

**NATIONAL IRRIGATION ADMINISTRATION
THE REPUBLIC OF THE PHILIPPINES**

**JICA PREPARATORY SURVEY
FOR
SECTOR LOAN
ON
REHABILITATION OF IRRIGATION FACILITIES**

FINAL REPORT

VOLUME - II

ANNEXES (1/2)

SEPTEMBER 2009

JAPAN INTERNATIONAL COOPERATION AGENCY

**NIPPON KOEI CO., LTD.
SANYU CONSULTANTS INC.**

JICA Preparatory Survey
for
Sector Loan on Rehabilitation of Irrigation Facilities

Final Report

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Annex A

NIS Summary Report for SLRIF

Draft Final Report

Annex A

NIS Summary Report for SLRIF

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32-NATIONAL IRRIGATION SYSTEMS (NISs)



| REGION I | |
|--------------------|-------------------|
| Name of System | SERVICE AREA (ha) |
| Laoag Vintar | 2,286 |
| Dingras | 1,004 |
| Madongan Area | 2,933 |
| Solsona Area | 1,340 |
| Labugaon Area | 1,470 |
| Papa Area | 2,337 |
| Sta. Lucia-Candon | 1,423 |
| Tagudin | 1,253 |
| Amburayan | 3,289 |
| San Fabian-Dumoloc | 2,026 |
| TOTAL | 20,893 |

| REGION III | |
|----------------|-------------------|
| Name of System | SERVICE AREA (ha) |
| Porac - Gumain | 3,126 |
| TOTAL | 3,126 |

| REGION IV | |
|----------------|-------------------|
| Name of System | SERVICE AREA (ha) |
| Dumacaa | 1,839 |
| Sta. Cruz | 2,185 |
| Malatgao | 3,014 |
| TOTAL | 7,038 |

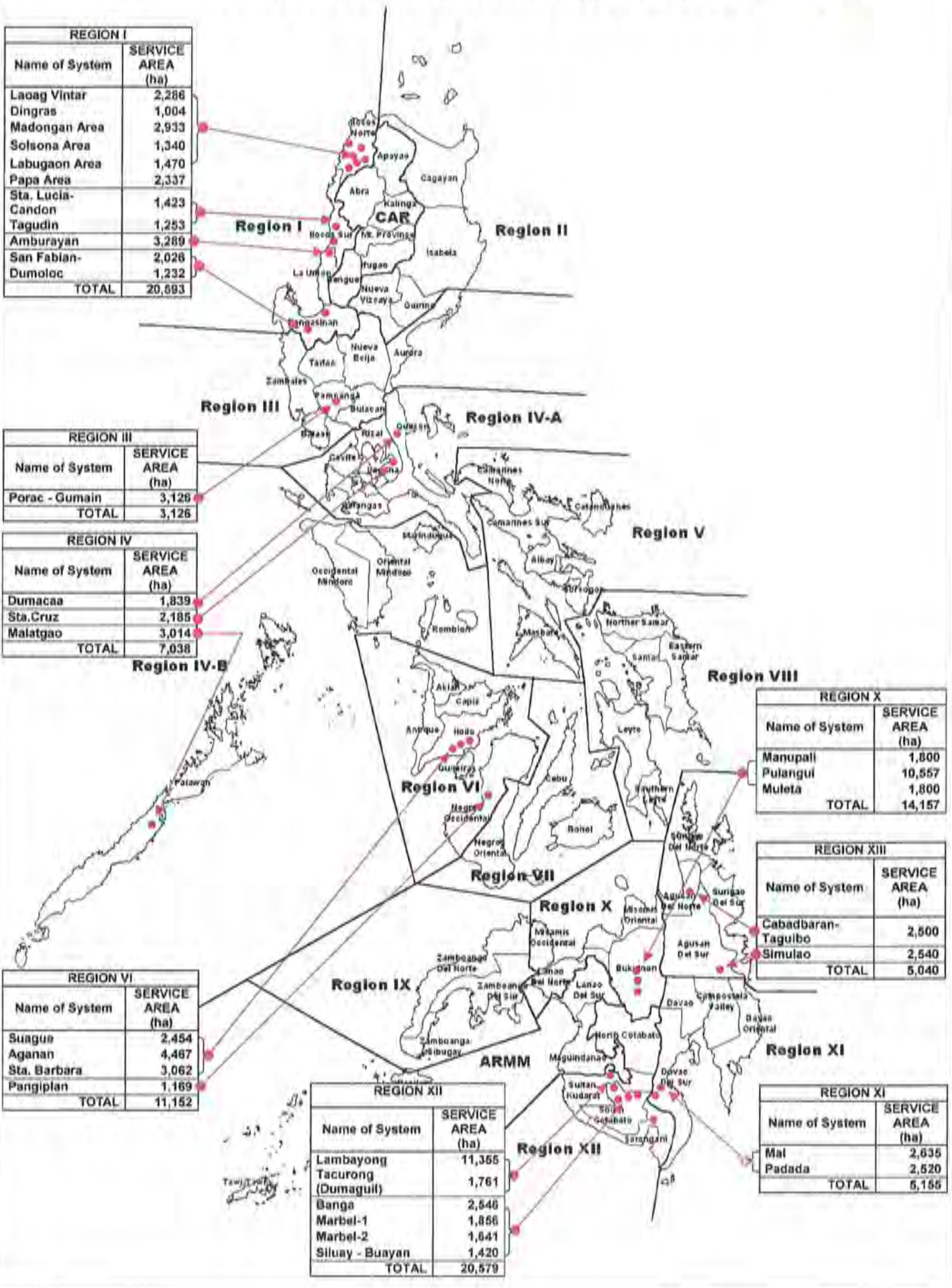
| REGION VI | |
|----------------|-------------------|
| Name of System | SERVICE AREA (ha) |
| Suague | 2,454 |
| Aganan | 4,487 |
| Sta. Barbara | 3,062 |
| Pangiplan | 1,169 |
| TOTAL | 11,152 |

| REGION XII | |
|---------------------|-------------------|
| Name of System | SERVICE AREA (ha) |
| Lambayong | 11,355 |
| Tacurong (Dumaguil) | 1,761 |
| Banga | 2,546 |
| Marbel-1 | 1,856 |
| Marbel-2 | 1,641 |
| Siluyay - Buayan | 1,420 |
| TOTAL | 20,579 |

| REGION X | |
|----------------|-------------------|
| Name of System | SERVICE AREA (ha) |
| Manupali | 1,800 |
| Pulangui | 10,557 |
| Muleta | 1,800 |
| TOTAL | 14,157 |

| REGION XIII | |
|---------------------|-------------------|
| Name of System | SERVICE AREA (ha) |
| Cabadbaran-Tagulibo | 2,500 |
| Simulao | 2,540 |
| TOTAL | 5,040 |

| REGION XI | |
|----------------|-------------------|
| Name of System | SERVICE AREA (ha) |
| Mal | 2,635 |
| Padada | 2,520 |
| TOTAL | 5,155 |



IRRIGATION DEVELOPMENT MAP

Region I



Luzon-Vintar RIS
Service Area = 2,286 ha.

Solomon RIS
Service Area = 1,540 ha.

Mabuhayon Area IS
Service Area = 2,933 ha.

Laluganwan RIS
Service Area = 1,470 ha.

Diagram RIS
Service Area = 1,004 ha.

Papa Area RIS
Service Area = 2,337 ha.

Santa Lucia-Candau RIS
Service Area = 1,423 ha.

Yapudis RIS
Service Area = 1,253 ha.

Amburayan RIS
Service Area = 3,289 ha.

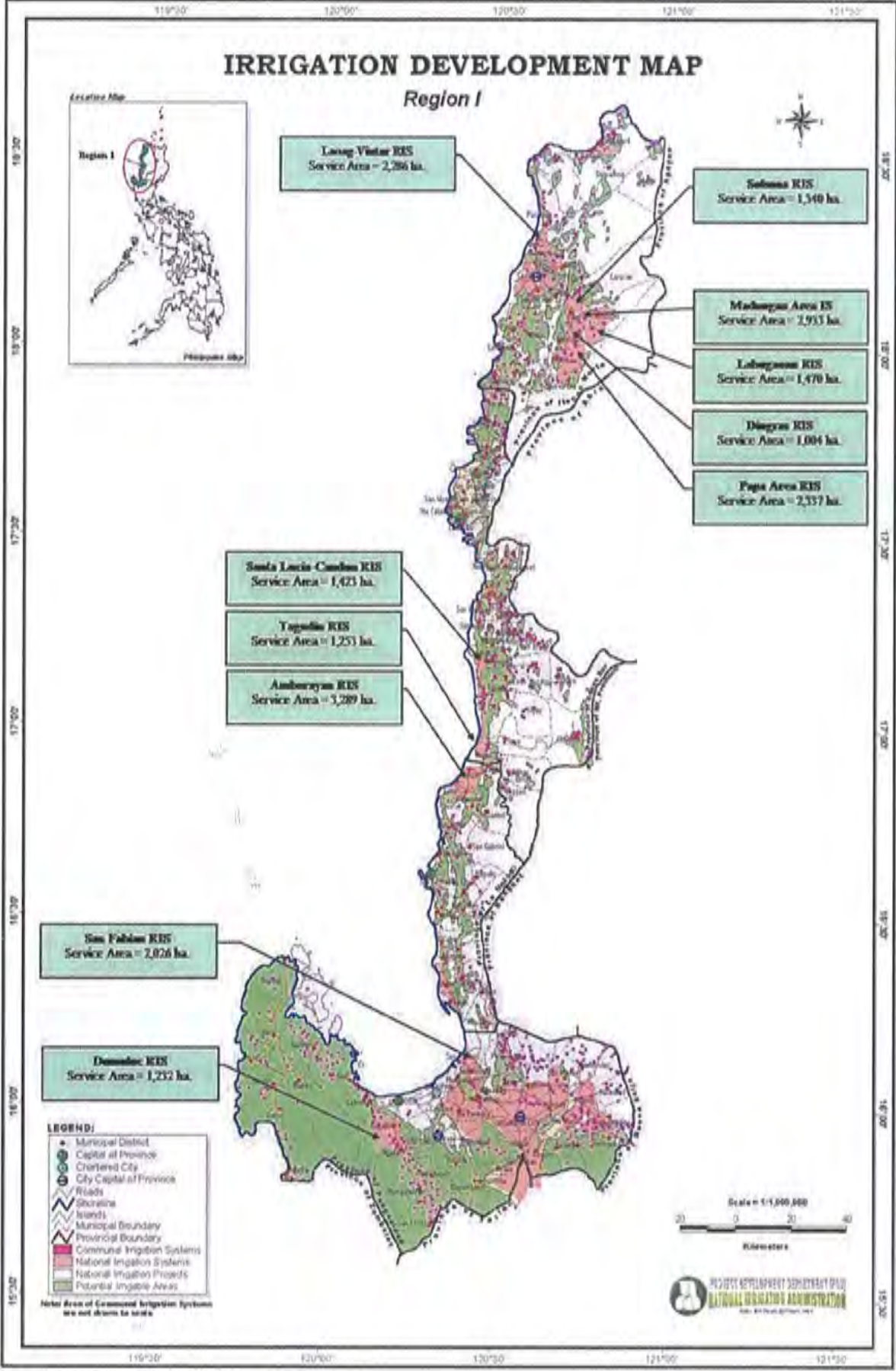
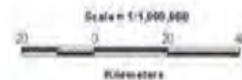
San Fabian RIS
Service Area = 2,026 ha.

Dumadac RIS
Service Area = 1,252 ha.

LEGEND:

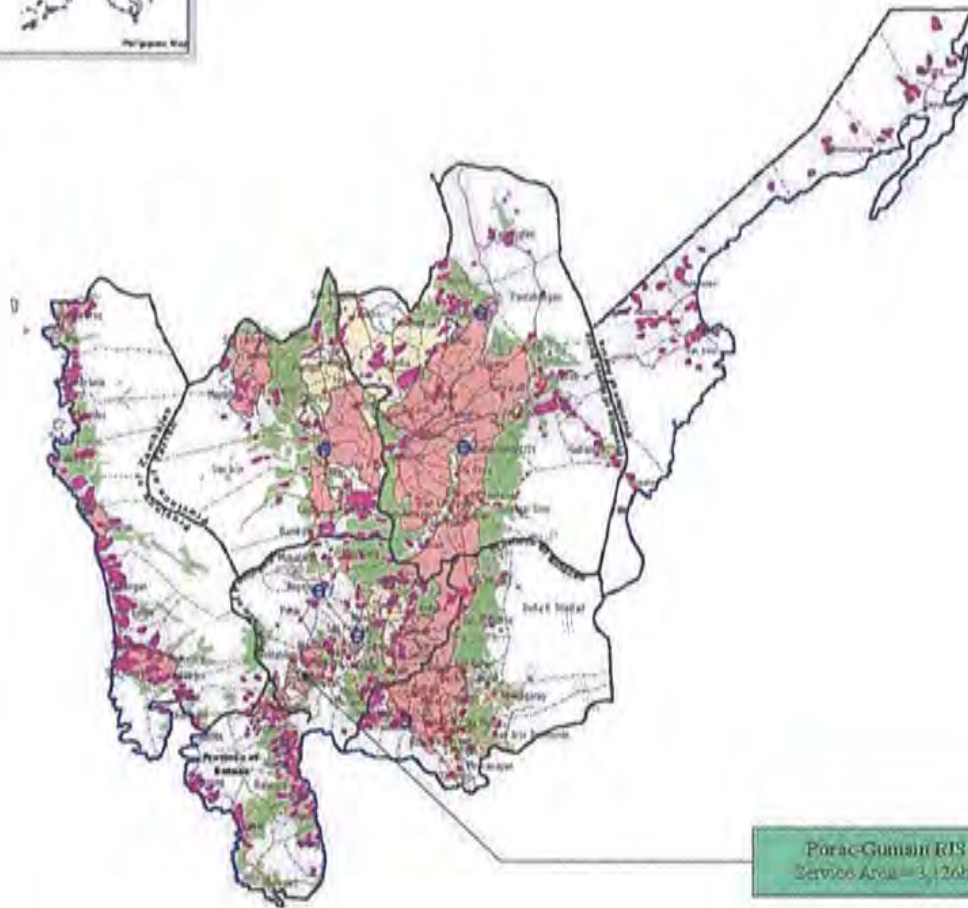
- Municipal District
- Capital of Province
- Chartered City
- City Capital of Province
- Roads
- Shoreline
- Islands
- Municipal Boundary
- Provincial Boundary
- Communal Irrigation Systems
- National Irrigation Systems
- National Irrigation Projects
- Potential Irrigable Areas

Note: Area of Communal Irrigation Systems are not shown in scale.



IRRIGATION DEVELOPMENT MAP

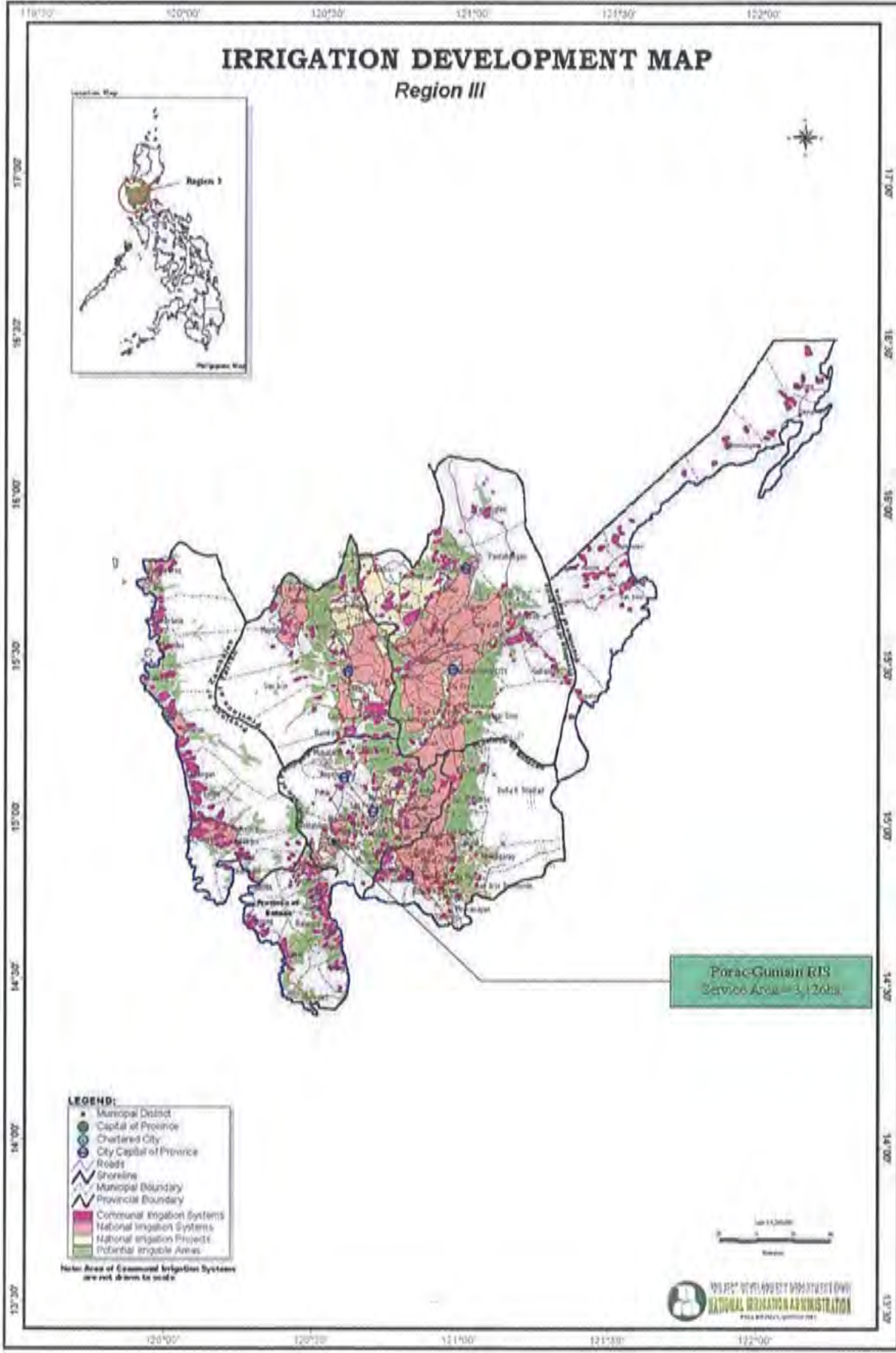
Region III

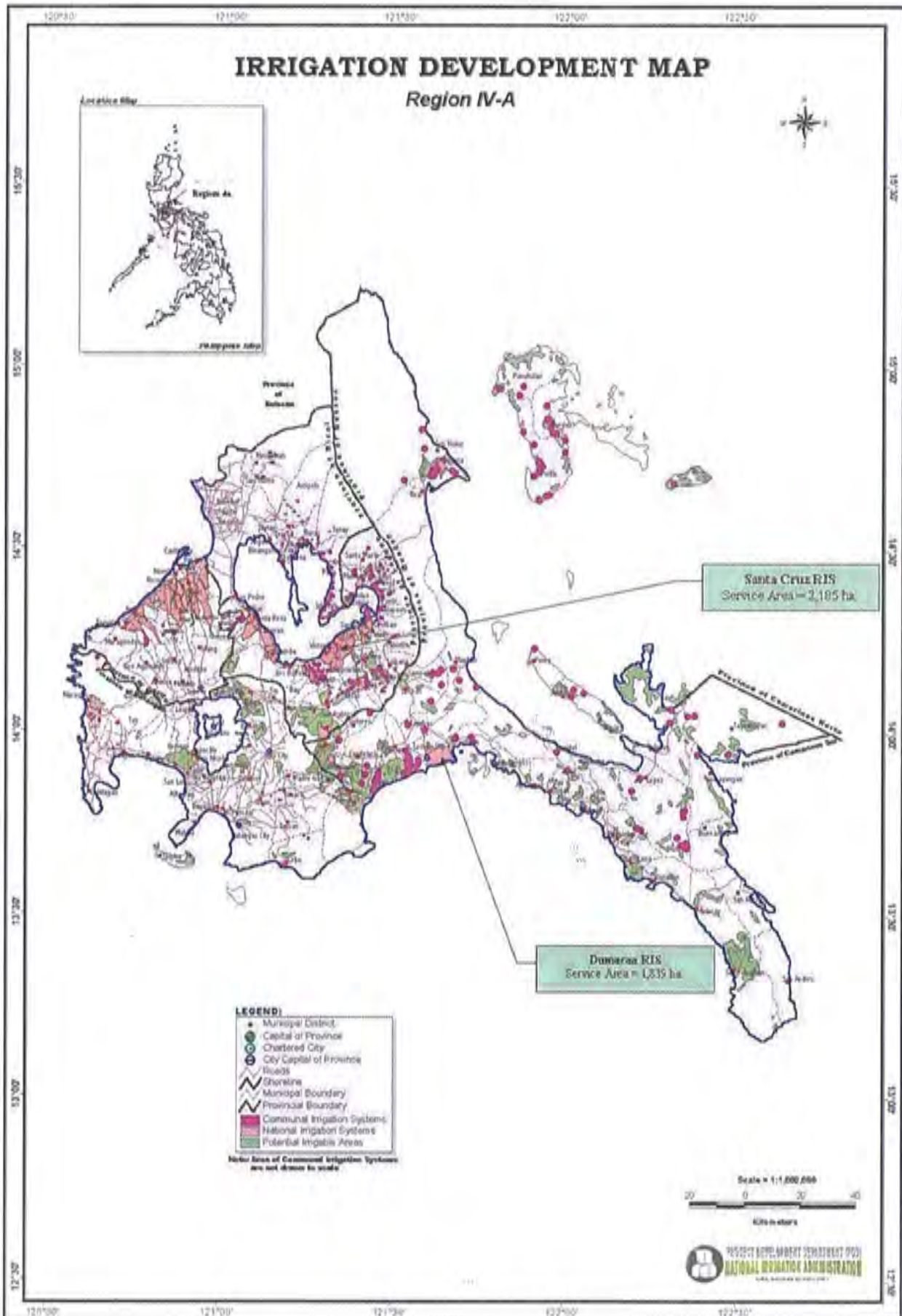


Porac-Gumain RIS
Service Area = 3,126ha

- LEGEND:**
- Municipal District
 - Capital of Province
 - Chartered City
 - City Capital of Province
 - Roads
 - Shoreline
 - Municipal Boundary
 - Provincial Boundary
 - Communal Irrigation Systems
 - National Irrigation Systems
 - National Irrigation Projects
 - Potential Irrigable Areas

Note: Area of Communal Irrigation Systems are not shown to scale





IRRIGATION DEVELOPMENT MAP

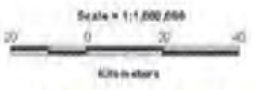
Region IV-A



Santa Cruz RIS
 Service Area = 2,185 ha

Dumarao RIS
 Service Area = 1,835 ha

- LEGEND:**
- Municipal District
 - Capital of Province
 - Chartered City
 - City Capital of Province
 - Roads
 - Shoreline
 - Municipal Boundary
 - Provincial Boundary
 - Communal Irrigation Systems
 - National Irrigation Systems
 - Potential Irrigation Areas
- Notes: Areas of Communal Irrigation Systems are not shown to scale



117°30'

119°00'

120°30'

IRRIGATION DEVELOPMENT MAP

Region IV- B (Sheet 2)

Location Map



12°08'

10°30'

9°02'

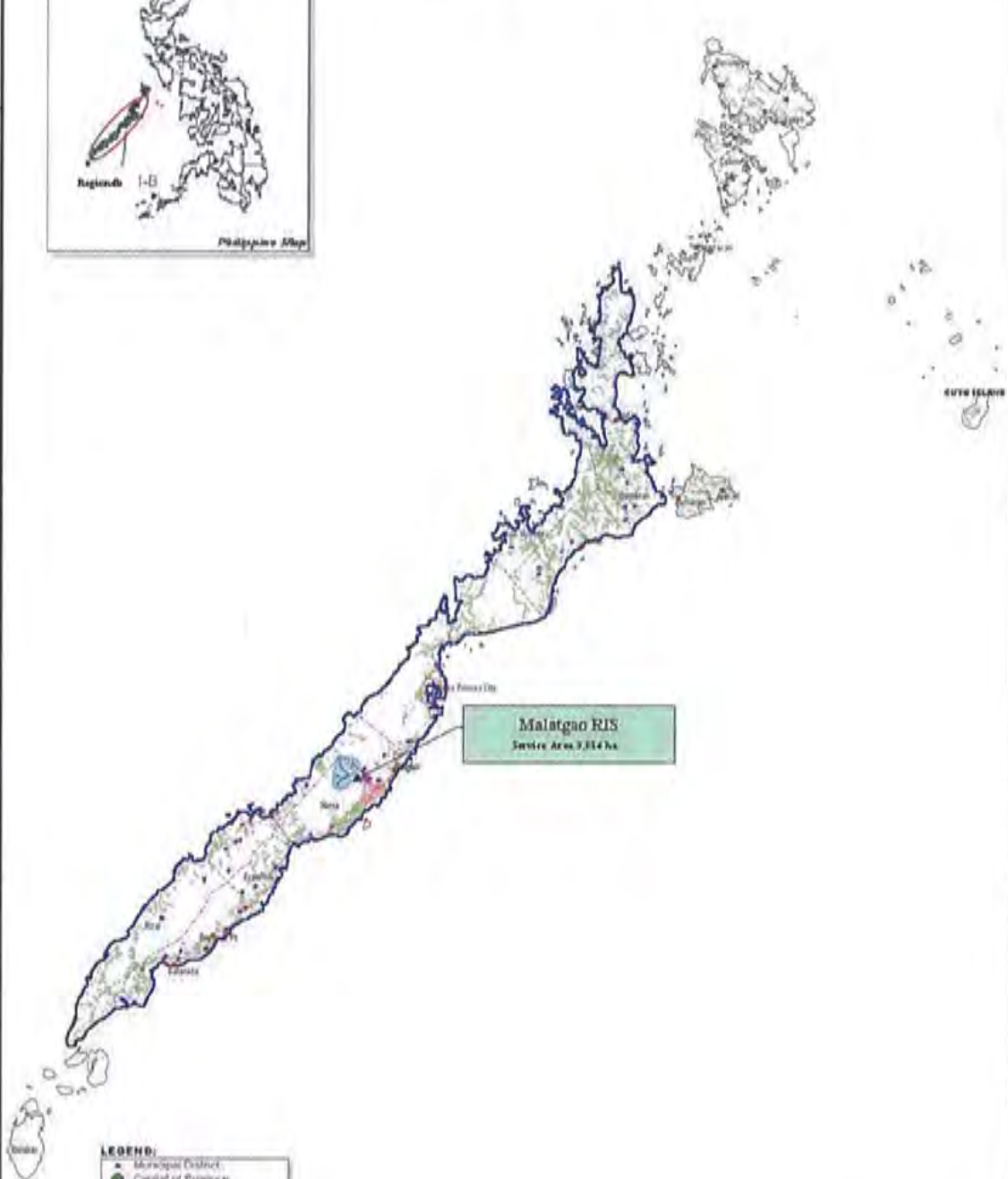
7°34'

120°22'

10°44'

9°06'

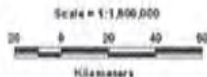
7°28'



LEGEND:

- Municipal District
- Capital of Province
- Chartered City
- City Capital of Province
- Roads
- District
- Municipal Boundary
- Provincial Boundary
- Communal Irrigation Systems
- National Irrigation Systems
- Potential Irrigable Area

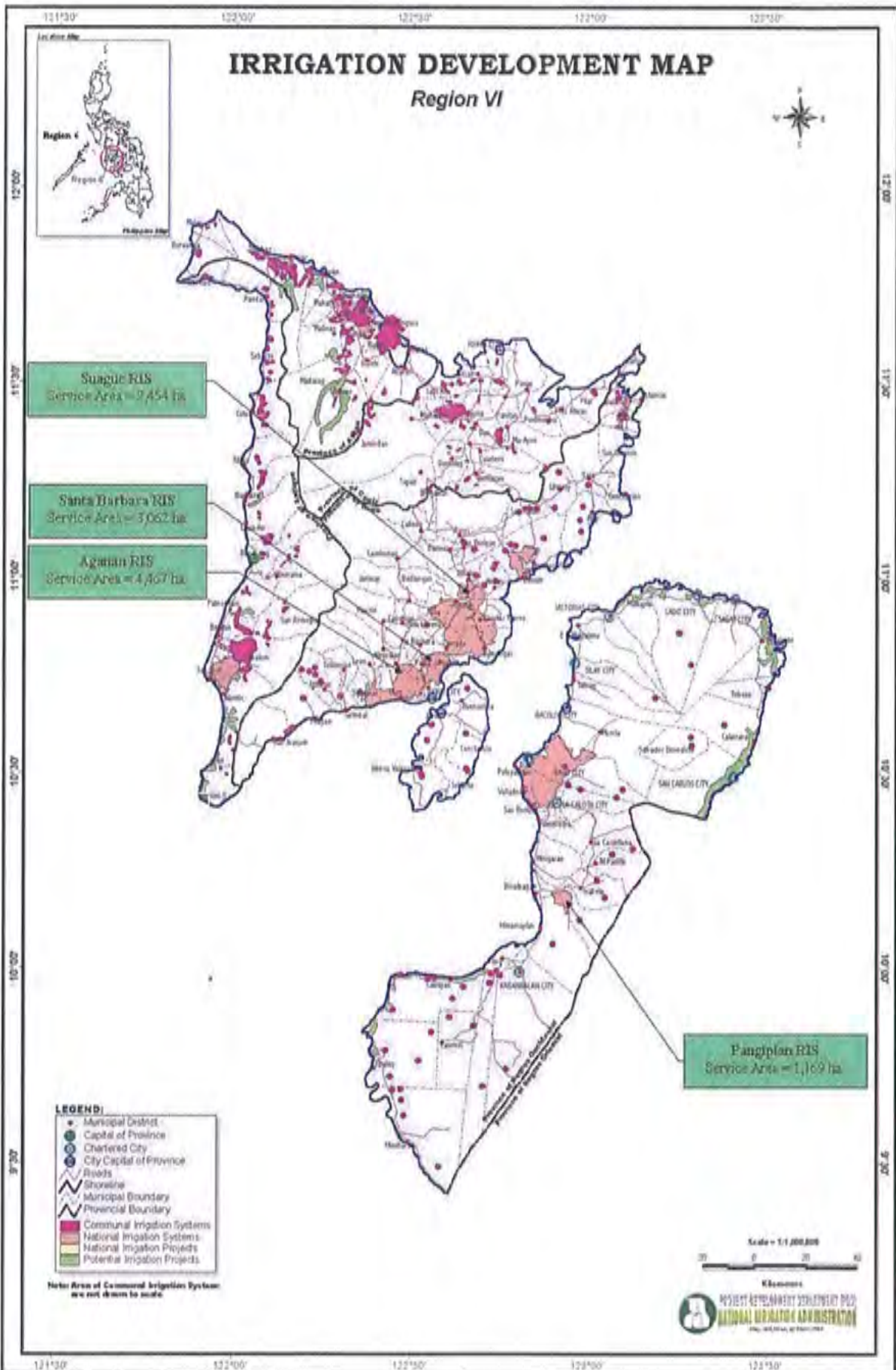
Note: Area of Communal Irrigation Systems are not shown to scale

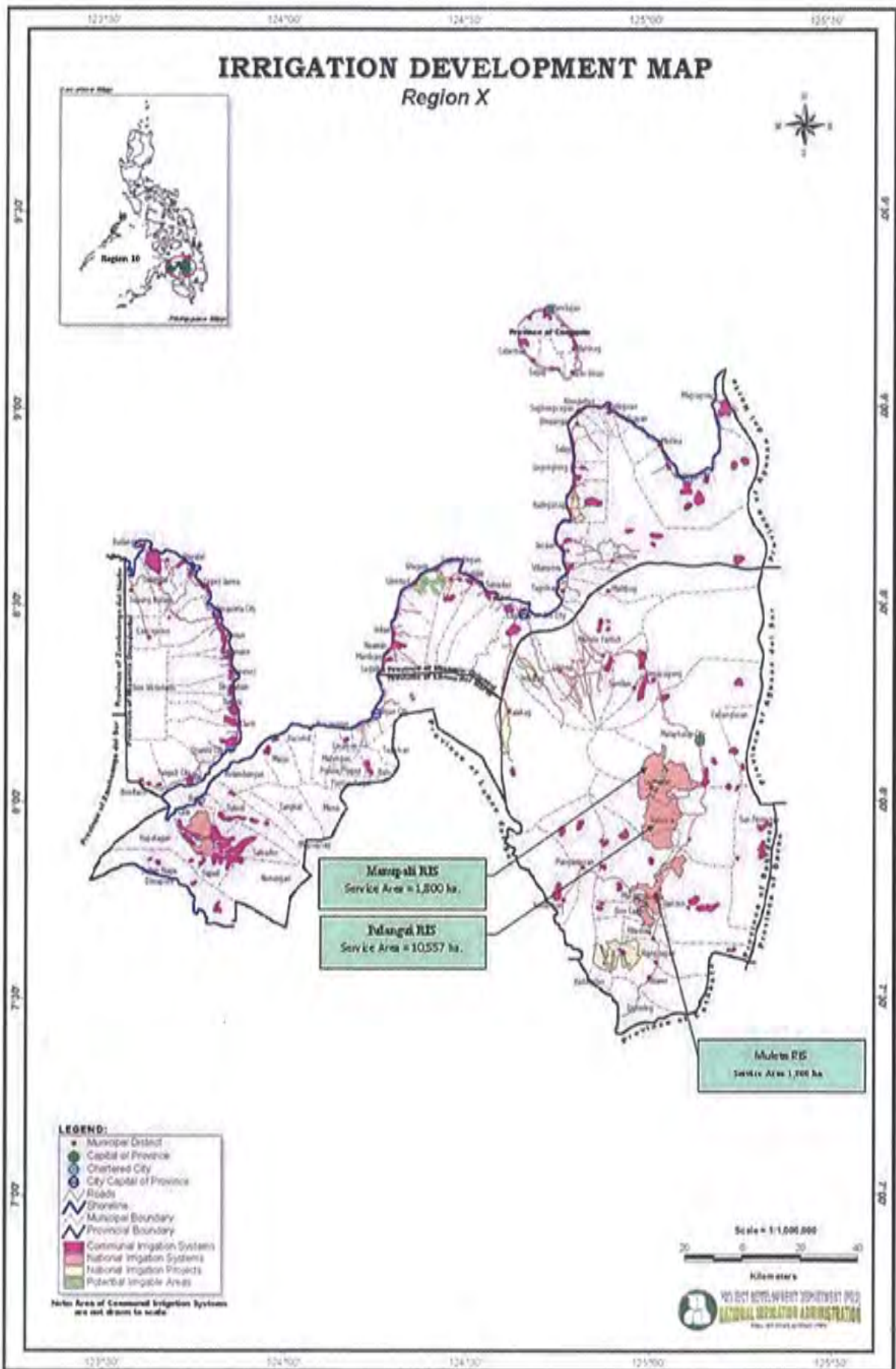


117°30'

119°00'

120°30'





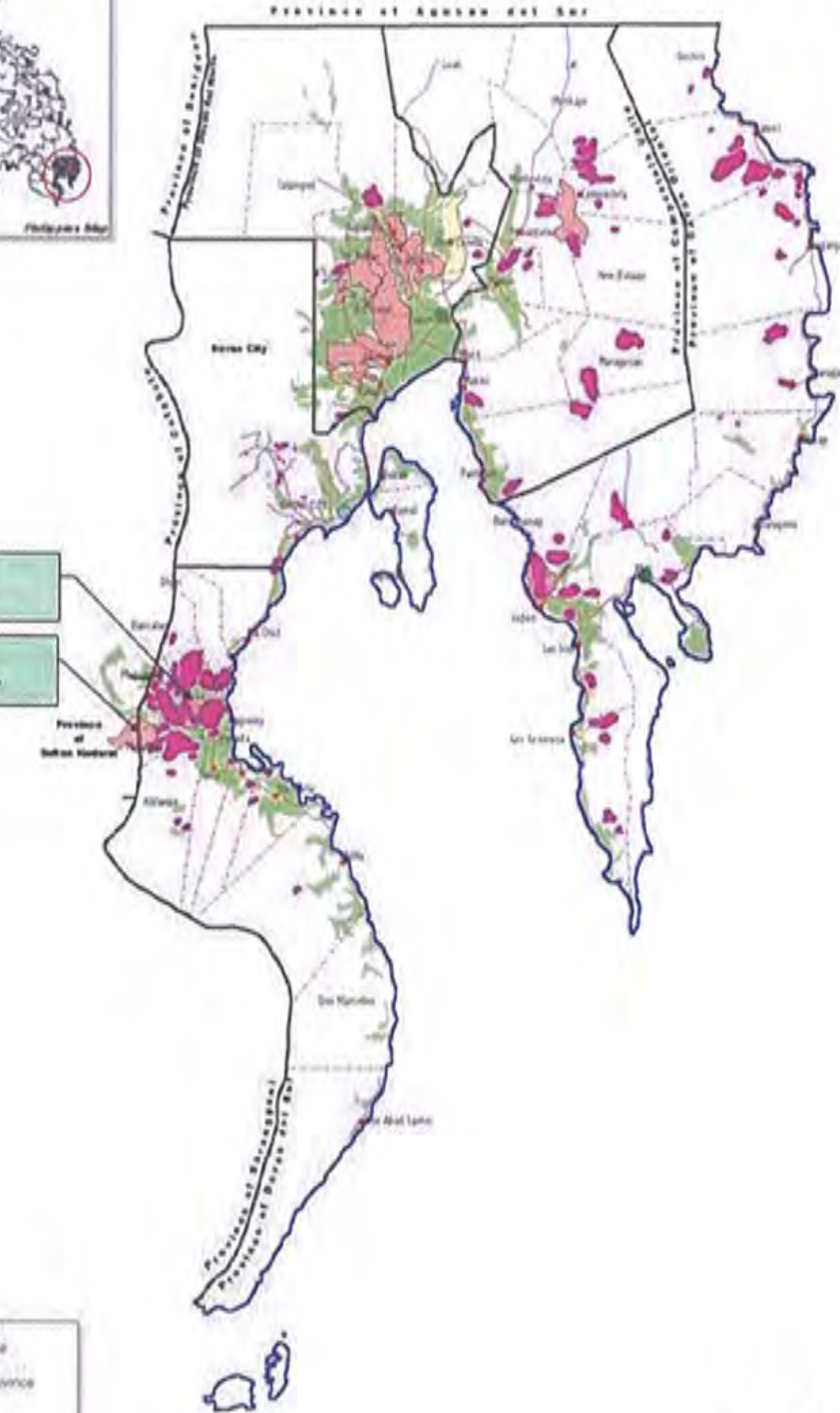
IRRIGATION DEVELOPMENT MAP

Region XI



8°00'
7°30'
7°00'
6°30'
6°00'
5°30'

8°00'
7°30'
7°00'
6°30'
6°00'
5°30'



Pactwa RE
Service Area 7,579 ha

Idah RE
Service Area 2,435 ha

- LEGEND:**
- Municipal District
 - Capital of Province
 - Chartered City
 - City Capital of Province
 - Roads
 - Shoreline
 - Municipal Boundary
 - Provincial Boundary
 - Communal Irrigation Systems
 - National Irrigation Systems
 - National Irrigation Projects
 - Potential Irrigable Areas
- Note: Service Area of Communal Irrigation Systems are not shown for scale*

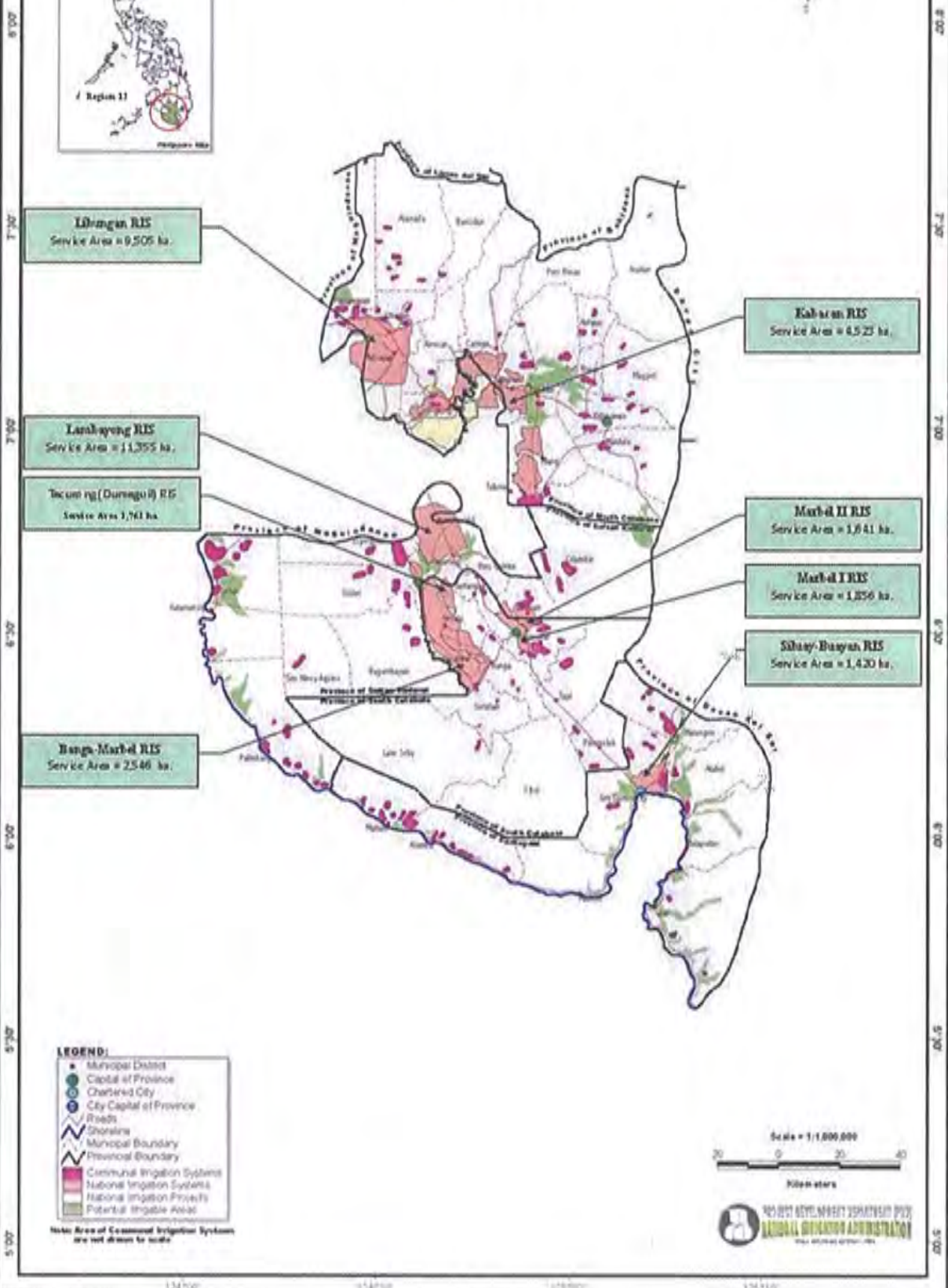


5°30'

125°00' 125°30' 126°00' 126°30'

IRRIGATION DEVELOPMENT MAP

Region XII



Ibigan RIS
Service Area = 9,505 ha.

Kabunon RIS
Service Area = 4,523 ha.

Lanangon RIS
Service Area = 11,355 ha.

Marbil II RIS
Service Area = 1,641 ha.

Dumaguete (Dumaguete) RIS
Service Area = 1,761 ha.

Marbil I RIS
Service Area = 1,856 ha.

Sibuyan-Bangay RIS
Service Area = 1,420 ha.

Banga-Marbil RIS
Service Area = 2,546 ha.

LEGEND:

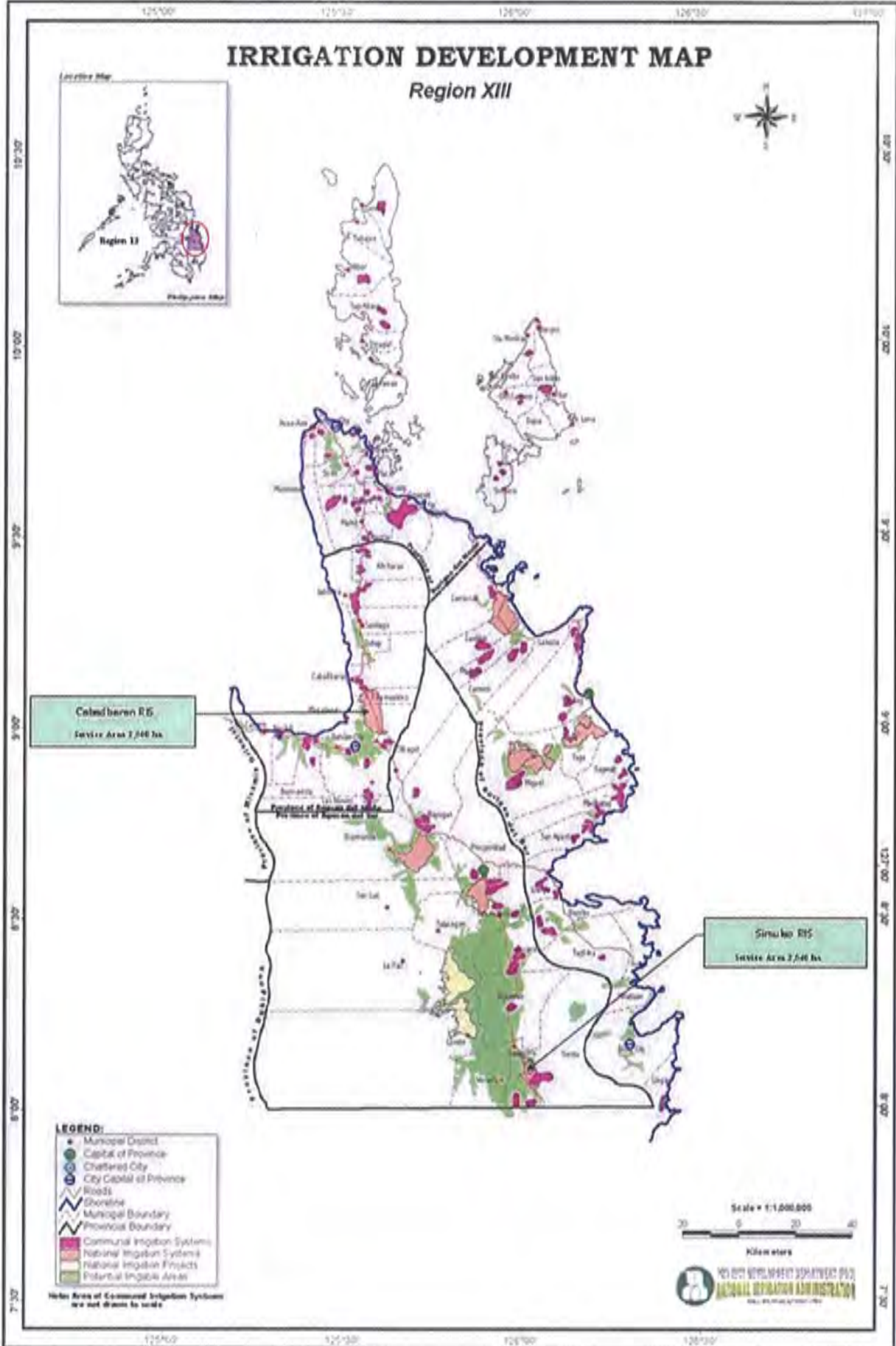
- Municipal District
- Capital of Province
- Chartered City
- City Capital of Province
- Roads
- Shoreline
- Municipal Boundary
- Provincial Boundary
- Central Irrigation Systems
- National Irrigation Systems
- National Irrigation Projects
- Potential Irrigable Area

Note: Area of Cassava Irrigation Systems are not shown to scale.



IRRIGATION DEVELOPMENT MAP

Region XIII

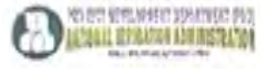


Central baron RIS
Service Area 2,646 ha

Simuho RIS
Service Area 2,646 ha

- LEGEND:**
- Municipal District
 - Capital of Province
 - Chartered City
 - City Capital of Province
 - Roads
 - Shoreline
 - Municipal Boundary
 - Provincial Boundary
 - Communal Irrigation Systems
 - National Irrigation Systems
 - National Irrigation Projects
 - Potential Irrigable Areas
- Note: Areas of Communal Irrigation Systems are not drawn to scale*

Scale = 1:1,000,000
0 5 10 20 40
Kilometers



**THE REPUBLIC OF PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION**

**Sector Loan on
Rehabilitation of Irrigation Facilities**

NIS SUMMARY REPORT

0101

Laoag Vintar RIS

Region 1

Illocos Norte 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**

| <i>Item</i> | <i>Description</i> | |
|---|--|---|
| 1) Name of NIS | Laoag Vintar RIS Code: 0101 | |
| 2) Location | Region | Region 1 |
| | Province | Ilocos Norte |
| | Municipality | Vintar, Sarrat, Bacarra, Laoag City |
| | Distance | 16 km from Laoag City |
| 3) Type of Water Source | Water Source | Vintar River |
| | Type | Diversion Dam (200 m wide, 1.50 m high) |
| 4) Area | Service Area | 2,377 ha |
| | FUSA | 2,286 ha |
| 5) Beneficiary Farmers | 2,394 farmers | Average paddy field cultivating size = 0.95 ha per farmer |
| 6) Irrigator's Association | IAs established = 5 FIA established = 1 in 2008 | |
| 7) Features of NIS and Necessity of the project | <p>The system has manually operated sluiceway gate where the gatekeeper needs 4 men to lift it during typhoons and heavy rain and lower it during resumption of operation. The system is prone to siltation as its irrigation canals and facilities built in sidehill. The last rehab was in 1980—1986 during the NISIP I project</p> <p>The rehabilitation works is necessary to restore the full functionality and stability of the dam and canal structures and to improve the efficiency of water delivery in the canals and efficiency of water distribution to the farms.</p> | |
| 8) Outline of the Proposed Project | <p>A. Engineering</p> <ol style="list-style-type: none"> 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 <p>B. Institutional Strengthening Program</p> <p>B.1 Basic Program</p> <ol style="list-style-type: none"> 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 <p>B.2 Specific Program to strengthen institutional mechanism together with LGUs</p> <ol style="list-style-type: none"> 1. Monitoring and control of illegal mechanical quarrying 2. Improvement of watershed management | |

| | | | | |
|---|--|-----|----------------|-------------------|
| 9) Proposed Project Component | <p>A. Engineering</p> <p>1. Construction of civil works for rehabilitation of diversion works, canal system, drainage system, roads, and IMT support facilities.</p> <p>B. Institutional Strengthening Program</p> <p>1. Reactivation of FIAs/IAs including reformation of TSGA / IA / FIA areas, construction of IMT support facilities (demand base)</p> <p>2. Strengthening NIA-IA- LGUs Partnership, especially coordination RDC, RAFC/PAFC with FIAs/IAs and ISMC</p> <p>3. Institutional development program to strengthen management capacity of NIA field offices and IAs.</p> | | | |
| 10) Project Cost (Direct cost only, excluding escalation, contingency, tax) | 1. Direct cost | | PHP | 241.16 Million |
| | - Civil Works | PHP | 231.54 Million | |
| | - Institutional Development | PHP | 4.80 Million | |
| | - Engineering Services | PHP | 4.82 Million | |
| | 2. Indirect cost | | PHP | 21.58 Million |
| | Total Project Cost (1+2) | | PHP | 262.74 Million |
| | Cost per ha | | PHP | 114,935.00 per ha |
| 11) Project Benefit | <p>1. To increase paddy production by 4,035.00 tons/year</p> <p>2. To increase farmers' net income to PHP64,238.00/ha/year</p> <p>3. To establish functional and self-reliant IAs</p> <p>4. To improve performance of NIS</p> | | | |
| 12) Project Justification | EIRR = 18.1 %, B/C = 1.21 (discount rate 15%) | | | |

2. Project History (Construction/Rehabilitation)

| Year | Description |
|-----------|-----------------------------------|
| 1929 | Completion of system |
| 1980-1986 | Rehab of the system under NISIP I |

3. Present Condition

3.1 Natural Conditions

| Item | Description |
|------------------------------|---|
| 1) Annual Rainfall | 2,070 mm |
| 2) Seasons | Wet season: May - Oct Dry season: Nov. - April |
| 3) Dominant Soil in NIS Area | Clay loam |
| 4) Topography | Undulated |

3.2 Socio-economy (Region/Province)

| Item | Description |
|---------------------------|--|
| 1) GRDP | PHP 185,566 million (Year 2007), Per Capita GRDP = PHP 38,566 per year |
| 2) Population | 547,284 (province) |
| 3) Population Growth Rate | 0.86 % per year (region) |
| 4) Labor Force | 3,183,000 (province) |
| 5) Poverty Population | 21.2% to total population (province) |

3.3 Present Agriculture in NIS

| <i>Item</i> | <i>Description</i> | | | | | | |
|---|---|---------------------------|--------|---------------------|-------|---------|-------|
| 1) Farm Household in NIS | Total beneficiaries | 2,394 households | | | | | |
| | Land owners | 445 households (18.6 %) | | | | | |
| | Tenant farmers | 1,949 households (81.4 %) | | | | | |
| 2) Paddy Field Size in NIS | 0.95 ha per household (FUSA/Total beneficiaries as of 2008) | | | | | | |
| 3) Present Land Use in NIS | Paddy field planted | 2,102 ha | 88.4 % | As of 2008 | | | |
| | Paddy field not planted | 184 ha | 7.8 % | 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 | 91 ha | 3.8 % | No data in response | | | |
| 4) Paddy Field in FUSA (ha) | 2,286 | | | | | | |
| 5) Paddy Cropped Area (ha) | 2004 | 2005 | 2006 | 2007 | 2008 | Average | |
| | Wet Season | 2,208 | 2,048 | 1,962 | 2,014 | 2,102 | 2,067 |
| | Dry Season | 1,460 | 1,437 | 1,483 | 1,353 | 1,257 | 1,398 |
| 6) Cropping Intensity (%) (per year) | 2004 | 2005 | 2006 | 2007 | 2008 | Average | |
| | 160 | 152 | 151 | 147 | 147 | 152 | |
| 7) Unit Yield of Paddy (ton/ha) | 2004 | 2005 | 2006 | 2007 | 2008 | Average | |
| | Wet Season | 4.90 | 4.20 | 4.40 | 4.60 | 4.00 | 4.42 |
| | Dry Season | 4.80 | 4.40 | 4.50 | 4.30 | 4.30 | 4.47 |
| 8) Paddy Production (ton) | 2004 | 2005 | 2006 | 2007 | 2008 | Average | |
| | Wet Season | 10,819 | 8,602 | 8,633 | 9,264 | 8,408 | 9,145 |
| | Dry Season | 7,008 | 6,323 | 6,674 | 5,818 | 5,405 | 6,245 |

3.4 Water Resources

| <i>Item</i> | <i>Description</i> |
|------------------------------|-------------------------|
| 1) Name of Rivers | Vintar River |
| 2) Catchment Area at Dam | 212.25 km ² |
| 3) Ave. River Discharge | 10.89 m ³ /s |
| 4) Ave. Dry Season Discharge | 7.33 m ³ /s |
| 5) Diverted Intake Discharge | 2.07 m ³ /s |
| 6) Water Requirement | 4.11 m ³ /s |
| 7) Sedimentation | High |

3.5 Existing Irrigation System

| <i>Item</i> | <i>Description</i> |
|------------------------|---|
| 1) Diversion Dam | Overflow crest width 200.0 m, Dam height 1.50 m |
| 2) Main Canal | Total length 31.30 km (Lined portion 0.517 km) |
| 3) Lateral Canals | Total length 41.68 km (Lined portion 0.00 km) |
| 4) On-farm facilities | Total length 76.00 km (Lined portion 0.00 km) Turn-outs = 152 units |
| 5) Drainage Canal | Total length 23.020 kms. |
| 6) Canal Structures | No. = 242 units |
| 7) Drainage Structures | No. = 30 |
| 8) Farm roads | Total length 48.505 km (pavement = 0 kms.) |

3.6 Institutions for O&M of NIS

| <i>Item</i> | <i>Description</i> | | | | | |
|--|------------------------------|------|------|------|------|---------|
| 1) Regional Irrigation Office | Name: Region 1-Ilocos Region | | | | | |
| 2) IMO | Name: Ilocos Norte IMO | | | | | |
| Staff in 2009 | Total number of staff: 60 | | | | | |
| 3) Irrigator' Association (IA) | 2004 | 2005 | 2006 | 2007 | 2008 | Average |
| Number of FIA (nos) | | | | | 1 | |
| Number of IA (nos) | | | | | 5 | |
| Number of TSAG (nos) | 60 | 60 | 64 | 66 | 68 | 64 |
| Functionality of IA | 84.5 | 85.0 | 85.0 | 86.1 | 82.4 | 84.60 |
| Collection of ISF,% (wet) | 30 | 0 | 0 | 0 | 0 | 30 |
| Collection of ISF,% (dry) | 61 | 59 | 68 | 0 | 63 | 63 |
| 4) NIS Category based on IA 2008 O&M Contract (NIA-IA) | No. of IA | | | | | |
| Category A | 0 | | | | | |
| Category B | 5 | | | | | |
| Category C | 0 | | | | | |

3.7 Existing Problems

| <i>Item</i> | <i>Description</i> |
|---|---|
| 1) Diversion Works | 1. River siltation/sedimentation 2. Hard to operate sluiceway gates/intake gates 3. Heavy scouring/damage to dam apron 4. Siltation of intake |
| 2) Canal and Structures | 1. Heavy damages of canals from siltation and erosions especially during inclement weather conditions 2. Damages to existing canal structures and appurtenant parts 3. Construction of new structures to suit actual field conditions |
| 3) Drainage Canal | 1. Damages to existing drainage canals 2. Damages to existing structures 3. Siltation to the canals 4. Other related works to the proper functioning of canals |
| 4) Other Project Facilities (road, bridge, flood dike, building, etc) | 1. Damages to road structures and appurtenant structures 2. Repair/rehab of existing field office/quarter |
| 5) Water Management and O&M Activities | 1. Continuing cooperative efforts by DA/MA/PA of increased rice production 2. Sharing of relative agro-statistical data of concerned entities 3. Installation/sharing of agro-meteorological equipments |
| 6) Status of NIS and IA Management | Status Type F evaluated by Radar Graph (no matured status). Specific problems are: 1. High ratio of tenancy at 75% 2. Low cropping intensity during the dry season at 60% 3. Low ISF collection efficiency during the dry and wet seasons at 0 and 63%, respectively 4. Low yield of paddy during the dry season at 61 cavans/ha |
| 7) Watershed Management | 1. Coordination to DENR and other concerned entities to address this effort 2. Watershed is significantly denuded. |
| 8) Coordination with LGUs and Agencies concerned | 1. Minimum coordination by NIA's field offices and IAs with concerned LGUs and other line agencies on the specific problems such as monitoring and control of illegal mechanical quarrying and watershed management |
| 9) Others | 1. Sharing of available logistics |

4. Proposed Rehabilitation Plan

4.1 Agricultural Development Plan

| Item | Description | | | |
|-------------------------------|-------------|--------------|--------------|--------|
| | Wet Season | Dry Season-1 | Dry Season-2 | Annual |
| Cropping schedule | | | | |
| 1) Type of Crops | Paddy | paddy | Corn | - |
| 2) Cropping Area (ha) | 2280 | 1000 | 368 | - |
| 3) Target Unit Yield (ton/ha) | 5 | 5 | 6 | - |
| 3) Total Production (ton) | 11400 | 5000 | 2208 | - |

4.2 Civil Works

| Item | Description |
|---------------------------|--|
| 1) Diversion Works | 1. Repair of sluiceway gate and intake gates including lifting mechanisms-1unit |
| 2) Canal Structures | 1. Repair of damaged structures - 93 units 2. Repair/replacement of dilapidated steel gates. 3. Installation of new structure steel gates |
| 3) Canalization | 1. Concrete lining of selected canal sections - 72 kms 2. De-silting of selected canal sections. 3. Realignment of canal 4. Construction of new canal |
| 4) Drainage Structures | 1. Repair of drainage structures – 15 units 2. Construction of additional structures |
| 5) Drainage Canalization | 1. De-silting of existing drainage canals -12.75 kms 2. Construction of additional drainage canals |
| 6) Service Roads | 1. Re-graveling of selected road sections-31 kms 2. Construction of side drains 3. Construction of drainage structures in strategic road locations |
| 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) | <ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> 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 |

| <i>Item</i> | <i>Description</i> |
|--|---|
| 2) Strengthening Program of NIA - IA - LGU Partnership | <ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> 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 | <ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> 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 | <ol style="list-style-type: none"> 1. Strengthening coordination with RDC, RAFC/PAFC and LGUs concerned through works shop on dissemination of the SLRIF to these organizations. 2. Request LGUs legal actions on protection of illegal mechanical quarrying prior to the commencement of the SLRIF through the coordination activities 3. Strengthening coordination with RDC, RAFC/PAFC and LGUs on training program of watershed management 4. Strengthening coordination on establishment of monitoring and control mechanism of illegal quarrying |

4.4 Proposed Counter Schemes

| <i>Item</i> | <i>Description</i> |
|-------------|--|
| 1) DENR | 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 | <ol style="list-style-type: none"> 1. LGU initiates training and upgrade technical skills of its engineers by inviting resource persons from the key line departments and/or national agencies (e.g. NIA, DPWH.) 2. LGUs take actions on information awareness on the Project implementation through local communication media. 3. LGU establishes a coordinating/steering committee at the provincial level to improve coordination and representation of NIA in local planning and budgeting. |

5. Cost Estimate for Initial Investment

| <i>Item</i> | <i>Description</i> | |
|--------------------------------|---|---------------------|
| 1) Direct Cost for Civil Works | A. Mobilization | Php 4.82 Million |
| | B. Protection Dikes | Php 18.71 Million |
| | C. Diversion Works | Php 12.77 Million |
| | D. Canal Structures | Php 32.21 Million |
| | E. Canalization | Php 125.43 Million |
| | F. Drainage Structures | Php 4.57 Million |
| | G. Drainage Canalization | Php 6.86 Million |
| | H. Roads | Php 7.33 Million |
| | I. On-Farm Facilities/T.O. Gates | Php 1.56 Million |
| | J. IMT Support Facilities | Php 15.00 Million |
| | K. IMT GIS Database | Php 2.29 Million |
| | L. Institutional Development (5% of Direct Cost) | Php 4.80 Million |
| | M. Feasibility Studies & Detailed Engineering (2% of Direct Cost) | Php 4.82 Million |
| | Sub-total (Direct Cost) | |
| 2) Indirect Cost | A. General Engineering Supervision and Administration (3.5% of Direct Cost) | Php 8.44 Million |
| | B. NIA Management Fee (5% of Total Project Cost) | Php 13.14 Million |
| | Sub-total (Indirect Cost) | |
| 3) Total Project Cost | = 1+2 | Php 262.74 Million |
| Cost per ha. | | Php 114,935.00 /ha. |

6. Implementation Plan

| <i>Item</i> | <i>Description</i> |
|--|-------------------------------------|
| 1) Contract package | 1 - Local Competitive Bidding (LCB) |
| 2) Implementation Schedule | |
| a) Civil Works | |
| 1) Survey, F/S, Design | 19 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

| <i>Item</i> | <i>Description</i> | |
|-------------------------|--|--|
| 1) Economic evaluation | | |
| EIRR (Base) | EIRR = 18.1 % | : Project life 50 years |
| Sensitivity | Case-1 | EIRR = 16.4 % : Cost 10% up |
| | Case-2 | EIRR = 16.3 % : Benefit 10% down |
| | Case-3 | EIRR = 14.8 % : Cost 10% up + Benefit 10% down |
| B/C | 1.21 | : discount rate 15% p.a. |
| NPV | PHP 31 million | : discount rate 15% p.a. |
| 2) Financial evaluation | Farmer's net income increase = PHP 21,131 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

| <i>Item</i> | <i>Description</i> |
|-------------------------|--|
| 1) Environmental aspect | Need to address problems related to sedimentation and insufficiency of drainage in the area. |
| 2) Relocation of houses | None |
| 3) Land acquisition | None |

Economic Evaluation (EIRR)

Case-1 (Cost 10% up)

Name of MS: 0101 - Laoag Vintar Region: 1 MO: R10 Locos: Norte

| | | | | | |
|--------------|---------------------------------|---------|------|-----------|-----|
| EIRR : 16.4% | Net Present Value (Million PHP) | Benefit | Cost | B/C Ratio | NPV |
| | (15 % discount rate) | 182 | 166 | 1.10 | 16 |

| Year In Order | Year | Economic Cost (M. PHP) | | | Annual O & M | Total | Economic Benefit (M. PHP) | | Net Cash Flow (M. PHP) |
|---------------|------|------------------------|---------------------------|----------------------|--------------|--------|---------------------------|--------------|------------------------|
| | | Civil Works | Institutional Development | Engineering Services | | | Benefit | without 1.5% | |
| 1 | 2011 | - | - | 1.32 | - | 1.32 | - | 1.31 | -0.01 |
| 2 | 2012 | - | - | 1.32 | - | 1.32 | - | 2.62 | 1.30 |
| 3 | 2013 | 73.09 | 0.85 | 1.32 | - | 75.26 | - | 3.93 | -71.33 |
| 4 | 2014 | 97.45 | 1.14 | 1.32 | 1.53 | 101.44 | 7.52 | 12.76 | -88.68 |
| 5 | 2015 | 73.09 | 0.85 | 1.32 | 3.57 | 78.83 | 18.48 | 25.03 | -53.80 |
| 6 | 2016 | - | - | - | 5.10 | 5.10 | 28.19 | 36.05 | 30.94 |
| 7 | 2017 | - | - | - | 5.10 | 5.10 | 30.38 | 39.55 | 34.45 |
| 8 | 2018 | - | - | - | 5.10 | 5.10 | 31.32 | 41.80 | 36.70 |
| 9 | 2019 | - | - | - | 5.10 | 5.10 | 31.32 | 43.11 | 38.01 |
| 10 | 2020 | - | - | - | 5.10 | 5.10 | 31.32 | 44.42 | 39.32 |
| 11 | 2021 | - | - | - | 5.10 | 5.10 | 31.32 | 45.73 | 40.63 |
| 12 | 2022 | - | - | - | 5.10 | 5.10 | 31.32 | 47.04 | 41.94 |
| 13 | 2023 | - | - | - | 5.10 | 5.10 | 31.32 | 48.35 | 43.25 |
| 14 | 2024 | - | - | - | 5.10 | 5.10 | 31.32 | 49.66 | 44.56 |
| 15 | 2025 | - | - | - | 5.10 | 5.10 | 31.32 | 50.97 | 45.87 |
| 16 | 2026 | - | - | - | 5.10 | 5.10 | 31.32 | 52.28 | 47.18 |
| 17 | 2027 | - | - | - | 5.10 | 5.10 | 31.32 | 53.59 | 48.49 |
| 18 | 2028 | - | - | - | 5.10 | 5.10 | 31.32 | 54.90 | 49.80 |
| 19 | 2029 | - | - | - | 5.10 | 5.10 | 31.32 | 56.21 | 51.11 |
| 20 | 2030 | - | - | - | 5.10 | 5.10 | 31.32 | 57.52 | 52.42 |
| 21 | 2031 | - | - | - | 5.10 | 5.10 | 31.32 | 58.83 | 53.73 |
| 22 | 2032 | - | - | - | 5.10 | 5.10 | 31.32 | 60.14 | 55.04 |
| 23 | 2033 | - | - | - | 5.10 | 5.10 | 31.32 | 61.45 | 56.35 |
| 24 | 2034 | - | - | - | 5.10 | 5.10 | 31.32 | 62.76 | 57.66 |
| 25 | 2035 | - | - | - | 5.10 | 5.10 | 31.32 | 64.07 | 58.97 |
| 26 | 2036 | - | - | - | 5.10 | 5.10 | 31.32 | 65.38 | 60.28 |
| 27 | 2037 | - | - | - | 5.10 | 5.10 | 31.32 | 66.69 | 61.59 |
| 28 | 2038 | - | - | - | 5.10 | 5.10 | 31.32 | 68.00 | 62.90 |
| 29 | 2039 | - | - | - | 5.10 | 5.10 | 31.32 | 69.31 | 64.21 |
| 30 | 2040 | - | - | - | 5.10 | 5.10 | 31.32 | 70.62 | 65.52 |
| 31 | 2041 | - | - | - | 5.10 | 5.10 | 31.32 | 71.93 | 66.83 |
| 32 | 2042 | - | - | - | 5.10 | 5.10 | 31.32 | 73.24 | 68.14 |
| 33 | 2043 | - | - | - | 5.10 | 5.10 | 31.32 | 74.55 | 69.45 |
| 34 | 2044 | - | - | - | 5.10 | 5.10 | 31.32 | 75.86 | 70.76 |
| 35 | 2045 | - | - | - | 5.10 | 5.10 | 31.32 | 77.17 | 72.07 |
| 36 | 2046 | - | - | - | 5.10 | 5.10 | 31.32 | 78.48 | 73.38 |
| 37 | 2047 | - | - | - | 5.10 | 5.10 | 31.32 | 79.79 | 74.69 |
| 38 | 2048 | - | - | - | 5.10 | 5.10 | 31.32 | 81.10 | 76.00 |
| 39 | 2049 | - | - | - | 5.10 | 5.10 | 31.32 | 82.41 | 77.31 |
| 40 | 2050 | - | - | - | 5.10 | 5.10 | 31.32 | 83.72 | 78.62 |
| 41 | 2051 | - | - | - | 5.10 | 5.10 | 31.32 | 85.03 | 79.93 |
| 42 | 2052 | - | - | - | 5.10 | 5.10 | 31.32 | 86.34 | 81.24 |
| 43 | 2053 | - | - | - | 5.10 | 5.10 | 31.32 | 87.65 | 82.55 |
| 44 | 2054 | - | - | - | 5.10 | 5.10 | 31.32 | 88.96 | 83.86 |
| 45 | 2055 | - | - | - | 5.10 | 5.10 | 31.32 | 90.27 | 85.17 |
| 46 | 2056 | - | - | - | 5.10 | 5.10 | 31.32 | 91.58 | 86.48 |
| 47 | 2057 | - | - | - | 5.10 | 5.10 | 31.32 | 92.89 | 87.79 |
| 48 | 2058 | - | - | - | 5.10 | 5.10 | 31.32 | 94.20 | 89.10 |
| 49 | 2059 | - | - | - | 5.10 | 5.10 | 31.32 | 95.51 | 90.41 |
| 50 | 2060 | - | - | - | 5.10 | 5.10 | 31.32 | 96.82 | 91.72 |

Table 0101 - Laoag Vintar

Basic Case

Name of MS: 0101 - Laoag Vintar Region: 1 MO: R10 Locos: Norte

| | | | | | |
|--------------|---------------------------------|---------|------|-----------|-----|
| EIRR : 18.1% | Net Present Value (Million PHP) | Benefit | Cost | B/C Ratio | NPV |
| | (15 % discount rate) | 182 | 151 | 1.21 | 31 |

| Year In Order | Year | Economic Cost (M. PHP) | | | Annual O & M | Total | Economic Benefit (M. PHP) | | Net Cash Flow (M. PHP) |
|---------------|------|------------------------|---------------------------|----------------------|--------------|-------|---------------------------|--------------|------------------------|
| | | Civil Works | Institutional Development | Engineering Services | | | Benefit | without 1.5% | |
| 1 | 2011 | - | - | 1.20 | - | 1.20 | - | 1.31 | 0.11 |
| 2 | 2012 | - | - | 1.20 | - | 1.20 | - | 2.62 | 1.42 |
| 3 | 2013 | 66.44 | 0.78 | 1.20 | - | 68.42 | - | 3.93 | -64.49 |
| 4 | 2014 | 88.59 | 1.04 | 1.20 | 1.39 | 92.22 | 7.52 | 12.76 | -79.46 |
| 5 | 2015 | 66.44 | 0.78 | 1.20 | 3.25 | 71.67 | 18.48 | 25.03 | -46.64 |
| 6 | 2016 | - | - | - | 4.64 | 4.64 | 28.19 | 36.05 | 31.41 |
| 7 | 2017 | - | - | - | 4.64 | 4.64 | 30.38 | 39.55 | 34.91 |
| 8 | 2018 | - | - | - | 4.64 | 4.64 | 31.32 | 41.80 | 37.16 |
| 9 | 2019 | - | - | - | 4.64 | 4.64 | 31.32 | 43.11 | 38.47 |
| 10 | 2020 | - | - | - | 4.64 | 4.64 | 31.32 | 44.42 | 39.78 |
| 11 | 2021 | - | - | - | 4.64 | 4.64 | 31.32 | 45.73 | 41.09 |
| 12 | 2022 | - | - | - | 4.64 | 4.64 | 31.32 | 47.04 | 42.40 |
| 13 | 2023 | - | - | - | 4.64 | 4.64 | 31.32 | 48.35 | 43.71 |
| 14 | 2024 | - | - | - | 4.64 | 4.64 | 31.32 | 49.66 | 45.02 |
| 15 | 2025 | - | - | - | 4.64 | 4.64 | 31.32 | 50.97 | 46.33 |
| 16 | 2026 | - | - | - | 4.64 | 4.64 | 31.32 | 52.28 | 47.64 |
| 17 | 2027 | - | - | - | 4.64 | 4.64 | 31.32 | 53.59 | 48.95 |
| 18 | 2028 | - | - | - | 4.64 | 4.64 | 31.32 | 54.90 | 50.26 |
| 19 | 2029 | - | - | - | 4.64 | 4.64 | 31.32 | 56.21 | 51.57 |
| 20 | 2030 | - | - | - | 4.64 | 4.64 | 31.32 | 57.52 | 52.88 |
| 21 | 2031 | - | - | - | 4.64 | 4.64 | 31.32 | 58.83 | 54.19 |
| 22 | 2032 | - | - | - | 4.64 | 4.64 | 31.32 | 60.14 | 55.50 |
| 23 | 2033 | - | - | - | 4.64 | 4.64 | 31.32 | 61.45 | 56.81 |
| 24 | 2034 | - | - | - | 4.64 | 4.64 | 31.32 | 62.76 | 58.12 |
| 25 | 2035 | - | - | - | 4.64 | 4.64 | 31.32 | 64.07 | 59.43 |
| 26 | 2036 | - | - | - | 4.64 | 4.64 | 31.32 | 65.38 | 60.74 |
| 27 | 2037 | - | - | - | 4.64 | 4.64 | 31.32 | 66.69 | 62.05 |
| 28 | 2038 | - | - | - | 4.64 | 4.64 | 31.32 | 68.00 | 63.36 |
| 29 | 2039 | - | - | - | 4.64 | 4.64 | 31.32 | 69.31 | 64.67 |
| 30 | 2040 | - | - | - | 4.64 | 4.64 | 31.32 | 70.62 | 65.98 |
| 31 | 2041 | - | - | - | 4.64 | 4.64 | 31.32 | 71.93 | 67.29 |
| 32 | 2042 | - | - | - | 4.64 | 4.64 | 31.32 | 73.24 | 68.60 |
| 33 | 2043 | - | - | - | 4.64 | 4.64 | 31.32 | 74.55 | 69.91 |
| 34 | 2044 | - | - | - | 4.64 | 4.64 | 31.32 | 75.86 | 71.22 |
| 35 | 2045 | - | - | - | 4.64 | 4.64 | 31.32 | 77.17 | 72.53 |
| 36 | 2046 | - | - | - | 4.64 | 4.64 | 31.32 | 78.48 | 73.84 |
| 37 | 2047 | - | - | - | 4.64 | 4.64 | 31.32 | 79.79 | 75.15 |
| 38 | 2048 | - | - | - | 4.64 | 4.64 | 31.32 | 81.10 | 76.46 |
| 39 | 2049 | - | - | - | 4.64 | 4.64 | 31.32 | 82.41 | 77.77 |
| 40 | 2050 | - | - | - | 4.64 | 4.64 | 31.32 | 83.72 | 79.08 |
| 41 | 2051 | - | - | - | 4.64 | 4.64 | 31.32 | 85.03 | 80.39 |
| 42 | 2052 | - | - | - | 4.64 | 4.64 | 31.32 | 86.34 | 81.70 |
| 43 | 2053 | - | - | - | 4.64 | 4.64 | 31.32 | 87.65 | 83.01 |
| 44 | 2054 | - | - | - | 4.64 | 4.64 | 31.32 | 88.96 | 84.32 |
| 45 | 2055 | - | - | - | 4.64 | 4.64 | 31.32 | 90.27 | 85.63 |
| 46 | 2056 | - | - | - | 4.64 | 4.64 | 31.32 | 91.58 | 86.94 |
| 47 | 2057 | - | - | - | 4.64 | 4.64 | 31.32 | 92.89 | 88.25 |
| 48 | 2058 | - | - | - | 4.64 | 4.64 | 31.32 | 94.20 | 89.56 |
| 49 | 2059 | - | - | - | 4.64 | 4.64 | 31.32 | 95.51 | 90.87 |
| 50 | 2060 | - | - | - | 4.64 | 4.64 | 31.32 | 96.82 | 92.18 |

Economic Evaluation (EIRR)

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

| | | | | | | | |
|---------------------------------|---------------------------------|-----------|------|-----------|-----|--------------|--|
| Name of NIS 0101 - Laoag Vintar | | Region: 1 | | IMOI | | Ilocos Norte | |
| EIRR : 14.8% | Net Present Value (Million PHP) | Benefit | Cost | B/C Ratio | NPV | | |
| | (- 15 % discount rate) | 164 | 166 | 0.99 | -2 | | |

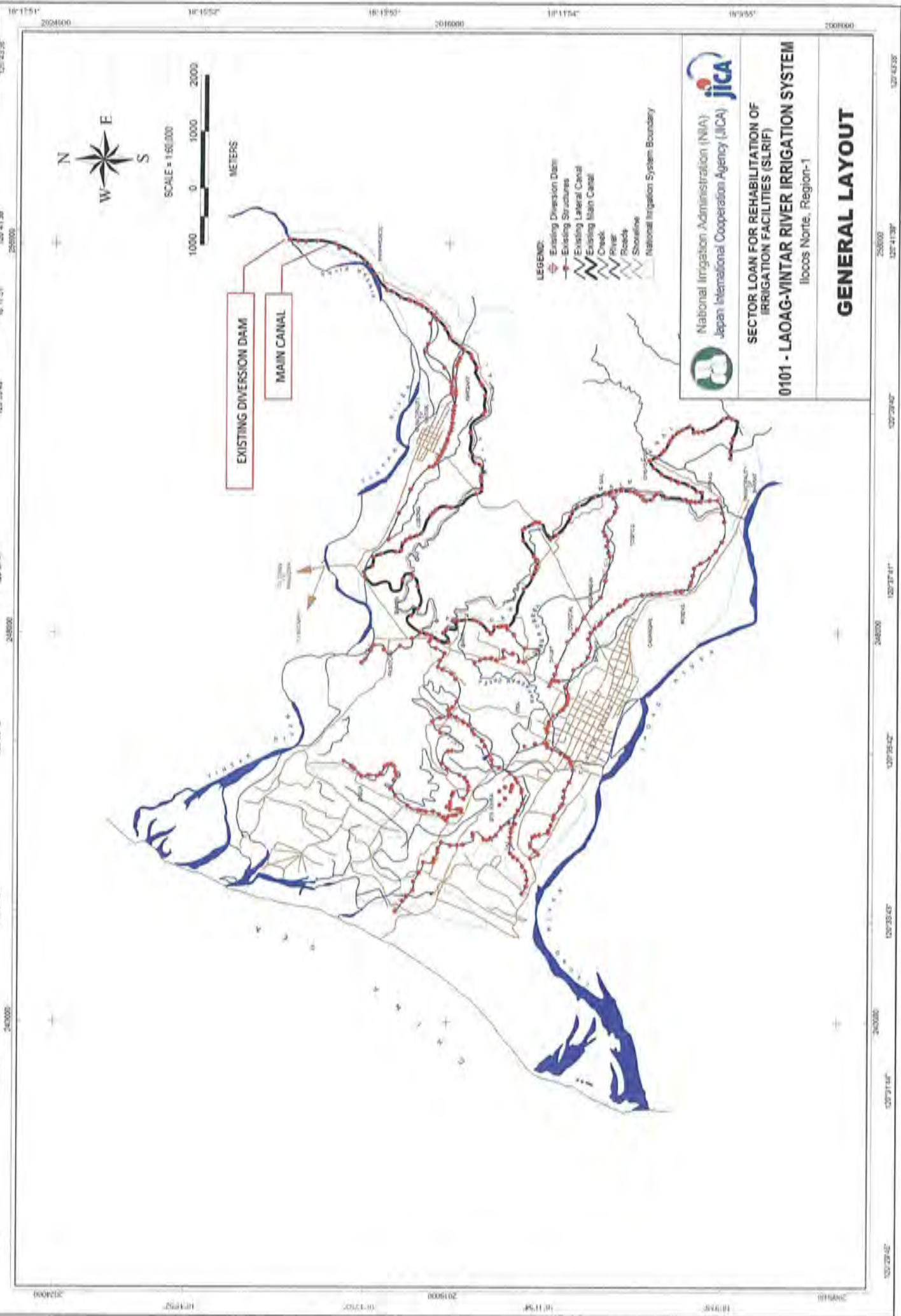
| Year in Order | Year | Economic Cost (M. PHP) | | | Economic Benefit (M. PHP) | | Total | Annual O & M | Civil Works | Institutional Development | Engineering Services | Net Cash Flow (M. PHP) |
|---------------|------|---------------------------|----------------------|---------|---------------------------|-------|--------|--------------|-------------|---------------------------|----------------------|------------------------|
| | | Institutional Development | Engineering Services | Benefit | without 1.5% | | | | | | | |
| 1 | 2011 | - | 1.32 | - | 1.32 | - | 1.32 | - | - | - | 1.18 | |
| 2 | 2012 | - | 1.32 | - | 1.32 | - | 1.32 | - | - | - | 2.36 | |
| 3 | 2013 | 73.09 | 0.85 | 1.32 | 75.26 | - | 75.26 | - | - | - | 3.54 | |
| 4 | 2014 | 97.45 | 1.14 | 1.32 | 101.44 | 6.77 | 101.44 | 1.53 | - | - | -71.72 | |
| 5 | 2015 | 73.09 | 0.85 | 1.32 | 78.83 | 16.63 | 78.83 | 3.57 | - | - | -89.96 | |
| 6 | 2016 | - | - | - | 5.10 | 25.37 | 5.10 | 5.10 | - | - | -56.31 | |
| 7 | 2017 | - | - | - | 5.10 | 27.34 | 5.10 | 5.10 | - | - | 27.34 | |
| 8 | 2018 | - | - | - | 5.10 | 28.19 | 5.10 | 5.10 | - | - | 30.49 | |
| 9 | 2019 | - | - | - | 5.10 | 28.19 | 5.10 | 5.10 | - | - | 32.52 | |
| 10 | 2020 | - | - | - | 5.10 | 28.19 | 5.10 | 5.10 | - | - | 33.70 | |
| 11 | 2021 | - | - | - | 5.10 | 28.19 | 5.10 | 5.10 | - | - | 34.87 | |
| 12 | 2022 | - | - | - | 5.10 | 28.19 | 5.10 | 5.10 | - | - | 36.05 | |
| 13 | 2023 | - | - | - | 5.10 | 28.19 | 5.10 | 5.10 | - | - | 37.23 | |
| 14 | 2024 | - | - | - | 5.10 | 28.19 | 5.10 | 5.10 | - | - | 38.41 | |
| 15 | 2025 | - | - | - | 5.10 | 28.19 | 5.10 | 5.10 | - | - | 39.59 | |
| 16 | 2026 | - | - | - | 5.10 | 28.19 | 5.10 | 5.10 | - | - | 40.77 | |
| 17 | 2027 | - | - | - | 5.10 | 28.19 | 5.10 | 5.10 | - | - | 41.95 | |
| 18 | 2028 | - | - | - | 5.10 | 28.19 | 5.10 | 5.10 | - | - | 43.13 | |
| 19 | 2029 | - | - | - | 5.10 | 28.19 | 5.10 | 5.10 | - | - | 44.31 | |
| 20 | 2030 | - | - | - | 5.10 | 28.19 | 5.10 | 5.10 | - | - | 45.49 | |
| 21 | 2031 | - | - | - | 5.10 | 28.19 | 5.10 | 5.10 | - | - | 46.66 | |
| 22 | 2032 | - | - | - | 5.10 | 28.19 | 5.10 | 5.10 | - | - | 47.84 | |
| 23 | 2033 | - | - | - | 5.10 | 28.19 | 5.10 | 5.10 | - | - | 49.02 | |
| 24 | 2034 | - | - | - | 5.10 | 28.19 | 5.10 | 5.10 | - | - | 50.20 | |
| 25 | 2035 | - | - | - | 5.10 | 28.19 | 5.10 | 5.10 | - | - | 51.38 | |
| 26 | 2036 | - | - | - | 5.10 | 28.19 | 5.10 | 5.10 | - | - | 52.56 | |
| 27 | 2037 | - | - | - | 5.10 | 28.19 | 5.10 | 5.10 | - | - | 53.74 | |
| 28 | 2038 | - | - | - | 5.10 | 28.19 | 5.10 | 5.10 | - | - | 54.92 | |
| 29 | 2039 | - | - | - | 5.10 | 28.19 | 5.10 | 5.10 | - | - | 56.10 | |
| 30 | 2040 | - | - | - | 5.10 | 28.19 | 5.10 | 5.10 | - | - | 57.28 | |
| 31 | 2041 | - | - | - | 5.10 | 28.19 | 5.10 | 5.10 | - | - | 58.45 | |
| 32 | 2042 | - | - | - | 5.10 | 28.19 | 5.10 | 5.10 | - | - | 59.63 | |
| 33 | 2043 | - | - | - | 5.10 | 28.19 | 5.10 | 5.10 | - | - | 60.81 | |
| 34 | 2044 | - | - | - | 5.10 | 28.19 | 5.10 | 5.10 | - | - | 61.99 | |
| 35 | 2045 | - | - | - | 5.10 | 28.19 | 5.10 | 5.10 | - | - | 63.17 | |
| 36 | 2046 | - | - | - | 5.10 | 28.19 | 5.10 | 5.10 | - | - | 64.35 | |
| 37 | 2047 | - | - | - | 5.10 | 28.19 | 5.10 | 5.10 | - | - | 65.53 | |
| 38 | 2048 | - | - | - | 5.10 | 28.19 | 5.10 | 5.10 | - | - | 66.71 | |
| 39 | 2049 | - | - | - | 5.10 | 28.19 | 5.10 | 5.10 | - | - | 67.89 | |
| 40 | 2050 | - | - | - | 5.10 | 28.19 | 5.10 | 5.10 | - | - | 69.07 | |
| 41 | 2051 | - | - | - | 5.10 | 28.19 | 5.10 | 5.10 | - | - | 70.24 | |
| 42 | 2052 | - | - | - | 5.10 | 28.19 | 5.10 | 5.10 | - | - | 71.42 | |
| 43 | 2053 | - | - | - | 5.10 | 28.19 | 5.10 | 5.10 | - | - | 72.60 | |
| 44 | 2054 | - | - | - | 5.10 | 28.19 | 5.10 | 5.10 | - | - | 73.78 | |
| 45 | 2055 | - | - | - | 5.10 | 28.19 | 5.10 | 5.10 | - | - | 74.96 | |
| 46 | 2056 | - | - | - | 5.10 | 28.19 | 5.10 | 5.10 | - | - | 76.14 | |
| 47 | 2057 | - | - | - | 5.10 | 28.19 | 5.10 | 5.10 | - | - | 77.32 | |
| 48 | 2058 | - | - | - | 5.10 | 28.19 | 5.10 | 5.10 | - | - | 78.50 | |
| 49 | 2059 | - | - | - | 5.10 | 28.19 | 5.10 | 5.10 | - | - | 79.68 | |
| 50 | 2060 | - | - | - | 5.10 | 28.19 | 5.10 | 5.10 | - | - | 80.86 | |

Table 0101 - Laoag Vintar

Case-2 (Benefit 10% down)

| | | | | | | | |
|---------------------------------|---------------------------------|-----------|------|-----------|-----|--------------|--|
| Name of NIS 0101 - Laoag Vintar | | Region: 1 | | IMOI | | Ilocos Norte | |
| EIRR : 16.3% | Net Present Value (Million PHP) | Benefit | Cost | B/C Ratio | NPV | | |
| | (- 15 % discount rate) | 164 | 151 | 1.09 | 13 | | |

| Year in Order | Year | Economic Cost (M. PHP) | | | Economic Benefit (M. PHP) | | Total | Annual O & M | Civil Works | Institutional Development | Engineering Services | Net Cash Flow (M. PHP) |
|---------------|------|---------------------------|----------------------|---------|---------------------------|-------|-------|--------------|-------------|---------------------------|----------------------|------------------------|
| | | Institutional Development | Engineering Services | Benefit | without 1.5% | | | | | | | |
| 1 | 2011 | - | 1.20 | - | 1.20 | - | 1.20 | - | - | - | -0.02 | |
| 2 | 2012 | - | 1.20 | - | 1.20 | - | 1.20 | - | - | - | 1.16 | |
| 3 | 2013 | 66.44 | 0.78 | 1.20 | 68.42 | - | 68.42 | - | - | - | 1.16 | |
| 4 | 2014 | 88.59 | 1.04 | 1.20 | 92.22 | 6.77 | 92.22 | 1.39 | - | - | -64.88 | |
| 5 | 2015 | 66.44 | 0.78 | 1.20 | 71.67 | 16.63 | 71.67 | 3.25 | - | - | -80.73 | |
| 6 | 2016 | - | - | - | 4.64 | 25.37 | 4.64 | 4.64 | - | - | -49.14 | |
| 7 | 2017 | - | - | - | 4.64 | 27.34 | 4.64 | 4.64 | - | - | 27.80 | |
| 8 | 2018 | - | - | - | 4.64 | 28.19 | 4.64 | 4.64 | - | - | 30.96 | |
| 9 | 2019 | - | - | - | 4.64 | 28.19 | 4.64 | 4.64 | - | - | 32.98 | |
| 10 | 2020 | - | - | - | 4.64 | 28.19 | 4.64 | 4.64 | - | - | 34.16 | |
| 11 | 2021 | - | - | - | 4.64 | 28.19 | 4.64 | 4.64 | - | - | 35.34 | |
| 12 | 2022 | - | - | - | 4.64 | 28.19 | 4.64 | 4.64 | - | - | 36.52 | |
| 13 | 2023 | - | - | - | 4.64 | 28.19 | 4.64 | 4.64 | - | - | 37.70 | |
| 14 | 2024 | - | - | - | 4.64 | 28.19 | 4.64 | 4.64 | - | - | 38.88 | |
| 15 | 2025 | - | - | - | 4.64 | 28.19 | 4.64 | 4.64 | - | - | 40.05 | |
| 16 | 2026 | - | - | - | 4.64 | 28.19 | 4.64 | 4.64 | - | - | 41.23 | |
| 17 | 2027 | - | - | - | 4.64 | 28.19 | 4.64 | 4.64 | - | - | 42.41 | |
| 18 | 2028 | - | - | - | 4.64 | 28.19 | 4.64 | 4.64 | - | - | 43.59 | |
| 19 | 2029 | - | - | - | 4.64 | 28.19 | 4.64 | 4.64 | - | - | 44.77 | |
| 20 | 2030 | - | - | - | 4.64 | 28.19 | 4.64 | 4.64 | - | - | 45.95 | |
| 21 | 2031 | - | - | - | 4.64 | 28.19 | 4.64 | 4.64 | - | - | 47.13 | |
| 22 | 2032 | - | - | - | 4.64 | 28.19 | 4.64 | 4.64 | - | - | 48.31 | |
| 23 | 2033 | - | - | - | 4.64 | 28.19 | 4.64 | 4.64 | - | - | 49.49 | |
| 24 | 2034 | - | - | - | 4.64 | 28.19 | 4.64 | 4.64 | - | - | 50.67 | |
| 25 | 2035 | - | - | - | 4.64 | 28.19 | 4.64 | 4.64 | - | - | 51.84 | |
| 26 | 2036 | - | - | - | 4.64 | 28.19 | 4.64 | 4.64 | - | - | 53.02 | |
| 27 | 2037 | - | - | - | 4.64 | 28.19 | 4.64 | 4.64 | - | - | 54.20 | |
| 28 | 2038 | - | - | - | 4.64 | 28.19 | 4.64 | 4.64 | - | - | 55.38 | |
| 29 | 2039 | - | - | - | 4.64 | 28.19 | 4.64 | 4.64 | - | - | 56.56 | |
| 30 | 2040 | - | - | - | 4.64 | 28.19 | 4.64 | 4.64 | - | - | 57.74 | |
| 31 | 2041 | - | - | - | 4.64 | 28.19 | 4.64 | 4.64 | - | - | 58.92 | |
| 32 | 2042 | - | - | - | 4.64 | 28.19 | 4.64 | 4.64 | - | - | 60.10 | |
| 33 | 2043 | - | - | - | 4.64 | 28.19 | 4.64 | 4.64 | - | - | 61.28 | |
| 34 | 2044 | - | - | - | 4.64 | 28.19 | 4.64 | 4.64 | - | - | 62.46 | |
| 35 | 2045 | - | - | - | 4.64 | 28.19 | 4.64 | 4.64 | - | - | 63.63 | |
| 36 | 2046 | - | - | - | 4.64 | 28.19 | 4.64 | 4.64 | - | - | 64.81 | |
| 37 | 2047 | - | - | - | 4.64 | 28.19 | 4.64 | 4.64 | - | - | 65.99 | |
| 38 | 2048 | - | - | - | 4.64 | 28.19 | 4.64 | 4.64 | - | - | 67.17 | |
| 39 | 2049 | - | - | - | 4.64 | 28.19 | 4.64 | 4.64 | - | - | 68.35 | |
| 40 | 2050 | - | - | - | 4.64 | 28.19 | 4.64 | 4.64 | - | - | 69.53 | |
| 41 | 2051 | - | - | - | 4.64 | 28.19 | 4.64 | 4.64 | - | - | 70.71 | |
| 42 | 2052 | - | - | - | 4.64 | 28.19 | 4.64 | 4.64 | - | - | 71.89 | |
| 43 | 2053 | - | - | - | 4.64 | 28.19 | 4.64 | 4.64 | - | - | 73.07 | |
| 44 | 2054 | - | - | - | 4.64 | 28.19 | 4.64 | 4.64 | - | - | 74.25 | |
| 45 | 2055 | - | - | - | 4.64 | 28.19 | 4.64 | 4.64 | - | - | 75.42 | |
| 46 | 2056 | - | - | - | 4.64 | 28.19 | 4.64 | 4.64 | - | - | 76.60 | |
| 47 | 2057 | - | - | - | 4.64 | 28.19 | 4.64 | 4.64 | - | - | 77.78 | |
| 48 | 2058 | - | - | - | 4.64 | 28.19 | 4.64 | 4.64 | - | - | 78.96 | |
| 49 | 2059 | - | - | - | 4.64 | 28.19 | 4.64 | 4.64 | - | - | 80.14 | |
| 50 | 2060 | - | - | - | 4.64 | 28.19 | 4.64 | 4.64 | - | - | 81.32 | |



EXISTING DIVERSION DAM

MAIN CANAL

- LEGEND:**
- Existing Diversion Dam
 - Existing Structures
 - Existing Lateral Canal
 - Existing Main Canal
 - Creek
 - River
 - Roads
 - Shoreline
 - National Irrigation System Boundary



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

SECTOR LOAN FOR REHABILITATION OF IRRIGATION FACILITIES (SLRIF)

0101 - LAOAG-VINTAR RIVER IRRIGATION SYSTEM
Ilocos Norte, Region-1

GENERAL LAYOUT




252000 255000 258000 261000 264000 267000 270000
127°41'39" 127°42'30" 127°43'21" 127°44'12" 127°45'03" 127°45'54" 127°46'45" 127°47'36" 127°48'27" 127°49'18" 127°50'09" 127°51'00"

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities

Photographs of Irrigation Facilities


NIS name: Laoag Vintar (Region 1)

Date: May 21, 2009

| Location / Facility | Photograph | Comments |
|--|--|---|
| Main Canal Sta 1 + 140 Side Hill of a bench flume. |  | A stand-by wheel mounted backhoe should be provided for de-silting when rainfall occurs. |
| Main Canal Sta 0+990 -24 080 Bench flume showing the improvement of this facility. |  | NIA with the help of the LGU of Ilocos Norte construct this facility |
| Main Canal Sta 0+990 -24 080 Bench flume showing this eroded service road. |  | The Provincial Government of Ilocos Norte is planning for repair/ rehab for this structure. |

NIS name: Laoag Vintar (Region 1)

Date: May 21, 2009

| Location / Facility | Photograph | Comments |
|---|--|---|
| <p>Laoag Vintar RIS Intake where the counter-weight is located.</p> <p>Longitude: 18° 14' 22" Latitude: 120°40' 22"</p> |  | Needs rehabilitation and programmed for mechanize intake. |
| Ogee dam showing the silted area at the intake. |  | Needs de-siltation |
| <p>Dam intake lifting mechanism.</p> <p>18° 14' 22" 120°40' 22"</p> |  | Needs repair/ in mechanize operation of opening and closing the intake. |
| <p>Main canal showing the check-gate.</p> <p>Sta 2+155</p> |  | <p>Needs repair and de-siltation.</p> <p>Installation of incline trash rack</p> |

**THE REPUBLIC OF PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION**

**Sector Loan on
Rehabilitation of Irrigation Facilities**

NIS SUMMARY REPORT

0102
Dingras RIS
Region 1
Ilocos Norte 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**

| <i>Item</i> | <i>Description</i> | |
|---|---|---|
| 1) Name of NIS | Dingras RIS | Code: 0102 |
| 2) Location | Region | Region 1 |
| | Province | Ilocos Norte |
| | Municipality | Dingras, Marcos |
| | Distance | 32 km from Laoag City (Capital of Province) |
| 3) Type of Water Source | Water Source | Dingras river |
| | Type | Intake Type |
| 4) Area | Service Area | 1,106 ha |
| | FUSA | 1,004 ha |
| | Rehabilitation | 1004 ha |
| 5) Beneficiary Farmers | 1,181 farmers | Average paddy field cultivating size = 0.85 ha per farmer |
| 6) Irrigator's Association | IAs established = 3 FIA established = 1 in 2008 | |
| 7) Features of NIS and Necessity of the project | <p>There is no permanent diversion dam to draw water to its intake. Of the intake at a considerable distance from the river flow, frequent re-channeling/training works are needed for the required water diversion to the intake. The area is also prone to siltation, erosion and damages to its irrigation canals, structures and other facilities during inclement weather conditions. Intake gates and structure needs major rehab/repair due to normal wear and tear including effects of nature elements.</p> <p>The rehabilitation works is necessary to restore the full functionality and stability of the dam and canal structures and to improve the efficiency of water delivery in the canals and efficiency of water distribution to the farms.</p> | |
| 8) Outline of the Proposed Project | <p>A. Engineering</p> <ol style="list-style-type: none"> 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 <p>B. Institutional Strengthening Program</p> <p>B. 1 Basic Program</p> <ol style="list-style-type: none"> 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 <p>B.2 Specific Program to strengthen institutional mechanism together with LGUs</p> <ol style="list-style-type: none"> 1. Monitoring and control of illegal mechanical quarrying 2. Improvement of watershed management | |

| | | | | |
|---|--|-----|-----------------------------|---------------|
| 9) Proposed Project Component | <p>A. Engineering</p> <p>1. Construction of civil works for rehabilitation of diversion works, canal system, drainage system, roads, and IMT support facilities.</p> <p>B. Institutional Strengthening Program</p> <p>1. Reactivation of FIAs/IAs including reformation of TSGA / IA / FIA areas, construction of IMT support facilities (demand base)</p> <p>2. Strengthening NIA-IA- LGUs Partnership, especially coordination RDC, RAFC/PAFC with FIAs/IAs and ISMC</p> <p>3. Institutional development program to strengthen management capacity of NIA field offices and IAs.</p> | | | |
| 10) Project Cost (Direct cost only, excluding escalation, contingency, tax) | 1. Direct cost | | PHP | 80.64 Million |
| | - Civil Works | PHP | 75.93 Million | |
| | - Institutional Development | PHP | 3.10 Million | |
| | - Engineering Services | PHP | 1.61 Million | |
| | 2. Indirect cost | | PHP | 7.22 Million |
| | Total Project Cost (1+2) | | PHP 87.86 Million | |
| | Cost per ha | | PHP 87,509.00 per ha | |
| 11) Project Benefit | <p>1. To increase paddy production by 505 tons/year</p> <p>2. To increase farmers' net income to PHP63,562.00/ha/year</p> <p>3. To establish functional and self-reliant IAs</p> <p>4. To improve performance of NIS</p> | | | |
| 12) Project Justification | EIRR = 19.7 %, B/C = 1.32 (discount rate 15%) | | | |

2. Project History (Construction/Rehabilitation)

| Year | Description |
|-----------|-------------------------------|
| 1931 | Construction of the System |
| 1980-1986 | Rehab of system under NISIP I |

3. Present Condition

3.1 Natural Conditions

| Item | Description |
|------------------------------|--|
| 1) Annual Rainfall | River basin : 2,070 mm |
| 2) Seasons | Wet season: from May to Oct Dry season: from Nov to April |
| 3) Dominant Soil in NIS Area | Clay loam |
| 4) Topography | Flat plain |

3.2 Socio-economy (Region/Province)

| Item | Description |
|---------------------------|---|
| 1) GRDP | PHP185,566 million (Year 2007), Per Capita GRDP = PHP 38,063 per year |
| 2) Population | 547,284 (province) |
| 3) Population Growth Rate | 0.86 % per year(province) |
| 4) Labor Force | 3,183,000 (region) |
| 5) Poverty Population | 21.2 % to total population (province) |

3.3 Present Agriculture in NIS

| Item | Description | | | | | | |
|----------------------------------|---|------------------|----------|---------------------|-------|---------|-------|
| 1) Farm Household in NIS | Total beneficiaries | 1,186 households | | | | | |
| | Land owners | 78 households | (6.4 %) | | | | |
| | Tenant farmers | 1,110 households | (93.6 %) | | | | |
| 2) Paddy Field Size in NIS | 0.85 ha per household (FUSA/Total beneficiaries as of 2008) | | | | | | |
| 3) Present Land Use in NIS | Paddy field planted | 985 ha | 89.1 % | As of 2008 | | | |
| | Paddy field not planted | 19 ha | 1.7 % | 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 | 102 ha | 9.2 % | No data in response | | | |
| 4) Paddy Field in FUSA (ha) | 1,004 | | | | | | |
| 5) Paddy Cropped Area (ha) | 2004 | 2005 | 2006 | 2007 | 2008 | Average | |
| | Wet Season | 984 | 984 | 984 | 984 | 985 | 984 |
| | Dry Season | 850 | 850 | 850 | 850 | 845 | 849 |
| 6) Cropping Intensity (per year) | 2004 | 2005 | 2006 | 2007 | 2008 | Average | |
| | 183 | 183 | 183 | 183 | 182 | 183 | |
| 7) Unit Yield of Paddy (ton/ha) | 2004 | 2005 | 2006 | 2007 | 2008 | Average | |
| | Wet Season | 4.40 | 4.50 | 4.30 | 4.70 | 4.20 | 4.42 |
| | Dry Season | 3.90 | 4.60 | 4.40 | 4.80 | 4.80 | 4.50 |
| 8) Paddy Production (ton) | 2004 | 2005 | 2006 | 2007 | 2008 | Average | |
| | Wet Season | 4,330 | 4,428 | 4,231 | 4,625 | 4,137 | 4,350 |
| | Dry Season | 3,315 | 3,910 | 3,740 | 4,080 | 4,056 | 3,820 |

3.4 Water Resources

| Item | Description |
|------------------------------|-------------------------|
| 1) Name of Rivers | Bonga River |
| 2) Catchment Area at Dam | 932.30 km ² |
| 3) Ave. River Discharge | 20.93 m ³ /s |
| 4) Ave. Dry Season Discharge | 14.08 m ³ /s |
| 5) Diverted Intake Discharge | 1.18 m ³ /s |
| 6) Water Requirement | 1.81 m ³ /s |
| 7) Sedimentation | High |

3.5 Existing Irrigation System

| Item | Description |
|------------------------|--|
| 1) Diversion Dam | Intake Type |
| 2) Main Canal | Total length <u>14.46</u> km (Lined portion <u>1.33</u> km) |
| 3) Lateral Canals | Total length <u>13.675</u> km (Lined portion <u>0</u> km) |
| 4) On-farm facilities | Total length <u>36.00</u> km (Lined portion <u>0</u> km Turn-outs = <u>66</u> units; |
| 5) Drainage Canal | Total length <u>13.00</u> kms. |
| 6) Canal Structures | No. = <u>73</u> units |
| 7) Drainage Structures | No. = <u>29</u> units |
| 8) Farm roads | Total length <u>10.812</u> km |

3.6 Institutions for O&M of NIS

| <i>Item</i> | <i>Description</i> | | | | | |
|--|---|------|------|------|------|---------|
| 1) Regional Irrigation Office | Name: Region 1-Ilocos Region | | | | | |
| 2) IMO | Name: Ilocos Norte IMO | | | | | |
| Staff in 2009 | Total number of staff: 60 Permanent Staff: 00 nos, Temporary staff: 00 nos. | | | | | |
| 3) Irrigator' Association (IA) | 2004 | 2005 | 2006 | 2007 | 2008 | Average |
| Number of FIA (nos) | | | | | 1 | |
| Number of IA (nos) | | | | | 3 | |
| Number of TSAG (nos) | 38 | 38 | 38 | 38 | 38 | 38 |
| Functionality of IA | 0.0 | 0.0 | 75.2 | 75.2 | 78.8 | 76.4 |
| Collection of ISF,% (wet) | 3 | 0 | 0 | 0 | 0 | 3 |
| Collection of ISF,% (dry) | 19 | 23 | 29 | 15 | 21 | 26 |
| 4) NIS Category based on IA 2008 O&M Contract (NIA-IA) | No. of IA | | | | | |
| Category A | 0 | | | | | |
| Category B | 3 | | | | | |
| Category C | 0 | | | | | |

3.7 Existing Problems

| <i>Item</i> | <i>Description</i> |
|---|--|
| 1) Diversion Works | <ol style="list-style-type: none"> 1. Siltation of the intake 2. repair/rehab of lifting mechanism 3. Mechanization of intake gates 4. Siltation/sedimentation of river |
| 2) Canal and Structures | <ol style="list-style-type: none"> 1. Siltation and erosion to irrigation canals 2. Damages to structures and appurtenant structures |
| 3) Drainage Canal | <ol style="list-style-type: none"> 1. Siltation of canals |
| 4) Other Project Facilities (road, bridge, flood dike, building, etc) | <ol style="list-style-type: none"> 1. The link roads needs maintenance and concrete pavement preferable 2. Damages to road structures and appurtenant structures 3. Repair/rehab of existing field office/quarter |
| 5) Water Management and O&M Activities | <ol style="list-style-type: none"> 1. Continuing water management education to concerned parties 2. Planning, implementation, revisions of O&M activities, i.e. water delivery and schedule, etc |
| 6) Status of NIS and IA Management | <p>Status Type F evaluated by Radar Graph (no matured status). Specific problems are:</p> <ol style="list-style-type: none"> 1. High ratio of tenancy at 93% 2. Low membership at 0 3. Low ISF collection efficiency during wet and dry seasons at 3% and 26%, respectively |
| 7) Watershed Management | <ol style="list-style-type: none"> 1. Coordination to DENR and other concerned entities to address this effort 2. Minimum coordination by NIA's field offices and IAs with concerned LGUs and other line agencies 3. Watershed is significantly denuded. |
| 8) Coordination with LGU and Agencies concerned | <ol style="list-style-type: none"> 1. Poor coordination by NIA's field offices and IAs with concerned LGUs and other line agencies on the specific problems such as monitoring and control of illegal mechanical quarrying and watershed management |
| 9) Agriculture | <ol style="list-style-type: none"> 1. Continuing cooperative efforts by DA/MA/PA of increased rice production 2. Sharing of relative agro-statistical data of concerned entities 3. Installation/sharing of agro-meteorological equipments 4. High price of agricultural inputs and low price of paddy. 5. Inadequate supply high quality rice seeds 6. Insufficient number of post harvest facilities particularly dryer. |

| <i>Item</i> | <i>Description</i> |
|-------------|-----------------------------------|
| 10) Others | 1. Sharing of available logistics |

4. Proposed Rehabilitation Plan

4.1 Agricultural Development Plan

| <i>Item</i> | <i>Description</i> | | | |
|-------------------------------|--------------------|---------------------|---------------------|---------------|
| Cropping schedule | <i>Wet Season</i> | <i>Dry Season-1</i> | <i>Dry Season-2</i> | <i>Annual</i> |
| 1) Type of Crops | Paddy | Paddy | - | - |
| 2) Cropping Area (ha) | 1,004 | 850 | - | - |
| 3) Target Unit Yield (ton/ha) | 4.6 | 4.8 | - | - |
| 3) Total Production (ton) | 4,618 | 4,080 | - | 8,698 |

4.2 Civil Works

| <i>Item</i> | <i>Description</i> |
|---------------------------|---|
| 1) Diversion Works | Construction of river training works/river channelization works/dam/repair intake gates and mechanism, change from manual to motorized operation of intake gates - 1 unit |
| 2) Canal Structures | Repair/rehab of structures and construction of new structures - 45 units |
| 3) Canalization | 1.Desilting works, including canal lining works, and embankment protection works-26.7 kms 2.Realignment of canal 3.Construction of new canal |
| 4) Drainage Structures | 1. Repair of existing structures - 14 units 2. Construction of additional structures |
| 5) Drainage Canalization | 1. De-silting of existing drainage canals - 2 kms 2. Construction of additional drainage canals |
| 6) Service Roads | 1. Re-graveling of selected road sections. - 8.2 kms 2. Construction of side drains 3. Construction of drainage structures in strategic road locations. |
| 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 unit |
| 9) IMT GIS Database | 1. Development and establishment of GIS database |

4.3 Institutional Strengthening Program

| <i>Item</i> | <i>Description</i> |
|--|---|
| 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 | 1. Executing body : Project Management Office with assistance of Consultant, & Management System Committee (MSC) of NIS |

| <i>Item</i> | <i>Description</i> |
|--|--|
| of NIA - IA - LGU Partnership | 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. Request LGUs legal actions on protection of illegal mechanical quarrying prior to the commencement of the SLRIF through the coordination activities 3. Strengthening coordination with RDC, RAFC/PAFC and LGUs on training program of watershed management 4. Strengthening coordination on establishment of monitoring and control mechanism of illegal quarrying |

4.4 Proposed Counter Schemes

| <i>Item</i> | <i>Description</i> |
|-------------|--|
| 1) DENR | 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 initiates training and upgrade technical skills of its engineers by inviting resource persons from the key line departments and/or national agencies (e.g. NIA, DPWH.) 2. LGUs take actions on information awareness on the Project implementation through local communication media. 3. LGU establishes a coordinating/steering committee at the provincial level to improve coordination and representation of NIA in local planning and budgeting. |

5. Cost Estimate for Initial Investment

| <i>Item</i> | <i>Description</i> | |
|--------------------------------|---|--------------------|
| 1) Direct Cost for Civil Works | A. Mobilization | Php 1.61 Million |
| | B. Protection Dikes | - |
| | C. Diversion Works | Php 43.21 Million |
| | D. Canal Structures | Php 9.00 Million |
| | E. Canalization | Php 9.84 Million |
| | F. Drainage Structures | Php 2.01 Million |
| | G. Drainage Canalization | Php 3.01 Million |
| | H. Roads | Php 0.54 Million |
| | I. On-Farm Facilities/T.O. Gates | Php 0.71 Million |
| | J. IMT Support Facilities | Php 5.00 Million |
| | K. IMT GIS Database | Php 1.00 Million |
| | L. Institutional Development (5% of Direct Cost) | Php 3.10 Million |
| | M. Feasibility Studies & Detailed Engineering (2% of Direct Cost) | Php 1.61 Million |
| | Sub-total (Direct Cost) | |
| 2) Indirect Cost | A. General Engineering Supervision and Administration (3.5% of Direct Cost) | Php 2.82 Million |
| | B. NIA Management Fee (5% of Total Project Cost) | Php 4.39 Million |
| | Sub-total (Indirect Cost) | |
| 3) Total Project Cost | = 1+2 | Php 87.86 Million |
| Cost per ha. | | Php 87,509.00 /ha. |

6. Implementation Plan

| <i>Item</i> | <i>Description</i> |
|--|-------------------------------------|
| 1) Contract package | 1 - Local Competitive Bidding (LCB) |
| 2) Implementation Schedule | |
| a) Civil Works | |
| 1) Survey, F/S, Design | 19 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

| <i>Item</i> | <i>Description</i> |
|------------------------|--|
| 1) Economic evaluation | |
| EIRR (Base) | EIRR = 19.7 % : Project life 50 years |
| Sensitivity Case-1 | EIRR = 17.9 % : Cost 10% up |
| Case-2 | EIRR = 17.8 % : Benefit 10% down |
| Case-3 | EIRR = 16.2 % : Cost 10% up + Benefit 10% down |
| B/C | 1.32 : discount rate 15% p.a. |
| NPV | PHP 17 million : discount rate 15% p.a. |

| | |
|-------------------------|--|
| 2) Financial evaluation | Farmer's net income increase = PHP 24,897 per ha per year |
| 3) Expected Impacts | <ol style="list-style-type: none"> 1. Increased farmers' income 2. Increased rice self sufficiency of the country 3. Increased job opportunities in rural areas |

8. Environmental Aspects

| <i>Item</i> | <i>Description</i> |
|-------------------------|---|
| 1) Environmental aspect | Need to address problems related to sedimentation |
| 2) Relocation of houses | None |
| 3) Land acquisition | None |

Table 0102 - Dingras Economic Evaluation (EIRR)

Basic Case

Case-1 (Cost 10% up)

Name of NS: 0102 - Dingras Region: 1 I M O R I O I o c o s s i N o r t e

| | | | | | |
|--------------|---------------------------------|---------|------|-----------|-----|
| EIRR : 19.7% | Net Present Value (Million PHP) | Benefit | Cost | B/C Ratio | NPV |
| | (15 % discount rate) | 69 | 52 | 1.32 | 17 |

| | | | | | |
|--------------|---------------------------------|---------|------|-----------|-----|
| EIRR : 17.9% | Net Present Value (Million PHP) | Benefit | Cost | B/C Ratio | NPV |
| | (15 % discount rate) | 69 | 57 | 1.20 | 12 |

| Year In Order | Year | Economic Cost (M. PHP) | | | Annual O & M | Total | Economic Benefit (M. PHP) | | Total | Net Cash Flow (M. PHP) |
|---------------|------|------------------------|---------------------------|----------------------|--------------|-------|---------------------------|--------------|-------|------------------------|
| | | Civil Works | Institutional Development | Engineering Services | | | Benefit | without 1.5% | | |
| 1 | 2011 | - | - | 0.43 | - | 0.43 | - | - | 0.74 | 0.31 |
| 2 | 2012 | - | - | 0.43 | - | 0.43 | - | - | 1.48 | 1.05 |
| 3 | 2013 | 23.96 | 0.56 | 0.43 | - | 24.95 | - | - | 2.22 | -22.73 |
| 4 | 2014 | 31.94 | 0.74 | 0.43 | 0.67 | 33.79 | 2.02 | 2.96 | 4.98 | -28.81 |
| 5 | 2015 | 23.96 | 0.56 | 0.43 | 1.57 | 26.52 | 4.97 | 3.70 | 8.67 | -17.84 |
| 6 | 2016 | - | - | - | 2.24 | 2.24 | 7.59 | 4.44 | 12.03 | 9.78 |
| 7 | 2017 | - | - | - | 2.24 | 2.24 | 8.18 | 5.18 | 13.36 | 11.11 |
| 8 | 2018 | - | - | - | 2.24 | 2.24 | 8.43 | 5.92 | 14.35 | 12.11 |
| 9 | 2019 | - | - | - | 2.24 | 2.24 | 8.43 | 6.66 | 15.09 | 12.85 |
| 10 | 2020 | - | - | - | 2.24 | 2.24 | 8.43 | 7.40 | 15.83 | 13.59 |
| 11 | 2021 | - | - | - | 2.24 | 2.24 | 8.43 | 8.14 | 16.57 | 14.33 |
| 12 | 2022 | - | - | - | 2.24 | 2.24 | 8.43 | 8.88 | 17.31 | 15.07 |
| 13 | 2023 | - | - | - | 2.24 | 2.24 | 8.43 | 9.62 | 18.05 | 15.81 |
| 14 | 2024 | - | - | - | 2.24 | 2.24 | 8.43 | 10.36 | 18.79 | 16.55 |
| 15 | 2025 | - | - | - | 2.24 | 2.24 | 8.43 | 11.10 | 19.53 | 17.29 |
| 16 | 2026 | - | - | - | 2.24 | 2.24 | 8.43 | 11.84 | 20.27 | 18.03 |
| 17 | 2027 | - | - | - | 2.24 | 2.24 | 8.43 | 12.58 | 21.01 | 18.77 |
| 18 | 2028 | - | - | - | 2.24 | 2.24 | 8.43 | 13.32 | 21.75 | 19.51 |
| 19 | 2029 | - | - | - | 2.24 | 2.24 | 8.43 | 14.06 | 22.49 | 20.25 |
| 20 | 2030 | - | - | - | 2.24 | 2.24 | 8.43 | 14.80 | 23.23 | 20.99 |
| 21 | 2031 | - | - | - | 2.24 | 2.24 | 8.43 | 15.54 | 23.97 | 21.73 |
| 22 | 2032 | - | - | - | 2.24 | 2.24 | 8.43 | 16.28 | 24.71 | 22.47 |
| 23 | 2033 | - | - | - | 2.24 | 2.24 | 8.43 | 17.02 | 25.45 | 23.21 |
| 24 | 2034 | - | - | - | 2.24 | 2.24 | 8.43 | 17.76 | 26.19 | 23.95 |
| 25 | 2035 | - | - | - | 2.24 | 2.24 | 8.43 | 18.50 | 26.93 | 24.69 |
| 26 | 2036 | - | - | - | 2.24 | 2.24 | 8.43 | 19.24 | 27.67 | 25.43 |
| 27 | 2037 | - | - | - | 2.24 | 2.24 | 8.43 | 19.98 | 28.41 | 26.17 |
| 28 | 2038 | - | - | - | 2.24 | 2.24 | 8.43 | 20.72 | 29.15 | 26.91 |
| 29 | 2039 | - | - | - | 2.24 | 2.24 | 8.43 | 21.46 | 29.89 | 27.65 |
| 30 | 2040 | - | - | - | 2.24 | 2.24 | 8.43 | 22.20 | 30.63 | 28.39 |
| 31 | 2041 | - | - | - | 2.24 | 2.24 | 8.43 | 22.94 | 31.37 | 29.13 |
| 32 | 2042 | - | - | - | 2.24 | 2.24 | 8.43 | 23.68 | 32.11 | 29.87 |
| 33 | 2043 | - | - | - | 2.24 | 2.24 | 8.43 | 24.42 | 32.85 | 30.61 |
| 34 | 2044 | - | - | - | 2.24 | 2.24 | 8.43 | 25.16 | 33.59 | 31.35 |
| 35 | 2045 | - | - | - | 2.24 | 2.24 | 8.43 | 25.90 | 34.33 | 32.09 |
| 36 | 2046 | - | - | - | 2.24 | 2.24 | 8.43 | 26.64 | 35.07 | 32.83 |
| 37 | 2047 | - | - | - | 2.24 | 2.24 | 8.43 | 27.38 | 35.81 | 33.57 |
| 38 | 2048 | - | - | - | 2.24 | 2.24 | 8.43 | 28.12 | 36.55 | 34.31 |
| 39 | 2049 | - | - | - | 2.24 | 2.24 | 8.43 | 28.86 | 37.29 | 35.05 |
| 40 | 2050 | - | - | - | 2.24 | 2.24 | 8.43 | 29.60 | 38.03 | 35.79 |
| 41 | 2051 | - | - | - | 2.24 | 2.24 | 8.43 | 30.34 | 38.77 | 36.53 |
| 42 | 2052 | - | - | - | 2.24 | 2.24 | 8.43 | 31.08 | 39.51 | 37.27 |
| 43 | 2053 | - | - | - | 2.24 | 2.24 | 8.43 | 31.82 | 40.25 | 38.01 |
| 44 | 2054 | - | - | - | 2.24 | 2.24 | 8.43 | 32.56 | 40.99 | 38.75 |
| 45 | 2055 | - | - | - | 2.24 | 2.24 | 8.43 | 33.30 | 41.73 | 39.49 |
| 46 | 2056 | - | - | - | 2.24 | 2.24 | 8.43 | 34.04 | 42.47 | 40.23 |
| 47 | 2057 | - | - | - | 2.24 | 2.24 | 8.43 | 34.78 | 43.21 | 40.97 |
| 48 | 2058 | - | - | - | 2.24 | 2.24 | 8.43 | 35.52 | 43.95 | 41.71 |
| 49 | 2059 | - | - | - | 2.24 | 2.24 | 8.43 | 36.26 | 44.69 | 42.45 |
| 50 | 2060 | - | - | - | 2.24 | 2.24 | 8.43 | 37.00 | 45.43 | 43.19 |

Name of NS: 0102 - Dingras Region: 1 I M O R I O I o c o s s i N o r t e

| | | | | | |
|--------------|---------------------------------|---------|------|-----------|-----|
| EIRR : 19.7% | Net Present Value (Million PHP) | Benefit | Cost | B/C Ratio | NPV |
| | (15 % discount rate) | 69 | 52 | 1.32 | 17 |

| Year In Order | Year | Economic Cost (M. PHP) | | | Annual O & M | Total | Economic Benefit (M. PHP) | | Total | Net Cash Flow (M. PHP) |
|---------------|------|------------------------|---------------------------|----------------------|--------------|-------|---------------------------|--------------|--------|------------------------|
| | | Civil Works | Institutional Development | Engineering Services | | | Benefit | without 1.5% | | |
| 1 | 2011 | 0.39 | - | 0.39 | - | 0.39 | 0.74 | 0.74 | 0.35 | |
| 2 | 2012 | 0.39 | - | 0.39 | - | 0.39 | 1.48 | 1.48 | 1.09 | |
| 3 | 2013 | 21.78 | 0.51 | 0.39 | - | 22.68 | 2.22 | 2.22 | -20.46 | |
| 4 | 2014 | 29.04 | 0.68 | 0.39 | 0.61 | 30.72 | 2.96 | 2.96 | -25.74 | |
| 5 | 2015 | 21.78 | 0.51 | 0.39 | 1.43 | 24.11 | 4.97 | 3.70 | -15.43 | |
| 6 | 2016 | - | - | - | 2.04 | 2.04 | 7.59 | 4.44 | 12.03 | 9.99 |
| 7 | 2017 | - | - | - | 2.04 | 2.04 | 8.18 | 5.18 | 13.36 | 11.32 |
| 8 | 2018 | - | - | - | 2.04 | 2.04 | 8.43 | 5.92 | 14.35 | 12.31 |
| 9 | 2019 | - | - | - | 2.04 | 2.04 | 8.43 | 6.66 | 15.09 | 13.05 |
| 10 | 2020 | - | - | - | 2.04 | 2.04 | 8.43 | 7.40 | 15.83 | 13.79 |
| 11 | 2021 | - | - | - | 2.04 | 2.04 | 8.43 | 8.14 | 16.57 | 14.53 |
| 12 | 2022 | - | - | - | 2.04 | 2.04 | 8.43 | 8.88 | 17.31 | 15.27 |
| 13 | 2023 | - | - | - | 2.04 | 2.04 | 8.43 | 9.62 | 18.05 | 16.01 |
| 14 | 2024 | - | - | - | 2.04 | 2.04 | 8.43 | 10.36 | 18.79 | 16.75 |
| 15 | 2025 | - | - | - | 2.04 | 2.04 | 8.43 | 11.10 | 19.53 | 17.49 |
| 16 | 2026 | - | - | - | 2.04 | 2.04 | 8.43 | 11.84 | 20.27 | 18.23 |
| 17 | 2027 | - | - | - | 2.04 | 2.04 | 8.43 | 12.58 | 21.01 | 18.97 |
| 18 | 2028 | - | - | - | 2.04 | 2.04 | 8.43 | 13.32 | 21.75 | 19.71 |
| 19 | 2029 | - | - | - | 2.04 | 2.04 | 8.43 | 14.06 | 22.49 | 20.45 |
| 20 | 2030 | - | - | - | 2.04 | 2.04 | 8.43 | 14.80 | 23.23 | 21.19 |
| 21 | 2031 | - | - | - | 2.04 | 2.04 | 8.43 | 15.54 | 23.97 | 21.93 |
| 22 | 2032 | - | - | - | 2.04 | 2.04 | 8.43 | 16.28 | 24.71 | 22.67 |
| 23 | 2033 | - | - | - | 2.04 | 2.04 | 8.43 | 17.02 | 25.45 | 23.41 |
| 24 | 2034 | - | - | - | 2.04 | 2.04 | 8.43 | 17.76 | 26.19 | 24.15 |
| 25 | 2035 | - | - | - | 2.04 | 2.04 | 8.43 | 18.50 | 26.93 | 24.89 |
| 26 | 2036 | - | - | - | 2.04 | 2.04 | 8.43 | 19.24 | 27.67 | 25.63 |
| 27 | 2037 | - | - | - | 2.04 | 2.04 | 8.43 | 19.98 | 28.41 | 26.37 |
| 28 | 2038 | - | - | - | 2.04 | 2.04 | 8.43 | 20.72 | 29.15 | 27.11 |
| 29 | 2039 | - | - | - | 2.04 | 2.04 | 8.43 | 21.46 | 29.89 | 27.85 |
| 30 | 2040 | - | - | - | 2.04 | 2.04 | 8.43 | 22.20 | 30.63 | 28.59 |
| 31 | 2041 | - | - | - | 2.04 | 2.04 | 8.43 | 22.94 | 31.37 | 29.33 |
| 32 | 2042 | - | - | - | 2.04 | 2.04 | 8.43 | 23.68 | 32.11 | 30.07 |
| 33 | 2043 | - | - | - | 2.04 | 2.04 | 8.43 | 24.42 | 32.85 | 30.81 |
| 34 | 2044 | - | - | - | 2.04 | 2.04 | 8.43 | 25.16 | 33.59 | 31.55 |
| 35 | 2045 | - | - | - | 2.04 | 2.04 | 8.43 | 25.90 | 34.33 | 32.29 |
| 36 | 2046 | - | - | - | 2.04 | 2.04 | 8.43 | 26.64 | 35.07 | 33.03 |
| 37 | 2047 | - | - | - | 2.04 | 2.04 | 8.43 | 27.38 | 35.81 | 33.77 |
| 38 | 2048 | - | - | - | 2.04 | 2.04 | 8.43 | 28.12 | 36.55 | 34.51 |
| 39 | 2049 | - | - | - | 2.04 | 2.04 | 8.43 | 28.86 | 37.29 | 35.25 |
| 40 | 2050 | - | - | - | 2.04 | 2.04 | 8.43 | 29.60 | 38.03 | 35.99 |
| 41 | 2051 | - | - | - | 2.04 | 2.04 | 8.43 | 30.34 | 38.77 | 36.73 |
| 42 | 2052 | - | - | - | 2.04 | 2.04 | 8.43 | 31.08 | 39.51 | 37.47 |
| 43 | 2053 | - | - | - | 2.04 | 2.04 | 8.43 | 31.82 | 40.25 | 38.21 |
| 44 | 2054 | - | - | - | 2.04 | 2.04 | 8.43 | 32.56 | 40.99 | 38.95 |
| 45 | 2055 | - | - | - | 2.04 | 2.04 | 8.43 | 33.30 | 41.73 | 39.69 |
| 46 | 2056 | - | - | - | 2.04 | 2.04 | 8.43 | 34.04 | 42.47 | 40.43 |
| 47 | 2057 | - | - | - | 2.04 | 2.04 | 8.43 | 34.78 | 43.21 | 41.17 |
| 48 | 2058 | - | - | - | 2.04 | 2.04 | 8.43 | 35.52 | 43.95 | 41.91 |
| 49 | 2059 | - | - | - | 2.04 | 2.04 | 8.43 | 36.26 | 44.69 | 42.65 |
| 50 | 2060 | - | - | - | 2.04 | 2.04 | 8.43 | 37.00 | 45.43 | 43.39 |

120°37'41" 120°39'40" 120°41'39" 120°43'38"

12°57'20" 12°57'20" 12°57'20" 12°57'20"

SCALE 0 1000 2000 METERS



Scale : 1:50,000

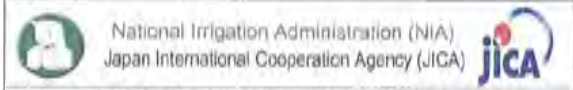


MAIN CANAL

EXISTING DIVERSION DAM

LEGEND:

- Existing Structures
- Existing Lateral Canal
- Existing Main Canal
- Creek
- River
- Roads
- National Irrigation System Boundary



SECTOR LOAN FOR REHABILITATION OF IRRIGATION FACILITIES (SLRIF) 0102 - DINGRAS RIVER IRRIGATION SYSTEM Ilocos Norte, Region-1

GENERAL LAYOUT




120°37'41" 120°39'40" 120°41'39" 120°43'38"

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities

Photographs of Irrigation Facilities



NIS name: Dingras (Region 1)

Date: May 21, 2009

| Location / Facility | Photograph | Comments |
|---|--|---|
| Dingras intake Sta. 0+000 River Channelization Longitude: 18° 00' 00" Latitude: 120°49' 37" |  | Needs a stand-by equipment for de-silting the intake. |
| Main Canal Intake Outlet |  | Intake needs de-silting/ needs crane for de-silting. |
| Dingras Intake Longitude: 18° 00' 00" Latitude: 120°49' 37" |  | The intake should be mechanized. |

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities

Photographs of Irrigation Facilities

| <i>Location / Facility</i> | <i>Photograph</i> | <i>Comments</i> |
|---|---|--------------------------------------|
| Banga River at Dingras RIS in front of intake. |  | River training should be implemented |
| Farm lots where fallow is followed. |  | Land holdings are very small. |

NIS name: Dingras (Region 1)

Date: May 21, 2009

**THE REPUBLIC OF PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION**

**Sector Loan on
Rehabilitation of Irrigation Facilities**

NIS SUMMARY REPORT

0103

Madongan Area RIS

Region 1

Illocos Norte 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**

| <i>Item</i> | <i>Description</i> | |
|---|---|---|
| 1) Name of NIS | Madongan Area RIS | Code: 0103 |
| 2) Location | Region | Region 1 |
| | Province | Ilocos Norte |
| | Municipality | Marcos, Dingras |
| | Distance | 46 km from Laoag City |
| 3) Type of Water Source | Water Source | Madongan River river |
| | Type | Diversion Dam (136.2 m wide, 3.4 m high) |
| 4) Area | Service Area | 3,621 ha |
| | FUSA | 2,933 ha |
| 5) Beneficiary Farmers | 2,110 farmers | Average paddy field cultivating size = 1.39 ha per farmer |
| 6) Irrigator's Association | IAs established = 8 FIA established = 1 in 2008 | |
| 7) Features of NIS and Necessity of the project | <p>The diversion dam serves the left and right portion service areas with its sluiceway and intake gates located in the right side portion. Major rehab is the construction/restoration of damaged left closed conduit and embankment works. Due to aggravated effects of inclement weather conditions and built for quite a long time, the System especially the dam structure and appurtenant structures needs major rehab/restoration works. Likewise, this is true to the irrigation canals and structures. The sluiceway gates and intake gates needs repair/replacement too.</p> <p>The rehabilitation works is necessary to restore the full functionality and stability of the dam and canal structures and to improve the efficiency of water delivery in the canals and efficiency of water distribution to the farms.</p> | |
| 8) Outline of the Proposed Project | <p>A. Engineering</p> <ol style="list-style-type: none"> 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 <p>B. Institutional Strengthening Program</p> <p>B. 1 Basic Program</p> <ol style="list-style-type: none"> 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 <p>B.2 Specific Program to strengthen institutional mechanism together with LGUs</p> <ol style="list-style-type: none"> 1. Monitoring and control of illegal mechanical quarrying 2. Improvement of watershed management | |

| | | | | |
|---|--|------------|------------------|----------------|
| 9) Proposed Project Component | <p>A. Engineering</p> <p>1. Construction of civil works for rehabilitation of diversion works, canal system, drainage system, roads, and IMT support facilities.</p> <p>B. Institutional Strengthening Program</p> <p>1. Reactivation of FIAs/IAs including reformation of TSGA / IA / FIA areas, construction of IMT support facilities (demand base)</p> <p>2. Strengthening NIA-IA- LGUs Partnership, especially coordination RDC, RAFC/PAFC with FIAs/IAs and ISMC</p> <p>3. Institutional development program to strengthen management capacity of NIA field offices and IAs.</p> | | | |
| 10) Project Cost (Direct cost only, excluding escalation, contingency, tax) | 1. Direct cost | PHP | 255.85 | Million |
| | - Civil Works | PHP | 245.54 | Million |
| | - Institutional Development | PHP | 5.20 | Million |
| | - Engineering Services | PHP | 5.12 | Million |
| | 2. Indirect cost | PHP | 22.89 | Million |
| | Total Project Cost (1+2) | PHP | 278.74 | Million |
| | Cost per ha | PHP | 95,037.00 | per ha |
| 11) Project Benefit | <p>1. To increase paddy production by 10,102 tons/year</p> <p>2. To increase farmers' net income to PHP58,828.00/ha/year</p> <p>3. To establish functional and self-reliant IAs</p> <p>4. To improve performance of NIS</p> | | | |
| 12) Project Justification | EIRR = 26.0 %, B/C = 1.68 (discount rate 15%) | | | |

2. Project History (Construction/Rehabilitation)

| Year | Description |
|--------------|---|
| 1983-1986 | Construction of dam, irrigation canals and other appurtenant structures |
| 1992-1994 | Construction of urgent disaster prevention works, i.e. levee, dikes, minor repair/rehab |
| 1995-Present | Continuing minor repair/rehab works to the irrigation canals and facilities |

3. Present Condition

3.1 Natural Conditions

| Item | Description |
|------------------------------|---|
| 1) Annual Rainfall | 2,070 mm |
| 2) Seasons | Wet season: May to October Dry season: November to April |
| 3) Dominant Soil in NIS Area | Silty loam |
| 4) Topography | Undulated |

3.2 Socio-economy (Region/Province)

| Item | Description |
|---------------------------|--|
| 1) GRDP | PHP 185,566 million (Year 2007), Per Capita GRDP = PHP 38,063 per year |
| 2) Population | 547,284 (province) |
| 3) Population Growth Rate | 0.86 % per year (province) |
| 4) Labor Force | 3,183,000 (region) |
| 5) Poverty Population | 21.2% to total population (province) |

3.3 Present Agriculture in NIS

| Item | Description | | | | | | |
|----------------------------|--|---------------------|------------------|-------------|-------------------------|----------------|---------------------------|
| 1) Farm Household in NIS | <table border="0"> <tr> <td>Total beneficiaries</td> <td>2,110 households</td> </tr> <tr> <td>Land owners</td> <td>689 households (32.7 %)</td> </tr> <tr> <td>Tenant farmers</td> <td>1,421 households (67.3 %)</td> </tr> </table> | Total beneficiaries | 2,110 households | Land owners | 689 households (32.7 %) | Tenant farmers | 1,421 households (67.3 %) |
| Total beneficiaries | 2,110 households | | | | | | |
| Land owners | 689 households (32.7 %) | | | | | | |
| Tenant farmers | 1,421 households (67.3 %) | | | | | | |
| 2) Paddy Field Size in NIS | 1.39 ha per household (FUSA/Total beneficiaries as of 2008) | | | | | | |

| Item | Description | | | | | |
|--------------------------------------|-------------------------|----------|--------|---------------------|-------|---------|
| 3) Present Land Use in NIS | Paddy field planted | 750 ha | 20.7 % | As of 2008 | | |
| | Paddy field not planted | 2,183 ha | 60.3 % | 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 | 688 ha | 19.0 % | No data in response | | |
| 4) Paddy Field in FUSA (ha) | 2,933 | | | | | |
| 5) Paddy Cropped Area (ha) | 2004 | 2005 | 2006 | 2007 | 2008 | Average |
| Wet Season | 1,120 | 2,030 | 730 | 740 | 740 | 1,072 |
| Dry Season | 1,485 | 407 | 740 | 736 | 750 | 820 |
| 6) Cropping Intensity (%) (per year) | 2004 | 2005 | 2006 | 2007 | 2008 | Average |
| | 88 | 83 | 50 | 50 | 51 | 64 |
| 7) Unit Yield of Paddy (ton/ha) | 2004 | 2005 | 2006 | 2007 | 2008 | Average |
| Wet Season | 4.10 | 3.50 | 4.30 | 4.30 | 4.00 | 4.03 |
| Dry Season | 4.20 | 4.20 | 4.40 | 4.40 | 3.80 | 4.20 |
| 8) Paddy Production (ton) | 2004 | 2005 | 2006 | 2007 | 2008 | Average |
| Wet Season | 4,592 | 7,714 | 3,139 | 3,182 | 2,960 | 4,317 |
| Dry Season | 6,153 | 1,709 | 3,256 | 3,238 | 2,850 | 3,441 |

3.4 Water Resources

| Item | Description |
|------------------------------|------------------------|
| 1) Name of Rivers | Madongan River |
| 2) Catchment Area at Dam | 153.8 km ² |
| 3) Ave. River Discharge | 6.85 m ³ /s |
| 4) Ave. Dry Season Discharge | 4.74 m ³ /s |
| 5) Diverted Intake Discharge | 2.70 m ³ /s |
| 6) Water Requirement | 5.28 m ³ /s |
| 7) Sedimentation | High |

3.5 Existing Irrigation System

| Item | Description |
|------------------------|--|
| 1) Diversion Dam | Overflow crest width 136.22 m, Dam height 3.40 m |
| 2) Main Canal | Total length 15.39 km (Lined portion 10.756 km) |
| 3) Lateral Canals | Total length 54.749 km (Lined portion 41.143 km) |
| 4) On-farm facilities | Total length 97.00 km (Lined portion 0 km) Turn-outs = 195 units |
| 5) Drainage Canal | Total length 38.00 kms. |
| 6) Canal Structures | No. = 309 units |
| 7) Drainage Structures | No. = 40 units |
| 8) Farm roads | Total length 47.823 km (pavement= _____ kms.) |

3.6 Institutions for O&M of NIS

| Item | Description | | | | | |
|--------------------------------|---|------|------|------|------|---------|
| 1) Regional Irrigation Office | Name: Region 1-Ilocos Region | | | | | |
| 2) IMO Staff in 2009 | Name: Ilocos Norte IMO Total number of staff: 60 | | | | | |
| 3) Irrigator' Association (IA) | 2004 | 2005 | 2006 | 2007 | 2008 | Average |

| <i>Item</i> | <i>Description</i> | | | | | |
|--|--------------------|------|------|------|-------|-------|
| Number of FIA (nos) | | | | | 1 | |
| Number of IA (nos) | | | | | 8 | 8 |
| Number of TSAG (nos) | 125 | 125 | 125 | 124 | 124 | 125 |
| Functionality of IA | 0 | 0 | 0 | 0 | 85.22 | 85.22 |
| Collection of ISF,% (wet) | 0 | 0 | 0 | 0 | 0 | 0 |
| Collection of ISF,% (dry) | 41.0 | 49.0 | 52.0 | 48.0 | 51.0 | 48.0 |
| 4) NIS Category based on IA 2008 O&M Contract (NIA-IA) | No. of IA | | | | | |
| Category A | 1 | | | | | |
| Category B | 0 | | | | | |
| Category C | 7 | | | | | |

3.7 Existing Problems

| <i>Item</i> | <i>Description</i> |
|---|--|
| 1) Diversion Works | <ol style="list-style-type: none"> 1. Dam body undermined and scoured endangering whole structure (with bridge) 2. Heavily damaged/scoured dam downstream apron and major bed, also ret. walls 3. Heavy siltation upstream of dam 4. Deteriorated sluiceway and intake gates, and misc. metal works 5. Modification/replacement of motor, & intake gates from manual to motorized operation with housing 6. The closed conduit serving left service area damaged and not served. |
| 2) Canal and Structures | <ol style="list-style-type: none"> 1. Heavy damages of canals from siltation and erosions especially during inclement weather conditions 2. Damages to existing canal structures and appurtenant parts 3. Construction of new structures to suit actual field conditions. |
| 3) Drainage Canal | <ol style="list-style-type: none"> 1. Damages to existing drainage canals 2. Damages to existing structures 3. Siltation to the canals 4. Other related works to the proper functioning of canals |
| 4) Other Project Facilities (road, bridge, flood dike, building, etc) | <ol style="list-style-type: none"> 1. The link roads needs maintenance and concrete pavement preferable 2. Damages to road structures and appurtenant structures 3. Repair/rehab of existing field office/quarter |
| 5) Water Management and O&M Activities | <ol style="list-style-type: none"> 1. Continuing water management education to concerned parties 2. Planning, implementation, revisions of O&M activities, i.e. water delivery and schedule, etc. |
| 6) Status of NIS and IA Management | <p>Status Type Bc evaluated by Radar Graph</p> <p>Specific problems are:</p> <ol style="list-style-type: none"> 1. Low ISF collection efficiency during wet and dry seasons at 34% and 48%, respectively 2. Low cropping intensity during wet and dry seasons at 46% and 45%, respectively 3. Medium yield of paddy during wet and dry seasons at 79 and 77 cavans/ha, respectively |
| 7) Watershed Management | <ol style="list-style-type: none"> 1. Coordination to DENR and other concerned entities to address this effort 2. Watershed is significantly denuded. 3. Minimum coordination by NIA's field offices and IAs with concerned LGUs and other line agencies |
| 8) Coordination with LGU and Agencies concerned | <ol style="list-style-type: none"> 1. Minimum coordination by NIA's field offices and IAs with concerned LGUs and other line agencies on the specific problems such as monitoring and control of illegal mechanical quarrying and watershed management |
| 9) Agriculture | <ol style="list-style-type: none"> 1. Continuing cooperative efforts by DA/MA/PA of increased rice production 2. Sharing of relative agro-statistical data of concerned entities |

| <i>Item</i> | <i>Description</i> |
|-------------|--|
| | 3. Installation/sharing of agro-meteorological equipments 4. Insufficient income of farmers, thereby, cannot procure the required amount of agricultural inputs needed by the crop. 5. Inadequate number of post harvest facilities to be utilized by the farmers. 6. Limited number of credit institution to serve the farmers at a lower interest rate. |
| 10) Others | 1. Sharing of available logistics |

4. Proposed Rehabilitation Plan

4.1 Agricultural Development Plan

| <i>Item</i> | <i>Description</i> | | | |
|-------------------------------|--------------------|---------------------|---------------------|---------------|
| Cropping schedule | <i>Wet Season</i> | <i>Dry Season-1</i> | <i>Dry Season-2</i> | <i>Annual</i> |
| 1) Type of Crops | Paddy | Paddy | Corn | - |
| 2) Cropping Area (ha) | 2,933 | 750 | 545 | - |
| 3) Target Unit Yield (ton/ha) | 4.30 | 4.40 | 6 | - |
| 3) Total Production (ton) | 12,612 | 3,300 | 3270 | - |

4.2 Civil Works

| <i>Item</i> | <i>Description</i> |
|---------------------------|---|
| 1) Diversion Works | 1. Embankment protection works – 1 unit 2. River channelization/training works, 3. Restoration of left closed conduit. |
| 2) Canal Structures | 1. Repair of damaged structures - 65 units 2. Repair/replacement of dilapidated steel gates. 3. Installation of new structure steel gates |
| 3) Canalization | 1. Concrete lining of selected canal sections – 18.2 kms 2. De-silting of selected canal sections 3. Realignment of canal 4. Construction of new canal |
| 4) Drainage Structures | 1. Repair of drainage structures – 19 units 2. Construction of additional structures |
| 5) Drainage Canalization | 1. De-silting of existing drainage canals – 1.14 kms 2. Construction of additional drainage canals |
| 6) Service Roads | 1. Re-graveling of selected road sections – 24 km 2. Construction of side drains 3. Construction of drainage structures in strategic road locations. |
| 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

| <i>Item</i> | <i>Description</i> |
|--|---|
| 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 |

| <i>Item</i> | <i>Description</i> |
|--|---|
| | 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. Request LGUs legal actions on protection of illegal mechanical quarrying prior to the commencement of the SLRIF through the coordination activities 3. Strengthening coordination with RDC, RAFC/PAFC and LGUs on training program of watershed management 4. Strengthening coordination on establishment of monitoring and control mechanism of illegal quarrying |

4.4 Proposed Counter Schemes

| <i>Item</i> | <i>Description</i> |
|-------------|---|
| 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 initiates training and upgrade technical skills of its engineers by inviting resource persons from the key line departments and/or national agencies (e.g. NIA, DPWH.) 2. LGUs take actions on information awareness on the Project implementation through local communication media. 3. LGU establishes a coordinating/steering committee at the provincial level to improve coordination and representation of NIA in local planning and budgeting |

5. Cost Estimate for Initial Investment

| <i>Item</i> | <i>Description</i> | |
|--------------------------------|---|--------------------|
| 1) Direct Cost for Civil Works | A. Mobilization | Php 5.12 Million |
| | B. Protection Dikes | Php 13.90 Million |
| | C. Diversion Works | Php 135.46 Million |
| | D. Canal Structures | Php 8.52 Million |
| | E. Canalization | Php 44.06 Million |
| | F. Drainage Structures | Php 5.87 Million |
| | G. Drainage Canalization | Php 8.80 Million |
| | H. Roads | Php 3.91 Million |
| | I. On-Farm Facilities/T.O. Gates | Php 1.97 Million |
| | J. IMT Support Facilities | Php 15.00 Million |
| | K. IMT GIS Database | Php 2.93 Million |
| | L. Institutional Development (5% of Direct Cost) | Php 5.20 Million |
| | M. Feasibility Studies & Detailed Engineering (2% of Direct Cost) | Php 5.12 Million |
| | Sub-total (Direct Cost) | |
| 2) Indirect Cost | A. General Engineering Supervision and Administration (3.5% of Direct Cost) | Php 8.95 Million |
| | B. NIA Management Fee (5% of Total Project Cost) | Php 13.94 Million |
| | Sub-total (Indirect Cost) | |
| 3) Total Project Cost | = 1+2 | Php 278.74 Million |
| Cost per ha. | | Php 95,037.00 /ha. |

6. Implementation Plan

| <i>Item</i> | <i>Description</i> |
|--|-------------------------------------|
| 1) Contract package | 1 - Local Competitive Bidding (LCB) |
| 2) Implementation Schedule | |
| a) Civil Works | |
| 1) Survey, F/S, Design | 19 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

| <i>Item</i> | <i>Description</i> | |
|-------------------------|--|--|
| 1) Economic evaluation | | |
| EIRR (Base) | EIRR = 26.0 % | : Project life 50 years |
| Sensitivity | Case-1 | EIRR = 23.6 % : Cost 10% up |
| | Case-2 | EIRR = 23.3 % : Benefit 10% down |
| | | EIRR = 21.1 % : Cost 10% up + Benefit 10% down |
| B/C | 1.68 | : discount rate 15% p.a. |
| NPV | PHP 110 million | : discount rate 15% p.a. |
| 2) Financial evaluation | Farmer's net income increase = PHP 36,442 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

| <i>Item</i> | <i>Description</i> |
|-------------------------|---|
| 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 0103 - Madongan Area

Case-2 (Benefit 10% down)

Name of NIS 0103 - Madongan Area **Region** **1** **IMO R I Rocos Norte**

| | | | | | |
|-----------------------|---------------------------------|---------|------|-----------|-----|
| EIRR : 23.3% | Net Present Value (Million PHP) | Benefit | Cost | B/C Ratio | NPV |
| (15 % discount rate) | | 244 | 161 | 1.51 | 83 |

(Unit : Pbp Million)

| Year in Order | Year | Economic Cost (M. PHP) | | | | Annual O & M | Economic Benefit (M. PHP) | | Total | Net Cash Flow (M. PHP) |
|---------------|------|------------------------|---------------------------|----------------------|---------|--------------|---------------------------|---------|--------|------------------------|
| | | Civil Works | Institutional Development | Engineering Services | Benefit | | without 1.5% | | | |
| | | | | | | | Benefit | Benefit | | |
| 1 | 2011 | - | - | 1.27 | - | 1.27 | 0.55 | 0.55 | -0.72 | |
| 2 | 2012 | - | - | 1.27 | - | 1.27 | 1.10 | 1.10 | -0.17 | |
| 3 | 2013 | 69.17 | 0.84 | 1.27 | - | 71.28 | 1.65 | 1.65 | -69.63 | |
| 4 | 2014 | 92.22 | 1.12 | 1.27 | 1.79 | 96.40 | 2.20 | 16.29 | -80.11 | |
| 5 | 2015 | 69.17 | 0.84 | 1.27 | 4.17 | 75.44 | 2.75 | 37.39 | -38.06 | |
| 6 | 2016 | - | - | - | 5.95 | 5.95 | 3.29 | 56.14 | 50.19 | |
| 7 | 2017 | - | - | - | 5.95 | 5.95 | 3.84 | 60.80 | 54.85 | |
| 8 | 2018 | - | - | - | 5.95 | 5.95 | 4.39 | 63.11 | 57.16 | |
| 9 | 2019 | - | - | - | 5.95 | 5.95 | 4.94 | 63.66 | 57.71 | |
| 10 | 2020 | - | - | - | 5.95 | 5.95 | 5.49 | 64.21 | 58.26 | |
| 11 | 2021 | - | - | - | 5.95 | 5.95 | 6.04 | 64.76 | 58.81 | |
| 12 | 2022 | - | - | - | 5.95 | 5.95 | 6.59 | 65.30 | 59.35 | |
| 13 | 2023 | - | - | - | 5.95 | 5.95 | 7.14 | 65.85 | 59.90 | |
| 14 | 2024 | - | - | - | 5.95 | 5.95 | 7.69 | 66.40 | 60.45 | |
| 15 | 2025 | - | - | - | 5.95 | 5.95 | 8.24 | 66.95 | 61.00 | |
| 16 | 2026 | - | - | - | 5.95 | 5.95 | 8.78 | 67.50 | 61.55 | |
| 17 | 2027 | - | - | - | 5.95 | 5.95 | 9.33 | 68.05 | 62.10 | |
| 18 | 2028 | - | - | - | 5.95 | 5.95 | 9.88 | 68.60 | 62.65 | |
| 19 | 2029 | - | - | - | 5.95 | 5.95 | 10.43 | 69.15 | 63.20 | |
| 20 | 2030 | - | - | - | 5.95 | 5.95 | 10.98 | 69.70 | 63.75 | |
| 21 | 2031 | - | - | - | 5.95 | 5.95 | 11.53 | 70.25 | 64.30 | |
| 22 | 2032 | - | - | - | 5.95 | 5.95 | 12.08 | 70.79 | 64.84 | |
| 23 | 2033 | - | - | - | 5.95 | 5.95 | 12.63 | 71.34 | 65.39 | |
| 24 | 2034 | - | - | - | 5.95 | 5.95 | 13.18 | 71.89 | 65.94 | |
| 25 | 2035 | - | - | - | 5.95 | 5.95 | 13.73 | 72.44 | 66.49 | |
| 26 | 2036 | - | - | - | 5.95 | 5.95 | 14.27 | 72.99 | 67.04 | |
| 27 | 2037 | - | - | - | 5.95 | 5.95 | 14.82 | 73.54 | 67.59 | |
| 28 | 2038 | - | - | - | 5.95 | 5.95 | 15.37 | 74.09 | 68.14 | |
| 29 | 2039 | - | - | - | 5.95 | 5.95 | 15.92 | 74.64 | 68.69 | |
| 30 | 2040 | - | - | - | 5.95 | 5.95 | 16.47 | 75.19 | 69.24 | |
| 31 | 2041 | - | - | - | 5.95 | 5.95 | 17.02 | 75.74 | 69.79 | |
| 32 | 2042 | - | - | - | 5.95 | 5.95 | 17.57 | 76.28 | 70.33 | |
| 33 | 2043 | - | - | - | 5.95 | 5.95 | 18.12 | 76.83 | 70.88 | |
| 34 | 2044 | - | - | - | 5.95 | 5.95 | 18.67 | 77.38 | 71.43 | |
| 35 | 2045 | - | - | - | 5.95 | 5.95 | 19.22 | 77.93 | 71.98 | |
| 36 | 2046 | - | - | - | 5.95 | 5.95 | 19.76 | 78.48 | 72.53 | |
| 37 | 2047 | - | - | - | 5.95 | 5.95 | 20.31 | 79.03 | 73.08 | |
| 38 | 2048 | - | - | - | 5.95 | 5.95 | 20.86 | 79.58 | 73.63 | |
| 39 | 2049 | - | - | - | 5.95 | 5.95 | 21.41 | 80.13 | 74.18 | |
| 40 | 2050 | - | - | - | 5.95 | 5.95 | 21.96 | 80.68 | 74.73 | |
| 41 | 2051 | - | - | - | 5.95 | 5.95 | 22.51 | 81.23 | 75.28 | |
| 42 | 2052 | - | - | - | 5.95 | 5.95 | 23.06 | 81.77 | 75.82 | |
| 43 | 2053 | - | - | - | 5.95 | 5.95 | 23.61 | 82.32 | 76.37 | |
| 44 | 2054 | - | - | - | 5.95 | 5.95 | 24.16 | 82.87 | 76.92 | |
| 45 | 2055 | - | - | - | 5.95 | 5.95 | 24.71 | 83.42 | 77.47 | |
| 46 | 2056 | - | - | - | 5.95 | 5.95 | 25.25 | 83.97 | 78.02 | |
| 47 | 2057 | - | - | - | 5.95 | 5.95 | 25.80 | 84.52 | 78.57 | |
| 48 | 2058 | - | - | - | 5.95 | 5.95 | 26.35 | 85.07 | 79.12 | |
| 49 | 2059 | - | - | - | 5.95 | 5.95 | 26.90 | 85.62 | 79.67 | |
| 50 | 2060 | - | - | - | 5.95 | 5.95 | 27.45 | 86.17 | 80.22 | |

Economic Evaluation (EIRR)

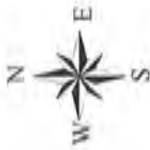
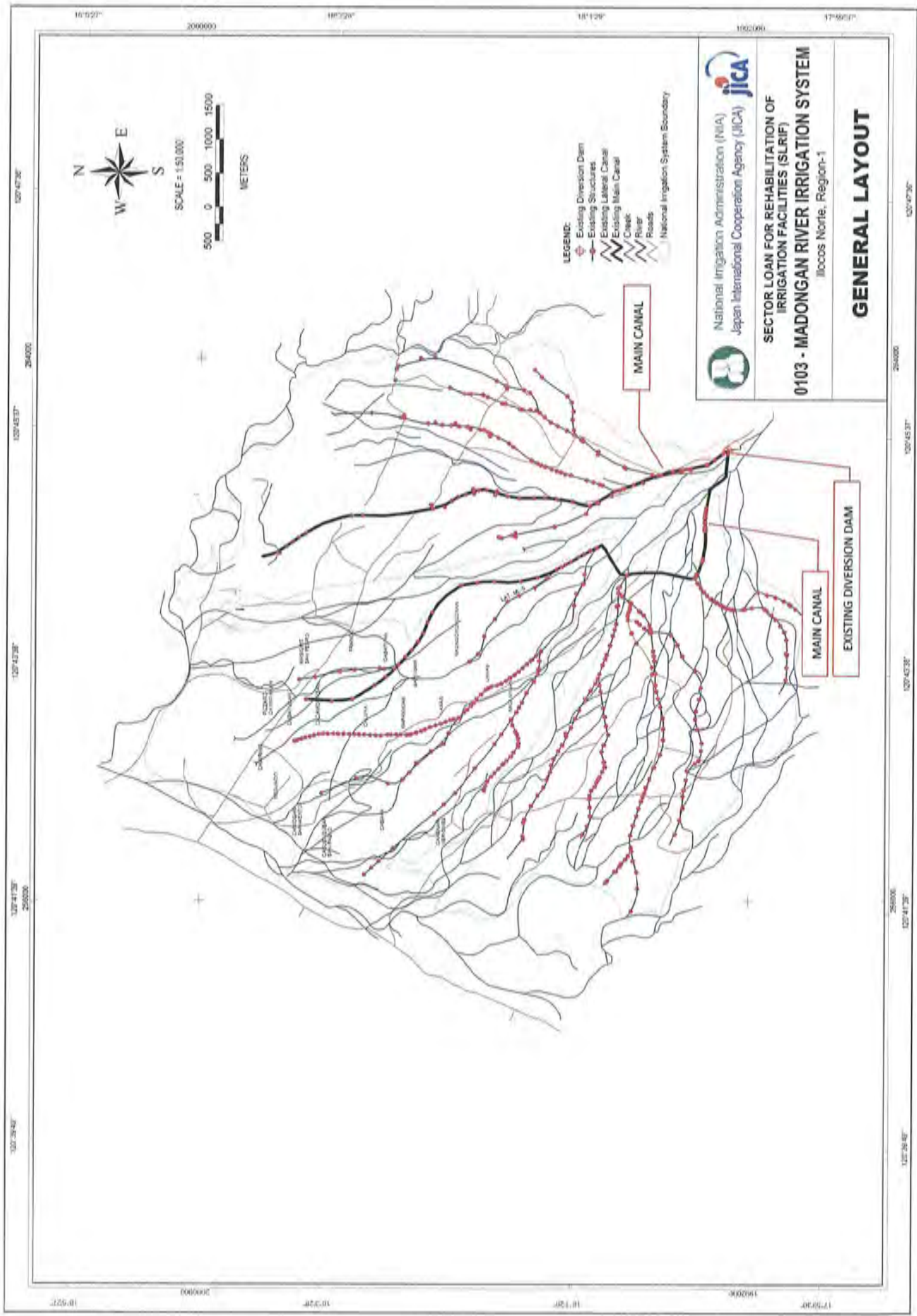
Case-3 (Cost 10% up and Benefit 10% down)

Name of NIS 0103 - Madongan Area **Region** **1** **IMO R I Rocos Norte**

| | | | | | |
|-----------------------|---------------------------------|---------|------|-----------|-----|
| EIRR : 21.1% | Net Present Value (Million PHP) | Benefit | Cost | B/C Ratio | NPV |
| (15 % discount rate) | | 244 | 177 | 1.38 | 67 |

(Unit : Pbp Million)

| Year in Order | Year | Economic Cost (M. PHP) | | | | Annual O & M | Economic Benefit (M. PHP) | | Total | Net Cash Flow (M. PHP) |
|---------------|------|------------------------|---------------------------|----------------------|---------|--------------|---------------------------|---------|--------|------------------------|
| | | Civil Works | Institutional Development | Engineering Services | Benefit | | without 1.5% | | | |
| | | | | | | | Benefit | Benefit | | |
| 1 | 2011 | - | - | 1.39 | - | 1.39 | 0.55 | 0.55 | -0.85 | |
| 2 | 2012 | - | - | 1.39 | - | 1.39 | 1.10 | 1.10 | -0.30 | |
| 3 | 2013 | 76.08 | 0.93 | 1.39 | - | 78.41 | 1.65 | 1.65 | -76.76 | |
| 4 | 2014 | 101.45 | 1.24 | 1.39 | 1.96 | 106.04 | 2.20 | 16.29 | -89.75 | |
| 5 | 2015 | 76.08 | 0.93 | 1.39 | 4.58 | 82.99 | 2.75 | 37.39 | -45.60 | |
| 6 | 2016 | - | - | - | 6.55 | 6.55 | 3.29 | 56.14 | 49.59 | |
| 7 | 2017 | - | - | - | 6.55 | 6.55 | 3.84 | 60.80 | 54.25 | |
| 8 | 2018 | - | - | - | 6.55 | 6.55 | 4.39 | 63.11 | 56.56 | |
| 9 | 2019 | - | - | - | 6.55 | 6.55 | 4.94 | 63.66 | 57.11 | |
| 10 | 2020 | - | - | - | 6.55 | 6.55 | 5.49 | 64.21 | 57.66 | |
| 11 | 2021 | - | - | - | 6.55 | 6.55 | 6.04 | 64.76 | 58.21 | |
| 12 | 2022 | - | - | - | 6.55 | 6.55 | 6.59 | 65.30 | 58.76 | |
| 13 | 2023 | - | - | - | 6.55 | 6.55 | 7.14 | 65.85 | 59.31 | |
| 14 | 2024 | - | - | - | 6.55 | 6.55 | 7.69 | 66.40 | 59.86 | |
| 15 | 2025 | - | - | - | 6.55 | 6.55 | 8.24 | 66.95 | 60.41 | |
| 16 | 2026 | - | - | - | 6.55 | 6.55 | 8.78 | 67.50 | 60.96 | |
| 17 | 2027 | - | - | - | 6.55 | 6.55 | 9.33 | 68.05 | 61.50 | |
| 18 | 2028 | - | - | - | 6.55 | 6.55 | 9.88 | 68.60 | 62.05 | |
| 19 | 2029 | - | - | - | 6.55 | 6.55 | 10.43 | 69.15 | 62.60 | |
| 20 | 2030 | - | - | - | 6.55 | 6.55 | 10.98 | 69.70 | 63.15 | |
| 21 | 2031 | - | - | - | 6.55 | 6.55 | 11.53 | 70.25 | 63.70 | |
| 22 | 2032 | - | - | - | 6.55 | 6.55 | 12.08 | 70.79 | 64.25 | |
| 23 | 2033 | - | - | - | 6.55 | 6.55 | 12.63 | 71.34 | 64.80 | |
| 24 | 2034 | - | - | - | 6.55 | 6.55 | 13.18 | 71.89 | 65.35 | |
| 25 | 2035 | - | - | - | 6.55 | 6.55 | 13.73 | 72.44 | 65.90 | |
| 26 | 2036 | - | - | - | 6.55 | 6.55 | 14.27 | 72.99 | 66.45 | |
| 27 | 2037 | - | - | - | 6.55 | 6.55 | 14.82 | 73.54 | 66.99 | |
| 28 | 2038 | - | - | - | 6.55 | 6.55 | 15.37 | 74.09 | 67.54 | |
| 29 | 2039 | - | - | - | 6.55 | 6.55 | 15.92 | 74.64 | 68.09 | |
| 30 | 2040 | - | - | - | 6.55 | 6.55 | 16.47 | 75.19 | 68.64 | |
| 31 | 2041 | - | - | - | 6.55 | 6.55 | 17.02 | 75.74 | 69.19 | |
| 32 | 2042 | - | - | - | 6.55 | 6.55 | 17.57 | 76.28 | 69.74 | |
| 33 | 2043 | - | - | - | 6.55 | 6.55 | 18.12 | 76.83 | 70.29 | |
| 34 | 2044 | - | - | - | 6.55 | 6.55 | 18.67 | 77.38 | 70.84 | |
| 35 | 2045 | - | - | - | 6.55 | 6.55 | 19.22 | 77.93 | 71.39 | |
| 36 | 2046 | - | - | - | 6.55 | 6.55 | 19.76 | 78.48 | 71.94 | |
| 37 | 2047 | - | - | - | 6.55 | 6.55 | 20.31 | 79.03 | 72.48 | |
| 38 | 2048 | - | - | - | 6.55 | 6.55 | 20.86 | 79.58 | 73.03 | |
| 39 | 2049 | - | - | - | 6.55 | 6.55 | 21.41 | 80.13 | 73.58 | |
| 40 | 2050 | - | - | - | 6.55 | 6.55 | 21.96 | 80.68 | 74.13 | |
| 41 | 2051 | - | - | - | 6.55 | 6.55 | 22.51 | 81.23 | 74.68 | |
| 42 | 2052 | - | - | - | 6.55 | 6.55 | 23.06 | 81.77 | 75.23 | |
| 43 | 2053 | - | - | - | 6.55 | 6.55 | 23.61 | 82.32 | 75.78 | |
| 44 | 2054 | - | - | - | 6.55 | 6.55 | 24.16 | 82.87 | 76.33 | |
| 45 | 2055 | - | - | - | 6.55 | 6.55 | 24.71 | 83.42 | 76.88 | |
| 46 | 2056 | - | - | - | 6.55 | 6.55 | 25.25 | 83.97 | 77.43 | |
| 47 | 2057 | - | - | - | 6.55 | 6.55 | 25.80 | 84.52 | 77.97 | |
| 48 | 2058 | - | - | - | 6.55 | 6.55 | 26.35 | 85.07 | 78.52 | |
| 49 | 2059 | - | - | - | 6.55 | 6.55 | 26.90 | 85.62 | 79.07 | |
| 50 | 2060 | - | - | - | 6.55 | 6.55 | 27.45 | 86.17 | 79.62 | |



SCALE = 1:50,000



- 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)

SECTOR LOAN FOR REHABILITATION OF IRRIGATION FACILITIES (SLRIF)
0103 - MADONGAN RIVER IRRIGATION SYSTEM
Ilocos Norte, Region-1

GENERAL LAYOUT

MAIN CANAL




MAIN CANAL

EXISTING DIVERSION DAM

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities

Photographs of Irrigation Facilities




NIS name: Madongan (Region 1)

| Location / Facility | Photograph | Comments |
|--------------------------------|--|---|
| 369 DOWNSTREAM OF MADONGAN DAM |  | Evident of Heavy scouring of river bed and river banks. |
| 377 RIGHT SIDE OF MADONGAN DAM |  | Damaged Left and Right Revetment and Protection Walls. |
| 384 SLUICeway |  | On-going minor repair of sluiceway/apron/slab heavily damaged and scoured |

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities

Photographs of Irrigation Facilities




NIS name: Madongan (Region 1)

| Location / Facility | Photograph | Comments |
|--|--|--|
| UPSTREAM OF PAPA DAM AND DOWNSTREAM OF DPWH SABO DAM |  | Sluiceway, slab, apron upstream portion heavily scoured. Needs constant river training |
| SLUICEWAY DOWNSTREAM SLAB |  | Heavily scoured sluiceway, slab & apron |
| DOWNSTREAM OF PAPA DAM |  | Heavily scoured apron, major bed. Background is scoured/damaged revetment wall. |

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities

Photographs of Irrigation Facilities

NIS name: Madongan (Region 1)

| Location / Facility | Photograph | Comments |
|---|--|--|
| PAPA DAM'S SLUICeway UPSTREAM PORTION DOWNSTREAM OF SABO DAM |  | Substantial river flow at Dam Site |
| PAPA DAM'S BRIDGE PIER |  | Pier markings showing various maximum flood elevations at damsite |
| MADONGAN RIGHT MAIN CANAL UPSTREAM PORTION |  | Shown not functional siphon outlet due to heavy siltation of structure |

**THE REPUBLIC OF PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION**

**Sector Loan on
Rehabilitation of Irrigation Facilities**

NIS SUMMARY REPORT

0104

Solsona Area RIS

Region 1

Illocos Norte 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**

| <i>Item</i> | <i>Description</i> | |
|---|---|--|
| 1) Name of NIS | Solsona Area RIS Code: 0104 | |
| 2) Location | Region | Region 1 |
| | Province | Ilocos Norte |
| | Municipality | Solsona, Dingras |
| | Distance | 44 km from Laoag City |
| 3) Type of Water Source | Water Source | Solsona river |
| | Type | Diversion Dam (45 m wide, 3.5 m high) Run-off the river/Floating |
| 4) Area | Service Area | 1,818 ha |
| | FUSA | 1,340 ha |
| | Rehabilitation | 1190 ha |
| 5) Beneficiary Farmers | 675 farmers | Average paddy field cultivating size = 1.3 0ha per farmer |
| 6) Irrigator's Association | IAs established = 5 FIA established = 1 in 2008 | |
| 7) Features of NIS and Necessity of the project | <p>Solsona dam has a bridge on top of the ogee and its sluiceway gate at the left side but serving left and right side of the river. Due to past inclement weather conditions, major bed and downstream apron including sluiceway slab are heavily scoured and undermined endangering the integrity of the whole structure. Portion of the right main canal was washed out from earlier typhoons. Hence, major repair/rehab work needed to address these problems needing substantial amount of investment/funding. The dam construction including other appurtenant structures and link roads were completed in 1986. The normal wear and tear has taken its toll to these irrigation canals and facilities aside from typhoons to include the sluiceway gates and intake gates and other misc. metal works. Heavy siltation and erosion to the canals with damages to structures.</p> <p>The rehabilitation works is necessary to restore the full functionality and stability of the dam and canal structures and to improve the efficiency of water delivery in the canals and efficiency of water distribution to the farms.</p> | |
| 8) Outline of the Proposed Project | <p>A. Engineering</p> <ol style="list-style-type: none"> 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 <p>B. Institutional Strengthening Program</p> <p>B. 1 Basic Program</p> <ol style="list-style-type: none"> 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 | | | |
| | <ol style="list-style-type: none"> 1. Monitoring and control of illegal mechanical quarrying 2. Improvement of watershed management | | | |
| 9) Proposed Project Component | <p>A. Engineering</p> <ol style="list-style-type: none"> 1. Construction of civil works for rehabilitation of diversion works, canal system, drainage system, roads, and IMT support facilities. <p>B. Institutional Strengthening Program</p> <ol style="list-style-type: none"> 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 | 202.11 Million |
| | - Civil Works | PHP | 194.17 | Million |
| | - Institutional Development | PHP | 3.90 | Million |
| | - Engineering Services | PHP | 4.04 | Million |
| | 2. Indirect cost | | PHP | 18.08 Million |
| | Total Project Cost (1+2) | | PHP | 220.19 Million |
| | Cost per ha | | PHP | 164,322.00 per ha |
| 11) Project Benefit | <ol style="list-style-type: none"> 1. To increase paddy production by 5,088 tons/year 2. To increase farmers' net income to PHP60,181.00/ha/year 3. To establish functional and self-reliant IAs 4. To improve performance of NIS | | | |
| 12) Project Justification | EIRR = 22 %, B/C = 1.45 (discount rate 15%) | | | |

2. Project History (Construction/Rehabilitation)

| Year | Description |
|--------------|---|
| 1983-1986 | Construction of dam, irrigation canals and other appurtenant structures |
| 1992-1994 | Construction of urgent disaster prevention works, i.e. levee, dikes, minor repair/rehab |
| 1995-Present | Continuing minor repair/rehab works to the irrigation canals and facilities |
| | |

3. Present Condition

3.1 Natural Conditions

| Item | Description |
|------------------------------|---|
| 1) Annual Rainfall | 2,070 mm |
| 2) Seasons | Wet season: May to October Dry season: November to April |
| 3) Dominant Soil in NIS Area | Silty Loam |
| 4) Topography | Flat plain / Undulated |

3.2 Socio-economy (Region/Province)

| Item | Description |
|---------------------------|--|
| 1) GRDP | PHP 185,566 million (Year 2007), Per Capita GRDP = PHP 38,063 per year |
| 2) Population | 547,284 (province) |
| 3) Population Growth Rate | 0.86 % per year (province) |
| 4) Labor Force | 3,183,000 (region) |
| 5) Poverty Population | 21.2% to total population (province) |

3.3 Present Agriculture in NIS

| Item | Description | | | | | | |
|--------------------------------------|---|------------------------|--------|------------|-------|---------|-------|
| 1) Farm Household in NIS | Total beneficiaries | 675 households | | | | | |
| | Land owners | 228 households (33.7%) | | | | | |
| | Tenant farmers | 447 households (66.3%) | | | | | |
| 2) Paddy Field Size in NIS | 1.30 ha per household (FUSA/Total beneficiaries as of 2008) | | | | | | |
| 3) Present Land Use in NIS | Paddy field planted | 431 ha | 23.7 % | As of 2008 | | | |
| | Paddy field not planted | 909 ha | 50.0 % | 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 % | | | | |
| 4) Paddy Field in FUSA (ha) | 1,340 | | | | | | |
| 5) Paddy Cropped Area (ha) | 2004 | 2005 | 2006 | 2007 | 2008 | Average | |
| | Wet Season | 758 | 869 | 725 | 431 | 431 | 643 |
| | Dry Season | 930 | 102 | 490 | 382 | 385 | 458 |
| 6) Cropping Intensity (%) (per year) | 2004 | 2005 | 2006 | 2007 | 2008 | Average | |
| | 126 | 72 | 91 | 61 | 61 | 82 | |
| 7) Unit Yield of Paddy (ton/ha) | 2004 | 2005 | 2006 | 2007 | 2008 | Average | |
| | Wet Season | 4.10 | 4.25 | 4.30 | 4.50 | 3.75 | 4.19 |
| | Dry Season | 4.25 | 4.30 | 4.40 | 3.85 | 3.85 | 4.15 |
| 8) Paddy Production (ton) | 2004 | 2005 | 2006 | 2007 | 2008 | Average | |
| | Wet Season | 3,108 | 3,693 | 3,118 | 1,940 | 1,616 | 2,695 |
| | Dry Season | 3,953 | 439 | 2,156 | 1,471 | 1,482 | 1,900 |

3.4 Water Resources

| Item | Description |
|------------------------------|------------------------|
| 1) Name of Rivers | Solsona River |
| 2) Catchment Area at Dam | 79.00 km ² |
| 3) Ave. River Discharge | 6.25 m ³ /s |
| 4) Ave. Dry Season Discharge | 3.08 m ³ /s |
| 5) Diverted Intake Discharge | 0.94 m ³ /s |
| 6) Water Requirement | 2.41 m ³ /s |
| 7) Sedimentation | Heavy |

3.5 Existing Irrigation System

| Item | Description |
|------------------------|---|
| 1) Diversion Dam | Overflow crest width <u>45.00</u> m, Dam height <u>3.50</u> m |
| 2) Main Canal | Total length <u>10.021</u> km (Lined portion <u>6.758</u> km) |
| 3) Lateral Canals | Total length <u>13.244</u> km (Lined portion <u>4.392</u> km) |
| 4) On-farm facilities | Total length <u>44.00</u> km (Lined portion <u>0</u> km) Turn-outs = <u>89</u> units; |
| 5) Drainage Canal | Total length <u>17.42</u> kms. |
| 6) Canal Structures | No. = <u>91</u> units |
| 7) Drainage Structures | No. = <u>20</u> units |
| 8) Farm roads | Total length <u>15.991</u> km |

3.6 Institutions for O&M of NIS

| <i>Item</i> | <i>Description</i> | | | | | |
|--|------------------------------|------|------|------|------|---------|
| 1) Regional Irrigation Office | Name: Region 1-Ilocos Region | | | | | |
| 2) IMO | Name: Ilocos Norte IMO | | | | | |
| Staff in 2009 | Total number of staff: 60 | | | | | |
| 3) Irrigator' Association (IA) | 2004 | 2005 | 2006 | 2007 | 2008 | Average |
| Number of FIA (nos) | | | | | 1 | |
| Number of IA (nos) | | | | | 5 | |
| Number of TSAG (nos) | 57 | 57 | 57 | 57 | 57 | 57 |
| Functionality of IA | 69.3 | 72.5 | 77.5 | 82.3 | 79.1 | 76.1 |
| Collection of ISF,% (wet) | 0 | 0 | 0 | 0 | 0 | 0 |
| Collection of ISF,% (dry) | 65 | 73 | 92 | 78 | 63 | 76 |
| 4) NIS Category based on IA 2008 O&M Contract (NIA-IA) | No. of IA | | | | | |
| Category A | 0 | | | | | |
| Category B | 0 | | | | | |
| Category C | 5 | | | | | |

3.7 Existing Problems

| <i>Item</i> | <i>Description</i> |
|---|---|
| 1) Diversion Works | <ol style="list-style-type: none"> 1. Dam body undermined and scoured endangering whole structure (with bridge) 2. Heavily damaged/scoured dam downstream apron and major bed, also ret. walls 3. Heavy siltation upstream of dam 4. Deteriorated sluiceway and intake gates, and misc. metal works 5. Modification/replacement of motor, & intake gates from manual to motorized operation with housing |
| 2) Canal and Structures | <ol style="list-style-type: none"> 1. Heavy damages of canals from siltation and erosions especially during inclement weather conditions 2. Damages to existing canal structures and appurtenant parts 3. Construction of new structures to suit actual field conditions. |
| 3) Drainage Canal | <ol style="list-style-type: none"> 1. Damages to existing drainage canals 2. Damages to existing structures 3. Siltation to the canals 4. Other related works to the proper functioning of canals |
| 4) Other Project Facilities (road, bridge, flood dike, building, etc) | <ol style="list-style-type: none"> 1. The link roads needs maintenance and concrete pavement preferable 2. Damages to road structures and appurtenant structures 3. Repair/rehab of existing field office/quarter |
| 5) Water Management and O&M Activities | <ol style="list-style-type: none"> 1. Continuing water management education to concerned parties 2. Planning, implementation, revisions of O&M activities, i.e. water delivery and schedule, etc |
| 6) Status of NIS and IA Management | <p>Status Type B evaluated by Radar Graph. Specific problems are:</p> <ol style="list-style-type: none"> 1. Low ISF collection efficiency during wet and dry seasons at 0 and 76%, respectively 2. Low cropping intensity during wet and dry seasons at 63% and 70%, respectively 3. Medium paddy yield during wet and dry seasons at 75 and 76 cavans/ha |
| 7) Watershed Management | <ol style="list-style-type: none"> 1. Coordination to DENR and other concerned entities to address this effort 2. Watershed is significantly denuded. |
| 8) Coordination with LGU and Agencies concerned | <ol style="list-style-type: none"> 1. Minimum coordination by NIA's field offices and IAs with concerned LGUs and other line agencies on the specific problems such as monitoring and control of illegal mechanical quarrying and watershed management |

| <i>Item</i> | <i>Description</i> |
|----------------|---|
| 9) Agriculture | <ol style="list-style-type: none"> 1. Continuing cooperative efforts by DA/MA/PA of increased rice production 2. Sharing of relative agro-statistical data of concerned entities 3. Installation/sharing of agro-meteorological equipments 4. Insufficient capital of the farmers to buy the optimum amount of agricultural input required by the crop. Lending institutions should always be available. 5. Inadequate drying facilities particularly during wet season crops. |
| 10) Others | <ol style="list-style-type: none"> 1. Sharing of available logistics |

4. Proposed Rehabilitation Plan

4.1 Agricultural Development Plan

| <i>Item</i> | <i>Description</i> | | | |
|-------------------------------|--------------------|---------------------|---------------------|---------------|
| Cropping schedule | <i>Wet Season</i> | <i>Dry Season-1</i> | <i>Dry Season-2</i> | <i>Annual</i> |
| 1) Type of Crops | Paddy | Paddy | Corn | - |
| 2) Cropping Area (ha) | 1,340 | 490 | 46 | - |
| 3) Target Unit Yield (ton/ha) | 4.50 | 4.40 | 6 | - |
| 3) Total Production (ton) | 6,030 | 2,156 | 276.0 | 2,432 |

4.2 Civil Works

| <i>Item</i> | <i>Description</i> |
|---------------------------|---|
| 1) Diversion Works | <ol style="list-style-type: none"> 1. Embankment protection works – 1 unit 2. River channelization/training works |
| 2) Canal Structures | <ol style="list-style-type: none"> 1. Repair of damaged structures 29 units 2. Repair/replacement of dilapidated steel gates. 3. Installation of new structure steel gates |
| 3) Canalization | <ol style="list-style-type: none"> 1. Concrete lining of selected canal sections – 22 kms 2. De-silting of selected canal sections 3. Realignment of canal 4. Construction of new canal |
| 4) Drainage Structures | <ol style="list-style-type: none"> 1. Repair of drainage structures – 9 units 2. Construction of additional structures |
| 5) Drainage Canalization | <ol style="list-style-type: none"> 1. De-silting of existing drainage canals – 3.60 kms 2. Construction of additional drainage canals |
| 6) Service Roads | <ol style="list-style-type: none"> 1. Re-graveling of selected road sections – 9.60 kms 2. Construction of side drains 3. Construction of drainage structures in strategic road locations. |
| 7) On-Farm Facilities | <ol style="list-style-type: none"> 1. Repair /replacement of dilapidated turn out steel gates 2. Construction of new turn outs and farm ditches |
| 8) IMT Support Facilities | <ol style="list-style-type: none"> 1. Construction of post-harvest facilities—warehouses, IA buildings, solar driers with shed – 2 units |
| 9) IMT GIS Database | <ol style="list-style-type: none"> 1. Development and establishment of GIS database |

4.3 Institutional Strengthening Program

| <i>Item</i> | <i>Description</i> |
|--|---|
| 1) Reactivation Program of FIAs/IAs and System Management Committee (ISMC) | <ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> 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 |

| <i>Item</i> | <i>Description</i> |
|--|---|
| | 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. Request LGUs legal actions on protection of illegal mechanical quarrying prior to the commencement of the SLRIF through the coordination activities 3. Strengthening coordination with RDC, RAFC/PAFC and LGUs on training program of watershed management 4. Strengthening coordination on establishment of monitoring and control mechanism of illegal quarrying |

4.4 Proposed Counter Schemes

| <i>Item</i> | <i>Description</i> |
|-------------|---|
| 1) DENR | 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 mechanical quarrying |
| 2) LGU | 1. LGU initiates training and upgrade technical skills of its engineers by inviting resource persons from the key line departments and/or national agencies (e.g. NIA, DPWH.) 2. LGUs take actions on information awareness on the Project implementation through local communication media. 3. LGU establishes a coordinating/steering committee at the provincial level to improve coordination and representation of NIA in local planning and budgeting |

5. Cost Estimate for Initial Investment

| <i>Item</i> | <i>Description</i> | | |
|--------------------------------|---|-----|-----------------|
| 1) Direct Cost for Civil Works | A. Mobilization | Php | 4.04 Million |
| | B. Protection Dikes | Php | 5.46 Million |
| | C. Diversion Works | Php | 146.80 Million |
| | D. Canal Structures | Php | 0.19 Million |
| | E. Canalization | Php | 5.97 Million |
| | F. Drainage Structures | Php | 2.68 Million |
| | G. Drainage Canalization | Php | 4.02 Million |
| | H. Roads | Php | 12.74 Million |
| | I. On-Farm Facilities/T.O. Gates | Php | 0.93 Million |
| | J. IMT Support Facilities | Php | 10.00 Million |
| | K. IMT GIS Database | Php | 1.34 Million |
| | L. Institutional Development (5% of Direct Cost) | Php | 3.90 Million |
| | M. Feasibility Studies & Detailed Engineering (2% of Direct Cost) | Php | 4.04 Million |
| | Sub-total (Direct Cost) | | Php |
| 2) Indirect Cost | A. General Engineering Supervision and Administration (3.5% of Direct Cost) | Php | 7.07 Million |
| | B. NIA Management Fee (5% of Total Project Cost) | Php | 11.01 Million |
| | Sub-total (Indirect Cost) | | Php |
| 3) Total Project Cost | = 1+2 | Php | 220.19 Million |
| Cost per ha. | | Php | 164,322.00 /ha. |

6. Implementation Plan

| <i>Item</i> | <i>Description</i> |
|--|-------------------------------------|
| 1) Contract package | 1 - Local Competitive Bidding (LCB) |
| 2) Implementation Schedule | |
| a) Civil Works | |
| 1) Survey, F/S, Design | 19 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

| <i>Item</i> | <i>Description</i> | |
|-------------------------|--|--|
| 1) Economic evaluation | | |
| EIRR (Base) | EIRR = 22% | : Project life 50 years |
| Sensitivity | Case-1 | EIRR = 20.0 % : Cost 10% up |
| | Case-2 | EIRR = 20.0 % : Benefit 10% down |
| | Case-3 | EIRR = 18.0 % : Cost 10% up + Benefit 10% down |
| B/C | 1.45 | : discount rate 15% p.a. |
| NPV | PHP 53.23million | : discount rate 15% p.a. |
| 2) Financial evaluation | Farmer's net income increase = PHP 42,583 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

| <i>Item</i> | <i>Description</i> |
|-------------------------|---|
| 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 |

Economic Evaluation (EIRR)

Case-1 (Cost 10% up)

| | | | | | | |
|---------------------------------|---------------------------------|-----------------------|---------|-------------------|-----------|-----|
| Name of IS: 0104 - Solsona Area | | Region: 1 | | MORIO Locos Norte | | |
| EIRR : 27.0% | Net Present Value (Million PHP) | (15 % discount rate) | Benefit | Cost | B/C Ratio | NPV |
| | | | 140 | 81 | 1.74 | 60 |

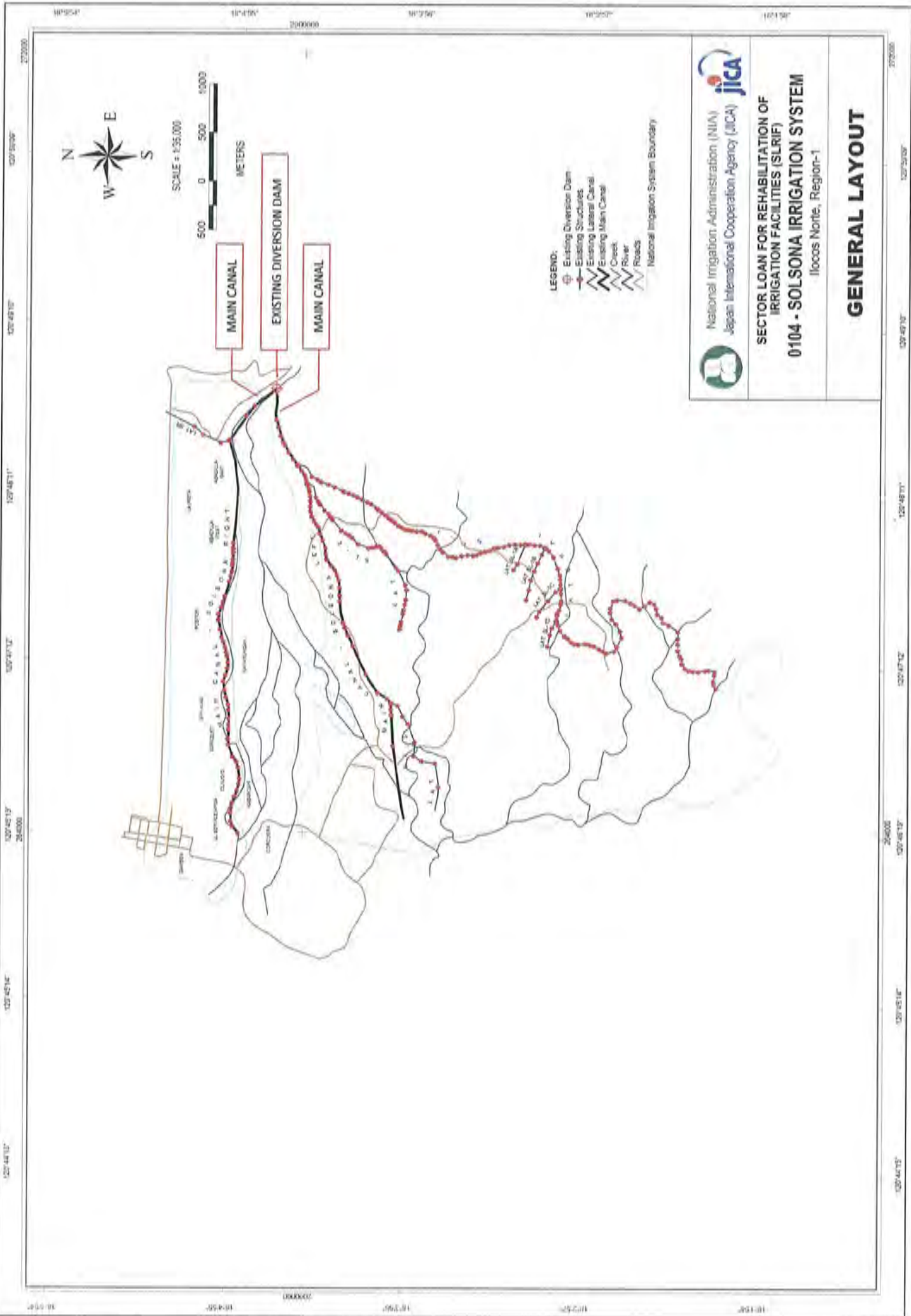
| Year in Order | Year | Economic Cost (M. PHP) | | | Economic Benefit (M. PHP) | | Economic Benefit without 1.5% (M. PHP) | | Net Cash Flow (M. PHP) |
|---------------|------|------------------------|---------------------------|----------------------|---------------------------|-------|--|-------|------------------------|
| | | Civil Works | Institutional Development | Engineering Services | Annual O & M | Total | Benefit | Cost | |
| | | | | | | | | | |
| 1 | 2011 | - | - | 0.62 | - | 0.62 | - | 0.31 | -0.31 |
| 2 | 2012 | - | - | 0.62 | - | 0.62 | - | 0.62 | 0.00 |
| 3 | 2013 | 34.33 | 0.71 | 0.62 | - | 35.65 | - | 0.93 | -34.72 |
| 4 | 2014 | 45.77 | 0.94 | 0.62 | 0.90 | 48.23 | 8.13 | 1.24 | 9.37 |
| 5 | 2015 | 34.33 | 0.71 | 0.62 | 2.09 | 37.75 | 19.98 | 1.55 | 21.53 |
| 6 | 2016 | - | - | - | 2.99 | 2.99 | 30.47 | 1.86 | 32.33 |
| 7 | 2017 | - | - | - | 2.99 | 2.99 | 32.84 | 2.17 | 35.01 |
| 8 | 2018 | - | - | - | 2.99 | 2.99 | 33.86 | 2.48 | 36.34 |
| 9 | 2019 | - | - | - | 2.99 | 2.99 | 33.86 | 2.79 | 36.65 |
| 10 | 2020 | - | - | - | 2.99 | 2.99 | 33.86 | 3.10 | 33.97 |
| 11 | 2021 | - | - | - | 2.99 | 2.99 | 33.86 | 3.41 | 37.27 |
| 12 | 2022 | - | - | - | 2.99 | 2.99 | 33.86 | 3.72 | 37.58 |
| 13 | 2023 | - | - | - | 2.99 | 2.99 | 33.86 | 4.03 | 34.90 |
| 14 | 2024 | - | - | - | 2.99 | 2.99 | 33.86 | 4.34 | 35.21 |
| 15 | 2025 | - | - | - | 2.99 | 2.99 | 33.86 | 4.65 | 35.52 |
| 16 | 2026 | - | - | - | 2.99 | 2.99 | 33.86 | 4.96 | 35.83 |
| 17 | 2027 | - | - | - | 2.99 | 2.99 | 33.86 | 5.27 | 36.14 |
| 18 | 2028 | - | - | - | 2.99 | 2.99 | 33.86 | 5.58 | 36.45 |
| 19 | 2029 | - | - | - | 2.99 | 2.99 | 33.86 | 5.89 | 36.76 |
| 20 | 2030 | - | - | - | 2.99 | 2.99 | 33.86 | 6.20 | 37.07 |
| 21 | 2031 | - | - | - | 2.99 | 2.99 | 33.86 | 6.51 | 37.38 |
| 22 | 2032 | - | - | - | 2.99 | 2.99 | 33.86 | 6.82 | 37.69 |
| 23 | 2033 | - | - | - | 2.99 | 2.99 | 33.86 | 7.13 | 38.00 |
| 24 | 2034 | - | - | - | 2.99 | 2.99 | 33.86 | 7.44 | 38.31 |
| 25 | 2035 | - | - | - | 2.99 | 2.99 | 33.86 | 7.75 | 38.62 |
| 26 | 2036 | - | - | - | 2.99 | 2.99 | 33.86 | 8.06 | 38.93 |
| 27 | 2037 | - | - | - | 2.99 | 2.99 | 33.86 | 8.37 | 39.24 |
| 28 | 2038 | - | - | - | 2.99 | 2.99 | 33.86 | 8.68 | 39.55 |
| 29 | 2039 | - | - | - | 2.99 | 2.99 | 33.86 | 8.99 | 39.86 |
| 30 | 2040 | - | - | - | 2.99 | 2.99 | 33.86 | 9.30 | 40.17 |
| 31 | 2041 | - | - | - | 2.99 | 2.99 | 33.86 | 9.61 | 40.48 |
| 32 | 2042 | - | - | - | 2.99 | 2.99 | 33.86 | 9.92 | 40.79 |
| 33 | 2043 | - | - | - | 2.99 | 2.99 | 33.86 | 10.23 | 41.10 |
| 34 | 2044 | - | - | - | 2.99 | 2.99 | 33.86 | 10.54 | 41.41 |
| 35 | 2045 | - | - | - | 2.99 | 2.99 | 33.86 | 10.85 | 41.72 |
| 36 | 2046 | - | - | - | 2.99 | 2.99 | 33.86 | 11.16 | 42.03 |
| 37 | 2047 | - | - | - | 2.99 | 2.99 | 33.86 | 11.47 | 42.34 |
| 38 | 2048 | - | - | - | 2.99 | 2.99 | 33.86 | 11.78 | 42.65 |
| 39 | 2049 | - | - | - | 2.99 | 2.99 | 33.86 | 12.09 | 42.96 |
| 40 | 2050 | - | - | - | 2.99 | 2.99 | 33.86 | 12.40 | 43.27 |
| 41 | 2051 | - | - | - | 2.99 | 2.99 | 33.86 | 12.71 | 43.58 |
| 42 | 2052 | - | - | - | 2.99 | 2.99 | 33.86 | 13.02 | 43.89 |
| 43 | 2053 | - | - | - | 2.99 | 2.99 | 33.86 | 13.33 | 44.20 |
| 44 | 2054 | - | - | - | 2.99 | 2.99 | 33.86 | 13.64 | 44.51 |
| 45 | 2055 | - | - | - | 2.99 | 2.99 | 33.86 | 13.95 | 44.82 |
| 46 | 2056 | - | - | - | 2.99 | 2.99 | 33.86 | 14.26 | 45.13 |
| 47 | 2057 | - | - | - | 2.99 | 2.99 | 33.86 | 14.57 | 45.44 |
| 48 | 2058 | - | - | - | 2.99 | 2.99 | 33.86 | 14.88 | 45.75 |
| 49 | 2059 | - | - | - | 2.99 | 2.99 | 33.86 | 15.19 | 46.06 |
| 50 | 2060 | - | - | - | 2.99 | 2.99 | 33.86 | 15.50 | 46.37 |

Table 0104 - Solsona Area

Basic Case

| | | | | | | |
|---------------------------------|---------------------------------|-----------------------|---------|-------------------|-----------|-----|
| Name of IS: 0104 - Solsona Area | | Region: 1 | | MORIO Locos Norte | | |
| EIRR : 29.8% | Net Present Value (Million PHP) | (15 % discount rate) | Benefit | Cost | B/C Ratio | NPV |
| | | | 140 | 73 | 1.92 | 67 |

| Year in Order | Year | Economic Cost (M. PHP) | | | Economic Benefit (M. PHP) | | Economic Benefit without 1.5% (M. PHP) | | Net Cash Flow (M. PHP) |
|---------------|------|------------------------|---------------------------|----------------------|---------------------------|-------|--|-------|------------------------|
| | | Civil Works | Institutional Development | Engineering Services | Annual O & M | Total | Benefit | Cost | |
| | | | | | | | | | |
| 1 | 2011 | - | - | 0.56 | - | 0.56 | 0.31 | 0.31 | -0.25 |
| 2 | 2012 | - | - | 0.56 | - | 0.56 | 0.62 | 0.62 | 0.06 |
| 3 | 2013 | 31.21 | 0.64 | 0.56 | - | 32.41 | 0.93 | 0.93 | -31.48 |
| 4 | 2014 | 41.61 | 0.86 | 0.56 | 0.82 | 43.85 | 8.13 | 1.24 | 9.37 |
| 5 | 2015 | 31.21 | 0.64 | 0.56 | 1.90 | 34.32 | 19.98 | 1.55 | 21.53 |
| 6 | 2016 | - | - | - | 2.72 | 2.72 | 30.47 | 1.86 | 32.33 |
| 7 | 2017 | - | - | - | 2.72 | 2.72 | 32.84 | 2.17 | 35.01 |
| 8 | 2018 | - | - | - | 2.72 | 2.72 | 33.86 | 2.48 | 36.34 |
| 9 | 2019 | - | - | - | 2.72 | 2.72 | 33.86 | 2.79 | 36.65 |
| 10 | 2020 | - | - | - | 2.72 | 2.72 | 33.86 | 3.10 | 36.96 |
| 11 | 2021 | - | - | - | 2.72 | 2.72 | 33.86 | 3.41 | 37.27 |
| 12 | 2022 | - | - | - | 2.72 | 2.72 | 33.86 | 3.72 | 37.58 |
| 13 | 2023 | - | - | - | 2.72 | 2.72 | 33.86 | 4.03 | 37.89 |
| 14 | 2024 | - | - | - | 2.72 | 2.72 | 33.86 | 4.34 | 38.20 |
| 15 | 2025 | - | - | - | 2.72 | 2.72 | 33.86 | 4.65 | 38.51 |
| 16 | 2026 | - | - | - | 2.72 | 2.72 | 33.86 | 4.96 | 38.82 |
| 17 | 2027 | - | - | - | 2.72 | 2.72 | 33.86 | 5.27 | 39.13 |
| 18 | 2028 | - | - | - | 2.72 | 2.72 | 33.86 | 5.58 | 39.44 |
| 19 | 2029 | - | - | - | 2.72 | 2.72 | 33.86 | 5.89 | 39.75 |
| 20 | 2030 | - | - | - | 2.72 | 2.72 | 33.86 | 6.20 | 40.06 |
| 21 | 2031 | - | - | - | 2.72 | 2.72 | 33.86 | 6.51 | 40.37 |
| 22 | 2032 | - | - | - | 2.72 | 2.72 | 33.86 | 6.82 | 40.68 |
| 23 | 2033 | - | - | - | 2.72 | 2.72 | 33.86 | 7.13 | 40.99 |
| 24 | 2034 | - | - | - | 2.72 | 2.72 | 33.86 | 7.44 | 41.30 |
| 25 | 2035 | - | - | - | 2.72 | 2.72 | 33.86 | 7.75 | 41.61 |
| 26 | 2036 | - | - | - | 2.72 | 2.72 | 33.86 | 8.06 | 41.92 |
| 27 | 2037 | - | - | - | 2.72 | 2.72 | 33.86 | 8.37 | 42.23 |
| 28 | 2038 | - | - | - | 2.72 | 2.72 | 33.86 | 8.68 | 42.54 |
| 29 | 2039 | - | - | - | 2.72 | 2.72 | 33.86 | 8.99 | 42.85 |
| 30 | 2040 | - | - | - | 2.72 | 2.72 | 33.86 | 9.30 | 43.16 |
| 31 | 2041 | - | - | - | 2.72 | 2.72 | 33.86 | 9.61 | 43.47 |
| 32 | 2042 | - | - | - | 2.72 | 2.72 | 33.86 | 9.92 | 43.78 |
| 33 | 2043 | - | - | - | 2.72 | 2.72 | 33.86 | 10.23 | 44.09 |
| 34 | 2044 | - | - | - | 2.72 | 2.72 | 33.86 | 10.54 | 44.40 |
| 35 | 2045 | - | - | - | 2.72 | 2.72 | 33.86 | 10.85 | 44.71 |
| 36 | 2046 | - | - | - | 2.72 | 2.72 | 33.86 | 11.16 | 45.02 |
| 37 | 2047 | - | - | - | 2.72 | 2.72 | 33.86 | 11.47 | 45.33 |
| 38 | 2048 | - | - | - | 2.72 | 2.72 | 33.86 | 11.78 | 45.64 |
| 39 | 2049 | - | - | - | 2.72 | 2.72 | 33.86 | 12.09 | 45.95 |
| 40 | 2050 | - | - | - | 2.72 | 2.72 | 33.86 | 12.40 | 46.26 |
| 41 | 2051 | - | - | - | 2.72 | 2.72 | 33.86 | 12.71 | 46.57 |
| 42 | 2052 | - | - | - | 2.72 | 2.72 | 33.86 | 13.02 | 46.88 |
| 43 | 2053 | - | - | - | 2.72 | 2.72 | 33.86 | 13.33 | 47.19 |
| 44 | 2054 | - | - | - | 2.72 | 2.72 | 33.86 | 13.64 | 47.50 |
| 45 | 2055 | - | - | - | 2.72 | 2.72 | 33.86 | 13.95 | 47.81 |
| 46 | 2056 | - | - | - | 2.72 | 2.72 | 33.86 | 14.26 | 48.12 |
| 47 | 2057 | - | - | - | 2.72 | 2.72 | 33.86 | 14.57 | 48.43 |
| 48 | 2058 | - | - | - | 2.72 | 2.72 | 33.86 | 14.88 | 48.74 |
| 49 | 2059 | - | - | - | 2.72 | 2.72 | 33.86 | 15.19 | 49.05 |
| 50 | 2060 | - | - | - | 2.72 | 2.72 | 33.86 | 15.50 | 49.36 |

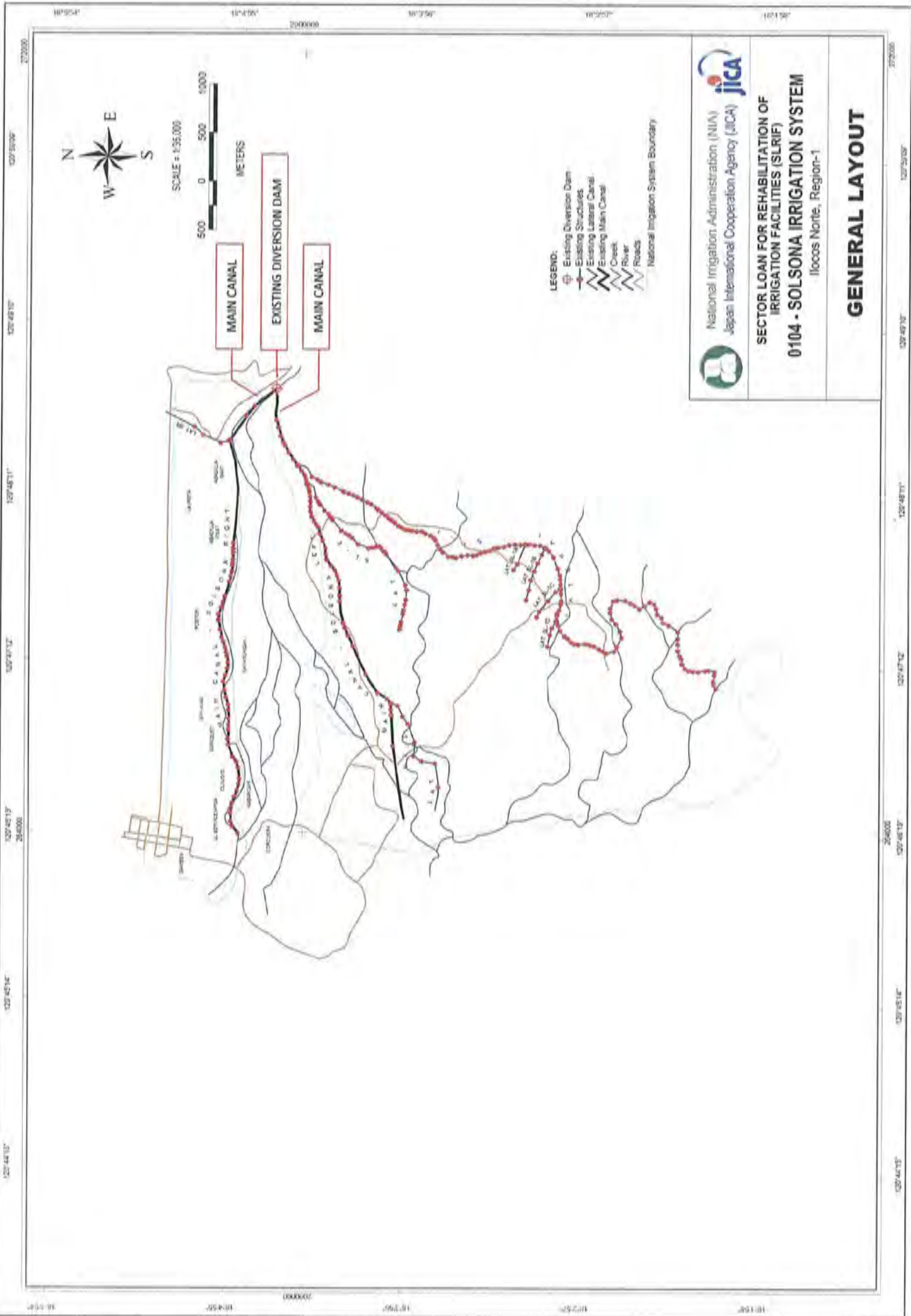


- LEGEND:**
- Existing Diversion Dam
 - Existing Structures
 - Existing Lateral Canal
 - Existing Main Canal
 - Creek
 - River
 - Roads
 - National Irrigation System Boundary



SECTOR LOAN FOR REHABILITATION OF IRRIGATION FACILITIES (SLRIF)
0104 - SOLSONA IRRIGATION SYSTEM
 Ilocos Norte, Region-1




GENERAL LAYOUT



JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities

Photographs of Irrigation Facilities




NIS name: Solsona (Region 1)

| Location / Facility | Photograph | Comments |
|--|--|---|
| SOLSONA DAM 18°05'11"N 120°48'48"E |  | Totally broken sluiceway and damaged left retaining wall & scoured revetment endangering exposed left conduit and dam structure due to scouring caused by heavy quarrying of sand and gravel downstream |
| SOLSONA DAM 18°05'11"N 120°48'48"E |  | Damaged and scoured downstream concrete apron for spillway, sluiceway, and loose stone protection due to flush flood caused by typhoon. Need to investigate the design based on new hydrologic data prior to rehabilitation and improvement of the design |
| SOLSONA DAM 18°05'11"N 120°48'48"E |  | Damaged and silted right side upstream side of the dam. Need to construct skimmer wall or silt excluder/extractor. |

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities

Photographs of Irrigation Facilities




NIS name: Solsona (Region 1)

| Location / Facility | Photograph | Comments |
|--|--|--|
| SOLSONA DAM 18°05'11"N 120°48'48"E |  | Damaged intake gates and mechanisms due to wear and tear. These needs repair and improvement. |
| SOLSONA DAM 18°05'11"N 120°48'48"E |  | Deteriorating sluiceway gates & lifting mechanisms needing replacement into motor driven mechanisms. Appurtenant structures and miscellaneous metal works needs restorations to its original forms. |
| SOLSONA DAM 18°05'11"N 120°48'48"E |  | Intake gates and mechanisms needs replacements/repair of miscellaneous metal works to change from manual to mechanized operation of gates |

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities

Photographs of Irrigation Facilities




NIS name: Solsona (Region 1)

| Location / Facility | Photograph | Comments |
|--|--|--|
| SOLSONA DAM 18°05'11"N 120°48'48"E |  | Heavily silted upstream of Ogee Dam. Heavily abraded concrete wearing surface of the spillway and sluice. Need to replace wearing surface with abrasion resistant high strength concrete or materials |
| SOLSONA DAM 18°05'11"N 120°48'48"E |  | Heavily silted emergency left intakes. Need to construct silt excluder/ejector or skimmer wall. |
| MAIN CANAL |  | Not operational siphon due to heavy silt. Need silt removal |

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities

Photographs of Irrigation Facilities

NIS name: Solsona (Region 1)

| Location / Facility | Photograph | Comments |
|-------------------------------|--|--|
| RIGHT SUPPLEMENTAL MAIN CANAL |  | Silted canal about ¾ depths filled with sand and gravel. As measured, only 40cm depth of water flowing the canal. |
| LATERAL CANAL |  | Silted canal about ¾ depths filled with sand and gravel, only 30cm depth flowing the canal Shown also uncontrolled irrigation water flowing through the turnout without steel gate. |
| MAIN FARM DITCH |  | Silted main farm ditch or canal filled with sand and gravel. About 15cm depth flowing water in shallow canal |

**THE REPUBLIC OF PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION**

**Sector Loan on
Rehabilitation of Irrigation Facilities**

NIS SUMMARY REPORT

0105
Labugaon Area RIS
Region 1
Ilocos Norte 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**

| <i>Item</i> | <i>Description</i> | |
|---|--|---|
| 1) Name of NIS | Labugaon Area RIS Code: 0105 | |
| 2) Location | Region | Region 1 |
| | Province | Ilocos Norte |
| | Municipality | Solsona |
| | Distance | 33 km from Laoag City |
| 3) Type of Water Source | Water Source | Labugaon River |
| | Type | Diversion Dam (45 m wide, 3.5 m high) |
| 4) Area | Service Area | 1,961 ha |
| | FUSA | 1,470 ha |
| 5) Beneficiary Farmers | 1,399 farmers | Average paddy field cultivating size = 1.05 ha per farmer |
| 6) Irrigator's Association | IAs established = 14 FIA established = 1 in 2008 | |
| 7) Features of NIS and Necessity of the project | <p>Labugaon RIS has a run off the river concrete dam with one main canal. The area is mainly served by this system except the downstream portion where there are other sources of water being tapped by the farmers. The FIA is active and even desires to undertake full O&M responsibility (IMT), thus the necessity of the project.</p> <p>The rehabilitation works is necessary to restore the full functionality and stability of the dam and canal structures and to improve the efficiency of water delivery in the canals and efficiency of water distribution to the farms.</p> | |
| 8) Outline of the Proposed Project | <p>A. Engineering</p> <ol style="list-style-type: none"> 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 <p>B. Institutional Strengthening Program</p> <p>B.1 Basic Program</p> <ol style="list-style-type: none"> 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 <p>B.2 Specific Program to strengthen institutional mechanism together with LGUs</p> <ol style="list-style-type: none"> 1. Monitoring and control of illegal mechanical quarrying 2. Improvement of watershed management | |
| 9) Proposed Project Component | <p>A. Engineering</p> <ol style="list-style-type: none"> 1. Construction of civil works for rehabilitation of diversion works, canal system, drainage system, roads, and support facilities. | |

| | | | | |
|---|--|-----|-----------------------------|---------------|
| | B. Institutional Strengthening Program | | | |
| | <ol style="list-style-type: none"> 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 | 78.37 Million |
| | - Civil Works | PHP | 69.50 Million | |
| | - Institutional Development | PHP | 7.30 Million | |
| | - Engineering Services | PHP | 1.57 Million | |
| | 2. Indirect cost | | PHP | 7.01 Million |
| | Total Project Cost (1+2) | | PHP 85.38 Million | |
| | Cost per ha | | PHP 58,082.00 per ha | |
| 11) Project Benefit | <ol style="list-style-type: none"> 1. To increase paddy production by 2,964 tons/year 2. To increase farmers' net income to PHP 56,800.00/ha/year 3. To establish functional and self-reliant IAs 4. To improve performance of NIS | | | |
| 12) Project Justification | EIRR = 29.8 %, B/C = 1.86 (discount rate 15%) | | | |

2. Project History (Construction/Rehabilitation)

| Year | Description |
|--------------|---|
| 1983-1986 | Construction of dam, irrigation canals and other appurtenant structures |
| 1992-1994 | Construction of urgent disaster prevention works, i.e. levee, dikes, minor repair/rehab |
| 1995-Present | Continuing minor repair/rehab works to the irrigation canals and facilities |

3. Present Condition

3.1 Natural Conditions

| Item | Description |
|------------------------------|---|
| 1) Annual Rainfall | 2,070 mm |
| 2) Seasons | Wet season: May to October Dry season: November to April |
| 3) Dominant Soil in NIS Area | Sandy loam |
| 4) Topography | Flat plain |

3.2 Socio-economy (Region/Province)

| Item | Description |
|---------------------------|--|
| 1) GRDP | PHP 185,566 million (Year 2007), Per Capita GRDP = PHP 38,063 per year |
| 2) Population | 547,284 (province) |
| 3) Population Growth Rate | 0.86 % per year (province) |
| 4) Labor Force | 3,183,000 (region) |
| 5) Poverty Population | 21.2 % to total population (province) |

3.3 Present Agriculture in NIS

| Item | Description | | | | | |
|--------------------------------------|---|-------------------------|--------|---------------------|-------|---------|
| 1) Farm Household in NIS | Total beneficiaries | 1,318 households | | | | |
| | Land owners | 433 households (32.8 %) | | | | |
| | Tenant farmers | 885 households (67.2 %) | | | | |
| 2) Paddy Field Size in NIS | 1.12 ha per household (FUSA/Total beneficiaries as of 2008) | | | | | |
| 3) Present Land Use in NIS | Paddy field planted | 729 ha | 37.2 % | As of 2008 | | |
| | Paddy field not planted | 741 ha | 37.8 % | 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 | 491 ha | 25.0 % | No data in response | | |
| 4) Paddy Field in FUSA (ha) | 1,470 | | | | | |
| 5) Paddy Cropped Area (ha) | 2004 | 2005 | 2006 | 2007 | 2008 | Average |
| Wet Season | 362 | 347 | 735 | 689 | 729 | 572 |
| Dry Season | 935 | 153 | 490 | 480 | 500 | 512 |
| 6) Cropping Intensity (%) (per year) | 2004 | 2005 | 2006 | 2007 | 2008 | Average |
| | 88 | 34 | 83 | 80 | 84 | 74 |
| 7) Unit Yield of Paddy (ton/ha) | 2004 | 2005 | 2006 | 2007 | 2008 | Average |
| Wet Season | 3.90 | 4.20 | 4.30 | 4.30 | 4.00 | 4.16 |
| Dry Season | 4.10 | 4.30 | 4.40 | 4.40 | 4.40 | 4.28 |
| 8) Paddy Production (ton) | 2004 | 2005 | 2006 | 2007 | 2008 | Average |
| Wet Season | 1,412 | 1,457 | 3,161 | 2,963 | 2,916 | 2,382 |
| Dry Season | 3,894 | 658 | 2,156 | 2,112 | 2,200 | 2,192 |

3.4 Water Resources

| Item | Description |
|------------------------------|------------------------|
| 1) Name of Rivers | Labugaon River |
| 2) Catchment Area at Dam | 100.50 km ² |
| 3) Ave. River Discharge | 7.19 m ³ /s |
| 4) Ave. Dry Season Discharge | 5.65 m ³ /s |
| 5) Diverted Intake Discharge | 2.00 m ³ /s |
| 6) Water Requirement | 2.65 m ³ /s |
| 7) Sedimentation | High |

3.5 Existing Irrigation System

| Item | Description |
|------------------------|--|
| 1) Diversion Dam | Overflow crest width <u>45</u> m, Dam height <u>3.5</u> m |
| 2) Main Canal | Total length <u>19.671</u> km (Lined portion <u>17.895</u> km) |
| 3) Lateral Canals | Total length <u>11.579</u> km (Lined portion <u>3.30</u> km) |
| 4) On-farm facilities | Total length <u>49.00</u> km (Lined portion <u>0.00</u> km) Turn-outs = <u>93</u> units; |
| 5) Drainage Canal | Total length <u>30.00</u> kms. |
| 6) Canal Structures | No. = <u>162</u> units |
| 7) Drainage Structures | No. = <u>51</u> units |
| 8) Farm roads | Total length <u>10.880</u> km (pavement= _____ kms.) |

3.6 Institutions for O&M of NIS

| <i>Item</i> | <i>Description</i> | | | | | |
|--|------------------------------|------|-------|------|------|---------|
| 1) Regional Irrigation Office | Name: Region 1-Ilocos Region | | | | | |
| 2) IMO | Name: Ilocos Norte IMO | | | | | |
| Staff in 2009 | Total number of staff: 60 | | | | | |
| 3) Irrigator' Association (IA) | 2004 | 2005 | 2006 | 2007 | 2008 | Average |
| Number of FIA (nos) | | | | | 1 | |
| Number of IA (nos) | | | | | 14 | |
| Number of TSAG (nos) | 56 | 39 | 39 | 40 | 41 | 43 |
| Functionality of IA | 72.0 | 69.5 | 147.5 | 81.9 | 77.1 | 89.6 |
| Collection of ISF,% (wet) | 0 | 0 | 0 | 0 | 0 | 0 |
| Collection of ISF,% (dry) | 57 | 60 | 88 | 82 | 77 | 73 |
| 4) NIS Category based on IA 2008 O&M Contract (NIA-IA) | No. of IA | | | | | |
| Category A | 6 | | | | | |
| Category B | 0 | | | | | |
| Category C | 8 | | | | | |

3.7 Existing Problems

| <i>Item</i> | <i>Description</i> |
|---|---|
| 1) Diversion Works | <ol style="list-style-type: none"> 1. Dam body undermined and scoured endangering whole structure (with bridge) 2. Heavily damaged/scoured dam downstream apron and major bed, also ret. walls 3. Heavy siltation upstream of dam 4. Deteriorated sluiceway and intake gates, and misc. metal works 5. Modification/replacement of motor, & intake gates from manual to motorized operation with housing |
| 2) Canal and Structures | <ol style="list-style-type: none"> 1. Heavy damages of canals from siltation and erosions especially during inclement weather conditions 2. Damages to existing canal structures and appurtenant parts 3. Construction of new structures to suit actual field conditions. |
| 3) Drainage Canal | <ol style="list-style-type: none"> 1. Damages to existing drainage canals 2. Damages to existing structures 3. Siltation to the canals 4. Other related works to the proper functioning of canals |
| 4) Other Project Facilities (road, bridge, flood dike, building, etc) | <ol style="list-style-type: none"> 1. The link roads needs maintenance and concrete pavement preferable 2. Damages to road structures and appurtenant structures 3. Repair/rehab of existing field office/quarter |
| 5) Water Management and O&M Activities | <ol style="list-style-type: none"> 1. Continuing water management education to concerned parties 2. Planning, implementation, revisions of O&M activities, i.e. water delivery and schedule, etc |
| 6) Status of NIS and IA Management | <p>Status Type D evaluated by Radar Graph. Specific problems are:</p> <ol style="list-style-type: none"> 1. Low ISF collection efficiency during wet and dry seasons at 0 and 73%, respectively 2. Low cropping intensity during wet and dry seasons at 57% 3. Medium ratio of tenancy at 56% 4. Medium paddy yield during wet and dry seasons at 75 cavans/ha 5. Low membership ratio at 40% |
| 7) Watershed Management | <ol style="list-style-type: none"> 1. Coordination to DENR and other concerned entities to address this effort 2. Watershed is significantly denuded. |
| 8) Coordination with LGU and Agencies concerned | <ol style="list-style-type: none"> 1. Minimum coordination by NIA's field offices and IAs with concerned LGUs and other line agencies on the specific problems such as monitoring and control of illegal mechanical quarrying and watershed management |

| <i>Item</i> | <i>Description</i> |
|----------------|--|
| 9) Agriculture | <ol style="list-style-type: none"> 1. Continuing cooperative efforts by DA/MA/PA of increased rice production 2. Sharing of relative agro-statistical data of concerned entities 3. Installation/sharing of agro-meteorological equipments 4. High prices of agricultural inputs. The farmers cannot afford to buy the required amount of agricultural inputs due to financial difficulties. 5. Poor condition of the farm to market roads 6. Lack of post harvest facilities particularly drying. |
| 10) Others | <ol style="list-style-type: none"> 1. Sharing of available logistics |

4. Proposed Rehabilitation Plan

4.1 Agricultural Development Plan

| <i>Item</i> | <i>Description</i> | | | |
|-------------------------------|--------------------|---------------------|---------------------|---------------|
| Cropping schedule | <i>Wet Season</i> | <i>Dry Season-1</i> | <i>Dry Season-2</i> | <i>Annual</i> |
| 1) Type of Crops | Paddy | Paddy | Corn | - |
| 2) Cropping Area (ha) | 1,470 | 500 | 200 | - |
| 3) Target Unit Yield (ton/ha) | 4.00 | 4.40 | 6 | - |
| 3) Total Production (ton) | 5,880 | 2,200 | 1200 | 7,080 |

4.2 Civil Works

| <i>Item</i> | <i>Description</i> |
|---------------------------|--|
| 1) Diversion Works | <ol style="list-style-type: none"> 1. Embankment protection works -1 unit 2. River channelization/training works |
| 2) Canal Structures | <ol style="list-style-type: none"> 1. Repair of damaged structures – 37 units 2. Repair/replacement of dilapidated steel gates. 3. Installation of new structure steel gates |
| 3) Canalization | <ol style="list-style-type: none"> 1. Concrete lining of selected canal sections – 10 kms 2. De-silting of selected canal sections. 3. Realignment of canal 4. Construction of new canal |
| 4) Drainage Structures | <ol style="list-style-type: none"> 1. Repair of drainage structures - 26 units 2. Construction of additional structures |
| 5) Drainage Canalization | <ol style="list-style-type: none"> 1. De-silting of existing drainage canals – 3 kms 2. Construction of additional drainage canals |
| 6) Service Roads | <ol style="list-style-type: none"> 1. Re-graveling of selected road sections -6.19 kms 2. Construction of side drains 3. Construction of drainage structures in strategic road locations. |
| 7) On-Farm Facilities | <ol style="list-style-type: none"> 1. Repair /replacement of dilapidated turn out steel gates 2. Construction of new turn outs and farm ditches |
| 8) IMT Support Facilities | <ol style="list-style-type: none"> 1. Construction of post-harvest facilities—warehouses, IA buildings, solar driers with shed – 3 sets |
| 9) IMT GIS Database | <ol style="list-style-type: none"> 1. Development and establishment of GIS database |

4.3 Institutional Strengthening Program

| <i>Item</i> | <i>Description</i> |
|--|---|
| 1) Reactivation Program of FIAs/IAs and System Management Committee (ISMC) | <ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> 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 |

| <i>Item</i> | <i>Description</i> |
|--|---|
| | 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. Request LGUs legal actions on protection of illegal mechanical quarrying prior to the commencement of the SLRIF through the coordination activities 3. Strengthening coordination with RDC, RAFC/PAFC and LGUs on training program of watershed management 4. Strengthening coordination on establishment of monitoring and control mechanism of illegal quarrying |

4.4 Proposed Counter Schemes

| <i>Item</i> | <i>Description</i> |
|-------------|--|
| 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 mechanical quarrying. |
| 2) LGU | 1. LGU initiates training and upgrade technical skills of its engineers by inviting resource persons from the key line departments and/or national agencies (e.g. NIA, DPWH.) 2. LGUs take actions on information awareness on the Project implementation through local communication media. 3. LGU establishes a coordinating/steering committee at the provincial level to improve coordination and representation of NIA in local planning and budgeting. |

5. Cost Estimate for Initial Investment

| <i>Item</i> | <i>Description</i> | |
|--------------------------------|---|--------------------|
| 1) Direct Cost for Civil Works | A. Mobilization | Php 1.57 Million |
| | B. Protection Dikes | Php 0.56 Million |
| | C. Diversion Works | Php 16.18 Million |
| | D. Canal Structures | Php 15.97 Million |
| | E. Canalization | Php 9.22 Million |
| | F. Drainage Structures | Php 2.94 Million |
| | G. Drainage Canalization | Php 4.41 Million |
| | H. Roads | Php 1.20 Million |
| | I. On-Farm Facilities/T.O. Gates | Php 0.99 Million |
| | J. IMT Support Facilities | Php 15.00 Million |
| | K. IMT GIS Database | Php 1.47 Million |
| | L. Institutional Development (5% of Direct Cost) | Php 7.30 Million |
| | M. Feasibility Studies & Detailed Engineering (2% of Direct Cost) | Php 1.57 Million |
| | Sub-total (Direct Cost) | |
| 2) Indirect Cost | A. General Engineering Supervision and Administration (3.5% of Direct Cost) | Php 2.74 Million |
| | B. NIA Management Fee (5% of Total Project Cost) | Php 4.27 Million |
| | Sub-total (Indirect Cost) | |
| 3) Total Project Cost | = 1+2 | Php 85.38 Million |
| Cost per ha. | | Php 58,082.00 /ha. |

6. Implementation Plan

| <i>Item</i> | <i>Description</i> |
|--|-------------------------------------|
| 1) Contract package | 1 - Local Competitive Bidding (LCB) |
| 2) Implementation Schedule | |
| a) Civil Works | |
| 1) Survey, F/S, Design | 19 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

| <i>Item</i> | <i>Description</i> |
|-------------------------|--|
| 1) Economic evaluation | |
| EIRR (Base) | EIRR = 29.8 % : Project life 50 years |
| Sensitivity Case-1 | EIRR = 26.8% : Cost 10% up |
| Case-2 | EIRR = 26.5 % : Benefit 10% down |
| Case-3 | EIRR = 23.9 % : Cost 10% up + Benefit 10% down |
| B/C | 1.86 : discount rate 15% p.a. |
| NPV | PHP 46 million : discount rate 15% p.a. |
| 2) Financial evaluation | Farmer's net income increase = PHP 20,724 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

| <i>Item</i> | <i>Description</i> |
|-------------------------|---|
| 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 |

Economic Evaluation (EIRR)

Case-1 (Cost 10% up)

| Name of NS (0105 - Labugaon Area) | | Region | | MO (RIO) Ilocos Norte | | | | |
|--|------|------------------------|---------------------------|-----------------------|-------|---------------------------|---------|------------------------|
| EIRR : 26.8% Net Present Value (Million PHP) | | (15 % discount rate) | | Benefit | Cost | B/C Ratio | NPV | |
| | | | | 99 | 58 | 1.69 | 40 | |
| (Unit : Php/Million) | | | | | | | | |
| Year in Order | Year | Economic Cost (M. PHP) | | | Total | Economic Benefit (M. PHP) | | Net Cash Flow (M. PHP) |
| | | Civil Works | Institutional Development | Engineering Services | | Annual O & M | Benefit | |
| 1 | 2011 | - | - | 0.39 | 0.39 | - | 0.51 | 0.12 |
| 2 | 2012 | - | - | 0.39 | - | - | 1.02 | 0.63 |
| 3 | 2013 | 21.90 | 1.30 | 0.39 | - | - | 1.53 | -22.06 |
| 4 | 2014 | 29.20 | 1.73 | 0.39 | 0.98 | 4.73 | 2.04 | -25.54 |
| 5 | 2015 | 21.90 | 1.30 | 0.39 | 2.29 | 11.63 | 2.55 | 14.18 |
| 6 | 2016 | - | - | - | 3.28 | 17.75 | 3.06 | 17.53 |
| 7 | 2017 | - | - | - | 3.28 | 19.13 | 3.57 | 19.42 |
| 8 | 2018 | - | - | - | 3.28 | 19.72 | 4.08 | 20.52 |
| 9 | 2019 | - | - | - | 3.28 | 19.72 | 4.59 | 21.03 |
| 10 | 2020 | - | - | - | 3.28 | 19.72 | 5.10 | 21.54 |
| 11 | 2021 | - | - | - | 3.28 | 19.72 | 5.61 | 22.05 |
| 12 | 2022 | - | - | - | 3.28 | 19.72 | 6.12 | 22.56 |
| 13 | 2023 | - | - | - | 3.28 | 19.72 | 6.63 | 23.07 |
| 14 | 2024 | - | - | - | 3.28 | 19.72 | 7.14 | 23.58 |
| 15 | 2025 | - | - | - | 3.28 | 19.72 | 7.65 | 24.09 |
| 16 | 2026 | - | - | - | 3.28 | 19.72 | 8.16 | 24.60 |
| 17 | 2027 | - | - | - | 3.28 | 19.72 | 8.67 | 25.11 |
| 18 | 2028 | - | - | - | 3.28 | 19.72 | 9.18 | 25.62 |
| 19 | 2029 | - | - | - | 3.28 | 19.72 | 9.69 | 26.13 |
| 20 | 2030 | - | - | - | 3.28 | 19.72 | 10.20 | 26.64 |
| 21 | 2031 | - | - | - | 3.28 | 19.72 | 10.71 | 27.15 |
| 22 | 2032 | - | - | - | 3.28 | 19.72 | 11.22 | 27.66 |
| 23 | 2033 | - | - | - | 3.28 | 19.72 | 11.73 | 28.17 |
| 24 | 2034 | - | - | - | 3.28 | 19.72 | 12.24 | 28.68 |
| 25 | 2035 | - | - | - | 3.28 | 19.72 | 12.75 | 29.19 |
| 26 | 2036 | - | - | - | 3.28 | 19.72 | 13.26 | 29.70 |
| 27 | 2037 | - | - | - | 3.28 | 19.72 | 13.77 | 30.21 |
| 28 | 2038 | - | - | - | 3.28 | 19.72 | 14.28 | 30.72 |
| 29 | 2039 | - | - | - | 3.28 | 19.72 | 14.79 | 31.23 |
| 30 | 2040 | - | - | - | 3.28 | 19.72 | 15.30 | 31.74 |
| 31 | 2041 | - | - | - | 3.28 | 19.72 | 15.81 | 32.25 |
| 32 | 2042 | - | - | - | 3.28 | 19.72 | 16.32 | 32.76 |
| 33 | 2043 | - | - | - | 3.28 | 19.72 | 16.83 | 33.27 |
| 34 | 2044 | - | - | - | 3.28 | 19.72 | 17.34 | 33.78 |
| 35 | 2045 | - | - | - | 3.28 | 19.72 | 17.85 | 34.29 |
| 36 | 2046 | - | - | - | 3.28 | 19.72 | 18.36 | 34.80 |
| 37 | 2047 | - | - | - | 3.28 | 19.72 | 18.87 | 35.31 |
| 38 | 2048 | - | - | - | 3.28 | 19.72 | 19.38 | 35.82 |
| 39 | 2049 | - | - | - | 3.28 | 19.72 | 19.89 | 36.33 |
| 40 | 2050 | - | - | - | 3.28 | 19.72 | 20.40 | 36.84 |
| 41 | 2051 | - | - | - | 3.28 | 19.72 | 20.91 | 37.35 |
| 42 | 2052 | - | - | - | 3.28 | 19.72 | 21.42 | 37.86 |
| 43 | 2053 | - | - | - | 3.28 | 19.72 | 21.93 | 38.37 |
| 44 | 2054 | - | - | - | 3.28 | 19.72 | 22.44 | 38.88 |
| 45 | 2055 | - | - | - | 3.28 | 19.72 | 22.95 | 39.39 |
| 46 | 2056 | - | - | - | 3.28 | 19.72 | 23.46 | 39.90 |
| 47 | 2057 | - | - | - | 3.28 | 19.72 | 23.97 | 40.41 |
| 48 | 2058 | - | - | - | 3.28 | 19.72 | 24.48 | 40.92 |
| 49 | 2059 | - | - | - | 3.28 | 19.72 | 24.99 | 41.43 |
| 50 | 2060 | - | - | - | 3.28 | 19.72 | 25.50 | 41.94 |

Table 0105 - Labugaon Area

Basic Case

| Name of NS (0105 - Labugaon Area) | | Region | | MO (RIO) Ilocos Norte | | | | |
|--|------|------------------------|---------------------------|-----------------------|-------|---------------------------|---------|------------------------|
| EIRR : 29.8% Net Present Value (Million PHP) | | (15 % discount rate) | | Benefit | Cost | B/C Ratio | NPV | |
| | | | | 99 | 53 | 1.86 | 46 | |
| (Unit : Php/Million) | | | | | | | | |
| Year in Order | Year | Economic Cost (M. PHP) | | | Total | Economic Benefit (M. PHP) | | Net Cash Flow (M. PHP) |
| | | Civil Works | Institutional Development | Engineering Services | | Annual O & M | Benefit | |
| 1 | 2011 | - | - | 0.36 | 0.36 | 0.51 | 0.51 | 0.15 |
| 2 | 2012 | - | - | 0.36 | - | 1.02 | 1.02 | 0.66 |
| 3 | 2013 | 19.91 | 1.18 | 0.36 | - | 1.53 | 1.53 | -19.92 |
| 4 | 2014 | 26.54 | 1.58 | 0.36 | 0.89 | 29.37 | 2.04 | -2.60 |
| 5 | 2015 | 19.91 | 1.18 | 0.36 | 2.09 | 23.53 | 2.55 | 14.18 |
| 6 | 2016 | - | - | - | 2.98 | 17.75 | 3.06 | 20.81 |
| 7 | 2017 | - | - | - | 2.98 | 19.13 | 3.57 | 22.70 |
| 8 | 2018 | - | - | - | 2.98 | 19.72 | 4.08 | 23.80 |
| 9 | 2019 | - | - | - | 2.98 | 19.72 | 4.59 | 24.31 |
| 10 | 2020 | - | - | - | 2.98 | 19.72 | 5.10 | 24.82 |
| 11 | 2021 | - | - | - | 2.98 | 19.72 | 5.61 | 25.33 |
| 12 | 2022 | - | - | - | 2.98 | 19.72 | 6.12 | 25.84 |
| 13 | 2023 | - | - | - | 2.98 | 19.72 | 6.63 | 26.35 |
| 14 | 2024 | - | - | - | 2.98 | 19.72 | 7.14 | 26.86 |
| 15 | 2025 | - | - | - | 2.98 | 19.72 | 7.65 | 27.37 |
| 16 | 2026 | - | - | - | 2.98 | 19.72 | 8.16 | 27.88 |
| 17 | 2027 | - | - | - | 2.98 | 19.72 | 8.67 | 28.39 |
| 18 | 2028 | - | - | - | 2.98 | 19.72 | 9.18 | 28.90 |
| 19 | 2029 | - | - | - | 2.98 | 19.72 | 9.69 | 29.41 |
| 20 | 2030 | - | - | - | 2.98 | 19.72 | 10.20 | 29.92 |
| 21 | 2031 | - | - | - | 2.98 | 19.72 | 10.71 | 30.43 |
| 22 | 2032 | - | - | - | 2.98 | 19.72 | 11.22 | 30.94 |
| 23 | 2033 | - | - | - | 2.98 | 19.72 | 11.73 | 31.45 |
| 24 | 2034 | - | - | - | 2.98 | 19.72 | 12.24 | 31.96 |
| 25 | 2035 | - | - | - | 2.98 | 19.72 | 12.75 | 32.47 |
| 26 | 2036 | - | - | - | 2.98 | 19.72 | 13.26 | 32.98 |
| 27 | 2037 | - | - | - | 2.98 | 19.72 | 13.77 | 33.49 |
| 28 | 2038 | - | - | - | 2.98 | 19.72 | 14.28 | 34.00 |
| 29 | 2039 | - | - | - | 2.98 | 19.72 | 14.79 | 34.51 |
| 30 | 2040 | - | - | - | 2.98 | 19.72 | 15.30 | 35.02 |
| 31 | 2041 | - | - | - | 2.98 | 19.72 | 15.81 | 35.53 |
| 32 | 2042 | - | - | - | 2.98 | 19.72 | 16.32 | 36.04 |
| 33 | 2043 | - | - | - | 2.98 | 19.72 | 16.83 | 36.55 |
| 34 | 2044 | - | - | - | 2.98 | 19.72 | 17.34 | 37.06 |
| 35 | 2045 | - | - | - | 2.98 | 19.72 | 17.85 | 37.57 |
| 36 | 2046 | - | - | - | 2.98 | 19.72 | 18.36 | 38.08 |
| 37 | 2047 | - | - | - | 2.98 | 19.72 | 18.87 | 38.59 |
| 38 | 2048 | - | - | - | 2.98 | 19.72 | 19.38 | 39.10 |
| 39 | 2049 | - | - | - | 2.98 | 19.72 | 19.89 | 39.61 |
| 40 | 2050 | - | - | - | 2.98 | 19.72 | 20.40 | 40.12 |
| 41 | 2051 | - | - | - | 2.98 | 19.72 | 20.91 | 40.63 |
| 42 | 2052 | - | - | - | 2.98 | 19.72 | 21.42 | 41.14 |
| 43 | 2053 | - | - | - | 2.98 | 19.72 | 21.93 | 41.65 |
| 44 | 2054 | - | - | - | 2.98 | 19.72 | 22.44 | 42.16 |
| 45 | 2055 | - | - | - | 2.98 | 19.72 | 22.95 | 42.67 |
| 46 | 2056 | - | - | - | 2.98 | 19.72 | 23.46 | 43.18 |
| 47 | 2057 | - | - | - | 2.98 | 19.72 | 23.97 | 43.69 |
| 48 | 2058 | - | - | - | 2.98 | 19.72 | 24.48 | 44.20 |
| 49 | 2059 | - | - | - | 2.98 | 19.72 | 24.99 | 44.71 |
| 50 | 2060 | - | - | - | 2.98 | 19.72 | 25.50 | 45.22 |

Economic Evaluation (EIRR)

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

Name of NS: 0106 - Labugaon Area Region: 1 MO: R I I C o s: Norte

| | | | | | | |
|-------------|---------------------------------|-----------------------|---------|------|-----------|-----|
| ERR : 23.8% | Net Present Value (Million PHP) | (15 % discount rate) | Benefit | Cost | B/C Ratio | NPV |
| | | | 89 | 58 | 1.52 | 30 |

| Year In Order | Year | Economic Cost (M. PHP) | | | | Annual O & M | Economic Benefit (M. PHP) | | Total | Net Cash Flow (M. PHP) |
|---------------|------|------------------------|---------------------------|----------------------|-------------|--------------|---------------------------|-------|--------|------------------------|
| | | Civil Works | Institutional Development | Engineering Services | Development | | without 1.5% | Total | | |
| | | | | | | | | | | |
| 1 | 2011 | - | - | 0.39 | - | - | 0.39 | 0.46 | 0.07 | |
| 2 | 2012 | - | - | 0.39 | - | - | 0.39 | 0.92 | 0.52 | |
| 3 | 2013 | 19.91 | 1.30 | 0.39 | - | - | 23.59 | 1.38 | -22.22 | |
| 4 | 2014 | 26.54 | 1.73 | 0.39 | - | - | 32.31 | 1.84 | -26.21 | |
| 5 | 2015 | 19.91 | 1.30 | 0.39 | - | - | 25.89 | 2.30 | -12.12 | |
| 6 | 2016 | - | - | - | - | - | 3.28 | 2.75 | 15.45 | |
| 7 | 2017 | - | - | - | - | - | 3.28 | 3.21 | 17.15 | |
| 8 | 2018 | - | - | - | - | - | 3.28 | 3.67 | 18.14 | |
| 9 | 2019 | - | - | - | - | - | 3.28 | 4.13 | 18.60 | |
| 10 | 2020 | - | - | - | - | - | 3.28 | 4.59 | 19.06 | |
| 11 | 2021 | - | - | - | - | - | 3.28 | 5.05 | 19.52 | |
| 12 | 2022 | - | - | - | - | - | 3.28 | 5.51 | 19.98 | |
| 13 | 2023 | - | - | - | - | - | 3.28 | 5.97 | 20.44 | |
| 14 | 2024 | - | - | - | - | - | 3.28 | 6.43 | 20.90 | |
| 15 | 2025 | - | - | - | - | - | 3.28 | 6.89 | 21.36 | |
| 16 | 2026 | - | - | - | - | - | 3.28 | 7.34 | 21.81 | |
| 17 | 2027 | - | - | - | - | - | 3.28 | 7.80 | 22.27 | |
| 18 | 2028 | - | - | - | - | - | 3.28 | 8.26 | 22.73 | |
| 19 | 2029 | - | - | - | - | - | 3.28 | 8.72 | 23.19 | |
| 20 | 2030 | - | - | - | - | - | 3.28 | 9.18 | 23.65 | |
| 21 | 2031 | - | - | - | - | - | 3.28 | 9.64 | 24.11 | |
| 22 | 2032 | - | - | - | - | - | 3.28 | 10.10 | 24.57 | |
| 23 | 2033 | - | - | - | - | - | 3.28 | 10.56 | 25.03 | |
| 24 | 2034 | - | - | - | - | - | 3.28 | 11.02 | 25.49 | |
| 25 | 2035 | - | - | - | - | - | 3.28 | 11.48 | 25.95 | |
| 26 | 2036 | - | - | - | - | - | 3.28 | 11.93 | 26.40 | |
| 27 | 2037 | - | - | - | - | - | 3.28 | 12.39 | 26.86 | |
| 28 | 2038 | - | - | - | - | - | 3.28 | 12.85 | 27.32 | |
| 29 | 2039 | - | - | - | - | - | 3.28 | 13.31 | 27.78 | |
| 30 | 2040 | - | - | - | - | - | 3.28 | 13.77 | 28.24 | |
| 31 | 2041 | - | - | - | - | - | 3.28 | 14.23 | 28.70 | |
| 32 | 2042 | - | - | - | - | - | 3.28 | 14.69 | 29.16 | |
| 33 | 2043 | - | - | - | - | - | 3.28 | 15.15 | 29.62 | |
| 34 | 2044 | - | - | - | - | - | 3.28 | 15.61 | 30.08 | |
| 35 | 2045 | - | - | - | - | - | 3.28 | 16.07 | 30.54 | |
| 36 | 2046 | - | - | - | - | - | 3.28 | 16.52 | 30.99 | |
| 37 | 2047 | - | - | - | - | - | 3.28 | 16.98 | 31.45 | |
| 38 | 2048 | - | - | - | - | - | 3.28 | 17.44 | 31.91 | |
| 39 | 2049 | - | - | - | - | - | 3.28 | 17.90 | 32.37 | |
| 40 | 2050 | - | - | - | - | - | 3.28 | 18.36 | 32.83 | |
| 41 | 2051 | - | - | - | - | - | 3.28 | 18.82 | 33.29 | |
| 42 | 2052 | - | - | - | - | - | 3.28 | 19.28 | 33.75 | |
| 43 | 2053 | - | - | - | - | - | 3.28 | 19.74 | 34.21 | |
| 44 | 2054 | - | - | - | - | - | 3.28 | 20.20 | 34.67 | |
| 45 | 2055 | - | - | - | - | - | 3.28 | 20.66 | 35.13 | |
| 46 | 2056 | - | - | - | - | - | 3.28 | 21.11 | 35.58 | |
| 47 | 2057 | - | - | - | - | - | 3.28 | 21.57 | 36.04 | |
| 48 | 2058 | - | - | - | - | - | 3.28 | 22.03 | 36.50 | |
| 49 | 2059 | - | - | - | - | - | 3.28 | 22.49 | 36.96 | |
| 50 | 2060 | - | - | - | - | - | 3.28 | 22.95 | 37.42 | |

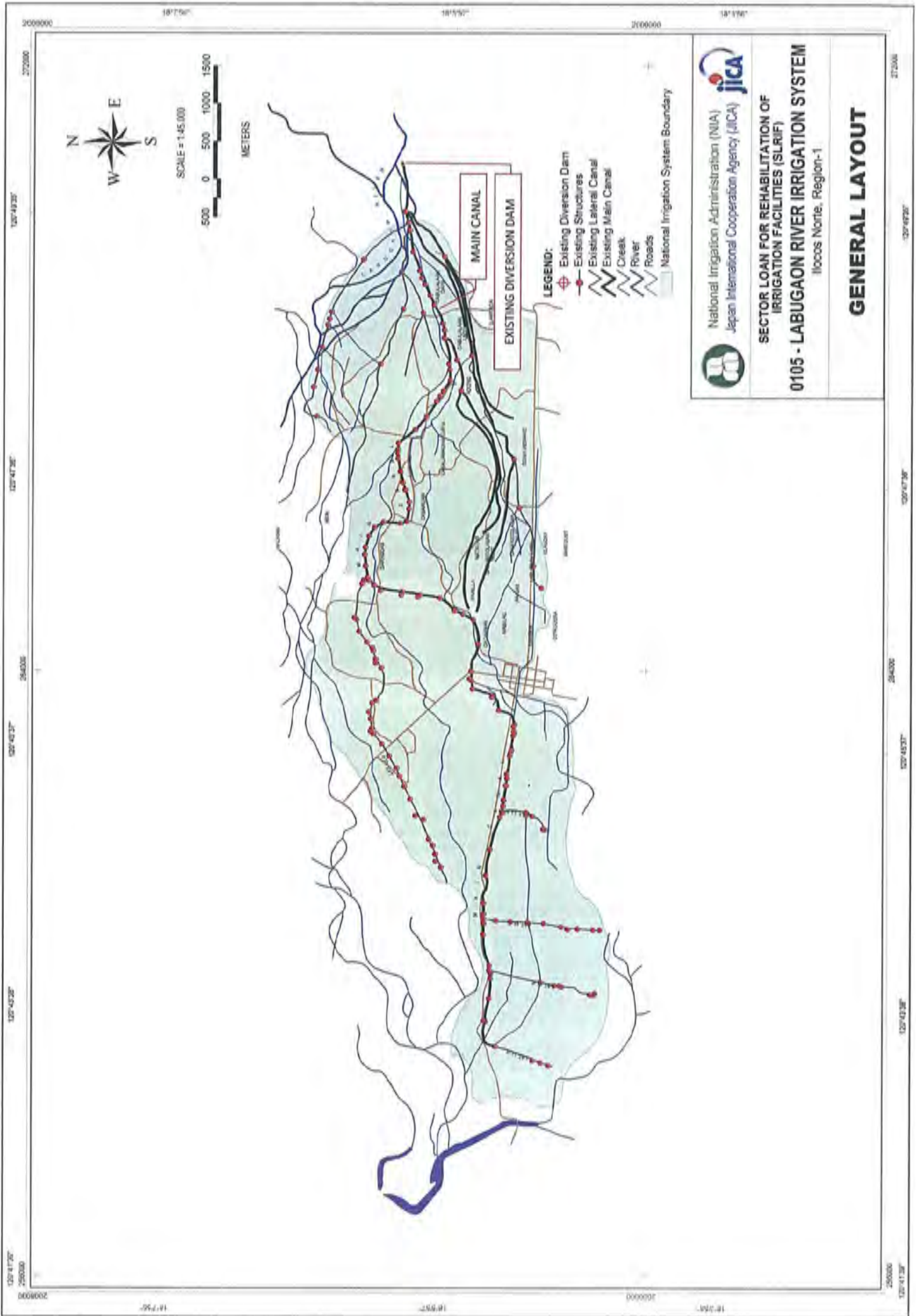
Table 0105 - Labugaon Area

Case-2 (Benefit 10% down)

Name of NS: 0105 - Labugaon Area Region: 1 MO: R I I C o s: Norte

| | | | | | | |
|-------------|---------------------------------|-----------------------|---------|------|-----------|-----|
| ERR : 26.5% | Net Present Value (Million PHP) | (15 % discount rate) | Benefit | Cost | B/C Ratio | NPV |
| | | | 89 | 53 | 1.67 | 36 |

| Year In Order | Year | Economic Cost (M. PHP) | | | | Annual O & M | Economic Benefit (M. PHP) | | Total | Net Cash Flow (M. PHP) |
|---------------|------|------------------------|---------------------------|----------------------|-------------|--------------|---------------------------|-------|--------|------------------------|
| | | Civil Works | Institutional Development | Engineering Services | Development | | without 1.5% | Total | | |
| | | | | | | | | | | |
| 1 | 2011 | - | - | 0.36 | - | - | 0.36 | 0.46 | 0.10 | |
| 2 | 2012 | - | - | 0.36 | - | - | 0.36 | 0.92 | 0.56 | |
| 3 | 2013 | 19.91 | 1.18 | 0.36 | - | - | 21.45 | 1.38 | -20.07 | |
| 4 | 2014 | 26.54 | 1.58 | 0.36 | - | - | 29.37 | 1.84 | -23.28 | |
| 5 | 2015 | 19.91 | 1.18 | 0.36 | - | - | 23.53 | 2.30 | -10.77 | |
| 6 | 2016 | - | - | - | - | - | 2.98 | 2.75 | 15.75 | |
| 7 | 2017 | - | - | - | - | - | 2.98 | 3.21 | 17.45 | |
| 8 | 2018 | - | - | - | - | - | 2.98 | 3.67 | 18.44 | |
| 9 | 2019 | - | - | - | - | - | 2.98 | 4.13 | 18.90 | |
| 10 | 2020 | - | - | - | - | - | 2.98 | 4.59 | 19.36 | |
| 11 | 2021 | - | - | - | - | - | 2.98 | 5.05 | 19.82 | |
| 12 | 2022 | - | - | - | - | - | 2.98 | 5.51 | 20.28 | |
| 13 | 2023 | - | - | - | - | - | 2.98 | 5.97 | 20.74 | |
| 14 | 2024 | - | - | - | - | - | 2.98 | 6.43 | 21.19 | |
| 15 | 2025 | - | - | - | - | - | 2.98 | 6.89 | 21.65 | |
| 16 | 2026 | - | - | - | - | - | 2.98 | 7.34 | 22.11 | |
| 17 | 2027 | - | - | - | - | - | 2.98 | 7.80 | 22.57 | |
| 18 | 2028 | - | - | - | - | - | 2.98 | 8.26 | 23.03 | |
| 19 | 2029 | - | - | - | - | - | 2.98 | 8.72 | 23.49 | |
| 20 | 2030 | - | - | - | - | - | 2.98 | 9.18 | 23.95 | |
| 21 | 2031 | - | - | - | - | - | 2.98 | 9.64 | 24.41 | |
| 22 | 2032 | - | - | - | - | - | 2.98 | 10.10 | 24.87 | |
| 23 | 2033 | - | - | - | - | - | 2.98 | 10.56 | 25.33 | |
| 24 | 2034 | - | - | - | - | - | 2.98 | 11.02 | 25.79 | |
| 25 | 2035 | - | - | - | - | - | 2.98 | 11.48 | 26.24 | |
| 26 | 2036 | - | - | - | - | - | 2.98 | 11.93 | 26.70 | |
| 27 | 2037 | - | - | - | - | - | 2.98 | 12.39 | 27.16 | |
| 28 | 2038 | - | - | - | - | - | 2.98 | 12.85 | 27.62 | |
| 29 | 2039 | - | - | - | - | - | 2.98 | 13.31 | 28.08 | |
| 30 | 2040 | - | - | - | - | - | 2.98 | 13.77 | 28.54 | |
| 31 | 2041 | - | - | - | - | - | 2.98 | 14.23 | 29.00 | |
| 32 | 2042 | - | - | - | - | - | 2.98 | 14.69 | 29.46 | |
| 33 | 2043 | - | - | - | - | - | 2.98 | 15.15 | 29.92 | |
| 34 | 2044 | - | - | - | - | - | 2.98 | 15.61 | 30.37 | |
| 35 | 2045 | - | - | - | - | - | 2.98 | 16.07 | 30.83 | |
| 36 | 2046 | - | - | - | - | - | 2.98 | 16.52 | 31.29 | |
| 37 | 2047 | - | - | - | - | - | 2.98 | 16.98 | 31.75 | |
| 38 | 2048 | - | - | - | - | - | 2.98 | 17.44 | 32.21 | |
| 39 | 2049 | - | - | - | - | - | 2.98 | 17.90 | 32.67 | |
| 40 | 2050 | - | - | - | - | - | 2.98 | 18.36 | 33.13 | |
| 41 | 2051 | - | - | - | - | - | 2.98 | 18.82 | 33.59 | |
| 42 | 2052 | - | - | - | - | - | 2.98 | 19.28 | 34.05 | |
| 43 | 2053 | - | - | - | - | - | 2.98 | 19.74 | 34.51 | |
| 44 | 2054 | - | - | - | - | - | 2.98 | 20.20 | 34.96 | |
| 45 | 2055 | - | - | - | - | - | 2.98 | 20.66 | 35.42 | |
| 46 | 2056 | - | - | - | - | - | 2.98 | 21.11 | 35.88 | |
| 47 | 2057 | - | - | - | - | - | 2.98 | 21.57 | 36.34 | |
| 48 | 2058 | - | - | - | - | - | 2.98 | 22.03 | 36.80 | |
| 49 | 2059 | - | - | - | - | - | 2.98 | 22.49 | 37.26 | |
| 50 | 2060 | - | - | - | - | - | 2.98 | 22.95 | 37.72 | |



SCALE = 1:45,000



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)

SECTOR LOAN FOR REHABILITATION OF IRRIGATION FACILITIES (SLRIF)
0105 - LABUGAON RIVER IRRIGATION SYSTEM
 Ilocos Norte, Region-1




GENERAL LAYOUT

2098000 18°41'30" 102°41'30" 254000 102°43'30" 102°45'30" 102°47'30" 102°49'30" 272000 18°43'00" 18°44'30" 18°46'00" 18°47'30" 18°49'00" 18°50'30" 2000000 272000 102°41'30" 102°43'30" 102°45'30" 102°47'30" 102°49'30" 272000

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities




Photographs of Irrigation Facilities

NIS name: Labugaon (Region 1)

| Location / Facility | Photograph | Comments |
|-----------------------------------|--|---|
| Dam Sluiceway portion |  | Wear and tear of sluiceway gates and mechanisms. Heavy scouring of sluiceway apron. |
| Sabo Dam |  | DPWH project built upstream of NIA dam. Evident heavy siltation needing occasional river channelization and training works. |
| Dam sluiceway and ogee major bed. |  | Heavy scouring at sluiceway slab apron and at the dam's ogee major bed. |

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

NIS name: Labugaon (Region 1)

| Location / Facility | Photograph | Comments |
|---------------------|--|---|
| Sabo dam |  | A DPWH project built upstream of NIA dam. |
| Sabo dam |  | Evident of heavy siltation upstream of NIA dam needing occasional river channelization and training works. |
| Sluiceway section |  | Scouring at sluiceway apron slab. Leakages from wear and tear of deteriorated sluiceway gate and mechanical and miscellaneous metalworks. |

THE REPUBLIC OF PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION

**Sector Loan on
Rehabilitation of Irrigation Facilities**

NIS SUMMARY REPORT

0106
Papa Area RIS
Region 1
Ilocos Norte 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**

| <i>Item</i> | <i>Description</i> | |
|---|---|---|
| 1) Name of NIS | Papa Area RIS Code: 0106 | |
| 2) Location | Region | Region 1 |
| | Province | Ilocos Norte |
| | Municipality | Marcos, Banna, Nueva Era |
| | Distance | 53 km from Laoag City |
| 3) Type of Water Source | Water Source | Papa river |
| | Type | Diversion Dam (159.80 m wide, 2.85 m high) |
| 4) Area | Service Area | 2,822 ha |
| | FUSA | 2,337 ha |
| 5) Beneficiary Farmers | 1,316 farmers | Average paddy field cultivating size = 1.78 ha per farmer |
| 6) Irrigator's Association | IAs established = 3 FIA established = 1 in 2008 | |
| 7) Features of NIS and Necessity of the project | <p>The system has a diversion dam serving left and right side with intake and sluiceway gates located at right side. From aggravated effects of inclement weather conditions and the system built for quite sometime for its normal wear and tear. River siltation and sedimentation is quite substantial. Sluiceway gates and intakes need some repair/rehab works including miscellaneous metal works and mechanisms. Ogee and major bed apron needs immediate concern too. Siltation and erosion to canals and damages to structures are experienced needed repair/rehab as well.</p> <p>The rehabilitation works is necessary to restore the full functionality and stability of the dam and canal structures and to improve the efficiency of water delivery in the canals and efficiency of water distribution to the farms.</p> | |
| 8) Outline of the Proposed Project | <p>A. Engineering</p> <ol style="list-style-type: none"> 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 <p>B. Institutional Strengthening Program</p> <p>B. 1 Basic Program</p> <ol style="list-style-type: none"> 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 <p>B.2 Specific Program to strengthen institutional mechanism together with LGUs</p> <ol style="list-style-type: none"> 1. Monitoring and control of illegal mechanical quarrying 2. Improvement of watershed management | |

| | | | | |
|---|--|------------|------------------|----------------|
| 9) Proposed Project Component | <p>A. Engineering</p> <p>1. Construction of civil works for rehabilitation of diversion works, canal system, drainage system, roads, and IMT support facilities.</p> <p>B. Institutional Strengthening Program</p> <p>1. Reactivation of FIAs/IAs including reformation of TSGA / IA / FIA areas, construction of IMT support facilities (demand base)</p> <p>2. Strengthening NIA-IA- LGUs Partnership, especially coordination RDC, RAFC/PAFC with FIAs/IAs and ISMC</p> <p>3. Institutional development program to strengthen management capacity of NIA field offices and IAs.</p> | | | |
| 10) Project Cost (Direct cost only, excluding escalation, contingency, tax) | 1. Direct cost | PHP | 163.59 | Million |
| | - Civil Works | PHP | 156.82 | Million |
| | - Institutional Development | PHP | 3.50 | Million |
| | - Engineering Services | PHP | 3.27 | Million |
| | 2. Indirect cost | PHP | 14.64 | Million |
| | Total Project Cost (1+2) | PHP | 178.23 | Million |
| | Cost per ha | PHP | 76,265.00 | per ha |
| 11) Project Benefit | <p>1. To increase paddy production to 5,159 tons/year</p> <p>2. To increase farmers' net income by PHP57,476.00/ha/year</p> <p>3. To establish functional and self-reliant IAs</p> <p>4. To improve performance of NIS</p> | | | |
| 12) Project Justification | EIRR = 23.1%, B/C = 1.5 (discount rate 15%) | | | |

2. Project History (Construction/Rehabilitation)

| Year | Description |
|--------------|---|
| 1983-1986 | Construction of dam, irrigation canals and other appurtenant structures |
| 1992-1994 | Construction of urgent disaster prevention works, i.e. levee, dikes, minor repair/rehab |
| 1995-Present | Continuing minor repair/rehab works to the irrigation canals and facilities |

3. Present Condition

3.1 Natural Conditions

| Item | Description |
|------------------------------|---|
| 1) Annual Rainfall | 2,070 mm |
| 2) Seasons | Wet season: May to October Dry season: November to April |
| 3) Dominant Soil in NIS Area | Silty loam/clay |
| 4) Topography | Undulated |

3.2 Socio-economy (Region/Province)

| Item | Description |
|---------------------------|--|
| 1) GRDP | PHP 185,566 million (Year 2007), Per Capita GRDP = PHP 38,566 per year |
| 2) Population | 547,284 (province) |
| 3) Population Growth Rate | 0.86 % per year (province) |
| 4) Labor Force | 3,183 thousand (region) |
| 5) Poverty Population | 21.2 % to total population (province) |

3.3 Present Agriculture in NIS

| <i>Item</i> | <i>Description</i> | | | | | | |
|---|---|------------------|--------|---------------------|-------|---------|-------|
| 1) Farm Household in NIS | Total beneficiaries | 1,316 households | | | | | |
| | Land owners | - households (%) | | | | | |
| | Tenant farmers | - households (%) | | | | | |
| 2) Paddy Field Size in NIS | 1.78 ha per household (FUSA/Total beneficiaries as of 2008) | | | | | | |
| 3) Present Land Use in NIS | Paddy field planted | 1,220 ha | 43.2 % | As of 2008 | | | |
| | Paddy field not planted | 1,117 ha | 39.6 % | 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 | 485 ha | 17.2 % | No data in response | | | |
| 4) Paddy Field in FUSA (ha) | 2,337 | | | | | | |
| 5) Paddy Cropped Area (ha) | 2004 | 2005 | 2006 | 2007 | 2008 | Average | |
| | Wet Season | 480 | 1,242 | 1,260 | 1,260 | 1,220 | 1,092 |
| | Dry Season | 807 | 137 | 530 | 530 | 560 | 513 |
| 6) Cropping Intensity (%) (per year) | 2004 | 2005 | 2006 | 2007 | 2008 | Average | |
| | 55 | 59 | 77 | 77 | 76 | 69 | |
| 7) Unit Yield of Paddy (ton/ha) | 2004 | 2005 | 2006 | 2007 | 2008 | Average | |
| | Wet Season | 4.00 | 3.90 | 4.20 | 4.20 | 4.00 | 4.07 |
| | Dry Season | 4.20 | 4.10 | 4.30 | 4.30 | 3.90 | 4.17 |
| 8) Paddy Production (ton) | 2004 | 2005 | 2006 | 2007 | 2008 | Average | |
| | Wet Season | 1,920 | 4,844 | 5,292 | 5,292 | 4,880 | 4,446 |
| | Dry Season | 3,389 | 562 | 2,279 | 2,279 | 2,184 | 2,139 |

3.4 Water Resources

| <i>Item</i> | <i>Description</i> |
|------------------------------|------------------------|
| 1) Name of Rivers | Papa River |
| 2) Catchment Area at Dam | 51.40 km ² |
| 3) Ave. River Discharge | 2.79 m ³ /s |
| 4) Ave. Dry Season Discharge | 1.78 m ³ /s |
| 5) Diverted Intake Discharge | 1.44 m ³ /s |
| 6) Water Requirement | 4.21 m ³ /s |
| 7) Sedimentation | High |

3.5 Existing Irrigation System

| <i>Item</i> | <i>Description</i> |
|------------------------|--|
| 1) Diversion Dam | Overflow crest width <u>158.80</u> m, Dam height <u>2.85</u> m |
| 2) Main Canal | Total length <u>12.813</u> km (Lined portion <u>7.236</u> km) |
| 3) Lateral Canals | Total length <u>35.649</u> km (Lined portion <u>12.378</u> km) |
| 4) On-farm facilities | Total length <u>77.00</u> km (Lined portion _____ km) Turn-outs = <u>155</u> units |
| 5) Drainage Canal | Total length <u>18.00</u> kms. |
| 6) Canal Structures | No. = <u>230</u> units |
| 7) Drainage Structures | No. = <u>37</u> units |
| 8) Farm roads | Total length <u>36.140</u> km (pavement= _____ kms.) |

3.6 Institutions for O&M of NIS

| <i>Item</i> | <i>Description</i> | | | | | |
|--|------------------------------|------|------|------|------|---------|
| 1) Regional Irrigation Office | Name: Region 1-Ilocos Region | | | | | |
| 2) IMO | Name: Ilocos Norte IMO | | | | | |
| Staff in 2009 | Total number of staff: 60 | | | | | |
| 3) Irrigator' Association (IA) | 2004 | 2005 | 2006 | 2007 | 2008 | Average |
| Number of FIA (nos) | | | | | 1 | |
| Number of IA (nos) | | | | | 3 | |
| Number of TSAG (nos) | 101 | 101 | 101 | 101 | 101 | 101 |
| Functionality of IA | 80.5 | 0.0 | 87.8 | 84.6 | 84.5 | 84.3 |
| Collection of ISF (wet, %) | 0 | 0 | 8.6 | 0 | 0 | 8.6 |
| Collection of ISF (dry, %) | 0 | 0 | 36.2 | 0 | 0 | 36.2 |
| 4) NIS Category based on IA 2008 O&M Contract (NIA-IA) | No. of IA | | | | | |
| Category A | 0 | | | | | |
| Category B | 0 | | | | | |
| Category C | 3 | | | | | |

3.7 Existing Problems

| <i>Item</i> | <i>Description</i> |
|---|---|
| 1) Diversion Works | <ol style="list-style-type: none"> 1. Dam body undermined and scoured endangering whole structure 2. Heavily damaged/scoured dam downstream apron and major bed, also ret. walls 3. Heavy siltation upstream of dam 4. Deteriorated sluiceway and intake gates, and misc. metal works 5. Modification/replacement of motor, & intake gates from manual to motorized operation with housing |
| 2) Canal and Structures | <ol style="list-style-type: none"> 1. Heavy damages of canals from siltation and erosions especially during inclement weather conditions 2. Damages to existing canal structures and appurtenant parts 3. Construction of new structures to suit actual field conditions. |
| 3) Drainage Canal | <ol style="list-style-type: none"> 1. Damages to existing drainage canals 2. Damages to existing structures 3. Siltation to the canals 4. Other related works to the proper functioning of canals |
| 4) Other Project Facilities (road, bridge, flood dike, building, etc) | <ol style="list-style-type: none"> 1. The link roads needs maintenance and concrete pavement preferable 2. Damages to road structures and appurtenant structures 3. Repair/rehab of existing field office/quarter |
| 5) Water Management and O&M Activities | <ol style="list-style-type: none"> 1. Continuing water management education to concerned parties 2. Planning, implementation, revisions of O&M activities, i.e. water delivery and schedule etc. |
| 6) Status of NIS and IA Management | <p>Status Type Ab evaluated by Radar Graph</p> <p>Specific problems are:</p> <ol style="list-style-type: none"> 1. Low ISF collection efficiency at 50% for both seasons 2. Low cropping intensity during wet and dry seasons at 25% and 52%, respectively |
| 7) Watershed Management | <ol style="list-style-type: none"> 1. Coordination to DENR and other concerned entities to address this effort 2. Watershed is significantly denuded. |
| 8) Coordination with LGU and Agencies concerned | <ol style="list-style-type: none"> 1. Minimum coordination by NIA's field offices and IAs with concerned LGUs and other line agencies on the specific problems such as monitoring and control of illegal mechanical quarrying and watershed management |
| 9) Agriculture | <ol style="list-style-type: none"> 1. Continuing cooperative efforts by DA/MA/PA of increased rice production |

| <i>Item</i> | <i>Description</i> |
|-------------|---|
| | 2. Sharing of relative agro-statistical data of concerned entities 3. Installation/sharing of agro-meteorological equipments 4. Inadequate supply of high quality rice seeds. 5. Inadequate utilization of agricultural inputs due to the poor financial status of the farmers. 6. Insufficient number of post harvest facilities particularly dryers |
| 10) Others | 1. Sharing of available logistics |

4. Proposed Rehabilitation Plan

4.1 Agricultural Development Plan

| <i>Item</i> | <i>Description</i> | | | |
|-------------------------------|--------------------|---------------------|---------------------|---------------|
| Cropping schedule | <i>Wet Season</i> | <i>Dry Season-1</i> | <i>Dry Season-2</i> | <i>Annual</i> |
| 1) Type of Crops | Paddy | Paddy | Corn | - |
| 2) Cropping Area (ha) | 2,337 | 560 | 200 | - |
| 3) Target Unit Yield (ton/ha) | 4.20 | 4.30 | 6 | - |
| 3) Total Production (ton) | 9,815 | 2,408 | 1200 | - |

4.2 Civil Works

| <i>Item</i> | <i>Description</i> |
|---------------------------|---|
| 1) Diversion Works | 1. Embankment protection works – 1 unit 2. River channelization/training works |
| 2) Canal Structures | 1. Repair of damaged structures - 158 units 2. Repair/replacement of dilapidated steel gates. 3. Installation of new structure steel gates |
| 3) Canalization | 1. Concrete lining of selected canal sections – 28.8 kms 2. De-silting of selected canal sections. |
| 4) Drainage Structures | 1. Repair of existing structures – 15 units 2. Construction of additional structures |
| 5) Drainage Canalization | 1. De-silting of existing drainage canals – 6.94 kms 2. Construction of additional drainage canals |
| 6) Service Roads | 1. Re-graveling of selected road sections – 21 kms 2. Construction of side drains 3. Construction of drainage structures in strategic road locations. |
| 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

| <i>Item</i> | <i>Description</i> |
|--|--|
| 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 |

| <i>Item</i> | <i>Description</i> |
|--|---|
| | h) Assistance of reactivated IAs/FIAs in organizational and management activities |
| 2) Strengthening Program of NIA - IA - LGU Partnership | <ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> 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 | <ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> 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 | <ol style="list-style-type: none"> 1. Strengthening coordination with RDC, RAFC/PAFC and LGUs concerned through works shop on dissemination of the SLRIF to these organizations. 2. Request LGUs legal actions on protection of illegal mechanical quarrying prior to the commencement of the SLRIF through the coordination activities 3. Strengthening coordination with RDC, RAFC/PAFC and LGUs on training program of watershed management 4. Strengthening coordination on establishment of monitoring and control mechanism of illegal quarrying |

4.4 Proposed Counter Schemes

| <i>Item</i> | <i>Description</i> |
|-------------|--|
| 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 | <ol style="list-style-type: none"> 1. LGU initiates training and upgrade technical skills of its engineers by inviting resource persons from the key line departments and/or national agencies (e.g. NIA, DPWH.) (2) LGUs take actions on information awareness on the Project implementation through local communication media. (3) LGU establishes a coordinating/steering committee at the provincial level to improve coordination and representation of NIA in local planning and budgeting. |

5. Cost Estimate for Initial Investment

| <i>Item</i> | <i>Description</i> | |
|--------------------------------|---|--------------------|
| 1) Direct Cost for Civil Works | A. Mobilization | Php 3.27 Million |
| | B. Protection Dikes | Php 11.83 Million |
| | C. Diversion Works | Php 56.08 Million |
| | D. Canal Structures | Php 21.93 Million |
| | E. Canalization | Php 27.30 Million |
| | F. Drainage Structures | Php 4.67 Million |
| | G. Drainage Canalization | Php 7.01 Million |
| | H. Roads | Php 0.83 Million |
| | I. On-Farm Facilities/T.O. Gates | Php 1.57 Million |
| | J. IMT Support Facilities | Php 20.00 Million |
| | K. IMT GIS Database | Php 2.34 Million |
| | L. Institutional Development (5% of Direct Cost) | Php 3.50 Million |
| | M. Feasibility Studies & Detailed Engineering (2% of Direct Cost) | Php 3.27 Million |
| | Sub-total (Direct Cost) | |
| 2) Indirect Cost | A. General Engineering Supervision and Administration (3.5% of Direct Cost) | Php 5.73 Million |
| | B. NIA Management Fee (5% of Total Project Cost) | Php 8.91 Million |
| | Sub-total (Indirect Cost) | |
| 3) Total Project Cost | = 1+2 | Php 178.23 Million |
| Cost per ha. | | Php 76,265.00 /ha. |

6. Implementation Plan

| <i>Item</i> | <i>Description</i> |
|--|-------------------------------------|
| 1) Contract package | 1 - Local Competitive Bidding (LCB) |
| 2) Implementation Schedule | |
| a) Civil Works | |
| 1) Survey, F/S, Design | 19 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

| <i>Item</i> | <i>Description</i> | |
|-------------------------|--|--|
| 1) Economic evaluation | | |
| EIRR (Base) | EIRR = 23.1 % | : Project life 50 years |
| Sensitivity | Case-1 | EIRR = 20.9 % : Cost 10% up |
| | Case-2 | EIRR = 20.7 % : Benefit 10% down |
| | Case-3 | EIRR = 18.7 % : Cost 10% up + Benefit 10% down |
| B/C | 1.5 | : discount rate 15% p.a. |
| NPV | PHP 54 million | : discount rate 15% p.a. |
| 2) Financial evaluation | Farmer's net income increase = PHP 18,924 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

| <i>Item</i> | <i>Description</i> |
|-------------------------|---|
| 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 |

Economic Evaluation (EIRR)

Case-1 (Cost 10% up)

Basic Case

Name of NIS: 0106 - Papa Area Region: 1 MO: ROR: Locos: Norite

Name of NIS: 0106 - Papa Area Region: 1 MO: ROR: Locos: Norite

| | | | | | |
|--------------|---------------------------------|---------|------|-----------|-----|
| EIRR : 20.9% | Net Present Value (Million PHP) | Benefit | Cost | B/C Ratio | NPV |
| | (15 % discount rate) | 163 | 119 | 1.37 | 44 |

| | | | | | |
|--------------|---------------------------------|---------|------|-----------|-----|
| EIRR : 23.1% | Net Present Value (Million PHP) | Benefit | Cost | B/C Ratio | NPV |
| | (15 % discount rate) | 163 | 108 | 1.50 | 54 |

| Year In Order | Year | Economic Cost (M. PHP) | | | Economic Benefit (M. PHP) | | Net Cash Flow (M. PHP) | |
|---------------|------|------------------------|---------------------------|----------------------|---------------------------|--------------|------------------------|--------|
| | | Civil Works | Institutional Development | Engineering Services | Total | without 1.5% | Total | |
| 1 | 2011 | - | - | 0.89 | 0.89 | 0.71 | 0.71 | -0.18 |
| 2 | 2012 | - | - | 0.89 | 0.89 | 1.42 | 1.42 | 0.53 |
| 3 | 2013 | 49.50 | 0.63 | 0.89 | 51.02 | 2.13 | 2.13 | -48.89 |
| 4 | 2014 | 66.00 | 0.84 | 0.89 | 69.30 | 2.84 | 2.84 | -58.21 |
| 5 | 2015 | 49.50 | 0.63 | 0.89 | 54.67 | 3.55 | 3.55 | -30.86 |
| 6 | 2016 | - | - | 5.21 | 5.21 | 30.91 | 4.26 | 35.17 |
| 7 | 2017 | - | - | 5.21 | 5.21 | 33.31 | 4.97 | 33.07 |
| 8 | 2018 | - | - | 5.21 | 5.21 | 34.34 | 5.68 | 34.81 |
| 9 | 2019 | - | - | 5.21 | 5.21 | 34.34 | 6.39 | 35.52 |
| 10 | 2020 | - | - | 5.21 | 5.21 | 34.34 | 7.10 | 36.23 |
| 11 | 2021 | - | - | 5.21 | 5.21 | 34.34 | 7.81 | 36.94 |
| 12 | 2022 | - | - | 5.21 | 5.21 | 34.34 | 8.52 | 37.65 |
| 13 | 2023 | - | - | 5.21 | 5.21 | 34.34 | 9.23 | 38.36 |
| 14 | 2024 | - | - | 5.21 | 5.21 | 34.34 | 9.94 | 39.07 |
| 15 | 2025 | - | - | 5.21 | 5.21 | 34.34 | 10.65 | 39.78 |
| 16 | 2026 | - | - | 5.21 | 5.21 | 34.34 | 11.36 | 40.49 |
| 17 | 2027 | - | - | 5.21 | 5.21 | 34.34 | 12.07 | 41.20 |
| 18 | 2028 | - | - | 5.21 | 5.21 | 34.34 | 12.78 | 41.91 |
| 19 | 2029 | - | - | 5.21 | 5.21 | 34.34 | 13.49 | 42.62 |
| 20 | 2030 | - | - | 5.21 | 5.21 | 34.34 | 14.20 | 43.33 |
| 21 | 2031 | - | - | 5.21 | 5.21 | 34.34 | 14.91 | 44.04 |
| 22 | 2032 | - | - | 5.21 | 5.21 | 34.34 | 15.62 | 44.75 |
| 23 | 2033 | - | - | 5.21 | 5.21 | 34.34 | 16.33 | 45.46 |
| 24 | 2034 | - | - | 5.21 | 5.21 | 34.34 | 17.04 | 46.17 |
| 25 | 2035 | - | - | 5.21 | 5.21 | 34.34 | 17.75 | 46.88 |
| 26 | 2036 | - | - | 5.21 | 5.21 | 34.34 | 18.46 | 47.59 |
| 27 | 2037 | - | - | 5.21 | 5.21 | 34.34 | 19.17 | 48.30 |
| 28 | 2038 | - | - | 5.21 | 5.21 | 34.34 | 19.88 | 49.01 |
| 29 | 2039 | - | - | 5.21 | 5.21 | 34.34 | 20.59 | 49.72 |
| 30 | 2040 | - | - | 5.21 | 5.21 | 34.34 | 21.30 | 50.43 |
| 31 | 2041 | - | - | 5.21 | 5.21 | 34.34 | 22.01 | 51.14 |
| 32 | 2042 | - | - | 5.21 | 5.21 | 34.34 | 22.72 | 51.85 |
| 33 | 2043 | - | - | 5.21 | 5.21 | 34.34 | 23.43 | 52.56 |
| 34 | 2044 | - | - | 5.21 | 5.21 | 34.34 | 24.14 | 53.27 |
| 35 | 2045 | - | - | 5.21 | 5.21 | 34.34 | 24.85 | 53.98 |
| 36 | 2046 | - | - | 5.21 | 5.21 | 34.34 | 25.56 | 54.69 |
| 37 | 2047 | - | - | 5.21 | 5.21 | 34.34 | 26.27 | 55.40 |
| 38 | 2048 | - | - | 5.21 | 5.21 | 34.34 | 26.98 | 56.11 |
| 39 | 2049 | - | - | 5.21 | 5.21 | 34.34 | 27.69 | 56.82 |
| 40 | 2050 | - | - | 5.21 | 5.21 | 34.34 | 28.40 | 57.53 |
| 41 | 2051 | - | - | 5.21 | 5.21 | 34.34 | 29.11 | 58.24 |
| 42 | 2052 | - | - | 5.21 | 5.21 | 34.34 | 29.82 | 58.95 |
| 43 | 2053 | - | - | 5.21 | 5.21 | 34.34 | 30.53 | 59.66 |
| 44 | 2054 | - | - | 5.21 | 5.21 | 34.34 | 31.24 | 60.37 |
| 45 | 2055 | - | - | 5.21 | 5.21 | 34.34 | 31.95 | 61.08 |
| 46 | 2056 | - | - | 5.21 | 5.21 | 34.34 | 32.66 | 61.79 |
| 47 | 2057 | - | - | 5.21 | 5.21 | 34.34 | 33.37 | 62.50 |
| 48 | 2058 | - | - | 5.21 | 5.21 | 34.34 | 34.08 | 63.21 |
| 49 | 2059 | - | - | 5.21 | 5.21 | 34.34 | 34.79 | 63.92 |
| 50 | 2060 | - | - | 5.21 | 5.21 | 34.34 | 35.50 | 64.63 |

| Year In Order | Year | Economic Cost (M. PHP) | | | Economic Benefit (M. PHP) | | Net Cash Flow (M. PHP) | |
|---------------|------|------------------------|---------------------------|----------------------|---------------------------|--------------|------------------------|--------|
| | | Civil Works | Institutional Development | Engineering Services | Total | without 1.5% | Total | |
| 1 | 2011 | 0.81 | - | 0.81 | 0.81 | 0.71 | 0.71 | -0.10 |
| 2 | 2012 | 0.81 | - | 0.81 | 0.81 | 1.42 | 1.42 | 0.61 |
| 3 | 2013 | 45.00 | 0.57 | 0.81 | 46.38 | 2.13 | 2.13 | -44.25 |
| 4 | 2014 | 60.00 | 0.76 | 0.81 | 63.00 | 2.84 | 2.84 | -51.91 |
| 5 | 2015 | 45.00 | 0.57 | 0.81 | 49.70 | 3.55 | 3.55 | -25.89 |
| 6 | 2016 | - | - | 4.74 | 4.74 | 30.91 | 4.26 | 35.17 |
| 7 | 2017 | - | - | 4.74 | 4.74 | 33.31 | 4.97 | 33.54 |
| 8 | 2018 | - | - | 4.74 | 4.74 | 34.34 | 5.68 | 35.28 |
| 9 | 2019 | - | - | 4.74 | 4.74 | 34.34 | 6.39 | 35.99 |
| 10 | 2020 | - | - | 4.74 | 4.74 | 34.34 | 7.10 | 36.70 |
| 11 | 2021 | - | - | 4.74 | 4.74 | 34.34 | 7.81 | 37.41 |
| 12 | 2022 | - | - | 4.74 | 4.74 | 34.34 | 8.52 | 38.12 |
| 13 | 2023 | - | - | 4.74 | 4.74 | 34.34 | 9.23 | 38.83 |
| 14 | 2024 | - | - | 4.74 | 4.74 | 34.34 | 9.94 | 39.54 |
| 15 | 2025 | - | - | 4.74 | 4.74 | 34.34 | 10.65 | 40.25 |
| 16 | 2026 | - | - | 4.74 | 4.74 | 34.34 | 11.36 | 40.96 |
| 17 | 2027 | - | - | 4.74 | 4.74 | 34.34 | 12.07 | 41.67 |
| 18 | 2028 | - | - | 4.74 | 4.74 | 34.34 | 12.78 | 42.38 |
| 19 | 2029 | - | - | 4.74 | 4.74 | 34.34 | 13.49 | 43.09 |
| 20 | 2030 | - | - | 4.74 | 4.74 | 34.34 | 14.20 | 43.80 |
| 21 | 2031 | - | - | 4.74 | 4.74 | 34.34 | 14.91 | 44.51 |
| 22 | 2032 | - | - | 4.74 | 4.74 | 34.34 | 15.62 | 45.22 |
| 23 | 2033 | - | - | 4.74 | 4.74 | 34.34 | 16.33 | 45.93 |
| 24 | 2034 | - | - | 4.74 | 4.74 | 34.34 | 17.04 | 46.64 |
| 25 | 2035 | - | - | 4.74 | 4.74 | 34.34 | 17.75 | 47.35 |
| 26 | 2036 | - | - | 4.74 | 4.74 | 34.34 | 18.46 | 48.06 |
| 27 | 2037 | - | - | 4.74 | 4.74 | 34.34 | 19.17 | 48.77 |
| 28 | 2038 | - | - | 4.74 | 4.74 | 34.34 | 19.88 | 49.48 |
| 29 | 2039 | - | - | 4.74 | 4.74 | 34.34 | 20.59 | 50.19 |
| 30 | 2040 | - | - | 4.74 | 4.74 | 34.34 | 21.30 | 50.90 |
| 31 | 2041 | - | - | 4.74 | 4.74 | 34.34 | 22.01 | 51.61 |
| 32 | 2042 | - | - | 4.74 | 4.74 | 34.34 | 22.72 | 52.32 |
| 33 | 2043 | - | - | 4.74 | 4.74 | 34.34 | 23.43 | 53.03 |
| 34 | 2044 | - | - | 4.74 | 4.74 | 34.34 | 24.14 | 53.74 |
| 35 | 2045 | - | - | 4.74 | 4.74 | 34.34 | 24.85 | 54.45 |
| 36 | 2046 | - | - | 4.74 | 4.74 | 34.34 | 25.56 | 55.16 |
| 37 | 2047 | - | - | 4.74 | 4.74 | 34.34 | 26.27 | 55.87 |
| 38 | 2048 | - | - | 4.74 | 4.74 | 34.34 | 26.98 | 56.58 |
| 39 | 2049 | - | - | 4.74 | 4.74 | 34.34 | 27.69 | 57.29 |
| 40 | 2050 | - | - | 4.74 | 4.74 | 34.34 | 28.40 | 58.00 |
| 41 | 2051 | - | - | 4.74 | 4.74 | 34.34 | 29.11 | 58.71 |
| 42 | 2052 | - | - | 4.74 | 4.74 | 34.34 | 29.82 | 59.42 |
| 43 | 2053 | - | - | 4.74 | 4.74 | 34.34 | 30.53 | 60.13 |
| 44 | 2054 | - | - | 4.74 | 4.74 | 34.34 | 31.24 | 60.84 |
| 45 | 2055 | - | - | 4.74 | 4.74 | 34.34 | 31.95 | 61.55 |
| 46 | 2056 | - | - | 4.74 | 4.74 | 34.34 | 32.66 | 62.26 |
| 47 | 2057 | - | - | 4.74 | 4.74 | 34.34 | 33.37 | 62.97 |
| 48 | 2058 | - | - | 4.74 | 4.74 | 34.34 | 34.08 | 63.68 |
| 49 | 2059 | - | - | 4.74 | 4.74 | 34.34 | 34.79 | 64.39 |
| 50 | 2060 | - | - | 4.74 | 4.74 | 34.34 | 35.50 | 65.10 |

Economic Evaluation (EIRR)

Table 0106 - Papa Area

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

Case-2 (Benefit 10% down)




| Name of NIS 0106 - Papa Area | | Region | | MORIO | | Ilocos Norte | | | |
|--|------|---------------|---------------------------|----------------------|--------------|------------------|---------------------------|----------|------------------------|
| EIRR : 18.7% Net Present Value (Million PHP) | | Benefit : 146 | | Cost : 119 | | B/C Ratio : 1.23 | | NPV : 27 | |
| (-15 % discount rate) | | | | | | | | | |
| Year In Order | Year | Civil Works | Economic Cost (M. PHP) | | | Total | Economic Benefit (M. PHP) | | Net Cash Flow (M. PHP) |
| | | | Institutional Development | Engineering Services | Annual O & M | | Benefit without 1.5% | Total | |
| 1 | 2011 | - | - | 0.89 | - | 0.89 | - | 0.64 | 0.64 |
| 2 | 2012 | - | - | 0.89 | - | 0.89 | - | 1.28 | 0.39 |
| 3 | 2013 | 49.50 | 0.63 | 0.89 | - | 51.02 | - | 1.92 | -49.10 |
| 4 | 2014 | 66.00 | 0.84 | 0.89 | 1.56 | 69.30 | 7.42 | 2.56 | -59.32 |
| 5 | 2015 | 49.50 | 0.63 | 0.89 | 3.65 | 54.67 | 18.23 | 3.20 | -33.24 |
| 6 | 2016 | - | - | - | 5.21 | 5.21 | 27.82 | 3.83 | 26.44 |
| 7 | 2017 | - | - | - | 5.21 | 5.21 | 29.98 | 4.47 | 29.24 |
| 8 | 2018 | - | - | - | 5.21 | 5.21 | 30.91 | 5.11 | 30.80 |
| 9 | 2019 | - | - | - | 5.21 | 5.21 | 30.91 | 5.75 | 31.44 |
| 10 | 2020 | - | - | - | 5.21 | 5.21 | 30.91 | 6.39 | 32.08 |
| 11 | 2021 | - | - | - | 5.21 | 5.21 | 30.91 | 7.03 | 32.72 |
| 12 | 2022 | - | - | - | 5.21 | 5.21 | 30.91 | 7.67 | 33.36 |
| 13 | 2023 | - | - | - | 5.21 | 5.21 | 30.91 | 8.31 | 34.00 |
| 14 | 2024 | - | - | - | 5.21 | 5.21 | 30.91 | 8.95 | 34.64 |
| 15 | 2025 | - | - | - | 5.21 | 5.21 | 30.91 | 9.59 | 35.28 |
| 16 | 2026 | - | - | - | 5.21 | 5.21 | 30.91 | 10.22 | 35.92 |
| 17 | 2027 | - | - | - | 5.21 | 5.21 | 30.91 | 10.86 | 36.56 |
| 18 | 2028 | - | - | - | 5.21 | 5.21 | 30.91 | 11.50 | 37.19 |
| 19 | 2029 | - | - | - | 5.21 | 5.21 | 30.91 | 12.14 | 37.83 |
| 20 | 2030 | - | - | - | 5.21 | 5.21 | 30.91 | 12.78 | 38.47 |
| 21 | 2031 | - | - | - | 5.21 | 5.21 | 30.91 | 13.42 | 39.11 |
| 22 | 2032 | - | - | - | 5.21 | 5.21 | 30.91 | 14.06 | 39.75 |
| 23 | 2033 | - | - | - | 5.21 | 5.21 | 30.91 | 14.70 | 40.39 |
| 24 | 2034 | - | - | - | 5.21 | 5.21 | 30.91 | 15.34 | 41.03 |
| 25 | 2035 | - | - | - | 5.21 | 5.21 | 30.91 | 15.98 | 41.67 |
| 26 | 2036 | - | - | - | 5.21 | 5.21 | 30.91 | 16.61 | 42.31 |
| 27 | 2037 | - | - | - | 5.21 | 5.21 | 30.91 | 17.25 | 42.95 |
| 28 | 2038 | - | - | - | 5.21 | 5.21 | 30.91 | 17.89 | 43.58 |
| 29 | 2039 | - | - | - | 5.21 | 5.21 | 30.91 | 18.53 | 44.22 |
| 30 | 2040 | - | - | - | 5.21 | 5.21 | 30.91 | 19.17 | 44.86 |
| 31 | 2041 | - | - | - | 5.21 | 5.21 | 30.91 | 19.81 | 45.50 |
| 32 | 2042 | - | - | - | 5.21 | 5.21 | 30.91 | 20.45 | 46.14 |
| 33 | 2043 | - | - | - | 5.21 | 5.21 | 30.91 | 21.09 | 46.78 |
| 34 | 2044 | - | - | - | 5.21 | 5.21 | 30.91 | 21.73 | 47.42 |
| 35 | 2045 | - | - | - | 5.21 | 5.21 | 30.91 | 22.37 | 48.06 |
| 36 | 2046 | - | - | - | 5.21 | 5.21 | 30.91 | 23.01 | 48.70 |
| 37 | 2047 | - | - | - | 5.21 | 5.21 | 30.91 | 23.64 | 49.34 |
| 38 | 2048 | - | - | - | 5.21 | 5.21 | 30.91 | 24.28 | 49.97 |
| 39 | 2049 | - | - | - | 5.21 | 5.21 | 30.91 | 24.92 | 50.61 |
| 40 | 2050 | - | - | - | 5.21 | 5.21 | 30.91 | 25.56 | 51.25 |
| 41 | 2051 | - | - | - | 5.21 | 5.21 | 30.91 | 26.20 | 51.89 |
| 42 | 2052 | - | - | - | 5.21 | 5.21 | 30.91 | 26.84 | 52.53 |
| 43 | 2053 | - | - | - | 5.21 | 5.21 | 30.91 | 27.48 | 53.17 |
| 44 | 2054 | - | - | - | 5.21 | 5.21 | 30.91 | 28.12 | 53.81 |
| 45 | 2055 | - | - | - | 5.21 | 5.21 | 30.91 | 28.76 | 54.45 |
| 46 | 2056 | - | - | - | 5.21 | 5.21 | 30.91 | 29.39 | 55.09 |
| 47 | 2057 | - | - | - | 5.21 | 5.21 | 30.91 | 30.03 | 55.73 |
| 48 | 2058 | - | - | - | 5.21 | 5.21 | 30.91 | 30.67 | 56.37 |
| 49 | 2059 | - | - | - | 5.21 | 5.21 | 30.91 | 31.31 | 57.01 |
| 50 | 2060 | - | - | - | 5.21 | 5.21 | 30.91 | 31.95 | 57.64 |

| Name of NIS 0106 - Papa Area | | Region | | MORIO | | Ilocos Norte | | | |
|--|------|---------------|---------------------------|----------------------|--------------|------------------|---------------------------|----------|------------------------|
| EIRR : 20.7% Net Present Value (Million PHP) | | Benefit : 146 | | Cost : 108 | | B/C Ratio : 1.35 | | NPV : 38 | |
| (-15 % discount rate) | | | | | | | | | |
| Year In Order | Year | Civil Works | Economic Cost (M. PHP) | | | Total | Economic Benefit (M. PHP) | | Net Cash Flow (M. PHP) |
| | | | Institutional Development | Engineering Services | Annual O & M | | Benefit without 1.5% | Total | |
| 1 | 2011 | - | - | 0.81 | - | 0.81 | - | 0.64 | -0.17 |
| 2 | 2012 | - | - | 0.81 | - | 0.81 | - | 1.28 | 0.47 |
| 3 | 2013 | 45.00 | 0.57 | 0.81 | - | 46.38 | - | 1.92 | -44.47 |
| 4 | 2014 | 60.00 | 0.76 | 0.81 | 1.42 | 63.00 | 7.42 | 2.56 | -53.02 |
| 5 | 2015 | 45.00 | 0.57 | 0.81 | 3.32 | 49.70 | 18.23 | 3.20 | -28.27 |
| 6 | 2016 | - | - | 4.74 | 4.74 | 4.74 | 27.82 | 3.83 | 26.91 |
| 7 | 2017 | - | - | 4.74 | 4.74 | 4.74 | 29.98 | 4.47 | 29.71 |
| 8 | 2018 | - | - | 4.74 | 4.74 | 4.74 | 30.91 | 5.11 | 31.28 |
| 9 | 2019 | - | - | 4.74 | 4.74 | 4.74 | 30.91 | 5.75 | 31.92 |
| 10 | 2020 | - | - | 4.74 | 4.74 | 4.74 | 30.91 | 6.39 | 32.56 |
| 11 | 2021 | - | - | 4.74 | 4.74 | 4.74 | 30.91 | 7.03 | 33.20 |
| 12 | 2022 | - | - | 4.74 | 4.74 | 4.74 | 30.91 | 7.67 | 33.83 |
| 13 | 2023 | - | - | 4.74 | 4.74 | 4.74 | 30.91 | 8.31 | 34.47 |
| 14 | 2024 | - | - | 4.74 | 4.74 | 4.74 | 30.91 | 8.95 | 35.11 |
| 15 | 2025 | - | - | 4.74 | 4.74 | 4.74 | 30.91 | 9.59 | 35.75 |
| 16 | 2026 | - | - | 4.74 | 4.74 | 4.74 | 30.91 | 10.22 | 36.39 |
| 17 | 2027 | - | - | 4.74 | 4.74 | 4.74 | 30.91 | 10.86 | 37.03 |
| 18 | 2028 | - | - | 4.74 | 4.74 | 4.74 | 30.91 | 11.50 | 37.67 |
| 19 | 2029 | - | - | 4.74 | 4.74 | 4.74 | 30.91 | 12.14 | 38.31 |
| 20 | 2030 | - | - | 4.74 | 4.74 | 4.74 | 30.91 | 12.78 | 38.95 |
| 21 | 2031 | - | - | 4.74 | 4.74 | 4.74 | 30.91 | 13.42 | 39.59 |
| 22 | 2032 | - | - | 4.74 | 4.74 | 4.74 | 30.91 | 14.06 | 40.22 |
| 23 | 2033 | - | - | 4.74 | 4.74 | 4.74 | 30.91 | 14.70 | 40.86 |
| 24 | 2034 | - | - | 4.74 | 4.74 | 4.74 | 30.91 | 15.34 | 41.50 |
| 25 | 2035 | - | - | 4.74 | 4.74 | 4.74 | 30.91 | 15.98 | 42.14 |
| 26 | 2036 | - | - | 4.74 | 4.74 | 4.74 | 30.91 | 16.61 | 42.78 |
| 27 | 2037 | - | - | 4.74 | 4.74 | 4.74 | 30.91 | 17.25 | 43.42 |
| 28 | 2038 | - | - | 4.74 | 4.74 | 4.74 | 30.91 | 17.89 | 44.06 |
| 29 | 2039 | - | - | 4.74 | 4.74 | 4.74 | 30.91 | 18.53 | 44.70 |
| 30 | 2040 | - | - | 4.74 | 4.74 | 4.74 | 30.91 | 19.17 | 45.34 |
| 31 | 2041 | - | - | 4.74 | 4.74 | 4.74 | 30.91 | 19.81 | 45.98 |
| 32 | 2042 | - | - | 4.74 | 4.74 | 4.74 | 30.91 | 20.45 | 46.61 |
| 33 | 2043 | - | - | 4.74 | 4.74 | 4.74 | 30.91 | 21.09 | 47.25 |
| 34 | 2044 | - | - | 4.74 | 4.74 | 4.74 | 30.91 | 21.73 | 47.89 |
| 35 | 2045 | - | - | 4.74 | 4.74 | 4.74 | 30.91 | 22.37 | 48.53 |
| 36 | 2046 | - | - | 4.74 | 4.74 | 4.74 | 30.91 | 23.01 | 49.17 |
| 37 | 2047 | - | - | 4.74 | 4.74 | 4.74 | 30.91 | 23.64 | 49.81 |
| 38 | 2048 | - | - | 4.74 | 4.74 | 4.74 | 30.91 | 24.28 | 50.45 |
| 39 | 2049 | - | - | 4.74 | 4.74 | 4.74 | 30.91 | 24.92 | 51.09 |
| 40 | 2050 | - | - | 4.74 | 4.74 | 4.74 | 30.91 | 25.56 | 51.73 |
| 41 | 2051 | - | - | 4.74 | 4.74 | 4.74 | 30.91 | 26.20 | 52.37 |
| 42 | 2052 | - | - | 4.74 | 4.74 | 4.74 | 30.91 | 26.84 | 53.01 |
| 43 | 2053 | - | - | 4.74 | 4.74 | 4.74 | 30.91 | 27.48 | 53.64 |
| 44 | 2054 | - | - | 4.74 | 4.74 | 4.74 | 30.91 | 28.12 | 54.28 |
| 45 | 2055 | - | - | 4.74 | 4.74 | 4.74 | 30.91 | 28.76 | 54.92 |
| 46 | 2056 | - | - | 4.74 | 4.74 | 4.74 | 30.91 | 29.39 | 55.56 |
| 47 | 2057 | - | - | 4.74 | 4.74 | 4.74 | 30.91 | 30.03 | 56.20 |
| 48 | 2058 | - | - | 4.74 | 4.74 | 4.74 | 30.91 | 30.67 | 56.84 |
| 49 | 2059 | - | - | 4.74 | 4.74 | 4.74 | 30.91 | 31.31 | 57.48 |
| 50 | 2060 | - | - | 4.74 | 4.74 | 4.74 | 30.91 | 31.95 | 58.12 |

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities

Photographs of Irrigation Facilities




NIS name: Papa Area (Region 1)

| Location / Facility | Photograph | Comments |
|-------------------------------|--|---|
| PAPA- RIGHT MAIN CANAL SIPHON |  | Scoured/ Damaged outlet transition protection and canal lining works. Needs repair and rehabilitation |
| PAPA RIGHT – MAIN CANAL CHUTE |  | Damaged structure walls that need repair. |
| PAPA DAM |  | Heavily damaged/scoured downstream apron & major bed |

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities

Photographs of Irrigation Facilities




NIS name: Papa Area (Region 1)

| Location / Facility | Photograph | Comments |
|-----------------------|--|--|
| PAPA DAM |  | Background showing heavy scours / damage to the apron and major bed |
| PAPA DAM |  | Panoramic view of the dam showing siltation and stones |
| PAPA RIGHT MAIN CANAL |  | Siltation of canal and damaged structures are the problems needing canal lining works and repair of structures |

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities

Photographs of Irrigation Facilities

NIS name: Papa Area (Region 1)

| Location / Facility | Photograph | Comments |
|----------------------------|--|--|
| PAPA DAM |  | Scoured/Damaged downstream apron & Major bed. Needs repair/rehabilitation of engineering works. |
| SABO DAM |  | DPWH project built upstream of PAPA Dam. In between SABO DAM and PAPA DAM requires regular rechanneling river training works due to heavy silts & stones. |
| SLUICeway AND INTAKE GATES |  | The effect of inclemental weather conditions, the sluiceway, intake facilities, appurtenant structures including gates, housings and mechanisms needs repair, construction and change from manual to mechanized. |

**THE REPUBLIC OF PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION**

**Sector Loan on
Rehabilitation of Irrigation Facilities**

NIS SUMMARY REPORT

0107

Sta. Lucia-Candon RIS

Region 1

Illocos Sur 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**

| <i>Item</i> | <i>Description</i> | |
|---|---|---|
| 1) Name of NIS | Sta. Lucia-Candon RIS Code: 0107 | |
| 2) Location | Region | Region 1 |
| | Province | Ilocos Sur |
| | Municipality | Sta Lucia, Sta Cruz, Candon City |
| | Distance | 85 kms.From Vigan City |
| 3) Type of Water Source | Water Source | Buaya River |
| | Type | Diversion Dam (93.0 m wide, 1.35 m high) Ogee Type |
| 4) Area | Service Area | 1,700 ha |
| | FUSA | 1,423 ha |
| 5) Beneficiary Farmers | 3,333 farmers | Average paddy field cultivating size = 0.43 ha per farmer |
| 6) Irrigator's Association | IAs established = 5 FIA established = 1 in 2008 | |
| 7) Features of NIS and Necessity of the project | To divert water from the intake to utmost part of the irrigable area, in order to increase food production. | |
| 8) Outline of the Proposed Project | <p>A. Engineering</p> <ol style="list-style-type: none"> 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 <p>B. Institutional Strengthening Program</p> <p>B. 1 Basic Program</p> <ol style="list-style-type: none"> 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 <p>B.2 Specific Program to strengthen institutional mechanism together with LGUs</p> <ol style="list-style-type: none"> 1. Monitoring and control of illegal mechanical quarrying 2. Improvement of watershed management | |
| 9) Proposed Project Component | <p>A. Engineering</p> <ol style="list-style-type: none"> 1. Construction of civil works for rehabilitation of diversion works, canal system, drainage system, roads, and IMT support facilities. | |

| | | | | |
|---|--|-----|------------------------------|---------------|
| | B. Institutional Strengthening Program | | | |
| | <ol style="list-style-type: none"> 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 | 62.49 Million |
| | - Civil Works | PHP | 56.64 Million | |
| | - Institutional Development | PHP | 4.60 Million | |
| | - Engineering Services | PHP | 1.25 Million | |
| | 2. Indirect cost | | PHP | 5.59 Million |
| | Total Project Cost (1+2) | | PHP 68.08 Million | |
| | Cost per ha | | PHP 47,846.00 per ha. | |
| 11) Project Benefit | <ol style="list-style-type: none"> 1. To increase paddy production (195 tons/year) 2. To increase farmers' net income (PHP56,800.00 /ha/year) 3. To establish functional and self-reliant IAs 4. To improve performance of NIS | | | |
| 12) Project Justification | EIRR = 18.0%, B/C = 1.19 (discount rate 15%) | | | |

2. Project History (Construction/Rehabilitation)

| Year | Description |
|-----------|---|
| 2004-2006 | A new Diversion Work, Protection Works and Intake Structure was constructed, and 8.0 km of canal lining along main canal. |

3. Present Condition

3.1 Natural Conditions

| Item | Description |
|------------------------------|---|
| 1) Annual Rainfall | 2,205 mm |
| 2) Seasons | Wet season: June to November Dry season: December to May |
| 3) Dominant Soil in NIS Area | Clay Loam |
| 4) Topography | Flat |

3.2 Socio-economy (Region/Province)

| Item | Description |
|---------------------------|--|
| 1) GRDP | PHP 185,566 million (Year 2007), Per Capita GRDP = PHP 38,063 per year |
| 2) Population | 632,255 (province) |
| 3) Population Growth Rate | 0.86 % per year (province) |
| 4) Labor Force | 3,183,000 (region) |
| 5) Poverty Population | 32.6 % to total population (province) |

3.3 Present Agriculture in NIS

| Item | Description | | | | | | |
|---------------------------------|---|---------------------------|--------|---------------------|-------|---------|-------|
| 1) Farm Household in NIS | Total beneficiaries | 3,333 households | | | | | |
| | Land owners | 1,547 households (46.4 %) | | | | | |
| | Tenant farmers | 1,786 households (53.6 %) | | | | | |
| 2) Paddy Field Size in NIS | 0.43 ha per household (FUSA/Total beneficiaries as of 2008) | | | | | | |
| 3) Present Land Use in NIS | Paddy field planted | 1,423 ha | 83.7 % | As of 2008 | | | |
| | Paddy field not planted | 0 ha | 0.0 % | 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 | 277 ha | 16.3 % | No data in response | | | |
| 4) Paddy Field in FUSA (ha) | 1,423 | | | | | | |
| 5) Paddy Cropped Area (ha) | 2004 | 2005 | 2006 | 2007 | 2008 | Average | |
| | Wet Season | 1,412 | 1,423 | 1,423 | 1,423 | 1,423 | 1,421 |
| | Dry Season | 341 | 259 | 237 | 300 | 350 | 297 |
| 6) Cropping Intensity (%) | 2004 | 2005 | 2006 | 2007 | 2008 | Average | |
| | (per year) | 123 | 118 | 117 | 121 | 125 | 121 |
| 7) Unit Yield of Paddy (ton/ha) | 2004 | 2005 | 2006 | 2007 | 2008 | Average | |
| | Wet Season | 3.81 | 4.30 | 4.07 | 4.25 | 4.48 | 4.18 |
| | Dry Season | 3.46 | 3.43 | 3.87 | 3.60 | 3.43 | 3.54 |
| 8) Paddy Production (ton) | 2004 | 2005 | 2006 | 2007 | 2008 | Average | |
| | Wet Season | 5,380 | 6,112 | 5,792 | 6,048 | 6,375 | 5,941 |
| | Dry Season | 1,176 | 888 | 917 | 1,080 | 1,199 | 1,052 |

3.4 Water Resources

| Item | Description |
|------------------------------|------------------------|
| 1) Name of Rivers | Buaya River |
| 2) Catchment Area at Dam | 153 km ² |
| 3) Ave. River Discharge | 7.73 m ³ /s |
| 4) Ave. Dry Season Discharge | 4.78 m ³ /s |
| 5) Diverted Intake Discharge | 1.25 m ³ /s |
| 6) Water Requirement | 2.56 m ³ /s |
| 7) Sedimentation | High |

3.5 Existing Irrigation System

| Item | Description |
|--------------------------|---|
| 1) Diversion Dam | Overflow crest width <u>93.00</u> m, Dam height <u>1.35</u> m |
| 2) Main Canal | Total length <u>16.00</u> km (Lined portion <u>9.60</u> km) |
| 3) Lateral Canals | Total length <u>31.00</u> km (Lined portion <u>0.00</u> km) |
| 4) On-farm facilities | Total length <u>15.00</u> km (Lined portion <u>0.00</u> km) Turn-outs = <u>94</u> units |
| 5) Drainage Canal | Total length <u>1.85</u> kms. |
| 6) Canal Structures | No. = <u>140</u> units |
| 7) Drainage Structures | No. = <u>18</u> units |
| 8) Farm roads | Total length <u>49.00</u> km |
| 9) Flood Protection Dike | Total length <u>0.143</u> km |

3.6 Institutions for O&M of NIS

| <i>Item</i> | <i>Description</i> | | | | | |
|--|------------------------------|------|------|------|------|---------|
| 1) Regional Irrigation Office | Name: Region 1-Ilocos Region | | | | | |
| 2) IMO | Name:Ilocos Sur IMO | | | | | |
| Staff in 2009 | Total number of staff: 43 | | | | | |
| 3) Irrigator' Association (IA) | 2004 | 2005 | 2006 | 2007 | 2008 | Average |
| Number of FIA (nos) | | | | | 1 | |
| Number of IA (nos) | | | | | 8 | |
| Number of TSAG (nos) | 0 | 0 | 0 | 61 | 61 | 61 |
| Functionality of IA | 0 | 0 | 80.0 | 72.8 | 84.1 | 79 |
| Collection of ISF (wet, %) | 0 | 0 | 0 | 10 | 16 | 13 |
| Collection of ISF (dry, %) | 0 | 0 | 0 | 0 | 36 | 36 |
| 4) NIS Category based on IA 2008 O&M Contract (NIA-IA) | No. of IA | | | | | |
| Category A | 3 | | | | | |
| Category B | 5 | | | | | |
| Category C | 0 | | | | | |

3.7 Existing Problems

| <i>Item</i> | <i>Description</i> |
|---|---|
| 1) Diversion Works | 1. Damage protection dike; needs repair and Construction of additional protection dike. 2. Heavy Siltation At upstream part of Diversion Dam |
| 2) Canal and Structures | 1. Silted and eroded canal: needs protection works and canal lining; damage canal structures: needs new steel gates for turn-outs |
| 3) Drainage Canal | 1. Rehabilitation of Drainage canal which needs desilting and protection works |
| 4) Other Project Facilities (road, bridge, flood dike, building, etc) | 1. Damage service roads, protection dike; needs repair |
| 5) Water Management and O&M Activities | 1. No steel gates 2. Increase rate of maintenance remunerations |
| 6) Status of NIS and IA Management | Status Type F evaluated by Radar Graph (no matured status). Specific problems are: 1. Medium tenancy ratio at 31% 2. Low cropping intensity during dry season at 36% |
| 7) Watershed Management | 1. Deteriorated canal structures 2. Unlined portion at main canal 3. Watershed is denuded. |
| 8) Coordination with LGU and Agencies concerned | 1. Minimum coordination by NIA's field offices and IAs with concerned LGUs and other line agencies on the specific problems such as monitoring and control of illegal mechanical quarrying and watershed management |
| 9) Agriculture | 1. High Cost of production 2. Inadequate number of credit institution to serve the farmers at a low interest rate. 3. Drying facilities are lacking particularly during the time of harvesting the wet season crops 4. High prices of agricultural inputs. |

4. Proposed Rehabilitation Plan

4.1 Agricultural Development Plan

| <i>Item</i> | <i>Description</i> | | | |
|-------------------------------|--------------------|---------------------|---------------------|---------------|
| | <i>Wet Season</i> | <i>Dry Season-1</i> | <i>Dry Season-2</i> | <i>Annual</i> |
| Cropping schedule | | | | |
| 1) Type of Crops | Paddy | Paddy | - | - |
| 2) Cropping Area (ha) | 1,423 | 350 | - | - |
| 3) Target Unit Yield (ton/ha) | 4.50 | 3.90 | - | - |
| 3) Total Production (ton) | 6,404 | 1,365 | - | 8,865 |

4.2 Civil Works

| <i>Item</i> | <i>Description</i> |
|-----------------------------|---|
| 1) Diversion Works | 1. Provision of additional protection dike |
| 2) Canal Structures | 1. Repair of deteriorated canal structures - 30 units |
| 3) Canalization | 1. Provision of canal lining – 35.9 kms 2. Realignment of canal 3. Construction of new canal |
| 4) Drainage Structures | 1. Repair of drainage structure – 1 unit |
| 5) Drainage Canalization | 1. Desilting of drainage canal – 1 kms |
| 6) Service Roads | 1. Graveling of farm to market road – 15.87 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 |
| 7) Project Facilities | Repair of field office |
| 8) O&M Facilities | Provision of mechanized tools and equipment for clearing and grubbing |
| 9) IA Supporting Facilities | |

4.3 Institutional Strengthening Program

| <i>Item</i> | <i>Description</i> |
|--|---|
| 1) Reactivation Program of FIAs/IAs and System Management Committee (ISMC) | <ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> 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 | <ol style="list-style-type: none"> 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 |

| <i>Item</i> | <i>Description</i> |
|--|--|
| | 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. Request LGUs legal actions on protection of illegal mechanical quarrying prior to the commencement of the SLRIF through the coordination activities 3. Strengthening coordination with RDC, RAFC/PAFC and LGUs on training program of watershed management 4. Strengthening coordination on establishment of monitoring and control mechanism of illegal quarrying |

4.4 Proposed Counter Schemes

| <i>Item</i> | <i>Description</i> |
|-------------|--|
| 1) DENR | 1. Reforestation 2. 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. LGU initiates training and upgrade technical skills of its engineers by inviting resource persons from the key line departments and/or national agencies (e.g. NIA, DPWH.) 2. LGUs take actions on information awareness on the Project implementation through local communication media. 3. LGU establishes a coordinating/steering committee at the provincial level to improve coordination and representation of NIA in local planning and budgeting. |

5. Cost Estimate for Initial Investment

| <i>Item</i> | <i>Description</i> | |
|--------------------------------|---|--------------------|
| 1) Direct Cost for Civil Works | A. Mobilization | Php 1.25 Million |
| | B. Protection Dikes | - |
| | C. Diversion Works | Php 6.00 Million |
| | D. Canal Structures | Php 5.13 Million |
| | E. Canalization | Php 22.75 Million |
| | F. Drainage Structures | Php 2.85 Million |
| | G. Drainage Canalization | Php 4.27 Million |
| | H. Roads | Php 2.00 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 4.60 Million |
| | M. Feasibility Studies & Detailed Engineering (2% of Direct Cost) | Php 1.25 Million |
| | Sub-total (Direct Cost) | |
| 2) Indirect Cost | A. General Engineering Supervision and Administration (3.5% of Direct Cost) | Php 2.19 Million |
| | B. NIA Management Fee (5% of Total Project Cost) | Php 3.40 Million |
| | Sub-total (Indirect Cost) | |
| 3) Total Project Cost | = 1+2 | Php 68.08 Million |
| Cost per ha. | | Php 47,846.00 /ha. |

6. Implementation Plan

| <i>Item</i> | <i>Description</i> |
|--|-------------------------------------|
| 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

| <i>Item</i> | <i>Description</i> | |
|-------------------------|---|----------------------------------|
| 1) Economic evaluation | | |
| EIRR (Base) | EIRR = 18.0 % | : Project life 50 years |
| Sensitivity Case-1 | EIRR = 16.3 % | : Cost 10% up |
| Case-2 | EIRR = 16.1 % | : Benefit 10% down |
| Case-3 | EIRR = 14.6% | : Cost 10% up + Benefit 10% down |
| B/C | 1.19 | : discount rate 15% p.a. |
| NPV | PHP 9 million | : discount rate 15% p.a. |
| 2) Financial evaluation | Farmer's net income increase = PHP 5,958 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

| <i>Item</i> | <i>Description</i> |
|-------------------------|---|
| 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 |

Economic Evaluation (EIRR)

Case-1 (Cost 10% up)

| | | | | | | | |
|---|---------------------------------|-----------------------|---------|----------|-----------|------------|--|
| Name of NIS: 0107 - Sta. Lucia - Candon | | Region: 1 | | IMO: R10 | | Ilocos Sur | |
| ERR : 16.1% | Net Present Value (Million PHP) | (15 % discount rate) | Benefit | Cost | B/C Ratio | NPV | |
| | | | 53 | 49 | 1.07 | 4 | |

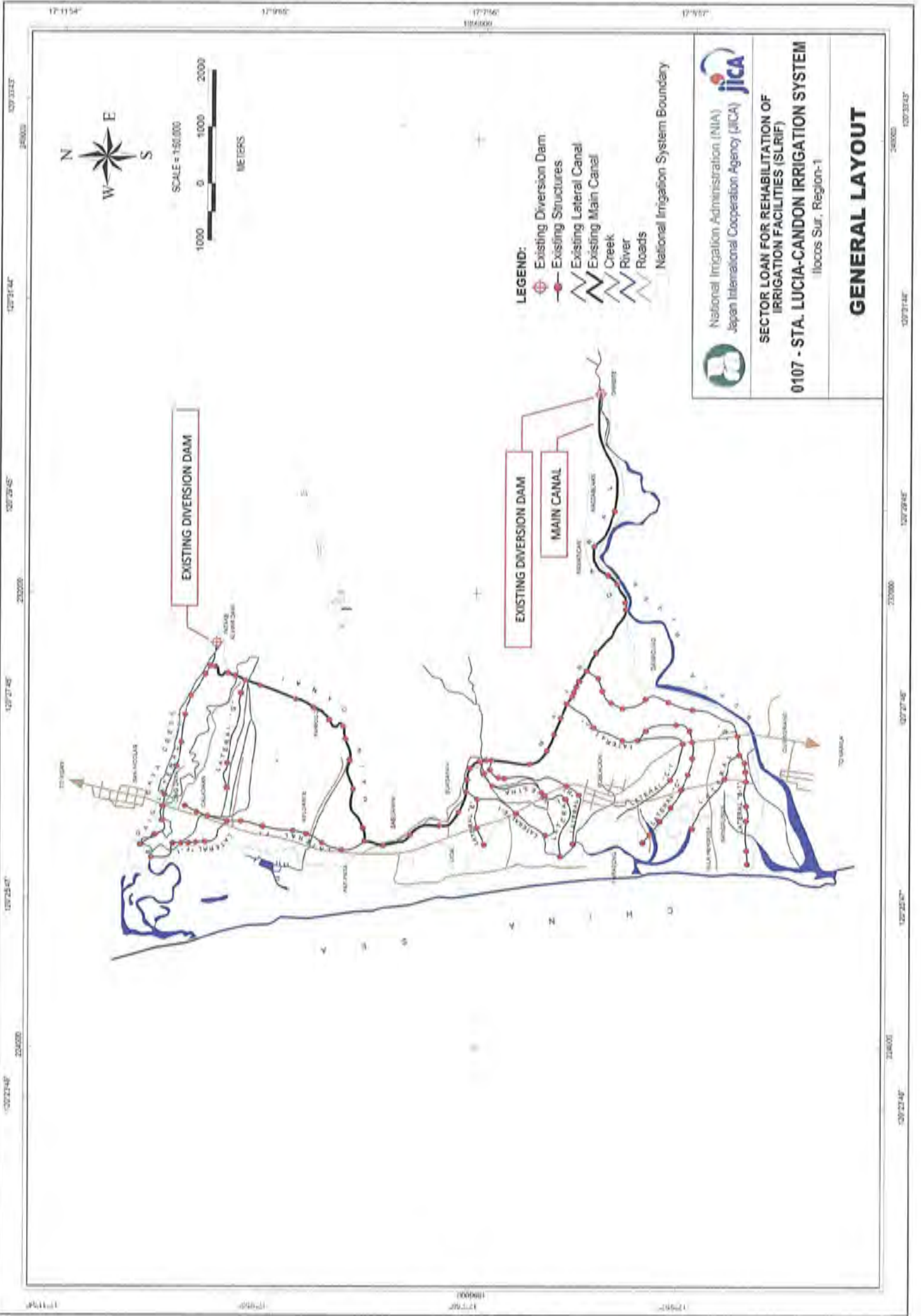
| Year In Order | Year | Economic Cost (M. PHP) | | | | Economic Benefit (M. PHP) | | | Total | Economic Benefit without 1.5% | | Net Cash Flow (M. PHP) |
|---------------|------|------------------------|---------------------------|----------------------|--------------|---------------------------|---------|--------------|-------|-------------------------------|-------|------------------------|
| | | Civil Works | Institutional Development | Engineering Services | Annual O & M | Benefit | Benefit | | | Total | | |
| | | | | | | | Benefit | without 1.5% | | | | |
| 1 | 2011 | - | - | 0.32 | - | 0.32 | - | 0.32 | - | 0.70 | 0.70 | 0.38 |
| 2 | 2012 | - | - | 0.32 | - | 0.32 | - | 0.32 | - | 1.40 | 1.40 | 1.08 |
| 3 | 2013 | 17.86 | 0.83 | 0.32 | - | 19.01 | - | 19.01 | - | 2.10 | 2.10 | -16.91 |
| 4 | 2014 | 23.81 | 1.10 | 0.32 | 0.95 | 26.19 | 1.12 | 27.31 | 1.12 | 2.80 | 3.92 | -22.27 |
| 5 | 2015 | 17.86 | 0.83 | 0.32 | 2.23 | 21.23 | 2.76 | 23.99 | 2.76 | 3.50 | 6.26 | -14.98 |
| 6 | 2016 | - | - | - | 3.18 | 3.18 | 4.20 | 7.38 | 4.20 | 4.20 | 8.40 | 5.22 |
| 7 | 2017 | - | - | - | 3.18 | 3.18 | 4.53 | 7.71 | 4.53 | 4.90 | 9.43 | 6.25 |
| 8 | 2018 | - | - | - | 3.18 | 3.18 | 4.67 | 8.35 | 4.67 | 5.60 | 10.27 | 7.09 |
| 9 | 2019 | - | - | - | 3.18 | 3.18 | 4.67 | 9.03 | 4.67 | 6.30 | 10.97 | 7.79 |
| 10 | 2020 | - | - | - | 3.18 | 3.18 | 4.67 | 9.71 | 4.67 | 7.00 | 11.67 | 8.49 |
| 11 | 2021 | - | - | - | 3.18 | 3.18 | 4.67 | 10.40 | 4.67 | 7.70 | 12.37 | 9.19 |
| 12 | 2022 | - | - | - | 3.18 | 3.18 | 4.67 | 11.10 | 4.67 | 8.40 | 13.07 | 9.89 |
| 13 | 2023 | - | - | - | 3.18 | 3.18 | 4.67 | 11.80 | 4.67 | 9.10 | 13.77 | 10.59 |
| 14 | 2024 | - | - | - | 3.18 | 3.18 | 4.67 | 12.50 | 4.67 | 9.80 | 14.47 | 11.29 |
| 15 | 2025 | - | - | - | 3.18 | 3.18 | 4.67 | 13.20 | 4.67 | 10.50 | 15.17 | 11.99 |
| 16 | 2026 | - | - | - | 3.18 | 3.18 | 4.67 | 13.90 | 4.67 | 11.20 | 15.87 | 12.69 |
| 17 | 2027 | - | - | - | 3.18 | 3.18 | 4.67 | 14.60 | 4.67 | 11.90 | 16.57 | 13.39 |
| 18 | 2028 | - | - | - | 3.18 | 3.18 | 4.67 | 15.30 | 4.67 | 12.60 | 17.27 | 14.09 |
| 19 | 2029 | - | - | - | 3.18 | 3.18 | 4.67 | 16.00 | 4.67 | 13.30 | 17.97 | 14.79 |
| 20 | 2030 | - | - | - | 3.18 | 3.18 | 4.67 | 16.70 | 4.67 | 14.00 | 18.67 | 15.49 |
| 21 | 2031 | - | - | - | 3.18 | 3.18 | 4.67 | 17.40 | 4.67 | 14.70 | 19.37 | 16.19 |
| 22 | 2032 | - | - | - | 3.18 | 3.18 | 4.67 | 18.10 | 4.67 | 15.40 | 20.07 | 16.89 |
| 23 | 2033 | - | - | - | 3.18 | 3.18 | 4.67 | 18.80 | 4.67 | 16.10 | 20.77 | 17.59 |
| 24 | 2034 | - | - | - | 3.18 | 3.18 | 4.67 | 19.50 | 4.67 | 16.80 | 21.47 | 18.29 |
| 25 | 2035 | - | - | - | 3.18 | 3.18 | 4.67 | 20.20 | 4.67 | 17.50 | 22.17 | 18.99 |
| 26 | 2036 | - | - | - | 3.18 | 3.18 | 4.67 | 20.90 | 4.67 | 18.20 | 22.87 | 19.69 |
| 27 | 2037 | - | - | - | 3.18 | 3.18 | 4.67 | 21.60 | 4.67 | 18.90 | 23.57 | 20.39 |
| 28 | 2038 | - | - | - | 3.18 | 3.18 | 4.67 | 22.30 | 4.67 | 19.60 | 24.27 | 21.09 |
| 29 | 2039 | - | - | - | 3.18 | 3.18 | 4.67 | 23.00 | 4.67 | 20.30 | 24.97 | 21.79 |
| 30 | 2040 | - | - | - | 3.18 | 3.18 | 4.67 | 23.70 | 4.67 | 21.00 | 25.67 | 22.49 |
| 31 | 2041 | - | - | - | 3.18 | 3.18 | 4.67 | 24.40 | 4.67 | 21.70 | 26.37 | 23.19 |
| 32 | 2042 | - | - | - | 3.18 | 3.18 | 4.67 | 25.10 | 4.67 | 22.40 | 27.07 | 23.89 |
| 33 | 2043 | - | - | - | 3.18 | 3.18 | 4.67 | 25.80 | 4.67 | 23.10 | 27.77 | 24.59 |
| 34 | 2044 | - | - | - | 3.18 | 3.18 | 4.67 | 26.50 | 4.67 | 23.80 | 28.47 | 25.29 |
| 35 | 2045 | - | - | - | 3.18 | 3.18 | 4.67 | 27.20 | 4.67 | 24.50 | 29.17 | 25.99 |
| 36 | 2046 | - | - | - | 3.18 | 3.18 | 4.67 | 27.90 | 4.67 | 25.20 | 29.87 | 26.69 |
| 37 | 2047 | - | - | - | 3.18 | 3.18 | 4.67 | 28.60 | 4.67 | 25.90 | 30.57 | 27.39 |
| 38 | 2048 | - | - | - | 3.18 | 3.18 | 4.67 | 29.30 | 4.67 | 26.60 | 31.27 | 28.09 |
| 39 | 2049 | - | - | - | 3.18 | 3.18 | 4.67 | 30.00 | 4.67 | 27.30 | 31.97 | 28.79 |
| 40 | 2050 | - | - | - | 3.18 | 3.18 | 4.67 | 30.70 | 4.67 | 28.00 | 32.67 | 29.49 |
| 41 | 2051 | - | - | - | 3.18 | 3.18 | 4.67 | 31.40 | 4.67 | 28.70 | 33.37 | 30.19 |
| 42 | 2052 | - | - | - | 3.18 | 3.18 | 4.67 | 32.10 | 4.67 | 29.40 | 34.07 | 30.89 |
| 43 | 2053 | - | - | - | 3.18 | 3.18 | 4.67 | 32.80 | 4.67 | 30.10 | 34.77 | 31.59 |
| 44 | 2054 | - | - | - | 3.18 | 3.18 | 4.67 | 33.50 | 4.67 | 30.80 | 35.47 | 32.29 |
| 45 | 2055 | - | - | - | 3.18 | 3.18 | 4.67 | 34.20 | 4.67 | 31.50 | 36.17 | 32.99 |
| 46 | 2056 | - | - | - | 3.18 | 3.18 | 4.67 | 34.90 | 4.67 | 32.20 | 36.87 | 33.69 |
| 47 | 2057 | - | - | - | 3.18 | 3.18 | 4.67 | 35.60 | 4.67 | 32.90 | 37.57 | 34.39 |
| 48 | 2058 | - | - | - | 3.18 | 3.18 | 4.67 | 36.30 | 4.67 | 33.60 | 38.27 | 35.09 |
| 49 | 2059 | - | - | - | 3.18 | 3.18 | 4.67 | 37.00 | 4.67 | 34.30 | 38.97 | 35.79 |
| 50 | 2060 | - | - | - | 3.18 | 3.18 | 4.67 | 37.70 | 4.67 | 35.00 | 39.67 | 36.49 |

Table 0107 - Sta. Lucia - Candon

Basic Case

| | | | | | | | |
|---|---------------------------------|-----------------------|---------|----------|-----------|------------|--|
| Name of NIS: 0107 - Sta. Lucia - Candon | | Region: 1 | | IMO: R10 | | Ilocos Sur | |
| ERR : 17.8% | Net Present Value (Million PHP) | (15 % discount rate) | Benefit | Cost | B/C Ratio | NPV | |
| | | | 53 | 45 | 1.18 | 8 | |




| Year In Order | Year | Economic Cost (M. PHP) | | | | Economic Benefit (M. PHP) | | | Total | Economic Benefit without 1.5% | | Net Cash Flow (M. PHP) |
|---------------|------|------------------------|---------------------------|----------------------|--------------|---------------------------|---------|--------------|-------|-------------------------------|--------|------------------------|
| | | Civil Works | Institutional Development | Engineering Services | Annual O & M | Benefit | Benefit | | | Total | | |
| | | | | | | | Benefit | without 1.5% | | | | |
| 1 | 2011 | 0.29 | - | 0.29 | - | 0.29 | - | 0.29 | 0.70 | 0.70 | 0.41 | |
| 2 | 2012 | 0.29 | - | 0.29 | - | 0.29 | - | 0.29 | 1.40 | 1.40 | 1.11 | |
| 3 | 2013 | 16.23 | 0.75 | 0.29 | - | 17.28 | - | 17.28 | 2.10 | 2.10 | -15.18 | |
| 4 | 2014 | 21.64 | 1.00 | 0.29 | 0.87 | 23.81 | 1.12 | 24.93 | 2.80 | 3.92 | -19.89 | |
| 5 | 2015 | 16.23 | 0.75 | 0.29 | 2.02 | 19.30 | 2.76 | 22.06 | 3.50 | 6.26 | -13.05 | |
| 6 | 2016 | - | - | - | 2.89 | 2.89 | 4.20 | 7.09 | 4.20 | 4.20 | 8.40 | 5.51 |
| 7 | 2017 | - | - | - | 2.89 | 2.89 | 4.53 | 7.42 | 4.53 | 4.90 | 9.43 | 6.54 |
| 8 | 2018 | - | - | - | 2.89 | 2.89 | 4.67 | 8.08 | 4.67 | 5.60 | 10.27 | 7.38 |
| 9 | 2019 | - | - | - | 2.89 | 2.89 | 4.67 | 8.78 | 4.67 | 6.30 | 10.97 | 8.08 |
| 10 | 2020 | - | - | - | 2.89 | 2.89 | 4.67 | 9.48 | 4.67 | 7.00 | 11.67 | 8.78 |
| 11 | 2021 | - | - | - | 2.89 | 2.89 | 4.67 | 10.18 | 4.67 | 7.70 | 12.37 | 9.48 |
| 12 | 2022 | - | - | - | 2.89 | 2.89 | 4.67 | 10.88 | 4.67 | 8.40 | 13.07 | 10.18 |
| 13 | 2023 | - | - | - | 2.89 | 2.89 | 4.67 | 11.58 | 4.67 | 9.10 | 13.77 | 10.88 |
| 14 | 2024 | - | - | - | 2.89 | 2.89 | 4.67 | 12.28 | 4.67 | 9.80 | 14.47 | 11.58 |
| 15 | 2025 | - | - | - | 2.89 | 2.89 | 4.67 | 12.98 | 4.67 | 10.50 | 15.17 | 12.28 |
| 16 | 2026 | - | - | - | 2.89 | 2.89 | 4.67 | 13.68 | 4.67 | 11.20 | 15.87 | 12.98 |
| 17 | 2027 | - | - | - | 2.89 | 2.89 | 4.67 | 14.38 | 4.67 | 11.90 | 16.57 | 13.68 |
| 18 | 2028 | - | - | - | 2.89 | 2.89 | 4.67 | 15.08 | 4.67 | 12.60 | 17.27 | 14.38 |
| 19 | 2029 | - | - | - | 2.89 | 2.89 | 4.67 | 15.78 | 4.67 | 13.30 | 17.97 | 15.08 |
| 20 | 2030 | - | - | - | 2.89 | 2.89 | 4.67 | 16.48 | 4.67 | 14.00 | 18.67 | 15.78 |
| 21 | 2031 | - | - | - | 2.89 | 2.89 | 4.67 | 17.18 | 4.67 | 14.70 | 19.37 | 16.48 |
| 22 | 2032 | - | - | - | 2.89 | 2.89 | 4.67 | 17.88 | 4.67 | 15.40 | 20.07 | 17.18 |
| 23 | 2033 | - | - | - | 2.89 | 2.89 | 4.67 | 18.58 | 4.67 | 16.10 | 20.77 | 17.88 |
| 24 | 2034 | - | - | - | 2.89 | 2.89 | 4.67 | 19.28 | 4.67 | 16.80 | 21.47 | 18.58 |
| 25 | 2035 | - | - | - | 2.89 | 2.89 | 4.67 | 19.98 | 4.67 | 17.50 | 22.17 | 19.28 |
| 26 | 2036 | - | - | - | 2.89 | 2.89 | 4.67 | 20.68 | 4.67 | 18.20 | 22.87 | 19.98 |
| 27 | 2037 | - | - | - | 2.89 | 2.89 | 4.67 | 21.38 | 4.67 | 18.90 | 23.57 | 20.68 |
| 28 | 2038 | - | - | - | 2.89 | 2.89 | 4.67 | 22.08 | 4.67 | 19.60 | 24.27 | 21.38 |
| 29 | 2039 | - | - | - | 2.89 | 2.89 | 4.67 | 22.78 | 4.67 | 20.30 | 24.97 | 22.08 |
| 30 | 2040 | - | - | - | 2.89 | 2.89 | 4.67 | 23.48 | 4.67 | 21.00 | 25.67 | 22.78 |
| 31 | 2041 | - | - | - | 2.89 | 2.89 | 4.67 | 24.18 | 4.67 | 21.70 | 26.37 | 23.48 |
| 32 | 2042 | - | - | - | 2.89 | 2.89 | 4.67 | 24.88 | 4.67 | 22.40 | 27.07 | 24.18 |
| 33 | 2043 | - | - | - | 2.89 | 2.89 | 4.67 | 25.58 | 4.67 | 23.10 | 27.77 | 24.88 |
| 34 | 2044 | - | - | - | 2.89 | 2.89 | 4.67 | 26.28 | 4.67 | 23.80 | 28.47 | 25.58 |
| 35 | 2045 | - | - | - | 2.89 | 2.89 | 4.67 | 26.98 | 4.67 | 24.50 | 29.17 | 26.28 |
| 36 | 2046 | - | - | - | 2.89 | 2.89 | 4.67 | 27.68 | 4.67 | 25.20 | 29.87 | 26.98 |
| 37 | 2047 | - | - | - | 2.89 | 2.89 | 4.67 | 28.38 | 4.67 | 25.90 | 30.57 | 27.68 |
| 38 | 2048 | - | - | - | 2.89 | 2.89 | 4.67 | 29.08 | 4.67 | 26.60 | 31.27 | 28.38 |
| 39 | 2049 | - | - | - | 2.89 | 2.89 | 4.67 | 29.78 | 4.67 | 27.30 | 31.97 | 29.08 |
| 40 | 2050 | - | - | - | 2.89 | 2.89 | 4.67 | 30.48 | 4.67 | 28.00 | 32.67 | 29.78 |
| 41 | 2051 | - | - | - | 2.89 | 2.89 | 4.67 | 31.18 | 4.67 | 28.70 | 33.37 | 30.48 |
| 42 | 2052 | - | - | - | 2.89 | 2.89 | 4.67 | 31.88 | 4.67 | 29.40 | 34.07 | 31.18 |
| 43 | 2053 | - | - | - | 2.89 | 2.89 | 4.67 | 32.58 | 4.67 | 30.10 | 34.77 | 31.88 |
| 44 | 2054 | - | - | - | 2.89 | 2.89 | 4.67 | 33.28 | 4.67 | 30.80 | 35.47 | 32.58 |
| 45 | 2055 | - | - | - | 2.89 | 2.89 | 4.67 | 33.98 | 4.67 | 31.50 | 36.17 | 33.28 |
| 46 | 2056 | - | - | - | 2.89 | 2.89 | 4.67 | 34.68 | 4.67 | 32.20 | 36.87 | 33.98 |
| 47 | 2057 | - | - | - | 2.89 | 2.89 | 4.67 | 35.38 | 4.67 | 32.90 | 37.57 | 34.68 |
| 48 | 2058 | - | - | - | 2.89 | 2.89 | 4.67 | 36.08 | 4.67 | 33.60 | 38.27 | 35.38 |
| 49 | 2059 | - | - | - | 2.89 | 2.89 | 4.67 | 36.78 | 4.67 | 34.30 | 38.97 | 36.08 |
| 50 | 2060 | - | - | - | 2.89 | 2.89 | 4.67 | 37.48 | 4.67 | 35 | | |



JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities




Photograph of Irrigation Facilities

NIS name: Sta Lucia-Candon (Region 1)

| Location / Facility | Photograph | Comments |
|--|--|---|
| Diversion Dam of STA. LUCIA – CANDON NIS |  | Upstream of intake Showing the river embankment which need additional protection work |
| Diversion Dam of STA. LUCIA – CANDON NIS |  | It needs additional Protection Works at the left embankment of dam just after the apron which serves as flood control |
| Diversion Dam of STA. LUCIA – CANDON NIS |  | Sluiceway of Diversion Work and at the left is the river which needs river channeling to divert water to the intake |

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities

Photograph of Irrigation Facilities*NIS name:* Sta Lucia-Candon (Region 1)

| <i>Location/ Facility</i> | <i>Photograph</i> | <i>Comments</i> |
|---|--|---|
| INTAKE of Diversion Dam of STA. LUCIA – CANDON NIS |  | Intake showing Mechanize steel Gate, Proposed construction of concrete shed To protect from Rapid deterioration |
| Diversion Dam of STA. LUCIA – CANDON NIS |  | Shown on picture Is the IS-IMO Division Manager showing portion of river embankment which needs additional protection work to Japanese Consultant |
| STA.LUCIA CANDON NIS |  | Lateral canal of Sta. Lucia- Candon NIS which needs desilting and additional canal lining |

**THE REPUBLIC OF PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION**

**Sector Loan on
Rehabilitation of Irrigation Facilities**

NIS SUMMARY REPORT

0108
Tagudin RIS
Region 1
Ilocos Sur 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**

| <i>Item</i> | <i>Description</i> | |
|---|--|---|
| 1) Name of NIS | Tagudin RIS | Code: 0108 |
| 2) Location | Region | Region 1 |
| | Province | Ilocos Sur |
| | Municipality | Tagudin, Suyo, Sta. Cruz |
| | Distance | 93 kms from Vigan City |
| 3) Type of Water Source | Water Source | Chico River |
| | Type | Diversion Dam (33.00 m wide, 2.15 m high) Ogee Type |
| 4) Area | Service Area | 1,400 ha |
| | FUSA | 1,253 ha |
| 5) Beneficiary Farmers | 2,590 farmers | Average paddy field cultivating size = 2.09 ha per farmer |
| 6) Irrigator's Association | IAs established = 6 FIA established = 1 in 2008 | |
| 7) Features of NIS and Necessity of the project | To divert water from the intake to the utmost part of irrigable area in order to increase food production. | |
| 8) Outline of the Proposed Project | <p>A. Engineering</p> <ol style="list-style-type: none"> 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 <p>B. Institutional Strengthening Program</p> <p>B.1 Basic Program</p> <ol style="list-style-type: none"> 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 <p>B.2 Specific Program to strengthen institutional mechanism together with LGUs</p> <ol style="list-style-type: none"> 1. Monitoring and control of illegal mechanical quarrying 2. Improvement of watershed management | |
| 9) Proposed Project Component | <p>A. Engineering</p> <ol style="list-style-type: none"> 1. Construction of civil works for rehabilitation of diversion works, canal system, drainage system, roads, and IMT support facilities. | |

| | | | |
|---|--|--------------------|------------------------------|
| | B. Institutional Strengthening Program | | |
| | <ol style="list-style-type: none"> 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 108.08 Million |
| | - Civil Works | PHP 101.82 Million | |
| | - Institutional Development | PHP 4.10 Million | |
| | - Engineering Services | PHP 2.16 Million | |
| | 2. Indirect cost | | PHP 9.67 Million |
| | Total Project Cost (1+2) | | PHP 117.75 Million |
| | Cost per ha | | PHP 93,975.00 per ha. |
| 11) Project Benefit | <ol style="list-style-type: none"> 1. To increase paddy production by 612 tons/year 2. To increase farmers' net income to PHP67,282.00/ha/year 3. To establish functional and self-reliant IAs 4. To improve performance of NIS | | |
| 12) Project Justification | EIRR = 22.6 %, B/C = 1.51 (discount rate 15%) | | |

2. Project History (Construction/Rehabilitation)

| Year | Description |
|------|---|
| 1922 | Intake Structure, 1.3 km. diversion tunnel was constructed during the American Regime and continued by the Japanese and thereafter by NIA |

3. Present Condition

3.1 Natural Conditions

| Item | Description |
|------------------------------|--|
| 1) Annual Rainfall | 2,205 mm |
| 2) Seasons | Wet season: May to November Dry season: December to April |
| 3) Dominant Soil in NIS Area | Clay Loam |
| 4) Topography | Flat |

3.2 Socio-economy (Region/Province)

| Item | Description |
|---------------------------|--|
| 1) GRDP | PHP 185,566 million (Year 2007), Per Capita GRDP = PHP 38,063 per year |
| 2) Population | 632,255 (province) |
| 3) Population Growth Rate | 0.86 % per year (province) |
| 4) Labor Force | 3,183,000 (region) |
| 5) Poverty Population | 32.6 % to total population (province) |

3.3 Present Agriculture in NIS

| <i>Item</i> | <i>Description</i> | | | | | | |
|---------------------------------|---|------------------|----------|---------------------|-------|---------|-------|
| 1) Farm Household in NIS | Total beneficiaries | 2,590 households | | | | | |
| | Land owners | 1,192 households | (46.0 %) | | | | |
| | Tenant farmers | 1,398 households | (54.0 %) | | | | |
| 2) Paddy Field Size in NIS | 0.48 ha per household (FUSA/Total beneficiaries as of 2008) | | | | | | |
| 3) Present Land Use in NIS | Paddy field planted | 1,253 ha | 89.5 % | As of 2008 | | | |
| | Paddy field not planted | 0 ha | 0.0 % | 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 | 147 ha | 10.5 % | No data in response | | | |
| 4) Paddy Field in FUSA (ha) | 1,253 | | | | | | |
| 5) Paddy Cropped Area (ha) | 2004 | 2005 | 2006 | 2007 | 2008 | Average | |
| | Wet Season | 1,253 | 1,253 | 1,253 | 1,253 | 1,253 | 1,253 |
| | Dry Season | 1,020 | 1,012 | 1,006 | 1,062 | 1,069 | 1,034 |
| 6) Cropping Intensity (%) | 2004 | 2005 | 2006 | 2007 | 2008 | Average | |
| | (per year) | 181 | 181 | 180 | 185 | 185 | 183 |
| 7) Unit Yield of Paddy (ton/ha) | 2004 | 2005 | 2006 | 2007 | 2008 | Average | |
| | Wet Season | 4.32 | 4.96 | 4.42 | 4.60 | 4.35 | 4.53 |
| | Dry Season | 3.75 | 4.51 | 4.93 | 4.47 | 5.14 | 4.56 |
| 8) Paddy Production (ton) | 2004 | 2005 | 2006 | 2007 | 2008 | Average | |
| | Wet Season | 5,413 | 6,209 | 5,532 | 5,764 | 5,451 | 5,674 |
| | Dry Season | 3,820 | 4,559 | 4,955 | 4,747 | 5,489 | 4,714 |

3.4 Water Resources

| <i>Item</i> | <i>Description</i> |
|------------------------------|------------------------|
| 1) Name of Rivers | Chico River |
| 2) Catchment Area at Dam | 230 km ² |
| 3) Ave. River Discharge | 3.28 m ³ /s |
| 4) Ave. Dry Season Discharge | 2.14 m ³ /s |
| 5) Diverted Intake Discharge | 1.64 m ³ /s |
| 6) Water Requirement | 2.26 m ³ /s |
| 7) Sedimentation | High |

3.5 Existing Irrigation System

| <i>Item</i> | <i>Description</i> |
|------------------------|---|
| 1) Diversion Dam | Overflow crest width <u>33.00</u> m, Dam height <u>2.15</u> m |
| 2) Main Canal | Total length <u>2.50</u> km Tunnel <u>1.30</u> km Open canal <u>1.20</u> km |
| 3) Lateral Canals | Total length <u>21.218</u> km (Lined portion <u>2.87</u> km) |
| 4) On-farm facilities | Total length <u>12.00</u> km Turn-outs = <u>83</u> units |
| 5) Drainage Canal | Total length <u>16.00</u> kms |
| 6) Canal Structures | No. = <u>133</u> units |
| 7) Drainage Structures | No. = <u>16</u> units |
| 8) Farm roads | Total length <u>22.50</u> km |

3.6 Institutions for O&M of NIS

| <i>Item</i> | <i>Description</i> | | | | | |
|--|--------------------------------|------|------|------|------|---------|
| 1) Regional Irrigation Office | Name: Region 1 - Ilocos Region | | | | | |
| 2) IMO | Name: Ilocos Sur IMO | | | | | |
| Staff in 2009 | Total number of staff: 43 | | | | | |
| 3) Irrigator' Association (IA) | 2004 | 2005 | 2006 | 2007 | 2008 | Average |
| Number of FIA (nos) | | | | | 1 | |
| Number of IA (nos) | | | | | 6 | |
| Number of TSAG (nos) | 35 | 35 | 35 | 60 | 60 | 45 |
| Functionality of IA | 0 | 0 | 89.0 | 86.9 | 95.7 | 90.5 |
| Collection of ISF (wet, %) | 0 | 0 | 0 | 30 | 0 | 30 |
| Collection of ISF (dry, %) | 0 | 0 | 0 | 0 | 39 | 39 |
| 4) NIS Category based on IA 2008 O&M Contract (NIA-IA) | No. of IA | | | | | |
| Category A | 2 | | | | | |
| Category B | 4 | | | | | |
| Category C | 0 | | | | | |

3.7 Existing Problems

| <i>Item</i> | <i>Description</i> |
|---|--|
| 1) Diversion Works | 1. There is a need to construct Another Diversion work @ Dalisis to divert water to existing Diversion dam downstream 2. Needs protection works for flood protection & erosions |
| 2) Canal and Structures | 1. Silted Canal & Canal Structures. 2. Canal seepage & Canal erosions 3. Worn out structures and steelgate |
| 3) Drainage Canal | 1. Silted & eroded drainage canal |
| 4) Other Project Facilities (road, bridge, flood dike, building, etc) | 1. Damaged/washed out & Unserviceable access/service roads. |
| 5) Water Management and O&M Activities | 1. Worn out steel gates 2. Increase rate of maintenance remunerations |
| 6) Status of NIS and IA Management | Status Type Ab evaluated by Radar Graph. Specific problems are: 1. Low ISF collection efficiency during wet and dry seasons at 50% for both seasons 2. Medium ratio of membership at 70% 3. Low cropping intensity during dry and wet seasons at 25% and 52%, respectively |
| 7) Watershed Management | 1. Deteriorated canal lining 2. Damaged canal structure 3. Watershed is denuded |
| 8) Coordination with LGU and Agencies concerned | 1. Minimum coordination by NIA's field offices and IAs with concerned LGUs and other line agencies on the specific problems such as monitoring and control of illegal mechanical quarrying and watershed management |
| 9) Agriculture | 1. High Cost of production Insufficient rate of utilization of agricultural inputs due to farmer's incapacity to buy the required quantity. 2. Inadequate number of post harvest facilities particularly drying. This condition forces the farmers to sell their palay just after the harvest at lower prices. 3. Poor condition of the farm to market roads. |

4. Proposed Rehabilitation Plan

4.1 Agricultural Development Plan

| Item | Description | | | |
|-------------------------------|-------------|--------------|--------------|--------|
| | Wet Season | Dry Season-1 | Dry Season-2 | Annual |
| Cropping schedule | | | | |
| 1) Type of Crops | Paddy | Paddy | - | - |
| 2) Cropping Area (ha) | 1,253 | 1,070 | - | - |
| 3) Target Unit Yield (ton/ha) | 4.95 | 5.00 | - | - |
| 3) Total Production (ton) | 6,202 | 5,350 | - | 11,915 |

4.2 Civil Works

| Item | Description |
|---------------------------|---|
| 1) Diversion Works | 1. Additional Protection work, upstream and downstream of Existing diversion dam, construction of Diversion dam @ Dalisis |
| 2) Canal Structures | 1. Needs repair – 30 units |
| 3) Canalization | 1. Needs desilting and canal lining – 6.81 kms 2. Realignment of canal 3. Construction of new canal |
| 4) Drainage Structures | 1. Improvement of drainage structures – 1 unit |
| 5) Drainage Canalization | 1. Improvement of drainage canal – 1 km |
| 6) Service Roads | 1. Graveling of farm to market road – 12 km |
| 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) | <ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> 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 | <ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> a) Workshop on Trouble Shooting of NIS and FIAs/ISs' Management b) Provision of work space for ISMC including office facilities |

| <i>Item</i> | <i>Description</i> |
|--|--|
| 3) NIA Institutional Strengthening Program | <ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> 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 | <ol style="list-style-type: none"> 1. Strengthening coordination with RDC, RAFC/PAFC and LGUs concerned through works shop on dissemination of the SLRIF to these organizations. 2. Request LGUs legal actions on protection of illegal mechanical quarrying prior to the commencement of the SLRIF through the coordination activities 3. Strengthening coordination with RDC, RAFC/PAFC and LGUs on training program of watershed management 4. Strengthening coordination on establishment of monitoring and control mechanism of illegal quarrying |

4.4 Proposed Counter Schemes

| <i>Item</i> | <i>Description</i> |
|-------------|--|
| 1) DENR | <ol style="list-style-type: none"> 1. Reforestation 2. 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 | <ol style="list-style-type: none"> 1. LGU initiates training and upgrade technical skills of its engineers by inviting resource persons from the key line departments and/or national agencies (e.g. NIA, DPWH.) 2. LGUs take actions on information awareness on the Project implementation through local communication media. 3. LGU establishes a coordinating/steering committee at the provincial level to improve coordination and representation of NIA in local planning and budgeting. |

5. Cost Estimate for Initial Investment

| <i>Item</i> | <i>Description</i> | |
|--------------------------------|---|--------------------|
| 1) Direct Cost for Civil Works | A. Mobilization | Php 2.16 Million |
| | B. Protection Dikes | - |
| | C. Diversion Works | Php 33.86 Million |
| | D. Canal Structures | Php 8.46 Million |
| | E. Canalization | Php 29.63 Million |
| | F. Drainage Structures | Php 2.51 Million |
| | G. Drainage Canalization | Php 3.76 Million |
| | H. Roads | Php 9.31 Million |
| | I. On-Farm Facilities/T.O. Gates | Php 0.88 Million |
| | J. IMT Support Facilities | Php 10.00 Million |
| | K. IMT GIS Database | Php 1.25 Million |
| | L. Institutional Development (5% of Direct Cost) | Php 4.10 Million |
| | M. Feasibility Studies & Detailed Engineering (2% of Direct Cost) | Php 2.16 Million |
| | Sub-total (Direct Cost) | Php 108.08 Million |

| | | | |
|-----------------------|---|-----|----------------|
| 2) Indirect Cost | A. General Engineering Supervision and Administration (3.5% of Direct Cost) | Php | 3.78 Million |
| | B. NIA Management Fee (5% of Total Project Cost) | Php | 5.89 Million |
| | Sub-total (Indirect Cost) | Php | 9.67 Million |
| 3) Total Project Cost | = 1+ 2 | Php | 117.75 Million |
| Cost per ha. | | Php | 93,975.00 /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 = 22.6 % : Project life 50 years |
| Sensitivity Case-1 | EIRR = 20.5% : Cost 10% up |
| Case-2 | EIRR = 20.3 % : Benefit 10% down |
| Case-3 | EIRR = 18.5% : Cost 10% up + Benefit 10% down |
| B/C | 1.51 : discount rate 15% p.a. |
| NPV | PHP 35 million : discount rate 15% p.a. |
| 2) Financial evaluation | Farmer's net income increase = PHP 27,360 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 0108 - Tagudin Economic Evaluation (EIRR)

Basic Case

Case-1 (Cost 10% up)

Name of MIS: 0108 - Tagudin Region: IMO:RIO:Loco:Sur

| EIRR : 22.6% | | Net Present Value (Million PHP) | | Benefit | | Cost | | B/C Ratio | | NPV | |
|---------------|------|---------------------------------|---------------------------|------------------------|--------------|-------|---------------------------|-----------|-------|------------------------|--------|
| | | (15 % discount rate) | | 104 | | 69 | | 1.51 | | 35 | |
| Year In Order | Year | Civil Works | Institutional Development | Economic Cost (M. PHP) | | Total | Economic Benefit (M. PHP) | | Total | Net Cash Flow (M. PHP) | |
| | | | | Engineering Services | Annual O & M | | without 1.5% | Total | | without 1.5% | Total |
| 1 | 2011 | | | 0.53 | | 0.53 | 0.91 | 0.91 | 0.91 | 0.38 | 0.33 |
| 2 | 2012 | | | 0.53 | | 0.53 | 1.82 | 1.82 | 1.82 | 1.29 | 1.24 |
| 3 | 2013 | 29.21 | 0.68 | 0.53 | | 30.41 | 2.73 | 2.73 | 2.73 | -27.68 | -30.72 |
| 4 | 2014 | 38.94 | 0.90 | 0.53 | 0.76 | 41.13 | 3.76 | 3.64 | 7.40 | -33.74 | -37.85 |
| 5 | 2015 | 29.21 | 0.68 | 0.53 | 1.78 | 32.19 | 9.23 | 4.55 | 13.78 | -18.40 | -21.62 |
| 6 | 2016 | | | | 2.54 | 2.54 | 14.09 | 5.46 | 19.55 | 17.01 | 16.75 |
| 7 | 2017 | | | | 2.54 | 2.54 | 15.18 | 6.37 | 21.55 | 19.01 | 18.76 |
| 8 | 2018 | | | | 2.54 | 2.54 | 15.65 | 7.28 | 22.93 | 20.39 | 20.14 |
| 9 | 2019 | | | | 2.54 | 2.54 | 15.65 | 8.19 | 23.84 | 21.30 | 21.05 |
| 10 | 2020 | | | | 2.54 | 2.54 | 15.65 | 9.10 | 24.75 | 22.21 | 21.96 |
| 11 | 2021 | | | | 2.54 | 2.54 | 15.65 | 10.01 | 25.66 | 23.12 | 22.87 |
| 12 | 2022 | | | | 2.54 | 2.54 | 15.65 | 10.92 | 26.57 | 24.03 | 23.78 |
| 13 | 2023 | | | | 2.54 | 2.54 | 15.65 | 11.83 | 27.48 | 24.94 | 24.69 |
| 14 | 2024 | | | | 2.54 | 2.54 | 15.65 | 12.74 | 28.39 | 25.85 | 25.60 |
| 15 | 2025 | | | | 2.54 | 2.54 | 15.65 | 13.65 | 29.30 | 26.76 | 26.51 |
| 16 | 2026 | | | | 2.54 | 2.54 | 15.65 | 14.56 | 30.21 | 27.67 | 27.42 |
| 17 | 2027 | | | | 2.54 | 2.54 | 15.65 | 15.47 | 31.12 | 28.58 | 28.33 |
| 18 | 2028 | | | | 2.54 | 2.54 | 15.65 | 16.38 | 32.03 | 29.49 | 29.24 |
| 19 | 2029 | | | | 2.54 | 2.54 | 15.65 | 17.29 | 32.94 | 30.40 | 30.15 |
| 20 | 2030 | | | | 2.54 | 2.54 | 15.65 | 18.20 | 33.85 | 31.31 | 31.06 |
| 21 | 2031 | | | | 2.54 | 2.54 | 15.65 | 19.11 | 34.76 | 32.22 | 31.97 |
| 22 | 2032 | | | | 2.54 | 2.54 | 15.65 | 20.02 | 35.67 | 33.13 | 32.88 |
| 23 | 2033 | | | | 2.54 | 2.54 | 15.65 | 20.93 | 36.58 | 34.04 | 33.79 |
| 24 | 2034 | | | | 2.54 | 2.54 | 15.65 | 21.84 | 37.49 | 34.95 | 34.70 |
| 25 | 2035 | | | | 2.54 | 2.54 | 15.65 | 22.75 | 38.40 | 35.86 | 35.61 |
| 26 | 2036 | | | | 2.54 | 2.54 | 15.65 | 23.66 | 39.31 | 36.77 | 36.52 |
| 27 | 2037 | | | | 2.54 | 2.54 | 15.65 | 24.57 | 40.22 | 37.68 | 37.43 |
| 28 | 2038 | | | | 2.54 | 2.54 | 15.65 | 25.48 | 41.13 | 38.59 | 38.34 |
| 29 | 2039 | | | | 2.54 | 2.54 | 15.65 | 26.39 | 42.04 | 39.50 | 39.25 |
| 30 | 2040 | | | | 2.54 | 2.54 | 15.65 | 27.30 | 42.95 | 40.41 | 40.16 |
| 31 | 2041 | | | | 2.54 | 2.54 | 15.65 | 28.21 | 43.86 | 41.32 | 41.07 |
| 32 | 2042 | | | | 2.54 | 2.54 | 15.65 | 29.12 | 44.77 | 42.23 | 41.98 |
| 33 | 2043 | | | | 2.54 | 2.54 | 15.65 | 30.03 | 45.68 | 43.14 | 42.89 |
| 34 | 2044 | | | | 2.54 | 2.54 | 15.65 | 30.94 | 46.59 | 44.05 | 43.80 |
| 35 | 2045 | | | | 2.54 | 2.54 | 15.65 | 31.85 | 47.50 | 44.96 | 44.71 |
| 36 | 2046 | | | | 2.54 | 2.54 | 15.65 | 32.76 | 48.41 | 45.87 | 45.62 |
| 37 | 2047 | | | | 2.54 | 2.54 | 15.65 | 33.67 | 49.32 | 46.78 | 46.53 |
| 38 | 2048 | | | | 2.54 | 2.54 | 15.65 | 34.58 | 50.23 | 47.69 | 47.44 |
| 39 | 2049 | | | | 2.54 | 2.54 | 15.65 | 35.49 | 51.14 | 48.60 | 48.35 |
| 40 | 2050 | | | | 2.54 | 2.54 | 15.65 | 36.40 | 52.05 | 49.51 | 49.26 |
| 41 | 2051 | | | | 2.54 | 2.54 | 15.65 | 37.31 | 52.96 | 50.42 | 50.17 |
| 42 | 2052 | | | | 2.54 | 2.54 | 15.65 | 38.22 | 53.87 | 51.33 | 51.08 |
| 43 | 2053 | | | | 2.54 | 2.54 | 15.65 | 39.13 | 54.78 | 52.24 | 51.99 |
| 44 | 2054 | | | | 2.54 | 2.54 | 15.65 | 40.04 | 55.69 | 53.15 | 52.90 |
| 45 | 2055 | | | | 2.54 | 2.54 | 15.65 | 40.95 | 56.60 | 54.06 | 53.81 |
| 46 | 2056 | | | | 2.54 | 2.54 | 15.65 | 41.86 | 57.51 | 54.97 | 54.72 |
| 47 | 2057 | | | | 2.54 | 2.54 | 15.65 | 42.77 | 58.42 | 55.88 | 55.63 |
| 48 | 2058 | | | | 2.54 | 2.54 | 15.65 | 43.68 | 59.33 | 56.79 | 56.54 |
| 49 | 2059 | | | | 2.54 | 2.54 | 15.65 | 44.59 | 60.24 | 57.70 | 57.45 |
| 50 | 2060 | | | | 2.54 | 2.54 | 15.65 | 45.50 | 61.15 | 58.61 | 58.36 |

| EIRR : 20.5% | | Net Present Value (Million PHP) | | Benefit | | Cost | | B/C Ratio | | NPV | |
|---------------|------|---------------------------------|---------------------------|------------------------|--------------|-------|---------------------------|-----------|-------|------------------------|--------|
| | | (15 % discount rate) | | 104 | | 76 | | 1.37 | | 28 | |
| Year In Order | Year | Civil Works | Institutional Development | Economic Cost (M. PHP) | | Total | Economic Benefit (M. PHP) | | Total | Net Cash Flow (M. PHP) | |
| | | | | Engineering Services | Annual O & M | | without 1.5% | Total | | without 1.5% | Total |
| 1 | 2011 | | | 0.58 | | 0.58 | 0.91 | 0.91 | 0.91 | 0.33 | 0.33 |
| 2 | 2012 | | | 0.58 | | 0.58 | 1.82 | 1.82 | 1.82 | 1.24 | 1.24 |
| 3 | 2013 | 32.13 | 0.74 | 0.58 | | 33.45 | 2.73 | 2.73 | 2.73 | -30.72 | -30.72 |
| 4 | 2014 | 42.84 | 0.99 | 0.58 | 0.84 | 45.25 | 3.76 | 3.64 | 7.40 | -37.85 | -37.85 |
| 5 | 2015 | 32.13 | 0.74 | 0.58 | 1.96 | 35.41 | 9.23 | 4.55 | 13.78 | -21.62 | -21.62 |
| 6 | 2016 | | | | 2.79 | 2.79 | 14.09 | 5.46 | 19.55 | 16.75 | 16.75 |
| 7 | 2017 | | | | 2.79 | 2.79 | 15.18 | 6.37 | 21.55 | 18.76 | 18.76 |
| 8 | 2018 | | | | 2.79 | 2.79 | 15.65 | 7.28 | 22.93 | 20.14 | 20.14 |
| 9 | 2019 | | | | 2.79 | 2.79 | 15.65 | 8.19 | 23.84 | 21.05 | 21.05 |
| 10 | 2020 | | | | 2.79 | 2.79 | 15.65 | 9.10 | 24.75 | 21.96 | 21.96 |
| 11 | 2021 | | | | 2.79 | 2.79 | 15.65 | 10.01 | 25.66 | 22.87 | 22.87 |
| 12 | 2022 | | | | 2.79 | 2.79 | 15.65 | 10.92 | 26.57 | 23.78 | 23.78 |
| 13 | 2023 | | | | 2.79 | 2.79 | 15.65 | 11.83 | 27.48 | 24.69 | 24.69 |
| 14 | 2024 | | | | 2.79 | 2.79 | 15.65 | 12.74 | 28.39 | 25.60 | 25.60 |
| 15 | 2025 | | | | 2.79 | 2.79 | 15.65 | 13.65 | 29.30 | 26.51 | 26.51 |
| 16 | 2026 | | | | 2.79 | 2.79 | 15.65 | 14.56 | 30.21 | 27.42 | 27.42 |
| 17 | 2027 | | | | 2.79 | 2.79 | 15.65 | 15.47 | 31.12 | 28.33 | 28.33 |
| 18 | 2028 | | | | 2.79 | 2.79 | 15.65 | 16.38 | 32.03 | 29.24 | 29.24 |
| 19 | 2029 | | | | 2.79 | 2.79 | 15.65 | 17.29 | 32.94 | 30.15 | 30.15 |
| 20 | 2030 | | | | 2.79 | 2.79 | 15.65 | 18.20 | 33.85 | 31.06 | 31.06 |
| 21 | 2031 | | | | 2.79 | 2.79 | 15.65 | 19.11 | 34.76 | 31.97 | 31.97 |
| 22 | 2032 | | | | 2.79 | 2.79 | 15.65 | 20.02 | 35.67 | 32.88 | 32.88 |
| 23 | 2033 | | | | 2.79 | 2.79 | 15.65 | 20.93 | 36.58 | 33.79 | 33.79 |
| 24 | 2034 | | | | 2.79 | 2.79 | 15.65 | 21.84 | 37.49 | 34.70 | 34.70 |
| 25 | 2035 | | | | 2.79 | 2.79 | 15.65 | 22.75 | 38.40 | 35.61 | 35.61 |
| 26 | 2036 | | | | 2.79 | 2.79 | 15.65 | 23.66 | 39.31 | 36.52 | 36.52 |
| 27 | 2037 | | | | 2.79 | 2.79 | 15.65 | 24.57 | 40.22 | 37.43 | 37.43 |
| 28 | 2038 | | | | 2.79 | 2.79 | 15.65 | 25.48 | 41.13 | 38.34 | 38.34 |
| 29 | 2039 | | | | 2.79 | 2.79 | 15.65 | 26.39 | 42.04 | 39.25 | 39.25 |
| 30 | 2040 | | | | 2.79 | 2.79 | 15.65 | 27.30 | 42.95 | 40.16 | 40.16 |
| 31 | 2041 | | | | 2.79 | 2.79 | 15.65 | 28.21 | 43.86 | 41.07 | 41.07 |
| 32 | 2042 | | | | 2.79 | 2.79 | 15.65 | 29.12 | 44.77 | 41.98 | 41.98 |
| 33 | 2043 | | | | 2.79 | 2.79 | 15.65 | 30.03 | 45.68 | 42.89 | 42.89 |
| 34 | 2044 | | | | 2.79 | 2.79 | 15.65 | 30.94 | 46.59 | 43.80 | 43.80 |
| 35 | 2045 | | | | 2.79 | 2.79 | 15.65 | 31.85 | 47.50 | 44.71 | 44.71 |
| 36 | 2046 | | | | 2.79 | 2.79 | 15.65 | 32.76 | 48.41 | 45.62 | 45.62 |
| 37 | 2047 | | | | 2.79 | 2.79 | 15.65 | 33.67 | 49.32 | 46.53 | 46.53 |
| 38 | 2048 | | | | 2.79 | 2.79 | 15.65 | 34.58 | 50.23 | 47.44 | 47.44 |
| 39 | 2049 | | | | 2.79 | 2.79 | 15.65 | 35.49 | 51.14 | 48.35 | 48.35 |
| 40 | 2050 | | | | 2.79 | 2.79 | 15.65 | 36.40 | 52.05 | 49.26 | 49.26 |
| 41 | 2051 | | | | 2.79 | 2.79 | 15.65 | 37.31 | 52.96 | 50.17 | 50.17 |
| 42 | 2052 | | | | 2.79 | 2.79 | 15.65 | 38.22 | 53.87 | 51.08 | 51.08 |
| 43 | 2053 | | | | 2.79 | 2.79 | 15.65 | 39.13 | 54.78 | 51.99 | 51.99 |
| 44 | 2054 | | | | 2.79 | 2.79 | 15.65 | 40.04 | 55.69 | 52.90 | 52.90 |
| 45 | 2055 | | | | 2.79 | 2.79 | 15.65 | 40.95 | 56.60 | 53.81 | 53.81 |
| 46 | 2056 | | | | 2.79 | 2.79 | 15.65 | 41.86 | 57.51 | 54.72 | 54.72 |
| 47 | 2057 | | | | 2.79 | 2.79 | 15.65 | 42.77 | 58.42 | 55.63 | 55.63 |
| 48 | 2058 | | | | 2.79 | 2.79 | 15.65 | 43.68 | 59.33 | 56.54 | 56.54 |
| 49 | 2059 | | | | 2.79 | 2.79 | 15.65 | 44.59 | 60.24 | 57.45 | 57.45 |
| 50 | 2060 | | | | 2.79 | 2.79 | 15.65 | 45.50 | 61.15 | 58.36 | 58.36 |

Economic Evaluation (EIRR)

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

| | | | | | | | |
|-----------------------------|---------------------------------|-----------|------|-----------|-----|------------|--|
| Name of NIS: 0108 - Tagudin | | Region: 1 | | MO: R10 | | Locos: Sur | |
| EIRR : 18.5% | Net Present Value (Million PHP) | Benefit | Cost | B/C Ratio | NPV | | |
| | (- 15 % discount rate) | 93 | 76 | 1.24 | 18 | | |

| Year In Order | Year | Economic Cost (M. PHP) | | | | Economic Benefit (M. PHP) | | Total | Annual O & M | Civil Works | Institutional Development | Engineering Services | Net Cash Flow (M. PHP) |
|---------------|------|---------------------------|----------------------|----------------------|-------|---------------------------|-------|-------|--------------|-------------|---------------------------|----------------------|------------------------|
| | | Institutional Development | Engineering Services | Benefit without 1.5% | Total | | | | | | | | |
| 1 | 2011 | - | - | - | 0.58 | - | 0.58 | - | - | - | - | 0.82 | |
| 2 | 2012 | - | - | - | 0.58 | - | 0.58 | - | - | - | - | 1.64 | |
| 3 | 2013 | 32.13 | 0.74 | 0.58 | 33.45 | - | 33.45 | - | - | - | - | 2.46 | |
| 4 | 2014 | 42.84 | 0.99 | 0.58 | 45.25 | 3.38 | 48.63 | 0.84 | - | - | - | 6.66 | |
| 5 | 2015 | 32.13 | 0.74 | 0.58 | 35.41 | 8.31 | 43.72 | 1.96 | - | - | - | 12.41 | |
| 6 | 2016 | - | - | - | 2.79 | 12.68 | 15.47 | 2.79 | - | - | - | 17.59 | |
| 7 | 2017 | - | - | - | 2.79 | 13.66 | 16.45 | 2.79 | - | - | - | 19.40 | |
| 8 | 2018 | - | - | - | 2.79 | 14.09 | 16.88 | 2.79 | - | - | - | 20.64 | |
| 9 | 2019 | - | - | - | 2.79 | 14.09 | 16.88 | 2.79 | - | - | - | 21.46 | |
| 10 | 2020 | - | - | - | 2.79 | 14.09 | 16.88 | 2.79 | - | - | - | 21.46 | |
| 11 | 2021 | - | - | - | 2.79 | 14.09 | 16.88 | 2.79 | - | - | - | 21.46 | |
| 12 | 2022 | - | - | - | 2.79 | 14.09 | 16.88 | 2.79 | - | - | - | 21.46 | |
| 13 | 2023 | - | - | - | 2.79 | 14.09 | 16.88 | 2.79 | - | - | - | 21.46 | |
| 14 | 2024 | - | - | - | 2.79 | 14.09 | 16.88 | 2.79 | - | - | - | 21.46 | |
| 15 | 2025 | - | - | - | 2.79 | 14.09 | 16.88 | 2.79 | - | - | - | 21.46 | |
| 16 | 2026 | - | - | - | 2.79 | 14.09 | 16.88 | 2.79 | - | - | - | 21.46 | |
| 17 | 2027 | - | - | - | 2.79 | 14.09 | 16.88 | 2.79 | - | - | - | 21.46 | |
| 18 | 2028 | - | - | - | 2.79 | 14.09 | 16.88 | 2.79 | - | - | - | 21.46 | |
| 19 | 2029 | - | - | - | 2.79 | 14.09 | 16.88 | 2.79 | - | - | - | 21.46 | |
| 20 | 2030 | - | - | - | 2.79 | 14.09 | 16.88 | 2.79 | - | - | - | 21.46 | |
| 21 | 2031 | - | - | - | 2.79 | 14.09 | 16.88 | 2.79 | - | - | - | 21.46 | |
| 22 | 2032 | - | - | - | 2.79 | 14.09 | 16.88 | 2.79 | - | - | - | 21.46 | |
| 23 | 2033 | - | - | - | 2.79 | 14.09 | 16.88 | 2.79 | - | - | - | 21.46 | |
| 24 | 2034 | - | - | - | 2.79 | 14.09 | 16.88 | 2.79 | - | - | - | 21.46 | |
| 25 | 2035 | - | - | - | 2.79 | 14.09 | 16.88 | 2.79 | - | - | - | 21.46 | |
| 26 | 2036 | - | - | - | 2.79 | 14.09 | 16.88 | 2.79 | - | - | - | 21.46 | |
| 27 | 2037 | - | - | - | 2.79 | 14.09 | 16.88 | 2.79 | - | - | - | 21.46 | |
| 28 | 2038 | - | - | - | 2.79 | 14.09 | 16.88 | 2.79 | - | - | - | 21.46 | |
| 29 | 2039 | - | - | - | 2.79 | 14.09 | 16.88 | 2.79 | - | - | - | 21.46 | |
| 30 | 2040 | - | - | - | 2.79 | 14.09 | 16.88 | 2.79 | - | - | - | 21.46 | |
| 31 | 2041 | - | - | - | 2.79 | 14.09 | 16.88 | 2.79 | - | - | - | 21.46 | |
| 32 | 2042 | - | - | - | 2.79 | 14.09 | 16.88 | 2.79 | - | - | - | 21.46 | |
| 33 | 2043 | - | - | - | 2.79 | 14.09 | 16.88 | 2.79 | - | - | - | 21.46 | |
| 34 | 2044 | - | - | - | 2.79 | 14.09 | 16.88 | 2.79 | - | - | - | 21.46 | |
| 35 | 2045 | - | - | - | 2.79 | 14.09 | 16.88 | 2.79 | - | - | - | 21.46 | |
| 36 | 2046 | - | - | - | 2.79 | 14.09 | 16.88 | 2.79 | - | - | - | 21.46 | |
| 37 | 2047 | - | - | - | 2.79 | 14.09 | 16.88 | 2.79 | - | - | - | 21.46 | |
| 38 | 2048 | - | - | - | 2.79 | 14.09 | 16.88 | 2.79 | - | - | - | 21.46 | |
| 39 | 2049 | - | - | - | 2.79 | 14.09 | 16.88 | 2.79 | - | - | - | 21.46 | |
| 40 | 2050 | - | - | - | 2.79 | 14.09 | 16.88 | 2.79 | - | - | - | 21.46 | |
| 41 | 2051 | - | - | - | 2.79 | 14.09 | 16.88 | 2.79 | - | - | - | 21.46 | |
| 42 | 2052 | - | - | - | 2.79 | 14.09 | 16.88 | 2.79 | - | - | - | 21.46 | |
| 43 | 2053 | - | - | - | 2.79 | 14.09 | 16.88 | 2.79 | - | - | - | 21.46 | |
| 44 | 2054 | - | - | - | 2.79 | 14.09 | 16.88 | 2.79 | - | - | - | 21.46 | |
| 45 | 2055 | - | - | - | 2.79 | 14.09 | 16.88 | 2.79 | - | - | - | 21.46 | |
| 46 | 2056 | - | - | - | 2.79 | 14.09 | 16.88 | 2.79 | - | - | - | 21.46 | |
| 47 | 2057 | - | - | - | 2.79 | 14.09 | 16.88 | 2.79 | - | - | - | 21.46 | |
| 48 | 2058 | - | - | - | 2.79 | 14.09 | 16.88 | 2.79 | - | - | - | 21.46 | |
| 49 | 2059 | - | - | - | 2.79 | 14.09 | 16.88 | 2.79 | - | - | - | 21.46 | |
| 50 | 2060 | - | - | - | 2.79 | 14.09 | 16.88 | 2.79 | - | - | - | 21.46 | |

Case-2 (Benefit 10% down)

| | | | | | | | |
|-----------------------------|---------------------------------|-----------|------|-----------|-----|------------|--|
| Name of NIS: 0108 - Tagudin | | Region: 1 | | MO: R10 | | Locos: Sur | |
| EIRR : 20.3% | Net Present Value (Million PHP) | Benefit | Cost | B/C Ratio | NPV | | |
| | (- 15 % discount rate) | 93 | 69 | 1.36 | 25 | | |

| Year In Order | Year | Economic Cost (M. PHP) | | | | Economic Benefit (M. PHP) | | Total | Annual O & M | Civil Works | Institutional Development | Engineering Services | Net Cash Flow (M. PHP) |
|---------------|------|---------------------------|----------------------|----------------------|-------|---------------------------|-------|-------|--------------|-------------|---------------------------|----------------------|------------------------|
| | | Institutional Development | Engineering Services | Benefit without 1.5% | Total | | | | | | | | |
| 1 | 2011 | - | - | - | 0.53 | - | 0.53 | - | - | - | - | 0.82 | |
| 2 | 2012 | - | - | - | 0.53 | - | 0.53 | - | - | - | - | 1.64 | |
| 3 | 2013 | 29.21 | 0.68 | 0.53 | 30.41 | - | 30.41 | - | - | - | - | 2.46 | |
| 4 | 2014 | 38.94 | 0.90 | 0.53 | 41.13 | 3.38 | 44.51 | 0.76 | - | - | - | 6.66 | |
| 5 | 2015 | 29.21 | 0.68 | 0.53 | 32.19 | 8.31 | 40.50 | 1.78 | - | - | - | 12.41 | |
| 6 | 2016 | - | - | - | 2.54 | 12.68 | 15.22 | 2.54 | - | - | - | 17.59 | |
| 7 | 2017 | - | - | - | 2.54 | 13.66 | 16.20 | 2.54 | - | - | - | 19.40 | |
| 8 | 2018 | - | - | - | 2.54 | 14.09 | 16.63 | 2.54 | - | - | - | 20.64 | |
| 9 | 2019 | - | - | - | 2.54 | 14.09 | 16.63 | 2.54 | - | - | - | 21.46 | |
| 10 | 2020 | - | - | - | 2.54 | 14.09 | 16.63 | 2.54 | - | - | - | 21.46 | |
| 11 | 2021 | - | - | - | 2.54 | 14.09 | 16.63 | 2.54 | - | - | - | 21.46 | |
| 12 | 2022 | - | - | - | 2.54 | 14.09 | 16.63 | 2.54 | - | - | - | 21.46 | |
| 13 | 2023 | - | - | - | 2.54 | 14.09 | 16.63 | 2.54 | - | - | - | 21.46 | |
| 14 | 2024 | - | - | - | 2.54 | 14.09 | 16.63 | 2.54 | - | - | - | 21.46 | |
| 15 | 2025 | - | - | - | 2.54 | 14.09 | 16.63 | 2.54 | - | - | - | 21.46 | |
| 16 | 2026 | - | - | - | 2.54 | 14.09 | 16.63 | 2.54 | - | - | - | 21.46 | |
| 17 | 2027 | - | - | - | 2.54 | 14.09 | 16.63 | 2.54 | - | - | - | 21.46 | |
| 18 | 2028 | - | - | - | 2.54 | 14.09 | 16.63 | 2.54 | - | - | - | 21.46 | |
| 19 | 2029 | - | - | - | 2.54 | 14.09 | 16.63 | 2.54 | - | - | - | 21.46 | |
| 20 | 2030 | - | - | - | 2.54 | 14.09 | 16.63 | 2.54 | - | - | - | 21.46 | |
| 21 | 2031 | - | - | - | 2.54 | 14.09 | 16.63 | 2.54 | - | - | - | 21.46 | |
| 22 | 2032 | - | - | - | 2.54 | 14.09 | 16.63 | 2.54 | - | - | - | 21.46 | |
| 23 | 2033 | - | - | - | 2.54 | 14.09 | 16.63 | 2.54 | - | - | - | 21.46 | |
| 24 | 2034 | - | - | - | 2.54 | 14.09 | 16.63 | 2.54 | - | - | - | 21.46 | |
| 25 | 2035 | - | - | - | 2.54 | 14.09 | 16.63 | 2.54 | - | - | - | 21.46 | |
| 26 | 2036 | - | - | - | 2.54 | 14.09 | 16.63 | 2.54 | - | - | - | 21.46 | |
| 27 | 2037 | - | - | - | 2.54 | 14.09 | 16.63 | 2.54 | - | - | - | 21.46 | |
| 28 | 2038 | - | - | - | 2.54 | 14.09 | 16.63 | 2.54 | - | - | - | 21.46 | |
| 29 | 2039 | - | - | - | 2.54 | 14.09 | 16.63 | 2.54 | - | - | - | 21.46 | |
| 30 | 2040 | - | - | - | 2.54 | 14.09 | 16.63 | 2.54 | - | - | - | 21.46 | |
| 31 | 2041 | - | - | - | 2.54 | 14.09 | 16.63 | 2.54 | - | - | - | 21.46 | |
| 32 | 2042 | - | - | - | 2.54 | 14.09 | 16.63 | 2.54 | - | - | - | 21.46 | |
| 33 | 2043 | - | - | - | 2.54 | 14.09 | 16.63 | 2.54 | - | - | - | 21.46 | |
| 34 | 2044 | - | - | - | 2.54 | 14.09 | 16.63 | 2.54 | - | - | - | 21.46 | |
| 35 | 2045 | - | - | - | 2.54 | 14.09 | 16.63 | 2.54 | - | - | - | 21.46 | |
| 36 | 2046 | - | - | - | 2.54 | 14.09 | 16.63 | 2.54 | - | - | - | 21.46 | |
| 37 | 2047 | - | - | - | 2.54 | 14.09 | 16.63 | 2.54 | - | - | - | 21.46 | |
| 38 | 2048 | - | - | - | 2.54 | 14.09 | 16.63 | 2.54 | - | - | - | 21.46 | |
| 39 | 2049 | - | - | - | 2.54 | 14.09 | 16.63 | 2.54 | - | - | - | 21.46 | |
| 40 | 2050 | - | - | - | 2.54 | 14.09 | 16.63 | 2.54 | - | - | - | 21.46 | |
| 41 | 2051 | - | - | - | 2.54 | 14.09 | 16.63 | 2.54 | - | - | - | 21.46 | |
| 42 | 2052 | - | - | - | 2.54 | 14.09 | 16.63 | 2.54 | - | - | - | 21.46 | |
| 43 | 2053 | - | - | - | 2.54 | 14.09 | 16.63 | 2.54 | - | - | - | 21.46 | |
| 44 | 2054 | - | - | - | 2.54 | 14.09 | 16.63 | 2.54 | - | - | - | 21.46 | |
| 45 | 2055 | - | - | - | 2.54 | 14.09 | 16.63 | 2.54 | - | - | - | 21.46 | |
| 46 | 2056 | - | - | - | 2.54 | 14.09 | 16.63 | 2.54 | - | - | - | 21.46 | |
| 47 | 2057 | - | - | - | 2.54 | 14.09 | 16.63 | 2.54 | - | - | - | 21.46 | |
| 48 | 2058 | - | - | - | 2.54 | 14.09 | 16.63 | 2.54 | - | - | - | 21.46 | |
| 49 | 2059 | - | - | - | 2.54 | 14.09 | 16.63 | 2.54 | - | - | - | 21.46 | |
| 50 | 2060 | - | - | - | 2.54 | 14.09 | 16.63 | 2.54 | - | - | - | 21.46 | |



SCALE = 1:50,000



METERS

EXISTING DIVERSION DAM

LEGEND:

- Existing Diversion Dam
- Existing Structures
- Existing Lateral Canal
- Existing Main Canal
- Creek
- River
- Roads
- National Irrigation System Boundary



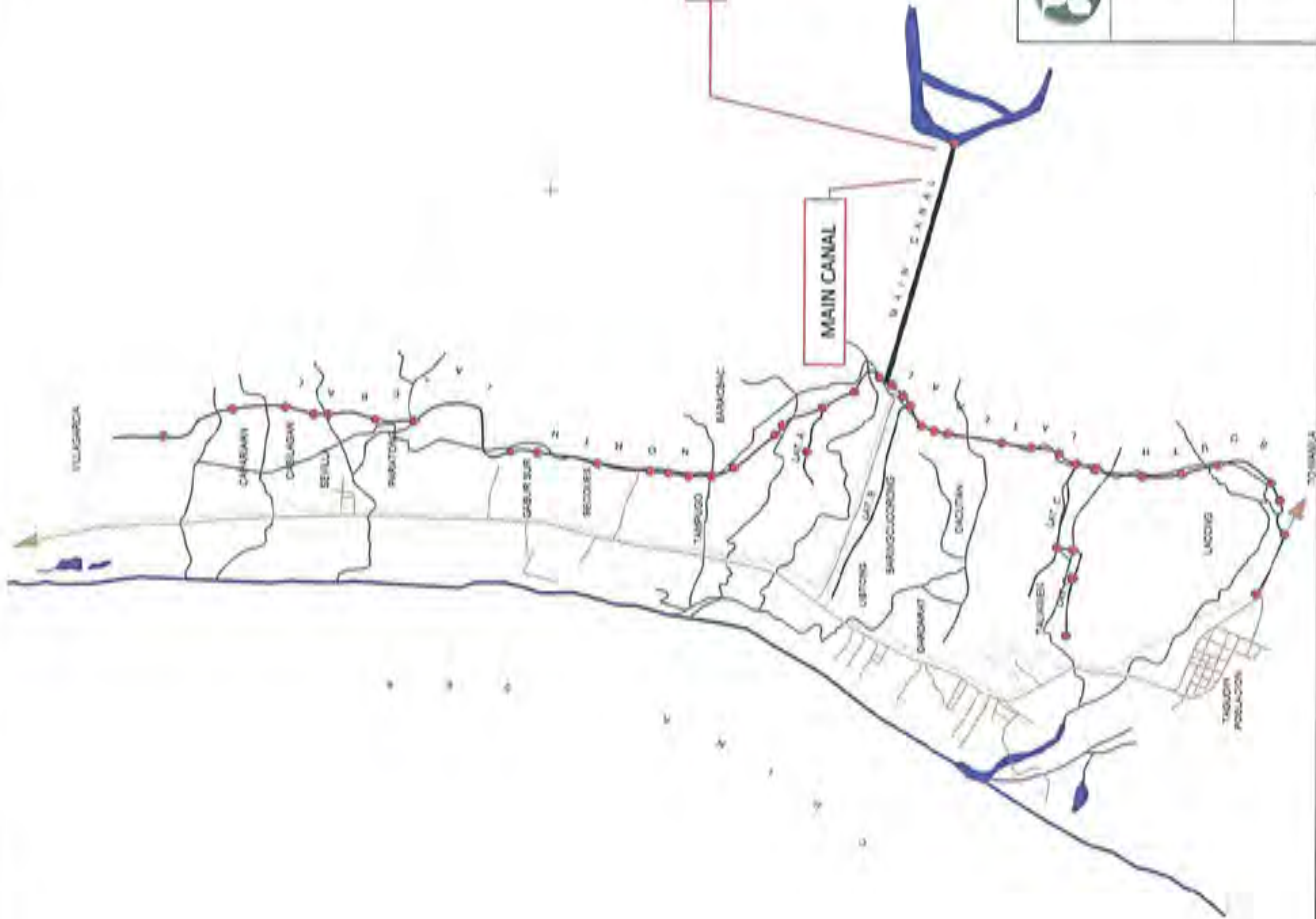
National Irrigation Administration (NIA)
Japan International Cooperation Agency (JICA)

SECTOR LOAN FOR REHABILITATION OF IRRIGATION FACILITIES (SLRIF)

0108 - TAGUDIN IRRIGATION SYSTEM

Ilocos Sur, Region-1


GENERAL LAYOUT



JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities

Photographs of Irrigation Facilities




NIS name: Tagudin (Region 1)

| Location / Facility | Photograph | Comments |
|-------------------------------|--|---|
| SUYO-TAGUDIN STA. CRUZ NIS |  | Proposed repair of Siphon @ South Lateral of Suyo-Tagudin-Sta. Cruz NIS |
| SUYO-TAGUDIN STA. CRUZ NIS |  | Lateral Canal of Suyo-Tagudin-Sta. Cruz NIS, proposed for canal lining |
| SUYO-TAGUDIN STA. CRUZ NIS |  | Canal structure along main canal, proposed for rehab and improvement |

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities

Photographs of Irrigation Facilities




NIS name: Tagudin (Region 1)

| <i>Location / Facility</i> | <i>Photograph</i> | <i>Comments</i> |
|-------------------------------|--|--|
| SUYO-TAGUDIN STA. CRUZ NIS |  | Damaged Canal Lining, proposed for repair/rehab along south lateral canal |
| SUYO-TAGUDIN STA. CRUZ NIS |  | Steelgate of Triforcation proposed for replacement |
| SUYO-TAGUDIN STA. CRUZ NIS |  | Triforcation proposed for repair and improvement, to be provided with protection work, |

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities

Photographs of Irrigation Facilities

NIS name: Tagudin (Region 1)

| | | |
|-------------------------------|--|--|
| SUYO-TAGUDIN STA. CRUZ NIS |  | Intake, proposed to be provided with concrete Shed |
| SUYO-TAGUDIN STA. CRUZ NIS |  | Intake Structure proposed for repair /rehab to be provided w/ retaining wall & additional cut off walls, |
| SUYO-TAGUDIN STA. CRUZ NIS |  | IS-IMO-Division Manager A Showing Defective parts of intake Which need repair/rehab to the Japanese consultant |

THE REPUBLIC OF PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION

**Sector Loan on
Rehabilitation of Irrigation Facilities**

NIS SUMMARY REPORT

0109
Amburayan RIS
Region 1
La Union 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**

| <i>Item</i> | <i>Description</i> | |
|---|---|---|
| 1) Name of NIS | Amburayan RIS Code: 0109 | |
| 2) Location | Region | Region 1 |
| | Province | La Union |
| | Municipality | Sudipen, Luna, Bangar, Balaon |
| | Distance | 50 km from San Fernando City (Capital of Province) |
| 3) Type of Water Source | Water Source | Amburayan river |
| | Type | Intake type – 6 gates (1.20 m wide, 1.60 m high gate opening) |
| 4) Area | Service Area | 3,800 ha |
| | FUSA | 3,289 ha |
| 5) Beneficiary Farmers | 7,270 farmers | Average paddy field cultivating size = 0.45 ha per farmer |
| 6) Irrigator's Association | IAs established = 14 FIA established = 1 in 2008 | |
| 7) Features of NIS and Necessity of the project | The system was constructed in 1926 and was operational in 1927, making it one of the oldest irrigation systems in the country. The Amburayan river can irrigate 3800 has. then but due to the constant siltation and deterioration of its facilities thru the years, the system can only now irrigate at least 2500 has. during dry season. | |
| 8) Outline of the Proposed Project | <p>A. Engineering</p> <ol style="list-style-type: none"> 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 <p>B. Institutional Strengthening Program</p> <p>B. 1 Basic Program</p> <ol style="list-style-type: none"> 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 <p>B.2 Specific Program to strengthen institutional mechanism together with LGUs</p> <ol style="list-style-type: none"> 1. Monitoring and control of illegal mechanical quarrying 2. Improvement of watershed management | |
| 9) Proposed Project Component | <p>A. Engineering</p> <p>Construction of civil works for rehabilitation of diversion works, canal system, drainage system, roads, and IMT support facilities.</p> | |

| | | | | |
|---|--|-----|------------------------------|----------------|
| | 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 | 122.05 Million |
| | - Civil Works | PHP | 109.71 Million | |
| | - Institutional Development | PHP | 9.90 Million | |
| | - Engineering Services | PHP | 2.44 Million | |
| | 2. Indirect cost | | PHP | 10.92 Million |
| | Total Project Cost (1+2) | | PHP 132.97 Million | |
| | Cost per ha | | PHP 40,430.00 per ha. | |
| 11) Project Benefit | 1. To increase paddy production by 1,715 tons/year 2. To increase farmers' net income to PHP59,167.00 /ha/year 3. To establish functional and self-reliant IAs 4. To improve performance of NIS | | | |
| 12) Project Justification | EIRR = 26.3 %, B/C = 1.67 (discount rate 15%) | | | |

2. Project History (Construction/Rehabilitation)

| Year | Description |
|------|--|
| 2004 | Canal desilting and repair of structures (PHP 6 million) |
| 2005 | Canal desilting and repair of steelgates (PHP 1 million) |
| 2006 | Repair of drainage spillway, steelgates and structures (PHP 6 million) |
| 2007 | Canal lining, desilting and repair of structures (PHP 9 million) |
| 2008 | Canal lining and desilting (PHP 7 million) |

3. Present Condition

3.1 Natural Conditions

| Item | Description |
|------------------------------|---|
| 1) Annual Rainfall | 1,253.10 mm |
| 2) Seasons | Wet season: May to October Dry season: November to April |
| 3) Dominant Soil in NIS Area | Clay loam |
| 4) Topography | Flat plain |

3.2 Socio-economy (Region/Province)

| Item | Description |
|---------------------------|--|
| 1) GRDP | PHP 185,566 million (Year 2007), Per Capita GRDP = PHP 38,063 per year |
| 2) Population | 720,972 (province) |
| 3) Population Growth Rate | 1.27% per year (province) |
| 4) Labor Force | 3,183,000 (region) |
| 5) Poverty Population | 32.6% to total population (province) |

3.3 Present Agriculture in NIS

| <i>Item</i> | <i>Description</i> | | | | | | |
|--------------------------------------|---|---------------------------|--------|------------|--------|---------|--------|
| 1) Farm Household in NIS | Total beneficiaries | 7,270 households | | | | | |
| | Land owners | 3,230 households (44.4 %) | | | | | |
| | Tenant farmers | 4,040 households (55.6 %) | | | | | |
| 2) Paddy Field Size in NIS | 0.45 ha per household (FUSA/Total beneficiaries as of 2008) | | | | | | |
| 3) Present Land Use in NIS | Paddy field planted | 3,011 ha | 79.2 % | As of 2008 | | | |
| | Paddy field not planted | 278 ha | 7.3 % | As of 2008 | | | |
| | Upland crop field | 0 ha | 0.0 % | | | | |
| | Permanent crop field | 0 ha | 0.0 % | | | | |
| | Undeveloped area | 511 ha | 13.5 % | | | | |
| | 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) | 3,289 | | | | | | |
| 5) Paddy Cropped Area (ha) | 2004 | 2005 | 2006 | 2007 | 2008 | Average | |
| | Wet Season | 2,616 | 2,403 | 1,954 | 3,000 | 3,011 | 2,597 |
| | Dry Season-2 (late) | 2,153 | 2,097 | 2,229 | 2,497 | 2,513 | 2,298 |
| 6) Cropping Intensity (%) (per year) | 2004 | 2005 | 2006 | 2007 | 2008 | Average | |
| | 145 | 137 | 127 | 167 | 168 | 149 | |
| 7) Unit Yield of Paddy (ton/ha) | 2004 | 2005 | 2006 | 2007 | 2008 | Average | |
| | Wet Season | 4.25 | 4.35 | 4.40 | 4.20 | 4.40 | 4.31 |
| | Dry Season | 4.50 | 4.70 | 4.65 | 4.60 | 4.50 | 4.58 |
| 8) Paddy Production (ton) | 2004 | 2005 | 2006 | 2007 | 2008 | Average | |
| | Wet Season | 11,118 | 10,453 | 8,598 | 12,600 | 13,248 | 11,203 |
| | Dry Season | 9,688 | 9,856 | 10,365 | 11,486 | 11,309 | 10,541 |

3.4 Water Resources

| <i>Item</i> | <i>Description</i> |
|------------------------------|------------------------|
| 1) Name of Rivers | Amburayan river |
| 2) Catchment Area at Dam | 124 km ² |
| 3) Ave. River Discharge | 2.30 m ³ /s |
| 4) Ave. Dry Season Discharge | 2.12 m ³ /s |
| 5) Diverted Intake Discharge | 2.07 m ³ /s |
| 6) Water Requirement | 5.92 m ³ /s |
| 7) Sedimentation | High |

3.5 Existing Irrigation System

| <i>Item</i> | <i>Description</i> |
|------------------------|--|
| 1) Diversion Dam | Intake Type – 6 gates (1.20 m wide, 1.6m height) |
| 2) Main Canal | Total length <u>20.42</u> km (Lined portion <u>3.39</u> km) |
| 3) Lateral Canals | Total length <u>63.054</u> km (Lined portion <u>18.760</u> km) |
| 4) On-farm facilities | Total length <u>109.00</u> km Turn-outs = <u>168</u> |
| 5) Drainage Canal | Total length <u>42.00</u> kms. |
| 6) Canal Structures | No. = <u>237</u> units |
| 7) Drainage Structures | No. = <u>32</u> units |
| 8) Farm roads | Total length <u>61.814</u> km |

3.6 Institutions for O&M of NIS

| <i>Item</i> | <i>Description</i> | | | | | |
|--|------------------------------|------|------|------|------|---------|
| 1) Regional Irrigation Office | Name: Region 1-Ilocos Region | | | | | |
| 2) IMO | Name: La Union IMO | | | | | |
| Staff in 2009 | Total number of staff: 25 | | | | | |
| 3) Irrigator' Association (IA) | 2004 | 2005 | 2006 | 2007 | 2008 | Average |
| Number of FIA (nos) | | | | | 1 | |
| Number of IA (nos) | | | | | 14 | |
| Number of TSAG (nos) | 116 | 123 | 133 | 137 | 138 | 129 |
| Functionality of IA | 0.0 | 75.4 | 65.1 | 76.8 | 78.2 | 73.9 |
| Collection of ISF (wet, %) | 17 | 18 | 16 | 21 | 22 | 19 |
| Collection of ISF (dry, %) | 22 | 20 | 23 | 30 | 25 | 25 |
| 4) NIS Category based on IA 2008 O&M Contract (NIA-IA) | No. of IA | | | | | |
| Category A | 1 | | | | | |
| Category B | 0 | | | | | |
| Category C | 13 | | | | | |

3.7 Existing Problems

| <i>Item</i> | <i>Description</i> |
|---|---|
| 1) Diversion Works | <ol style="list-style-type: none"> 1. Heavy siltation in front of the intake (river channeling) 2. Damaged intake gates 3. Siltation inside the tunnel 4. Collapsed tunnel wall (20m) |
| 2) Canal and Structures | <ol style="list-style-type: none"> 1. Heavy siltation at main canal due to erosion 2. Lateral canal siltation 3. Low canal embankment 4. Damaged headgates and turn-out gates (steelgates) 5. Silted pipeline at lateral A 6. Clogged barrel crossings 7. Washed-out canal embankments |
| 3) Drainage Canal | <ol style="list-style-type: none"> 1. Washed-out embankments 2. Heavily silted drainage canals 3. Narrow sections of canals 4. Non-functional Overhead drainage structures at main canal 5. Collapsed/ damaged turn-in at main canal 6. Perennial erosion of hillside slope during heavy rains (lack of drainage canal) |
| 4) Other Project Facilities (road, bridge, flood dike, building, etc) | <ol style="list-style-type: none"> 1. Gatekeepers quarters at intake and sluiceway heavily damaged (no water, no electric) 2. Main canal road at sta. 14+000 needs regular gravel-surfacing works 3. Repair of farm to market roads intersecting some lateral canals |
| 5) Water Management and O&M Activities | <ol style="list-style-type: none"> 1. Lack of trainings on water management for farmers as well as staff 2. No regular clearing of canals by IAs (plenty of basura in the canal) 3. Farmers don't follow the water delivery and distribution schedule |
| 6) Status of NIS and IA Management | <p>Status Type Ba evaluated by Radar Graph</p> <p>Specific problems are:</p> <ol style="list-style-type: none"> 1. Low ISF collection efficiency during wet and dry seasons at 19% and 25% respectively 2. Medium ratio of tenancy at 42% 3. Medium ratio of membership at 63% |
| 7) Watershed Management | <ol style="list-style-type: none"> 1. Loose side-hill soil causing erosion during heavy rains 2. Cutting trees along watershed area not prohibited 3. Watershed is significantly denuded |

| <i>Item</i> | <i>Description</i> |
|---|--|
| 8) Coordination with LGU and Agencies concerned | 1. Minimum coordination by NIA's field offices and IA with concerned municipal LGUs on the specific problems such as monitoring and control of illegal mechanical quarrying and watershed management |
| 9) Agriculture | 1. Lack of farming machineries for farmers 2. Lack of available high yielding varieties of rice 3. Lack of post harvest facilities increasing losses of palay 4. Inadequate number of credit institution to serve the farmers. Most of the farmers are availing loan from the private traders at a very high interest rate. 5. Insufficient supply of high quality rice seeds. 6. Inadequate number of post harvest facilities particularly dryers. |
| 10) Others | 1. Political intervention in the implementation of some projects 2. Farmer-leaders are more interested in rehab projects than in farming activities |

4. Proposed Rehabilitation Plan

4.1 Agricultural Development Plan

| <i>Item</i> | <i>Description</i> | | | |
|-------------------------------|--------------------|---------------------|---------------------|---------------|
| | <i>Wet Season</i> | <i>Dry Season-1</i> | <i>Dry Season-2</i> | <i>Annual</i> |
| Cropping schedule | | | | |
| 1) Type of Crops | Paddy | Paddy | Paddy (rice) | Paddy (rice) |
| 2) Cropping Area (ha) | 3,289 | 2,520 | 1300 | 500 |
| 3) Target Unit Yield (ton/ha) | 4.25 | 4.50 | 4.75 | 4 |
| 3) Total Production (ton) | 13,978 | 11,340 | 6175 | 2000 |

4.2 Civil Works

| <i>Item</i> | <i>Description</i> |
|-----------------------------|---|
| 1) Diversion Works | De-siltation work inside the tunnel and repair of the intake gates |
| 2) Canal Structures | Repair of irrigation facilities along the main canal and lateral canals - 76 units |
| 3) Canalization | De-silting of main canal and lateral canals – 43.5 kms Realignment of canal Construction of new canal |
| 4) Drainage Structures | 1. Repair of drainage structures – 12 units |
| 5) Drainage Canalization | 1. De-siltation work on critical drainage canals – 15 kms |
| 6) Service Roads | 1. Concrete pavement of access roads and re-surfacing of farm to market roads – 6 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 – 4 sets |
| 9) IMT GIS Database | 1. Development and establishment of GIS database |
| 7) Project Facilities | Construction of bodega, quarters and field office for the project |
| 8) O&M Facilities | Provision of motorcycles and vehicles for monitoring activities |
| 9) IA Supporting Facilities | Provision of farm machineries and field offices for IAs |

4.3 Institutional Strengthening Program

| <i>Item</i> | <i>Description</i> |
|--|---|
| 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 |

| <i>Item</i> | <i>Description</i> |
|--|---|
| | <ul style="list-style-type: none"> 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 | <ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> 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 | <ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> 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 | <ul style="list-style-type: none"> 1. Strengthening coordination with RDC, RAFC/PAFC and LGUs concerned through works shop on dissemination of the SLRIF to these organizations. 2. Request LGUs legal actions on protection of illegal mechanical quarrying prior to the commencement of the SLRIF through the coordination activities 3. Strengthening coordination with RDC, RAFC/PAFC and LGUs on training program of watershed management 4. Strengthening coordination on establishment of monitoring and control mechanism of illegal quarrying |

4.4 Proposed Counter Schemes

| <i>Item</i> | <i>Description</i> |
|-------------|--|
| 1) DENR | <ul style="list-style-type: none"> 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 | <ul style="list-style-type: none"> 2. LGU initiates training and upgrade technical skills of its engineers by inviting resource persons from the key line departments and/or national agencies (e.g. NIA, DPWH.) 3. LGUs take actions on information awareness on the Project implementation through local communication media. 4. LGU establishes a coordinating/steering committee at the provincial level to improve coordination and representation of NIA in local planning and budgeting. |

5. Cost Estimate for Initial Investment

| <i>Item</i> | <i>Description</i> | |
|--------------------------------|---|--------------------|
| 1) Direct Cost for Civil Works | A. Mobilization | Php 2.44 Million |
| | B. Protection Dikes | - |
| | C. Diversion Works | Php 1.45 Million |
| | D. Canal Structures | Php 27.07 Million |
| | E. Canalization | Php 33.19 Million |
| | F. Drainage Structures | Php 6.58 Million |
| | G. Drainage Canalization | Php 12.00 Million |
| | H. Roads | Php 1.50 Million |
| | I. On-Farm Facilities/T.O. Gates | Php 2.20 Million |
| | J. IMT Support Facilities | Php 20.00 Million |
| | K. IMT GIS Database | Php 3.29 Million |
| | L. Institutional Development (5% of Direct Cost) | Php 9.90 Million |
| | M. Feasibility Studies & Detailed Engineering (2% of Direct Cost) | Php 2.44 Million |
| | Sub-total (Direct Cost) | |
| 2) Indirect Cost | A. General Engineering Supervision and Administration (3.5% of Direct Cost) | Php 4.27 Million |
| | B. NIA Management Fee (5% of Total Project Cost) | Php 6.65 Million |
| | Sub-total (Indirect Cost) | |
| 3) Total Project Cost | = 1+2 | Php 132.97 Million |
| Cost per ha. | | Php 40,430.00 /ha. |

6. Implementation Plan

| <i>Item</i> | <i>Description</i> |
|--|-------------------------------------|
| 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

| <i>Item</i> | <i>Description</i> |
|-------------------------|--|
| 1) Economic evaluation | |
| EIRR (Base) | EIRR = 26.3 % : Project life 50 years |
| Sensitivity Case-1 | EIRR = 23.5 % : Cost 10% up |
| Case-2 | EIRR = 23.2 % : Benefit 10% down |
| Case-3 | EIRR = 20.9 % : Cost 10% up + Benefit 10% down |
| B/C | 1.67 : discount rate 15% p.a. |
| NPV | PHP 61 million : discount rate 15% p.a. |
| 2) Financial evaluation | Farmer's net income increase = PHP 4,531 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

| <i>Item</i> | <i>Description</i> |
|-------------------------|---|
| 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 0109 - Amburayan

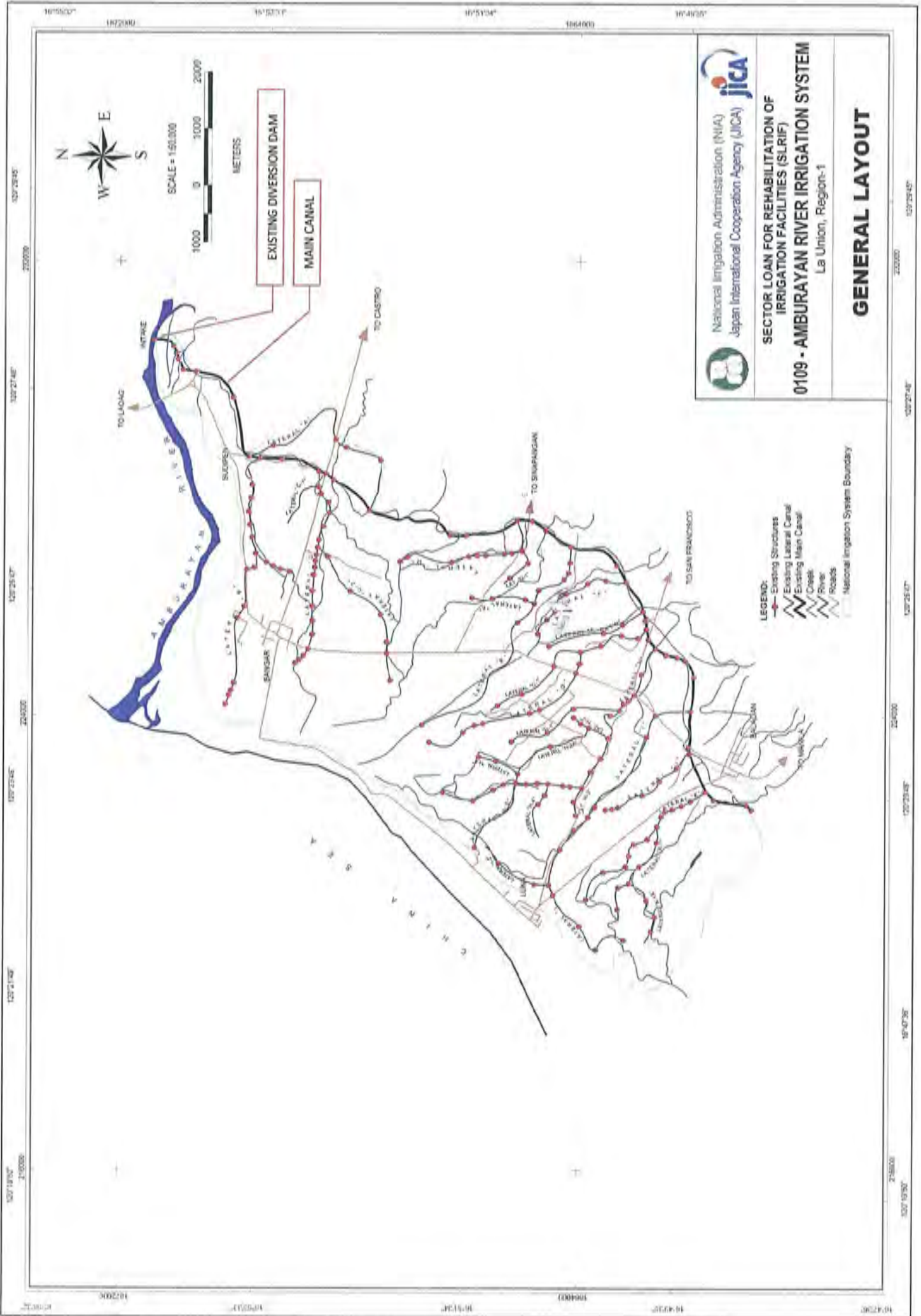
Case-2 (Benefit 10% down)

| Name of NIS: 0109 - Amburayan | | | | | Region: 1 - MO: R10: LA: Union | | | | | | |
|-------------------------------|------|---------------------------------|---------------------------|------------------------------|--------------------------------|---------|-------------------------------|-----------|------------------------|-----|--|
| ERR : 23.2% | | Net Present Value (Million PHP) | | Benefit (15 % discount rate) | | Cost | | B/C Ratio | | NPV | |
| | | | | 137 | | 91 | | 1.51 | | 46 | |
| Year In Order | Year | Economic Cost (M. PHP) | | | Economic Benefit (M. PHP) | | Economic Benefit without 1.5% | | Net Cash Flow (M. PHP) | | |
| | | Civil Works | Institutional Development | Engineering Services | Total | Benefit | Total | Total | Total | | |
| 1 | 2011 | - | - | 0.57 | 0.57 | - | 2.17 | 2.17 | 1.60 | | |
| 2 | 2012 | - | - | 0.57 | 0.57 | - | 4.34 | 4.34 | 3.77 | | |
| 3 | 2013 | 31.44 | 1.62 | 0.57 | 33.62 | - | 6.51 | 6.51 | -27.12 | | |
| 4 | 2014 | 41.92 | 2.16 | 0.57 | 46.64 | 1.74 | 8.68 | 10.42 | -36.22 | | |
| 5 | 2015 | 31.44 | 1.62 | 0.57 | 38.29 | 4.29 | 10.85 | 15.13 | -23.16 | | |
| 6 | 2016 | - | - | 6.67 | 6.67 | 6.54 | 13.01 | 19.55 | -12.88 | | |
| 7 | 2017 | - | - | 6.67 | 6.67 | 7.05 | 15.18 | 22.23 | 15.56 | | |
| 8 | 2018 | - | - | 6.67 | 6.67 | 7.26 | 17.35 | 24.62 | 17.95 | | |
| 9 | 2019 | - | - | 6.67 | 6.67 | 7.26 | 19.52 | 26.78 | 20.11 | | |
| 10 | 2020 | - | - | 6.67 | 6.67 | 7.26 | 21.69 | 28.95 | 22.28 | | |
| 11 | 2021 | - | - | 6.67 | 6.67 | 7.26 | 23.86 | 31.12 | 24.45 | | |
| 12 | 2022 | - | - | 6.67 | 6.67 | 7.26 | 26.03 | 33.29 | 26.62 | | |
| 13 | 2023 | - | - | 6.67 | 6.67 | 7.26 | 28.20 | 35.46 | 28.79 | | |
| 14 | 2024 | - | - | 6.67 | 6.67 | 7.26 | 30.37 | 37.63 | 30.96 | | |
| 15 | 2025 | - | - | 6.67 | 6.67 | 7.26 | 32.54 | 39.80 | 33.13 | | |
| 16 | 2026 | - | - | 6.67 | 6.67 | 7.26 | 34.70 | 41.97 | 35.30 | | |
| 17 | 2027 | - | - | 6.67 | 6.67 | 7.26 | 36.87 | 44.14 | 37.47 | | |
| 18 | 2028 | - | - | 6.67 | 6.67 | 7.26 | 39.04 | 46.31 | 39.64 | | |
| 19 | 2029 | - | - | 6.67 | 6.67 | 7.26 | 41.21 | 48.47 | 41.80 | | |
| 20 | 2030 | - | - | 6.67 | 6.67 | 7.26 | 43.38 | 50.64 | 43.97 | | |
| 21 | 2031 | - | - | 6.67 | 6.67 | 7.26 | 45.55 | 52.81 | 46.14 | | |
| 22 | 2032 | - | - | 6.67 | 6.67 | 7.26 | 47.72 | 54.98 | 48.31 | | |
| 23 | 2033 | - | - | 6.67 | 6.67 | 7.26 | 49.89 | 57.15 | 50.48 | | |
| 24 | 2034 | - | - | 6.67 | 6.67 | 7.26 | 52.06 | 59.32 | 52.65 | | |
| 25 | 2035 | - | - | 6.67 | 6.67 | 7.26 | 54.23 | 61.49 | 54.82 | | |
| 26 | 2036 | - | - | 6.67 | 6.67 | 7.26 | 56.39 | 63.66 | 56.99 | | |
| 27 | 2037 | - | - | 6.67 | 6.67 | 7.26 | 58.56 | 65.83 | 59.16 | | |
| 28 | 2038 | - | - | 6.67 | 6.67 | 7.26 | 60.73 | 68.00 | 61.33 | | |
| 29 | 2039 | - | - | 6.67 | 6.67 | 7.26 | 62.90 | 70.16 | 63.49 | | |
| 30 | 2040 | - | - | 6.67 | 6.67 | 7.26 | 65.07 | 72.33 | 65.66 | | |
| 31 | 2041 | - | - | 6.67 | 6.67 | 7.26 | 67.24 | 74.50 | 67.83 | | |
| 32 | 2042 | - | - | 6.67 | 6.67 | 7.26 | 69.41 | 76.67 | 70.00 | | |
| 33 | 2043 | - | - | 6.67 | 6.67 | 7.26 | 71.58 | 78.84 | 72.17 | | |
| 34 | 2044 | - | - | 6.67 | 6.67 | 7.26 | 73.75 | 81.01 | 74.34 | | |
| 35 | 2045 | - | - | 6.67 | 6.67 | 7.26 | 75.91 | 83.18 | 76.51 | | |
| 36 | 2046 | - | - | 6.67 | 6.67 | 7.26 | 78.08 | 85.35 | 78.68 | | |
| 37 | 2047 | - | - | 6.67 | 6.67 | 7.26 | 80.25 | 87.52 | 80.85 | | |
| 38 | 2048 | - | - | 6.67 | 6.67 | 7.26 | 82.42 | 89.68 | 83.01 | | |
| 39 | 2049 | - | - | 6.67 | 6.67 | 7.26 | 84.59 | 91.85 | 85.18 | | |
| 40 | 2050 | - | - | 6.67 | 6.67 | 7.26 | 86.76 | 94.02 | 87.35 | | |
| 41 | 2051 | - | - | 6.67 | 6.67 | 7.26 | 88.93 | 96.19 | 89.52 | | |
| 42 | 2052 | - | - | 6.67 | 6.67 | 7.26 | 91.10 | 98.36 | 91.69 | | |
| 43 | 2053 | - | - | 6.67 | 6.67 | 7.26 | 93.27 | 100.53 | 93.86 | | |
| 44 | 2054 | - | - | 6.67 | 6.67 | 7.26 | 95.44 | 102.70 | 96.03 | | |
| 45 | 2055 | - | - | 6.67 | 6.67 | 7.26 | 97.60 | 104.87 | 98.20 | | |
| 46 | 2056 | - | - | 6.67 | 6.67 | 7.26 | 99.77 | 107.04 | 100.37 | | |
| 47 | 2057 | - | - | 6.67 | 6.67 | 7.26 | 101.94 | 109.21 | 102.54 | | |
| 48 | 2058 | - | - | 6.67 | 6.67 | 7.26 | 104.11 | 111.38 | 104.71 | | |
| 49 | 2059 | - | - | 6.67 | 6.67 | 7.26 | 106.28 | 113.54 | 106.87 | | |
| 50 | 2060 | - | - | 6.67 | 6.67 | 7.26 | 108.45 | 115.71 | 109.04 | | |

Economic Evaluation (EIRR)

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

| Name of NIS: 0109 - Amburayan | | | | | Region: 1 - MO: R10: LA: Union | | | | | | |
|-------------------------------|------|---------------------------------|---------------------------|------------------------------|--------------------------------|---------|-------------------------------|-----------|------------------------|-----|--|
| ERR : 20.9% | | Net Present Value (Million PHP) | | Benefit (15 % discount rate) | | Cost | | B/C Ratio | | NPV | |
| | | | | 137 | | 100 | | 1.37 | | 37 | |
| Year In Order | Year | Economic Cost (M. PHP) | | | Economic Benefit (M. PHP) | | Economic Benefit without 1.5% | | Net Cash Flow (M. PHP) | | |
| | | Civil Works | Institutional Development | Engineering Services | Total | Benefit | Total | Total | Total | | |
| 1 | 2011 | - | - | 0.62 | 0.62 | - | 2.17 | 2.17 | 1.55 | | |
| 2 | 2012 | - | - | 0.62 | 0.62 | - | 4.34 | 4.34 | 3.72 | | |
| 3 | 2013 | 34.58 | 1.78 | 0.62 | 36.99 | - | 6.51 | 6.51 | -30.48 | | |
| 4 | 2014 | 46.11 | 2.38 | 0.62 | 51.31 | 1.74 | 8.68 | 10.42 | -40.89 | | |
| 5 | 2015 | 34.58 | 1.78 | 0.62 | 42.12 | 4.29 | 10.85 | 15.13 | -26.99 | | |
| 6 | 2016 | - | - | 7.34 | 7.34 | 6.54 | 13.01 | 19.55 | 12.21 | | |
| 7 | 2017 | - | - | 7.34 | 7.34 | 7.05 | 15.18 | 22.23 | 14.89 | | |
| 8 | 2018 | - | - | 7.34 | 7.34 | 7.26 | 17.35 | 24.62 | 17.28 | | |
| 9 | 2019 | - | - | 7.34 | 7.34 | 7.26 | 19.52 | 26.78 | 19.45 | | |
| 10 | 2020 | - | - | 7.34 | 7.34 | 7.26 | 21.69 | 28.95 | 21.62 | | |
| 11 | 2021 | - | - | 7.34 | 7.34 | 7.26 | 23.86 | 31.12 | 23.79 | | |
| 12 | 2022 | - | - | 7.34 | 7.34 | 7.26 | 26.03 | 33.29 | 25.95 | | |
| 13 | 2023 | - | - | 7.34 | 7.34 | 7.26 | 28.20 | 35.46 | 28.12 | | |
| 14 | 2024 | - | - | 7.34 | 7.34 | 7.26 | 30.37 | 37.63 | 30.29 | | |
| 15 | 2025 | - | - | 7.34 | 7.34 | 7.26 | 32.54 | 39.80 | 32.46 | | |
| 16 | 2026 | - | - | 7.34 | 7.34 | 7.26 | 34.70 | 41.97 | 34.63 | | |
| 17 | 2027 | - | - | 7.34 | 7.34 | 7.26 | 36.87 | 44.14 | 36.80 | | |
| 18 | 2028 | - | - | 7.34 | 7.34 | 7.26 | 39.04 | 46.31 | 38.97 | | |
| 19 | 2029 | - | - | 7.34 | 7.34 | 7.26 | 41.21 | 48.47 | 41.14 | | |
| 20 | 2030 | - | - | 7.34 | 7.34 | 7.26 | 43.38 | 50.64 | 43.31 | | |
| 21 | 2031 | - | - | 7.34 | 7.34 | 7.26 | 45.55 | 52.81 | 45.48 | | |
| 22 | 2032 | - | - | 7.34 | 7.34 | 7.26 | 47.72 | 54.98 | 47.64 | | |
| 23 | 2033 | - | - | 7.34 | 7.34 | 7.26 | 49.89 | 57.15 | 49.81 | | |
| 24 | 2034 | - | - | 7.34 | 7.34 | 7.26 | 52.06 | 59.32 | 51.98 | | |
| 25 | 2035 | - | - | 7.34 | 7.34 | 7.26 | 54.23 | 61.49 | 54.15 | | |
| 26 | 2036 | - | - | 7.34 | 7.34 | 7.26 | 56.39 | 63.66 | 56.32 | | |
| 27 | 2037 | - | - | 7.34 | 7.34 | 7.26 | 58.56 | 65.83 | 58.49 | | |
| 28 | 2038 | - | - | 7.34 | 7.34 | 7.26 | 60.73 | 68.00 | 60.66 | | |
| 29 | 2039 | - | - | 7.34 | 7.34 | 7.26 | 62.90 | 70.16 | 62.83 | | |
| 30 | 2040 | - | - | 7.34 | 7.34 | 7.26 | 65.07 | 72.33 | 65.00 | | |
| 31 | 2041 | - | - | 7.34 | 7.34 | 7.26 | 67.24 | 74.50 | 67.16 | | |
| 32 | 2042 | - | - | 7.34 | 7.34 | 7.26 | 69.41 | 76.67 | 69.33 | | |
| 33 | 2043 | - | - | 7.34 | 7.34 | 7.26 | 71.58 | 78.84 | 71.50 | | |
| 34 | 2044 | - | - | 7.34 | 7.34 | 7.26 | 73.75 | 81.01 | 73.67 | | |
| 35 | 2045 | - | - | 7.34 | 7.34 | 7.26 | 75.91 | 83.18 | 75.84 | | |
| 36 | 2046 | - | - | 7.34 | 7.34 | 7.26 | 78.08 | 85.35 | 78.01 | | |
| 37 | 2047 | - | - | 7.34 | 7.34 | 7.26 | 80.25 | 87.52 | 80.18 | | |
| 38 | 2048 | - | - | 7.34 | 7.34 | 7.26 | 82.42 | 89.68 | 82.35 | | |
| 39 | 2049 | - | - | 7.34 | 7.34 | 7.26 | 84.59 | 91.85 | 84.52 | | |
| 40 | 2050 | - | - | 7.34 | 7.34 | 7.26 | 86.76 | 94.02 | 86.69 | | |
| 41 | 2051 | - | - | 7.34 | 7.34 | 7.26 | 88.93 | 96.19 | 88.85 | | |
| 42 | 2052 | - | - | 7.34 | 7.34 | 7.26 | 91.10 | 98.36 | 91.02 | | |
| 43 | 2053 | - | - | 7.34 | 7.34 | 7.26 | 93.27 | 100.53 | 93.19 | | |
| 44 | 2054 | - | - | 7.34 | 7.34 | 7.26 | 95.44 | 102.70 | 95.36 | | |
| 45 | 2055 | - | - | 7.34 | 7.34 | 7.26 | 97.60 | 104.87 | 97.53 | | |
| 46 | 2056 | - | - | 7.34 | 7.34 | 7.26 | 99.77 | 107.04 | 99.70 | | |
| 47 | 2057 | - | - | 7.34 | 7.34 | 7.26 | 101.94 | 109.21 | 101.87 | | |
| 48 | 2058 | - | - | 7.34 | 7.34 | 7.26 | 104.11 | 111.38 | 104.04 | | |
| 49 | 2059 | - | - | 7.34 | 7.34 | 7.26 | 106.28 | 113.54 | 106.21 | | |
| 50 | 2060 | - | - | 7.34 | 7.34 | 7.26 | 108.45 | 115.71 | 108.38 | | |



SECTOR LOAN FOR REHABILITATION OF IRRIGATION FACILITIES (SLRIF)
0109 - AMBURAYAN RIVER IRRIGATION SYSTEM
 La Union, Region-1

GENERAL LAYOUT

- LEGEND:**
- Existing Structures
 - Existing Lateral Canal
 - Existing Main Canal
 - Creek
 - River
 - Roads
 - National Irrigation System Boundary

107°18'00" 107°21'00" 107°24'00" 107°27'00" 107°30'00"
 215000 220000 225000 230000 235000
 107°18'00" 107°19'00" 107°20'00" 107°21'00" 107°22'00"

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities

Photographs of Irrigation Facilities


NIS name: Amburayan (Region 1)

| Location / Facility | Photograph | Comments |
|---|--|--|
| <p>Intake at Amburayan river</p> <p>Six-gated intake type diversion facility with 760m tunnel</p> |  | <p>Silt intrusion is the perennial problem at the intake and tunnel. These lessen the capacity on diverting water for irrigation. River channelization is proposed and manual de-silting of the tunnel where the silt material should be conveyed/ lifted 20 meters uphill. Also, installation of steel screen is needed to prevent large stones from entering the tunnel which are hard to flush-out to the catch basin at the tunnel outlet.</p> |
| <p>Intake at Amburayan River.</p> <p>Gate mechanism at intake.</p> |  | <p>The gates are already rusty and corroded that need new sets of steelgates. Two (2) gates are currently un-operational. Cofferdam is needed at the river during the installation of new gates for water care.</p> |
| <p>Tunnel outlet MC sta. 0+000</p> <p>At the outlet of the 760m tunnel is a catch basin.</p> |  | <p>The catch basin needs regular cleaning/ de-siltation work to flush out silt inside the tunnel thus increasing its capacity. The system is currently without any heavy equipment to do the work.</p> |

JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities

Photographs of Irrigation Facilities

NIS name: Amburayan (Region 1)

| Location / Facility | Photograph | Comments |
|---|--|---|
| Main Canal Sta. 0+350 Drainage spillway at the end of the catch basin. |  | This waterway was constructed to avoid the constant washed-out of the canal embankment during typhoons. Water comes down from nearby mountains towards the canal embankment. Regular de-siltation work is also needed. |
| Main Canal Sta. 1+600 Drainage spillway |  | During rainy season, flood water from nearby hills brings along soil & stones that clogged the drainage canal including the main canal in case of overflow. De silting is needed and some tree planting at the hillsides to prevent erosion. |
| Main Canal Sta. 1+600 Drainage Catch Basin |  | The catch basin was constructed to prevent the intrusion of soil & stones to the main canal due to erosion at hillside during heavy rains. De-silting work is badly needed not only in the drainage canal but more important in the main canal. |

**THE REPUBLIC OF PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION**

**Sector Loan on
Rehabilitation of Irrigation Facilities**

NIS SUMMARY REPORT

0110
San Fabian RIS
Region 1
La Union 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**

| <i>Item</i> | <i>Description</i> | |
|---|---|---|
| 1) Name of NIS | San Fabian RIS Code: 0110 | |
| 2) Location | Region | Region 1 |
| | Province | Pangasinan |
| | Municipality | Manaoag, San Jacinto, San Fabian |
| | Distance | 35 km from Lingayen |
| 3) Type of Water Source | Water Source | Bued river |
| | Type | Diversion Dam (413 m wide, 3.50 m height) |
| 4) Area | Service Area | 2,765 ha |
| | FUSA | 2,026 ha |
| 5) Beneficiary Farmers | 1,637 farmers | Average paddy field cultivating size = 1.24 ha per farmer |
| 6) Irrigator's Association | IAs established = 7 FIA established = 1 in 2008 | |
| 7) Features of NIS and Necessity of the project | By year 2010 3 IAs will be under IMT and by year 2012, 4 IAs will also be under IMT, if all these proposed Repair/ Rehab will be fully implemented. | |
| 8) Outline of the Proposed Project | <p>A. Engineering</p> <ol style="list-style-type: none"> 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 <p>B. Institutional Strengthening Program</p> <p>B. 1 Basic Program</p> <ol style="list-style-type: none"> 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 <p>B.2 Specific Program to strengthen institutional mechanism together with LGUs</p> <ol style="list-style-type: none"> 1. Monitoring and control of illegal mechanical quarrying 2. Improvement of watershed management | |
| 9) Proposed Project Component | <p>A. Engineering</p> <ol style="list-style-type: none"> 1. Construction of civil works for rehabilitation of diversion works, canal system, drainage system, roads, and IMT support facilities. <p>B. Institutional Strengthening Program</p> <ol style="list-style-type: none"> 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 | 100.89 | Million |
| | - Civil Works | PHP | 93.27 | Million |
| | - Institutional Development | PHP | 5.60 | Million |
| | - Engineering Services | PHP | 2.02 | Million |
| | 2. Indirect cost | PHP | 9.03 | Million |
| | Total Project Cost (1+2) | PHP | 109.92 | Million |
| | Cost per ha | PHP | 54,253.00 | per ha. |
| 11) Project Benefit | 1. To increase paddy production by 6,121 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 = 39.7 %, B/C = 2.37 (discount rate 15%) | | | |

2. Project History (Construction/Rehabilitation)

| Year | Description | Fund Source |
|------|---|-------------|
| 2004 | Canal Lining, Desilting, Repair of Canal Structures | CARP/ GAA |
| 2005 | Canal Lining, Desilting, Road Re-gravelling, Repair of Steel gates | CARP/ GAA |
| 2006 | Canal Lining | CARP |
| 2007 | Repair of Diversion Dam, River Channeling, Canal Lining, Desilting, Repair of Structures, Protection Dike | GAA |
| 2008 | Canal Lining, Road Re-gravelling, Desilting, Repair of Steel gates | GAA |

3. Present Condition

3.1 Natural Conditions

| Item | Description |
|------------------------------|--|
| 1) Annual Rainfall | 1,929.70 mm |
| 2) Seasons | Wet season: June to October Dry season: November to April |
| 3) Dominant Soil in NIS Area | Clay |
| 4) Topography | Flat plain |

3.2 Socio-economy (Region/Province)

| Item | Description |
|---------------------------|--|
| 1) GRDP | PHP 185,566 million (Year 2007), Per Capita GRDP = PHP 38,063 per year |
| 2) Population | 2,645,395 (province) |
| 3) Population Growth Rate | 1.15 % per year (province) |
| 4) Labor Force | 3,183 thousand (region) |
| 5) Poverty Population | 35% to total population (province) |

3.3 Present Agriculture in NIS

| <i>Item</i> | <i>Description</i> | | | | | |
|--------------------------------------|--|--------|----------------|---------------------|------------|---------|
| 1) Farm Household in NIS | Total beneficiaries | | households | | | |
| | Land owners | | households (%) | | | |
| | Tenant farmers | | households (%) | | | |
| 2) Paddy Field Size in NIS | 0.0 ha per household (FUSA/Total beneficiaries as of 2008) | | | | | |
| 3) Present Land Use in NIS | Paddy field planted | | 1,903 ha | 68.8 % | As of 2008 | |
| | Paddy field not planted | | 123 ha | 4.5 % | 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 | | 739 ha | 26.7 % | No data in response | | |
| 4) Paddy Field in FUSA (ha) | 2,026 | | | | | |
| 5) Paddy Cropped Area (ha) | 2004 | 2005 | 2006 | 2007 | 2008 | Average |
| Wet Season | 1,446 | 1,553 | 1,423 | 1,472 | 809 | 1,341 |
| Dry Season | 1,017 | 1,007 | 1,936 | 1,037 | 1,903 | 1,200 |
| 6) Cropping Intensity (%) (per year) | 2004 | 2005 | 2006 | 2007 | 2008 | Average |
| | 122 | 126 | 121 | 124 | 134 | 125 |
| 7) Unit Yield of Paddy (ton/ha) | 2004 | 2005 | 2006 | 2007 | 2008 | Average |
| Wet Season | 4.00 | 4.00 | 3.50 | 3.65 | 2.00 | 3.58 |
| Dry Season | 3.75 | 3.75 | 2.55 | 2.55 | 2.70 | 3.00 |
| 8) Paddy Production (ton) | 2004 | 2005 | 2006 | 2007 | 2008 | Average |
| Wet Season | 5,784 | 6,212 | 4,981 | 5,373 | 1,618 | 4,793 |
| Dry Season | 3,814 | 3,776 | 2,642 | 2,644 | 5,138 | 3,603 |

3.4 Water Resources

| <i>Item</i> | <i>Description</i> |
|------------------------------|-------------------------|
| 1) Name of Rivers | Bued River |
| 2) Catchment Area at Dam | 297 km ² |
| 3) Ave. River Discharge | 16.89 m ³ /s |
| 4) Ave. Dry Season Discharge | 4.27 m ³ /s |
| 5) Diverted Intake Discharge | 1.48 m ³ /s |
| 6) Water Requirement | 3.65 m ³ /s |
| 7) Sedimentation | Severe |

3.5 Existing Irrigation System

| <i>Item</i> | <i>Description</i> |
|--------------------------|---|
| 1) Diversion Dam | Overflow crest width 413.00 m, Dam height 3.50 m |
| 2) Main Canal | Total length <u>17.646</u> km (Lined portion <u>0.00</u> km) |
| 3) Lateral Canals | Total length <u>37.693</u> km (Lined portion <u>15.258</u> km) |
| 4) On-farm facilities | Total length <u>67.00</u> km (Lined portion <u>4.30</u> km) Turn-outs = <u>80</u> units |
| 5) Drainage Canal | Total length <u>26.00</u> kms. |
| 6) Canal Structures | No. = <u>157</u> units |
| 7) Drainage Structures | No. = <u>27</u> units |
| 8) Farm roads | Total length <u>47.194</u> km |
| 9) Flood Protection Dike | Total length <u>180.00</u> m |

3.6 Institutions for O&M of NIS

| <i>Item</i> | <i>Description</i> | | | | | |
|--|--------------------------------|------|------|------|------|---------|
| 1) Regional Irrigation Office | Name: Region 1 – Ilocos Region | | | | | |
| 2) IMO | Name: Pangasinan IMO | | | | | |
| Staff in 2009 | Total number of staff: 86 | | | | | |
| 3) Irrigator' Association (IA) | 2004 | 2005 | 2006 | 2007 | 2008 | Average |
| Number of FIA (nos) | | | | | 1 | |
| Number of IA (nos) | | | | | 7 | |
| Number of TSAG (nos) | 105 | 105 | 105 | 105 | 105 | 105 |
| Functionality of IA | 0 | 0 | 73.4 | 70.5 | 63.2 | 69.1 |
| Collection of ISF (wet, %) | 39 | 0 | 49 | 66 | 14 | 43 |
| Collection of ISF (dry, %) | 22 | 55 | 36 | 37 | 37 | 37 |
| 4) NIS Category based on IA 2008 O&M Contract (NIA-IA) | No. of IA | | | | | |
| Category A | 0 | | | | | |
| Category B | 7 | | | | | |
| Category C | 0 | | | | | |

3.7 Existing Problems

| <i>Item</i> | <i>Description</i> |
|---|--|
| 1) Diversion Works (Sluiceway Base, Sideslope, Steel gate) | 1. Scoured/ Laying of rubber seal 2. Laying of concrete blocks 3. Convert Manual Operation to Electrical Operation and Mechanical Operation |
| 2) Canal and Structures | 1. Clogged convert system to flume , repair outlet transition |
| 3) Drainage Canal | 1. Silted Canal Drainage 2. No Drainage outlet |
| 4) Other Project Facilities (road, bridge, flood dike, building, etc) | 1. Lack of Manpower and Equipment |
| 5) Water Management and O&M Activities | 1. Poor implementation of cropping schedule 2. Lack of staff gauges |
| 6) Status of NIS and IA Management | Status Type Bb evaluated by Radar Graph Specific problems are: 1. Low cropping intensity during wet and dry seasons at 40% and 43%, respectively 2. Low ISF collection efficiency during wet and dry seasons at 37% and 43%, respectively 3. Medium ratio of tenancy at 21% 4. Medium paddy yield during wet and dry seasons at 43 cavans/ha and 76 cavans/ha, respectively |
| 7) Watershed Management | 1. Illegal & excessive cutting of trees which cause erosion 2. Watershed is significantly denuded |
| 8) Coordination with LGU and Agencies concerned | 1. Minimal coordination by NIA and IA with concerned municipal LGUs agencies on the specific problems such as monitoring and control of illegal mechanical quarrying and watershed management |
| 10) Agriculture | 1. Lack of Machinerics 2. Cropping calendar not followed strictly by the farmers. 3. Financial incapacity of the farmers to buy the right amount of agricultural inputs. 4. Inadequate number of post harvest facilities particularly dryer. |

4. Proposed Rehabilitation Plan

4.1 Agricultural Development Plan

| Item | Description | | | |
|-------------------------------|-------------|--------------|--------------|--------|
| | Wet Season | Dry Season-1 | Dry Season-2 | Annual |
| Cropping schedule | | | | |
| 1) Type of Crops | Paddy | Paddy | - | - |
| 2) Cropping Area (ha) | 2,026 | 1,140 | - | - |
| 3) Target Unit Yield (ton/ha) | 4.00 | 4.05 | - | - |
| 3) Total Production (ton) | 8,104 | 4,617 | - | - |

4.2 Civil Works

| Item | Description |
|---------------------------|---|
| 1) Diversion Works | 1. Laying of concrete blocks at the downstream apron 2. Repair of sluice and intake gates 3. Conversion of lifting mechanism from manual to mechanized |
| 2) Canal Structures | 1. Repair of damaged structures – 25 units 2. Repair/replacement of dilapidated steel gates. 3. Installation of new structure steel gates |
| 3) Canalization | 1. Concrete lining of selected canal sections – 25.6 kms 2. De-silting of selected canal sections 3. Realignment of canal 4. Construction of new canal |
| 4) Drainage Structures | 1. Repair of drainage structures – 13 units 2. Construction of additional structures |
| 5) Drainage Canalization | 1. De-silting of existing drainage canals – 19.7 kms 2. Construction of additional drainage canals |
| 6) Service Roads | 1. Re-graveling of selected road sections – 47.2 kms 2. Construction of side drains 3. Construction of drainage structures in strategic road locations. |
| 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 |

| <i>Item</i> | <i>Description</i> |
|--|---|
| 2) Strengthening Program of NIA - IA - LGU Partnership | <ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> 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 | <ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> 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 | <ol style="list-style-type: none"> 1. Strengthening coordination with RDC, RAFC/PAFC and LGUs concerned through works shop on dissemination of the SLRIF to these organizations. 2. Request LGUs legal actions on protection of illegal mechanical quarrying prior to the commencement of the SLRIF through the coordination activities 3. Strengthening coordination with RDC, RAFC/PAFC and LGUs on training program of watershed management 4. Strengthening coordination on establishment of monitoring and control mechanism of illegal quarrying |

4.4 Proposed Counter Schemes

| <i>Item</i> | <i>Description</i> |
|-------------|---|
| 1) DENR | <ol style="list-style-type: none"> 1. Should secure watershed area from illegal cutting of trees and quarrying |
| 2) LGU | <ol style="list-style-type: none"> 1. LGU initiates training and upgrade technical skills of its engineers by inviting resource persons from the key line departments and/or national agencies (e.g. NIA, DPWH.) 2. LGUs take actions on information awareness on the Project implementation through local communication media. 3. LGU establishes a coordinating/steering committee at the provincial level to improve coordination and representation of NIA in local planning and budgeting |

5. Cost Estimate for Initial Investment

| <i>Item</i> | <i>Description</i> | |
|--------------------------------|---|--------------------|
| 1) Direct Cost for Civil Works | A. Mobilization | Php 2.02 Million |
| | B. Protection Dikes | Php 2.44 Million |
| | C. Diversion Works | Php 24.36 Million |
| | D. Canal Structures | Php 5.19 Million |
| | E. Canalization | Php 13.22 Million |
| | F. Drainage Structures | Php 4.05 Million |
| | G. Drainage Canalization | Php 6.08 Million |
| | H. Roads | Php 1.39 Million |
| | I. On-Farm Facilities/T.O. Gates | Php 17.50 Million |
| | J. IMT Support Facilities | Php 15.00 Million |
| | K. IMT GIS Database | Php 2.03 Million |
| | L. Institutional Development (5% of Direct Cost) | Php 5.60 Million |
| | M. Feasibility Studies & Detailed Engineering (2% of Direct Cost) | Php 2.02 Million |
| | Sub-total (Direct Cost) | |
| 2) Indirect Cost | A. General Engineering Supervision and Administration (3.5% of Direct Cost) | Php 3.53 Million |
| | B. NIA Management Fee (5% of Total Project Cost) | Php 5.50 Million |
| | Sub-total (Indirect Cost) | |
| 3) Total Project Cost | = 1+2 | Php 109.92 Million |
| Cost per ha. | | Php 54,253.00 /ha. |

6. Implementation Plan

| <i>Item</i> | <i>Description</i> |
|--|-------------------------------------|
| 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

| <i>Item</i> | <i>Description</i> | |
|-------------------------|--|--|
| 1) Economic evaluation | | |
| EIRR (Base) | EIRR = 39.7% | : Project life 50 years |
| Sensitivity | Case-1 | EIRR = 35.6 % : Cost 10% up |
| | Case-2 | EIRR = 35.2 % : Benefit 10% down |
| | Case-3 | EIRR = 31.6 % : Cost 10% up + Benefit 10% down |
| B/C | 2.37 | : discount rate 15% p.a. |
| NPV | PHP 95 million | : discount rate 15% p.a. |
| 2) Financial evaluation | Farmer's net income increase = PHP 25,822 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

| <i>Item</i> | <i>Description</i> |
|-------------------------|---|
| 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 |

Economic Evaluation (EIRR)

Case-1 (Cost 10% up)

Basic Case

| Name of NIS: 0110 - San Fabian | | | | | | | | | | Region: 1 - MORIO Pangasinan | | | |
|--|------|------------------------|---------------------------|----------------------|---------------------------|----------------------|-------|------------------------|--------------|--|--|--|--|
| EIRR : 35.6% Net Present Value (Million PHP) | | | | | | | | | | EIRR : 39.7% Net Present Value (Million PHP) | | | |
| (15 % discount rate) | | | | | | | | | | (15 % discount rate) | | | |
| Benefit 165 Cost 76 B/C Ratio 2.16 NPV 88 | | | | | | | | | | Benefit 165 Cost 69 B/C Ratio 2.37 NPV 95 | | | |
| Year in Order | Year | Economic Cost (M. PHP) | | | Economic Benefit (M. PHP) | | | Net Cash Flow (M. PHP) | | | | | |
| | | Civil Works | Institutional Development | Engineering Services | Total | Benefit without 1.5% | Total | Total | without 1.5% | Total | | | |
| Annual O & M | | | | | | | | | | Annual O & M | | | |
| 1 | 2011 | - | - | 0.53 | - | 0.53 | - | 0.53 | 0.75 | 0.22 | | | |
| 2 | 2012 | - | - | 0.53 | - | 0.53 | - | 0.53 | 1.50 | 0.97 | | | |
| 3 | 2013 | 28.88 | 1.00 | 0.53 | - | 30.41 | - | 30.41 | 2.25 | -25.40 | | | |
| 4 | 2014 | 38.50 | 1.34 | 0.53 | 1.36 | 41.73 | 8.26 | 30.30 | 2.25 | -26.68 | | | |
| 5 | 2015 | 28.88 | 1.00 | 0.53 | 3.16 | 33.58 | 20.30 | 30.97 | 3.75 | 24.05 | | | |
| 6 | 2016 | - | - | - | 4.52 | 4.52 | 30.97 | 4.50 | 35.47 | 31.36 | | | |
| 7 | 2017 | - | - | - | 4.52 | 4.52 | 33.38 | 5.25 | 38.63 | 34.52 | | | |
| 8 | 2018 | - | - | - | 4.52 | 4.52 | 34.41 | 6.00 | 40.41 | 36.30 | | | |
| 9 | 2019 | - | - | - | 4.52 | 4.52 | 34.41 | 6.75 | 41.16 | 37.05 | | | |
| 10 | 2020 | - | - | - | 4.52 | 4.52 | 34.41 | 7.50 | 41.91 | 37.80 | | | |
| 11 | 2021 | - | - | - | 4.52 | 4.52 | 34.41 | 8.25 | 42.66 | 38.55 | | | |
| 12 | 2022 | - | - | - | 4.52 | 4.52 | 34.41 | 9.00 | 43.41 | 39.30 | | | |
| 13 | 2023 | - | - | - | 4.52 | 4.52 | 34.41 | 9.75 | 44.16 | 40.05 | | | |
| 14 | 2024 | - | - | - | 4.52 | 4.52 | 34.41 | 10.50 | 44.91 | 40.80 | | | |
| 15 | 2025 | - | - | - | 4.52 | 4.52 | 34.41 | 11.25 | 45.66 | 41.55 | | | |
| 16 | 2026 | - | - | - | 4.52 | 4.52 | 34.41 | 12.00 | 46.41 | 42.30 | | | |
| 17 | 2027 | - | - | - | 4.52 | 4.52 | 34.41 | 12.75 | 47.16 | 43.05 | | | |
| 18 | 2028 | - | - | - | 4.52 | 4.52 | 34.41 | 13.50 | 47.91 | 43.80 | | | |
| 19 | 2029 | - | - | - | 4.52 | 4.52 | 34.41 | 14.25 | 48.66 | 44.55 | | | |
| 20 | 2030 | - | - | - | 4.52 | 4.52 | 34.41 | 15.00 | 49.41 | 45.30 | | | |
| 21 | 2031 | - | - | - | 4.52 | 4.52 | 34.41 | 15.75 | 50.16 | 46.05 | | | |
| 22 | 2032 | - | - | - | 4.52 | 4.52 | 34.41 | 16.50 | 50.91 | 46.80 | | | |
| 23 | 2033 | - | - | - | 4.52 | 4.52 | 34.41 | 17.25 | 51.66 | 47.55 | | | |
| 24 | 2034 | - | - | - | 4.52 | 4.52 | 34.41 | 18.00 | 52.41 | 48.30 | | | |
| 25 | 2035 | - | - | - | 4.52 | 4.52 | 34.41 | 18.75 | 53.16 | 49.05 | | | |
| 26 | 2036 | - | - | - | 4.52 | 4.52 | 34.41 | 19.50 | 53.91 | 49.80 | | | |
| 27 | 2037 | - | - | - | 4.52 | 4.52 | 34.41 | 20.25 | 54.66 | 50.55 | | | |
| 28 | 2038 | - | - | - | 4.52 | 4.52 | 34.41 | 21.00 | 55.41 | 51.30 | | | |
| 29 | 2039 | - | - | - | 4.52 | 4.52 | 34.41 | 21.75 | 56.16 | 52.05 | | | |
| 30 | 2040 | - | - | - | 4.52 | 4.52 | 34.41 | 22.50 | 56.91 | 52.80 | | | |
| 31 | 2041 | - | - | - | 4.52 | 4.52 | 34.41 | 23.25 | 57.66 | 53.55 | | | |
| 32 | 2042 | - | - | - | 4.52 | 4.52 | 34.41 | 24.00 | 58.41 | 54.30 | | | |
| 33 | 2043 | - | - | - | 4.52 | 4.52 | 34.41 | 24.75 | 59.16 | 55.05 | | | |
| 34 | 2044 | - | - | - | 4.52 | 4.52 | 34.41 | 25.50 | 59.91 | 55.80 | | | |
| 35 | 2045 | - | - | - | 4.52 | 4.52 | 34.41 | 26.25 | 60.66 | 56.55 | | | |
| 36 | 2046 | - | - | - | 4.52 | 4.52 | 34.41 | 27.00 | 61.41 | 57.30 | | | |
| 37 | 2047 | - | - | - | 4.52 | 4.52 | 34.41 | 27.75 | 62.16 | 58.05 | | | |
| 38 | 2048 | - | - | - | 4.52 | 4.52 | 34.41 | 28.50 | 62.91 | 58.80 | | | |
| 39 | 2049 | - | - | - | 4.52 | 4.52 | 34.41 | 29.25 | 63.66 | 59.55 | | | |
| 40 | 2050 | - | - | - | 4.52 | 4.52 | 34.41 | 30.00 | 64.41 | 60.30 | | | |
| 41 | 2051 | - | - | - | 4.52 | 4.52 | 34.41 | 30.75 | 65.16 | 61.05 | | | |
| 42 | 2052 | - | - | - | 4.52 | 4.52 | 34.41 | 31.50 | 65.91 | 61.80 | | | |
| 43 | 2053 | - | - | - | 4.52 | 4.52 | 34.41 | 32.25 | 66.66 | 62.55 | | | |
| 44 | 2054 | - | - | - | 4.52 | 4.52 | 34.41 | 33.00 | 67.41 | 63.30 | | | |
| 45 | 2055 | - | - | - | 4.52 | 4.52 | 34.41 | 33.75 | 68.16 | 64.05 | | | |
| 46 | 2056 | - | - | - | 4.52 | 4.52 | 34.41 | 34.50 | 68.91 | 64.80 | | | |
| 47 | 2057 | - | - | - | 4.52 | 4.52 | 34.41 | 35.25 | 69.66 | 65.55 | | | |
| 48 | 2058 | - | - | - | 4.52 | 4.52 | 34.41 | 36.00 | 70.41 | 66.30 | | | |
| 49 | 2059 | - | - | - | 4.52 | 4.52 | 34.41 | 36.75 | 71.16 | 67.05 | | | |
| 50 | 2060 | - | - | - | 4.52 | 4.52 | 34.41 | 37.50 | 71.91 | 67.80 | | | |

| Name of NIS: 0110 - San Fabian | | | | | | | | | | Region: 1 - MORIO Pangasinan | | | |
|--|------|------------------------|---------------------------|----------------------|---------------------------|----------------------|-------|------------------------|--------------|--|--|--|--|
| EIRR : 35.6% Net Present Value (Million PHP) | | | | | | | | | | EIRR : 39.7% Net Present Value (Million PHP) | | | |
| (15 % discount rate) | | | | | | | | | | (15 % discount rate) | | | |
| Benefit 165 Cost 76 B/C Ratio 2.16 NPV 88 | | | | | | | | | | Benefit 165 Cost 69 B/C Ratio 2.37 NPV 95 | | | |
| Year in Order | Year | Economic Cost (M. PHP) | | | Economic Benefit (M. PHP) | | | Net Cash Flow (M. PHP) | | | | | |
| | | Civil Works | Institutional Development | Engineering Services | Total | Benefit without 1.5% | Total | Total | without 1.5% | Total | | | |
| Annual O & M | | | | | | | | | | Annual O & M | | | |
| 1 | 2011 | - | - | 0.48 | - | 0.48 | - | 0.48 | 0.75 | 0.27 | | | |
| 2 | 2012 | - | - | 0.48 | - | 0.48 | - | 0.48 | 1.50 | 1.02 | | | |
| 3 | 2013 | 26.25 | 0.91 | 0.48 | - | 27.66 | - | 27.66 | 2.25 | -25.40 | | | |
| 4 | 2014 | 35.00 | 1.22 | 0.48 | 1.23 | 37.94 | 8.26 | 30.30 | 3.00 | -6.47 | | | |
| 5 | 2015 | 26.25 | 0.91 | 0.48 | 2.88 | 30.52 | 20.30 | 30.97 | 3.75 | 24.05 | | | |
| 6 | 2016 | - | - | - | 4.11 | 4.11 | 30.97 | 4.50 | 35.47 | 31.36 | | | |
| 7 | 2017 | - | - | - | 4.11 | 4.11 | 33.38 | 5.25 | 38.63 | 34.52 | | | |
| 8 | 2018 | - | - | - | 4.11 | 4.11 | 34.41 | 6.00 | 40.41 | 36.30 | | | |
| 9 | 2019 | - | - | - | 4.11 | 4.11 | 34.41 | 6.75 | 41.16 | 37.05 | | | |
| 10 | 2020 | - | - | - | 4.11 | 4.11 | 34.41 | 7.50 | 41.91 | 37.80 | | | |
| 11 | 2021 | - | - | - | 4.11 | 4.11 | 34.41 | 8.25 | 42.66 | 38.55 | | | |
| 12 | 2022 | - | - | - | 4.11 | 4.11 | 34.41 | 9.00 | 43.41 | 39.30 | | | |
| 13 | 2023 | - | - | - | 4.11 | 4.11 | 34.41 | 9.75 | 44.16 | 40.05 | | | |
| 14 | 2024 | - | - | - | 4.11 | 4.11 | 34.41 | 10.50 | 44.91 | 40.80 | | | |
| 15 | 2025 | - | - | - | 4.11 | 4.11 | 34.41 | 11.25 | 45.66 | 41.55 | | | |
| 16 | 2026 | - | - | - | 4.11 | 4.11 | 34.41 | 12.00 | 46.41 | 42.30 | | | |
| 17 | 2027 | - | - | - | 4.11 | 4.11 | 34.41 | 12.75 | 47.16 | 43.05 | | | |
| 18 | 2028 | - | - | - | 4.11 | 4.11 | 34.41 | 13.50 | 47.91 | 43.80 | | | |
| 19 | 2029 | - | - | - | 4.11 | 4.11 | 34.41 | 14.25 | 48.66 | 44.55 | | | |
| 20 | 2030 | - | - | - | 4.11 | 4.11 | 34.41 | 15.00 | 49.41 | 45.30 | | | |
| 21 | 2031 | - | - | - | 4.11 | 4.11 | 34.41 | 15.75 | 50.16 | 46.05 | | | |
| 22 | 2032 | - | - | - | 4.11 | 4.11 | 34.41 | 16.50 | 50.91 | 46.80 | | | |
| 23 | 2033 | - | - | - | 4.11 | 4.11 | 34.41 | 17.25 | 51.66 | 47.55 | | | |
| 24 | 2034 | - | - | - | 4.11 | 4.11 | 34.41 | 18.00 | 52.41 | 48.30 | | | |
| 25 | 2035 | - | - | - | 4.11 | 4.11 | 34.41 | 18.75 | 53.16 | 49.05 | | | |
| 26 | 2036 | - | - | - | 4.11 | 4.11 | 34.41 | 19.50 | 53.91 | 49.80 | | | |
| 27 | 2037 | - | - | - | 4.11 | 4.11 | 34.41 | 20.25 | 54.66 | 50.55 | | | |
| 28 | 2038 | - | - | - | 4.11 | 4.11 | 34.41 | 21.00 | 55.41 | 51.30 | | | |
| 29 | 2039 | - | - | - | 4.11 | 4.11 | 34.41 | 21.75 | 56.16 | 52.05 | | | |
| 30 | 2040 | - | - | - | 4.11 | 4.11 | 34.41 | 22.50 | 56.91 | 52.80 | | | |
| 31 | 2041 | - | - | - | 4.11 | 4.11 | 34.41 | 23.25 | 57.66 | 53.55 | | | |
| 32 | 2042 | - | - | - | 4.11 | 4.11 | 34.41 | 24.00 | 58.41 | 54.30 | | | |
| 33 | 2043 | - | - | - | 4.11 | 4.11 | 34.41 | 24.75 | 59.16 | 55.05 | | | |
| 34 | 2044 | - | - | - | 4.11 | 4.11 | 34.41 | 25.50 | 59.91 | 55.80 | | | |
| 35 | 2045 | - | - | - | 4.11 | 4.11 | 34.41 | 26.25 | 60.66 | 56.55 | | | |
| 36 | 2046 | - | - | - | 4.11 | 4.11 | 34.41 | 27.00 | 61.41 | 57.30 | | | |
| 37 | 2047 | - | - | - | 4.11 | 4.11 | 34.41 | 27.75 | 62.16 | 58.05 | | | |
| 38 | 2048 | - | - | - | 4.11 | 4.11 | 34.41 | 28.50 | 62.91 | 58.80 | | | |
| 39 | 2049 | - | - | - | 4.11 | 4.11 | 34.41 | 29.25 | 63.66 | 59.55 | | | |
| 40 | 2050 | - | - | - | 4.11 | 4.11 | 34.41 | 30.00 | 64.41 | 60.30 | | | |
| 41 | 2051 | - | - | - | 4.11 | 4.11 | 34.41 | 30.75 | 65.16 | 61.05 | | | |
| 42 | 2052 | - | - | - | 4.11 | 4.11 | 34.41 | 31.50 | 65.91 | 61.80 | | | |
| 43 | 2053 | - | - | - | 4.11 | 4.11 | 34.41 | 32.25 | 66.66 | 62.55 | | | |
| 44 | 2054 | - | - | - | 4.11 | 4.11 | 34.41 | 33.00 | 67.41 | 63.30 | | | |
| 45 | 2055 | - | - | - | 4.11 | 4.11 | 34.41 | 33.75 | 68.16 | 64.05 | | | |
| 46 | 2056 | - | - | - | 4.11 | 4.11 | 34.41 | 34.50 | 68.91 | 64.80 | | | |
| 47 | 2057 | - | - | - | 4.11 | 4.11 | 34.41 | 35.25 | 69.66 | 65.55 | | | |
| 48 | 2058 | - | - | - | 4.11 | 4.11 | 34.41 | 36.00 | 70.41 | 66.30 | | | |
| 49 | 2059 | - | - | - | 4.11 | 4.11 | 34.41 | 36.75 | 71.16 | 67.05 | | | |
| 50 | 2060 | - | - | - | 4.11 | 4.11 | 34.41 | 37.50 | 71.91 | 67.80 | | | |

Table 0110 - San Fabian

Case-2 (Benefit 10% down)

| | | | |
|--------------------------------|---------------------------------|---------------------------------|------|
| Name of NIS: 0110 - San Fabian | | Region: 1 - IMO: RIO Pangasinan | |
| EIRR : 35.2% | Net Present Value (Million PHP) | Benefit | Cost |
| | (-15 % discount rate) | 148 | 69 |
| | | B/C Ratio | NPV |
| | | 2.14 | 79 |

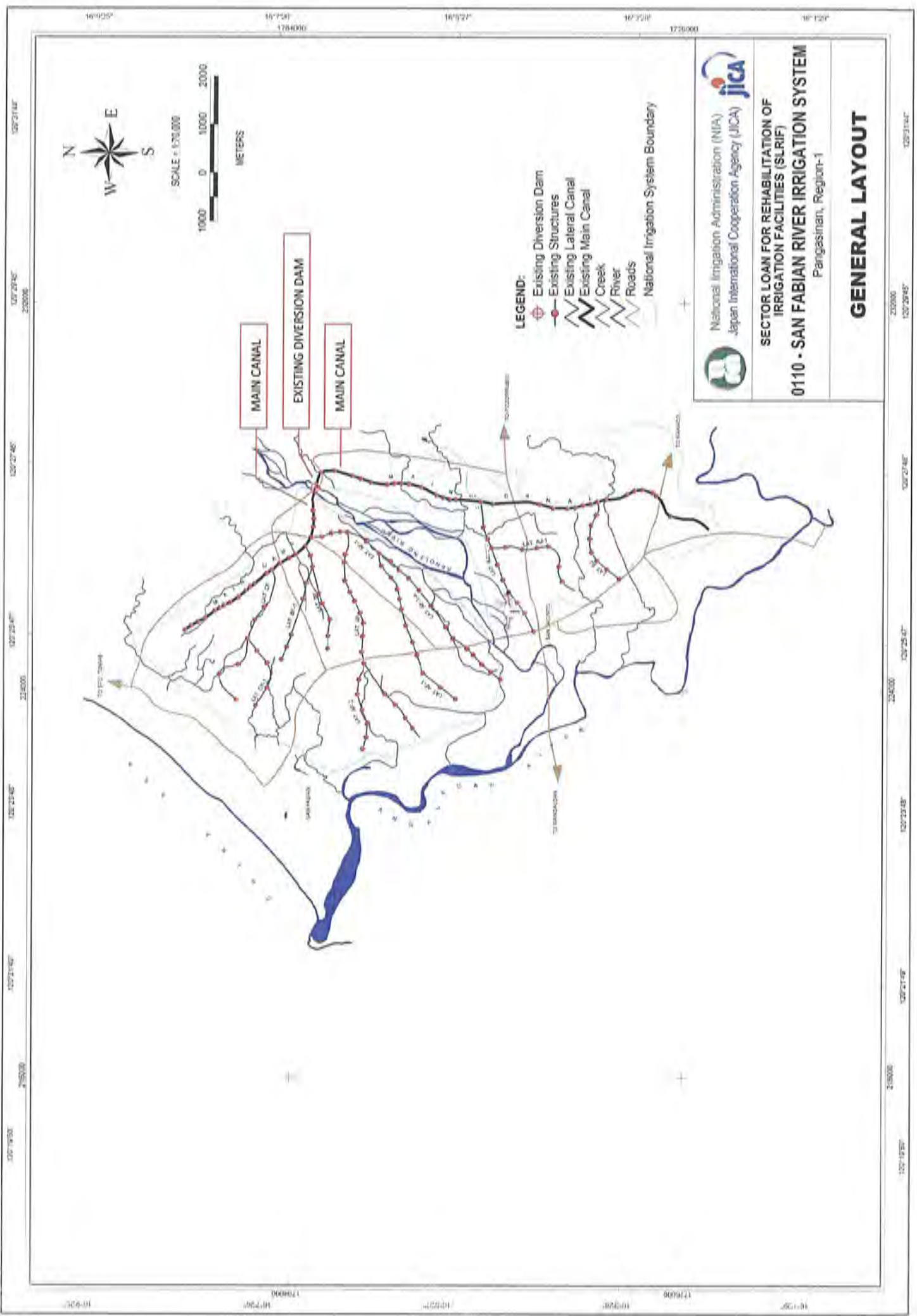
| Year In Order | Year | Economic Cost (M. PHP) | | | Economic Benefit (M. PHP) | | Annual O & M | Civil Works | Institutional Development | Engineering Services | Net Cash Flow (M. PHP) |
|---------------|------|------------------------|----------------------|-------|---------------------------|-------|--------------|-------------|---------------------------|----------------------|------------------------|
| | | Development | Engineering Services | Total | without 1.5% | Total | | | | | |
| 1 | 2011 | - | 0.48 | - | 0.48 | 0.68 | 0.68 | 0.14 | - | - | 0.14 |
| 2 | 2012 | - | 0.48 | - | 0.48 | 1.35 | 1.35 | 0.87 | - | - | 0.87 |
| 3 | 2013 | 0.91 | 0.48 | - | 2.765 | 2.03 | 2.03 | -25.62 | - | - | -25.62 |
| 4 | 2014 | 35.00 | 1.22 | 0.48 | 37.70 | 7.43 | 7.43 | -7.80 | - | - | -7.80 |
| 5 | 2015 | 26.25 | 0.91 | 0.48 | 30.52 | 18.27 | 3.38 | 21.65 | -8.88 | - | 12.77 |
| 6 | 2016 | - | - | - | 4.11 | 27.87 | 4.05 | 31.92 | - | - | 27.81 |
| 7 | 2017 | - | - | - | 4.11 | 30.04 | 4.73 | 34.76 | - | - | 30.65 |
| 8 | 2018 | - | - | - | 4.11 | 30.97 | 5.40 | 36.37 | - | - | 32.26 |
| 9 | 2019 | - | - | - | 4.11 | 30.97 | 6.08 | 37.04 | - | - | 32.93 |
| 10 | 2020 | - | - | - | 4.11 | 30.97 | 6.75 | 37.72 | - | - | 33.61 |
| 11 | 2021 | - | - | - | 4.11 | 30.97 | 7.43 | 38.39 | - | - | 34.28 |
| 12 | 2022 | - | - | - | 4.11 | 30.97 | 8.10 | 39.07 | - | - | 34.96 |
| 13 | 2023 | - | - | - | 4.11 | 30.97 | 8.78 | 39.74 | - | - | 35.63 |
| 14 | 2024 | - | - | - | 4.11 | 30.97 | 9.45 | 40.42 | - | - | 36.31 |
| 15 | 2025 | - | - | - | 4.11 | 30.97 | 10.13 | 41.09 | - | - | 36.98 |
| 16 | 2026 | - | - | - | 4.11 | 30.97 | 10.80 | 41.77 | - | - | 37.66 |
| 17 | 2027 | - | - | - | 4.11 | 30.97 | 11.48 | 42.44 | - | - | 38.33 |
| 18 | 2028 | - | - | - | 4.11 | 30.97 | 12.15 | 43.12 | - | - | 39.01 |
| 19 | 2029 | - | - | - | 4.11 | 30.97 | 12.83 | 43.79 | - | - | 39.68 |
| 20 | 2030 | - | - | - | 4.11 | 30.97 | 13.50 | 44.47 | - | - | 40.36 |
| 21 | 2031 | - | - | - | 4.11 | 30.97 | 14.18 | 45.14 | - | - | 41.03 |
| 22 | 2032 | - | - | - | 4.11 | 30.97 | 14.85 | 45.82 | - | - | 41.71 |
| 23 | 2033 | - | - | - | 4.11 | 30.97 | 15.53 | 46.49 | - | - | 42.38 |
| 24 | 2034 | - | - | - | 4.11 | 30.97 | 16.20 | 47.17 | - | - | 43.06 |
| 25 | 2035 | - | - | - | 4.11 | 30.97 | 16.88 | 47.84 | - | - | 43.73 |
| 26 | 2036 | - | - | - | 4.11 | 30.97 | 17.55 | 48.52 | - | - | 44.41 |
| 27 | 2037 | - | - | - | 4.11 | 30.97 | 18.23 | 49.19 | - | - | 45.08 |
| 28 | 2038 | - | - | - | 4.11 | 30.97 | 18.90 | 49.87 | - | - | 45.76 |
| 29 | 2039 | - | - | - | 4.11 | 30.97 | 19.58 | 50.54 | - | - | 46.43 |
| 30 | 2040 | - | - | - | 4.11 | 30.97 | 20.25 | 51.22 | - | - | 47.11 |
| 31 | 2041 | - | - | - | 4.11 | 30.97 | 20.93 | 51.89 | - | - | 47.78 |
| 32 | 2042 | - | - | - | 4.11 | 30.97 | 21.60 | 52.57 | - | - | 48.46 |
| 33 | 2043 | - | - | - | 4.11 | 30.97 | 22.28 | 53.24 | - | - | 49.13 |
| 34 | 2044 | - | - | - | 4.11 | 30.97 | 22.95 | 53.92 | - | - | 49.81 |
| 35 | 2045 | - | - | - | 4.11 | 30.97 | 23.63 | 54.59 | - | - | 50.48 |
| 36 | 2046 | - | - | - | 4.11 | 30.97 | 24.30 | 55.27 | - | - | 51.16 |
| 37 | 2047 | - | - | - | 4.11 | 30.97 | 24.98 | 55.94 | - | - | 51.83 |
| 38 | 2048 | - | - | - | 4.11 | 30.97 | 25.65 | 56.62 | - | - | 52.51 |
| 39 | 2049 | - | - | - | 4.11 | 30.97 | 26.33 | 57.29 | - | - | 53.18 |
| 40 | 2050 | - | - | - | 4.11 | 30.97 | 27.00 | 57.97 | - | - | 53.86 |
| 41 | 2051 | - | - | - | 4.11 | 30.97 | 27.68 | 58.64 | - | - | 54.53 |
| 42 | 2052 | - | - | - | 4.11 | 30.97 | 28.35 | 59.32 | - | - | 55.21 |
| 43 | 2053 | - | - | - | 4.11 | 30.97 | 29.03 | 59.99 | - | - | 55.88 |
| 44 | 2054 | - | - | - | 4.11 | 30.97 | 29.70 | 60.67 | - | - | 56.56 |
| 45 | 2055 | - | - | - | 4.11 | 30.97 | 30.38 | 61.34 | - | - | 57.23 |
| 46 | 2056 | - | - | - | 4.11 | 30.97 | 31.05 | 62.02 | - | - | 57.91 |
| 47 | 2057 | - | - | - | 4.11 | 30.97 | 31.73 | 62.69 | - | - | 58.58 |
| 48 | 2058 | - | - | - | 4.11 | 30.97 | 32.40 | 63.37 | - | - | 59.26 |
| 49 | 2059 | - | - | - | 4.11 | 30.97 | 33.08 | 64.04 | - | - | 59.93 |
| 50 | 2060 | - | - | - | 4.11 | 30.97 | 33.75 | 64.72 | - | - | 60.61 |

Economic Evaluation (EIRR)

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

| | | | |
|--------------------------------|---------------------------------|---------------------------------|------|
| Name of NIS: 0110 - San Fabian | | Region: 1 - IMO: RIO Pangasinan | |
| EIRR : 31.6% | Net Present Value (Million PHP) | Benefit | Cost |
| | (-15 % discount rate) | 148 | 76 |
| | | B/C Ratio | NPV |
| | | 1.94 | 72 |

| Year In Order | Year | Economic Cost (M. PHP) | | | Economic Benefit (M. PHP) | | Annual O & M | Civil Works | Institutional Development | Engineering Services | Net Cash Flow (M. PHP) |
|---------------|------|------------------------|----------------------|-------|---------------------------|-------|--------------|-------------|---------------------------|----------------------|------------------------|
| | | Development | Engineering Services | Total | without 1.5% | Total | | | | | |
| 1 | 2011 | - | 0.53 | - | 0.53 | 0.68 | 0.68 | 0.14 | - | - | 0.14 |
| 2 | 2012 | - | 0.53 | - | 0.53 | 1.35 | 1.35 | 0.82 | - | - | 0.82 |
| 3 | 2013 | 1.00 | 0.53 | - | 30.41 | 2.03 | 2.03 | -28.39 | - | - | -28.39 |
| 4 | 2014 | 38.50 | 1.34 | 0.53 | 41.73 | 7.43 | 7.43 | -11.60 | - | - | -11.60 |
| 5 | 2015 | 28.88 | 1.00 | 0.53 | 33.58 | 18.27 | 3.38 | 21.65 | -11.93 | - | 10.72 |
| 6 | 2016 | - | - | - | 4.52 | 27.87 | 4.05 | 31.92 | - | - | 27.40 |
| 7 | 2017 | - | - | - | 4.52 | 30.04 | 4.73 | 34.76 | - | - | 30.24 |
| 8 | 2018 | - | - | - | 4.52 | 30.97 | 5.40 | 36.37 | - | - | 31.85 |
| 9 | 2019 | - | - | - | 4.52 | 30.97 | 6.08 | 37.04 | - | - | 32.52 |
| 10 | 2020 | - | - | - | 4.52 | 30.97 | 6.75 | 37.72 | - | - | 33.20 |
| 11 | 2021 | - | - | - | 4.52 | 30.97 | 7.43 | 38.39 | - | - | 33.87 |
| 12 | 2022 | - | - | - | 4.52 | 30.97 | 8.10 | 39.07 | - | - | 34.55 |
| 13 | 2023 | - | - | - | 4.52 | 30.97 | 8.78 | 39.74 | - | - | 35.22 |
| 14 | 2024 | - | - | - | 4.52 | 30.97 | 9.45 | 40.42 | - | - | 35.90 |
| 15 | 2025 | - | - | - | 4.52 | 30.97 | 10.13 | 41.09 | - | - | 36.57 |
| 16 | 2026 | - | - | - | 4.52 | 30.97 | 10.80 | 41.77 | - | - | 37.25 |
| 17 | 2027 | - | - | - | 4.52 | 30.97 | 11.48 | 42.44 | - | - | 37.92 |
| 18 | 2028 | - | - | - | 4.52 | 30.97 | 12.15 | 43.12 | - | - | 38.60 |
| 19 | 2029 | - | - | - | 4.52 | 30.97 | 12.83 | 43.79 | - | - | 39.27 |
| 20 | 2030 | - | - | - | 4.52 | 30.97 | 13.50 | 44.47 | - | - | 39.95 |
| 21 | 2031 | - | - | - | 4.52 | 30.97 | 14.18 | 45.14 | - | - | 40.62 |
| 22 | 2032 | - | - | - | 4.52 | 30.97 | 14.85 | 45.82 | - | - | 41.30 |
| 23 | 2033 | - | - | - | 4.52 | 30.97 | 15.53 | 46.49 | - | - | 41.97 |
| 24 | 2034 | - | - | - | 4.52 | 30.97 | 16.20 | 47.17 | - | - | 42.65 |
| 25 | 2035 | - | - | - | 4.52 | 30.97 | 16.88 | 47.84 | - | - | 43.32 |
| 26 | 2036 | - | - | - | 4.52 | 30.97 | 17.55 | 48.52 | - | - | 44.00 |
| 27 | 2037 | - | - | - | 4.52 | 30.97 | 18.23 | 49.19 | - | - | 44.67 |
| 28 | 2038 | - | - | - | 4.52 | 30.97 | 18.90 | 49.87 | - | - | 45.35 |
| 29 | 2039 | - | - | - | 4.52 | 30.97 | 19.58 | 50.54 | - | - | 46.02 |
| 30 | 2040 | - | - | - | 4.52 | 30.97 | 20.25 | 51.22 | - | - | 46.70 |
| 31 | 2041 | - | - | - | 4.52 | 30.97 | 20.93 | 51.89 | - | - | 47.37 |
| 32 | 2042 | - | - | - | 4.52 | 30.97 | 21.60 | 52.57 | - | - | 48.05 |
| 33 | 2043 | - | - | - | 4.52 | 30.97 | 22.28 | 53.24 | - | - | 48.72 |
| 34 | 2044 | - | - | - | 4.52 | 30.97 | 22.95 | 53.92 | - | - | 49.40 |
| 35 | 2045 | - | - | - | 4.52 | 30.97 | 23.63 | 54.59 | - | - | 50.07 |
| 36 | 2046 | - | - | - | 4.52 | 30.97 | 24.30 | 55.27 | - | - | 50.75 |
| 37 | 2047 | - | - | - | 4.52 | 30.97 | 24.98 | 55.94 | - | - | 51.42 |
| 38 | 2048 | - | - | - | 4.52 | 30.97 | 25.65 | 56.62 | - | - | 52.10 |
| 39 | 2049 | - | - | - | 4.52 | 30.97 | 26.33 | 57.29 | - | - | 52.77 |
| 40 | 2050 | - | - | - | 4.52 | 30.97 | 27.00 | 57.97 | - | - | 53.45 |
| 41 | 2051 | - | - | - | 4.52 | 30.97 | 27.68 | 58.64 | - | - | 54.12 |
| 42 | 2052 | - | - | - | 4.52 | 30.97 | 28.35 | 59.32 | - | - | 54.80 |
| 43 | 2053 | - | - | - | 4.52 | 30.97 | 29.03 | 59.99 | - | - | 55.47 |
| 44 | 2054 | - | - | - | 4.52 | 30.97 | 29.70 | 60.67 | - | - | 56.15 |
| 45 | 2055 | - | - | - | 4.52 | 30.97 | 30.38 | 61.34 | - | - | 56.82 |
| 46 | 2056 | - | - | - | 4.52 | 30.97 | 31.05 | 62.02 | - | - | 57.50 |
| 47 | 2057 | - | - | - | 4.52 | 30.97 | 31.73 | 62.69 | - | - | 58.17 |
| 48 | 2058 | - | - | - | 4.52 | 30.97 | 32.40 | 63.37 | - | - | 58.85 |
| 49 | 2059 | - | - | - | 4.52 | 30.97 | 33.08 | 64.04 | - | - | 59.52 |
| 50 | 2060 | - | - | - | 4.52 | 30.97 | 33.75 | 64.72 | - | - | 60.20 |



- LEGEND:**
- Existing Diversion Dam
 - Existing Structures
 - Existing Lateral Canal
 - Existing Main Canal
 - Creek
 - River
 - Roads
 - National Irrigation System Boundary



SECTOR LOAN FOR REHABILITATION OF IRRIGATION FACILITIES (SLRIF)
0110 - SAN FABIAN RIVER IRRIGATION SYSTEM
 Pangasinan, Region-1

GENERAL LAYOUT

16°50' 16°51' 16°52' 17°00'

120°21'45" 120°23'45" 120°25'45" 120°27'45"

10000 0 10000 20000 METERS

SCALE = 1:70,000

N
W E
S

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

SECTOR LOAN FOR REHABILITATION OF IRRIGATION FACILITIES (SLRIF)
0110 - SAN FABIAN RIVER IRRIGATION SYSTEM
 Pangasinan, Region-1

GENERAL LAYOUT

20000 10000 0 10000 20000 METERS

120°21'45" 120°23'45" 120°25'45" 120°27'45"

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

NIS name: San Fabian (Region 1)

| <i>Location/Facility</i> | <i>Photograph</i> | <i>Comments</i> |
|--|--|---|
| San Fabian RIS Diversion Dam, Brgy. Binday, San Fabian Pangasinan |  | Repair/ Modification of Dam, Sluice gate & Intake gates |
| San Fabian RIS Diversion Dam, Brgy. Binday, San Fabian Pangasinan |  | Repair/ Modification of Dam, Sluice gate & Intake gates |
| San Fabian RIS Diversion Dam, Brgy. Binday, San Fabian Pangasinan |  | Repair/ Modification of Dam, Sluice gate & Intake gates |

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

NIS name: San Fabian (Region 1)

| <i>Location/Facility</i> | <i>Photograph</i> | <i>Comments</i> |
|---|--|--|
| San Fabian RIS Barangay San Jose, San Jacinto, Pangasinan |  | Proposed Canal lining @ Lat. AJ-1, sta. 0+000 – 2+000 |
| San Fabian, RIS Barangay Lobong Proper, San Jacinto Pangasinan |  | Proposed Re- gravelling and surfacing of O&M service road, @ sta. 0+000 -1+000 |
| San Fabian RIS, Barangay Cabaruan, San Fabian, Pangasinan |  | Proposed Canal lining @ lat. AF-1, Sta. 2+500 – 4+500 |



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

NIS name: San Fabian (Region 1)

| <i>Location/Facility</i> | <i>Photograph</i> | <i>Comments</i> |
|--|--|--|
| San Fabian RIS Barangay San Jose, San Jacinto, Pangasinan |  | Proposed Canal lining @ Lat. AJ, sta. 0+868 – 2+500 |
| San Fabian RIS Barangay San Jose, San Jacinto, Pangasinan |  | Proposed Canal lining @ Lat. AJ, sta. 0+868 – 2+500 |
| San Fabian RIS, Barangay Binday, San Fabian, Pangasinan |  | Damaged Siphon @ MCF, Sta. 2+120 convert to flume structure |

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

NIS name: San Fabian (Region 1)

| <i>Location/Facility</i> | <i>Photograph</i> | <i>Comments</i> |
|---|---|--|
| San Fabian RIS, Barangay Bindow, San Fabian, Pangasinan |  | Damaged Siphon @ MCF, Sta. 2+120 convert to flume structure |
| San Fabian RIS, Barangay Bindow, San Fabian, Pangasinan |  | Damaged Siphon @ MCF, Sta. 2+120 convert to flume structure |

THE REPUBLIC OF PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION

**Sector Loan on
Rehabilitation of Irrigation Facilities**

NIS SUMMARY REPORT

0111

Dumuloc RIS

Region 1

La Union 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**

| <i>Item</i> | <i>Description</i> | |
|---|---|---|
| 1) Name of NIS | Dumuloc RIS | Code: 0111 |
| 2) Location | Region | Region 1 |
| | Province | Pangasinan |
| | Municipality | Bugallon |
| | Distance | 10km from Lingayen |
| 3) Type of Water Source | Water Source | Dumuloc River |
| | Type | Diversion Dam (77.0 m wide; 3.20 m high) |
| 4) Area | Service Area | 2,000 ha |
| | FUSA | 1,232 ha |
| 5) Beneficiary Farmers | 2,436 farmers | Average paddy field cultivating size = 0.51 ha per farmer |
| 6) Irrigator's Association | IAs established = 11 FIA established = 0 | |
| 7) Features of NIS and Necessity of the project | One IA is under IMT contract. After the Rehabilitation and Strengthening of IAs, the rest of 4 IAs will be also program to be under IMT in the year 2012. | |
| 8) Outline of the Proposed Project | <p>A. Engineering</p> <ol style="list-style-type: none"> 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 <p>B. Institutional Strengthening Program</p> <p>B. 1 Basic Program</p> <ol style="list-style-type: none"> 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 <p>B.2 Specific Program to strengthen institutional mechanism together with LGUs</p> <ol style="list-style-type: none"> 1. Monitoring and control of illegal mechanical quarrying 2. Improvement of watershed management | |
| 9) Proposed Project Component | <p>A. Engineering</p> <ol style="list-style-type: none"> 1. Construction of civil works for rehabilitation of diversion works, canal system, drainage system, roads, and IMT support facilities. <p>B. Institutional Strengthening Program</p> <ol style="list-style-type: none"> 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 | 92.03 Million |
| | - Civil Works | PHP | 83.59 Million | |
| | - Institutional Development | PHP | 6.60 Million | |
| | - Engineering Services | PHP | 1.84 Million | |
| | 2. Indirect cost | | PHP | 8.23 Million |
| | Total Project Cost (1+2) | | PHP | 100.26 Million |
| | Cost per ha | | PHP | 81,834.00 per ha. |
| 11) Project Benefit | 1. To increase paddy production by 1,764 tons/year 2. To increase farmers' net income to PHP53,758.00 /ha/year 3. To establish functional and self-reliant IAs 4. To improve performance of NIS | | | |
| 12) Project Justification | EIRR = 18.6%, B/C = 1.23 (discount rate 15%) | | | |

2. Project History (Construction/Rehabilitation)

| Year | Description | Fund Source |
|------|--|-------------|
| 2005 | Canal Desilting | GAA |
| 2006 | Canal Desilting | GAA |
| 2007 | Repair Diversion Dam, Channeling, Canal Lining, Desilting, Repair Structures, Protection Dike. | GAA |
| 2008 | Canal Lining, Desilting, River Channeling | NDC |

3. Present Condition

3.1 Natural Conditions

| Item | Description |
|------------------------------|--|
| 1) Annual Rainfall | 2,106.70 mm |
| 2) Seasons | Wet season: October to April Dry season: May to September |
| 3) Dominant Soil in NIS Area | Sandy Loam |
| 4) Topography | Undulated |

3.2 Socio-economy (Region/Province)

| Item | Description |
|---------------------------|--|
| 1) GRDP | PHP 185,566 million (Year 2007), Per Capita GRDP = PHP 38,063 per year |
| 2) Population | 2,645,395 (province) |
| 3) Population Growth Rate | 1.15 % per year (province) |
| 4) Labor Force | 3,183,000 (region) |
| 5) Poverty Population | 35 % to total population (province) |

3.3 Present Agriculture in NIS

| <i>Item</i> | <i>Description</i> | | | | | | |
|--------------------------------------|---|------------------|----------|---------------------|-------|---------|-------|
| 1) Farm Household in NIS | Total beneficiaries | 2,436 households | | | | | |
| | Land owners | 1,636 households | (67.2 %) | | | | |
| | Tenant farmers | 800 households | (32.8 %) | | | | |
| 2) Paddy Field Size in NIS | 0.51 ha per household (FUSA/Total beneficiaries as of 2008) | | | | | | |
| 3) Present Land Use in NIS | Paddy field planted | 912 ha | 45.6 % | As of 2008 | | | |
| | Paddy field not planted | 320 ha | 16.0 % | 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 | 768 ha | 38.4 % | No data in response | | | |
| 4) Paddy Field in FUSA (ha) | 1,232 | | | | | | |
| 5) Paddy Cropped Area (ha) | 2004 | 2005 | 2006 | 2007 | 2008 | Average | |
| | Wet Season | 912 | 897 | 894 | 914 | 912 | 906 |
| | Dry Season | 418 | 510 | 580 | 572 | 613 | 539 |
| 6) Cropping Intensity (%) (per year) | 2004 | 2005 | 2006 | 2007 | 2008 | Average | |
| | 108 | 114 | 120 | 121 | 124 | 117 | |
| 7) Unit Yield of Paddy (ton/ha) | 2004 | 2005 | 2006 | 2007 | 2008 | Average | |
| | Wet Season | 4.00 | 4.00 | 4.00 | 4.00 | 3.50 | 3.90 |
| | Dry Season | 3.75 | 3.75 | 3.90 | 3.95 | 3.95 | 3.87 |
| 8) Paddy Production (ton) | 2004 | 2005 | 2006 | 2007 | 2008 | Average | |
| | Wet Season | 3,648 | 3,588 | 3,576 | 3,656 | 3,192 | 3,532 |
| | Dry Season | 1,568 | 1,913 | 2,262 | 2,259 | 2,421 | 2,085 |

3.4 Water Resources

| <i>Item</i> | <i>Description</i> |
|------------------------------|------------------------------|
| 1) Name of Rivers | Dumuloc River/Cabatuan River |
| 2) Catchment Area at Dam | 200.00 km ² |
| 3) Ave. River Discharge | 5.87 m ³ /s |
| 4) Ave. Dry Season Discharge | 5.43 m ³ /s |
| 5) Diverted Intake Discharge | 0.88 m ³ /s |
| 6) Water Requirement | 2.22 m ³ /s |
| 7) Sedimentation | Severe |

3.5 Existing Irrigation System

| <i>Item</i> | <i>Description</i> |
|------------------------|--|
| 1) Diversion Dam | Overflow crest width <u>77.00</u> m, Dam height <u>3.20</u> m Dam width <u>68.00</u> m |
| 2) Main Canal | Total length <u>9.79</u> km (Lined portion <u>0.335</u> km) |
| 3) Lateral Canals | Total length <u>31.031</u> km (Lined portion <u>6.210</u> km) |
| 4) On-farm facilities | Total length <u>41.00</u> km (Lined portion <u>0</u> km) Turn-outs = <u>62</u> units |
| 5) Drainage Canal | Total length <u>16.00</u> kms. |
| 6) Canal Structures | No. = <u>116</u> units |
| 7) Drainage Structures | No. = <u>16</u> units |
| 8) Farm roads | Total length <u>7.955</u> km |

3.6 Institutions for O&M of NIS

| <i>Item</i> | <i>Description</i> | | | | | |
|--|------------------------------|------|------|------|------|---------|
| 1) Regional Irrigation Office | Name: Region 1-Ilocos Region | | | | | |
| 2) IMO | Name: Pangasinan IMO | | | | | |
| Staff in 2009 | Total number of staff: 86 | | | | | |
| 3) Irrigator' Association (IA) | 2004 | 2005 | 2006 | 2007 | 2008 | Average |
| Number of FIA (nos) | | | | | 0 | |
| Number of IA (nos) | | | | | 11 | |
| Number of TSAG (nos) | 99 | 99 | 99 | 99 | 99 | 99 |
| Functionality of IA | 0.0 | 0.0 | 74.7 | 72.4 | 45.8 | 64.3 |
| Collection of ISF (wet, %) | 31 | 0 | 70 | 66 | 33 | 48 |
| Collection of ISF (dry, %) | 35 | 40 | 40 | 34 | 36 | 43 |
| 4) NIS Category based on IA 2008 O&M Contract (NIA-IA) | No. of IA | | | | | |
| Category A | 6 | | | | | |
| Category B | 4 | | | | | |
| Category C | 2 | | | | | |

3.7 Existing Problems

| <i>Item</i> | <i>Description</i> |
|---|--|
| 1) Diversion Works (Cabatuan & Laguit Dam) | 1. Collapsed Wall 2. Semi-functional Sluice & Intake gates 3. Damaged Downstream Apron |
| 2) Canal and Structures | 1. Clogged Canal Structures 2. Some Semi-functional Structures due to wear & tear |
| 3) Drainage Canal | 1. Silted Drainage Canal and Lack of Drainage Structures |
| 4) Other Project Facilities (road, bridge, flood dike, building, etc) | 1. Lack of Equipment |
| 5) Water Management and O&M Activities | 1. Poor implementation of cropping schedule 2. Lack of Staff gauges & control gates. |
| 6) Status of NIS and IA Management | Status Type Bb evaluated by Radar Graph. Specific problems are: 1. Low ISF collection efficiency during wet and dry seasons at 42% and 50%, respectively 2. Low cropping intensity during wet and dry season at 39% and 58%, respectively 3. Low paddy yield during wet and dry seasons at 74 and 72 cavans/ha, respectively |
| 7) Watershed Management | 1. Illegal quarrying 2. Watershed is very denuded |
| 8) Coordination with LGU and Agencies concerned | 1. Minimum coordination by NIA's field offices and IA with concerned municipal LGUs on the specific problems such as monitoring and control of illegal mechanical quarrying and watershed management |
| 9) Agriculture | 1. Lack of Machineries 2. Insufficient supply of high quality rice seeds. 3. Lack of financial support for the farmers to buy farm inputs. 4. Inadequate number of post harvest facilities particularly dryer |
| 10) Others | |

4. Proposed Rehabilitation Plan

4.1 Agricultural Development Plan

| Item | Description | | | |
|-------------------------------|-------------|--------------|--------------|--------|
| | Wet Season | Dry Season-1 | Dry Season-2 | Annual |
| Cropping schedule | | | | |
| 1) Type of Crops | Paddy | Paddy | - | - |
| 2) Cropping Area (ha) | 1,232 | 620 | - | - |
| 3) Target Unit Yield (ton/ha) | 4.00 | 3.95 | - | - |
| 3) Total Production (ton) | 4,928 | 2,449 | - | 7,377 |

4.2 Civil Works

| Item | Description |
|---------------------------|--|
| 1) Diversion Works | <ol style="list-style-type: none"> 1. Restoration of apron 2. Laying of concrete blocks. 3. Installation of intake gate 4. Construction of gate keeper's quarter 5. Construction of protection dike 6. Construction of retaining wall 7. Repair of sluice gates |
| 2) Canal Structures | <ol style="list-style-type: none"> 1. Repair of damaged structures – 50 units 2. Repair/replacement of dilapidated steel gates. 3. Installation of new structure steel gates |
| 3) Canalization | <ol style="list-style-type: none"> 1. Concrete lining of selected canal sections – 34.2 kms 2. De-silting of selected canal sections. 3. Realignment of canal 4. Construction of new canal |
| 4) Drainage Structures | <ol style="list-style-type: none"> 1. Repair of drainage structures – 8 units 2. Construction of additional structures |
| 5) Drainage Canalization | <ol style="list-style-type: none"> 1. De-silting of existing drainage canals – 8.50 kms 2. Construction of additional drainage canals |
| 6) Service Roads | <ol style="list-style-type: none"> 1. Re-graveling of selected road sections – 8 kms 2. Construction of side drains 3. Construction of drainage structures in strategic road locations. |
| 7) On-Farm Facilities | <ol style="list-style-type: none"> 1. Repair /replacement of dilapidated turn out steel gates 2. Construction of new turn outs and farm ditches |
| 8) IMT Support Facilities | <ol style="list-style-type: none"> 1. Construction of post-harvest facilities—warehouses, IA buildings, solar driers with shed – 3 sets |
| 9) IMT GIS Database | <ol style="list-style-type: none"> 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) | <ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> 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 |

| <i>Item</i> | <i>Description</i> |
|--|---|
| | h) Assistance of reactivated IAs/FIAs in organizational and management activities |
| 2) Strengthening Program of NIA - IA - LGU Partnership | <ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> 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 | <ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> 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 | <ol style="list-style-type: none"> 1. Strengthening coordination with RDC, RAFC/PAFC and LGUs concerned through works shop on dissemination of the SLRIF to these organizations. 2. Request LGUs legal actions on protection of illegal mechanical quarrying prior to the commencement of the SLRIF through the coordination activities 3. Strengthening coordination with RDC, RAFC/PAFC and LGUs on training program of watershed management 4. Strengthening coordination on establishment of monitoring and control mechanism of illegal quarrying |

4.4 Proposed Counter Schemes

| <i>Item</i> | <i>Description</i> |
|-------------|--|
| 1) DENR | Should secure watershed area from illegal cutting of trees and quarrying |
| 2) LGU | <ol style="list-style-type: none"> 1. LGU initiates training and upgrade technical skills of its engineers by inviting resource persons from the key line departments and/or national agencies (e.g. NIA, DPWH.) 2. LGUs take actions on information awareness on the Project implementation through local communication media. 3. LGU establishes a coordinating/steering committee at the provincial level to improve coordination and representation of NIA in local planning and budgeting. |

5. Cost Estimate for Initial Investment

| <i>Item</i> | <i>Description</i> | |
|--------------------------------|--|--------------------|
| 1) Direct Cost for Civil Works | A. Mobilization | Php 1.84 Million |
| | B. Protection Dikes | - |
| | C. Diversion Works | Php 32.96 Million |
| | D. Canal Structures | Php 2.28 Million |
| | E. Canalization | Php 16.53 Million |
| | F. Drainage Structures | Php 2.46 Million |
| | G. Drainage Canalization | Php 4.46 Million |
| | H. Roads | Php 0.60 Million |
| | I. On-Farm Facilities/T.O. Gates | Php 11.24 Million |
| | J. IMT Support Facilities | Php 10.00 Million |
| | K. IMT GIS Database | Php 1.23 Million |
| | L. Institutional Development (5% of Direct Cost) | Php 6.60 Million |
| | M. Feasibility Studies & Detailed Engineering (2% of Direct Cost) | Php 1.84 Million |
| | Sub-total (Direct Cost) | |
| 2) Indirect Cost | A. General Engineering Supervision and Administration 3.5% of Direct Cost) | Php 3.22 Million |
| | B. NIA Management Fee (5% of Total Project Cost) | Php 5.01 Million |
| | Sub-total (Indirect Cost) | |
| 3) Total Project Cost | = 1+2 | Php 100.26 Million |
| Cost per ha. | | Php 81,384.00 /ha. |

6. Implementation Plan

| <i>Item</i> | <i>Description</i> |
|--|-------------------------------------|
| 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

| <i>Item</i> | <i>Description</i> | |
|-------------------------|--|----------------------------------|
| 1) Economic evaluation | | |
| EIRR (Base) | EIRR = 18.6 % | : Project life 50 years |
| Sensitivity Case-1 | EIRR = 16.8% | : Cost 10% up |
| Case-2 | EIRR = 16.7 % | : Benefit 10% down |
| Case-3 | EIRR = 15.1 % | : Cost 10% up + Benefit 10% down |
| B/C | 1.23 | : discount rate 15% p.a. |
| NPV | PHP 14 million | : discount rate 15% p.a. |
| 2) Financial evaluation | Farmer's net income increase = PHP 15,922 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

| <i>Item</i> | <i>Description</i> |
|-------------------------|---|
| 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 0111 - Dumuloc Economic Evaluation (EIRR)

| | | | |
|-----------------------------|---|------------------------------|-----------|
| Basic Case | | Case-1 (Cost 10% up) | |
| Name of NIS: 0111 - Dumuloc | | Region: 1 - MORIO Pangasinan | |
| EIRR : 18.6% | Net Present Value (Million PHP) (15 % discount rate) | Benefit | Cost |
| | | 72 | 64 |
| | | | B/C Ratio |
| | | | 1.12 |
| | | | NPV |
| | | | 8 |

| | | | |
|-----------------------------|---|------------------------------|-----------|
| Basic Case | | Case-1 (Cost 10% up) | |
| Name of NIS: 0111 - Dumuloc | | Region: 1 - MORIO Pangasinan | |
| EIRR : 18.6% | Net Present Value (Million PHP) (15 % discount rate) | Benefit | Cost |
| | | 72 | 58 |
| | | | B/C Ratio |
| | | | 1.23 |
| | | | NPV |
| | | | 14 |

| Year In Order | Year | Economic Cost (M. PHP) | | | Economic Benefit (M. PHP) | | Annual O & M | Total | Economic Benefit (M. PHP) | | Net Cash Flow (M. PHP) |
|---------------|------|---------------------------|----------------------|-------------|---------------------------|--------------|--------------|-------|---------------------------|-------|------------------------|
| | | Institutional Development | Engineering Services | Development | Benefit | without 1.5% | | | Total | | |
| 1 | 2011 | - | - | 0.48 | - | - | 0.48 | - | - | 0.56 | 0.08 |
| 2 | 2012 | - | - | 0.48 | - | - | 0.48 | - | - | 1.12 | 0.64 |
| 3 | 2013 | 25.87 | 1.17 | 0.48 | - | - | 27.52 | - | - | 1.68 | -25.84 |
| 4 | 2014 | 34.50 | 1.57 | 0.48 | 0.83 | - | 37.36 | 2.82 | 2.24 | 2.24 | -32.31 |
| 5 | 2015 | 25.87 | 1.17 | 0.48 | 1.93 | - | 29.45 | 6.93 | 2.80 | 9.73 | -19.72 |
| 6 | 2016 | - | - | - | 2.75 | - | 2.75 | 10.57 | 3.36 | 13.93 | 11.18 |
| 7 | 2017 | - | - | - | 2.75 | - | 2.75 | 11.39 | 3.92 | 15.31 | 12.56 |
| 8 | 2018 | - | - | - | 2.75 | - | 2.75 | 11.74 | 4.48 | 16.22 | 13.47 |
| 9 | 2019 | - | - | - | 2.75 | - | 2.75 | 11.74 | 5.04 | 16.78 | 14.03 |
| 10 | 2020 | - | - | - | 2.75 | - | 2.75 | 11.74 | 5.60 | 17.34 | 14.59 |
| 11 | 2021 | - | - | - | 2.75 | - | 2.75 | 11.74 | 6.16 | 17.90 | 15.15 |
| 12 | 2022 | - | - | - | 2.75 | - | 2.75 | 11.74 | 6.72 | 18.46 | 15.71 |
| 13 | 2023 | - | - | - | 2.75 | - | 2.75 | 11.74 | 7.28 | 19.02 | 16.27 |
| 14 | 2024 | - | - | - | 2.75 | - | 2.75 | 11.74 | 7.84 | 19.58 | 16.83 |
| 15 | 2025 | - | - | - | 2.75 | - | 2.75 | 11.74 | 8.40 | 20.14 | 17.39 |
| 16 | 2026 | - | - | - | 2.75 | - | 2.75 | 11.74 | 8.96 | 20.70 | 17.95 |
| 17 | 2027 | - | - | - | 2.75 | - | 2.75 | 11.74 | 9.52 | 21.26 | 18.51 |
| 18 | 2028 | - | - | - | 2.75 | - | 2.75 | 11.74 | 10.08 | 21.82 | 19.07 |
| 19 | 2029 | - | - | - | 2.75 | - | 2.75 | 11.74 | 10.64 | 22.38 | 19.63 |
| 20 | 2030 | - | - | - | 2.75 | - | 2.75 | 11.74 | 11.20 | 22.94 | 20.19 |
| 21 | 2031 | - | - | - | 2.75 | - | 2.75 | 11.74 | 11.76 | 23.50 | 20.75 |
| 22 | 2032 | - | - | - | 2.75 | - | 2.75 | 11.74 | 12.32 | 24.06 | 21.31 |
| 23 | 2033 | - | - | - | 2.75 | - | 2.75 | 11.74 | 12.88 | 24.62 | 21.87 |
| 24 | 2034 | - | - | - | 2.75 | - | 2.75 | 11.74 | 13.44 | 25.18 | 22.43 |
| 25 | 2035 | - | - | - | 2.75 | - | 2.75 | 11.74 | 14.00 | 25.74 | 22.99 |
| 26 | 2036 | - | - | - | 2.75 | - | 2.75 | 11.74 | 14.56 | 26.30 | 23.55 |
| 27 | 2037 | - | - | - | 2.75 | - | 2.75 | 11.74 | 15.12 | 26.86 | 24.11 |
| 28 | 2038 | - | - | - | 2.75 | - | 2.75 | 11.74 | 15.68 | 27.42 | 24.67 |
| 29 | 2039 | - | - | - | 2.75 | - | 2.75 | 11.74 | 16.24 | 27.98 | 25.23 |
| 30 | 2040 | - | - | - | 2.75 | - | 2.75 | 11.74 | 16.80 | 28.54 | 25.79 |
| 31 | 2041 | - | - | - | 2.75 | - | 2.75 | 11.74 | 17.36 | 29.10 | 26.35 |
| 32 | 2042 | - | - | - | 2.75 | - | 2.75 | 11.74 | 17.92 | 29.66 | 26.91 |
| 33 | 2043 | - | - | - | 2.75 | - | 2.75 | 11.74 | 18.48 | 30.22 | 27.47 |
| 34 | 2044 | - | - | - | 2.75 | - | 2.75 | 11.74 | 19.04 | 30.78 | 28.03 |
| 35 | 2045 | - | - | - | 2.75 | - | 2.75 | 11.74 | 19.60 | 31.34 | 28.59 |
| 36 | 2046 | - | - | - | 2.75 | - | 2.75 | 11.74 | 20.16 | 31.90 | 29.15 |
| 37 | 2047 | - | - | - | 2.75 | - | 2.75 | 11.74 | 20.72 | 32.46 | 29.71 |
| 38 | 2048 | - | - | - | 2.75 | - | 2.75 | 11.74 | 21.28 | 33.02 | 30.27 |
| 39 | 2049 | - | - | - | 2.75 | - | 2.75 | 11.74 | 21.84 | 33.58 | 30.83 |
| 40 | 2050 | - | - | - | 2.75 | - | 2.75 | 11.74 | 22.40 | 34.14 | 31.39 |
| 41 | 2051 | - | - | - | 2.75 | - | 2.75 | 11.74 | 22.96 | 34.70 | 31.95 |
| 42 | 2052 | - | - | - | 2.75 | - | 2.75 | 11.74 | 23.52 | 35.26 | 32.51 |
| 43 | 2053 | - | - | - | 2.75 | - | 2.75 | 11.74 | 24.08 | 35.82 | 33.07 |
| 44 | 2054 | - | - | - | 2.75 | - | 2.75 | 11.74 | 24.64 | 36.38 | 33.63 |
| 45 | 2055 | - | - | - | 2.75 | - | 2.75 | 11.74 | 25.20 | 36.94 | 34.19 |
| 46 | 2056 | - | - | - | 2.75 | - | 2.75 | 11.74 | 25.76 | 37.50 | 34.75 |
| 47 | 2057 | - | - | - | 2.75 | - | 2.75 | 11.74 | 26.32 | 38.06 | 35.31 |
| 48 | 2058 | - | - | - | 2.75 | - | 2.75 | 11.74 | 26.88 | 38.62 | 35.87 |
| 49 | 2059 | - | - | - | 2.75 | - | 2.75 | 11.74 | 27.44 | 39.18 | 36.43 |
| 50 | 2060 | - | - | - | 2.75 | - | 2.75 | 11.74 | 28.00 | 39.74 | 36.99 |

| Year In Order | Year | Economic Cost (M. PHP) | | | Economic Benefit (M. PHP) | | Annual O & M | Total | Economic Benefit (M. PHP) | | Net Cash Flow (M. PHP) |
|---------------|------|---------------------------|----------------------|-------------|---------------------------|--------------|--------------|-------|---------------------------|--------|------------------------|
| | | Institutional Development | Engineering Services | Development | Benefit | without 1.5% | | | Total | | |
| 1 | 2011 | 0.43 | 0.43 | 0.43 | 0.56 | 0.56 | 0.43 | 0.43 | 0.56 | 0.13 | |
| 2 | 2012 | 0.43 | 0.43 | 0.43 | 1.12 | 1.12 | 0.43 | 0.43 | 1.12 | 0.69 | |
| 3 | 2013 | 23.52 | 1.07 | 0.43 | 1.68 | 1.68 | -23.34 | 25.02 | 1.68 | -23.34 | |
| 4 | 2014 | 31.36 | 1.42 | 0.43 | 2.82 | 2.24 | -28.91 | 33.97 | 2.24 | -28.91 | |
| 5 | 2015 | 23.52 | 1.07 | 0.43 | 6.93 | 2.80 | -17.04 | 26.77 | 2.80 | -17.04 | |
| 6 | 2016 | - | - | - | 10.57 | 3.36 | 13.93 | 2.50 | 3.36 | 13.93 | |
| 7 | 2017 | - | - | - | 11.39 | 3.92 | 15.31 | 2.50 | 3.92 | 15.31 | |
| 8 | 2018 | - | - | - | 11.74 | 4.48 | 16.22 | 2.50 | 4.48 | 16.22 | |
| 9 | 2019 | - | - | - | 11.74 | 5.04 | 16.78 | 2.50 | 5.04 | 16.78 | |
| 10 | 2020 | - | - | - | 11.74 | 5.60 | 17.34 | 2.50 | 5.60 | 17.34 | |
| 11 | 2021 | - | - | - | 11.74 | 6.16 | 17.90 | 2.50 | 6.16 | 17.90 | |
| 12 | 2022 | - | - | - | 11.74 | 6.72 | 18.46 | 2.50 | 6.72 | 18.46 | |
| 13 | 2023 | - | - | - | 11.74 | 7.28 | 19.02 | 2.50 | 7.28 | 19.02 | |
| 14 | 2024 | - | - | - | 11.74 | 7.84 | 19.58 | 2.50 | 7.84 | 19.58 | |
| 15 | 2025 | - | - | - | 11.74 | 8.40 | 20.14 | 2.50 | 8.40 | 20.14 | |
| 16 | 2026 | - | - | - | 11.74 | 8.96 | 20.70 | 2.50 | 8.96 | 20.70 | |
| 17 | 2027 | - | - | - | 11.74 | 9.52 | 21.26 | 2.50 | 9.52 | 21.26 | |
| 18 | 2028 | - | - | - | 11.74 | 10.08 | 21.82 | 2.50 | 10.08 | 21.82 | |
| 19 | 2029 | - | - | - | 11.74 | 10.64 | 22.38 | 2.50 | 10.64 | 22.38 | |
| 20 | 2030 | - | - | - | 11.74 | 11.20 | 22.94 | 2.50 | 11.20 | 22.94 | |
| 21 | 2031 | - | - | - | 11.74 | 11.76 | 23.50 | 2.50 | 11.76 | 23.50 | |
| 22 | 2032 | - | - | - | 11.74 | 12.32 | 24.06 | 2.50 | 12.32 | 24.06 | |
| 23 | 2033 | - | - | - | 11.74 | 12.88 | 24.62 | 2.50 | 12.88 | 24.62 | |
| 24 | 2034 | - | - | - | 11.74 | 13.44 | 25.18 | 2.50 | 13.44 | 25.18 | |
| 25 | 2035 | - | - | - | 11.74 | 14.00 | 25.74 | 2.50 | 14.00 | 25.74 | |
| 26 | 2036 | - | - | - | 11.74 | 14.56 | 26.30 | 2.50 | 14.56 | 26.30 | |
| 27 | 2037 | - | - | - | 11.74 | 15.12 | 26.86 | 2.50 | 15.12 | 26.86 | |
| 28 | 2038 | - | - | - | 11.74 | 15.68 | 27.42 | 2.50 | 15.68 | 27.42 | |
| 29 | 2039 | - | - | - | 11.74 | 16.24 | 27.98 | 2.50 | 16.24 | 27.98 | |
| 30 | 2040 | - | - | - | 11.74 | 16.80 | 28.54 | 2.50 | 16.80 | 28.54 | |
| 31 | 2041 | - | - | - | 11.74 | 17.36 | 29.10 | 2.50 | 17.36 | 29.10 | |
| 32 | 2042 | - | - | - | 11.74 | 17.92 | 29.66 | 2.50 | 17.92 | 29.66 | |
| 33 | 2043 | - | - | - | 11.74 | 18.48 | 30.22 | 2.50 | 18.48 | 30.22 | |
| 34 | 2044 | - | - | - | 11.74 | 19.04 | 30.78 | 2.50 | 19.04 | 30.78 | |
| 35 | 2045 | - | - | - | 11.74 | 19.60 | 31.34 | 2.50 | 19.60 | 31.34 | |
| 36 | 2046 | - | - | - | 11.74 | 20.16 | 31.90 | 2.50 | 20.16 | 31.90 | |
| 37 | 2047 | - | - | - | 11.74 | 20.72 | 32.46 | 2.50 | 20.72 | 32.46 | |
| 38 | 2048 | - | - | - | 11.74 | 21.28 | 33.02 | 2.50 | 21.28 | 33.02 | |
| 39 | 2049 | - | - | - | 11.74 | 21.84 | 33.58 | 2.50 | 21.84 | 33.58 | |
| 40 | 2050 | - | - | - | 11.74 | 22.40 | 34.14 | 2.50 | 22.40 | 34.14 | |
| 41 | 2051 | - | - | - | 11.74 | 22.96 | 34.70 | 2.50 | 22.96 | 34.70 | |
| 42 | 2052 | - | - | - | 11.74 | 23.52 | 35.26 | 2.50 | 23.52 | 35.26 | |
| 43 | 2053 | - | - | - | 11.74 | 24.08 | 35.82 | 2.50 | 24.08 | 35.82 | |
| 44 | 2054 | - | - | - | 11.74 | 24.64 | 36.38 | 2.50 | 24.64 | 36.38 | |
| 45 | 2055 | - | - | - | 11.74 | 25.20 | 36.94 | 2.50 | 25.20 | 36.94 | |
| 46 | 2056 | - | - | - | 11.74 | 25.76 | 37.50 | 2.50 | 25.76 | 37.50 | |
| 47 | 2057 | - | - | - | 11.74 | 26.32 | 38.06 | 2.50 | 26.32 | 38.06 | |
| 48 | 2058 | - | - | - | 11.74 | 26.88 | 38.62 | 2.50 | 26.88 | 38.62 | |
| 49 | 2059 | - | - | - | 11.74 | 27.44 | 39.18 | 2.50 | 27.44 | 39.18 | |
| 50 | 2060 | - | - | - | 11.74 | 28.00 | 39.74 | 2.50 | 28.00 | 39.74 | |

Economic Evaluation (EIRR)

Case-2 (Benefit 10% down)

| | | | |
|-----------------------------|---------------------------------|------------------------------|-----------|
| Name of NIS: 0111 - Dumuloc | | Region: 1 - MORIO Pangasinan | |
| EIRR : 16.7% | Net Present Value (Million PHP) | Benefit : 65 | Cost : 58 |
| | (- 15 % discount rate) | | |
| | | B/C Ratio | NPV |
| | | 1.11 | 6 |




| Year In Order | Year | Economic Cost (M. PHP) | | | Economic Benefit (M. PHP) | | Annual O & M | Total | Benefit without 1.5% | Economic Benefit (M. PHP) without 1.5% | Net Cash Flow (M. PHP) |
|---------------|------|------------------------|---------------------------|----------------------|---------------------------|---------|--------------|-------|----------------------|--|------------------------|
| | | Civil Works | Institutional Development | Engineering Services | Development | Benefit | | | | | |
| 1 | 2011 | - | - | 0.43 | - | 0.43 | - | 0.43 | 0.50 | 0.07 | |
| 2 | 2012 | - | - | 0.43 | - | 0.43 | - | 0.43 | 1.01 | 0.58 | |
| 3 | 2013 | 23.52 | 1.07 | 0.43 | - | 25.02 | - | 25.02 | 1.51 | -23.51 | |
| 4 | 2014 | 31.36 | 1.42 | 0.43 | 0.75 | 33.97 | 2.54 | 33.97 | 2.02 | -29.41 | |
| 5 | 2015 | 23.52 | 1.07 | 0.43 | 1.75 | 26.77 | 6.23 | 26.77 | 2.52 | -18.02 | |
| 6 | 2016 | - | - | - | 2.50 | 2.50 | 9.51 | 2.50 | 3.02 | 10.03 | |
| 7 | 2017 | - | - | - | 2.50 | 2.50 | 10.25 | 2.50 | 3.53 | 11.28 | |
| 8 | 2018 | - | - | - | 2.50 | 2.50 | 10.57 | 2.50 | 4.03 | 12.10 | |
| 9 | 2019 | - | - | - | 2.50 | 2.50 | 10.57 | 2.50 | 4.54 | 12.60 | |
| 10 | 2020 | - | - | - | 2.50 | 2.50 | 10.57 | 2.50 | 5.04 | 13.11 | |
| 11 | 2021 | - | - | - | 2.50 | 2.50 | 10.57 | 2.50 | 5.54 | 13.61 | |
| 12 | 2022 | - | - | - | 2.50 | 2.50 | 10.57 | 2.50 | 6.05 | 14.11 | |
| 13 | 2023 | - | - | - | 2.50 | 2.50 | 10.57 | 2.50 | 6.55 | 14.62 | |
| 14 | 2024 | - | - | - | 2.50 | 2.50 | 10.57 | 2.50 | 7.06 | 15.12 | |
| 15 | 2025 | - | - | - | 2.50 | 2.50 | 10.57 | 2.50 | 7.56 | 15.63 | |
| 16 | 2026 | - | - | - | 2.50 | 2.50 | 10.57 | 2.50 | 8.06 | 16.13 | |
| 17 | 2027 | - | - | - | 2.50 | 2.50 | 10.57 | 2.50 | 8.57 | 16.63 | |
| 18 | 2028 | - | - | - | 2.50 | 2.50 | 10.57 | 2.50 | 9.07 | 17.14 | |
| 19 | 2029 | - | - | - | 2.50 | 2.50 | 10.57 | 2.50 | 9.58 | 17.64 | |
| 20 | 2030 | - | - | - | 2.50 | 2.50 | 10.57 | 2.50 | 10.08 | 18.15 | |
| 21 | 2031 | - | - | - | 2.50 | 2.50 | 10.57 | 2.50 | 10.58 | 18.65 | |
| 22 | 2032 | - | - | - | 2.50 | 2.50 | 10.57 | 2.50 | 11.09 | 19.15 | |
| 23 | 2033 | - | - | - | 2.50 | 2.50 | 10.57 | 2.50 | 11.59 | 19.66 | |
| 24 | 2034 | - | - | - | 2.50 | 2.50 | 10.57 | 2.50 | 12.10 | 20.16 | |
| 25 | 2035 | - | - | - | 2.50 | 2.50 | 10.57 | 2.50 | 12.60 | 20.67 | |
| 26 | 2036 | - | - | - | 2.50 | 2.50 | 10.57 | 2.50 | 13.10 | 21.17 | |
| 27 | 2037 | - | - | - | 2.50 | 2.50 | 10.57 | 2.50 | 13.61 | 21.67 | |
| 28 | 2038 | - | - | - | 2.50 | 2.50 | 10.57 | 2.50 | 14.11 | 22.18 | |
| 29 | 2039 | - | - | - | 2.50 | 2.50 | 10.57 | 2.50 | 14.62 | 22.68 | |
| 30 | 2040 | - | - | - | 2.50 | 2.50 | 10.57 | 2.50 | 15.12 | 23.19 | |
| 31 | 2041 | - | - | - | 2.50 | 2.50 | 10.57 | 2.50 | 15.62 | 23.69 | |
| 32 | 2042 | - | - | - | 2.50 | 2.50 | 10.57 | 2.50 | 16.13 | 24.19 | |
| 33 | 2043 | - | - | - | 2.50 | 2.50 | 10.57 | 2.50 | 16.63 | 24.70 | |
| 34 | 2044 | - | - | - | 2.50 | 2.50 | 10.57 | 2.50 | 17.14 | 25.20 | |
| 35 | 2045 | - | - | - | 2.50 | 2.50 | 10.57 | 2.50 | 17.64 | 25.71 | |
| 36 | 2046 | - | - | - | 2.50 | 2.50 | 10.57 | 2.50 | 18.14 | 26.21 | |
| 37 | 2047 | - | - | - | 2.50 | 2.50 | 10.57 | 2.50 | 18.65 | 26.71 | |
| 38 | 2048 | - | - | - | 2.50 | 2.50 | 10.57 | 2.50 | 19.15 | 27.22 | |
| 39 | 2049 | - | - | - | 2.50 | 2.50 | 10.57 | 2.50 | 19.66 | 27.72 | |
| 40 | 2050 | - | - | - | 2.50 | 2.50 | 10.57 | 2.50 | 20.16 | 28.23 | |
| 41 | 2051 | - | - | - | 2.50 | 2.50 | 10.57 | 2.50 | 20.66 | 28.73 | |
| 42 | 2052 | - | - | - | 2.50 | 2.50 | 10.57 | 2.50 | 21.17 | 29.23 | |
| 43 | 2053 | - | - | - | 2.50 | 2.50 | 10.57 | 2.50 | 21.67 | 29.74 | |
| 44 | 2054 | - | - | - | 2.50 | 2.50 | 10.57 | 2.50 | 22.18 | 30.24 | |
| 45 | 2055 | - | - | - | 2.50 | 2.50 | 10.57 | 2.50 | 22.68 | 30.75 | |
| 46 | 2056 | - | - | - | 2.50 | 2.50 | 10.57 | 2.50 | 23.18 | 31.25 | |
| 47 | 2057 | - | - | - | 2.50 | 2.50 | 10.57 | 2.50 | 23.69 | 31.75 | |
| 48 | 2058 | - | - | - | 2.50 | 2.50 | 10.57 | 2.50 | 24.19 | 32.26 | |
| 49 | 2059 | - | - | - | 2.50 | 2.50 | 10.57 | 2.50 | 24.70 | 32.76 | |
| 50 | 2060 | - | - | - | 2.50 | 2.50 | 10.57 | 2.50 | 25.20 | 33.27 | |

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

| | | | |
|-----------------------------|---------------------------------|------------------------------|-----------|
| Name of NIS: 0111 - Dumuloc | | Region: 1 - MORIO Pangasinan | |
| EIRR : 15.1% | Net Present Value (Million PHP) | Benefit : 65 | Cost : 64 |
| | (- 15 % discount rate) | | |
| | | B/C Ratio | NPV |
| | | 1.01 | 1 |

| Year In Order | Year | Economic Cost (M. PHP) | | | Economic Benefit (M. PHP) | | Annual O & M | Total | Benefit without 1.5% | Economic Benefit (M. PHP) without 1.5% | Net Cash Flow (M. PHP) |
|---------------|------|------------------------|---------------------------|----------------------|---------------------------|---------|--------------|-------|----------------------|--|------------------------|
| | | Civil Works | Institutional Development | Engineering Services | Development | Benefit | | | | | |
| 1 | 2011 | - | - | 0.48 | - | 0.48 | - | 0.48 | 0.50 | 0.03 | |
| 2 | 2012 | - | - | 0.48 | - | 0.48 | - | 0.48 | 1.01 | 0.53 | |
| 3 | 2013 | 25.87 | 1.17 | 0.48 | - | 27.52 | - | 27.52 | 1.51 | -26.01 | |
| 4 | 2014 | 34.50 | 1.57 | 0.48 | 0.83 | 37.36 | 2.54 | 37.36 | 2.02 | -32.81 | |
| 5 | 2015 | 25.87 | 1.17 | 0.48 | 1.93 | 29.45 | 6.23 | 29.45 | 2.52 | -20.69 | |
| 6 | 2016 | - | - | - | 2.75 | 2.75 | 9.51 | 2.75 | 3.02 | 9.78 | |
| 7 | 2017 | - | - | - | 2.75 | 2.75 | 10.25 | 2.75 | 3.53 | 11.03 | |
| 8 | 2018 | - | - | - | 2.75 | 2.75 | 10.57 | 2.75 | 4.03 | 11.85 | |
| 9 | 2019 | - | - | - | 2.75 | 2.75 | 10.57 | 2.75 | 4.54 | 12.35 | |
| 10 | 2020 | - | - | - | 2.75 | 2.75 | 10.57 | 2.75 | 5.04 | 12.86 | |
| 11 | 2021 | - | - | - | 2.75 | 2.75 | 10.57 | 2.75 | 5.54 | 13.36 | |
| 12 | 2022 | - | - | - | 2.75 | 2.75 | 10.57 | 2.75 | 6.05 | 13.86 | |
| 13 | 2023 | - | - | - | 2.75 | 2.75 | 10.57 | 2.75 | 6.55 | 14.37 | |
| 14 | 2024 | - | - | - | 2.75 | 2.75 | 10.57 | 2.75 | 7.06 | 14.87 | |
| 15 | 2025 | - | - | - | 2.75 | 2.75 | 10.57 | 2.75 | 7.56 | 15.38 | |
| 16 | 2026 | - | - | - | 2.75 | 2.75 | 10.57 | 2.75 | 8.06 | 15.88 | |
| 17 | 2027 | - | - | - | 2.75 | 2.75 | 10.57 | 2.75 | 8.57 | 16.39 | |
| 18 | 2028 | - | - | - | 2.75 | 2.75 | 10.57 | 2.75 | 9.07 | 16.89 | |
| 19 | 2029 | - | - | - | 2.75 | 2.75 | 10.57 | 2.75 | 9.58 | 17.39 | |
| 20 | 2030 | - | - | - | 2.75 | 2.75 | 10.57 | 2.75 | 10.08 | 17.90 | |
| 21 | 2031 | - | - | - | 2.75 | 2.75 | 10.57 | 2.75 | 10.58 | 18.40 | |
| 22 | 2032 | - | - | - | 2.75 | 2.75 | 10.57 | 2.75 | 11.09 | 18.90 | |
| 23 | 2033 | - | - | - | 2.75 | 2.75 | 10.57 | 2.75 | 11.59 | 19.41 | |
| 24 | 2034 | - | - | - | 2.75 | 2.75 | 10.57 | 2.75 | 12.10 | 19.91 | |
| 25 | 2035 | - | - | - | 2.75 | 2.75 | 10.57 | 2.75 | 12.60 | 20.42 | |
| 26 | 2036 | - | - | - | 2.75 | 2.75 | 10.57 | 2.75 | 13.10 | 20.92 | |
| 27 | 2037 | - | - | - | 2.75 | 2.75 | 10.57 | 2.75 | 13.61 | 21.42 | |
| 28 | 2038 | - | - | - | 2.75 | 2.75 | 10.57 | 2.75 | 14.11 | 21.93 | |
| 29 | 2039 | - | - | - | 2.75 | 2.75 | 10.57 | 2.75 | 14.62 | 22.43 | |
| 30 | 2040 | - | - | - | 2.75 | 2.75 | 10.57 | 2.75 | 15.12 | 22.94 | |
| 31 | 2041 | - | - | - | 2.75 | 2.75 | 10.57 | 2.75 | 15.62 | 23.44 | |
| 32 | 2042 | - | - | - | 2.75 | 2.75 | 10.57 | 2.75 | 16.13 | 23.94 | |
| 33 | 2043 | - | - | - | 2.75 | 2.75 | 10.57 | 2.75 | 16.63 | 24.45 | |
| 34 | 2044 | - | - | - | 2.75 | 2.75 | 10.57 | 2.75 | 17.14 | 24.95 | |
| 35 | 2045 | - | - | - | 2.75 | 2.75 | 10.57 | 2.75 | 17.64 | 25.46 | |
| 36 | 2046 | - | - | - | 2.75 | 2.75 | 10.57 | 2.75 | 18.14 | 25.96 | |
| 37 | 2047 | - | - | - | 2.75 | 2.75 | 10.57 | 2.75 | 18.65 | 26.46 | |
| 38 | 2048 | - | - | - | 2.75 | 2.75 | 10.57 | 2.75 | 19.15 | 26.97 | |
| 39 | 2049 | - | - | - | 2.75 | 2.75 | 10.57 | 2.75 | 19.66 | 27.47 | |
| 40 | 2050 | - | - | - | 2.75 | 2.75 | 10.57 | 2.75 | 20.16 | 27.98 | |
| 41 | 2051 | - | - | - | 2.75 | 2.75 | 10.57 | 2.75 | 20.66 | 28.48 | |
| 42 | 2052 | - | - | - | 2.75 | 2.75 | 10.57 | 2.75 | 21.17 | 28.98 | |
| 43 | 2053 | - | - | - | 2.75 | 2.75 | 10.57 | 2.75 | 21.67 | 29.49 | |
| 44 | 2054 | - | - | - | 2.75 | 2.75 | 10.57 | 2.75 | 22.18 | 29.99 | |
| 45 | 2055 | - | - | - | 2.75 | 2.75 | 10.57 | 2.75 | 22.68 | 30.50 | |
| 46 | 2056 | - | - | - | 2.75 | 2.75 | 10.57 | 2.75 | 23.18 | 31.00 | |
| 47 | 2057 | - | - | - | 2.75 | 2.75 | 10.57 | 2.75 | 23.69 | 31.50 | |
| 48 | 2058 | - | - | - | 2.75 | 2.75 | 10.57 | 2.75 | 24.19 | 32.01 | |
| 49 | 2059 | - | - | - | 2.75 | 2.75 | 10.57 | 2.75 | 24.70 | 32.51 | |
| 50 | 2060 | - | - | - | 2.75 | 2.75 | 10.57 | 2.75 | 25.20 | 33.02 | |

*JICA Preparatory Survey for Sector Loan on Rehabilitation of Irrigation Facilities***Photographs of Irrigation Facilities***NIS name:* Dumoloc (Region 1)

| <i>Location/ Facility</i> | <i>Photograph</i> | <i>Comments</i> |
|--|--|--|
| Cabatuan Diversion Dam, Brgy. Hacienda, Bugallon, Pangasinan |  | To Repair/ Rehab at downstream apron & retaining wall, Replacement of sluce and intake gate. |
| Cabatuan Diversion Dam, Brgy. Hacienda, Bugallon, Pangasinan |  | To Repair/ Rehab at downstream apron & retaining wall, Replacement of sluce and intake gate. |
| Dumoloc Ris, Laguit, Bugallon, Pangasinan Cabigaan Check Gate |  | Canal excavation & installation of steel gate |




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

NIS name: Dumoloc (Region 1)

| <i>Location/ Facility</i> | <i>Photograph</i> | <i>Comments</i> |
|---|--|---|
| Dumoloc Ris, Bugallon, Pangasinan Dumoloc Diversion Dam, Portic, Bugallon, Pangasinan |  | Fabrication/ Laying of Concrete Blocks at downstream portion |
| Dumoloc Ris, Bugallon, Pangasinan Dumoloc Diversion Dam, Portic, Bugallon, Pangasinan |  | Fabrication/ Laying of Concrete Blocks at downstream portion |
| Dumoloc Ris, Bugallon, Pangasinan Dumoloc Diversion Dam, Portic, Bugallon, Pangasinan |  | Repair/ Modification and installation of sluice gate and intake steel gate |

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

NIS name: Dumoloc (Region 1)

| <i>Location/Facility</i> | <i>Photograph</i> | <i>Comments</i> |
|---|--|---|
| Dumoloc Ris, Bugallon, Pangasinan Dumoloc Diversion Dam, Portic, Bugallon, Pangasinan |  | Repair/ Modification and installation of sluice gate and intake steel gate |
| Dumoloc Ris, Bugallon, Pangasinan Dumoloc Diversion Dam, Portic, Bugallon, Pangasinan |  | Repair/ Modification and installation of sluice gate and intake steel gate |
| Dumoloc Ris, Bugallon, Pangasinan Dumoloc Diversion Dam, Portic, Bugallon, Pangasinan |  | Repair of downstream apron and embankment protection |

THE REPUBLIC OF PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION

**Sector Loan on
Rehabilitation of Irrigation Facilities**

NIS SUMMARY REPORT

0301
Porac-Gumain RIS
Region 3
Pampanga 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**

| <i>Item</i> | <i>Description</i> | |
|---|--|---|
| 1) Name of NIS | Porac-Gumain RIS Code: 0301 | |
| 2) Location | Region | Region 3 |
| | Province | Pampanga |
| | Municipality | Guagua, Floridablanca, Lubao, Sta Rita |
| | Distance | 20 km from city of San Fernando, Pampanga (Capital of Province) |
| 3) Type of Water Source | Water Source | Gumain river |
| | Type | Diversion Dam (224 m wide, 2.20 m high) |
| 4) Area | Service Area | 2,167.61 ha |
| | FUSA | 3,126 ha |
| 5) Beneficiary Farmers | 1,280 farmers | Average paddy field cultivating size = 1.1 ha per farmer |
| 6) Irrigator's Association | IAs established = 23 FIA established = 1 in 2008 | |
| 7) Features of NIS and Necessity of the project | <p>The Porac-Gumain NIS is a combination of two (2) diversion dam with an irrigable service area of 754 hectares and 1,635 hectares, respectively, totaling to 2,389 and the firm ed uo service area is 1,639 hectares. The watershed is tremendously denuded due to eruption of volcano. Water supply from the river for irrigation is inadequate, however, some creeks were tapped by constructing check or small dams to augment the requirement. Another strategy is the "RE-USE" of the drainage water by constructing check structure.</p> <p>This project is essential to resolved all problems prior to Irrigation Management Transfer (IMT) such as squatters, ROW problems, water usage control, environment awareness, conservation and protection of irrigation and drainage facilities.</p> <p>The project will help increase rice production in the area and help also self sufficiency the region.</p> | |
| 8) Outline of the Proposed Project | <p>A. Engineering</p> <ol style="list-style-type: none"> 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 <p>B. Institutional Strengthening Program</p> <p>B. 1 Basic Program</p> <ol style="list-style-type: none"> 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 | | | |
| | <ol style="list-style-type: none"> 1. Improvement of watershed management 2. Monitoring and control on illegal dumping of wastes | | | |
| 9) Proposed Project Component | <p>A. Engineering</p> <ol style="list-style-type: none"> 1. Construction of civil works for rehabilitation of diversion works, canal system, drainage system, roads, and IMT support facilities. <p>B. Institutional</p> <ol style="list-style-type: none"> 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 | | | |
| 10) Project Cost (Direct cost only, excluding escalation, contingency, tax) | 1. Direct cost | | PHP | 203.96 Million |
| | - Civil Works | PHP | 185.09 Million | |
| | - Institutional Development | PHP | 14.80 Million | |
| | - Engineering Services | PHP | 4.08 Million | |
| | 2. Indirect cost | | PHP | 18.25 Million |
| | Total Project Cost (1+2) | | PHP | 222.21 Million |
| | Cost per ha | | PHP | 71,086.00 per ha. |
| 11) Project Benefit | <ol style="list-style-type: none"> 1. To increase paddy production by 6,862 tons/year 2. To increase farmers' net income to PHP52,743.00/ha/year 3. To establish functional and self-reliant IAs 4. To improve performance of NIS | | | |
| 12) Project Justification | EIRR = 28.4 %, B/C = 1.82 (discount rate 15%) | | | |

2. Project History (Construction/Rehabilitation)

| Year | Description |
|------|---|
| 1957 | Construction of Diversion Dam |
| 2006 | Canal Lining Desilting |
| 2007 | Canal Lining, Slope protection & facilities improvement |
| 2008 | Canal Lining & facilities improvement |

3. Present Condition

3.1 Natural Conditions

| Item | Description |
|------------------------------|--|
| 1) Annual Rainfall | 2,106.70 mm |
| 2) Seasons | Wet season: June to October Dry season: October to February |
| 3) Dominant Soil in NIS Area | Sandy Loam, Clay Loam, Sandy |
| 4) Topography | Flat plain |

3.2 Socio-economy (Region/Province)

| Item | Description |
|---------------------------|--|
| 1) GRDP | PHP 501,356 million (Year 2007), Per Capita GRDP = PHP 52,351 per year |
| 2) Population | 1,911,951 (province) |
| 3) Population Growth Rate | 2.36 % per year (province) |
| 4) Labor Force | 6,212,000 (region) |
| 5) Poverty Population | 10.8 % to total population (province) |

3.3 Present Agriculture in NIS

| Item | Description | | | | | | |
|---|---|---------------------------|--------|---------------------|-------|---------|-------|
| 1) Farm Household in NIS | Total beneficiaries | 4,293 households | | | | | |
| | Land owners | 1,084 households (25.2 %) | | | | | |
| | Tenant farmers | 3,209 households (74.8 %) | | | | | |
| 2) Paddy Field Size in NIS | 0.73 ha per household (FUSA/Total beneficiaries as of 2008) | | | | | | |
| 3) Present Land Use in NIS | Paddy field planted | 2,651 ha | 72.4 % | As of 2008 | | | |
| | Paddy field not planted | 475 ha | 13.0 % | As of 2008 | | | |
| | Upland crop field | 10 ha | 0.3 % | | | | |
| | 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 | 526 ha | 14.3 % | No data in response | | | |
| 4) Paddy Field in FUSA (ha) | 3,126 | | | | | | |
| 5) Paddy Cropped Area (ha) | 2004 | 2005 | 2006 | 2007 | 2008 | Average | |
| | Wet Season | 1,121 | 1,586 | 1,320 | 1,630 | 1,817 | 1,495 |
| | Dry Season | 1,963 | 2,037 | 2,275 | 1,843 | 2,651 | 2,154 |
| 6) Cropping Intensity (%) (per year) | 2004 | 2005 | 2006 | 2007 | 2008 | Average | |
| | 99 | 116 | 115 | 111 | 143 | 117 | |
| 7) Unit Yield of Paddy (ton/ha) | 2004 | 2005 | 2006 | 2007 | 2008 | Average | |
| | Wet Season | 3.56 | 3.85 | 2.86 | 3.01 | 3.26 | 3.30 |
| | Dry Season | 3.13 | 4.32 | 3.84 | 3.55 | 3.66 | 3.70 |
| 8) Paddy Production (ton) | 2004 | 2005 | 2006 | 2007 | 2008 | Average | |
| | Wet Season | 3,994 | 6,105 | 3,775 | 4,913 | 5,914 | 4,940 |
| | Dry Season | 6,134 | 8,791 | 8,730 | 6,543 | 9,696 | 7,979 |

3.4 Water Resources

| Item | Description |
|------------------------------|--------------------------|
| 1) Name of Rivers | Gumain River/Porac River |
| 2) Catchment Area at Dam | 111.0 km ² |
| 3) Ave. River Discharge | 4.20 m ³ /s |
| 4) Ave. Dry Season Discharge | 3.36 m ³ /s |
| 5) Diverted Intake Discharge | 3.30 m ³ /s |
| 6) Water Requirement | 5.63 m ³ /s |
| 7) Sedimentation | Severe |

3.5 Existing Irrigation System

| Item | Description |
|--------------------------|---|
| 1) Diversion Dam | Overflow crest width <u>46.3</u> m, Dam height <u>1.40</u> m Dam width <u>54.30</u> m |
| 2) Main Canal | Total length <u>18.505</u> km (Lined portion <u>7.85</u> km) |
| 3) Lateral Canals | Total length <u>31.64</u> km (Lined portion <u>1.623</u> km) |
| 4) On-farm facilities | Total length <u>104.00</u> km (Lined portion <u>0.00</u> km) Turn-outs = <u>104</u> units |
| 5) Drainage Canal | Total length <u>40.00</u> kms |
| 5) Canal Structures | No. = <u>170</u> units |
| 6) Drainage Structures | No. = <u>41</u> units |
| 7) Farm roads | Total length <u>27.94</u> km (pavement= <u>0.50</u> kms.) |
| 8) Flood Protection Dike | Total length <u>0.07</u> km (for rehab. = <u>0.03</u> kms.) |
| 9) Water Masters Quarter | No. = <u>1</u> unit |

| | |
|--------------------------|---|
| 10) Gate Keepers Quarter | No. = <u>0</u> unit |
| 11) Check Structure | No. = <u>31</u> unit (Damaged = <u>7</u> units) |

3.6 Institutions for O&M of NIS

| <i>Item</i> | <i>Description</i> | | | | | |
|--|------------------------------|-------|-------|------|-------|---------|
| 1) Regional Irrigation Office | Name: Region 3-Central Luzon | | | | | |
| 2) IMO | Name: Pampanga-Bataan IMO | | | | | |
| Staff in 2009 | Total number of staff: 75 | | | | | |
| 3) Irrigator' Association (IA) | 2004 | 2005 | 2006 | 2007 | 2008 | Average |
| Number of FIA (nos) | | | | | 1 | |
| Number of IA (nos) | | | | | 23 | |
| Number of TSAG (nos) | 134 | 133 | 117 | 115 | 125 | 125 |
| Functionality of IA | 86.65 | 86.06 | 83.74 | 81.8 | 82.48 | 84.15 |
| Collection of ISF (wet, %) | 80 | 78 | 54 | 61 | 71 | 69 |
| Collection of ISF (dry, %) | 45 | 68 | 76 | 77 | 76 | 68 |
| 4) NIS Category based on IA 2008 O&M Contract (NIA-IA) | No. of IA | | | | | |
| Category A | 5 | | | | | |
| Category B | 18 | | | | | |
| Category C | 0 | | | | | |

3.7 Existing Problems

| <i>Item</i> | <i>Description</i> |
|---|--|
| 1) Diversion Works | <ol style="list-style-type: none"> Operating water surface of the dam or existing weir height is not enough to irrigate at field level due to increase in elevation of farmland caused by lahar flooding from volcano eruption. Steel gates are rusted and needs repair and replacement Intake gates has no roofing or canopy and perimeter fence, to protect steel gates from rusting and vandalism |
| 2) Canal and Structures | <ol style="list-style-type: none"> Broken concrete canal lining Scoured inlet and outlet transition protection works Rusted and stolen gates Encroachment of houses, buildings, and structures along canal right of way Silted and shallow canal due to collapsed side slope embankment works along auxiliary berm and roadway berm Widening and eroded canal due to wallowing of carabao/water buffalo Unauthorized extraction of water from the canal |
| 3) Drainage Canal | <ol style="list-style-type: none"> Silted and shallow canal due to collapsed side slope embankment works along auxiliary berm and roadway berm Widening and eroded canal due to wallowing of carabao/water buffalo |
| 4) Other Project Facilities (road, bridge, flood dike, building, etc) | <ol style="list-style-type: none"> Lack of gravel maintenance of some service roads Access roads lack side drainage, crown surface, and gravel surfacing. |
| 5) Water Management and O&M Activities | <ol style="list-style-type: none"> No measuring tools or staff gages along canal and dams Wasted uncontrolled flow or overflowing of irrigation water at field level Lack of gravel maintenance of some service roads Tolerant of NIA to squatters, vandalizers, illegal waste and garbage disposal to the canals |

| <i>Item</i> | <i>Description</i> |
|---|---|
| 6) Status of NIS and IA Management | Status Type B evaluated by Radar graph. Specific problems are: 1. Medium ISF collection efficiency during wet and dry seasons at 69% and 71%, respectively 2. Medium ratio of tenancy at 63% |
| 7) Watershed Management | 1. Lack of water conservation and watershed protection works 2. Prevalent ongoing cutting of trees upstream of the diversion dam |
| 8) Coordination with LGU and Agencies concerned | 1. Poor coordination by NIA's field offices and IA with concerned LGUS on specific problems such as watershed management and monitoring and control of illegal dumping of wastes |
| 9) Agriculture | 1. Prevalence of pest and diseases due to poor farm management among the farmers. 2. Inadequate number of post harvest facilities particularly dryer. 3. Insufficient number of credit facilities. Farmers are availing loans from private traders with high rates of interest. |
| 10) Others | 1. Flooding along the downstream part of the irrigable area due lack of drainage canal 2. Common disposal of garbage and other domestic waste to Porac River, Gumain River, irrigation, and drainage canals |

4. Proposed Rehabilitation Plan

4.1 Agricultural Development Plan

| <i>Item</i> | <i>Description</i> | | | |
|-------------------------------|--------------------|---------------------|---------------------|---------------|
| Cropping schedule | <i>Wet Season</i> | <i>Dry Season-1</i> | <i>Dry Season-2</i> | <i>Annual</i> |
| 1) Type of Crops | Paddy | Paddy | - | - |
| 2) Cropping Area (ha) | 3,126 | 2,660 | - | - |
| 3) Target Unit Yield (ton/ha) | 3.70 | 4.100 | - | - |
| 4) Total Production (ton) | 11,566 | 10,906 | - | 22,472 |

4.2 Civil Works

| <i>Item</i> | <i>Description</i> |
|--------------------------|--|
| 1) Diversion Works | <u>Porac Dam</u> a) Repair works of the ogee by raising the elevation of the weir b) Repair works by replacing the rusted pulleys c) Construction of downstream slope protection works d) Construction of gate keepers quarter <u>Gumain Dam</u> a) Improve the lifting mechanism of secondary check gates from pulley type to engine driven b) Repair and repaint of rusted roller guide assembly and horizontal roller guide beam |
| 2) Canal Structures | a) Repair damage structures b) Construct scour protection at inlet and outlet transition c) Replacement of stolen and damage gates |
| 3) Canalization | a) Construction of concrete canal lining or CHB flume – 25.5 kms |
| 4) Drainage Structures | a) Construct additional culvert crossing structure – 20 units |
| 5) Drainage Canalization | a) Drainage canal excavation and desilting – 2 kms |
| 6) Service Roads | Gravel surfacing and side drainage construction – 27.44 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 – 1 set |
| 9) IMT GIS Database | 1. Development and establishment of GIS database |

4.3 Institutional Strengthening Program

| <i>Item</i> | <i>Description</i> |
|--|---|
| 1) Reactivation Program of FIAs/IAs and System Management Committee (ISMC) | <ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> 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 | <ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> 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 | <ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> 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 dumping of wastes | <ol style="list-style-type: none"> 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 dumping of wastes |

4.4 Proposed Counter Schemes

| <i>Item</i> | <i>Description</i> |
|-------------|--|
| 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 dumping of waste materials |
| 2) LGU | 1. Provincial LGUs initiates co-mentoring to municipal LGUs to increase their technical skills on technology advice 2. LGU provided area (24 ha) for solid waste management 3. LGU invite farmer leaders to be part of the regular planning and budgeting workshop of concerned LGUs |

5. Cost Estimate for Initial Investment

| <i>Item</i> | <i>Description</i> | | |
|--------------------------------|---|---------------------------|----------------|
| 1) Direct Cost for Civil Works | A. Mobilization | Php | 4.08 Million |
| | B. Protection Dikes | | - |
| | C. Diversion Works | Php | 60.00 Million |
| | D. Canal Structures | Php | 35.00 Million |
| | E. Canalization | Php | 42.00 Million |
| | F. Drainage Structures | Php | 6.25 Million |
| | G. Drainage Canalization | Php | 9.38 Million |
| | H. Roads | Php | 1.25 Million |
| | I. On-Farm Facilities/T.O. Gates | Php | 4.00 Million |
| | J. IMT Support Facilities | Php | 20.00 Million |
| | K. IMT GIS Database | Php | 3.13 Million |
| | L. Institutional Development (5% of Direct Cost) | Php | 14.80 Million |
| | M. Feasibility Studies & Detailed Engineering (2% of Direct Cost) | Php | 4.08 Million |
| | | Sub-total (Direct Cost) | Php |
| 2) Indirect Cost | A. General Engineering Supervision and Administration (3.5% of Direct Cost) | Php | 7.14 Million |
| | B. NIA Management Fee (5% of Total Project Cost) | Php | 11.11 Million |
| | | Sub-total (Indirect Cost) | Php |
| 3) Total Project Cost | = 1+2 | Php | 222.21 Million |
| Cost per ha. | | Php | 71,086.00 /ha. |

6. Implementation Plan

| <i>Item</i> | <i>Description</i> |
|--|-------------------------------------|
| 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

| <i>Item</i> | <i>Description</i> |
|-------------------------|--|
| 1) Economic evaluation | |
| EIRR (Base) | EIRR = 28.4 % : Project life 50 years |
| Sensitivity Case-1 | EIRR = 25.6 % : Cost 10% up |
| Case-2 | EIRR = 25.3 % : Benefit 10% down |
| Case-3 | EIRR = 22.9 % : Cost 10% up + Benefit 10% down |
| B/C | 1.82 : discount rate 15% p.a. |
| NPV | PHP 110 million : discount rate 15% p.a. |
| 2) Financial evaluation | Farmer's net income increase = PHP 23,971 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

| <i>Item</i> | <i>Description</i> |
|-------------------------|---|
| 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 |

Economic Evaluation (EIRR)

Case-1 (Cost 10% up)

Name of NIS: 0301 - Porac-Gumain (Region: 3) (MORIO) Pampanga-Bataan

| | | | | | | |
|--------------|---------------------------------|-----------------------|---------|------|-----------|-----|
| EIRR : 25.6% | Net Present Value (Million PHP) | (15 % discount rate) | Benefit | Cost | B/C Ratio | NPV |
| | | | 244 | 147 | 1.66 | 97 |

| Year In Order | Year | Economic Cost (M. PHP) | | | Economic Benefit (M. PHP) | | Net Cash Flow (M. PHP) | |
|---------------|------|------------------------|---------------------------|----------------------|---------------------------|--------------|------------------------|--------|
| | | Civil Works | Institutional Development | Engineering Services | Total | Without 1.5% | Total | |
| 1 | 2011 | - | - | 1.05 | 1.05 | 1.58 | 1.58 | 0.53 |
| 2 | 2012 | - | - | 1.05 | 1.05 | 3.16 | 3.16 | 2.11 |
| 3 | 2013 | 58.35 | 2.65 | 1.05 | 62.06 | 4.74 | 4.74 | -57.32 |
| 4 | 2014 | 77.81 | 3.54 | 1.05 | 84.48 | 10.65 | 16.97 | -67.52 |
| 5 | 2015 | 58.35 | 2.65 | 1.05 | 66.94 | 26.18 | 34.08 | -32.86 |
| 6 | 2016 | - | - | 6.97 | 6.97 | 39.93 | 46.90 | 42.44 |
| 7 | 2017 | - | - | 6.97 | 6.97 | 43.04 | 50.01 | 47.12 |
| 8 | 2018 | - | - | 6.97 | 6.97 | 44.37 | 51.34 | 50.04 |
| 9 | 2019 | - | - | 6.97 | 6.97 | 44.37 | 51.34 | 51.62 |
| 10 | 2020 | - | - | 6.97 | 6.97 | 44.37 | 51.34 | 53.20 |
| 11 | 2021 | - | - | 6.97 | 6.97 | 44.37 | 51.34 | 54.78 |
| 12 | 2022 | - | - | 6.97 | 6.97 | 44.37 | 51.34 | 56.36 |
| 13 | 2023 | - | - | 6.97 | 6.97 | 44.37 | 51.34 | 57.94 |
| 14 | 2024 | - | - | 6.97 | 6.97 | 44.37 | 51.34 | 59.52 |
| 15 | 2025 | - | - | 6.97 | 6.97 | 44.37 | 51.34 | 61.10 |
| 16 | 2026 | - | - | 6.97 | 6.97 | 44.37 | 51.34 | 62.68 |
| 17 | 2027 | - | - | 6.97 | 6.97 | 44.37 | 51.34 | 64.26 |
| 18 | 2028 | - | - | 6.97 | 6.97 | 44.37 | 51.34 | 65.84 |
| 19 | 2029 | - | - | 6.97 | 6.97 | 44.37 | 51.34 | 67.42 |
| 20 | 2030 | - | - | 6.97 | 6.97 | 44.37 | 51.34 | 69.00 |
| 21 | 2031 | - | - | 6.97 | 6.97 | 44.37 | 51.34 | 70.58 |
| 22 | 2032 | - | - | 6.97 | 6.97 | 44.37 | 51.34 | 72.16 |
| 23 | 2033 | - | - | 6.97 | 6.97 | 44.37 | 51.34 | 73.74 |
| 24 | 2034 | - | - | 6.97 | 6.97 | 44.37 | 51.34 | 75.32 |
| 25 | 2035 | - | - | 6.97 | 6.97 | 44.37 | 51.34 | 76.90 |
| 26 | 2036 | - | - | 6.97 | 6.97 | 44.37 | 51.34 | 78.48 |
| 27 | 2037 | - | - | 6.97 | 6.97 | 44.37 | 51.34 | 80.06 |
| 28 | 2038 | - | - | 6.97 | 6.97 | 44.37 | 51.34 | 81.64 |
| 29 | 2039 | - | - | 6.97 | 6.97 | 44.37 | 51.34 | 83.22 |
| 30 | 2040 | - | - | 6.97 | 6.97 | 44.37 | 51.34 | 84.80 |
| 31 | 2041 | - | - | 6.97 | 6.97 | 44.37 | 51.34 | 86.38 |
| 32 | 2042 | - | - | 6.97 | 6.97 | 44.37 | 51.34 | 87.96 |
| 33 | 2043 | - | - | 6.97 | 6.97 | 44.37 | 51.34 | 89.54 |
| 34 | 2044 | - | - | 6.97 | 6.97 | 44.37 | 51.34 | 91.12 |
| 35 | 2045 | - | - | 6.97 | 6.97 | 44.37 | 51.34 | 92.70 |
| 36 | 2046 | - | - | 6.97 | 6.97 | 44.37 | 51.34 | 94.28 |
| 37 | 2047 | - | - | 6.97 | 6.97 | 44.37 | 51.34 | 95.86 |
| 38 | 2048 | - | - | 6.97 | 6.97 | 44.37 | 51.34 | 97.44 |
| 39 | 2049 | - | - | 6.97 | 6.97 | 44.37 | 51.34 | 99.02 |
| 40 | 2050 | - | - | 6.97 | 6.97 | 44.37 | 51.34 | 100.60 |
| 41 | 2051 | - | - | 6.97 | 6.97 | 44.37 | 51.34 | 102.18 |
| 42 | 2052 | - | - | 6.97 | 6.97 | 44.37 | 51.34 | 103.76 |
| 43 | 2053 | - | - | 6.97 | 6.97 | 44.37 | 51.34 | 105.34 |
| 44 | 2054 | - | - | 6.97 | 6.97 | 44.37 | 51.34 | 106.92 |
| 45 | 2055 | - | - | 6.97 | 6.97 | 44.37 | 51.34 | 108.50 |
| 46 | 2056 | - | - | 6.97 | 6.97 | 44.37 | 51.34 | 110.08 |
| 47 | 2057 | - | - | 6.97 | 6.97 | 44.37 | 51.34 | 111.66 |
| 48 | 2058 | - | - | 6.97 | 6.97 | 44.37 | 51.34 | 113.24 |
| 49 | 2059 | - | - | 6.97 | 6.97 | 44.37 | 51.34 | 114.82 |
| 50 | 2060 | - | - | 6.97 | 6.97 | 44.37 | 51.34 | 116.40 |

Table 0301 - Porac-Gumain

Basic Case

Name of NIS: 0301 - Porac-Gumain (Region: 3) (MORIO) Pampanga-Bataan

| | | | | | | |
|--------------|---------------------------------|-----------------------|---------|------|-----------|-----|
| EIRR : 28.4% | Net Present Value (Million PHP) | (15 % discount rate) | Benefit | Cost | B/C Ratio | NPV |
| | | | 244 | 134 | 1.82 | 110 |

| Year In Order | Year | Economic Cost (M. PHP) | | | Economic Benefit (M. PHP) | | Net Cash Flow (M. PHP) | |
|---------------|------|------------------------|---------------------------|----------------------|---------------------------|--------------|------------------------|--------|
| | | Civil Works | Institutional Development | Engineering Services | Total | Without 1.5% | Total | |
| 1 | 2011 | 0.95 | 0.95 | 1.58 | 1.58 | 3.16 | 3.16 | 0.63 |
| 2 | 2012 | 0.95 | 0.95 | 3.16 | 3.16 | 4.74 | 4.74 | 2.21 |
| 3 | 2013 | 53.05 | 2.41 | 0.95 | 56.42 | 6.32 | 16.97 | -51.68 |
| 4 | 2014 | 70.73 | 3.22 | 0.95 | 76.80 | 10.65 | 26.18 | -59.84 |
| 5 | 2015 | 53.05 | 2.41 | 0.95 | 60.85 | 26.18 | 34.08 | -26.77 |
| 6 | 2016 | 6.34 | 6.34 | 6.34 | 19.02 | 39.93 | 46.25 | 43.07 |
| 7 | 2017 | 6.34 | 6.34 | 6.34 | 19.02 | 43.04 | 52.36 | 47.76 |
| 8 | 2018 | 6.34 | 6.34 | 6.34 | 19.02 | 44.37 | 54.69 | 50.67 |
| 9 | 2019 | 6.34 | 6.34 | 6.34 | 19.02 | 44.37 | 54.69 | 52.25 |
| 10 | 2020 | 6.34 | 6.34 | 6.34 | 19.02 | 44.37 | 54.69 | 53.83 |
| 11 | 2021 | 6.34 | 6.34 | 6.34 | 19.02 | 44.37 | 54.69 | 55.41 |
| 12 | 2022 | 6.34 | 6.34 | 6.34 | 19.02 | 44.37 | 54.69 | 56.99 |
| 13 | 2023 | 6.34 | 6.34 | 6.34 | 19.02 | 44.37 | 54.69 | 58.57 |
| 14 | 2024 | 6.34 | 6.34 | 6.34 | 19.02 | 44.37 | 54.69 | 60.15 |
| 15 | 2025 | 6.34 | 6.34 | 6.34 | 19.02 | 44.37 | 54.69 | 61.73 |
| 16 | 2026 | 6.34 | 6.34 | 6.34 | 19.02 | 44.37 | 54.69 | 63.31 |
| 17 | 2027 | 6.34 | 6.34 | 6.34 | 19.02 | 44.37 | 54.69 | 64.89 |
| 18 | 2028 | 6.34 | 6.34 | 6.34 | 19.02 | 44.37 | 54.69 | 66.47 |
| 19 | 2029 | 6.34 | 6.34 | 6.34 | 19.02 | 44.37 | 54.69 | 68.05 |
| 20 | 2030 | 6.34 | 6.34 | 6.34 | 19.02 | 44.37 | 54.69 | 69.63 |
| 21 | 2031 | 6.34 | 6.34 | 6.34 | 19.02 | 44.37 | 54.69 | 71.21 |
| 22 | 2032 | 6.34 | 6.34 | 6.34 | 19.02 | 44.37 | 54.69 | 72.79 |
| 23 | 2033 | 6.34 | 6.34 | 6.34 | 19.02 | 44.37 | 54.69 | 74.37 |
| 24 | 2034 | 6.34 | 6.34 | 6.34 | 19.02 | 44.37 | 54.69 | 75.95 |
| 25 | 2035 | 6.34 | 6.34 | 6.34 | 19.02 | 44.37 | 54.69 | 77.53 |
| 26 | 2036 | 6.34 | 6.34 | 6.34 | 19.02 | 44.37 | 54.69 | 79.11 |
| 27 | 2037 | 6.34 | 6.34 | 6.34 | 19.02 | 44.37 | 54.69 | 80.69 |
| 28 | 2038 | 6.34 | 6.34 | 6.34 | 19.02 | 44.37 | 54.69 | 82.27 |
| 29 | 2039 | 6.34 | 6.34 | 6.34 | 19.02 | 44.37 | 54.69 | 83.85 |
| 30 | 2040 | 6.34 | 6.34 | 6.34 | 19.02 | 44.37 | 54.69 | 85.43 |
| 31 | 2041 | 6.34 | 6.34 | 6.34 | 19.02 | 44.37 | 54.69 | 87.01 |
| 32 | 2042 | 6.34 | 6.34 | 6.34 | 19.02 | 44.37 | 54.69 | 88.59 |
| 33 | 2043 | 6.34 | 6.34 | 6.34 | 19.02 | 44.37 | 54.69 | 90.17 |
| 34 | 2044 | 6.34 | 6.34 | 6.34 | 19.02 | 44.37 | 54.69 | 91.75 |
| 35 | 2045 | 6.34 | 6.34 | 6.34 | 19.02 | 44.37 | 54.69 | 93.33 |
| 36 | 2046 | 6.34 | 6.34 | 6.34 | 19.02 | 44.37 | 54.69 | 94.91 |
| 37 | 2047 | 6.34 | 6.34 | 6.34 | 19.02 | 44.37 | 54.69 | 96.49 |
| 38 | 2048 | 6.34 | 6.34 | 6.34 | 19.02 | 44.37 | 54.69 | 98.07 |
| 39 | 2049 | 6.34 | 6.34 | 6.34 | 19.02 | 44.37 | 54.69 | 99.65 |
| 40 | 2050 | 6.34 | 6.34 | 6.34 | 19.02 | 44.37 | 54.69 | 101.23 |
| 41 | 2051 | 6.34 | 6.34 | 6.34 | 19.02 | 44.37 | 54.69 | 102.81 |
| 42 | 2052 | 6.34 | 6.34 | 6.34 | 19.02 | 44.37 | 54.69 | 104.39 |
| 43 | 2053 | 6.34 | 6.34 | 6.34 | 19.02 | 44.37 | 54.69 | 105.97 |
| 44 | 2054 | 6.34 | 6.34 | 6.34 | 19.02 | 44.37 | 54.69 | 107.55 |
| 45 | 2055 | 6.34 | 6.34 | 6.34 | 19.02 | 44.37 | 54.69 | 109.13 |
| 46 | 2056 | 6.34 | 6.34 | 6.34 | 19.02 | 44.37 | 54.69 | 110.71 |
| 47 | 2057 | 6.34 | 6.34 | 6.34 | 19.02 | 44.37 | 54.69 | 112.29 |
| 48 | 2058 | 6.34 | 6.34 | 6.34 | 19.02 | 44.37 | 54.69 | 113.87 |
| 49 | 2059 | 6.34 | 6.34 | 6.34 | 19.02 | 44.37 | 54.69 | 115.45 |
| 50 | 2060 | 6.34 | 6.34 | 6.34 | 19.02 | 44.37 | 54.69 | 117.03 |

Economic Evaluation (EIRR)

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

| Name of NIS: 0301 - Porac-Gumain | | Region: 3 | | MO: Rio Pampanga-Bataan | | | | | | | |
|----------------------------------|------|---------------------------------|---------------------------|-------------------------|-------|---------------------------|----------------------|-----------|---------------------------|--------|------------------------|
| EIRR : 22.9% | | Net Present Value (Million PHP) | | Benefit | | Cost | | B/C Ratio | | NPV | |
| | | (15 % discount rate) | | 219 | | 147 | | 1.49 | | 72 | |
| Year in Order | Year | Economic Cost (M. PHP) | | | Total | Economic Benefit (M. PHP) | | Total | Economic Benefit (M. PHP) | | Net Cash Flow (M. PHP) |
| | | Civil Works | Institutional Development | Engineering Services | | Annual O & M | Benefit without 1.5% | | Benefit | | |
| 1 | 2011 | - | - | 1.05 | 1.05 | - | 1.42 | 1.42 | - | 0.37 | |
| 2 | 2012 | - | - | 1.05 | 1.05 | - | 2.84 | 2.84 | - | 1.79 | |
| 3 | 2013 | 58.35 | 2.65 | 1.05 | 62.06 | - | 4.27 | 4.27 | - | -57.79 | |
| 4 | 2014 | 77.81 | 3.54 | 1.05 | 84.48 | 9.58 | 15.27 | 15.27 | - | -69.21 | |
| 5 | 2015 | 58.35 | 2.65 | 1.05 | 66.94 | 23.56 | 30.67 | 30.67 | - | -36.27 | |
| 6 | 2016 | - | - | - | 6.97 | 35.94 | 44.47 | 44.47 | - | 37.50 | |
| 7 | 2017 | - | - | - | 6.97 | 38.74 | 45.71 | 45.71 | - | 41.72 | |
| 8 | 2018 | - | - | - | 6.97 | 39.93 | 46.90 | 46.90 | - | 44.34 | |
| 9 | 2019 | - | - | - | 6.97 | 39.93 | 48.19 | 48.19 | - | 45.76 | |
| 10 | 2020 | - | - | - | 6.97 | 39.93 | 50.00 | 50.00 | - | 47.18 | |
| 11 | 2021 | - | - | - | 6.97 | 39.93 | 51.81 | 51.81 | - | 48.60 | |
| 12 | 2022 | - | - | - | 6.97 | 39.93 | 53.62 | 53.62 | - | 50.02 | |
| 13 | 2023 | - | - | - | 6.97 | 39.93 | 55.43 | 55.43 | - | 51.45 | |
| 14 | 2024 | - | - | - | 6.97 | 39.93 | 57.24 | 57.24 | - | 52.87 | |
| 15 | 2025 | - | - | - | 6.97 | 39.93 | 59.05 | 59.05 | - | 54.29 | |
| 16 | 2026 | - | - | - | 6.97 | 39.93 | 60.86 | 60.86 | - | 55.71 | |
| 17 | 2027 | - | - | - | 6.97 | 39.93 | 62.67 | 62.67 | - | 57.13 | |
| 18 | 2028 | - | - | - | 6.97 | 39.93 | 64.48 | 64.48 | - | 58.56 | |
| 19 | 2029 | - | - | - | 6.97 | 39.93 | 66.29 | 66.29 | - | 59.98 | |
| 20 | 2030 | - | - | - | 6.97 | 39.93 | 68.10 | 68.10 | - | 61.40 | |
| 21 | 2031 | - | - | - | 6.97 | 39.93 | 69.91 | 69.91 | - | 62.82 | |
| 22 | 2032 | - | - | - | 6.97 | 39.93 | 71.72 | 71.72 | - | 64.24 | |
| 23 | 2033 | - | - | - | 6.97 | 39.93 | 73.53 | 73.53 | - | 65.67 | |
| 24 | 2034 | - | - | - | 6.97 | 39.93 | 75.34 | 75.34 | - | 67.09 | |
| 25 | 2035 | - | - | - | 6.97 | 39.93 | 77.15 | 77.15 | - | 68.51 | |
| 26 | 2036 | - | - | - | 6.97 | 39.93 | 78.96 | 78.96 | - | 69.93 | |
| 27 | 2037 | - | - | - | 6.97 | 39.93 | 80.77 | 80.77 | - | 71.35 | |
| 28 | 2038 | - | - | - | 6.97 | 39.93 | 82.58 | 82.58 | - | 72.78 | |
| 29 | 2039 | - | - | - | 6.97 | 39.93 | 84.39 | 84.39 | - | 74.20 | |
| 30 | 2040 | - | - | - | 6.97 | 39.93 | 86.20 | 86.20 | - | 75.62 | |
| 31 | 2041 | - | - | - | 6.97 | 39.93 | 88.01 | 88.01 | - | 77.04 | |
| 32 | 2042 | - | - | - | 6.97 | 39.93 | 89.82 | 89.82 | - | 78.46 | |
| 33 | 2043 | - | - | - | 6.97 | 39.93 | 91.63 | 91.63 | - | 79.89 | |
| 34 | 2044 | - | - | - | 6.97 | 39.93 | 93.44 | 93.44 | - | 81.31 | |
| 35 | 2045 | - | - | - | 6.97 | 39.93 | 95.25 | 95.25 | - | 82.73 | |
| 36 | 2046 | - | - | - | 6.97 | 39.93 | 97.06 | 97.06 | - | 84.15 | |
| 37 | 2047 | - | - | - | 6.97 | 39.93 | 98.87 | 98.87 | - | 85.57 | |
| 38 | 2048 | - | - | - | 6.97 | 39.93 | 100.68 | 100.68 | - | 87.00 | |
| 39 | 2049 | - | - | - | 6.97 | 39.93 | 102.49 | 102.49 | - | 88.42 | |
| 40 | 2050 | - | - | - | 6.97 | 39.93 | 104.30 | 104.30 | - | 89.84 | |
| 41 | 2051 | - | - | - | 6.97 | 39.93 | 106.11 | 106.11 | - | 91.26 | |
| 42 | 2052 | - | - | - | 6.97 | 39.93 | 107.92 | 107.92 | - | 92.68 | |
| 43 | 2053 | - | - | - | 6.97 | 39.93 | 109.73 | 109.73 | - | 94.11 | |
| 44 | 2054 | - | - | - | 6.97 | 39.93 | 111.54 | 111.54 | - | 95.53 | |
| 45 | 2055 | - | - | - | 6.97 | 39.93 | 113.35 | 113.35 | - | 96.95 | |
| 46 | 2056 | - | - | - | 6.97 | 39.93 | 115.16 | 115.16 | - | 98.37 | |
| 47 | 2057 | - | - | - | 6.97 | 39.93 | 116.97 | 116.97 | - | 99.79 | |
| 48 | 2058 | - | - | - | 6.97 | 39.93 | 118.78 | 118.78 | - | 101.22 | |
| 49 | 2059 | - | - | - | 6.97 | 39.93 | 120.59 | 120.59 | - | 102.64 | |
| 50 | 2060 | - | - | - | 6.97 | 39.93 | 122.40 | 122.40 | - | 104.06 | |

Table 0301 - Porac-Gumain

Case-2 (Benefit 10% down)

| Name of NIS: 0301 - Porac-Gumain | | Region: 3 | | MO: Rio Pampanga-Bataan | | | | | | | |
|----------------------------------|------|---------------------------------|---------------------------|-------------------------|-------|---------------------------|----------------------|-----------|---------------------------|--------|------------------------|
| EIRR : 25.3% | | Net Present Value (Million PHP) | | Benefit | | Cost | | B/C Ratio | | NPV | |
| | | (15 % discount rate) | | 219 | | 134 | | 1.64 | | 86 | |
| Year in Order | Year | Economic Cost (M. PHP) | | | Total | Economic Benefit (M. PHP) | | Total | Economic Benefit (M. PHP) | | Net Cash Flow (M. PHP) |
| | | Civil Works | Institutional Development | Engineering Services | | Annual O & M | Benefit without 1.5% | | Benefit | | |
| 1 | 2011 | - | - | 0.95 | 0.95 | - | 1.42 | 1.42 | - | 0.47 | |
| 2 | 2012 | - | - | 0.95 | 0.95 | - | 2.84 | 2.84 | - | 1.89 | |
| 3 | 2013 | 53.05 | 2.41 | 0.95 | 56.42 | 9.58 | 4.27 | 4.27 | - | -52.15 | |
| 4 | 2014 | 70.73 | 3.22 | 0.95 | 76.80 | 23.56 | 15.27 | 15.27 | - | -30.18 | |
| 5 | 2015 | 53.05 | 2.41 | 0.95 | 60.85 | 7.11 | 30.67 | 30.67 | - | 38.13 | |
| 6 | 2016 | - | - | - | 6.34 | 35.94 | 44.47 | 44.47 | - | 42.35 | |
| 7 | 2017 | - | - | - | 6.34 | 38.74 | 45.71 | 45.71 | - | 44.97 | |
| 8 | 2018 | - | - | - | 6.34 | 39.93 | 47.16 | 47.16 | - | 46.39 | |
| 9 | 2019 | - | - | - | 6.34 | 39.93 | 48.58 | 48.58 | - | 47.81 | |
| 10 | 2020 | - | - | - | 6.34 | 39.93 | 50.00 | 50.00 | - | 49.24 | |
| 11 | 2021 | - | - | - | 6.34 | 39.93 | 51.42 | 51.42 | - | 50.66 | |
| 12 | 2022 | - | - | - | 6.34 | 39.93 | 52.84 | 52.84 | - | 52.08 | |
| 13 | 2023 | - | - | - | 6.34 | 39.93 | 54.26 | 54.26 | - | 53.50 | |
| 14 | 2024 | - | - | - | 6.34 | 39.93 | 55.68 | 55.68 | - | 54.92 | |
| 15 | 2025 | - | - | - | 6.34 | 39.93 | 57.10 | 57.10 | - | 56.35 | |
| 16 | 2026 | - | - | - | 6.34 | 39.93 | 58.52 | 58.52 | - | 57.77 | |
| 17 | 2027 | - | - | - | 6.34 | 39.93 | 60.00 | 60.00 | - | 59.19 | |
| 18 | 2028 | - | - | - | 6.34 | 39.93 | 61.42 | 61.42 | - | 60.61 | |
| 19 | 2029 | - | - | - | 6.34 | 39.93 | 62.84 | 62.84 | - | 62.03 | |
| 20 | 2030 | - | - | - | 6.34 | 39.93 | 64.26 | 64.26 | - | 63.46 | |
| 21 | 2031 | - | - | - | 6.34 | 39.93 | 65.68 | 65.68 | - | 64.88 | |
| 22 | 2032 | - | - | - | 6.34 | 39.93 | 67.10 | 67.10 | - | 66.30 | |
| 23 | 2033 | - | - | - | 6.34 | 39.93 | 68.52 | 68.52 | - | 67.72 | |
| 24 | 2034 | - | - | - | 6.34 | 39.93 | 70.00 | 70.00 | - | 69.14 | |
| 25 | 2035 | - | - | - | 6.34 | 39.93 | 71.42 | 71.42 | - | 70.57 | |
| 26 | 2036 | - | - | - | 6.34 | 39.93 | 72.84 | 72.84 | - | 71.99 | |
| 27 | 2037 | - | - | - | 6.34 | 39.93 | 74.26 | 74.26 | - | 73.41 | |
| 28 | 2038 | - | - | - | 6.34 | 39.93 | 75.68 | 75.68 | - | 74.83 | |
| 29 | 2039 | - | - | - | 6.34 | 39.93 | 77.10 | 77.10 | - | 76.25 | |
| 30 | 2040 | - | - | - | 6.34 | 39.93 | 78.52 | 78.52 | - | 77.68 | |
| 31 | 2041 | - | - | - | 6.34 | 39.93 | 80.00 | 80.00 | - | 79.10 | |
| 32 | 2042 | - | - | - | 6.34 | 39.93 | 81.42 | 81.42 | - | 80.52 | |
| 33 | 2043 | - | - | - | 6.34 | 39.93 | 82.84 | 82.84 | - | 81.94 | |
| 34 | 2044 | - | - | - | 6.34 | 39.93 | 84.26 | 84.26 | - | 83.36 | |
| 35 | 2045 | - | - | - | 6.34 | 39.93 | 85.68 | 85.68 | - | 84.79 | |
| 36 | 2046 | - | - | - | 6.34 | 39.93 | 87.10 | 87.10 | - | 86.21 | |
| 37 | 2047 | - | - | - | 6.34 | 39.93 | 88.52 | 88.52 | - | 87.63 | |
| 38 | 2048 | - | - | - | 6.34 | 39.93 | 90.00 | 90.00 | - | 89.05 | |
| 39 | 2049 | - | - | - | 6.34 | 39.93 | 91.42 | 91.42 | - | 90.47 | |
| 40 | 2050 | - | - | - | 6.34 | 39.93 | 92.84 | 92.84 | - | 91.89 | |
| 41 | 2051 | - | - | - | 6.34 | 39.93 | 94.26 | 94.26 | - | 93.32 | |
| 42 | 2052 | - | - | - | 6.34 | 39.93 | 95.68 | 95.68 | - | 94.74 | |
| 43 | 2053 | - | - | - | 6.34 | 39.93 | 97.10 | 97.10 | - | 96.16 | |
| 44 | 2054 | - | - | - | 6.34 | 39.93 | 98.52 | 98.52 | - | 97.58 | |
| 45 | 2055 | - | - | - | 6.34 | 39.93 | 100.00 | 100.00 | - | 99.01 | |
| 46 | 2056 | - | - | - | 6.34 | 39.93 | 101.42 | 101.42 | - | 100.43 | |
| 47 | 2057 | - | - | - | 6.34 | 39.93 | 102.84 | 102.84 | - | 101.85 | |
| 48 | 2058 | - | - | - | 6.34 | 39.93 | 104.26 | 104.26 | - | 103.27 | |
| 49 | 2059 | - | - | - | 6.34 | 39.93 | 105.68 | 105.68 | - | 104.69 | |
| 50 | 2060 | - | - | - | 6.34 | 39.93 | 107.10 | 107.10 | - | 106.11 | |




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

NIS name: Porac-GumainNIS (Region 3) *Date:* June 9, 2009

| <i>Location / Facility</i> | <i>Photograph</i> | <i>Comments</i> |
|--|--|---|
| Porac Diversion Dam N-15d 00m 15s E-120d 31m 54s |  | Need to raise weir elevation due to farm level was covered by ash fall or lahar by about 30cm as an effect of Pinatubo Volcano eruption |
| Porac Diversion Dam N-15d 00m 15s E-120d 31m 54s |  | Replacement of Engine and Driver for Lifting Mechanism |

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




NIS name: Porac-GumainNIS (Region 3) Date: Jun 9, 2009

| Location / Facility | Photograph | Comments |
|--|--|---|
| <p>Solib Dam</p> <p>N-14d 58m 23s E-120d 32m 03s</p> |  | <p>Replacement of manual operation to diesel engine operation of lifting mechanism, installation of canopy/shed. Replacement, repair & repainting of steel gates assembly</p> |
| <p>Gumain Dam</p> <p>N-14d 57m 00s E-120d 31m 07s</p> |  | <p>Construction of bank and bottom scour protection works</p> |
| <p>Patangue Check Structure</p> <p>N-14d 57m 47s E-120d 33m 31s</p> |  | <p>Replacement and modify concrete check structure and steel gates with provision for eliminating clogged-up of water plants</p> |

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

NIS name: Porac-GumainNIS (Region 3)

Date: June 9, 2009

| Location / Facility | Photograph | Comments |
|--|--|---|
| Lateral A N-14d 56m 51s E-120d 31m 23s |  | Elevate or increase elevation of canal embankment to have a better command in operating water surface due to increase in elevation at field level cause as a result of lahar/volcanic ash flood due to eruption Mt Pinatubo Vulcano |
| Lateral A |  | Removal of houses and buildings along the canal to avoid vandalizing canal facilities and unauthorized disposal of garbage. |
| Lateral A |  | |

THE REPUBLIC OF PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION

**Sector Loan on
Rehabilitation of Irrigation Facilities**

NIS SUMMARY REPORT

0401
Sta. Cruz RIS
Region 4
Laguna 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**

| <i>Item</i> | <i>Description</i> | |
|---|---|--|
| 1) Name of NIS | Sta. Cruz RIS | Code: 0401 |
| 2) Location | Region | Region 4 |
| | Province | Laguna |
| | Municipality | Calauan, Victoria, Liliw, Nagcarlan, Pila, Sta Cruz |
| | Distance | Sta Cruz, Laguna (Capital of Province) with in the Capital |
| 3) Type of Water Source | Water Source | Sta Cruz Lapad River |
| | Type | Diversion Dam (80 m wide, 3.00 m high) |
| 4) Area | Service Area | 4,133 ha |
| | FUSA | 2,185 ha |
| 5) Beneficiary Farmers | 2,013 farmers | Average paddy field cultivating size = 1.09 ha per farmer |
| 6) Irrigator's Association | IAs established = 5 FIA established = 0 | |
| 7) Features of NIS and Necessity of the project | <p>The Sta. Cruz started its operation on August 1, 1958 and has designed area of 4,133 hectares with present firm-up area of 2,185. The reduction of the irrigable area is attributed to expansion of development for urban area of Sta. Cruz as Capital City of Laguna, which resulted to conversion of agricultural land to commercial, residential, other land utilization such as road, canals, etc.</p> <p>There are some land owners belongs to present generation which were not aware of the previous generations arrangement with NIA, claiming that NIA has not paid the ROW, hence will not pay ISF in return. The NIA, at Regional Level do not have any documents to show ownership of the canal right of way.</p> <p>This project is essential to resolved all problems prior to Irrigation Management Transfer (IMT) such as squatters' problems, ROW problems, water usage control, environment awareness, conservation and protection of irrigation and drainage facilities.</p> <p>The project will help increase rice production in the area and help also self sufficiency the region.</p> | |
| 8) Outline of the Proposed Project | <p>A. Engineering</p> <ol style="list-style-type: none"> 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 <p>B. Institutional Strengthening Program</p> <p>B. 1 Basic Program</p> <ol style="list-style-type: none"> 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 | | | |
| | <ol style="list-style-type: none"> 1. Improvement of watershed management 2. Monitoring and control on illegal dumping of wastes | | | |
| 9) Proposed Project Component | <p>A. Engineering</p> <ol style="list-style-type: none"> 1. Construction of civil works for rehabilitation of diversion works, canal system, drainage system, roads, and IMT support facilities. <p>B. Institutional Strengthening Program</p> <ol style="list-style-type: none"> 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 | 88.68 Million |
| | - Civil Works | PHP | 81.81 Million | |
| | - Institutional Development | PHP | 5.10 Million | |
| | - Engineering Services | PHP | 1.77 Million | |
| | 2. Indirect cost | | PHP | 7.93 Million |
| | Total Project Cost (1+2) | | PHP | 96.61 Million |
| | Cost per ha | | PHP | 44,217.00 per ha. |
| 11) Project Benefit | <ol style="list-style-type: none"> 1. To increase paddy production by 170 tons/year 2. To increase farmers' net income to PHP67,619.00 /ha/year 3. To establish functional and self-reliant IAs 4. To improve performance of NIS | | | |
| 12) Project Justification | EIRR = 27.0 %, B/C = 1.75 (discount rate 15%) | | | |

2. Project History (Construction/Rehabilitation)

| Year | Description |
|------|---|
| 2004 | No rehabilitation conducted |
| 2005 | No Rehabilitation conducted |
| 2006 | <ol style="list-style-type: none"> 1. Repair of irrigation canal, desilting works, canal lining along Barangay Tubuan-Tanlon, 2. Repair of Sta Cruz Dam phase 1&2 funded by GOP |
| 2007 | <ol style="list-style-type: none"> 1. Installation of protection works/gabion retaining wall at diversion dam, rehabilitation of roads and canal system funded by GOP 2. Construction of diversion dam, funded by GOP |
| 2008 | <ol style="list-style-type: none"> 1. Installation of protection works/grouted riprap along canal, repair of irrigation canal at Barangay Victoria, Sta. Cruz City, Barangay Nagcarian funded by GOP 2. Repair of check gate at Callios funded by GOP |

3. Present Condition

3.1 Natural Conditions

| <i>Item</i> | <i>Description</i> |
|------------------------------|---|
| 1) Annual Rainfall | 1,887.90 mm |
| 2) Seasons | Wet season: May to October Dry season: November to April |
| 3) Dominant Soil in NIS Area | Clay loam / Sandy Loam |
| 4) Topography | 100% Flat plain |

3.2 Socio-economy (Region/Province)

| <i>Item</i> | <i>Description</i> |
|---------------------------|---|
| 1) GRDP | PHP 752,430 million (Year 2007), Per Capita GRDP = PHP67,466 per year |
| 2) Population | 2,473,530 (province) |
| 3) Population Growth Rate | 3.22 % per year (province) |
| 4) Labor Force | 7,282,000 (region) |
| 5) Poverty Population | 13.2 % to total population (province) |

3.3 Present Agriculture in NIS

| <i>Item</i> | <i>Description</i> | | | | | | |
|--------------------------------------|---|------------------|--------|---------------------|------|---------|--------|
| 1) Farm Household in NIS | Total beneficiaries | 2,013 households | | | | | |
| | Land owners | households (%) | | | | | |
| | Tenant farmers | households (%) | | | | | |
| 2) Paddy Field Size in NIS | 1.09 ha per household (FUSA/Total beneficiaries as of 2008) | | | | | | |
| 3) Present Land Use in NIS | Paddy filed planted | 2,182 ha | 70.4 % | As of 2008 | | | |
| | Paddy filed not planted | 3 ha | 0.1 % | As of 2008 | | | |
| | Upland crop field | 0 ha | 0.0 % | | | | |
| | Permanent crop field | 0 ha | 0.0 % | | | | |
| | Undeveloped area | 250 ha | 8.1 % | | | | |
| | Build-up area | 0 ha | 0.0 % | | | | |
| | High ground | 0 ha | 0.0 % | | | | |
| | Grassland | 0 ha | 0.0 % | | | | |
| | Swamp | 113 ha | 3.6 % | | | | |
| | Unspecified area | 552 ha | 17.8 % | No data in response | | | |
| 4) Paddy Field in FUSA (ha) | 2,185 | | | | | | |
| 5) Paddy Cropped Area (ha) | 2004 | 2005 | 2006 | 2007 | 2008 | Average | |
| | Wet Season | 2,070 | 2,020 | 2,009 | - | 2,147 | 2,062 |
| | Dry Season | 2,010 | 1,995 | 1,990 | - | 2,182 | 2,044 |
| 6) Cropping Intensity (%) (per year) | 2004 | 2005 | 2006 | 2007 | 2008 | Average | |
| | 187 | 184 | 183 | - | 198 | 188 | |
| 7) Unit Yield of Paddy (ton/ha) | 2004 | 2005 | 2006 | 2007 | 2008 | Average | |
| | Wet Season | 3.50 | 3.75 | 4.00 | - | 4.75 | 4.01 |
| | Dry Season | 5.00 | 5.50 | 5.25 | - | 5.25 | 5.25 |
| 8) Paddy Production (ton) | 2004 | 2005 | 2006 | 2007 | 2008 | Average | |
| | Wet Season | 7,245 | 7,575 | 8,036 | - | 10,198 | 8,264 |
| | Dry Season | 10,050 | 10,973 | 10,448 | - | 11,456 | 10,731 |

3.4 Water Resources

| <i>Item</i> | <i>Description</i> |
|------------------------------|------------------------|
| 1) Name of Rivers | Sta Cruz (Lapad) River |
| 2) Catchment Area at Dam | 103 km ² |
| 3) Ave. River Discharge | 4.52 m ³ /s |
| 4) Ave. Dry Season Discharge | 4.95 m ³ /s |
| 5) Diverted Intake Discharge | 2.82 m ³ /s |
| 6) Water Requirement | 3.93 m ³ /s |
| 7) Sedimentation | Low |

3.5 Existing Irrigation System

| <i>Item</i> | <i>Description</i> |
|------------------------|---|
| 1) Diversion Dam | Overflow crest width <u>75</u> m, Dam height <u>3.0</u> m Dam width <u>80</u> m |
| 2) Main Canal | Total length <u>9.00</u> km (Lined portion <u>0.35</u> km) |
| 3) Lateral Canals | Total length <u>68.0</u> km (Lined portion <u>9.50</u> km) |
| 4) On-farm facilities | Total length <u>72.00</u> km (Lined portion <u>0.00</u> km Turn-outs = <u>70</u> units) |
| 5) Drainage Canal | Total length <u>28.00</u> kms. |
| 6) Canal Structures | No. = <u>234</u> units (Damaged = <u>5</u> units) |
| 7) Drainage Structures | No. = <u>29</u> units (Damaged = <u>4</u> units) |
| 8) Farm roads | Total length <u>62.00</u> km (pavement= <u>14.90</u> kms.) |

3.6 Institutions for O&M of NIS

| <i>Item</i> | <i>Description</i> | | | | | |
|--|-----------------------------------|-------|-------|-------|-------|---------|
| 1) Regional Irrigation Office | Name: Region 4 – Southern Tagalog | | | | | |
| 2) IMO | Name: Laguna-Rizal IMO | | | | | |
| Staff in 2009 | Total number of staff: 41 | | | | | |
| 3) Irrigator' Association (IA) | 2004 | 2005 | 2006 | 2007 | 2008 | Average |
| Number of FIA (nos) | | | | | 0 | |
| Number of IA (nos) | | | | | 5 | |
| Number of TSAG (nos) | 36.0 | 36.0 | 36.0 | 35.0 | 50.0 | 39 |
| Functionality of IA | 72.19 | 60.68 | 72.49 | 72.49 | 77.69 | 71.11 |
| Collection of ISF (wet, %) | 27 | 21 | 42 | - | 47 | 34 |
| Collection of ISF (dry, %) | - | - | - | - | 50 | - |
| 4) NIS Category based on IA 2008 O&M Contract (NIA-IA) | No. of IA | | | | | |
| Category A | 2 | | | | | |
| Category B | 3 | | | | | |
| Category C | 0 | | | | | |

3.7 Existing Problems

| <i>Item</i> | <i>Description</i> |
|-------------------------|---|
| 1) Diversion Works | 1. Diversion works was newly constructed 2. Intake gates has no roofing or canopy and perimeter fence, to protect steel gates from rusting and vandalism |
| 2) Canal and Structures | 1. Broken concrete canal lining 2. Scoured inlet and outlet transition protection works 3. Rusted and stolen gates 4. Encroachment of houses, buildings, and structures along canal right of way 5. Silted and shallow canal due to collapsed side slope embankment works along auxiliary berm and roadway berm 6. Widening and eroded canal due to wallowing of carabao/water buffalo 7. Unauthorized extraction of water from the canal |

| <i>Item</i> | <i>Description</i> |
|---|---|
| 3) Drainage Canal | <ol style="list-style-type: none"> Silted and shallow canal due to collapsed side slope embankment works along auxiliary berm and roadway berm Widening and eroded canal due to wallowing of carabao/water buffalo |
| 4) Other Project Facilities (road, bridge, flood dike, building, etc) | <ol style="list-style-type: none"> Lack of gravel maintenance of some service roads Access roads lack side drainage, crown surface, and gravel surfacing. |
| 5) Water Management and O&M Activities | <ol style="list-style-type: none"> No measuring tools or staff gages along canal and dams Wasted uncontrolled flow or overflowing of irrigation water at field level Lack of gravel maintenance of some service roads Tolerant of NIA to squatters, vandalizers, illegal waste and garbage disposal to the canals |
| 6) Status of NIS and IA Management | <p>Status Type C evaluated by Radar Graph. Specific problems are:</p> <ol style="list-style-type: none"> Low ISF collection efficiency during wet and dry seasons at 47% and 50%, respectively Medium ratio of tenancy at 39% |
| 7) Watershed Management | <ol style="list-style-type: none"> Lack of water conservation and watershed protection works Prevalent ongoing cutting of trees upstream of the diversion dam |
| 8) Coordination with LGU and Agencies concerned | <ol style="list-style-type: none"> Poor coordination y NIA's field offices and IAs with concerned LGUs on specific problems such as watershed management and monitoring and control of illegal dumping of wastes |
| 9) Agriculture | <ol style="list-style-type: none"> Farmers are not following strictly the cropping calendar. Inadequate number of credit facilities. Insufficient number of post harvest facilities particularly dryer. |
| 10) Others | <ol style="list-style-type: none"> Tidal influence during wet season, about 150 hectares are inundated due to closure of flood gates every heavy rainfall occurrence. The flooding in the area is influenced by flood gate control by Laguna de Bay Authority so as to control flooding problems in Metro Manila during typhoon and heavy rainfall |

4. Proposed Rehabilitation Plan

4.1 Agricultural Development Plan

| <i>Item</i> | <i>Description</i> | | | |
|-------------------------------|--------------------|---------------------|---------------------|---------------|
| Cropping schedule | <i>Wet Season</i> | <i>Dry Season-1</i> | <i>Dry Season-2</i> | <i>Annual</i> |
| 1) Type of Crops | Rice | Rice | - | - |
| 2) Cropping Area (ha) | 2,185 | 2,180 | - | - |
| 3) Target Unit Yield (ton/ha) | 4.75 | 5.25 | - | - |
| 3) Total Production (ton) | 10,379 | 11,445 | - | 21,824 |

4.2 Civil Works

| <i>Item</i> | <i>Description</i> |
|--------------------------|--|
| 1) Diversion Works | 1. Construction of perimeter fence, roofing of intake steel gates for protection |
| 2) Canal Structures | 1. Restoration of inlet & outlet scour protection works, installation of steel gates - 24 units |
| 3) Canalization | <ol style="list-style-type: none"> Construction side slope protection slope/grouted riprap – 3.8 kms Realignment of canal Construction of new canal |
| 4) Drainage Structures | 1. Repair and construction of additional structures – 14 units |
| 5) Drainage Canalization | 1. Removal of silts and installation of scour protection works – 3.1 kms |
| 6) Service Roads | 1. Gravel surfacing and side drainage construction – 20.4 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

| <i>Item</i> | <i>Description</i> |
|--|---|
| 1) Reactivation Program of FIAs/IAs and System Management Committee (ISMC) | <ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> 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 | <ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> 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 | <ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> 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 dumping of wastes | <ol style="list-style-type: none"> 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 dumping of wastes |

4.4 Proposed Counter Schemes

| <i>Item</i> | <i>Description</i> |
|-------------|--|
| 1) DENR | |
| 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. |

5. Cost Estimate for Initial Investment

| <i>Item</i> | <i>Description</i> | | |
|--------------------------------|---|---------------------------|----------------|
| 1) Direct Cost for Civil Works | A. Mobilization | Php | 1.77 Million |
| | B. Protection Dikes | | - |
| | C. Diversion Works | Php | 1.00 Million |
| | D. Canal Structures | Php | 1.59 Million |
| | E. Canalization | Php | 35.25 Million |
| | F. Drainage Structures | Php | 4.37 Million |
| | G. Drainage Canalization | Php | 6.56 Million |
| | H. Roads | Php | 12.59 Million |
| | I. On-Farm Facilities/T.O. Gates | Php | 1.50 Million |
| | J. IMT Support Facilities | Php | 15.00 Million |
| | K. IMT GIS Database | Php | 2.19 Million |
| | L. Institutional Development (5% of Direct Cost) | Php | 5.10 Million |
| | M. Feasibility Studies & Detailed Engineering (2% of Direct Cost) | Php | 1.77 Million |
| | | Sub-total (Direct Cost) | Php |
| 2) Indirect Cost | A. General Engineering Supervision and Administration (3.5% of Direct Cost) | Php | 3.10 Million |
| | B. NIA Management Fee (5% of Total Project Cost) | Php | 4.83 Million |
| | | Sub-total (Indirect Cost) | Php |
| 3) Total Project Cost | = 1+2 | Php | 96.61 Million |
| Cost per ha. | | Php | 44,217.00 /ha. |

6. Implementation Plan

| <i>Item</i> | <i>Description</i> |
|--|-------------------------------------|
| 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

| <i>Item</i> | <i>Description</i> |
|-------------------------|--|
| 1) Economic evaluation | |
| EIRR (Base) | EIRR = 27.0 % : Project life 50 years |
| Sensitivity Case-1 | EIRR = 24.1 % : Cost 10% up |
| Case-2 | EIRR = 23.9 % : Benefit 10% down |
| Case-3 | EIRR = 21.5% : Cost 10% up + Benefit 10% down |
| B/C | 1.75 : discount rate 15% p.a. |
| NPV | PHP 49 million : discount rate 15% p.a. |
| 2) Financial evaluation | Farmer's net income increase = PHP 937 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

| <i>Item</i> | <i>Description</i> |
|-------------------------|---|
| 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 0401 - Sta. Cruz Economic Evaluation (EIRR)

Basic Case

Case-1 (Cost 10% up)

Name of NIS: 0401 - Sta. Cruz Region: 4 - MORIO - Laguna-Rizal

| EIRR : 27.0% (15 % discount rate) | | Benefit | Cost | B/C Ratio | NPV | | |
|------------------------------------|------|------------------------|---------------------------|----------------------|---------------------------|--------------|------------------------|
| | | 114 | 65 | 1.75 | 49 | | |
| Year In Order | Year | Economic Cost (M. PHP) | | | Economic Benefit (M. PHP) | | Net Cash Flow (M. PHP) |
| | | Civil Works | Institutional Development | Engineering Services | Total | Without 1.5% | |
| 1 | 2011 | | | 0.42 | 0.42 | 2.16 | 1.74 |
| 2 | 2012 | | | 0.42 | 0.42 | 4.32 | 3.90 |
| 3 | 2013 | 23.45 | 0.83 | 0.42 | 24.70 | 6.48 | -18.22 |
| 4 | 2014 | 31.27 | 1.10 | 0.42 | 34.12 | 8.64 | -25.21 |
| 5 | 2015 | 23.45 | 0.83 | 0.42 | 27.80 | 10.80 | 11.47 |
| 6 | 2016 | | | 0.42 | 4.43 | 12.96 | 13.98 |
| 7 | 2017 | | | 0.42 | 4.43 | 15.12 | 16.22 |
| 8 | 2018 | | | 0.42 | 4.43 | 17.28 | 18.41 |
| 9 | 2019 | | | 0.42 | 4.43 | 19.44 | 20.57 |
| 10 | 2020 | | | 0.42 | 4.43 | 21.60 | 22.73 |
| 11 | 2021 | | | 0.42 | 4.43 | 23.76 | 24.89 |
| 12 | 2022 | | | 0.42 | 4.43 | 25.92 | 27.05 |
| 13 | 2023 | | | 0.42 | 4.43 | 28.08 | 29.21 |
| 14 | 2024 | | | 0.42 | 4.43 | 30.24 | 31.37 |
| 15 | 2025 | | | 0.42 | 4.43 | 32.40 | 33.53 |
| 16 | 2026 | | | 0.42 | 4.43 | 34.56 | 35.69 |
| 17 | 2027 | | | 0.42 | 4.43 | 36.72 | 37.85 |
| 18 | 2028 | | | 0.42 | 4.43 | 38.88 | 40.01 |
| 19 | 2029 | | | 0.42 | 4.43 | 41.04 | 42.17 |
| 20 | 2030 | | | 0.42 | 4.43 | 43.20 | 44.33 |
| 21 | 2031 | | | 0.42 | 4.43 | 45.36 | 46.49 |
| 22 | 2032 | | | 0.42 | 4.43 | 47.52 | 48.65 |
| 23 | 2033 | | | 0.42 | 4.43 | 49.68 | 50.81 |
| 24 | 2034 | | | 0.42 | 4.43 | 51.84 | 52.97 |
| 25 | 2035 | | | 0.42 | 4.43 | 54.00 | 55.13 |
| 26 | 2036 | | | 0.42 | 4.43 | 56.16 | 57.29 |
| 27 | 2037 | | | 0.42 | 4.43 | 58.32 | 59.45 |
| 28 | 2038 | | | 0.42 | 4.43 | 60.48 | 61.61 |
| 29 | 2039 | | | 0.42 | 4.43 | 62.64 | 63.77 |
| 30 | 2040 | | | 0.42 | 4.43 | 64.80 | 65.93 |
| 31 | 2041 | | | 0.42 | 4.43 | 66.96 | 68.09 |
| 32 | 2042 | | | 0.42 | 4.43 | 69.12 | 70.25 |
| 33 | 2043 | | | 0.42 | 4.43 | 71.28 | 72.41 |
| 34 | 2044 | | | 0.42 | 4.43 | 73.44 | 74.57 |
| 35 | 2045 | | | 0.42 | 4.43 | 75.60 | 76.73 |
| 36 | 2046 | | | 0.42 | 4.43 | 77.76 | 78.89 |
| 37 | 2047 | | | 0.42 | 4.43 | 79.92 | 81.05 |
| 38 | 2048 | | | 0.42 | 4.43 | 82.08 | 83.21 |
| 39 | 2049 | | | 0.42 | 4.43 | 84.24 | 85.37 |
| 40 | 2050 | | | 0.42 | 4.43 | 86.40 | 87.53 |
| 41 | 2051 | | | 0.42 | 4.43 | 88.56 | 89.69 |
| 42 | 2052 | | | 0.42 | 4.43 | 90.72 | 91.85 |
| 43 | 2053 | | | 0.42 | 4.43 | 92.88 | 94.01 |
| 44 | 2054 | | | 0.42 | 4.43 | 95.04 | 96.17 |
| 45 | 2055 | | | 0.42 | 4.43 | 97.20 | 98.33 |
| 46 | 2056 | | | 0.42 | 4.43 | 99.36 | 100.49 |
| 47 | 2057 | | | 0.42 | 4.43 | 101.52 | 102.65 |
| 48 | 2058 | | | 0.42 | 4.43 | 103.68 | 104.81 |
| 49 | 2059 | | | 0.42 | 4.43 | 105.84 | 106.97 |
| 50 | 2060 | | | 0.42 | 4.43 | 108.00 | 109.13 |

| EIRR : 24.1% (15 % discount rate) | | Benefit | Cost | B/C Ratio | NPV | | |
|------------------------------------|------|------------------------|---------------------------|----------------------|---------------------------|--------------|------------------------|
| | | 114 | 71 | 1.59 | 42 | | |
| Year In Order | Year | Economic Cost (M. PHP) | | | Economic Benefit (M. PHP) | | Net Cash Flow (M. PHP) |
| | | Civil Works | Institutional Development | Engineering Services | Total | Without 1.5% | |
| 1 | 2011 | | | 0.46 | 0.46 | 2.16 | 1.70 |
| 2 | 2012 | | | 0.46 | 0.46 | 4.32 | 3.86 |
| 3 | 2013 | 25.80 | 0.91 | 0.46 | 27.17 | 6.48 | -20.69 |
| 4 | 2014 | 34.40 | 1.21 | 0.46 | 37.54 | 8.64 | -28.62 |
| 5 | 2015 | 25.80 | 0.91 | 0.46 | 30.58 | 10.80 | 11.47 |
| 6 | 2016 | | | 0.46 | 4.87 | 12.96 | 13.98 |
| 7 | 2017 | | | 0.46 | 4.87 | 15.12 | 16.22 |
| 8 | 2018 | | | 0.46 | 4.87 | 17.28 | 18.41 |
| 9 | 2019 | | | 0.46 | 4.87 | 19.44 | 20.57 |
| 10 | 2020 | | | 0.46 | 4.87 | 21.60 | 22.73 |
| 11 | 2021 | | | 0.46 | 4.87 | 23.76 | 24.89 |
| 12 | 2022 | | | 0.46 | 4.87 | 25.92 | 27.05 |
| 13 | 2023 | | | 0.46 | 4.87 | 28.08 | 29.21 |
| 14 | 2024 | | | 0.46 | 4.87 | 30.24 | 31.37 |
| 15 | 2025 | | | 0.46 | 4.87 | 32.40 | 33.53 |
| 16 | 2026 | | | 0.46 | 4.87 | 34.56 | 35.69 |
| 17 | 2027 | | | 0.46 | 4.87 | 36.72 | 37.85 |
| 18 | 2028 | | | 0.46 | 4.87 | 38.88 | 40.01 |
| 19 | 2029 | | | 0.46 | 4.87 | 41.04 | 42.17 |
| 20 | 2030 | | | 0.46 | 4.87 | 43.20 | 44.33 |
| 21 | 2031 | | | 0.46 | 4.87 | 45.36 | 46.49 |
| 22 | 2032 | | | 0.46 | 4.87 | 47.52 | 48.65 |
| 23 | 2033 | | | 0.46 | 4.87 | 49.68 | 50.81 |
| 24 | 2034 | | | 0.46 | 4.87 | 51.84 | 52.97 |
| 25 | 2035 | | | 0.46 | 4.87 | 54.00 | 55.13 |
| 26 | 2036 | | | 0.46 | 4.87 | 56.16 | 57.29 |
| 27 | 2037 | | | 0.46 | 4.87 | 58.32 | 59.45 |
| 28 | 2038 | | | 0.46 | 4.87 | 60.48 | 61.61 |
| 29 | 2039 | | | 0.46 | 4.87 | 62.64 | 63.77 |
| 30 | 2040 | | | 0.46 | 4.87 | 64.80 | 65.93 |
| 31 | 2041 | | | 0.46 | 4.87 | 66.96 | 68.09 |
| 32 | 2042 | | | 0.46 | 4.87 | 69.12 | 70.25 |
| 33 | 2043 | | | 0.46 | 4.87 | 71.28 | 72.41 |
| 34 | 2044 | | | 0.46 | 4.87 | 73.44 | 74.57 |
| 35 | 2045 | | | 0.46 | 4.87 | 75.60 | 76.73 |
| 36 | 2046 | | | 0.46 | 4.87 | 77.76 | 78.89 |
| 37 | 2047 | | | 0.46 | 4.87 | 79.92 | 81.05 |
| 38 | 2048 | | | 0.46 | 4.87 | 82.08 | 83.21 |
| 39 | 2049 | | | 0.46 | 4.87 | 84.24 | 85.37 |
| 40 | 2050 | | | 0.46 | 4.87 | 86.40 | 87.53 |
| 41 | 2051 | | | 0.46 | 4.87 | 88.56 | 89.69 |
| 42 | 2052 | | | 0.46 | 4.87 | 90.72 | 91.85 |
| 43 | 2053 | | | 0.46 | 4.87 | 92.88 | 94.01 |
| 44 | 2054 | | | 0.46 | 4.87 | 95.04 | 96.17 |
| 45 | 2055 | | | 0.46 | 4.87 | 97.20 | 98.33 |
| 46 | 2056 | | | 0.46 | 4.87 | 99.36 | 100.49 |
| 47 | 2057 | | | 0.46 | 4.87 | 101.52 | 102.65 |
| 48 | 2058 | | | 0.46 | 4.87 | 103.68 | 104.81 |
| 49 | 2059 | | | 0.46 | 4.87 | 105.84 | 106.97 |
| 50 | 2060 | | | 0.46 | 4.87 | 108.00 | 109.13 |

Economic Evaluation (EIRR)

Case-2 (Benefit 10% down)

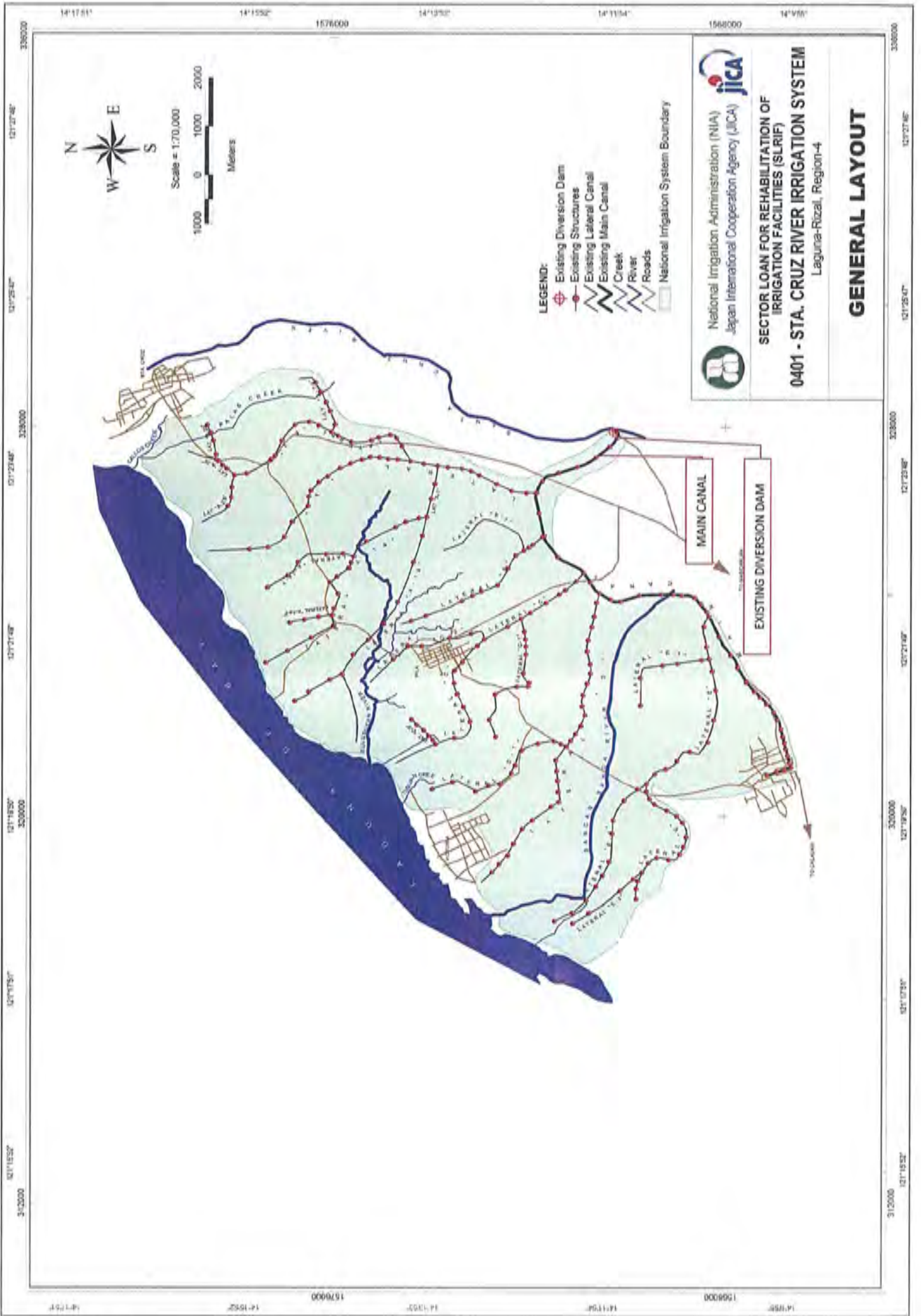
| | | | | | | | | | |
|-------------------------------|---------------------------------|---------------------------|------|-----------------------|-----|------------|--|-----------|--|
| Name of NIS: 0401 - Sta. Cruz | | Region: 4 - Ilocos Region | | MO: 10 - Ilocos Norte | | LA: Laguna | | RI: Rizal | |
| EIRR : 23.9% | Net Present Value (Million PHP) | Benefit | Cost | B/C Ratio | NPV | | | | |
| | (15 % discount rate) | 102 | 65 | 1.58 | 38 | | | | |

| Year In Order | Year | Economic Cost (M. PHP) | | | Economic Benefit (M. PHP) | | Net Cash Flow (M. PHP) | |
|---------------|------|------------------------|---------------------------|----------------------------|---------------------------|---------|------------------------|--------|
| | | Civil Works | Institutional Development | Engineering Services O & M | Total | Benefit | without 1.5% | Total |
| 1 | 2011 | - | - | 0.42 | 0.42 | 1.94 | 1.94 | 1.52 |
| 2 | 2012 | - | - | 0.42 | 0.42 | 3.89 | 3.89 | 3.47 |
| 3 | 2013 | 23.45 | 0.83 | 0.42 | 24.70 | 5.83 | 5.83 | -18.87 |
| 4 | 2014 | 31.27 | 1.10 | 0.42 | 34.12 | 7.78 | 8.02 | -26.10 |
| 5 | 2015 | 23.45 | 0.83 | 0.42 | 27.80 | 0.60 | 9.72 | 10.32 |
| 6 | 2016 | - | - | 4.43 | 4.43 | 0.92 | 11.66 | 12.58 |
| 7 | 2017 | - | - | 4.43 | 4.43 | 0.99 | 13.61 | 14.59 |
| 8 | 2018 | - | - | 4.43 | 4.43 | 1.02 | 15.55 | 16.57 |
| 9 | 2019 | - | - | 4.43 | 4.43 | 1.02 | 17.50 | 18.51 |
| 10 | 2020 | - | - | 4.43 | 4.43 | 1.02 | 19.44 | 20.46 |
| 11 | 2021 | - | - | 4.43 | 4.43 | 1.02 | 21.38 | 22.40 |
| 12 | 2022 | - | - | 4.43 | 4.43 | 1.02 | 23.33 | 24.35 |
| 13 | 2023 | - | - | 4.43 | 4.43 | 1.02 | 25.27 | 26.29 |
| 14 | 2024 | - | - | 4.43 | 4.43 | 1.02 | 27.22 | 28.23 |
| 15 | 2025 | - | - | 4.43 | 4.43 | 1.02 | 29.16 | 30.18 |
| 16 | 2026 | - | - | 4.43 | 4.43 | 1.02 | 31.10 | 32.12 |
| 17 | 2027 | - | - | 4.43 | 4.43 | 1.02 | 33.05 | 34.07 |
| 18 | 2028 | - | - | 4.43 | 4.43 | 1.02 | 34.99 | 36.01 |
| 19 | 2029 | - | - | 4.43 | 4.43 | 1.02 | 36.94 | 37.95 |
| 20 | 2030 | - | - | 4.43 | 4.43 | 1.02 | 38.88 | 39.90 |
| 21 | 2031 | - | - | 4.43 | 4.43 | 1.02 | 40.82 | 41.84 |
| 22 | 2032 | - | - | 4.43 | 4.43 | 1.02 | 42.77 | 43.79 |
| 23 | 2033 | - | - | 4.43 | 4.43 | 1.02 | 44.71 | 45.73 |
| 24 | 2034 | - | - | 4.43 | 4.43 | 1.02 | 46.66 | 47.67 |
| 25 | 2035 | - | - | 4.43 | 4.43 | 1.02 | 48.60 | 49.62 |
| 26 | 2036 | - | - | 4.43 | 4.43 | 1.02 | 50.54 | 51.56 |
| 27 | 2037 | - | - | 4.43 | 4.43 | 1.02 | 52.49 | 53.51 |
| 28 | 2038 | - | - | 4.43 | 4.43 | 1.02 | 54.43 | 55.45 |
| 29 | 2039 | - | - | 4.43 | 4.43 | 1.02 | 56.38 | 57.39 |
| 30 | 2040 | - | - | 4.43 | 4.43 | 1.02 | 58.32 | 59.34 |
| 31 | 2041 | - | - | 4.43 | 4.43 | 1.02 | 60.26 | 61.28 |
| 32 | 2042 | - | - | 4.43 | 4.43 | 1.02 | 62.21 | 63.23 |
| 33 | 2043 | - | - | 4.43 | 4.43 | 1.02 | 64.15 | 65.17 |
| 34 | 2044 | - | - | 4.43 | 4.43 | 1.02 | 66.10 | 67.11 |
| 35 | 2045 | - | - | 4.43 | 4.43 | 1.02 | 68.04 | 69.06 |
| 36 | 2046 | - | - | 4.43 | 4.43 | 1.02 | 69.98 | 71.00 |
| 37 | 2047 | - | - | 4.43 | 4.43 | 1.02 | 71.93 | 72.94 |
| 38 | 2048 | - | - | 4.43 | 4.43 | 1.02 | 73.87 | 74.89 |
| 39 | 2049 | - | - | 4.43 | 4.43 | 1.02 | 75.82 | 76.83 |
| 40 | 2050 | - | - | 4.43 | 4.43 | 1.02 | 77.76 | 78.78 |
| 41 | 2051 | - | - | 4.43 | 4.43 | 1.02 | 79.70 | 80.72 |
| 42 | 2052 | - | - | 4.43 | 4.43 | 1.02 | 81.65 | 82.66 |
| 43 | 2053 | - | - | 4.43 | 4.43 | 1.02 | 83.59 | 84.61 |
| 44 | 2054 | - | - | 4.43 | 4.43 | 1.02 | 85.54 | 86.55 |
| 45 | 2055 | - | - | 4.43 | 4.43 | 1.02 | 87.48 | 88.50 |
| 46 | 2056 | - | - | 4.43 | 4.43 | 1.02 | 89.42 | 90.44 |
| 47 | 2057 | - | - | 4.43 | 4.43 | 1.02 | 91.37 | 92.38 |
| 48 | 2058 | - | - | 4.43 | 4.43 | 1.02 | 93.31 | 94.33 |
| 49 | 2059 | - | - | 4.43 | 4.43 | 1.02 | 95.26 | 96.27 |
| 50 | 2060 | - | - | 4.43 | 4.43 | 1.02 | 97.20 | 98.22 |

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

| | | | | | | | | | |
|-------------------------------|---------------------------------|---------------------------|------|-----------------------|-----|------------|--|-----------|--|
| Name of NIS: 0401 - Sta. Cruz | | Region: 4 - Ilocos Region | | MO: 10 - Ilocos Norte | | LA: Laguna | | RI: Rizal | |
| EIRR : 21.5% | Net Present Value (Million PHP) | Benefit | Cost | B/C Ratio | NPV | | | | |
| | (15 % discount rate) | 102 | 71 | 1.43 | 31 | | | | |

| Year In Order | Year | Economic Cost (M. PHP) | | | Economic Benefit (M. PHP) | | Net Cash Flow (M. PHP) | |
|---------------|------|------------------------|---------------------------|----------------------------|---------------------------|---------|------------------------|--------|
| | | Civil Works | Institutional Development | Engineering Services O & M | Total | Benefit | without 1.5% | Total |
| 1 | 2011 | - | - | 0.46 | 0.46 | - | 1.94 | 1.48 |
| 2 | 2012 | - | - | 0.46 | 0.46 | - | 3.89 | 3.42 |
| 3 | 2013 | 25.80 | 0.91 | 0.46 | 27.17 | - | 5.83 | -21.34 |
| 4 | 2014 | 34.40 | 1.21 | 0.46 | 37.54 | 0.24 | 7.78 | -29.52 |
| 5 | 2015 | 25.80 | 0.91 | 0.46 | 30.58 | 0.60 | 9.72 | -20.26 |
| 6 | 2016 | - | - | 4.87 | 4.87 | 0.92 | 11.66 | 7.71 |
| 7 | 2017 | - | - | 4.87 | 4.87 | 0.99 | 13.61 | 9.72 |
| 8 | 2018 | - | - | 4.87 | 4.87 | 1.02 | 15.55 | 11.70 |
| 9 | 2019 | - | - | 4.87 | 4.87 | 1.02 | 17.50 | 13.64 |
| 10 | 2020 | - | - | 4.87 | 4.87 | 1.02 | 19.44 | 15.58 |
| 11 | 2021 | - | - | 4.87 | 4.87 | 1.02 | 21.38 | 17.53 |
| 12 | 2022 | - | - | 4.87 | 4.87 | 1.02 | 23.33 | 19.47 |
| 13 | 2023 | - | - | 4.87 | 4.87 | 1.02 | 25.27 | 21.42 |
| 14 | 2024 | - | - | 4.87 | 4.87 | 1.02 | 27.22 | 23.36 |
| 15 | 2025 | - | - | 4.87 | 4.87 | 1.02 | 29.16 | 25.30 |
| 16 | 2026 | - | - | 4.87 | 4.87 | 1.02 | 31.10 | 27.25 |
| 17 | 2027 | - | - | 4.87 | 4.87 | 1.02 | 33.05 | 29.19 |
| 18 | 2028 | - | - | 4.87 | 4.87 | 1.02 | 34.99 | 31.14 |
| 19 | 2029 | - | - | 4.87 | 4.87 | 1.02 | 36.94 | 33.08 |
| 20 | 2030 | - | - | 4.87 | 4.87 | 1.02 | 38.88 | 35.02 |
| 21 | 2031 | - | - | 4.87 | 4.87 | 1.02 | 40.82 | 36.97 |
| 22 | 2032 | - | - | 4.87 | 4.87 | 1.02 | 42.77 | 38.91 |
| 23 | 2033 | - | - | 4.87 | 4.87 | 1.02 | 44.71 | 40.86 |
| 24 | 2034 | - | - | 4.87 | 4.87 | 1.02 | 46.66 | 42.80 |
| 25 | 2035 | - | - | 4.87 | 4.87 | 1.02 | 48.60 | 44.74 |
| 26 | 2036 | - | - | 4.87 | 4.87 | 1.02 | 50.54 | 46.69 |
| 27 | 2037 | - | - | 4.87 | 4.87 | 1.02 | 52.49 | 48.63 |
| 28 | 2038 | - | - | 4.87 | 4.87 | 1.02 | 54.43 | 50.58 |
| 29 | 2039 | - | - | 4.87 | 4.87 | 1.02 | 56.38 | 52.52 |
| 30 | 2040 | - | - | 4.87 | 4.87 | 1.02 | 58.32 | 54.46 |
| 31 | 2041 | - | - | 4.87 | 4.87 | 1.02 | 60.26 | 56.41 |
| 32 | 2042 | - | - | 4.87 | 4.87 | 1.02 | 62.21 | 58.35 |
| 33 | 2043 | - | - | 4.87 | 4.87 | 1.02 | 64.15 | 60.30 |
| 34 | 2044 | - | - | 4.87 | 4.87 | 1.02 | 66.10 | 62.24 |
| 35 | 2045 | - | - | 4.87 | 4.87 | 1.02 | 68.04 | 64.18 |
| 36 | 2046 | - | - | 4.87 | 4.87 | 1.02 | 69.98 | 66.13 |
| 37 | 2047 | - | - | 4.87 | 4.87 | 1.02 | 71.93 | 68.07 |
| 38 | 2048 | - | - | 4.87 | 4.87 | 1.02 | 73.87 | 70.02 |
| 39 | 2049 | - | - | 4.87 | 4.87 | 1.02 | 75.82 | 71.96 |
| 40 | 2050 | - | - | 4.87 | 4.87 | 1.02 | 77.76 | 73.90 |
| 41 | 2051 | - | - | 4.87 | 4.87 | 1.02 | 79.70 | 75.85 |
| 42 | 2052 | - | - | 4.87 | 4.87 | 1.02 | 81.65 | 77.79 |
| 43 | 2053 | - | - | 4.87 | 4.87 | 1.02 | 83.59 | 79.74 |
| 44 | 2054 | - | - | 4.87 | 4.87 | 1.02 | 85.54 | 81.68 |
| 45 | 2055 | - | - | 4.87 | 4.87 | 1.02 | 87.48 | 83.62 |
| 46 | 2056 | - | - | 4.87 | 4.87 | 1.02 | 89.42 | 85.57 |
| 47 | 2057 | - | - | 4.87 | 4.87 | 1.02 | 91.37 | 87.51 |
| 48 | 2058 | - | - | 4.87 | 4.87 | 1.02 | 93.31 | 89.46 |
| 49 | 2059 | - | - | 4.87 | 4.87 | 1.02 | 95.26 | 91.40 |
| 50 | 2060 | - | - | 4.87 | 4.87 | 1.02 | 97.20 | 93.34 |



Scale = 1:70,000
 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)

SECTOR LOAN FOR REHABILITATION OF IRRIGATION FACILITIES (SLRIF)
0401 - STA. CRUZ RIVER IRRIGATION SYSTEM
 Laguna-Rizal, Region-4




GENERAL LAYOUT

MAIN CANAL
 EXISTING DIVERSION DAM

312000 121°15'21" 121°15'22" 121°15'23" 121°15'24" 121°15'25" 121°15'26" 121°15'27" 121°15'28" 121°15'29" 121°15'30" 121°15'31" 121°15'32" 121°15'33" 121°15'34" 121°15'35" 121°15'36" 121°15'37" 121°15'38" 121°15'39" 121°15'40" 121°15'41" 121°15'42" 121°15'43" 121°15'44" 121°15'45" 121°15'46" 121°15'47" 121°15'48" 121°15'49" 121°15'50" 121°15'51" 121°15'52" 121°15'53" 121°15'54" 121°15'55" 121°15'56" 121°15'57" 121°15'58" 121°15'59" 121°16'00"




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

NIS name: Sta Cruz NIS (Region 4) *Date:* June 4, 2009

| <i>Location / Facility</i> | <i>Photograph</i> | <i>Comments</i> |
|--|--|--|
| 01. Lateral A N-14d 15m 25s E-121d 23m 45s |  | Encroachment of houses along Right of Way of Canal: a)throwing of garbage in canal, b)direct sewer disposal to canal thus possible contamination of bacteria and diseases to farmers. c) obstruction to maintenance works |
| 02. Lateral A N-14d 15m 25s E-121d 23m 45s |  | Encroachment of houses along Right of Way of Canal Obstructions to operation works |
| 03. Lateral A N-14d 15m 25s E-121d 23m 45s |  | Garbage thrown to canals accumulate at trash rack |




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

NIS name: Sta Cruz NIS (Region 4) *Date:* June 4, 2009

| <i>Location / Facility</i> | <i>Photograph</i> | <i>Comments</i> |
|---|--|---|
| 04. Lateral A1 N-14d 14m 11s E-121d 23m 11s |  | Eroded and scoured outlet transition scour protection works |
| 05. Drainage Canal N-14d 14m 56s E-121d 23m 31s |  | Need improvements by desilting and dredging |
| 06. Lateral A1 |  | Stolen steel gates and eroded/scoured downstream section |

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

NIS name: Sta Cruz NIS (Region 4) *Date:* June 4, 2009

| <i>Location / Facility</i> | <i>Photograph</i> | <i>Comments</i> |
|---|--|--|
| 07. Lateral A1 N-14d 14m 34s E-121d 23m 17s |  | a) Need construction of parallel concrete wall to protect constructed wall and to have efficient delivery of irrigation supply. b) Need gravel road surfacing |
| 08. Head Gate of Lateral A N-14d 13m 01s E-121d 23m 40s |  | Need concrete lining or extend scour protection works |
| 09. Lateral A |  | Illegal disposal of domestic waste (hog waste) |

THE REPUBLIC OF PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION

**Sector Loan on
Rehabilitation of Irrigation Facilities**

NIS SUMMARY REPORT

0402

Dumacaa RIS

Region 4

Quezon 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**

| <i>Item</i> | <i>Description</i> | |
|---|--|---|
| 1) Name of NIS | Dumacaa RIS | Code: 0402 |
| 2) Location | Region | Region 4 |
| | Province | Quezon |
| | Municipality | Tayabas City, Lucena City, Pagbilao |
| | Distance | 10.60 km from Tayabas to Lucena City (Capital of Province), 14.90 km from Pagbilao to Lucena City |
| 3) Type of Water Source | Water Source | Ibia, Dumacaa, Mayao, Lakawan, Dumuolong & Iyakin River |
| | Type | Diversion Dam (53.00 m wide, 2.00 m high) -Ogee |
| 4) Area | Service Area | 2,227.0 ha |
| | FUSA | 1,839 ha |
| 5) Beneficiary Farmers | 1,301 farmers | Average paddy field cultivating size = 1.41 ha per farmer |
| 6) Irrigator's Association | IAs established = 8 FIA established = 0 | |
| 7) Features of NIS and Necessity of the project | <p>The Dumacaa NIS started its operation on August 31, 1954, the system covered 3 municipalities namely; Tayabas, Pagbilao & Lucena City with the total service area of 2,227 hectares that will be irrigated through irrigation with 1,743 farmer-beneficiaries. Originally, the system is supplied by Dumacaa River, however, due to watershed deforestation, river water supply remarkably reduced. As a result, additional water source were tapped and "RE-USE" of drainage water are adopted to augment the irrigation water requirement. The total length of main canal is 3.702 kms. lateral canal is 79.193 kms. and service roads is 62.70 km.</p> <p>Dumacaa NIS irrigable areas are located in the center of populated area where houses and other structures are built within the right of way of the irrigation canal, which hampers maintenance of the irrigation facilities. Another problem is the unauthorized disposal of domestic waste and sewer into the irrigation canal which could harm farmers and domestic animals including environment.</p> <p>The project is essential for the re-institutionalization of water users and beneficiaries in the area. The LGU, IA, and NIA Staff shall be given trainings and workshop on the conservation and protection of irrigation and drainage facilities against improper disposal of waste. Further, the rehabilitation of system is important for optimization of water usage and improvement of rice management towards maximum production of paddy rice. The project will help increase rice production in the area and help also self sufficiency the region.</p> | |
| 8) Outline of the Proposed Project | <p>A. Engineering</p> <ol style="list-style-type: none"> 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 | |

| | | | | |
|---|---|------------|------------------|----------------|
| | <p>B. Institutional Strengthening Program</p> <p>B. 1 Basic Program</p> <ol style="list-style-type: none"> 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 <p>B.2 Specific Program to strengthen institutional mechanism together with LGUs</p> <ol style="list-style-type: none"> 1. Improvement of watershed management 2. Monitoring and control on illegal dumping of wastes | | | |
| 9) Proposed Project Component | <p>A. Engineering</p> <ol style="list-style-type: none"> 1. Construction of civil works for rehabilitation of diversion works, canal system, drainage system, roads, and IMT support facilities. <p>B. Institutional</p> <ol style="list-style-type: none"> 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 | 136.88 | Million |
| | - Civil Works | PHP | 128.74 | Million |
| | - Institutional Development | PHP | 5.40 | Million |
| | - Engineering Services | PHP | 2.74 | Million |
| | 2. Indirect cost | PHP | 12.25 | Million |
| | Total Project Cost (1+2) | PHP | 149.12 | Million |
| | Cost per ha | PHP | 81,088.00 | per ha. |
| 11) Project Benefit | <ol style="list-style-type: none"> 1. To increase paddy production by 1,909 tons/year 2. To increase farmers' net income to PHP52,067.00 /ha/year 3. To establish functional and self-reliant IAs 4. To improve performance of NIS | | | |
| 12) Project Justification | EIRR = 16 %, B/C = 1.13 (discount rate 15%) | | | |

2. Project History (Construction/Rehabilitation)

| Year | Description |
|------|--|
| 2004 | Repair and rehabilitation of canal lining |
| 2005 | Desilting and construction of canal lining |
| 2006 | Desilting and construction of canal lining |
| 2007 | Repair of steel gates, service roads, and construction of canal lining |
| 2008 | Repair and rehabilitation of canal lining |

3. Present Condition

3.1 Natural Conditions

| <i>Item</i> | <i>Description</i> |
|------------------------------|--|
| 1) Annual Rainfall | 3,090.10 mm |
| 2) Seasons | Wet season: June to October Dry season: November to March |
| 3) Dominant Soil in NIS Area | Clay loam |
| 4) Topography | Generally Plain at the lower part of the irrigable area and undulated at the upper part near the diversion works with maximum slope of 3%. |

3.2 Socio-economy (Region/Province)

| <i>Item</i> | <i>Description</i> |
|---------------------------|--|
| 1) GRDP | PHP 752,430 million (Year 2007), Per Capita GRDP = PHP 67,466 per year |
| 2) Population | 1,646,510 (province) |
| 3) Population Growth Rate | 1.45 % per year (province) |
| 4) Labor Force | 7,282,000 (region) |
| 5) Poverty Population | 47.7% to total population (province) |

3.3 Present Agriculture in NIS

| <i>Item</i> | <i>Description</i> | | | | | | |
|--------------------------------------|---|------------------|----------|------------|-------|---------|-------|
| 1) Farm Household in NIS | Total beneficiaries | 1,301 households | | | | | |
| | Land owners | 625 households | (48.0 %) | | | | |
| | Tenant farmers | 676 households | (52.0 %) | | | | |
| 2) Paddy Field Size in NIS | 1.43 ha per household (FUSA/Total beneficiaries as of 2008) | | | | | | |
| 3) Present Land Use in NIS | Paddy field planted | 1,423 ha | 63.9 % | As of 2008 | | | |
| | Paddy field not planted | 416 ha | 18.7 % | As of 2008 | | | |
| | Upland crop field | 0 ha | 0.0 % | | | | |
| | Permanent crop field | 10 ha | 0.4 % | | | | |
| | Undeveloped area | 5 ha | 0.2 % | | | | |
| | Built-up area | 19 ha | 0.9 % | | | | |
| | High ground | 19 ha | 0.9 % | | | | |
| | Grassland | 10 ha | 0.4 % | | | | |
| | Swamp | 5 ha | 0.2 % | | | | |
| Fallow area | 320 ha | 14.4 % | | | | | |
| 4) Paddy Field in FUSA (ha) | 1,839 | | | | | | |
| 5) Paddy Cropped Area (ha) | 2004 | 2005 | 2006 | 2007 | 2008 | Average | |
| | Wet Season | 1,451 | 1,734 | 1,340 | 1,076 | 1,395 | 1,399 |
| | Dry Season | 1,514 | 1,399 | 1,424 | 1,445 | 1,423 | 1,441 |
| 6) Cropping Intensity (%) (per year) | 2004 | 2005 | 2006 | 2007 | 2008 | Average | |
| | 161 | 170 | 150 | 137 | 153 | 154 | |
| 7) Unit Yield of Paddy (ton/ha) | 2004 | 2005 | 2006 | 2007 | 2008 | Average | |
| | Wet Season | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 |
| | Dry Season | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 |
| 8) Paddy Production (ton) | 2004 | 2005 | 2006 | 2007 | 2008 | Average | |
| | Wet Season | 5,079 | 6,069 | 4,690 | 3,766 | 4,883 | 4,897 |
| | Dry Season | 6,056 | 5,596 | 5,696 | 5,780 | 5,692 | 5,764 |

3.4 Water Resources

| Item | Description |
|------------------------------|--------------------------|
| 1) Name of Rivers | Dumacaa River/Ibia River |
| 2) Catchment Area at Dam | 69 km ² |
| 3) Ave. River Discharge | 8.22 m ³ /s |
| 4) Ave. Dry Season Discharge | 9.69 m ³ /s |
| 5) Diverted Intake Discharge | 1.79 m ³ /s |
| 6) Water Requirement | 3.31 m ³ /s |
| 7) Sedimentation | Medium |

3.5 Existing Irrigation System

| Item | Description |
|--------------------------|---|
| 1) Diversion Dam | |
| a) Ibia Dam | Overflow crest width <u>48.0</u> m, Dam height <u>2.0</u> m Dam width <u>53</u> m |
| b) Alsam Dam | Overflow crest width _____ m, Dam height _____ m Dam width _____ m |
| c) Lakawan Dam | Overflow crest width <u>15.41</u> m, Dam height <u>2.48</u> m Dam width <u>23.00</u> m |
| d) Lower Lakawan Dam | Overflow crest width _____ m, Dam height _____ m Dam width _____ m |
| e) Mayao Dam | Overflow crest width _____ m, Dam height _____ m Dam width _____ m |
| f) Iyakin Dam | Overflow crest width _____ m, Dam height _____ m Dam width _____ m |
| g) Bangkal Dam | Overflow crest width <u>18.00</u> m, Dam height <u>1.28</u> m Dam width <u>20.00</u> m |
| h) Maabo Dam | Overflow crest width _____ m, Dam height _____ m Dam width _____ m |
| i) Dumuolong Dam | Overflow crest width _____ m, Dam height _____ m Dam width _____ m |
| 2) Main Canal | Total length <u>3.702</u> km (Lined portion <u>0.551</u> km) |
| 3) Lateral Canals | Total length <u>79.193</u> km (Lined portion <u>26.04</u> km) |
| 4) On-farm facilities | Total length <u>62.00</u> km (Lined portion <u>0.00</u> km) Turn-outs = <u>63</u> units |
| 5) Drainage Canal | Total length <u>24.00</u> kms. |
| 6) Canal Structures | No. = <u>174</u> units (Damaged = <u>44</u> units) |
| 7) Drainage Structures | No. = <u>24</u> units (Damaged = <u>9</u> units) |
| 8) Farm roads | Total length <u>62.702</u> km (pavement= <u>36.702</u> kms.) |
| 9) Water Masters Quarter | No. = <u>3</u> units |
| 10) Gate Keepers Quarter | No. = <u>5</u> units |

3.6 Institutions for O&M of NIS

| Item | Description | | | | | |
|--|-----------------------------------|------|------|------|------|---------|
| 1) Regional Irrigation Office | Name: Region 4 – Southern Tagalog | | | | | |
| 2) IMO | Name: Quezon-Marinduque IMO | | | | | |
| Staff in 2009 | Total number of staff: 51 | | | | | |
| 3) Irrigator' Association (IA) | 2004 | 2005 | 2006 | 2007 | 2008 | Average |
| Number of FIA (nos) | | | | | | |
| Number of IA (nos) | | | | | 8 | |
| Number of TSAG (nos) | 211 | 211 | 220 | 233 | 239 | 223 |
| Functionality of IA | - | - | - | - | - | - |
| Collection of ISF (wet, %) | - | - | - | - | 49 | - |
| Collection of ISF (dry, %) | - | - | - | - | 39 | - |
| 4) NIS Category based on IA 2008 O&M Contract (NIA-IA) | No. of IA | | | | | |
| Category A | 3 | | | | | |
| Category B | 5 | | | | | |
| Category C | 0 | | | | | |

3.7 Existing Problems

| <i>Item</i> | <i>Description</i> |
|--|--|
| 1) Diversion Works | <ol style="list-style-type: none"> 1. Ibia Dam-damaged downstream of scour protection works, damaged intake steel gate, no roofing and fence protecting steel gates from vandalism, no access to the damsite 2. Alsam/Dumacaa Dam-scoured downstream loose stone protection works, rusted sluice gate and intake assembly, 3. Lakawan Dam-no steel gates for 6-bays sluiceway, no roofing and fence protection for the steel gates at sluice ways and intakes, scoured embankment along its left most side. 4. Sausage Dam-stolen intake gate 5. Dumuclong Check Dam-no provision space for maintenance due to enclosed by fence inside the subdivision or residential houses 6. Mayao Dam-no roofing and protection fence for the intake gates and sluice gates, no steel gates for 6-bays, rusted gates, 7. Iyakin Dam- no access to the dam, no steel gates, scoured downstream protection works 8. Bangkal Dam-no road, flood overflows and flooded some adjacent areas, stolen intake gate pedestal & lifting mechanism 9. Maabo Dam-scoured and damaged concrete structure, no access road to dam, no steel gate control, no dike thus causing flooding during heavy rain |
| 2) Canal and Structures | <ol style="list-style-type: none"> 1. Plenty of garbage thrown in the canal, 2. Domestic waste are thrown in the canal 3. Scoured inlet and outlet stone protection works 4. Stolen gates and non-functional steel gates 5. Scoured, shallow, silted, and collapsed side slope canal embankment 6. Bored holes along embankment and auxiliary berm due to unauthorized extraction of water by farmers 7. Crack, holes, and collapsed concrete canal lining 8. Lacking of footbridges at populated areas 9. Encroachment of houses, building structures, and building along right of way of the canal |
| 3) Drainage Canal | <ol style="list-style-type: none"> 1. Lack of drainage canal facilities 2. Scoured, shallow, silted, and collapsed side slope drainage canal 3. Do not have defined drainage canals and drainage course, 4. Lacking of drainage culvert crossing |
| 4) Other Project Facilities (road, bridge, flood dike, building, etc) | <ol style="list-style-type: none"> 1. Access roads lack side drainage, crown surface, and gravel surfacing |
| 5) Water Management and O&M Activities | <ol style="list-style-type: none"> 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 | <p>Status Type Ba evaluated by Radar Graph</p> <p>Specific problems are:</p> <ol style="list-style-type: none"> 1. Low ISF collection efficiency during wet and dry seasons at 49% and 39%, respectively 2. Medium ratio of tenancy at 35% 3. Low ratio of membership at 41% |

| <i>Item</i> | <i>Description</i> |
|---|---|
| 7) Watershed Management | 1. Lack of water conservation and watershed protection works 2. Prevalent ongoing cutting of trees upstream of the diversion dam |
| 8) Coordination with LGU and Agencies concerned | 1. Poor coordination by NIA field offices and IA with concerned municipal LGUs and agencies on specific problems such as watershed management and monitoring and control of illegal dumping of wastes |
| 9) Agriculture | 1. No synchronize farming operation, cropping calendar not strictly followed. 2. Inadequate number of post harvest facilities particularly drying so that farmers are forced to sell their paddy production just after their harvest resulting to a lower price. 3. Lack of credit institution to serve the farmer at a lower interest rate. |
| 10) Others | 1. As per interview from farmer beneficiaries, there is lack of collaborative support from LGU on the maintenance of the service roads used by public commuters at the Pagbilao Municipality where the diversion works are located due to majority of the area irrigated is located at Tayabas City and Lucena City 2. The Barangay of Tayabas City instituted Barangay Ordinance for "PASSAGE FEE" for transport vehicles passing service road along irrigation canal, while NIA had not imposed any provision to collect road fee. |

4. Proposed Rehabilitation Plan

4.1 Agricultural Development Plan

| <i>Item</i> | <i>Description</i> | | | |
|-------------------------------|--------------------|---------------------|---------------------|---------------|
| Cropping schedule | <i>Wet Season</i> | <i>Dry Season-1</i> | <i>Dry Season-2</i> | <i>Annual</i> |
| 1) Type of Crops | Paddy | Paddy | - | - |
| 2) Cropping Area (ha) | 1,839 | 1,430 | - | - |
| 3) Target Unit Yield (ton/ha) | 3.6 | 4.10 | - | - |
| 3) Total Production (ton) | 6,620 | 5,863 | - | 12,483 |

4.2 Civil Works

| <i>Item</i> | <i>Description</i> |
|--------------------------|--|
| 1) Diversion Works | 1. Alsam/Dumacaa Dam- Repair and rehabilitation of downstream protection works, replacement of sluiceway steel gate roller guide, greasing and repainting of steel gate assembly, construction of roofing or protection of intake gates, replacement of roofing of sluiceway gate. 2. Ibia Dam- Repair and rehabilitation of downstream protection works, construction of roofing and perimeter fencing of gates for protection from vandalism 3. Lacawan Dam- Replacement of stolen intake steel gate assembly, construction of roofing and perimeter fencing for protection from vandalism 4. Mayao Dam- Repair of steel gate assembly, construction of roofing and perimeter fencing for protection from vandalism 5. Bangkal Dam- Repair of steel gate assembly, construction of roofing and perimeter fencing for protection from vandalism, repair weir concrete structure |
| 2) Canal Structures | 1. For rehab. – 44 units |
| 3) Canalization | 1. Construct concrete canal lining of all irrigation canals – 56.2 kms 2. Realignment of canal 3. Construction of new canal |
| 4) Drainage Structures | 1. Construct additional culvert crossing structures – 12 units |
| 5) Drainage Canalization | 1. Improvement of existing drainage canals and construction of new drainage canals – 10 kms |
| 6) Service Roads | 1. Crown development, gravel surfacing, and side drainage improvement – 26 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 – 1 set |
| 9) IMT GIS Database | 1. Development and establishment of GIS database |

4.3 Institutional Strengthening Program

| <i>Item</i> | <i>Description</i> |
|--|---|
| 1) Reactivation Program of FIAs/IAs and System Management Committee (ISMC) | <ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> 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 | <ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> 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 | <ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> 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 dumping of wastes | <ol style="list-style-type: none"> 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 dumping of wastes |

4.4 Proposed Counter Schemes

| <i>Item</i> | <i>Description</i> |
|-------------|--|
| 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, dumping of waste materials and house encroachment to canals. |
| 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. |

5. Cost Estimate for Initial Investment

| <i>Item</i> | <i>Description</i> | | |
|--------------------------------|---|---------------------------|----------------|
| 1) Direct Cost for Civil Works | A. Mobilization | Php | 2.74 Million |
| | B. Protection Dikes | | - |
| | C. Diversion Works | Php | 8.12 Million |
| | D. Canal Structures | Php | 2.65 Million |
| | E. Canalization | Php | 78.27 Million |
| | F. Drainage Structures | Php | 3.68 Million |
| | G. Drainage Canalization | Php | 5.52 Million |
| | H. Roads | Php | 9.64 Million |
| | I. On-Farm Facilities/T.O. Gates | Php | 1.28 Million |
| | J. IMT Support Facilities | Php | 15.00 Million |
| | K. IMT GIS Database | Php | 1.84 Million |
| | L. Institutional Development (5% of Direct Cost) | Php | 5.40 Million |
| | M. Feasibility Studies & Detailed Engineering (2% of Direct Cost) | Php | 2.74 Million |
| | | Sub-total (Direct Cost) | Php |
| 2) Indirect Cost | A. General Engineering Supervision and Administration (3.5% of Direct Cost) | Php | 4.79 Million |
| | B. NIA Management Fee (5% of Total Project Cost) | Php | 7.46 Million |
| | | Sub-total (Indirect Cost) | Php |
| 3) Total Project Cost | = 1+2 | Php | 149.12 Million |
| Cost per ha. | | Php | 81,088.00 /ha. |

6. Implementation Plan

| <i>Item</i> | <i>Description</i> |
|--|-------------------------------------|
| 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

| <i>Item</i> | <i>Description</i> | |
|-------------------------|--|--|
| 1) Economic evaluation | | |
| EIRR (Base) | EIRR = 16.9 % | : Project life 50 years |
| Sensitivity | Case-1 | EIRR = 15.4 % : Cost 10% up |
| | Case-2 | EIRR = 15.3 % : Benefit 10% down |
| | Case-3 | EIRR = 13.9 % : Cost 10% up + Benefit 10% down |
| B/C | 1.13 | : discount rate 15% p.a. |
| NPV | PHP 12 million | : discount rate 15% p.a. |
| 2) Financial evaluation | Farmer's net income increase = PHP 11,378 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

| <i>Item</i> | <i>Description</i> |
|-------------------------|---|
| 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 0402 - Dumacaa Economic Evaluation (EIRR)

Basic Case

| | | | |
|-----------------------------|---------------------------------|---------------------------------------|---------|
| Name of NIS: 0402 - Dumacaa | | Region: 4 - IMO:RIO Quezon Marinduque | |
| EIRR : 16.9% | Net Present Value (Million PHP) | (15 % discount rate) | Benefit |
| | | | 101 |
| | | Cost | 89 |
| | | B/C Ratio | 1.13 |
| | | NPV | 12 |

Case-1 (Cost 10% up)

| | | | |
|-----------------------------|---------------------------------|---------------------------------------|---------|
| Name of NIS: 0402 - Dumacaa | | Region: 4 - IMO:RIO Quezon Marinduque | |
| EIRR : 15.4% | Net Present Value (Million PHP) | (15 % discount rate) | Benefit |
| | | | 101 |
| | | Cost | 98 |
| | | B/C Ratio | 1.03 |
| | | NPV | 3 |

| Year In Order | Year | Economic Cost (M. PHP) | | | | Economic Benefit (M. PHP) | | Annual O & M | Total | Net Cash Flow (M. PHP) | |
|---------------|------|------------------------|---------------------------|----------------------|-------------|---------------------------|--------------|--------------|-------|------------------------|--------------|
| | | Civil Works | Institutional Development | Engineering Services | Development | Benefit | without 1.5% | | | Total | without 1.5% |
| 1 | 2011 | | | 0.66 | | 0.66 | | 0.66 | 1.06 | 0.40 | |
| 2 | 2012 | | | 0.66 | | 0.66 | | 0.66 | 2.12 | 1.46 | |
| 3 | 2013 | 36.93 | 0.89 | 0.66 | | 38.48 | | 38.48 | 3.18 | -35.30 | |
| 4 | 2014 | 49.24 | 1.18 | 0.66 | 1.12 | 52.20 | 3.05 | 52.20 | 4.24 | -44.92 | |
| 5 | 2015 | 36.93 | 0.89 | 0.66 | 2.61 | 41.09 | 7.49 | 41.09 | 5.30 | -28.30 | |
| 6 | 2016 | | | | 3.73 | 3.73 | 11.43 | 3.73 | 6.36 | 14.06 | |
| 7 | 2017 | | | | 3.73 | 3.73 | 12.32 | 3.73 | 7.42 | 16.01 | |
| 8 | 2018 | | | | 3.73 | 3.73 | 12.70 | 3.73 | 8.48 | 17.45 | |
| 9 | 2019 | | | | 3.73 | 3.73 | 12.70 | 3.73 | 9.54 | 18.51 | |
| 10 | 2020 | | | | 3.73 | 3.73 | 12.70 | 3.73 | 10.60 | 19.57 | |
| 11 | 2021 | | | | 3.73 | 3.73 | 12.70 | 3.73 | 11.66 | 20.63 | |
| 12 | 2022 | | | | 3.73 | 3.73 | 12.70 | 3.73 | 12.72 | 21.69 | |
| 13 | 2023 | | | | 3.73 | 3.73 | 12.70 | 3.73 | 13.78 | 22.75 | |
| 14 | 2024 | | | | 3.73 | 3.73 | 12.70 | 3.73 | 14.84 | 23.81 | |
| 15 | 2025 | | | | 3.73 | 3.73 | 12.70 | 3.73 | 15.90 | 24.87 | |
| 16 | 2026 | | | | 3.73 | 3.73 | 12.70 | 3.73 | 16.96 | 25.93 | |
| 17 | 2027 | | | | 3.73 | 3.73 | 12.70 | 3.73 | 18.02 | 26.99 | |
| 18 | 2028 | | | | 3.73 | 3.73 | 12.70 | 3.73 | 19.08 | 28.05 | |
| 19 | 2029 | | | | 3.73 | 3.73 | 12.70 | 3.73 | 20.14 | 29.11 | |
| 20 | 2030 | | | | 3.73 | 3.73 | 12.70 | 3.73 | 21.20 | 30.17 | |
| 21 | 2031 | | | | 3.73 | 3.73 | 12.70 | 3.73 | 22.26 | 31.23 | |
| 22 | 2032 | | | | 3.73 | 3.73 | 12.70 | 3.73 | 23.32 | 32.29 | |
| 23 | 2033 | | | | 3.73 | 3.73 | 12.70 | 3.73 | 24.38 | 33.35 | |
| 24 | 2034 | | | | 3.73 | 3.73 | 12.70 | 3.73 | 25.44 | 34.41 | |
| 25 | 2035 | | | | 3.73 | 3.73 | 12.70 | 3.73 | 26.50 | 35.47 | |
| 26 | 2036 | | | | 3.73 | 3.73 | 12.70 | 3.73 | 27.56 | 36.53 | |
| 27 | 2037 | | | | 3.73 | 3.73 | 12.70 | 3.73 | 28.62 | 37.59 | |
| 28 | 2038 | | | | 3.73 | 3.73 | 12.70 | 3.73 | 29.68 | 38.65 | |
| 29 | 2039 | | | | 3.73 | 3.73 | 12.70 | 3.73 | 30.74 | 39.71 | |
| 30 | 2040 | | | | 3.73 | 3.73 | 12.70 | 3.73 | 31.80 | 40.77 | |
| 31 | 2041 | | | | 3.73 | 3.73 | 12.70 | 3.73 | 32.86 | 41.83 | |
| 32 | 2042 | | | | 3.73 | 3.73 | 12.70 | 3.73 | 33.92 | 42.89 | |
| 33 | 2043 | | | | 3.73 | 3.73 | 12.70 | 3.73 | 34.98 | 43.95 | |
| 34 | 2044 | | | | 3.73 | 3.73 | 12.70 | 3.73 | 36.04 | 45.01 | |
| 35 | 2045 | | | | 3.73 | 3.73 | 12.70 | 3.73 | 37.10 | 46.07 | |
| 36 | 2046 | | | | 3.73 | 3.73 | 12.70 | 3.73 | 38.16 | 47.13 | |
| 37 | 2047 | | | | 3.73 | 3.73 | 12.70 | 3.73 | 39.22 | 48.19 | |
| 38 | 2048 | | | | 3.73 | 3.73 | 12.70 | 3.73 | 40.28 | 49.25 | |
| 39 | 2049 | | | | 3.73 | 3.73 | 12.70 | 3.73 | 41.34 | 50.31 | |
| 40 | 2050 | | | | 3.73 | 3.73 | 12.70 | 3.73 | 42.40 | 51.37 | |
| 41 | 2051 | | | | 3.73 | 3.73 | 12.70 | 3.73 | 43.46 | 52.43 | |
| 42 | 2052 | | | | 3.73 | 3.73 | 12.70 | 3.73 | 44.52 | 53.49 | |
| 43 | 2053 | | | | 3.73 | 3.73 | 12.70 | 3.73 | 45.58 | 54.55 | |
| 44 | 2054 | | | | 3.73 | 3.73 | 12.70 | 3.73 | 46.64 | 55.61 | |
| 45 | 2055 | | | | 3.73 | 3.73 | 12.70 | 3.73 | 47.70 | 56.67 | |
| 46 | 2056 | | | | 3.73 | 3.73 | 12.70 | 3.73 | 48.76 | 57.73 | |
| 47 | 2057 | | | | 3.73 | 3.73 | 12.70 | 3.73 | 49.82 | 58.79 | |
| 48 | 2058 | | | | 3.73 | 3.73 | 12.70 | 3.73 | 50.88 | 59.85 | |
| 49 | 2059 | | | | 3.73 | 3.73 | 12.70 | 3.73 | 51.94 | 60.91 | |
| 50 | 2060 | | | | 3.73 | 3.73 | 12.70 | 3.73 | 53.00 | 61.97 | |

| Year In Order | Year | Economic Cost (M. PHP) | | | | Economic Benefit (M. PHP) | | Annual O & M | Total | Net Cash Flow (M. PHP) | |
|---------------|------|------------------------|---------------------------|----------------------|-------------|---------------------------|--------------|--------------|-------|------------------------|--------------|
| | | Civil Works | Institutional Development | Engineering Services | Development | Benefit | without 1.5% | | | Total | without 1.5% |
| 1 | 2011 | | | 0.73 | | 0.73 | | 0.73 | 1.06 | 0.33 | |
| 2 | 2012 | | | 0.73 | | 0.73 | | 0.73 | 2.12 | 1.39 | |
| 3 | 2013 | 40.62 | 0.98 | 0.73 | | 42.33 | | 42.33 | 3.18 | -39.15 | |
| 4 | 2014 | 54.16 | 1.30 | 0.73 | 1.23 | 57.42 | 3.05 | 57.42 | 4.24 | -50.14 | |
| 5 | 2015 | 40.62 | 0.98 | 0.73 | 2.87 | 45.20 | 7.49 | 45.20 | 5.30 | -32.41 | |
| 6 | 2016 | | | | 4.10 | 4.10 | 11.43 | 4.10 | 6.36 | 13.69 | |
| 7 | 2017 | | | | 4.10 | 4.10 | 12.32 | 4.10 | 7.42 | 15.64 | |
| 8 | 2018 | | | | 4.10 | 4.10 | 12.70 | 4.10 | 8.48 | 17.08 | |
| 9 | 2019 | | | | 4.10 | 4.10 | 12.70 | 4.10 | 9.54 | 18.14 | |
| 10 | 2020 | | | | 4.10 | 4.10 | 12.70 | 4.10 | 10.60 | 19.20 | |
| 11 | 2021 | | | | 4.10 | 4.10 | 12.70 | 4.10 | 11.66 | 20.26 | |
| 12 | 2022 | | | | 4.10 | 4.10 | 12.70 | 4.10 | 12.72 | 21.32 | |
| 13 | 2023 | | | | 4.10 | 4.10 | 12.70 | 4.10 | 13.78 | 22.38 | |
| 14 | 2024 | | | | 4.10 | 4.10 | 12.70 | 4.10 | 14.84 | 23.44 | |
| 15 | 2025 | | | | 4.10 | 4.10 | 12.70 | 4.10 | 15.90 | 24.50 | |
| 16 | 2026 | | | | 4.10 | 4.10 | 12.70 | 4.10 | 16.96 | 25.56 | |
| 17 | 2027 | | | | 4.10 | 4.10 | 12.70 | 4.10 | 18.02 | 26.62 | |
| 18 | 2028 | | | | 4.10 | 4.10 | 12.70 | 4.10 | 19.08 | 27.68 | |
| 19 | 2029 | | | | 4.10 | 4.10 | 12.70 | 4.10 | 20.14 | 28.74 | |
| 20 | 2030 | | | | 4.10 | 4.10 | 12.70 | 4.10 | 21.20 | 29.80 | |
| 21 | 2031 | | | | 4.10 | 4.10 | 12.70 | 4.10 | 22.26 | 30.86 | |
| 22 | 2032 | | | | 4.10 | 4.10 | 12.70 | 4.10 | 23.32 | 31.92 | |
| 23 | 2033 | | | | 4.10 | 4.10 | 12.70 | 4.10 | 24.38 | 32.98 | |
| 24 | 2034 | | | | 4.10 | 4.10 | 12.70 | 4.10 | 25.44 | 34.04 | |
| 25 | 2035 | | | | 4.10 | 4.10 | 12.70 | 4.10 | 26.50 | 35.10 | |
| 26 | 2036 | | | | 4.10 | 4.10 | 12.70 | 4.10 | 27.56 | 36.16 | |
| 27 | 2037 | | | | 4.10 | 4.10 | 12.70 | 4.10 | 28.62 | 37.22 | |
| 28 | 2038 | | | | 4.10 | 4.10 | 12.70 | 4.10 | 29.68 | 38.28 | |
| 29 | 2039 | | | | 4.10 | 4.10 | 12.70 | 4.10 | 30.74 | 39.34 | |
| 30 | 2040 | | | | 4.10 | 4.10 | 12.70 | 4.10 | 31.80 | 40.40 | |
| 31 | 2041 | | | | 4.10 | 4.10 | 12.70 | 4.10 | 32.86 | 41.46 | |
| 32 | 2042 | | | | 4.10 | 4.10 | 12.70 | 4.10 | 33.92 | 42.52 | |
| 33 | 2043 | | | | 4.10 | 4.10 | 12.70 | 4.10 | 34.98 | 43.58 | |
| 34 | 2044 | | | | 4.10 | 4.10 | 12.70 | 4.10 | 36.04 | 44.64 | |
| 35 | 2045 | | | | 4.10 | 4.10 | 12.70 | 4.10 | 37.10 | 45.70 | |
| 36 | 2046 | | | | 4.10 | 4.10 | 12.70 | 4.10 | 38.16 | 46.76 | |
| 37 | 2047 | | | | 4.10 | 4.10 | 12.70 | 4.10 | 39.22 | 47.82 | |
| 38 | 2048 | | | | 4.10 | 4.10 | 12.70 | 4.10 | 40.28 | 48.88 | |
| 39 | 2049 | | | | 4.10 | 4.10 | 12.70 | 4.10 | 41.34 | 49.94 | |
| 40 | 2050 | | | | 4.10 | 4.10 | 12.70 | 4.10 | 42.40 | 51.00 | |
| 41 | 2051 | | | | 4.10 | 4.10 | 12.70 | 4.10 | 43.46 | 52.06 | |
| 42 | 2052 | | | | 4.10 | 4.10 | 12.70 | 4.10 | 44.52 | 53.12 | |
| 43 | 2053 | | | | 4.10 | 4.10 | 12.70 | 4.10 | 45.58 | 54.18 | |
| 44 | 2054 | | | | 4.10 | 4.10 | 12.70 | 4.10 | 46.64 | 55.24 | |
| 45 | 2055 | | | | 4.10 | 4.10 | 12.70 | 4.10 | 47.70 | 56.30 | |
| 46 | 2056 | | | | 4.10 | 4.10 | 12.70 | 4.10 | 48.76 | 57.36 | |
| 47 | 2057 | | | | 4.10 | 4.10 | 12.70 | 4.10 | 49.82 | 58.42 | |
| 48 | 2058 | | | | 4.10 | 4.10 | 12.70 | 4.10 | 50.88 | 59.48 | |
| 49 | 2059 | | | | 4.10 | 4.10 | 12.70 | 4.10 | 51.94 | 60.54 | |
| 50 | 2060 | | | | 4.10 | 4.10 | 12.70 | 4.10 | 53.00 | 61.60 | |

Economic Evaluation (EIRR)

Case-2 (Benefit 10% down)

| | | | | | | |
|-----------------------------|---------------------------------|-----------------------|---------|---------------------------|-----------|-----|
| Name of NIS: 0402 - Dumacaa | | Region: 4 | | MO: Rio Guazon-Marinduque | | |
| EIRR: 15.3% | Net Present Value (Million PHP) | (15 % discount rate) | Benefit | Cost | B/C Ratio | NPV |
| | | | 91 | 89 | 1.02 | 2 |

| Year In Order | Year | Economic Cost (M. PHP) | | | Economic Benefit (M. PHP) | | Annual O & M | Total | Net Cash Flow (M. PHP) | |
|---------------|------|------------------------|---------------------------|----------------------|---------------------------|--------------|--------------|-------|------------------------|------|
| | | Civil Works | Institutional Development | Engineering Services | Benefit | Without 1.5% | | | Total | Flow |
| 1 | 2011 | - | - | 0.66 | 0.66 | - | 0.66 | 0.95 | 0.29 | |
| 2 | 2012 | - | - | 0.66 | 0.66 | - | 0.66 | 1.91 | 1.24 | |
| 3 | 2013 | 36.93 | 0.89 | 0.66 | 0.66 | - | 38.48 | 2.86 | -35.62 | |
| 4 | 2014 | 49.24 | 1.18 | 0.66 | 0.66 | 1.12 | 52.20 | 3.82 | 6.56 | |
| 5 | 2015 | 36.93 | 0.89 | 0.66 | 0.66 | 2.61 | 41.09 | 6.74 | -29.58 | |
| 6 | 2016 | - | - | 3.73 | 3.73 | 3.73 | 3.73 | 5.72 | 12.28 | |
| 7 | 2017 | - | - | 3.73 | 3.73 | 3.73 | 3.73 | 6.68 | 14.04 | |
| 8 | 2018 | - | - | 3.73 | 3.73 | 3.73 | 3.73 | 7.63 | 15.33 | |
| 9 | 2019 | - | - | 3.73 | 3.73 | 3.73 | 3.73 | 8.59 | 16.29 | |
| 10 | 2020 | - | - | 3.73 | 3.73 | 3.73 | 3.73 | 9.54 | 17.24 | |
| 11 | 2021 | - | - | 3.73 | 3.73 | 3.73 | 3.73 | 10.49 | 18.19 | |
| 12 | 2022 | - | - | 3.73 | 3.73 | 3.73 | 3.73 | 11.45 | 19.15 | |
| 13 | 2023 | - | - | 3.73 | 3.73 | 3.73 | 3.73 | 12.40 | 20.10 | |
| 14 | 2024 | - | - | 3.73 | 3.73 | 3.73 | 3.73 | 13.36 | 21.06 | |
| 15 | 2025 | - | - | 3.73 | 3.73 | 3.73 | 3.73 | 14.31 | 22.01 | |
| 16 | 2026 | - | - | 3.73 | 3.73 | 3.73 | 3.73 | 15.26 | 22.96 | |
| 17 | 2027 | - | - | 3.73 | 3.73 | 3.73 | 3.73 | 16.22 | 23.92 | |
| 18 | 2028 | - | - | 3.73 | 3.73 | 3.73 | 3.73 | 17.17 | 24.87 | |
| 19 | 2029 | - | - | 3.73 | 3.73 | 3.73 | 3.73 | 18.13 | 25.83 | |
| 20 | 2030 | - | - | 3.73 | 3.73 | 3.73 | 3.73 | 19.08 | 26.78 | |
| 21 | 2031 | - | - | 3.73 | 3.73 | 3.73 | 3.73 | 20.03 | 27.73 | |
| 22 | 2032 | - | - | 3.73 | 3.73 | 3.73 | 3.73 | 20.99 | 28.69 | |
| 23 | 2033 | - | - | 3.73 | 3.73 | 3.73 | 3.73 | 21.94 | 29.64 | |
| 24 | 2034 | - | - | 3.73 | 3.73 | 3.73 | 3.73 | 22.90 | 30.60 | |
| 25 | 2035 | - | - | 3.73 | 3.73 | 3.73 | 3.73 | 23.85 | 31.55 | |
| 26 | 2036 | - | - | 3.73 | 3.73 | 3.73 | 3.73 | 24.80 | 32.50 | |
| 27 | 2037 | - | - | 3.73 | 3.73 | 3.73 | 3.73 | 25.76 | 33.46 | |
| 28 | 2038 | - | - | 3.73 | 3.73 | 3.73 | 3.73 | 26.71 | 34.41 | |
| 29 | 2039 | - | - | 3.73 | 3.73 | 3.73 | 3.73 | 27.67 | 35.37 | |
| 30 | 2040 | - | - | 3.73 | 3.73 | 3.73 | 3.73 | 28.62 | 36.32 | |
| 31 | 2041 | - | - | 3.73 | 3.73 | 3.73 | 3.73 | 29.57 | 37.27 | |
| 32 | 2042 | - | - | 3.73 | 3.73 | 3.73 | 3.73 | 30.53 | 38.23 | |
| 33 | 2043 | - | - | 3.73 | 3.73 | 3.73 | 3.73 | 31.48 | 39.18 | |
| 34 | 2044 | - | - | 3.73 | 3.73 | 3.73 | 3.73 | 32.44 | 40.14 | |
| 35 | 2045 | - | - | 3.73 | 3.73 | 3.73 | 3.73 | 33.39 | 41.09 | |
| 36 | 2046 | - | - | 3.73 | 3.73 | 3.73 | 3.73 | 34.34 | 42.04 | |
| 37 | 2047 | - | - | 3.73 | 3.73 | 3.73 | 3.73 | 35.30 | 43.00 | |
| 38 | 2048 | - | - | 3.73 | 3.73 | 3.73 | 3.73 | 36.25 | 43.95 | |
| 39 | 2049 | - | - | 3.73 | 3.73 | 3.73 | 3.73 | 37.21 | 44.91 | |
| 40 | 2050 | - | - | 3.73 | 3.73 | 3.73 | 3.73 | 38.16 | 45.86 | |
| 41 | 2051 | - | - | 3.73 | 3.73 | 3.73 | 3.73 | 39.11 | 46.81 | |
| 42 | 2052 | - | - | 3.73 | 3.73 | 3.73 | 3.73 | 40.07 | 47.77 | |
| 43 | 2053 | - | - | 3.73 | 3.73 | 3.73 | 3.73 | 41.02 | 48.72 | |
| 44 | 2054 | - | - | 3.73 | 3.73 | 3.73 | 3.73 | 41.98 | 49.68 | |
| 45 | 2055 | - | - | 3.73 | 3.73 | 3.73 | 3.73 | 42.93 | 50.63 | |
| 46 | 2056 | - | - | 3.73 | 3.73 | 3.73 | 3.73 | 43.88 | 51.58 | |
| 47 | 2057 | - | - | 3.73 | 3.73 | 3.73 | 3.73 | 44.84 | 52.54 | |
| 48 | 2058 | - | - | 3.73 | 3.73 | 3.73 | 3.73 | 45.79 | 53.49 | |
| 49 | 2059 | - | - | 3.73 | 3.73 | 3.73 | 3.73 | 46.75 | 54.45 | |
| 50 | 2060 | - | - | 3.73 | 3.73 | 3.73 | 3.73 | 47.70 | 55.40 | |




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

| | | | | | | |
|-----------------------------|---------------------------------|-----------------------|---------|---------------------------|-----------|-----|
| Name of NIS: 0402 - Dumacaa | | Region: 4 | | MO: Rio Guazon-Marinduque | | |
| EIRR: 13.9% | Net Present Value (Million PHP) | (15 % discount rate) | Benefit | Cost | B/C Ratio | NPV |
| | | | 91 | 98 | 0.92 | -7 |

| Year In Order | Year | Economic Cost (M. PHP) | | | Economic Benefit (M. PHP) | | Annual O & M | Total | Net Cash Flow (M. PHP) | |
|---------------|------|------------------------|---------------------------|----------------------|---------------------------|--------------|--------------|-------|------------------------|------|
| | | Civil Works | Institutional Development | Engineering Services | Benefit | Without 1.5% | | | Total | Flow |
| 1 | 2011 | - | - | 0.73 | 0.73 | - | 0.73 | 0.95 | 0.22 | |
| 2 | 2012 | - | - | 0.73 | 0.73 | - | 0.73 | 1.91 | 1.18 | |
| 3 | 2013 | 40.62 | 0.98 | 0.73 | 0.73 | - | 42.33 | 2.86 | -39.46 | |
| 4 | 2014 | 54.16 | 1.30 | 0.73 | 0.73 | 1.23 | 57.42 | 3.82 | 6.56 | |
| 5 | 2015 | 40.62 | 0.98 | 0.73 | 0.73 | 2.87 | 45.20 | 6.74 | -33.69 | |
| 6 | 2016 | - | - | 4.10 | 4.10 | 4.10 | 4.10 | 5.72 | 16.01 | |
| 7 | 2017 | - | - | 4.10 | 4.10 | 4.10 | 4.10 | 6.68 | 17.77 | |
| 8 | 2018 | - | - | 4.10 | 4.10 | 4.10 | 4.10 | 7.63 | 19.06 | |
| 9 | 2019 | - | - | 4.10 | 4.10 | 4.10 | 4.10 | 8.59 | 20.02 | |
| 10 | 2020 | - | - | 4.10 | 4.10 | 4.10 | 4.10 | 9.54 | 20.97 | |
| 11 | 2021 | - | - | 4.10 | 4.10 | 4.10 | 4.10 | 10.49 | 21.92 | |
| 12 | 2022 | - | - | 4.10 | 4.10 | 4.10 | 4.10 | 11.45 | 22.88 | |
| 13 | 2023 | - | - | 4.10 | 4.10 | 4.10 | 4.10 | 12.40 | 23.83 | |
| 14 | 2024 | - | - | 4.10 | 4.10 | 4.10 | 4.10 | 13.36 | 24.79 | |
| 15 | 2025 | - | - | 4.10 | 4.10 | 4.10 | 4.10 | 14.31 | 25.74 | |
| 16 | 2026 | - | - | 4.10 | 4.10 | 4.10 | 4.10 | 15.26 | 26.69 | |
| 17 | 2027 | - | - | 4.10 | 4.10 | 4.10 | 4.10 | 16.22 | 27.65 | |
| 18 | 2028 | - | - | 4.10 | 4.10 | 4.10 | 4.10 | 17.17 | 28.60 | |
| 19 | 2029 | - | - | 4.10 | 4.10 | 4.10 | 4.10 | 18.13 | 29.56 | |
| 20 | 2030 | - | - | 4.10 | 4.10 | 4.10 | 4.10 | 19.08 | 30.51 | |
| 21 | 2031 | - | - | 4.10 | 4.10 | 4.10 | 4.10 | 20.03 | 31.46 | |
| 22 | 2032 | - | - | 4.10 | 4.10 | 4.10 | 4.10 | 20.99 | 32.42 | |
| 23 | 2033 | - | - | 4.10 | 4.10 | 4.10 | 4.10 | 21.94 | 33.37 | |
| 24 | 2034 | - | - | 4.10 | 4.10 | 4.10 | 4.10 | 22.90 | 34.33 | |
| 25 | 2035 | - | - | 4.10 | 4.10 | 4.10 | 4.10 | 23.85 | 35.28 | |
| 26 | 2036 | - | - | 4.10 | 4.10 | 4.10 | 4.10 | 24.80 | 36.23 | |
| 27 | 2037 | - | - | 4.10 | 4.10 | 4.10 | 4.10 | 25.76 | 37.19 | |
| 28 | 2038 | - | - | 4.10 | 4.10 | 4.10 | 4.10 | 26.71 | 38.14 | |
| 29 | 2039 | - | - | 4.10 | 4.10 | 4.10 | 4.10 | 27.67 | 39.10 | |
| 30 | 2040 | - | - | 4.10 | 4.10 | 4.10 | 4.10 | 28.62 | 40.05 | |
| 31 | 2041 | - | - | 4.10 | 4.10 | 4.10 | 4.10 | 29.57 | 41.00 | |
| 32 | 2042 | - | - | 4.10 | 4.10 | 4.10 | 4.10 | 30.53 | 41.96 | |
| 33 | 2043 | - | - | 4.10 | 4.10 | 4.10 | 4.10 | 31.48 | 42.91 | |
| 34 | 2044 | - | - | 4.10 | 4.10 | 4.10 | 4.10 | 32.44 | 43.87 | |
| 35 | 2045 | - | - | 4.10 | 4.10 | 4.10 | 4.10 | 33.39 | 44.82 | |
| 36 | 2046 | - | - | 4.10 | 4.10 | 4.10 | 4.10 | 34.34 | 45.77 | |
| 37 | 2047 | - | - | 4.10 | 4.10 | 4.10 | 4.10 | 35.30 | 46.73 | |
| 38 | 2048 | - | - | 4.10 | 4.10 | 4.10 | 4.10 | 36.25 | 47.68 | |
| 39 | 2049 | - | - | 4.10 | 4.10 | 4.10 | 4.10 | 37.21 | 48.64 | |
| 40 | 2050 | - | - | 4.10 | 4.10 | 4.10 | 4.10 | 38.16 | 49.59 | |
| 41 | 2051 | - | - | 4.10 | 4.10 | 4.10 | 4.10 | 39.11 | 50.54 | |
| 42 | 2052 | - | - | 4.10 | 4.10 | 4.10 | 4.10 | 40.07 | 51.50 | |
| 43 | 2053 | - | - | 4.10 | 4.10 | 4.10 | 4.10 | 41.02 | 52.45 | |
| 44 | 2054 | - | - | 4.10 | 4.10 | 4.10 | 4.10 | 41.98 | 53.41 | |
| 45 | 2055 | - | - | 4.10 | 4.10 | 4.10 | 4.10 | 42.93 | 54.36 | |
| 46 | 2056 | - | - | 4.10 | 4.10 | 4.10 | 4.10 | 43.88 | 55.31 | |
| 47 | 2057 | - | - | 4.10 | 4.10 | 4.10 | 4.10 | 44.84 | 56.27 | |
| 48 | 2058 | - | - | 4.10 | 4.10 | 4.10 | 4.10 | 45.79 | 57.22 | |
| 49 | 2059 | - | - | 4.10 | 4.10 | 4.10 | 4.10 | 46.75 | 58.18 | |
| 50 | 2060 | - | - | 4.10 | 4.10 | 4.10 | 4.10 | 47.70 | 59.13 | |




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

NIS name: Dumacaa NIS (Region 4) *Date:* June 5, 2009

| <i>Location / Facility</i> | <i>Photograph</i> | <i>Comments</i> |
|--|--|---|
| 01. Alsam Dam N-14d 01m 33s E-121d 37m 07s |  | Replacement of parts and cable, painting of antirust and epoxy paint |
| 02. Alsam Dam N-14d 01m 33s E-121d 37m 07s |  | Replacement of roller guide and embedded parts |
| 03. Ibia Dam N-14d 01m 31s E-121d 36m 32s |  | Construction of perimeter fence and canopy for protection from vandalism, construction of access road |




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

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| <i>Location / Facility</i> | <i>Photograph</i> | <i>Comments</i> |
|---|--|--|
| 04. Ibia Dam N-14d 01m 31s E-121d 36m 32s |  | Restoration of downstream side slope and apron scour protection works |
| 05. Lakauan Dam N-13d 59m 121s E-121d 37m 33s |  | Repair of scoured and eroded right protection dike. Installation of steel gates and engine driven for lifting mechanism. Construction of elevated concrete platform slab |
| 06. Sausage Dam N-13d 59m 07s E-121d 37m 32s |  | Replacement of stolen steel gates and lifting mechanism |

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

NIS name: Dumacaa NIS (Region 4) *Date:* June 5, 2009

| <i>Location / Facility</i> | <i>Photograph</i> | <i>Comments</i> |
|--|--|---|
| 07. Lateral B |  | Repair of concrete canal lining |
| 08. Lateral B |  | Removal of houses and building structures along canals |
| 09. Maabo Dam N-13d 55m 59s E-121d 38m 47s |  | a) Repair of concrete structure and provide elevated steel gate operating flat form, b) install steel gates, c) construct access road for maintenance |