4.20	-	-
3) Total Production (ton)	11,125	9,828	-	-

4.2 Civil Works

Item	*Description*
1) Diversion Works	1. Repair of Cabadbaran Dam right protection dike/groynes, Extend ogee weir by 55 meters, restore launching apron downstream of concrete apron, restoration of concrete blocks at downstream side slope protection works, installation of engine driven lifting mechanism assembly for sluiceway gates. 2. Repair of Taguibo Dam curtain wall, installation of engine driven lifting mechanism assembly for sluiceway gates. 3. Restoration of side slope protection works of Casao-casao Intake
2) Canal Structures	1. Repair of damage inlet and outlet transition scour protection works (Angeles Dr Structure, Angeles River Control, Turnout A1-5, Tagbongabong Chk Str, Dacera Water Re-use Str, Ladido Chk Str, Ochale Chk Str, Lat C1 Chk Str, Dao Area Chk Str) – 120 units
3) Canalization	1. Construction of 2km rectangular flume from end of main canal in Cabadbaran to Head gate of Lateral B – 530 kms 2. Repair of damage canal lining in main canal, installation of 40 meters canal lining at lateral canal after the head gate transition for water measurement. 3. Rehabilitation of canal – 53 kms
4) Drainage Structures	1. Construction of Check Structure for "RE-USE" of drainage water 2. Repair of drainage structures – 17 units

5) Drainage Canalization	1. Desilting and improvement of drainage canals and various creeks - 12.5 kms
6) Service Roads	1. Gravel surfacing on roads – 35.1 kms
7) On-Farm Facilities	1. Repair /replacement of dilapidated turn out steel gates 2. Construction of new turn outs and farm ditches
8) IMT Support Facilities	1. Construction of post-harvest facilities—warehouses, IA buildings, solar driers with shed – 2 sets
9) IMT GIS Database	1. Development and establishment of GIS database

4.3 Institutional Strengthening Program

Item	*Description*
1) Reactivation Program of FIAs/IAs and System Management Committee (ISMC)	1. Executing body : Project Management Office with assistance of Consultant 2. Schedule: 34 months / NIS 3. Counter body for execution: NIA Regional Office and IMO office 4. Attendant / Trainee: President of FIAs/IAs and secretary group, staff of NIA RIO/IMO, Chairmen of ISMC and Secretary group and LGUs officers, 5. Contents: a) Survey & Study by Consultant b) Workshops on coordination activities with and dissemination on reformation plan to FIAs/IAs c) Workshop on coordination activities with LGUs d) Organization and Legal Registration of FIAs/IAs to be re-active and reactivation of SMC e) Construction of IMT support facilities for FIAs/CIA f) Workshop and Training of FIAs/IAs members on management under the IMT g) Assessment/Evaluation for and Negotiation of Contracting under IMT h) Assistance of reactivated IAs/FIAs in organizational and management activities
2) Strengthening Program of NIA - IA - LGU Partnership	1. Executing body : Project Management Office with assistance of Consultant, & Management System Committee (MSC) of NIS 2. Schedule: 7 months / NIS 3. Counter body for execution: Regional Development Council with Secretary of NEDA Regional Office 4. Attendant / Trainee: Secretaries of Regional Organizations, LGUs officers, President of FIAs/IAs and secretary group, staff of NIA RIO/IMO, Chairmen of ISMC and Secretary group 5. Contents: a) Workshop on Trouble Shooting of NIS and FIAs/ISs' Management b) Provision of work space for ISMC including office facilities
3) NIA Institutional Strengthening Program	1. Executing body : Institutional Development Division of CO, NIA 2. Schedule: 7 months / NIS 3. Counter body for execution: NIA Regional Office and IMO office 4. Attendant / Trainee: NIA personnel at CO, RIO and IMO 5. Contents: a. Capability built-up program (Central and Regional NIA Offices) b. Improvement program on management mechanism of NIA c. Support program for IMT implementation d. Strengthening program of Integrated Management information System
4) Specific Program on watershed management plan	1. Strengthening coordination with RDC, RAFC/PAFC and LGUs concerned through works shop on dissemination of the SLRIF to these organizations. 2. Strengthening coordination with RDC, RAFC/PAFC and LGUs on training program of watershed management

4.4 Proposed Counter Schemes

Item	*Description*
1) DENR	1. Technical assistance to concerned Provincial/municipal LGUs on watershed rehabilitation and management such as establishment of nurseries, community-based livelihood
2) LGU	1. LGUs improve coordination program with NIA to give priority of the projects in annual budgeting and funds programming 2. Provincial LGUs to extend training to municipal agricultural officers to improve skills on technology promotion 3. LGUs improve capacity of its personnel to prepare project proposals through a training by DILG to ensure project's fund access to municipal development fund 4. LGUs provide reliable post-harvest facilities to ensure optimal operation of the facilities

5. Cost Estimate for Initial Investment

Item	*Description*		
1) Direct Cost for Civil Works	A. Mobilization	Php	6.03 Million
	B. Protection Dikes		-
	C. Diversion Works	Php	172.97 Million
	D. Canal Structures		-
	E. Canalization	Php	12.31 Million
	F. Drainage Structures	Php	5.00 Million
	G. Drainage Canalization	Php	29.06 Million
	H. Roads	Php	26.68 Million
	I. On-Farm Facilities/T.O. Gates	Php	11.00 Million
	J. IMT Support Facilities	Php	20.00 Million
	K. IMT GIS Database	Php	2.50 Million
	L. Institutional Development (5% of Direct Cost)	Php	9.80 Million
	M. Feasibility Studies & Detailed Engineering (2% of Direct Cost)	Php	6.03 Million
	Sub-total (Direct Cost)	Php	301.38 Million
2) Indirect Cost	A. General Engineering Supervision and Administration (3.5% of Direct Cost)	Php	10.55 Million
	B. NIA Management Fee (5% of Total Project Cost)	Php	16.42 Million
	Sub-total (Indirect Cost)	Php	26.97 Million
3) Total Project Cost	= 1+2	Php	328.34 Million
Cost per ha.		Php	131,338.00 /ha.

6. Implementation Plan

Item	*Description*
1) Contract package	1 - Local Competitive Bidding (LCB)
2) Implementation Schedule	
a) Civil Works	
1) Survey, F/S, Design	18 months
2) Tendering	6 months
3) Construction	27 months
b) Institutional Improvement Works	
1) Reactivation Program of FIAs/IAs and Irrigation System Management Committee	34 months
2) NIA-IA-LGU Partnership	7 months
3) Strengthening of NIA staff	7 months

7. Project Evaluation

Item		*Description*	
1) Economic evaluation			
EIRR (Base)		EIRR = 18.5 %	: Project life 50 years
Sensitivity	Case-1	EIRR = 16.8 %	: Cost 10% up
	Case-2	EIRR = 16.7 %	: Benefit 10% down
	Case-3	EIRR = 15.2%	: Cost 10% up + Benefit 10% down
B/C		1.24	: discount rate 15% p.a.
NPV		PHP 44 million	: discount rate 15% p.a.
2) Financial evaluation		Farmer's net income increase = PHP 32,942 per ha per year	
3) Expected Impacts		1. Increased farmers' income 2. Increased rice self sufficiency of the country 3. Increased job opportunities in rural areas	

8. Environmental Aspects

Item	*Description*
1) Environmental aspect	1. Collaboration with DENR, DA, LGU, IA on the following: a) Conservation of Watersheds Programs b) Slope protection for reduction of siltation c) Municipal ordinance on prohibition of illegal domestic disposal d) Moratorium on quarry of sand and gravel at downstream of the Dam regardless of distance
2) Relocation of houses	None
3) Land acquisition	None

Table 1301 - Cabadbaran - Taguibo Economic Evaluation (EIRR)

Basic Case

Name of NIS: 1301 - Cabadbaran - Taguibo | Region: 13 | IMO: RIO | Agusan-Surigao Del Norte

EIRR : 18.5%	Net Present Value (Million PHP) (15 % discount rate)	Benefit	Cost	B/C Ratio	NPV
		228	184	1.24	43

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011			1.47		1.47		1.46	1.46	-0.01
2	2012			1.47		1.47		2.92	2.92	1.45
3	2013	81.92	1.59	1.47		84.99		4.38	4.38	-80.61
4	2014	109.23	2.12	1.47	1.52	114.35	10.02	5.84	15.86	-98.49
5	2015	81.92	1.59	1.47	3.55	88.54	24.63	7.30	31.93	-56.61
6	2016				5.07	5.07	37.57	8.76	46.33	41.26
7	2017				5.07	5.07	40.49	10.22	50.71	45.64
8	2018				5.07	5.07	41.74	11.68	53.42	48.35
9	2019				5.07	5.07	41.74	13.14	54.88	49.81
10	2020				5.07	5.07	41.74	14.60	56.34	51.27
11	2021				5.07	5.07	41.74	16.06	57.80	52.73
12	2022				5.07	5.07	41.74	17.52	59.26	54.19
13	2023				5.07	5.07	41.74	18.98	60.72	55.65
14	2024				5.07	5.07	41.74	20.44	62.18	57.11
15	2025				5.07	5.07	41.74	21.90	63.64	58.57
16	2026				5.07	5.07	41.74	23.36	65.10	60.03
17	2027				5.07	5.07	41.74	24.82	66.56	61.49
18	2028				5.07	5.07	41.74	26.28	68.02	62.95
19	2029				5.07	5.07	41.74	27.74	69.48	64.41
20	2030				5.07	5.07	41.74	29.20	70.94	65.87
21	2031				5.07	5.07	41.74	30.66	72.40	67.33
22	2032				5.07	5.07	41.74	32.12	73.86	68.79
23	2033				5.07	5.07	41.74	33.58	75.32	70.25
24	2034				5.07	5.07	41.74	35.04	76.78	71.71
25	2035				5.07	5.07	41.74	36.50	78.24	73.17
26	2036				5.07	5.07	41.74	37.96	79.70	74.63
27	2037				5.07	5.07	41.74	39.42	81.16	76.09
28	2038				5.07	5.07	41.74	40.88	82.62	77.55
29	2039				5.07	5.07	41.74	42.34	84.08	79.01
30	2040				5.07	5.07	41.74	43.80	85.54	80.47
31	2041				5.07	5.07	41.74	45.26	87.00	81.93
32	2042				5.07	5.07	41.74	46.72	88.46	83.39
33	2043				5.07	5.07	41.74	48.18	89.92	84.85
34	2044				5.07	5.07	41.74	49.64	91.38	86.31
35	2045				5.07	5.07	41.74	51.10	92.84	87.77
36	2046				5.07	5.07	41.74	52.56	94.30	89.23
37	2047				5.07	5.07	41.74	54.02	95.76	90.69
38	2048				5.07	5.07	41.74	55.48	97.22	92.15
39	2049				5.07	5.07	41.74	56.94	98.68	93.61
40	2050				5.07	5.07	41.74	58.40	100.14	95.07
41	2051				5.07	5.07	41.74	59.86	101.60	96.53
42	2052				5.07	5.07	41.74	61.32	103.06	97.99
43	2053				5.07	5.07	41.74	62.78	104.52	99.45
44	2054				5.07	5.07	41.74	64.24	105.98	100.91
45	2055				5.07	5.07	41.74	65.70	107.44	102.37
46	2056				5.07	5.07	41.74	67.16	108.90	103.83
47	2057				5.07	5.07	41.74	68.62	110.36	105.29
48	2058				5.07	5.07	41.74	70.08	111.82	106.75
49	2059				5.07	5.07	41.74	71.54	113.28	108.21
50	2060				5.07	5.07	41.74	73.00	114.74	109.67

Case-1 (Cost 10% up)

Name of NIS: 1301 - Cabadbaran - Taguibo | Region: 13 | IMO: RIO | Agusan-Surigao Del Norte

EIRR : 16.8%	Net Present Value (Million PHP) (15 % discount rate)	Benefit	Cost	B/C Ratio	NPV
		228	203	1.12	25

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	1.62	-	1.62	-	1.46	1.46	-0.16
2	2012	-	-	1.62	-	1.62	-	2.92	2.92	1.30
3	2013	90.11	1.75	1.62	-	93.49	-	4.38	4.38	-89.11
4	2014	120.15	2.34	1.62	1.67	125.78	10.02	5.84	15.86	-109.92
5	2015	90.11	1.75	1.62	3.90	97.39	24.63	7.30	31.93	-65.46
6	2016	-	-	-	5.58	5.58	37.57	8.76	46.33	40.75
7	2017	-	-	-	5.58	5.58	40.49	10.22	50.71	45.13
8	2018	-	-	-	5.58	5.58	41.74	11.68	53.42	47.84
9	2019	-	-	-	5.58	5.58	41.74	13.14	54.88	49.30
10	2020	-	-	-	5.58	5.58	41.74	14.60	56.34	50.76
11	2021	-	-	-	5.58	5.58	41.74	16.06	57.80	52.22
12	2022	-	-	-	5.58	5.58	41.74	17.52	59.26	53.68
13	2023	-	-	-	5.58	5.58	41.74	18.98	60.72	55.14
14	2024	-	-	-	5.58	5.58	41.74	20.44	62.18	56.60
15	2025	-	-	-	5.58	5.58	41.74	21.90	63.64	58.06
16	2026	-	-	-	5.58	5.58	41.74	23.36	65.10	59.52
17	2027	-	-	-	5.58	5.58	41.74	24.82	66.56	60.98
18	2028	-	-	-	5.58	5.58	41.74	26.28	68.02	62.44
19	2029	-	-	-	5.58	5.58	41.74	27.74	69.48	63.90
20	2030	-	-	-	5.58	5.58	41.74	29.20	70.94	65.36
21	2031	-	-	-	5.58	5.58	41.74	30.66	72.40	66.82
22	2032	-	-	-	5.58	5.58	41.74	32.12	73.86	68.28
23	2033	-	-	-	5.58	5.58	41.74	33.58	75.32	69.74
24	2034	-	-	-	5.58	5.58	41.74	35.04	76.78	71.20
25	2035	-	-	-	5.58	5.58	41.74	36.50	78.24	72.66
26	2036	-	-	-	5.58	5.58	41.74	37.96	79.70	74.12
27	2037	-	-	-	5.58	5.58	41.74	39.42	81.16	75.58
28	2038	-	-	-	5.58	5.58	41.74	40.88	82.62	77.04
29	2039	-	-	-	5.58	5.58	41.74	42.34	84.08	78.50
30	2040	-	-	-	5.58	5.58	41.74	43.80	85.54	79.96
31	2041	-	-	-	5.58	5.58	41.74	45.26	87.00	81.42
32	2042	-	-	-	5.58	5.58	41.74	46.72	88.46	82.88
33	2043	-	-	-	5.58	5.58	41.74	48.18	89.92	84.34
34	2044	-	-	-	5.58	5.58	41.74	49.64	91.38	85.80
35	2045	-	-	-	5.58	5.58	41.74	51.10	92.84	87.26
36	2046	-	-	-	5.58	5.58	41.74	52.56	94.30	88.72
37	2047	-	-	-	5.58	5.58	41.74	54.02	95.76	90.18
38	2048	-	-	-	5.58	5.58	41.74	55.48	97.22	91.64
39	2049	-	-	-	5.58	5.58	41.74	56.94	98.68	93.10
40	2050	-	-	-	5.58	5.58	41.74	58.40	100.14	94.56
41	2051	-	-	-	5.58	5.58	41.74	59.86	101.60	96.02
42	2052	-	-	-	5.58	5.58	41.74	61.32	103.06	97.48
43	2053	-	-	-	5.58	5.58	41.74	62.78	104.52	98.94
44	2054	-	-	-	5.58	5.58	41.74	64.24	105.98	100.40
45	2055	-	-	-	5.58	5.58	41.74	65.70	107.44	101.86
46	2056	-	-	-	5.58	5.58	41.74	67.16	108.90	103.32
47	2057	-	-	-	5.58	5.58	41.74	68.62	110.36	104.78
48	2058	-	-	-	5.58	5.58	41.74	70.08	111.82	106.24
49	2059	-	-	-	5.58	5.58	41.74	71.54	113.28	107.70
50	2060	-	-	-	5.58	5.58	41.74	73.00	114.74	109.16

Table 1301 - Cabadbaran - Taguibo Economic Evaluation (EIRR)

Case-2 (Benefit 10% down)

Name of NIS: 1301 - Cabadbaran - Taguibo | Region: 13 IMO RIO: Agusan-Surigao Del Norte

EIRR : 16.6%	Net Present Value (Million PHP) (15 % discount rate)	Benefit	Cost	B/C Ratio	NPV
		205	184	1.11	21

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	1.47	-	1.47	-	1.31	1.31	-0.16
2	2012	-	-	1.47	-	1.47	-	2.63	2.63	1.15
3	2013	81.92	1.59	1.47	-	84.99	-	3.94	3.94	-81.05
4	2014	109.23	2.12	1.47	1.52	114.35	9.02	5.26	14.27	-100.08
5	2015	81.92	1.59	1.47	3.55	88.54	22.16	6.57	28.73	-59.80
6	2016	-	-	-	5.07	5.07	33.81	7.88	41.69	36.62
7	2017	-	-	-	5.07	5.07	36.44	9.20	45.64	40.57
8	2018	-	-	-	5.07	5.07	37.57	10.51	48.08	43.01
9	2019	-	-	-	5.07	5.07	37.57	11.83	49.39	44.32
10	2020	-	-	-	5.07	5.07	37.57	13.14	50.71	45.64
11	2021	-	-	-	5.07	5.07	37.57	14.45	52.02	46.95
12	2022	-	-	-	5.07	5.07	37.57	15.77	53.33	48.26
13	2023	-	-	-	5.07	5.07	37.57	17.08	54.65	49.58
14	2024	-	-	-	5.07	5.07	37.57	18.40	55.96	50.89
15	2025	-	-	-	5.07	5.07	37.57	19.71	57.28	52.21
16	2026	-	-	-	5.07	5.07	37.57	21.02	58.59	53.52
17	2027	-	-	-	5.07	5.07	37.57	22.34	59.90	54.83
18	2028	-	-	-	5.07	5.07	37.57	23.65	61.22	56.15
19	2029	-	-	-	5.07	5.07	37.57	24.97	62.53	57.46
20	2030	-	-	-	5.07	5.07	37.57	26.28	63.85	58.78
21	2031	-	-	-	5.07	5.07	37.57	27.59	65.16	60.09
22	2032	-	-	-	5.07	5.07	37.57	28.91	66.47	61.40
23	2033	-	-	-	5.07	5.07	37.57	30.22	67.79	62.72
24	2034	-	-	-	5.07	5.07	37.57	31.54	69.10	64.03
25	2035	-	-	-	5.07	5.07	37.57	32.85	70.42	65.35
26	2036	-	-	-	5.07	5.07	37.57	34.16	71.73	66.66
27	2037	-	-	-	5.07	5.07	37.57	35.48	73.04	67.97
28	2038	-	-	-	5.07	5.07	37.57	36.79	74.36	69.29
29	2039	-	-	-	5.07	5.07	37.57	38.11	75.67	70.60
30	2040	-	-	-	5.07	5.07	37.57	39.42	76.99	71.92
31	2041	-	-	-	5.07	5.07	37.57	40.73	78.30	73.23
32	2042	-	-	-	5.07	5.07	37.57	42.05	79.61	74.54
33	2043	-	-	-	5.07	5.07	37.57	43.36	80.93	75.86
34	2044	-	-	-	5.07	5.07	37.57	44.68	82.24	77.17
35	2045	-	-	-	5.07	5.07	37.57	45.99	83.56	78.49
36	2046	-	-	-	5.07	5.07	37.57	47.30	84.87	79.80
37	2047	-	-	-	5.07	5.07	37.57	48.62	86.18	81.11
38	2048	-	-	-	5.07	5.07	37.57	49.93	87.50	82.43
39	2049	-	-	-	5.07	5.07	37.57	51.25	88.81	83.74
40	2050	-	-	-	5.07	5.07	37.57	52.56	90.13	85.06
41	2051	-	-	-	5.07	5.07	37.57	53.87	91.44	86.37
42	2052	-	-	-	5.07	5.07	37.57	55.19	92.75	87.68
43	2053	-	-	-	5.07	5.07	37.57	56.50	94.07	89.00
44	2054	-	-	-	5.07	5.07	37.57	57.82	95.38	90.31
45	2055	-	-	-	5.07	5.07	37.57	59.13	96.70	91.63
46	2056	-	-	-	5.07	5.07	37.57	60.44	98.01	92.94
47	2057	-	-	-	5.07	5.07	37.57	61.76	99.32	94.25
48	2058	-	-	-	5.07	5.07	37.57	63.07	100.64	95.57
49	2059	-	-	-	5.07	5.07	37.57	64.39	101.95	96.88
50	2060	-	-	-	5.07	5.07	37.57	65.70	103.27	98.20

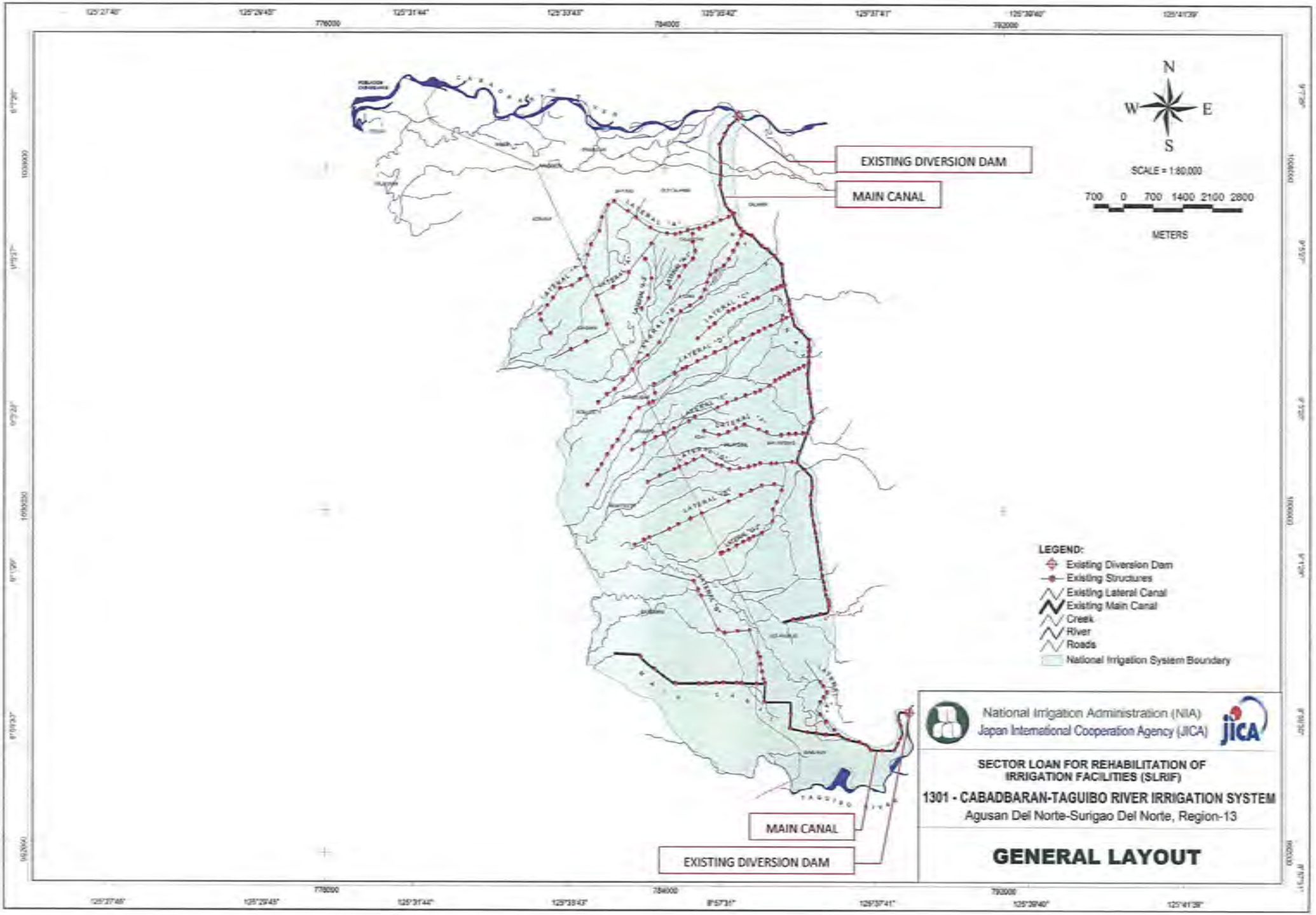
Case-3 (Cost 10% up and Benefit 10% down)

Name of NIS: 1301 - Cabadbaran - Taguibo | Region: 13 IMO RIO: Agusan-Surigao Del Norte

EIRR : 15.2%	Net Present Value (Million PHP) (15 % discount rate)	Benefit	Cost	B/C Ratio	NPV
		205	203	1.01	2

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	1.62	-	1.62	-	1.31	1.31	-0.31
2	2012	-	-	1.62	-	1.62	-	2.63	2.63	1.01
3	2013	90.11	1.75	1.62	-	93.49	-	3.94	3.94	-89.54
4	2014	120.15	2.34	1.62	1.67	125.78	9.02	5.26	14.27	-111.51
5	2015	90.11	1.75	1.62	3.90	97.39	22.16	6.57	28.73	-68.66
6	2016	-	-	-	5.58	5.58	33.81	7.88	41.69	36.12
7	2017	-	-	-	5.58	5.58	36.44	9.20	45.64	40.06
8	2018	-	-	-	5.58	5.58	37.57	10.51	48.08	42.50
9	2019	-	-	-	5.58	5.58	37.57	11.83	49.39	43.82
10	2020	-	-	-	5.58	5.58	37.57	13.14	50.71	45.13
11	2021	-	-	-	5.58	5.58	37.57	14.45	52.02	46.44
12	2022	-	-	-	5.58	5.58	37.57	15.77	53.33	47.76
13	2023	-	-	-	5.58	5.58	37.57	17.08	54.65	49.07
14	2024	-	-	-	5.58	5.58	37.57	18.40	55.96	50.39
15	2025	-	-	-	5.58	5.58	37.57	19.71	57.28	51.70
16	2026	-	-	-	5.58	5.58	37.57	21.02	58.59	53.01
17	2027	-	-	-	5.58	5.58	37.57	22.34	59.90	54.33
18	2028	-	-	-	5.58	5.58	37.57	23.65	61.22	55.64
19	2029	-	-	-	5.58	5.58	37.57	24.97	62.53	56.96
20	2030	-	-	-	5.58	5.58	37.57	26.28	63.85	58.27
21	2031	-	-	-	5.58	5.58	37.57	27.59	65.16	59.58
22	2032	-	-	-	5.58	5.58	37.57	28.91	66.47	60.90
23	2033	-	-	-	5.58	5.58	37.57	30.22	67.79	62.21
24	2034	-	-	-	5.58	5.58	37.57	31.54	69.10	63.53
25	2035	-	-	-	5.58	5.58	37.57	32.85	70.42	64.84
26	2036	-	-	-	5.58	5.58	37.57	34.16	71.73	66.15
27	2037	-	-	-	5.58	5.58	37.57	35.48	73.04	67.47
28	2038	-	-	-	5.58	5.58	37.57	36.79	74.36	68.78
29	2039	-	-	-	5.58	5.58	37.57	38.11	75.67	70.10
30	2040	-	-	-	5.58	5.58	37.57	39.42	76.99	71.41
31	2041	-	-	-	5.58	5.58	37.57	40.73	78.30	72.72
32	2042	-	-	-	5.58	5.58	37.57	42.05	79.61	74.04
33	2043	-	-	-	5.58	5.58	37.57	43.36	80.93	75.35
34	2044	-	-	-	5.58	5.58	37.57	44.68	82.24	76.67
35	2045	-	-	-	5.58	5.58	37.57	45.99	83.56	77.98
36	2046	-	-	-	5.58	5.58	37.57	47.30	84.87	79.29
37	2047	-	-	-	5.58	5.58	37.57	48.62	86.18	80.61
38	2048	-	-	-	5.58	5.58	37.57	49.93	87.50	81.92
39	2049	-	-	-	5.58	5.58	37.57	51.25	88.81	83.24
40	2050	-	-	-	5.58	5.58	37.57	52.56	90.13	84.55
41	2051	-	-	-	5.58	5.58	37.57	53.87	91.44	85.86
42	2052	-	-	-	5.58	5.58	37.57	55.19	92.75	87.18
43	2053	-	-	-	5.58	5.58	37.57	56.50	94.07	88.49
44	2054	-	-	-	5.58	5.58	37.57	57.82	95.38	89.81
45	2055	-	-	-	5.58	5.58	37.57	59.13	96.70	91.12
46	2056	-	-	-	5.58	5.58	37.57	60.44	98.01	92.43
47	2057	-	-	-	5.58	5.58	37.57	61.76	99.32	93.75
48	2058	-	-	-	5.58	5.58	37.57	63.07	100.64	95.06
49	2059	-	-	-	5.58	5.58	37.57	64.39	101.95	96.38
50	2060	-	-	-	5.58	5.58	37.57	65.70	103.27	97.69


EXISTING DIVERSION DAM
MAIN CANAL
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METERS
LEGEND:
Existing Diversion Dam
Existing Structures
Existing Lateral Canal
Existing Main Canal
Creek
River
Roads
National Irrigation System Boundary
MAIN CANAL
EXISTING DIVERSION DAM
National Irrigation Administration (NIA)
Japan International Cooperation Agency (JICA)
JICA
SECTOR LOAN FOR REHABILITATION OF IRRIGATION FACILITIES (SLRIF)
1301 - CABADBARAN-TAGUIBO RIVER IRRIGATION SYSTEM
Agusan Del Norte-Surigao Del Norte, Region-13
GENERAL LAYOUT

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities

Photograph of Irrigation Facilities

NIS name: Cabadbaran & Taguibo NIS (Region 13) Date: May 19, 2009

Location / Facility	*Photograph*	*Comments*
01. Taguibo Diversion Dam (d/s view) Long,E=8-59-55 Lat, N=125-38-11		Eroded loose stone protection at spillway area downstream of concrete apron due high flood and degradation of river slope due quarrying activities about 1.5 kilometer downstream of the dam Reduction of water supply due to deforestation in watershed area and approved extraction of water by NWRC for domestic supply
02. Taguibo Diversion Dam (d/s side view) Long,E=8-59-55 Lat, N=125-38-11		Rusted Steel Frame for mechanical lifting mechanism. Subject for Replacement.
03. Drainage Canal (Taguibo Service Area) Improvement and re-use of drain water at "Mangabao Creek" Long,E=9-00-00 Lat, N=125-35-00		Verify the following: -tidal influence due to proximity of the sea, -settlement of ROW at no expense to GOP by creating MOA with LGU-IA-NIA and Landowners, -commitment of Landowners to pay ISF, guaranteed by IA

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities

Photograph of Irrigation Facilities

NIS name: Cabadbaran & Taguibo NIS (Region 13) Date: May 19, 2006

Location / Facility	*Photograph*	*Comments*
04. Irrigation Canals (Taguibo Service Area) Sta Longitude: E Latitude: N		Trees growing the bank of canals. Roots of trees bore holes and create cracks on earth embankment. This way water easily saturates and liquefy soils that leads to erosion and deteriorations.
05. Cabadbaran Diversion Dam (d/s view) Long,E=9-07-15 Lat, N=125-36-20		Breach of left protection dike for the third (3) times due to flood. Repair of the dike is proposed and provision of floodway for floodwater.
06. Cabadbaran Diversion Dam Left Sideslope protection Works (d/s view) Long,E=9-07-15 Lat, N=125-36-20		Eroded and dislodged of concrete blocks

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities

Photograph of Irrigation Facilities

NIS name: Cabadbaran & Taguibo NIS (Region 13) Date: May 19, 2006

Location / Facility	*Photograph*	*Comments*
07. Main Canal (facing upstream) Sta 10+650 of Main Canal		Eroded berm embankment due to uncontrolled water distribution, which results to overtopping of irrigation water
08. Main Canal (facing upstream) Sta 10+698 of Main Canal		Breach on main canal due to erosion and collapsed of outlet concrete transition of drainage canal
09. Main Canal (facing upstream) Sta 10+670 of Main Canal		Severe deterioration of auxiliary embankment of canal

THE REPUBLIC OF PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION

Sector Loan on Rehabilitation of Irrigation Facilities

NIS SUMMARY REPORT

1302
Simulao RIS
Region 13
Agusan del Sur Province

July 2009

Survey Team for
Japan International Cooperation Agency
(JICA)

Features of NIS for Rehabilitation Project

1. General

Item	*Description*		
1) Name of NIS	**Simulao RIS**		Code: 1302
2) Location	Region	Region 13	
	Province	Agusan del Sur	
	Municipality	Trento, Bunawan	
	Distance	50.00 km,	
3) Type of Water Source	Water Source	Simulao River	
	Type	Diversion Dam (192 m wide, 4.00 m high)	
4) Area	Service Area	3,200 ha	
	FUSA	2,540 ha	
5) Beneficiary Farmers	1,843 farmers	Average paddy field cultivating size = 1.38 ha per farmer	
6) Irrigator's Association	IAs established = 17 FIA established = 1 in 2008		
7) Features of NIS and Necessity of the project	a) The system was completed on December 1983, first operation or first cropping of the system is on 1984 with first firmed-up area of 2,946 ha. b) The entire rehabilitation of the system was from 1992 to 1997, in the Irrigation System Improvement Project Stage 1 (ISIP1) under the financial assistance of the World Bank. c) Irrigation system have deteriorated and eroded, shallow canal bottom due to siltation, erosion due wallowing of carabao and collapsed side slope of canal, bored holes made from unauthorized extraction of water d) Drainage system is inefficient due to silt accumulation and collapse of canal side slope that caused to shallow the drainage outlet of Lucad Creek that drains towards Simulao River. e) Flooding affects approximately 660 hectares adjacent to Lucad Creek and Simulao River Essential rehabilitation of irrigation and drainage facilities will increase irrigable area approximately 600 hectares comprising restored areas and additional areas which are previously submerged and underwater.		
8) Outline of the Proposed Project	A. Engineering 1. Repair of diversion dam 2. Repair and improvement of irrigation canal and structures 3. Repair and improvement of drainage canal and structures 4. Repair and improvement of service roads 5. Repair and improvement of on-farm facilities 6. Repair and construction of IMT support facilities-IA Bldg solar drier, warehouse with IA building 7. Development and establishment of IMT GIS database B. Institutional Strengthening Program B. 1 Basic Program 1. Reactivation of FIA/IA and Strengthening of Irrigation System Management Committee (ISMC) of NIS including construction of IMT support facilities 2. Strengthening of NIA-IA-LGUs Partnership 3. Strengthening NIA Institutional Capacity		

	B.2 Specific Program to strengthen institutional mechanism together with LGUs 1. Improvement of watershed management
9) Proposed Project Component	A. Engineering 1. Construction of civil works for rehabilitation of diversion works, canal system, drainage system, roads, and IMT support facilities. B. Institutional Strengthening Program 1. Reactivation of FIAs/IAs including reformation of TSGA / IA / FIA areas, construction of IMT support facilities (demand base) 2. Strengthening NIA-IA- LGUs Partnership, especially coordination RDC, RAFC/PAFC with FIAs/IAs and ISMC 3. Institutional development program to strengthen management capacity of NIA field offices and IAs.
10) Project Cost (Direct cost only, excluding escalation, contingency, tax)	1. Direct cost PHP 238.57 Million - *Civil Works* *PHP 222.50 Million* - *Institutional Development* *PHP 11.30 Million* - *Engineering Services* *PHP 4.77 Million* 2. Indirect cost PHP 21.35 Million Total Project Cost (1+2) PHP 259.92 Million Cost per ha PHP 102,329.00 per ha.
11) Project Benefit	1. To increase paddy production by 1,971 tons/year 2. To increase farmers' net income to PHP51,390.00 /ha/year 3. To establish functional and self-reliant IAs 4. To improve performance of NIS
12) Project Justification	EIRR = 17.6 %, B/C = 1.18 (discount rate 15%)

2. Project History (Construction/Rehabilitation)

Year	*Description*
2004	Gravelling of selected service road and repair of existing on-farm facilities
2005	Gravelling of selected service road and repair of existing on-farm facilities
2006	Rehabilitation and improvement of selected drainage canal, gravel road surfacing
2007	Desilting of selected canal, drainage improvement
2008	Canal repair of embankment works, gravel road surfacing, rehabilitation of on-farm facilities

3. Present Condition

3.1 Natural Conditions

Item	*Description*
1) Annual Rainfall	1,876.10 mm
2) Seasons	Wet season: November-April , Dry season: May-October
3) Dominant Soil in NIS Area	Clay and Silty Clay
4) Topography	Sloping terrain from 1.5% to flat

3.2 Socio-economy (Region/Province)

Item	*Description*
1) GRDP	PHP 96,364 million (Year 2007), Per Capita GRDP = PHP 40,012 per year
2) Population	609,447 (province)
3) Population Growth Rate	1.19 % per year (province)
4) Labor Force	1,504,000 (region)
5) Poverty Population	56.2 % to total population (province)

3.3 Present Agriculture in NIS

Item	*Description*					
1) Farm Household in NIS	Total beneficiaries	1,843 households				
	Land owners	619 households	(33.5 %)			
	Tenant farmers	1,224 households	(66.5 %)			
2) Paddy Field Size in NIS	1.38 ha per household (FUSA/Total beneficiaries as of 2008)					
3) Present Land Use in NIS	Paddy field planted	2,380 ha	74.4 %	As of 2008		
	Paddy field not planted	160 ha	5.0 %	As of 2008		
	Upland crop field	0 ha	0.0 %			
	Permanent crop field	21 ha	0.7 %			
	Undeveloped area	435 ha	13.6 %			
	Build-up area	29 ha	0.9 %			
	High ground	95 ha	2.9 %			
	Grassland	52 ha	1.6 %			
	Swamp	28 ha	0.9 %			
	Unspecified area	0 ha	0.0 %			
4) Paddy Field in FUSA (ha)	2,540					

5) Paddy Cropped Area (ha)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Wet Season	2,189	2,149	2,314	2,353	2,540	2,309
Dry Season	2,211	2,190	2,301	2,360	2,380	2,288
6) Cropping Intensity (%)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
(per year)	173y	171	182	186	194	181
7) Unit Yield of Paddy (ton/ha)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Wet Season	3.18	3.57	2.85	3.39	3.38	3.27
Dry Season	3.37	2.84	3.38	3.77	3.42	3.36
8) Paddy Production (ton)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Wet Season	6,971	7,679	6,595	7,978	8,580	7,561
Dry Season	7,452	6,215	7,773	8,895	8,129	7,683

3.4 Water Resources

Item	*Description*
1) Name of Rivers	Simulao
2) Catchment Area at Dam	445 km^2
3) Ave. River Discharge	5.49 m^3/s
4) Ave. Dry Season Discharge	6.18 m^3/s
5) Diverted Intake Discharge	3.86 m^3/s
6) Water Requirement	4.57 m^3/s
7) Sedimentation	Low

3.5 Existing Irrigation System

Item	*Description*
1) Diversion Dam	Overflow crest width 140.0 m, Dam height 4.0 m Dam width 192 m
2) Main Canal	Total length 17.961 km (Lined portion 0.00)
3) Lateral Canals	Total length 35.06 km (Lined portion 1.176 km)
4) On-farm facilities	Total length 84.00 km (Lined portion 0.00 km) Turn-outs = 131 units
5) Drainage Canal	Total length 58.00 kms. For new Lucad = 7.70 kms
6) Canal Structures	No. = 158 units
7) Drainage Structures	No. = 52 units (Damaged = 0 unit)
8) Farm roads	Total length 51.335 km (pavement= 0.00 kms.)
9) Water Masters Quarter	No. = 1 For rehab. = 3 units
10) Gate Keepers Quarter	No. = 1 For rehab. = 1 units

3.6 Institutions for O&M of NIS

Item	*Description*					
1) Regional Irrigation Office	Name: Region 13 - CARAGA					
2) IMO	Name: Agusan del Sur IMO					
Staff in 2009	Total number of staff: 28 nos					
3) Irrigator' Association (IA)	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Number of FIA (nos)					1	
Number of IA (nos)					17	
Number of TSAG (nos)	114	120	127	128	128	123
Functionality of IA	88.3	83.2	88.3	92.4	96.2	89.68
Collection of ISF (wet, %)	78	76	75	76	83	77
Collection of ISF (dry, %)	85	56	71	74	72	71
4) NIS Category based on IA 2008 O&M Contract (NIA-IA)	No. of IA					
Category A	2					
Category B	10					
Category C	5					

3.7 Existing Problems

Item	*Description*
1) Diversion Works	1. Dam spillway is used as log pond and log transport area which threatens to damage concrete apron on impact of log fall from upstream to downstream. 2. Scoured and eroded at Intake outlet transition 3. Rusted steel foundation of sluiceway steel gate lifting drum 4. Gate keeper quarter need rehabilitation 5. Replacement of engine for driver of sluice gate lifting mechanism
2) Canal and Structures	1. Leaking at u/s of Simulao siphon and overflowing at inlet of siphon due debris accumulation 2. Eroded loose stone protection 3. Collapsed side slope protection and auxiliary berm 4. Damaged concrete canal lining 5. Encroachment of houses along canal 6. Rusted and damaged steel gates 7. Seepage along main canal from 4+800m- 8+870m, 13+570m-17+961m due to damaged embankment of canal
3) Drainage Canal	1. Shallow canal bottom due to siltation and erosion 2. Lack of farm drainages, and lateral drainages 3. Lack of drainage crossing structures 4. Construction of check structures along drainage canal hampers efficient drainages of the irrigation system

Item	*Description*
4) Other Project Facilities (road, bridge, flood dike, building, etc)	1. Lack road network 2. Impassable road due to lack of maintenance 3. Lack of drainage crossing structures
5) Water Management and O&M Activities	1. No measuring device such as staff gages along canals and diversion dam 2. Grasses and trees along canals are not frequently cut
6) Status of NIS and IA Management	Status Type A evaluated by Radar Graph Minor problems are: 1. Medium cropping intensity during wet and dry seasons at 83% and 88%, respectively 2. Medium ISF collection efficiency during dry and wet seasons at 71% and 77%, respectively 3. Medium paddy yield during wet and dry seasons at 66 and 68 cavans/ha, respectively
7) Watershed Management	1. Frequent cutting of trees in the catchment /watershed areas
8) Coordination with LGU and Agencies concerned	1. Lack of coordination by NIA's field offices and IAs with concerned LGUs and other line agencies on specific problem such as watershed management
9) Agriculture	1. Inadequate supply of high quality seeds for distribution. 2. Insufficient number of credit institution to serve the farmer beneficiaries. 3. Poor condition of farm to market roads

4. Proposed Rehabilitation Plan

4.1 Agricultural Development Plan

Item	*Description*			
Cropping schedule	*Wet Season*	*Dry Season-1*	*Dry Season-2*	*Annual*
1) Type of Crops	Paddy	Paddy	-	-
2) Cropping Area (ha)	2540	2380	-	-
3) Target Unit Yield (ton/ha)	3.70	3.90	-	-
3) Total Production (ton)	9,398	9,282	-	-

4.2 Civil Works

Item	*Description*
1) Diversion Works	1) Increase height/elevation of waste way along right side of the sluiceway 2) Provide logs loading dock area upstream about 4" thick 50m length concrete slab along side slope 3) Repair of existing left incline wall and concrete blocks protection (facing upstream) 4) Replacement of trash rack at sluiceway
2) Canal Structures	1) Additional six (8) units structures along main canal – 43 units 2) Additional two (2) units along lateral canal 3) Additional 56 units foot bridges in all canal 4) Restoration of inlet and outlet loose stone protection 5) Installation of steel gates at headgates
3) Canalization	1) Concrete canal lining of Main Canal and Lateral Canals – 51.7 kms 2) Desilting and repair of earth embankment along auxiliary berm 3) Realignment of canals 4) Construction of new canals
4) Drainage Structures	1. Repair of drainage structures – 3 units 1) Additional 12 units drainage structures 2) Construction of concrete elevated flume as replacement of temporary flume
5) Drainage Canalization	1) Dredging, excavation, and desilting of Lucad Creek and lateral drainage totaling to 43km – 31.45 kms

6) Service Roads	1) Gravel road surfacing of 42km canal service road – 51.3 kms 2) Gravel road surfacing of 18km access roads
7) On-Farm Facilities	1. Repair /replacement of dilapidated turn out steel gates 2.Construction of new turn outs and farm ditches
8) IMT Support Facilities	1. Construction of post-harvest facilities—warehouses, IA buildings, solar driers with shed – 2 units
9) IMT GIS Database	1. Development and establishment of GIS database

4.3 Institutional Strengthening Program

Item	*Description*
1) Reactivation Program of FIAs/IAs and System Management Committee (ISMC)	1. Executing body : Project Management Office with assistance of Consultant 2. Schedule: 34 months / NIS 3. Counter body for execution: NIA Regional Office and IMO office 4. Attendant / Trainee: President of FIAs/IAs and secretary group, staff of NIA RIO/IMO, Chairmen of ISMC and Secretary group and LGUs officers, 5. Contents: a) Survey & Study by Consultant b) (Workshops on coordination activities with and dissemination on reformation plan to FIAs/IAs c) Workshop on coordination activities with LGUs d) Organization and Legal Registration of FIAs/IAs to be re-active and reactivation of SMC e) Construction of IMT support facilities for FIAs/CIA f) Workshop and Training of FIAs/IAs members on management under the IMT g) Assessment/Evaluation for and Negotiation of Contracting under IMT h) Assistance of reactivated IAs/FIAs in organizational and management activities
2) Strengthening Program of NIA - IA - LGU Partnership	1. Executing body : Project Management Office with assistance of Consultant, & Management System Committee (MSC) of NIS 2. Schedule: 7 months / NIS 3. Counter body for execution: Regional Development Council with Secretary of NEDA Regional Office 4. Attendant / Trainee: Secretaries of Regional Organizations, LGUs officers, President of FIAs/IAs and secretary group, staff of NIA RIO/IMO, Chairmen of ISMC and Secretary group 5. Contents: a) Workshop on Trouble Shooting of NIS and FIAs/ISs' Management b) Provision of work space for ISMC including office facilities
3) NIA Institutional Strengthening Program	1. Executing body : Institutional Development Division of CO, NIA 2. Schedule: 7 months / NIS 3. Counter body for execution: NIA Regional Office and IMO office 4. Attendant / Trainee: NIA personnel at CO, RIO and IMO 5. Contents: a) Capability built-up program (Central and Regional NIA Offices) b) Improvement program on management mechanism of NIA c) Support program for IMT implementation d) Strengthening program of Integrated Management information System
4) Specific Program on watershed management plan	1. Strengthening coordination with RDC, RAFC/PAFC and LGUs concerned through works shop on dissemination of the SLRIF to these organizations 2. Strengthening coordination with RDC, RAFC/PAFC and LGUs on training program of watershed management

4.4 Proposed Counter Schemes

Item	*Description*
1) DENR	1. Technical assistance to concerned Provincial/municipal LGUs on watershed rehabilitation and management such as establishment of nurseries, community-based livelihood
2) LGU	1. LGUs improve coordination program with NIA to give priority of the projects in annual budgeting and funds programming 2. Provincial LGUs to extend training to municipal agricultural officers to improve skills on technology promotion 3. LGUs improve capacity of its personnel to prepare project proposals through a training by DILG to ensure project's fund access to municipal development fund 4. LGUs provide reliable post-harvest facilities to ensure optimal operation of the facilities.

5. Cost Estimate for Initial Investment

Item	*Description*		
1) Direct Cost for Civil Works	A. Mobilization	Php	4.77 Million
	B. Protection Dikes		-
	C. Diversion Works	Php	5.75 Million
	D. Canal Structures	Php	17.06 Million
	E. Canalization	Php	44.06 Million
	F. Drainage Structures	Php	5.08 Million
	G. Drainage Canalization	Php	112.90 Million
	H. Roads	Php	12.72 Million
	I. On-Farm Facilities/T.O. Gates	Php	2.62 Million
	J. IMT Support Facilities	Php	15.00 Million
	K. IMT GIS Database	Php	2.54 Million
	L. Institutional Development (5% of Direct Cost)	Php	11.30 Million
	M. Feasibility Studies & Detailed Engineering (2% of Direct Cost)	Php	4.77 Million
	Sub-total (Direct Cost)	Php	238.57 Million
2) Indirect Cost	A. General Engineering Supervision and Administration (3.5% of Direct Cost)	Php	8.35 Million
	B. NIA Management Fee (5% of Total Project Cost)	Php	13.00 Million
	Sub-total (Indirect Cost)	Php	21.35 Million
3) Total Project Cost	= 1+2	Php	259.92 Million
Cost per ha.		Php	102,329.00 /ha.

6. Implementation Plan

Item	*Description*
1) Contract package	1 - Local Competitive Bidding (LCB)
2) Implementation Schedule	
a) Civil Works	
1) Survey, F/S, Design	18 months
2) Tendering	6 months
3) Construction	27 months
b) Institutional Improvement Works	
1) Reactivation Program of FIAs/IAs and Irrigation System Management Committee	34 months
2) NIA-IA-LGU Partnership	7 months
3) Strengthening of NIA staff	7 months

7. Project Evaluation

Item		*Description*	
1) Economic evaluation			
EIRR (Base)		EIRR = 17.6 %	: Project life 50 years
Sensitivity	Case-1	EIRR = 16.0 %	: Cost 10% up
	Case-2	EIRR = 15.9 %	: Benefit 10% down
	Case-3	EIRR = 14.5 %	: Cost 10% up + Benefit 10% down
B/C		1.18	: discount rate 15% p.a.
NPV		PHP 27 million	: discount rate 15% p.a.
2) Financial evaluation		Farmer's n.et income increase = PHP 23,709 per ha per year	
3) Expected Impacts		1. Increased farmers' income 2. Increased rice self sufficiency of the country 3. Increased job opportunities in rural areas	

8. Environmental Aspects

Item	*Description*
1) Environmental aspect	1. Collaboration with DENR, DA, LGU, IA on the following: a) Conservation of Watersheds Programs b) Slope protection for reduction of siltation c) Municipal ordinance on prohibition of illegal domestic disposal d) Moratorium on quarry of sand and gravel at downstream of the Dam regardless of distance
2) Relocation of houses	None
3) Land acquisition	None

Table 1302 - Simulao Economic Evaluation (EIRR)

Basic Case

Name of NIS 1302 - Simulao | Region : 13 IMO,RIO Aqusan Del Sur

EIRR : 17.6%	Net Present Value (Million PHP)	Benefit	Cost	B/C Ratio	NPV
	(15 % discount rate)	176	149	1.18	27

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011			1.15		1.15		1.45	1.45	0.30
2	2012			1.15		1.15		2.90	2.90	1.75
3	2013	63.69	1.84	1.15		66.67		4.35	4.35	-62.32
4	2014	84.92	2.45	1.15	1.55	90.06	6.66	5.80	12.46	-77.60
5	2015	63.69	1.84	1.15	3.61	70.28	16.36	7.25	23.61	-46.67
6	2016				5.15	5.15	24.96	8.70	33.66	28.51
7	2017				5.15	5.15	26.90	10.15	37.05	31.90
8	2018				5.15	5.15	27.73	11.60	39.33	34.18
9	2019				5.15	5.15	27.73	13.05	40.78	35.63
10	2020				5.15	5.15	27.73	14.50	42.23	37.08
11	2021				5.15	5.15	27.73	15.95	43.68	38.53
12	2022				5.15	5.15	27.73	17.40	45.13	39.98
13	2023				5.15	5.15	27.73	18.85	46.58	41.43
14	2024				5.15	5.15	27.73	20.30	48.03	42.88
15	2025				5.15	5.15	27.73	21.75	49.48	44.33
16	2026				5.15	5.15	27.73	23.20	50.93	45.78
17	2027				5.15	5.15	27.73	24.65	52.38	47.23
18	2028				5.15	5.15	27.73	26.10	53.83	48.68
19	2029				5.15	5.15	27.73	27.55	55.28	50.13
20	2030				5.15	5.15	27.73	29.00	56.73	51.58
21	2031				5.15	5.15	27.73	30.45	58.18	53.03
22	2032				5.15	5.15	27.73	31.90	59.63	54.48
23	2033				5.15	5.15	27.73	33.35	61.08	55.93
24	2034				5.15	5.15	27.73	34.80	62.53	57.38
25	2035				5.15	5.15	27.73	36.25	63.98	58.83
26	2036				5.15	5.15	27.73	37.70	65.43	60.28
27	2037				5.15	5.15	27.73	39.15	66.88	61.73
28	2038				5.15	5.15	27.73	40.60	68.33	63.18
29	2039				5.15	5.15	27.73	42.05	69.78	64.63
30	2040				5.15	5.15	27.73	43.50	71.23	66.08
31	2041				5.15	5.15	27.73	44.95	72.68	67.53
32	2042				5.15	5.15	27.73	46.40	74.13	68.98
33	2043				5.15	5.15	27.73	47.85	75.58	70.43
34	2044				5.15	5.15	27.73	49.30	77.03	71.88
35	2045				5.15	5.15	27.73	50.75	78.48	73.33
36	2046				5.15	5.15	27.73	52.20	79.93	74.78
37	2047				5.15	5.15	27.73	53.65	81.38	76.23
38	2048				5.15	5.15	27.73	55.10	82.83	77.68
39	2049				5.15	5.15	27.73	56.55	84.28	79.13
40	2050				5.15	5.15	27.73	58.00	85.73	80.58
41	2051				5.15	5.15	27.73	59.45	87.18	82.03
42	2052				5.15	5.15	27.73	60.90	88.63	83.48
43	2053				5.15	5.15	27.73	62.35	90.08	84.93
44	2054				5.15	5.15	27.73	63.80	91.53	86.38
45	2055				5.15	5.15	27.73	65.25	92.98	87.83
46	2056				5.15	5.15	27.73	66.70	94.43	89.28
47	2057				5.15	5.15	27.73	68.15	95.88	90.73
48	2058				5.15	5.15	27.73	69.60	97.33	92.18
49	2059				5.15	5.15	27.73	71.05	98.78	93.63
50	2060				5.15	5.15	27.73	72.50	100.23	95.08

Case-1 (Cost 10% up)

Name of NIS 1302 - Simulao | Region : 13 IMO,RIO Aqusan Del Sur

EIRR : 16.0%	Net Present Value (Million PHP)	Benefit	Cost	B/C Ratio	NPV
	(15 % discount rate)	176	164	1.07	12

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	1.26	-	1.26	-	1.45	1.45	0.19
2	2012	-	-	1.26	-	1.26	-	2.90	2.90	1.64
3	2013	70.06	2.02	1.26	-	73.34	-	4.35	4.35	-68.99
4	2014	93.41	2.69	1.26	1.70	99.06	6.66	5.80	12.46	-86.61
5	2015	70.06	2.02	1.26	3.97	77.30	16.36	7.25	23.61	-53.69
6	2016	-	-	-	5.67	5.67	24.96	8.70	33.66	27.99
7	2017	-	-	-	5.67	5.67	26.90	10.15	37.05	31.38
8	2018	-	-	-	5.67	5.67	27.73	11.60	39.33	33.67
9	2019	-	-	-	5.67	5.67	27.73	13.05	40.78	35.12
10	2020	-	-	-	5.67	5.67	27.73	14.50	42.23	36.57
11	2021	-	-	-	5.67	5.67	27.73	15.95	43.68	38.02
12	2022	-	-	-	5.67	5.67	27.73	17.40	45.13	39.47
13	2023	-	-	-	5.67	5.67	27.73	18.85	46.58	40.92
14	2024	-	-	-	5.67	5.67	27.73	20.30	48.03	42.37
15	2025	-	-	-	5.67	5.67	27.73	21.75	49.48	43.82
16	2026	-	-	-	5.67	5.67	27.73	23.20	50.93	45.27
17	2027	-	-	-	5.67	5.67	27.73	24.65	52.38	46.72
18	2028	-	-	-	5.67	5.67	27.73	26.10	53.83	48.17
19	2029	-	-	-	5.67	5.67	27.73	27.55	55.28	49.62
20	2030	-	-	-	5.67	5.67	27.73	29.00	56.73	51.07
21	2031	-	-	-	5.67	5.67	27.73	30.45	58.18	52.52
22	2032	-	-	-	5.67	5.67	27.73	31.90	59.63	53.97
23	2033	-	-	-	5.67	5.67	27.73	33.35	61.08	55.42
24	2034	-	-	-	5.67	5.67	27.73	34.80	62.53	56.87
25	2035	-	-	-	5.67	5.67	27.73	36.25	63.98	58.32
26	2036	-	-	-	5.67	5.67	27.73	37.70	65.43	59.77
27	2037	-	-	-	5.67	5.67	27.73	39.15	66.88	61.22
28	2038	-	-	-	5.67	5.67	27.73	40.60	68.33	62.67
29	2039	-	-	-	5.67	5.67	27.73	42.05	69.78	64.12
30	2040	-	-	-	5.67	5.67	27.73	43.50	71.23	65.57
31	2041	-	-	-	5.67	5.67	27.73	44.95	72.68	67.02
32	2042	-	-	-	5.67	5.67	27.73	46.40	74.13	68.47
33	2043	-	-	-	5.67	5.67	27.73	47.85	75.58	69.92
34	2044	-	-	-	5.67	5.67	27.73	49.30	77.03	71.37
35	2045	-	-	-	5.67	5.67	27.73	50.75	78.48	72.82
36	2046	-	-	-	5.67	5.67	27.73	52.20	79.93	74.27
37	2047	-	-	-	5.67	5.67	27.73	53.65	81.38	75.72
38	2048	-	-	-	5.67	5.67	27.73	55.10	82.83	77.17
39	2049	-	-	-	5.67	5.67	27.73	56.55	84.28	78.62
40	2050	-	-	-	5.67	5.67	27.73	58.00	85.73	80.07
41	2051	-	-	-	5.67	5.67	27.73	59.45	87.18	81.52
42	2052	-	-	-	5.67	5.67	27.73	60.90	88.63	82.97
43	2053	-	-	-	5.67	5.67	27.73	62.35	90.08	84.42
44	2054	-	-	-	5.67	5.67	27.73	63.80	91.53	85.87
45	2055	-	-	-	5.67	5.67	27.73	65.25	92.98	87.32
46	2056	-	-	-	5.67	5.67	27.73	66.70	94.43	88.77
47	2057	-	-	-	5.67	5.67	27.73	68.15	95.88	90.22
48	2058	-	-	-	5.67	5.67	27.73	69.60	97.33	91.67
49	2059	-	-	-	5.67	5.67	27.73	71.05	98.78	93.12
50	2060	-	-	-	5.67	5.67	27.73	72.50	100.23	94.57

Table 1302 - Simulao Economic Evaluation (EIRR)

Case-2 (Benefit 10% down)

Name of NIS 1302 - Simulao | Region : 13 IMO RIO Agusan Del Sur

EIRR : 15.9%	Net Present Value (Million PHP)	Benefit	Cost	B/C Ratio	NPV
	(15 % discount rate)	158	149	1.06	9

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	1.15	-	1.15	-	1.31	1.31	0.16
2	2012	-	-	1.15	-	1.15	-	2.61	2.61	1.46
3	2013	63.69	1.84	1.15	-	66.67	-	3.92	3.92	-62.76
4	2014	84.92	2.45	1.15	1.55	90.06	5.99	5.22	11.21	-78.85
5	2015	63.69	1.84	1.15	3.61	70.28	14.72	6.53	21.25	-49.03
6	2016	-	-	-	5.15	5.15	22.46	7.83	30.29	25.14
7	2017	-	-	-	5.15	5.15	24.21	9.14	33.34	28.19
8	2018	-	-	-	5.15	5.15	24.96	10.44	35.40	30.25
9	2019	-	-	-	5.15	5.15	24.96	11.75	36.70	31.55
10	2020	-	-	-	5.15	5.15	24.96	13.05	38.01	32.86
11	2021	-	-	-	5.15	5.15	24.96	14.36	39.31	34.16
12	2022	-	-	-	5.15	5.15	24.96	15.66	40.62	35.47
13	2023	-	-	-	5.15	5.15	24.96	16.97	41.92	36.77
14	2024	-	-	-	5.15	5.15	24.96	18.27	43.23	38.08
15	2025	-	-	-	5.15	5.15	24.96	19.58	44.53	39.38
16	2026	-	-	-	5.15	5.15	24.96	20.88	45.84	40.69
17	2027	-	-	-	5.15	5.15	24.96	22.19	47.14	41.99
18	2028	-	-	-	5.15	5.15	24.96	23.49	48.45	43.30
19	2029	-	-	-	5.15	5.15	24.96	24.80	49.75	44.60
20	2030	-	-	-	5.15	5.15	24.96	26.10	51.06	45.91
21	2031	-	-	-	5.15	5.15	24.96	27.41	52.36	47.21
22	2032	-	-	-	5.15	5.15	24.96	28.71	53.67	48.52
23	2033	-	-	-	5.15	5.15	24.96	30.02	54.97	49.82
24	2034	-	-	-	5.15	5.15	24.96	31.32	56.28	51.13
25	2035	-	-	-	5.15	5.15	24.96	32.63	57.58	52.43
26	2036	-	-	-	5.15	5.15	24.96	33.93	58.89	53.74
27	2037	-	-	-	5.15	5.15	24.96	35.24	60.19	55.04
28	2038	-	-	-	5.15	5.15	24.96	36.54	61.50	56.35
29	2039	-	-	-	5.15	5.15	24.96	37.85	62.80	57.65
30	2040	-	-	-	5.15	5.15	24.96	39.15	64.11	58.96
31	2041	-	-	-	5.15	5.15	24.96	40.46	65.41	60.26
32	2042	-	-	-	5.15	5.15	24.96	41.76	66.72	61.57
33	2043	-	-	-	5.15	5.15	24.96	43.07	68.02	62.87
34	2044	-	-	-	5.15	5.15	24.96	44.37	69.33	64.18
35	2045	-	-	-	5.15	5.15	24.96	45.68	70.63	65.48
36	2046	-	-	-	5.15	5.15	24.96	46.98	71.94	66.79
37	2047	-	-	-	5.15	5.15	24.96	48.29	73.24	68.09
38	2048	-	-	-	5.15	5.15	24.96	49.59	74.55	69.40
39	2049	-	-	-	5.15	5.15	24.96	50.90	75.85	70.70
40	2050	-	-	-	5.15	5.15	24.96	52.20	77.16	72.01
41	2051	-	-	-	5.15	5.15	24.96	53.51	78.46	73.31
42	2052	-	-	-	5.15	5.15	24.96	54.81	79.77	74.62
43	2053	-	-	-	5.15	5.15	24.96	56.12	81.07	75.92
44	2054	-	-	-	5.15	5.15	24.96	57.42	82.38	77.23
45	2055	-	-	-	5.15	5.15	24.96	58.73	83.68	78.53
46	2056	-	-	-	5.15	5.15	24.96	60.03	84.99	79.84
47	2057	-	-	-	5.15	5.15	24.96	61.34	86.29	81.14
48	2058	-	-	-	5.15	5.15	24.96	62.64	87.60	82.45
49	2059	-	-	-	5.15	5.15	24.96	63.95	88.90	83.75
50	2060	-	-	-	5.15	5.15	24.96	65.25	90.21	85.06

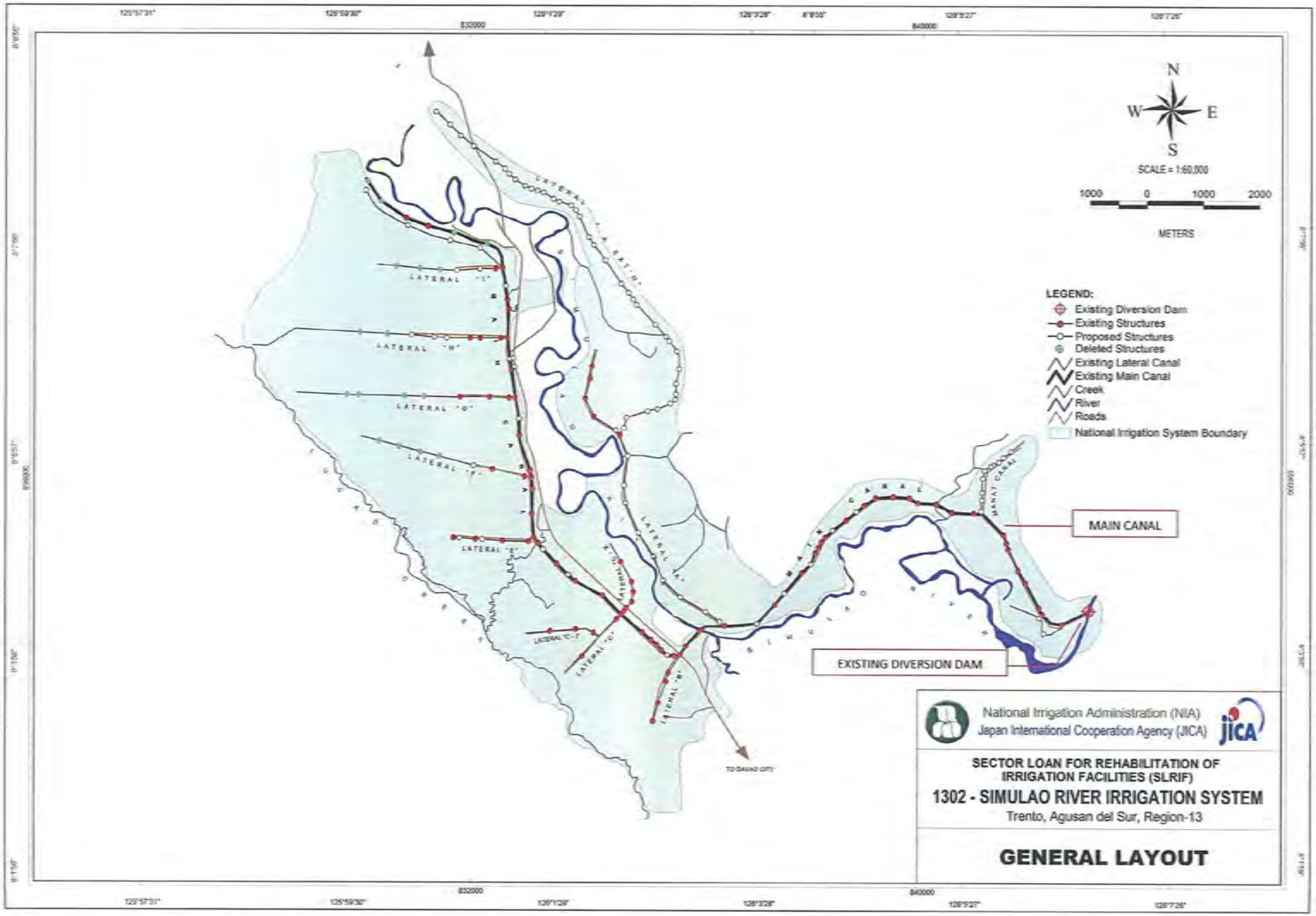
Case-3 (Cost 10% up and Benefit 10% down)

Name of NIS 1302 - Simulao | Region : 13 IMO RIO Agusan Del Sur

EIRR : 14.5%	Net Present Value (Million PHP)	Benefit	Cost	B/C Ratio	NPV
	(15 % discount rate)	158	164	0.96	-6

(Unit : Php Million)

Year in Order	Year	Economic Cost (M. PHP)					Economic Benefit (M. PHP)			Net Cash Flow (M. PHP)
		Civil Works	Institutional Development	Engineering Services	Annual O & M	Total	Benefit	without 1.5%	Total	
1	2011	-	-	1.26	-	1.26	-	1.31	1.31	0.04
2	2012	-	-	1.26	-	1.26	-	2.61	2.61	1.35
3	2013	70.06	2.02	1.26	-	73.34	-	3.92	3.92	-69.42
4	2014	93.41	2.69	1.26	1.70	99.06	5.99	5.22	11.21	-87.85
5	2015	70.06	2.02	1.26	3.97	77.30	14.72	6.53	21.25	-56.05
6	2016	-	-	-	5.67	5.67	22.46	7.83	30.29	24.63
7	2017	-	-	-	5.67	5.67	24.21	9.14	33.34	27.68
8	2018	-	-	-	5.67	5.67	24.96	10.44	35.40	29.73
9	2019	-	-	-	5.67	5.67	24.96	11.75	36.70	31.04
10	2020	-	-	-	5.67	5.67	24.96	13.05	38.01	32.34
11	2021	-	-	-	5.67	5.67	24.96	14.36	39.31	33.65
12	2022	-	-	-	5.67	5.67	24.96	15.66	40.62	34.95
13	2023	-	-	-	5.67	5.67	24.96	16.97	41.92	36.26
14	2024	-	-	-	5.67	5.67	24.96	18.27	43.23	37.56
15	2025	-	-	-	5.67	5.67	24.96	19.58	44.53	38.87
16	2026	-	-	-	5.67	5.67	24.96	20.88	45.84	40.17
17	2027	-	-	-	5.67	5.67	24.96	22.19	47.14	41.48
18	2028	-	-	-	5.67	5.67	24.96	23.49	48.45	42.78
19	2029	-	-	-	5.67	5.67	24.96	24.80	49.75	44.09
20	2030	-	-	-	5.67	5.67	24.96	26.10	51.06	45.39
21	2031	-	-	-	5.67	5.67	24.96	27.41	52.36	46.70
22	2032	-	-	-	5.67	5.67	24.96	28.71	53.67	48.00
23	2033	-	-	-	5.67	5.67	24.96	30.02	54.97	49.31
24	2034	-	-	-	5.67	5.67	24.96	31.32	56.28	50.61
25	2035	-	-	-	5.67	5.67	24.96	32.63	57.58	51.92
26	2036	-	-	-	5.67	5.67	24.96	33.93	58.89	53.22
27	2037	-	-	-	5.67	5.67	24.96	35.24	60.19	54.53
28	2038	-	-	-	5.67	5.67	24.96	36.54	61.50	55.83
29	2039	-	-	-	5.67	5.67	24.96	37.85	62.80	57.14
30	2040	-	-	-	5.67	5.67	24.96	39.15	64.11	58.44
31	2041	-	-	-	5.67	5.67	24.96	40.46	65.41	59.75
32	2042	-	-	-	5.67	5.67	24.96	41.76	66.72	61.05
33	2043	-	-	-	5.67	5.67	24.96	43.07	68.02	62.36
34	2044	-	-	-	5.67	5.67	24.96	44.37	69.33	63.66
35	2045	-	-	-	5.67	5.67	24.96	45.68	70.63	64.97
36	2046	-	-	-	5.67	5.67	24.96	46.98	71.94	66.27
37	2047	-	-	-	5.67	5.67	24.96	48.29	73.24	67.58
38	2048	-	-	-	5.67	5.67	24.96	49.59	74.55	68.88
39	2049	-	-	-	5.67	5.67	24.96	50.90	75.85	70.19
40	2050	-	-	-	5.67	5.67	24.96	52.20	77.16	71.49
41	2051	-	-	-	5.67	5.67	24.96	53.51	78.46	72.80
42	2052	-	-	-	5.67	5.67	24.96	54.81	79.77	74.10
43	2053	-	-	-	5.67	5.67	24.96	56.12	81.07	75.41
44	2054	-	-	-	5.67	5.67	24.96	57.42	82.38	76.71
45	2055	-	-	-	5.67	5.67	24.96	58.73	83.68	78.02
46	2056	-	-	-	5.67	5.67	24.96	60.03	84.99	79.32
47	2057	-	-	-	5.67	5.67	24.96	61.34	86.29	80.63
48	2058	-	-	-	5.67	5.67	24.96	62.64	87.60	81.93
49	2059	-	-	-	5.67	5.67	24.96	63.95	88.90	83.24
50	2060	-	-	-	5.67	5.67	24.96	65.25	90.21	84.54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METERS
LEGEND:
Existing Diversion Dam
Existing Structures
Proposed Structures
Deleted Structures
Existing Lateral Canal
Existing Main Canal
Creek
River
Roads
National Irrigation System Boundary
MAIN CANAL
EXISTING DIVERSION DAM
LATERAL "I"
LATERAL "H"
LATERAL "G"
LATERAL "F"
LATERAL "E"
LATERAL "D"
LATERAL "C"
LATERAL "B"
LATERAL "A"
TO DAVAO CITY
National Irrigation Administration (NIA)
Japan International Cooperation Agency (JICA)
SECTOR LOAN FOR REHABILITATION OF IRRIGATION FACILITIES (SLRIF)
1302 - SIMULAO RIVER IRRIGATION SYSTEM
Trento, Agusan del Sur, Region-13
GENERAL LAYOUT

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities
Photograph of Irrigation Facilities

NIS name: Simulao NIS (Region 13) Date: May 20, 2009

Location / Facility	*Photograph*	*Comments*
01. Simulao Diversion Dam (ogee weir spillway) Long,E=8-04-34 Lat, N=126-06-47		Logs floating upstream of the Diversion Dam waiting to float over the spillway and loaded to truck downstream site
02. Simulao Diversion Dam (d/s view) Long,E=8-04-34 Lat, N=126-06-47		Proposed ideal loading site upstream of Dam to avoid damaging concrete structure
03. Simulao Diversion Dam (sluice way side) Long,E=8-04-34 Lat, N=126-06-47		Rusted Gear, Manually operated intake gate lifting mechanism proposed for engine driven

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities
Photograph of Irrigation Facilities

NIS name: Simulao NIS (Region 13) Date: May 20, 2006

Location / Facility	*Photograph*	*Comments*
04. Intake Structure Sta 0+000 of Main Canal		Eroded embankment at outlet transition of the intake, showing also the vertical staff gage at the center of the canal
05. Siphon Structure (Manat River) Long,E=8-5-34 Lat, N=126-05-23		Proposed provision of wasteway and silt/debris excluder about inlet of the Siphon Structure at Manat River
06. Headgate Structure of Lateral E (d/s Main Canal)		Silted Canal

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities
Photograph of Irrigation Facilities

NIS name: Simulao NIS (Region 13) Date: May 20, 2006

Location / Facility	*Photograph*	*Comments*
07. Main Canal		Built houses along the irrigation canal
08. Lucad Creek (end of Lateral E) Long N8-06-05 Lat E126-00-00		Silted Drainage Canal, need dredging and widening
09. Access Road (along Lucad Creek, connecting Lateral F) Long N8-06-05 Lat E125-59-30		No Passable Road during wet season