

PROPOSED LOANS AND TECHNICAL ASSISTANCE GRANT  
SECOND IRRIGATION SYSTEMS IMPROVEMENT PROJECT  
(PHILIPPINES)

The Report and Recommendation of the President (RRP:PHI 24078) on proposed loans and technical assistance grant to the Philippines for the Second Irrigation Systems Improvement Project is circulated herewith, together with the following attachments:

- (a) (Draft) Loan Agreement (Ordinary Operations)
- (b) (Draft) Loan Agreement (Special Operations)
- (c) (Draft) Project Agreement

2. This Report and Recommendation should be read with the review of economic developments and Bank operations in the Philippines (EBO PHI 95006) which was circulated to the Board on 4 July 1995 (DOC.IN.111-95).

For Enquiries: Mr. M. A. Malik, Agriculture and Social  
Sectors Department (East) (Ext. 6903)  
Mr. A. Roach, Programs Department (East)  
(Ext. 6227)  
Ms. E. McGill, Office of the General Counsel  
(Ext. 4095)

## CURRENCY EQUIVALENTS

(as of 14 July 1995)

Currency Unit	-	Philippine Peso (P)
P1.00	=	\$0.039
\$1.00	=	P25.472

The exchange rate of the peso is determined on the basis of a floating rate system related to daily foreign currency transactions of the banking sector.

For purposes of the Report, the exchange rate of P25.00 per US dollar that prevailed during appraisal has been utilized.

## ABBREVIATIONS

ADF	-	Asian Development Fund
AT	-	Agricultural Technician
ATI	-	Agricultural Training Institute
BME	-	Benefit Monitoring and Evaluation
CARP	-	Comprehensive Agrarian Reform Program
CIS	-	Communal Irrigation System
DA	-	Department of Agriculture
DENR	-	Department of Environment and Natural Resources
DOH	-	Department of Health
DPWH	-	Department of Public Works and Highways
EA	-	Executing Agency
ECC	-	Environmental Compliance Certificate
EIA	-	Environmental Impact Assessment
EIRR	-	Economic Internal Rate of Return
EMB	-	Environmental Management Bureau
EMPAS	-	Environmental Management and Protected Area Service
FW	-	Future With Project
FWO	-	Future Without Project
GEF	-	Global Environment Fund
GPEP	-	Grain Production Enhancement Program
IA	-	Irrigators' Association
IAMIS	-	Irrigators' Association Management Information System
IEE	-	Initial Environmental Examination
IIMI	-	International Irrigation Management Institute
IMIS	-	Irrigation Management Information System
IOSP	-	Irrigation Operation Support Project
IPM	-	Integrated Pest Management
ISC	-	Irrigators' Service Cooperative
ISF	-	Irrigation Service Fee
KPA	-	Key Production Area
LBP	-	Land Bank of the Philippines
LCB	-	Local Competitive Bidding
LGC	-	Local Government Code
LGU	-	Local Government Unit
MAO	-	Municipal Agricultural Officer
MMT	-	Multipartite Monitoring Team

## NOTES

- (i) The fiscal year of the Government is the same as the calendar year.
- (ii) In this Report, "\$" refers to US dollars.

## **ABBREVIATIONS**

(continued)

MOA	-	Memorandum of Agreement
MTPDP	-	Medium-Term Philippine Development Plan
NEDA	-	National Economic and Development Authority
NFA	-	National Food Authority
NGO	-	Nongovernment Organization
NIA	-	National Irrigation Administration
NIS	-	National Irrigation System
NISIP	-	National Irrigation Systems Improvement Project
NTC	-	National Training Center
O&M	-	Operation and Maintenance
OCR	-	Ordinary Capital Resources
PNOC	-	Philippine National Oil Company
PSC	-	Project Steering Committee
RCD	-	Research-cum-Demonstration (plot)
RIS	-	River Irrigation System
RUG	-	Rotational Unit Group
SCF	-	Standard Conversion Factor
SI	-	Sensitivity Index
SMNIS	-	Shared Management of National Irrigation Systems
STP	-	Sociotechnical Profile
SV	-	Switching Value
TSA	-	Turnout Service Area
VISCA	-	Visayas State College of Agriculture

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**REPUBLIC OF THE PHILIPPINES  
SECOND IRRIGATION SYSTEMS IMPROVEMENT PROJECT**

**LOANS AND PROJECT SUMMARY**

<b>Borrower</b>	Republic of the Philippines
<b>Project Description</b>	<p>The Project will improve irrigation facilities in about 12,649 hectares (ha) of existing service area, extend facilities to an additional 809 ha, and introduce a more efficient irrigation method. The Project will also improve rural roads to extend access to markets and will undertake beneficiary organization and training to enable farmer groups to undertake higher levels of participation during implementation and operation and maintenance (O&amp;M) responsibilities. The Project will also provide for improved agricultural extension services, schistosomiasis control, and environmental improvement and monitoring.</p>
<b>Classification</b>	<p>Primary : Poverty reduction Environment : Category B</p>
<b>Rationale</b>	<p>About two thirds of the poor in the Eastern Visayas Region live in rural areas and derive their livelihood directly or indirectly from agricultural activities. While the rainfed areas generally provide subsistence living, the beneficiaries of the irrigation systems located in the Region are not better off, with more than two thirds below the poverty line. This is due primarily to deterioration of the systems, which has resulted in poor and inequitable distribution of irrigation supplies, leading to low production levels and underemployment. A significant reduction in poverty among the beneficiaries of these systems can be brought about by raising their income levels through improvement of these existing systems, which will lead to more assured and equitable irrigation supplies, thus improving agricultural productivity and generating more employment opportunities. This will be achieved under the Project by rehabilitating the existing systems and, to a limited extent, extending the irrigated areas in a cost-effective manner with due consideration to environmental protection. The Project will also undertake beneficiary organization and training to increase their capacity to operate and maintain irrigation systems, while also strengthening their self-help capabilities. This approach is consistent with the Government's policy of reducing poverty in the rural areas through increased agricultural productivity with more efficient use of infrastructure and water resources, and sustainability of the benefits.</p>
<b>Objective and Scope</b>	<p>The primary objective of the Project is to reduce poverty among the beneficiaries by increasing their family incomes through increased agricultural productivity brought about by improvements in irrigation facilities of the Project systems. The Project scope includes (i) physical infrastructure to improve irrigation, drainage, and rural road facilities</p>

along with implementation of a more efficient, rotational system of irrigation distribution and arrangements for proper O&M; (ii) institutional development involving training of the beneficiaries to form and strengthen irrigators' associations and irrigators' service cooperatives to undertake system O&M and other activities; (iii) agricultural improvement to provide agricultural extension services, mainly through research-cum-demonstration plots; and (iv) environment and social improvement, and monitoring which will involve facilities and mechanisms to improve the environment monitoring capabilities of the local government agencies and coordination with other agencies in implementing reforestation in the catchment areas of the Project systems.

## Cost Estimates

(\$ million equivalent)

Component	Foreign Exchange	Local Currency	Total
<b>A. Base Costs</b>			
1. Physical Infrastructure <sup>a</sup>	10.632	16.776	27.408
2. Institutional Development	0.761	3.587	4.348
3. Agricultural Improvement	0.104	0.913	1.017
4. Environmental and Social Improvement and Monitoring	0.674	0.366	1.040
5. Project Management	<u>0.438</u>	<u>1.312</u>	<u>1.750</u>
Subtotal (A)	12.609	22.954	35.563
<b>B. Contingencies</b>			
1. Physical	1.202	2.035	3.237
2. Price	<u>1.535</u>	<u>2.589</u>	<u>4.124</u>
Subtotal (B)	2.737	4.624	7.361
<b>C. Interest &amp; Other Charges during Construction</b>	<u>3.960</u>	<u>-</u>	<u>3.960</u>
<b>Total (A+B+C)</b>	<b>19.306</b>	<b>27.578</b>	<b>46.884</b>
Percent	41	59	100

<sup>a</sup> Including in-kind contribution of beneficiaries for farm ditch construction (\$1.0 million), strengthening of paddy bunds (\$1.5 million), and the cost of land acquisition for postharvest facilities (\$51,000).

## Financing Plan

(\$ million equivalent)

Source	Foreign Exchange	Local Currency	Total	Percent
<b>Bank</b>				
ADF Loan	9.653	5.347	15.000	32.0
OCR Loan	9.653	5.347	15.000	32.0
Government	-	14.333	14.333	30.6
Beneficiaries	<u>-</u>	<u>2.551</u>	<u>2.551</u>	<u>5.4</u>
<b>Total</b>	<b>19.306</b>	<b>27.578</b>	<b>46.884</b>	<b>100.0</b>

**Loan Amounts  
and Terms**

The proposed Bank financing would be provided through two loans: (i) one loan in the amount of \$15.0 million from the Bank's ordinary capital resources having an amortization period of 27 years, including a grace period of seven years, with interest calculated in accordance with the Bank's pool-based variable lending rate system for US dollar loans, and a commitment charge of 0.75 percent per annum; and (ii) one loan in various currencies equivalent to SDR 9.631 million (currently equivalent to \$15.0 million) from the Bank's Special Funds resources with a service charge at the rate of 1 percent per annum and with amortization of 35 years, including a grace period of 10 years.

**Period of  
Utilization**

Until 31 December 2002

**Implementation  
Arrangements**

The Project will be implemented by the National Irrigation Administration (NIA) through its Regional Irrigation Office, Region 8, with strong beneficiary participation in (i) delineating rotational unit group boundaries, (ii) scheduling improvement works with minimum interruption to currently irrigated areas, and (iii) undertaking minor civil works through small package contracts. NIA will be directly responsible for the execution of all civil works; institutional development; and procurement of equipment, goods, materials, and consulting services. An interagency Project Steering Committee will be created to coordinate with other agencies involved in Project implementation, including the local government units, Department of Health, Department of Environment and Natural Resources, and Philippine National Oil Company, and will monitor the progress of Project implementation.

**Executing  
Agency**

NIA under the Department of Agriculture

**Procurement**

Procurement will be in accordance with the Bank's *Guidelines for Procurement*. Civil works will be awarded on the basis of local competitive bidding among prequalified bidders and by small package contracts and force account works in accordance with the Borrower's procedures, satisfactory to the Bank. Supply contracts costing \$500,000 equivalent or more will be awarded following international competitive bidding procedures; contracts of less than \$500,000 equivalent will follow international shopping procedures. Small supply contracts for construction materials that are locally available at competitive prices will be awarded on the basis of local competitive bidding procedures.

**Consulting  
Services**

The Project provides for three packages of consulting services consisting of 40 person-months of international consultants and 68 person-months of domestic consultants. The main consulting services

package will assist the Government in addressing the infrastructural and institutional strengthening components of the Project. The second package will include the services of two experts from the International Irrigation Management Institute to assist the Executing Agency in reviewing consultants' performance and developing appropriate strategies for implementation of rotational irrigation. Under the third package, managers of successful cooperatives in the Project area will be engaged to advise on local issues. Consultants will be engaged according to the Bank's *Guidelines on the Use of Consultants*.

**Estimated Project  
Completion Date**

30 June 2002

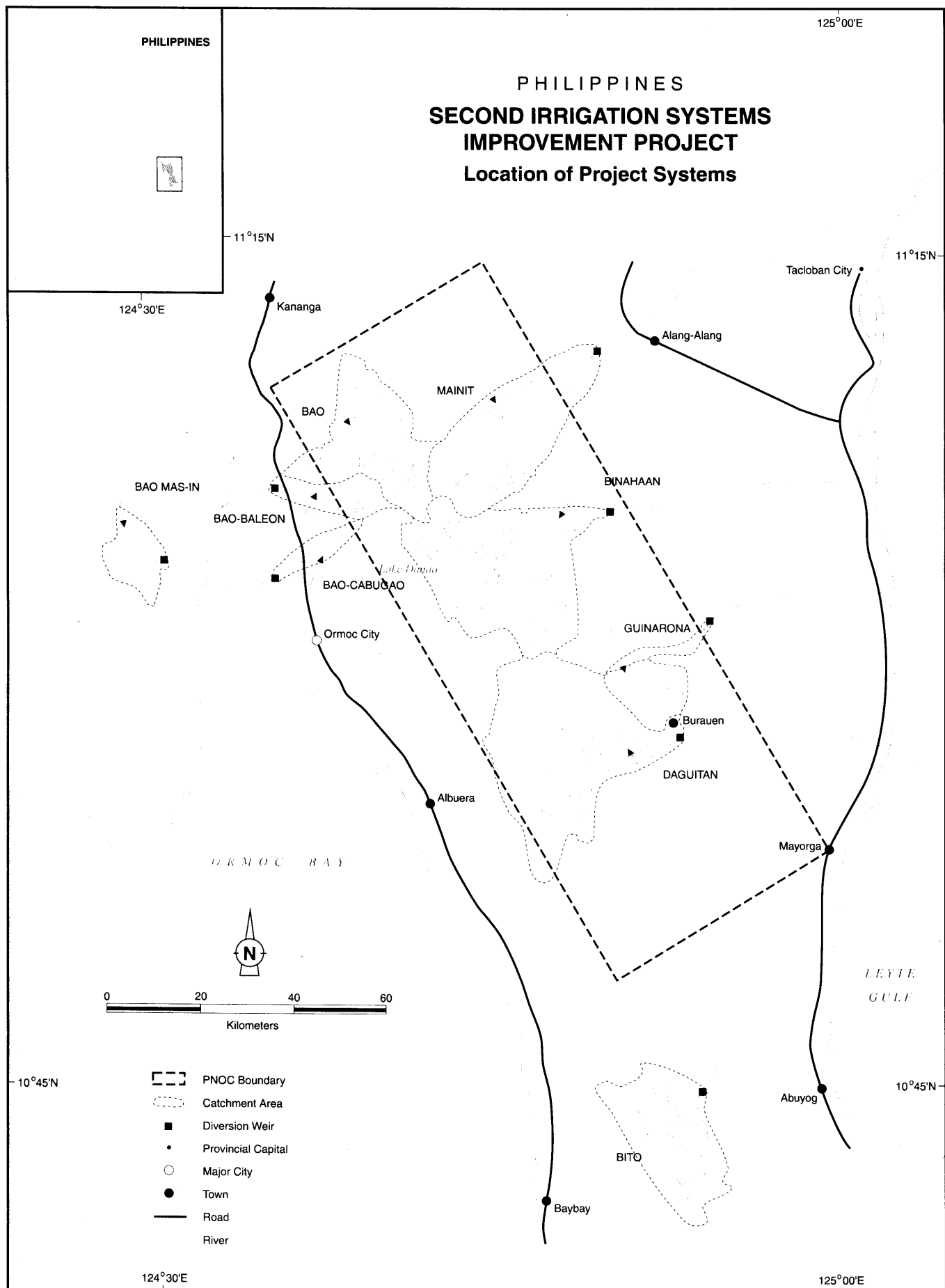
**Project Benefits  
and  
Beneficiaries**

The Project will directly benefit about 62,400 people belonging to about 12,000 households. Average annual household incomes are expected to increase from about ₱28,900 (\$1,156) to over ₱44,800 (\$1,792). At present, 72 percent of households in the Project area are below the poverty threshold; the Project will reduce this to about 42 percent. Improved agricultural production will result from an increase in (i) the effectively irrigated area from about 8,583 ha to 13,458 ha; (ii) average irrigated paddy yields by 9 percent; and (iii) cropping intensities during two cropping seasons to 190 percent, consisting of 180 percent irrigated paddy and 10 percent rainfed diversified crops. Through beneficiary organization and training, the Project will increase the self-reliance of farmers and facilitate the development of postharvest, marketing, and off-farm skills. Development of barangay and access roads will reduce transport costs and increase the ability of rural communities to participate in economic development. Schistosomiasis eradication will improve health in the community. The economic internal rate of return of the Project is estimated at 17.3 percent.

**Technical  
Assistance**

The Government has requested advisory technical assistance (TA) for environmental evaluation of swamps and marshlands to assist NIA in developing plans for optimal use of swamps and marshlands located within and adjacent to the Project area. The total cost of the TA is \$124,000 equivalent, of which \$100,000 equivalent would be financed by the Bank on a grant basis. The TA will require 18 person-months of domestic consulting services.





5. A factor underlying rural poverty is the small size of land holdings: the national average size of rice farms is 2.7 hectares (ha) and in the national irrigation systems (NISs)<sup>1</sup> this falls to 1.4 ha. Under rainfed conditions, such farms can generally support only subsistence living. Even under irrigated conditions, production of marketable surpluses from small farms can be achieved only if irrigation is adequate, reliable, and associated with appropriate levels of agricultural inputs and postharvest and marketing facilities.

6. The Eastern Visayas is one of the poorest regions of the country, with per capita gross regional domestic product at 47 percent of the national average.<sup>2</sup> The average annual family income in 1991 was estimated at ₱38,475, which, against a poverty threshold at ₱27,950, put about 40 percent of the families (47 percent of the population) below the poverty line. The region is predominantly rural, with 67 percent of the population living in rural areas. About 40 percent are reported to be underemployed.<sup>3</sup> Poor productivity of the agriculture sector — which employs about 64 percent of the labor force — is mainly responsible for low family incomes and the consequent higher incidence of poverty in the region. Literacy at the regional level is estimated at 91 percent, with the urban population registering a higher literacy rate of 95 percent compared with 89 percent for the rural population.

7. Irrigation systems in Leyte Province were constructed with national resources and, to a limited extent, external financing.<sup>4</sup> These systems were intended to improve rural living conditions through an increase in farm family incomes as a result of increased rice production. However, the systems have suffered from poor design, inadequate physical and social infrastructural support, and substandard operation and maintenance (O&M). Despite a rainfall pattern that can support two crops a year in run-of-river irrigation systems, the productivity of the systems is poor, and average irrigated paddy yields are 10 percent below the national average. As a result, the incidence of poverty in major NISs varies from 50 to 85 percent. The region is also food deficient, and about 20,000 tons (t) of milled rice, 10,000 t of corn, and 2,500 t of vegetables are shipped in annually from neighboring regions. The region has inadequate postharvest facilities and a poor network of farm-to-market roads, which results in high wastage and increased marketing costs, thus reducing returns to the farmers. In cooperation with the beneficiaries, the improvement of the poorly performing irrigation systems combined with the removal of other production constraints will serve to reduce the incidence of poverty in the region through increased agricultural incomes. The increased agricultural production would also help improve food security in the region.

## **2. The Irrigation Subsector**

### **a. Overview**

8. The improved performance of irrigation systems is the key to reduction of rural poverty, and projects in the irrigation sector need to address the following key points: (i) beneficiary involvement in project design and implementation; (ii) greater levels of beneficiary

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<sup>1</sup> NISs are larger systems with irrigation service area generally greater than 1,000 ha.

<sup>2</sup> National Economic and Development Authority (NEDA), *1991 Philippine Development Report*, June 1992.

<sup>3</sup> NEDA Region 8, *Highlights of the Eastern Visayas Regional Development Plan 1993-1998*, February 1994.

<sup>4</sup> The World Bank financed four systems in Leyte Province, but none of these is included in the proposed Project.

responsibility for O&M and irrigation service fee (ISF)<sup>1</sup> collection; and (iii) adequate allocation and timely release of the funds needed for the Project implementation.

9. In the Bank's ongoing two major irrigation projects,<sup>2</sup> beneficiary participation through irrigators' associations (IAs)<sup>3</sup> has been incorporated into both project design and implementation. In addition, beneficiary involvement is important in scheduling improvement works to minimize irrigation disruption, and in undertaking minor civil works through small package contracts. The National Irrigation Administration (NIA) is relying heavily on beneficiary participation to improve O&M practices in system operation, maintenance, and ISF collection through beneficiary organization, training, and gradual devolution of O&M responsibilities. NIA's Shared Management of National Irrigation Systems (SMNIS) program, amended in 1990, provides three types of beneficiary participation in O&M: a Type I contract is for routine maintenance of a certain section of a canal network; a Type II contract is for O&M of irrigation facilities and collection of ISFs within a designated area below a main canal; and a Type III contract is for handing over an irrigation system to an IA with full responsibility for system O&M, and amortization of the investment costs. While Type III contracts are limited to systems with service areas of less than 1,000 ha, these contracts incorporate the most desirable approach to ensure full beneficiary participation, assuming that the beneficiaries have the necessary managerial and financial capabilities. A variation on these contracts has been included in the Project design.<sup>4</sup>

10. Despite NIA's efforts, success in improving O&M standards and ISF collections has been limited because of (i) lack of beneficiary involvement in design and implementation; and (ii) poor farm level distribution networks, resulting in high water losses. Sustainable improvements in irrigation systems will require fundamental changes in the distribution network supported by greater beneficiary participation in design, implementation, and O&M activities.

11. A general weakness in past years in the implementation of development projects in the Philippines, including irrigation projects, has been the inadequate allocation of funds by the Government and subsequent delay in the release of allocated funds. This has resulted in implementation delays and increased project costs. Uncertainty and delay in the release of funds

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<sup>1</sup> ISFs are collectible from irrigated areas with yield in excess of 2 t/ha. The ISF can be paid either in kind or in its equivalent value using the Government support price for paddy. The current ISF rate for gravity-fed NISs is 100 kilograms (kg) paddy/ha for the wet season and 150 kg paddy/ha for the dry season. The current support price of paddy is ₱ 6.0/kg.

<sup>2</sup> Loan Nos. 1048/49(SF)-PHI: Irrigation Systems Improvement Project, for \$29.0 million, approved on 8 November 1990; and Loan No. 1136-PHI(SF): Kabunanan Irrigation and Area Development Project, for \$48.0 million, approved on 28 November 1991.

<sup>3</sup> Under section 2 of Presidential Decree 552, dated 1974, an IA is a nonstock and nonprofit legal entity of the beneficiaries of a communal irrigation system or a lateral canal of a NIS that needs to be registered with the Securities and Exchange Commission. The functions of an IA in a NIS include: (i) water distribution and maintenance within the area covered; (ii) contractual responsibilities for O&M above the turnout area and/or ISF collection; and (iii) collaborative functions related to increasing agricultural production and beneficiary incomes within the irrigation system. Being a nonprofit entity, an IA cannot involve itself in commercial activities like trucking, marketing, trading or credit mediation.

<sup>4</sup> As of the end of 1992, NIA had entered into 369 Type I contracts covering 119,000 ha and 75,000 farmer members, 900 Type II contracts covering 273,000 ha and 191,000 farmer members and 46 Type III contracts covering 14,000 ha and 13,000 farmer members. See NIA, *Annual Report 1992*.

make effective scheduling and control of implementation impossible; works that should be undertaken at the time of dry season low flows are delayed into the wet season, increasing the time needed to do them, and damaging temporary protection works and main structures under construction. In the past year, the budgetary restrictions have eased, and it is expected that the required financial resources will be made available, with releases in line with the project requirements.

12. The enactment of the Local Government Code (LGC) of 1991, giving greater autonomy in the management of public services to local government units (LGUs) has caused some confusion regarding funding and implementation responsibilities for irrigation systems. This resulted in delays, particularly in locally financed communal irrigation systems (CISs).<sup>1</sup> However, their implementation was resumed in 1993/1994 after all the relevant issues were resolved. Poverty reduction projects in the poorest provinces of the Philippines, such as this Project in Leyte, are nonetheless fully supported by the national Government.

#### **b. Methods of Irrigation**

13. In the Philippines, irrigation water is applied to the crops continuously up to the time of crop maturity. This practice, which is possible only for paddy production, requires minimum labor and supervision by irrigators. Continuous irrigation systems generally have poor irrigation efficiency, currently estimated at 30-50 percent, and inequitable distribution of water. Farmers in the upper reaches, having access to assured supplies, pay little attention to water conservation management practices, such as strengthening bunds to minimize wastage caused by spillover, or to the harvesting of rainwater to meet plant water requirements. Statistics of the selected irrigation systems in Leyte Province confirm that because of the inequitable distribution of irrigation supplies, farmers in the lower reaches of irrigation networks have low incomes and, therefore, the incidence of poverty is higher in lower reaches. Wastage of water in the upper reaches not only deprives farmers in the lower reaches but increases the drainable surplus as well. This often results in the creation of marshlands and promotes schistosomiasis.<sup>2</sup> In many systems, unauthorized turnouts in upper reaches of the systems outnumber legitimate turnouts, and because of poor tertiary system development, NIA appears to have little control over them. There is an urgent need for implementation of a more efficient water distribution system suitable for paddy production, which would enable equitable water distribution and control illegal turnouts. However, considering that NIA's knowledge and experience in the methods of irrigation

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<sup>1</sup> CISs are smaller systems with irrigation service area generally less than 1,000 ha and are managed entirely by the beneficiary organizations.

<sup>2</sup> Schistosomiasis, a waterborne disease, is caused by the presence of *Schistosoma japonicum* worms in the blood vessels lining the intestine. The intermediate host, *Oncomelania quadrasi*, is a tiny snail rarely exceeding five mm in length and living in a variety of wet habitats. The spread of the disease is by people, not snails. Where promiscuous defecation is the practice, the eggs of the parasite find their way to the water, where they hatch, and the first stage larva infects the snail host, where its development takes place. The second stage larva is shed from the snail and penetrates the skin of humans during water-contact activities. It follows the blood circulation, winding up in the mesenteric blood vessels in the intestine, where the parasite matures and lays eggs. Schistosomiasis is found only in rural areas and affects mostly farmers and their families. Besides suffering and death, the disease tremendously reduces the working capacity of the infected persons. The disease can be prevented by breaking the life cycle of the worm by eliminating wet habitats and application of molluscicides. The Bank, in eight previous irrigation projects in the Philippines, has provided assistance for schistosomiasis control, and this intervention has generally been effective.

has been limited to continuous irrigation, implementation of any other method would require international consultants to assist and train NIA staff in Project design and implementation. In addition, NIA staff would need hands-on overseas training on some existing systems to enable them to undertake O&M of systems with improved irrigation methods.

### **c. Issues Affecting Irrigated Agriculture in Leyte Province**

14. Leyte Province has an irrigated area of 40,607 ha, comprised of 14,567 ha in 14 NISs, 22,840 ha in 99 CISs, and 3,200 ha in 47 privately owned gravity irrigation systems.<sup>1</sup> The development and performance of these systems have been poor despite favorable agroclimatic conditions. Most of the systems were financed out of national resources, and financial constraints have resulted in their not being fully developed. Poor drainage and substandard O&M have reduced irrigated areas over time. Physical deficiencies right from the start in the distribution networks have resulted in inequitable water distribution and poor irrigation efficiencies, currently estimated at 40 percent. As a result, irrigation benefits are not fully achieved, and average irrigated paddy yield in the region is 2.96 t/ha, about 10 percent below the national average of 3.3 t/ha. Because of the poor performance of the irrigation systems, the incidence of poverty is high. Data on nine selected irrigation systems in Leyte Province show that, in 1994, average annual farm family income was ₱28,900 against a poverty threshold of ₱31,945 for the province, with about 72 percent of the systems' beneficiaries below the poverty line. Because of poor water delivery and low yields, ISF collection in the region is less than 50 percent of that needed for adequate O&M. In common with the situation nationwide, most of NIA's costs are for salaries, administration, and operating expenses, and when combined with low ISF collection, this results in little money actually spent on maintenance works per se. As a result, O&M of the systems is below the required levels, leading to system deterioration, decline in yields, and reduced farm family income. In addition, a major typhoon in 1991 affected the region, damaging most of the irrigation systems, some of which have not yet been fully restored.

15. The capacity of the beneficiaries to pay the ISF is influenced largely by the extent of benefits derived from irrigation. This was confirmed through consultation with farmers and is supported by the ISF collection data of the major irrigation systems of the region (Appendix 2). Bao, a well-performing river irrigation system (RIS)<sup>2</sup> with an irrigated cropping intensity of 187 percent, has an ISF collection of ₱850/ha, which, when combined with other receipts, comes to ₱1,152/ha of irrigated area and can meet a substantial part of the estimated O&M costs of about ₱1,310/ha. On the other hand, in three poorly performing systems (Lower Binahaan, Guinarona, and Daguitan RISs), ISF collection is on the average less than ₱550/ha of irrigated area. Farmer consultations were undertaken by the TA consultants during the course of the feasibility study<sup>3</sup> for this Project to identify their perceptions of the deficiencies and their proposed solutions. The farmers who did not pay their ISF insisted that they were not satisfied with irrigation services and consequent disappointing yields. The farmers indicated that a major

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<sup>1</sup> Source: NIA.

<sup>2</sup> Bao RIS was badly damaged as a result of the Ormoc flood of 1991, which killed up to 7,000 persons. Most of the structures damaged during the flood have since been rehabilitated. The proposed Project will provide additional improvement and protection against floods.

<sup>3</sup> The survey was administered to 40 farmers in each system — 360 farmers altogether — representing about 2.5 percent of the existing irrigators.

improvement in irrigation and drainage infrastructure, when combined with the introduction of more efficient methods of irrigation, would lead to better water deliveries and would result in their paying full ISF collection to sustain maintenance and benefits. Consultation with the farmers of Bao RIS, which is performing very well, confirmed this.

16. In addition to irrigation water-related constraints, the agricultural enterprises in the region suffer from poor farm-to-market roads, substandard postharvest facilities and inadequate agricultural support services. Almost all irrigation systems in the province have inadequate farm-to-market road networks, thus increasing marketing costs and reducing net returns to the farmers. Some cooperatives have postharvest facilities, but in relation to the total paddy produced, their capacities are insignificant. The National Food Authority (NFA), which is mandated to support paddy prices through procurement and storage of 10 percent of the paddy produced in the region, has not been able to play an effective role because of the lack of financial resources and institutional constraints. Because of poor postharvest facilities and the ineffective role of NFA, farmers indicated that they are forced to sell their produce at the time of the harvest, when the procurement prices of paddy are 10-20 percent under normal prices. Poor farmers with limited financial resources appear to be the worst affected. Farmers indicated that access to adequate postharvest facilities would enable them to hold back at the time of harvest and sell at the time when prices return to normal, thus averting a 10-20 percent loss to total returns, which could translate into 12-25 percent of net returns. An improvement in farm-to-market roads and provision of postharvest facilities would go a long way toward improving returns to the farmer beneficiaries.

17. A large number of functions of the Department of Agriculture (DA) were devolved under the LGC, causing temporary uncertainty about the continuation of the research and extension services. With regard to research, the Visayas State College of Agriculture (VISCA), located in Baybay, continues to be directly funded by the national Government as a State college. The Agricultural Training Institute-National Training Center (ATI-NTC) is located at VISCA and is centrally funded through DA to provide off-farm training courses in cooperation with VISCA. Together, VISCA and ATI-NTC provide a center for agricultural research and training courses in the region, with satisfactory facilities and staff, using nationally budgeted funds.

18. Since 1991, demonstrations, field trials, and extension services have been devolved to LGUs and funded from LGU budgets. The Provincial Agricultural Office operates 15 education, research, and extension facilities, including the Abuyog Experimental Farm, which have been entirely devolved to the province. They are underfunded and have limited capability and expertise for applied agricultural research. Extension services are provided by agricultural technicians (ATs) employed by the municipalities after the devolution of the function from DA under the LGC. Typically, each municipality has about 10,000 ha of farmland covered by about 10 ATs. The area assigned to an AT varies significantly between municipalities, but is generally too large for frequent contact with the farmers. The problem is exacerbated by limited expertise, scarce training opportunities, and inadequate transport. Farmer training is generally poorly organized and conducted on an *ad hoc* basis. The desirable level of extension services in irrigated areas requires one technician for every 200-250 ha. Therefore, extension activities in the irrigated areas need to be intensified, and the skills of and facilities for the extension workers enhanced.

19. The progressive farmers in Leyte Province are generally aware of advanced techniques for crop production, and those with adequate financial resources and relatively assured irrigation supplies use high-yielding variety seeds and appropriate amounts of fertilizers and agrochemicals. Some farmers have attended training workshops on integrated pest management (IPM) and are now acting as trainers. Fields with good paddy crops and yields of more than 5 t/ha are not uncommon, especially in the upper reaches of the irrigation systems. Interviews with the farmers revealed that many of those not using proper crop production inputs are aware of these techniques but are constrained by irrigation water supply and/or financial resources. The farmers have expressed their interest in adopting better production inputs if (i) adequate and timely supply of irrigation water can be assured, (ii) seasonal financial constraints can be removed through credit facilities, and (iii) adequate extension services through demonstration plots can be made available.

20. Leyte Province was classified in 1991 as a Strategic Operation Province under the Comprehensive Agrarian Reform Program (CARP), which was expected to accelerate land reform. Some 78,200 ha of land in the province is programmed for redistribution, with about 47,000 ha scheduled under Phase 1 of CARP. Up to 1990, little over 10,000 ha had actually been redistributed and, of this, 8,760 ha was planned for redistribution under Presidential Decree (PD) 27 of 1972. Despite this slow progress, share-tenants are a minority in the irrigation systems, accounting for about 34 percent of beneficiaries.

21. Farmers in Leyte Province have limited access to institutional credit. The STPs prepared under the TA<sup>1</sup> show that 55 percent of the beneficiaries had borrowed an average of ₱5,400 in the previous year, but only 6 percent had borrowed from the formal credit sector. The other borrowers obtained their credit from informal lenders including relatives, paying high interest rates of 60-100 percent per annum. Most institutional loans were from the Land Bank of the Philippines (LBP) through cooperatives or IAs. LBP's normal loan channeling is through cooperatives. However, under a Memorandum of Agreement (MOA) entered into with NIA in 1990, LBP has made credit available to selected IAs.<sup>2</sup> Under this MOA, LBP has been extending credit facilities to IAs in Leyte Province. As of the end of 1993, the total loans extended to nine IAs in the province amounted to ₱55.4 million, of which 86 percent was extended to one IA in Bao RIS, mainly for onlending to farmers engaged in sugarcane production. Loans used for rice production accounted for 25 percent of the total loan amount. Under the NIA-LBP agreement, LBP extends loans to IAs recommended by NIA on the condition that the IAs convert within one year to irrigators' service cooperatives (ISCs);<sup>3</sup> otherwise, the IAs will not be able to borrow from LBP on a continuing basis.

22. The quality of irrigation water in Bao River is potentially at risk from the geothermal development activities of the Philippine National Oil Company (PNOC) in the Leyte Geothermal Reservation, which may result in accidental discharge of heavy-metal pollutants. PNOC has concessionary rights for geothermal exploration and development in about 107,000 ha

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<sup>1</sup> TA No. 1882-PHI: Second Irrigation Systems Improvement Project, for \$600,000, approved on 11 May 1993.

<sup>2</sup> This agreement expired on 30 June 1995. A new MOA is being negotiated.

<sup>3</sup> An ISC is registered with the Cooperatives Development Authority and is eligible to undertake credit mediation and other commercial activities such as trucking, marketing, and trading in addition to the usual activities of an IA. An IA, being a nonprofit entity, is not eligible to get itself involved in commercial activities.

encompassing catchment areas of the major irrigation systems of the province. Geothermal development, which is limited to the catchment area of the Bao River, has caused some degree of downstream pollution by boron, although generally still within the prescribed standards. PNOC plans to expand the presently operating geothermal power station of 112.5 megawatts (MW) capacity by 640 MW by the end of 1997. This expansion, which also involves the expansion of National Power Corporation's transmission system for geothermal electric power, will be financed in part by the World Bank, the Export-Import Bank of Japan, and the Global Environment Fund (GEF). Geothermal expansion involves extensive drilling and well development. The water used for geothermal development is generally not recycled, and therefore Bao RIS, located downstream, has the potential environmental risk of pollution from heavy metals such as boron, arsenic, and mercury. As such, the Project will need to strengthen the environmental protection facilities that are already in place.

23. A Multipartite Monitoring Team (MMT) consisting of the Department of Environment and Natural Resources (DENR), PNOC, a local nongovernment organization (NGO), LGUs, and the Regional Development Council of NEDA is mandated to regularly monitor the water quality of the tributaries and rivers draining the PNOC concession area to ensure that the downstream impact of the geothermal operation is within acceptable levels. The monitoring team is, however, constrained by the absence of an environmental laboratory in the region and the nonavailability of data on river discharge and water quality because of the abandonment of the stream gauging stations on these rivers. While environmental conservation and monitoring within the Leyte Geothermal Reservation are expected to improve with the GEF-funded component of the PNOC expansion project, further augmentation of these facilities will be required.

24. The present forest cover of the watersheds serving irrigation systems in Leyte Province is not considered satisfactory, with many logged-over areas and abandoned agricultural lands.<sup>1</sup> PNOC has effective control over access to its concession area, which has discouraged in-migration of settlers and conversion of forests into agricultural lands. PNOC has carried out reforestation of the watersheds with community participation to provide livelihood projects for the local communities and to improve the environment as provided in its environmental compliance certificate (ECC). The pace of reforestation, however, has been slow. The ban imposed by DENR on logging and slash-and-burn activities in forest lands has also helped to maintain the watersheds in areas outside the PNOC concession. Nevertheless, the long-term preservation and improvement of the catchments will require major reforestation activities and a program of educating the rainfed area farmers in improved cultivation practices.

25. Poor water-use efficiencies have resulted in excessive water wastage, which, combined with inadequate and poorly maintained drainage facilities, has created a waterlogged environment favorable for the spread of schistosomiasis. Effective control of schistosomiasis requires improvement of drainage and killing of host snail colonies; improving environmental sanitation, including provision of safe drinking water and watersealed toilets; medical treatment; and health education. Reduction in the prevalence of schistosomiasis in the province from 23 to 9 percent during the first half of 1980s is attributed partly to the World Bank-financed National Irrigation Systems Improvement Project (NISIP). During 1990-1993, the prevalence was further

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<sup>1</sup> While unique climatic conditions gave rise to the extraordinary rainfall that precipitated the 1991 Ormoc flood, the lack of forest cover in the region was certainly a contributing factor.



reduced from 9 to 5 percent by implementation of the World Bank-financed nationwide project for schistosomiasis control, which had Leyte as a priority area. Schistosomiasis control activities, when made an integral part of an irrigation and drainage improvement project, lead to notable results, with sustainability achieved with small additional outlays. In Leyte, with a good network of health facilities and where about 60-80 percent of households are already provided with safe drinking water and watersealed toilet facilities, schistosomiasis control could be effectively achieved through improved drainage, vegetation control, and use of chemicals for destroying snail colonies.

## **B. Government Policies and Plans**

26. The *Medium-Term Philippine Development Plan : 1993-1998* (MTPDP) sets long-term goals for poverty reduction and improved distribution of incomes and wealth for present and future generations of Filipinos, stressing that *"sustainable development implies that future generations must not suffer from the present generation's actions in degrading the environment"*. The MTPDP targets a reduction in the proportion of the national population living below the poverty threshold to 30 percent by 1998.

27. To reduce poverty in the rural areas, the MTPDP stresses increased productivity, increased value added, and diversification of the rural economy. Measures are proposed to increase farm incomes while increasing off-farm and nonfarm incomes through development of agroprocessing industries and dispersal of labor-intensive industries to the regions. In the analysis of performance in the previous plan period, the MTPDP concludes that *"agricultural productivity growth has also been tapering off owing to inadequate investments in research and irrigation."* Increased investment in irrigation and drainage is considered a key element of policies to increase farm incomes. Complementary research, provision of appropriate inputs, and IPM are considered as effective and sustainable means of increasing harvested yields. In the wider context of rural development, the MTPDP also plans increased investments in farm-to-market roads and postharvest facilities, and deregulation of commerce and transport to force efficiencies using market mechanisms.

28. In common with other infrastructure facilities, the MTPDP plans increased funding for irrigation capital and O&M expenditure, emphasizing rehabilitation and maintenance programs. The total irrigation service area is to be increased from 1.53 to 1.93 million ha by 1998, and 480,820 ha of existing service area is to be rehabilitated. Emphasis is placed on food security through productivity increases, sustained through improved ISF collection efficiency to fund O&M, and improved watershed management to provide dependable water resources.

29. To achieve food security targets, DA has developed a medium-term agricultural development plan based on the concept of key production area (KPA) in which production is based on the comparative advantage of different areas.<sup>1</sup> Areas with existing or potential irrigation have been selected as KPAs for paddy production under the Grain Production Enhancement Program (GPEP). Leyte province is a paddy KPA. Countrywide, irrigated areas within paddy KPAs are planned to be increased from 750,000 ha in 1993 to 1.2 million ha in 1998, and an

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<sup>1</sup> Loan No. 1332-PHI(SF): Rural Infrastructure Development Project, for \$17.5 million, approved on 10 November 1994 provides for infrastructure support to the KPA concept in Region 9.

average irrigated yield of 5 t/ha is targeted by 1998. Yield increases are to be achieved through GPEP support in the form of (i) subsidized certified seed, (ii) efficient fertilizer use, (iii) irrigation support, (iv) production technology development and dissemination, (v) credit, (vi) postharvest facilities and technology support (vii) transport infrastructure, and (viii) marketing. The MTPDP envisages an average annual increase in paddy production of 3.8 percent to achieve self-sufficiency by 1998, with irrigation development playing a central role. Assessments by the World Bank, however, suggest that these production goals are optimistic.

30. NIA's *Corporate Plan : 1993-2002* is set in the context of the MTPDP, planning nationwide development of 437,620 ha of new irrigation service area and rehabilitation of 586,680 ha by 2002. NIA strategies are aimed at increasing food production and socioeconomic development in rural areas. The former places emphasis on developing areas with higher production potential rather than concentrating simply on poverty reduction in rural areas.

31. The NIA Corporate Plan seeks to increase income generation from ISFs and other sources so that O&M can be fully funded. The ISF collection nationwide now amounts to less than half of the requirements. NIA plans to improve ISF collection through the restoration of irrigation service, where it has deteriorated, and the provision of sustained improvement in the quality of services. As a target for service performance, NIA aims to increase the average irrigated cropping intensity from a national average of 144 percent in 1993 to 162 percent by 2002. NIA plans to sustain higher cropping intensities by improving and protecting environment and water resources and by improving O&M practices.

32. NIA's plan recognizes the circularity of the argument that improved ISF collection depends on improved O&M, while improved O&M depends on improved ISF collection. NIA is addressing this paradox through plans to reduce its costs and through "*developing a dynamic and viable NIA-IA partnership in systems management*." NIA has already instituted the development of IAs so that, at the beginning of the Corporate Plan period, some 590,000 farmers were members of 3,986 IAs, 1740 in NISs, and 2,246 in CISs. Under the SMNIS Program, some IAs have entered into contracts for ISF collection and maintenance and, ultimately, the turnover of the whole or part of a system to the IA. Such contracts have reduced O&M costs, and NIA notes that higher cropping intensities have been achieved as increased responsibility has been turned over to farmers. NIA plans further institutional development to "*facilitate transformation of IAs into Irrigators' Cooperatives*," plus increased farmer participation and capability in irrigation system development and O&M.

33. Institutional development within NIA is also planned to improve efficiency and effectiveness. In terms of ISF collection and O&M, management information and control systems are to be developed, including cadastral mapping and improved accounting and monitoring systems. In the early years of the plan, emphasis is being placed on restoration and reconstruction of systems to fully irrigate service areas with greater reliability and effectiveness. Environmental and institutional development measures will promote sustainability of the improved systems and operations. For increased longer term benefits, the plan promotes more efficient methods of water application to increase cropping intensity and irrigated area.

## **C. External Assistance to the Sector**

### **1. The World Bank**

34. The World Bank has so far financed, on a national basis, 15 irrigation projects — all for paddy production enhancement — three rural development projects with irrigation components, one land settlement, and one watershed management project. The 20 projects involve financing of some \$864 million; 14 of these projects have been completed.

35. Recent World Bank projects have focused on improving the performance of existing irrigation systems. These projects include the NISIP and two irrigation operations support projects (IOSPs). Excluding IOSPs, which had countrywide coverage, World Bank projects have benefited some 290,000 families and covered about 490,000 ha — 200,000 ha of new development and 290,000 ha of rehabilitation and upgrading.

36. The lessons learned from the World Bank IOSPs were as follows<sup>1</sup>: (i) the strategy for rehabilitation needs to be defined more specifically and with more beneficiary participation; (ii) improved water delivery induces users to pay ISFs more readily; (iii) beneficiary participation in system operation leads to better system performance; (iv) training and support are crucial to enable beneficiaries achieve higher levels of participatory management; (v) training in water management is helpful in systems operation; and (vi) adequate and workable provisions need to be made for improving and monitoring water deliveries. These lessons apply equally well to any similar project in the sector, and need to be incorporated in future project designs, including this Project.

### **2. Other Agencies**

37. The Overseas Economic Cooperation Fund of Japan has financed 11 irrigation projects — all to increase agricultural production — with total loans of ¥40,667 million (about \$230 million). These projects include one groundwater irrigation project; six river irrigation systems; one small water impounding project; one integrated agricultural development project; and two projects for improvement of existing irrigation systems, including cofinancing of the World Bank IOSP I. The Bohol Irrigation Project (Region 7) and the Small Water Impounding Management Project (nationwide) are under implementation.

38. The European Union has cofinanced two of the Bank-assisted projects: the Bicol River Basin Irrigation Development Project and the Palawan Integrated Area Development Project. The United States Agency for International Development provided assistance for the Bicol River Basin Program and the Upland Access Project, involving construction of rural roads.

## **D. The Bank's Involvement and Lessons Learned**

39. The Bank's involvement in the irrigation sector has in the past focused principally on economic growth. Up to the mid-1980s, the emphasis of Bank investment was on irrigation development per se, but since then it has shifted to a multisectoral approach, involving social

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<sup>1</sup> World Bank, Staff Appraisal Report, *Second Irrigation Operation Support Project (IOSP II)*, March 1993.

and environmental aspects of irrigation and safeguards for sustainability of the benefits. The Kabulnan Irrigation and Area Development Project (Loan No. 1136-PHI) was the first to have poverty reduction as its primary objective.

40. The Bank has approved 30 TAs totalling \$12 million<sup>1</sup> and 28 loans totalling \$610 million for irrigation development projects in the Philippines (see Appendix 3 for lists of projects). Of the loan projects, 22 have been completed and six are under implementation. The projects have covered the development of about 181,000 ha of new irrigation service areas and improvement of about 102,000 ha of existing systems. Of the 28 projects, 18 are located in Mindanao, 8 are in Luzon, and 2 provided special implementation assistance to various projects in Mindanao and Luzon. The proposed Project will be the Bank's first project in the Eastern Visayas Region of the country.

41. In contrast to the World Bank, which has, in the last decade, shifted to address issues relevant to the operational efficiency of the NISs with countrywide coverage, the Bank has concentrated on a project approach, addressing project-specific problems like the incidence of poverty, the prevalence of schistosomiasis, and environmental degradation. The Bank's two major ongoing irrigation projects<sup>2</sup> have components for schistosomiasis control, watershed improvement/reforestation, and beneficiary organization and training. NIA, the Executing Agency (EA) for these projects, is coordinating with the Department of Health (DOH) and DENR for implementation of the health and watershed components, respectively. Although the projects have suffered from implementation delays, mainly because of the lack of counterpart funding support, there have been no major coordination problems.

42. The Bank's first Irrigation Systems Improvement Project (Loan Nos. 1048/1049(SF)-PHI) aims at improving five Bank-financed irrigation systems in Regions 11 and 12 in Mindanao. The Project scope includes (i) improvement of irrigation systems including headworks, canals, farm facilities, and roads; (ii) construction of erosion control structures; (iii) provision of equipment; (iv) institutional development; (v) consulting services; (vi) control of schistosomiasis; and (vii) benefit monitoring and evaluation (BME). The Project aims to increase the irrigation service area from 15,500 to 23,400 ha, cropping intensity from 173 to 199 percent, and paddy yield from 3.8 to 4.7 t/ha. The Project is under implementation and is expected to be completed by mid-1996, one year after the originally scheduled loan closing date of June 1995. At appraisal the Project economic internal rate of return (EIRR) was estimated at 26.9 percent. A midterm review conducted in 1993 estimated a decline in EIRR to 17.4 percent after completion, mainly because of the implementation delay of one year. Lessons learned thus far during the implementation of Irrigation Systems Improvement Project include the following: (i) subprojects should not be scattered over too large an area; (ii) implementation periods should allow for delays caused by natural calamities; (iii) the Project Management Office should be located in the project area; and (iv) the availability of adequate funds from the government during the implementation period should be ascertained before commencement. The delay in Project completion has been largely due to inadequate allocations and the delayed release of funds.

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<sup>1</sup> Of the 30 TAs, 21 were project preparatory and 9 were advisory TAs.

<sup>2</sup> Loan Nos. 1048/1049(SF)-PHI and Loan No. 1136-PHI(SF).

43. The Bank's *Irrigation Sector Study of the Philippines*<sup>1</sup> has identified unsatisfactory O&M standards resulting from inadequate ISF collection as the main cause for the poor performance of existing irrigation systems. The study underlines the role the IAs have played in the past in the development and management of small-scale irrigation systems and emphasizes their role in future projects, starting from project inception to ultimate management and operation of the systems. The study envisions beneficiary participation in system O&M and ISF collection to result in better system performance at lower cost. The study cites the general successful role of farmers' organizations in acting as intermediaries in providing credit from formal institutions, and recommends that future projects facilitate access to credit facilities for both individuals and beneficiary groups.

44. The lessons learned from the Bank's previous projects including those given in postevaluation reports,<sup>2</sup> have been incorporated in the formulation of the proposed Project as follows: (i) beneficiary organization, training, and participation are integral parts of the Project; (ii) improved provisions have been made for O&M and its financing to ensure sustainability; (iii) measures have been incorporated to rectify deficiencies of original design before rehabilitation<sup>3</sup>; (iv) geographic proximity was a major criterion for selecting Project systems within one province; (v) a realistic implementation period has been adopted; (vi) environmental protection and monitoring measures have been included; (vii) provisions have been made for interagency coordination and monitoring of Project implementation and benefits; (viii) the Project Management Office has been located within the Project area; and (ix) assurances have been provided by the Government regarding the availability of adequate funds and their timely release.

## **E. The Bank's Country and Sectoral Strategies**

45. One of the key objectives of the Bank's operational strategy in the Philippines is to reduce poverty by raising the rate of economic growth and creating an environment for long-term sustainable development. This objective calls for the Bank's TA and policy-based lending to support the Government in enhancing agricultural productivity, improving rural infrastructure, and rehabilitating the environmental resource base. The Bank will also assist in providing long-term solutions to poverty reduction through improvements in physical infrastructure and more rational and efficient utilization of resources and their protection to ensure sustainable development. Near-term benefits can result from an emphasis on greater involvement of the private sector in the economy (including NGOs and cooperatives), increased interaction with the international marketplace, and the promotion of a more open economy both domestically and internationally.

46. In the areas of agricultural and rural development, the Bank's operational strategy in the Philippines is to (i) improve the policy environment and remove institutional constraints; (ii) promote integrated area development for enhancing the socioeconomic well-being of the rural population; (iii) promote and strengthen farmers' cooperatives and other rural organizations, and

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<sup>1</sup> *Irrigation Sector Study of the Philippines*, December 1994.

<sup>2</sup> *Sector Synthesis of Postevaluation Findings in the Irrigation and Rural Development Sector*, May 1995.

<sup>3</sup> Special emphasis has been placed on the refinement of hydrological estimates for the finalization of the design for diversion structures, studies on river geomorphology and flood protection, and complete redesign of the distribution system to suit new operational requirements.

facilitate their access to credit for agricultural and off-farm income-generation activities; (iv) strengthen agricultural support services including extension, research, and credit; (v) increase agricultural production and productivity through the provision and maintenance of rural roads and markets, irrigation, and postharvest facilities; and (vi) support sustainable approaches to resource management. The proposed Project is consistent with the Bank's operational strategy.

## **F. Policy Dialogue**

47. Policy dialogue has focused on reinforcing existing Government policy for reducing rural poverty through improvements in the productivity of existing irrigation systems and O&M procedures to sustain the benefits achieved from these investments. These measures include (i) improving physical infrastructure and providing facilities so that the irrigation systems can be operated on a rotational basis; (ii) organizing and training beneficiaries to promote project ownership, and enabling them to participate actively during implementation, manage the systems after completion, and undertake cooperative activities; and (iii) turning over the management of systems below the main canals to the beneficiary organizations, which will also involve assisting NIA in ISF collection. The ISF will be shared by the beneficiary organizations and NIA in predetermined proportions commensurate with their O&M responsibilities.

48. The Government has reflected the benefits of beneficiary participation in the three types of NIA contracts involving different levels of participation (see para. 9). The arrangements proposed under the Project will introduce a variation on NIA's existing contracts by including turnover of the management, along with rotational scheduling of irrigation supplies, to beneficiary organizations, and a formal sharing of ISF collections between the parties. The Government has recognized that adequate and equitable distribution of water realized through implementation of rotational irrigation, combined with turning over the management to the beneficiary organizations, will ensure the achievement and sustenance of the envisaged benefits and high O&M standards. The Government would, however, like to evaluate the performance of the proposed Project and derive lessons from it before adopting this innovative approach to water resources management in other NISs.

## **IV. THE PROJECT**

### **A. Rationale**

49. Poverty reduction in rural areas is a key development objective of the Government that is to be achieved through increased productivity of the farms and diversification of the rural economy. To support the Government's objective, the Bank's strategic approach to poverty reduction in the Philippines includes, inter alia, rural development through improvement of existing irrigation systems, strengthening O&M, provision of support services and inputs, and assistance for strengthening cooperatives. Irrigation investments, with associated improvements in agricultural support services, are considered as an effective intervention to reduce poverty and increase the standard of living of poor agrarian communities. While development of new irrigation systems involves higher investment costs, improvement of existing systems is generally more cost-effective and offers higher returns with less adverse environmental impacts. Leyte Province provides an ideal setting for addressing poverty reduction in accordance with the Government's and the Bank's approaches, as the province includes a number of poorly performing irrigation systems with more than two thirds of the beneficiaries below the poverty line, despite favorable

soil and climatic conditions. Improvement of these systems will lead to poverty reduction and improvements in food security.

50. In selecting the Project systems and developing strategies for their improvement, due consideration has been given to the lessons learned from other projects and the Bank's strategic approaches for rural development. While the lessons learned and their incorporation in the Project design are discussed in para. 46, the main features of the Project that address the Bank's operational strategy for the Philippines include the following: (i) about 72 percent of the Project beneficiaries are poor, and the Project will reduce poverty through cost-effective improvements in Project irrigation systems; (ii) the Project entails maximum beneficiary participation at all stages of project design, implementation, and O&M; (iii) the Project includes provisions for support facilities and services including improved rural roads, postharvest facilities, better access to credit, enhanced agricultural extension services, and schistosomiasis control; and (iv) due consideration has been given to protection, improvement, and monitoring of the environment.

51. The irrigation systems selected for improvement are: Bao, Mainit, Tibak, Binahaan North, Binahaan South, Lower Binahaan, Guinarona, Daguitan, and Bito (see map on page vi).

52. The present irrigated area of the Project systems is 8,583 ha, ranging from 248 ha in Lower Binahaan to 1,801 ha in Bao (see Appendix 2 for details). The irrigation efficiency is low, between 30 and 50 percent. Consequently, ISF collection during 1987-1994 was also low at ₱429 per ha. This resulted in O&M expenditures of about ₱606 per ha, which is below the desirable level of about ₱1,310 per ha, thus leading to continued system deterioration.

53. The STPs of the Project systems, prepared during the feasibility study in 1994, estimated the average annual family income of the beneficiaries of the nine Project systems at ₱28,900 against a poverty threshold of ₱31,945 for Leyte Province. In effect, about 72 percent of the systems beneficiaries are below the poverty line (see Appendix 2 for more information). This is mainly a result of the poor performance of the irrigation systems, which has led to a reduction in the systems' productivity and consequent underemployment, with resulting low farm family incomes. About 48 percent of the farmers are owners, 18 percent leaseholders, and 34 percent share-tenants. Farms are generally small; 62 percent are 1.0 ha and below in size, while 78 percent are 1.5 ha and below. There are 38 existing IAs covering about 80 percent of the service area. Two of these IAs — one in transition to an ISC and the other having a parallel multipurpose cooperative — have embarked on cooperative activities and are among the well-performing IAs of the country. These two IAs also exhibit indications of sustainability. The remaining 36 IAs are generally weak and need substantial strengthening to undertake effective irrigation water distribution, procurement of agricultural inputs, and marketing of the produce.

54. The Project systems are located in 14 municipalities. In addition to irrigated farming, the municipalities have large areas under rainfed farming and perennial crops. A significant proportion of households in the municipalities have sanitary toilets and safe water, although malnutrition in half of the municipalities is about 20 percent (see Appendix 4 for social profiles of beneficiary communities by municipality).

55. To improve water use efficiency and ensure equitable distribution of irrigation supplies, the Project will replace the present system of continuous irrigation with more efficient

and sustainable rotational irrigation. All distribution networks will be redesigned and constructed under the Project to meet the requirements of rotational irrigation. In addition, adequate drainage facilities will be provided for the entire Project area. While the farms currently suffering from inadequate irrigation supplies will benefit from the Project owing to more equitable distribution of irrigation supplies, the farms that are already receiving adequate irrigation supplies will also benefit owing to more reliable supplies, provision of drainage facilities, and improvements in water management, which will all lead to increased yields and better environment. To improve access and facilitate marketing, the Project will also finance the improvement of existing rural roads and construction of new roads, which will benefit all Project beneficiaries.

56. In view of limited local operational experience with rotational irrigation, it is proposed that, during the first two years, the Project will be implemented in pilot areas covering about 10 percent of the area of each system, with on-the-job training to NIA staff and domestic consultants by international consultants in project design and implementation. The experience gained and lessons learned from the pilot areas will be used with full beneficiary participation to adjust and improve the design and implementation procedures in the remaining areas of the Project systems as required.

57. The Project has been formulated based on intensive beneficiary participation. The beneficiaries' problems and aspirations were determined through a social survey conducted during the feasibility study and documented in the STPs. Another survey was conducted by the Irrigation Engineer of the feasibility study team to obtain an assessment of the deficiencies of the Project irrigation systems. The response clearly indicated a general shortage and inequitable distribution of irrigation water, with greater shortages in the lower reaches caused by unauthorized turnouts further upstream. The proposed Project was formulated taking all these aspects into consideration. The Project interventions were discussed with and agreed upon by the beneficiaries during several consultative meetings held during the preparation of the feasibility study. These results were confirmed by the Bank's missions during loan processing.

58. The Project will foster empowerment of the beneficiaries through organizing them into IAs and ISCs and training them to undertake cooperative activities and to maintain and operate the systems including ISF collection after Project completion. The Project will also facilitate participation of the LGUs in Project implementation and subsequent maintenance of *barangay*<sup>1</sup> and access roads and drainage networks improved under the Project. The Project will also finance procurement of equipment required during implementation and for O&M of the Project systems, plus provision of postharvest and storage facilities to the beneficiary organizations to give them a marketing advantage at times of low farmgate prices.

59. The Project will remove constraints caused by poor agricultural support services and environmental degradation, provide for a more effective role for women in development, and ensure efficient implementation through BME mechanisms. To sustain water quality and quantity, the Project will provide for soil conservation measures in cultivated areas in the catchments and for equipment to enhance the environmental monitoring capabilities of DENR. To control schistosomiasis — prevalent in eight out of the nine systems — the Project will provide for

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<sup>1</sup>

A barangay is the basic political and administrative unit occupying the lowest level among the LGUs.



improvements in drainage, construction of foot bridges, and use of chemicals to kill host snails in infested creeks.

## **B. Objectives and Scope**

60. The primary objective of the Project is to reduce poverty by increasing the incomes of about 12,000 farm households. The Project will enable them to secure increased food production for their own consumption and significantly increase marketable surpluses to augment their cash incomes. The Project will also improve the general living standard of the farming communities by improving the road network leading to better access to markets. Further, the Project provides for control of schistosomiasis. The Project will also promote environmental protection and monitoring by promoting reforestation in the catchment areas, providing equipment for an environmental laboratory, and improving coordination among relevant monitoring agencies. The Project framework is given in Appendix 5.

61. The Project includes the following components: (i) physical infrastructure, (ii) institutional development, (iii) agricultural improvement, and (iv) environmental and social improvement and monitoring. These components are mutually self-supporting in achieving the objectives of the Project; a brief description of them follows.

### **1. Physical Infrastructure**

62. This component has been based on extensive consultations with the beneficiaries of the Project systems and will include remodeling of the existing irrigation service area of 12,649 ha in nine Project systems to operate on a rotational basis, and extension of the area to an additional 809 ha. The irrigation works will include improvement of existing diversions and distribution networks and transformation of the entire service area of 13,458 ha into turnout service area units of about 50 ha each. More specifically, this will involve (i) replacement and/or modification of sluice gates of seven diversions, modification of 12 weir structures and offtakes, and earthwork and scour protection of all diversions; (ii) desilting of about 52 kilometers (km) of main canals and about 240 km of lateral canals; (iii) embankment strengthening of all main and lateral canals, improvement of about 176 km of existing roads, and construction of about 181 km of new roads along the main and lateral canals; (iv) improvement of existing canal structures and construction of 47 new fall<sup>1</sup> structures and 54 other structures including discharge measuring flumes; (v) replacement of key check structures in lateral canals with duck-bill weirs<sup>2</sup>; and (vi) turnout service area development, which, for a typical 50-ha unit, will involve construction of about 1 km of lined main farm ditch, 2 km of supplementary earthen farm ditches, one turnout, 20 checks and turnouts, and two crossings. The Project will also undertake, as a priority, reconstruction of the Guinarona diversion, which was damaged in July and December 1994, as well as emergency repairs of the Lower Binahaan supply works and rehabilitation of the Daguitan headworks.

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<sup>1</sup> Fall structures help in keeping the water velocity to a non-erosive limit of 0.5 meters per second.

<sup>2</sup> A duck-bill weir reduces the water level variation in a lateral canal and thereby minimizes variation in the discharge diverted to farm turnout(s).

63. Improvements to the drainage infrastructure will include construction of an effective network of farm drains covering the entire service area. It will also involve improvement of about 49 km of existing drains, construction of about 27 km of new drains, and construction of 33 road crossings and seven drain outlets. In addition, the Project will improve about 136 km of barangay roads and construct 36 km of access roads.

64. The Project will also institute measures to achieve and sustain high standards for O&M through improvements in ISF collection and clear delegation of O&M responsibilities. The proposed O&M arrangement conforms to NIA's Type II contract, albeit with an enhanced role for beneficiaries in systems maintenance and operation as required by rotational irrigation. Improvement in ISF collection will be achieved through improvements in collection procedures, reduction in NIA's administrative expenditures, and involvement of beneficiaries in ISF collection. NIA will be responsible for O&M of diversion works, main canals, and drainage networks, while Project beneficiaries, through their IAs/ISCs, will be responsible for O&M of irrigation service area networks including lateral canals. LGUs, with equipment assistance from NIA, will be responsible for maintenance of barangay roads (see Appendix 6 for a description O&M arrangements). The Project will provide for equipment required for Project implementation and maintenance of headworks, main canals and drainage networks.

## **2. Institutional Development**

65. The Project will develop effective beneficiary organizations by strengthening existing IAs and ISCs and by assisting in the formation of new IAs or ISCs where none exist to facilitate (i) Project design and implementation, (ii) training in the implementation of rotational irrigation and undertaking O&M and ISF collection activities after completion, and (iii) training to undertake cooperative activities. It is expected that of the total annual O&M cost of about ₱1,310 per ha, work worth about ₱450 (35 percent) will be carried out by the beneficiary organizations, and the remaining by NIA. It is further expected that a number of existing IAs will want to form ISCs under the auspices of the Cooperative Development Authority, and the Project will facilitate this. Where IAs do not currently exist, they will be formed or, alternatively, ISCs may be established directly. Conversion of IAs to ISCs will facilitate farmers' access to credit from formal credit institutions (namely LBP) at reasonable interest rates, nonavailability of which is currently a constraint in mobilizing the resources required for higher levels of inputs in the Project irrigation systems (see para. 21). To facilitate the extension of credit by LBP to the IAs of the Project systems that have not yet converted to ISCs, NIA will facilitate the extension of the MOA with LBP dated 1990, which expired on 30 June 1995. All irrigation users in the Project area, including leaseholders, share-tenants, and women, will have equal opportunities to participate in IA/ISC activities. In the longer term, the ISCs of a system will have the opportunity to form a federation of ISCs to expand the extent of support services to the members.

66. An IA/ISC will cover an irrigation service area of 200-300 ha. For operational purposes, an IA/ISC will be split up into about five turnout service area (TSA) groups, each on a dedicated turnout to serve an area of about 50 ha. The beneficiaries within a TSA group will be divided into about five rotational unit groups (RUGs), each with about 10 ha area to be served with irrigation supplies for one day out of a five-day rotational period. The Project will provide for organization of the beneficiaries at all levels and their training in the fields of irrigation water management, organizational and financial management, and integration of support services for farmers. The beneficiaries have committed to contribute in-kind labor for farm ditch construction

and strengthening paddy bunds, as well as the land for postharvest facilities, with aggregate values equivalent to \$1.0 million, \$1.5 million, and \$51,000, respectively. Trainers' training will also be conducted for NIA institutional development staff, farmer irrigators organizers, and water masters to enable them to conduct precooperative membership training and other training programs to enhance the capabilities of IAs and ISCs.

67. Supporting the formation of ISCs, the Project will provide all beneficiary organizations, currently estimated at 47, with an office and postharvest facilities — consisting of a concrete solar drier and storage warehouse — sufficient for the processing and storage of all marketable surplus grain produced by their members. The cost of the postharvest facilities will be repaid to NIA in installments by the beneficiaries.

68. To increase the capabilities of irrigation management, the Project will provide local and overseas training for NIA staff in water management, system rehabilitation, and system O&M under rotational irrigation. The overseas training will give NIA field staff an opportunity to get hands-on training in operating the irrigation systems using rotational procedures, which will be valuable for efficient operation of the Project systems. In addition, while working closely with the Project consultants, NIA field office staff will have ample opportunities for on-the-job training in irrigation system planning, design, construction, and O&M.

69. The Project will also provide for BME, which will involve (i) preparation and analysis of benchmark information, (ii) benefit monitoring, and (iii) benefit evaluation of the completed Project. The scope of NIA's existing Irrigation Management Information System (IMIS) and Irrigators' Association Management Information System (IAMIS) will be expanded to facilitate their use for BME of the Project.<sup>1</sup> Because of the key role of beneficiary organizations in the O&M of the Project systems, the Project proposes the use of both IMIS and IAMIS for BME. The Project will provide for collection of benchmark information on existing IAs in the Project systems, for monitoring of the performance of these IAs and their transformation into ISCs, and for postevaluation of ISCs at Project completion. The BME activities during Stage I will include updating STPs to the IMIS format and implementing an improved IAMIS for IAs in the pilot areas. At the end of Stage I, the BME activities in the pilot areas will be reviewed, and a plan for Stage II BME activities will be prepared. At Project completion, the STPs of the beneficiary communities and IA profiles will be updated to establish Project benefits and the impact of the Project on the standard of living of the beneficiaries. The Project provides for BME activities following the Bank's handbook *Benefit Monitoring and Evaluation*.

### **3. Agricultural Improvement**

70. The Project will help farmers to exploit the improved water supply for improved crop yields and farm incomes. The Municipal Agricultural Officers (MAOs) and ATs of the Provincial Agricultural Office will be utilized to design and disseminate appropriate production technologies to intensify land use, optimize fertilizer and pesticide application, and diversify to

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<sup>1</sup> IMIS is an information system developed by NIA for monitoring the implementation of the cropping calendar and pattern, water delivery and distribution, area irrigated and benefited, maintenance and repair, ISF collection, and crop production and O&M activities in the NISs. IAMIS monitors similar activities in CISs including the management of the IAs.

higher value crops and farm products. This will be accomplished through three main activities: research-cum-demonstration (RCD) plots, IPM, and income-generating activities for women.

71. The Project will establish at least five RCD plots at strategic locations in each of the nine Project systems. Each RCD plot will incorporate the most promising technologies jointly agreed upon by farmers and MAOs as best suited to the specific local conditions. High-yielding varieties, optimum fertilizer and pesticide application, more intensive cropping patterns and diversification to high-value crops are some of the components of improved technologies that will be tested and demonstrated in RCD plots. DA will facilitate the supply of certified seed, fertilizer, and other agricultural inputs to the Project systems under GPEP.

72. IPM activities will supplement and intensify the current efforts of the national IPM program "Kasakahkasan," which has already been begun in Leyte. The Project will provide on-farm training to farmer beneficiaries in monitoring harmful insects and beneficial predators that can be used as a basis for appropriate pest management. Only when it is absolutely necessary will chemical control be used.

73. The Project will support income-generating activities for women in the Project area that have been identified after due consideration to their time constraints and priorities. Topics for training will include cultivation of high-value crops, home gardening, and postharvest processing to increase the value and marketability of farm products. In addition, the Project will support women's participation and employment in activities such as IPM, and in IAs and ISCs. One of the duties of the marketing consultant provided under the Project will be to look specifically at the marketing of products and services of the women involved in the Project.

#### **4. Environmental and Social Improvement and Monitoring**

74. The Project will provide for environmental protection in a number of different aspects. To promote better soil and water conservation, the Project will provide planting materials and agricultural extension services to farmers in the catchments of the Project systems, which will also enable them to improve current cropping technologies. These improvements will include the use of contour farming involving vegetative slope protection and alternative farming systems.

75. The Project will also promote improvements in the upper watersheds. Through cooperation with DENR — the EA of the ongoing Bank-financed Forestry Sector Project<sup>1</sup> — reforestation will be undertaken on about 3,000 ha during 1996-1998 under community-based forest management programs within the catchments of the Project systems. The Project will also facilitate coordination with PNOC, which has plans to reforest, by 2004, about 4,200 ha within its concession area with the active participation of the local communities in order to provide them additional livelihood opportunities and also to improve the environment. All reforestation areas lie in the catchment areas of the Project systems. Of PNOC's target of 4,200 ha, about 1,200 ha have already been reforested. Reforestation and forest management activities will also improve the general living conditions in and around the Project area.

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<sup>1</sup>

Loan Nos. 1191/1192(SF)-PHI: Forestry Sector Project, for \$100.0 million approved on 19 November 1992.

76. As there are potential environmental risks from the geothermal activities of PNO, the Project will establish an environmental laboratory at the DENR regional office in Tacloban and rehabilitate seven gauging stations on major rivers of the Project systems. The MMT is proposed to be expanded to include NIA, the Regional Health Office for Region 8, and the Leyte Metropolitan Water District. In addition, the Project will provide for review of the practices and field operations of PNO to identify areas of activities that could be strengthened to improve the environment. A series of low-flow gaugings will also be undertaken by the Department of Public Works and Highways (DPWH) during the dry season in selected river reaches to confirm Project estimates of low-flow regimes.

77. The Project will also provide for schistosomiasis control through (i) drainage improvement; (ii) construction of foot bridges at selected crossings; (iii) vegetative control; and (iv) to a limited extent, use of chemicals. While the decision regarding whether to drain and develop major swamp and marshlands found in the Project area will be made in the light of findings of the TA accompanying the Project (see para. 108), the creeks in the Project area infested with host snails will be drained and disinfected by the application of molluscicides and by vegetative control. DOH has already identified the infested creeks. Provision of foot bridges at major waterway crossings will also facilitate eradication of the epidemic, as it will reduce the exposure of the beneficiaries to the disease. The provisions in this component will also cater for proper land use of the swamp and marshlands, the scope of which will be determined in the light of the findings of the TA accompanying the proposed loan. Public education, which is important for schistosomiasis control, is already being provided under the ongoing schistosomiasis control program of DOH, and therefore is not included in the Project.

### **C. Cost Estimates**

78. The total Project cost is estimated at \$46.9 million equivalent, composed of \$19.3 million in foreign exchange and \$27.6 million equivalent in local currency. A summary of these estimated costs is given in Table 1, with more detailed cost estimates provided in Appendix 7. The estimate of Project costs includes physical and price contingencies, as well as interest and other charges during construction. The Project beneficiaries will contribute in kind the costs of farm ditch construction, estimated at \$1.0 million equivalent; strengthening of paddy bunds, estimated at \$1.5 million equivalent; and land for the IA/ISC offices and postharvest facilities, estimated at \$51,000 equivalent.

### **D. Financing Plan**

79. It is proposed that the Bank finance \$30.0 million equivalent, or about 64 percent of the total Project cost, which will cover all foreign exchange costs, including interest and other charges during construction, and \$10.694 million equivalent of the local currency costs. Of the remaining \$16.884 million equivalent of the Project costs, \$14.333 million equivalent will be financed by the Government. In addition, the Project beneficiaries will contribute in kind the equivalent of \$2.551 million, which will cover the cost of labor and materials to construct farm ditches and to strengthen paddy bunds, and the cost of land for the IA/ISC offices and postharvest facilities. The Government expects to recover from the IAs and ISCs the equivalent of \$2.0 million, representing the estimated cost of the IA/ISC offices and postharvest facilities to be constructed under the Project, in interest-free installments over a period not exceeding 50 years. A summary of the proposed financing plan is provided in Table 2.

**Table 1: Summary of Project Costs**  
(\$ million equivalent)

Component	Foreign Exchange	Local Currency	Total
<b>A. Base Costs</b>			
1. Physical Infrastructure <sup>a</sup>	10.632	16.776	27.408
2. Institutional Development	0.761	3.587	4.348
3. Agricultural Improvement	0.104	0.913	1.017
4. Environmental and Social Improvement and Monitoring	0.674	0.366	1.040
5. Project Management	0.438	1.312	1.750
Subtotal (A) <sup>b</sup>	12.609	22.954	35.563
<b>B. Contingencies</b>			
1. Physical <sup>c</sup>	1.202	2.035	3.237
2. Price <sup>d</sup>	1.535	2.589	4.124
Subtotal (B)	2.737	4.624	7.361
<b>C. Interest and Other Charges during Construction<sup>e</sup></b>	3.960	-	3.960
<b>Total (A+B+C)</b>	<b>19.306</b>	<b>27.578</b>	<b>46.884</b>
Percent	41	59	100

- = magnitude zero

<sup>a</sup> Including beneficiaries' in-kind contribution of \$2.551 million equivalent.

<sup>b</sup> Including taxes and duties estimated at \$3.592 million equivalent.

<sup>c</sup> At 10 percent for civil works and services, and 5 percent for vehicles and equipment.

<sup>d</sup> At 2.2 percent annually for 1995-2002 for foreign currency costs, and 8 percent annually for the same period for local currency costs.

<sup>e</sup> Including service charge on a \$15.0 million equivalent loan from the Bank's Special Funds resources, and interest and commitment charge on a \$15.0 million loan from the Bank's ordinary capital resources.

Source: Staff estimates

**Table 2: Financing Plan**  
(\$ million equivalent)

Source	Foreign Exchange	Local Currency	Total Costs	Percent
Bank				
ADF Loan	9.653	5.347	15.000	32.0
OCR Loan	9.653	5.347	15.000	32.0
Government	-	14.333 <sup>a</sup>	14.333	30.6
Beneficiaries	-	2.551	2.551	5.4
<b>Total</b>	<b>19.306</b>	<b>27.578</b>	<b>46.884</b>	<b>100.0</b>

- = magnitude zero

<sup>a</sup> Includes taxes and duties estimated at \$ 3.592 million equivalent.

Source: Staff estimates

80. The proposed Bank financing would be provided through two loans: (i) one loan in the amount of \$15.0 million from the Bank's ordinary capital resources (the OCR loan); and (ii) one loan in various currencies equivalent to SDR 9.631 million (currently equivalent to \$15.0 million) from the Bank's Special Funds resources (the ADF loan). The borrower in each case would be the Republic of the Philippines. The proposed OCR loan would have an amortization period of 27 years, including a grace period of 7 years, interest calculated in accordance with the Bank's pool-based variable lending rate system for US dollar loans, and a commitment charge of 0.75 percent per annum. The proposed ADF loan would have an amortization period of 35 years, including a grace period of 10 years, and a service charge of 1 percent per annum. The Bank's financing stands at about 64 percent of the total Project costs which is 4 percent higher than the limit of 60 percent for the Group B countries to which the Philippines belongs. The higher level of Bank financing is warranted in view of the Project's strong contribution towards social and environmental improvement. The Project beneficiaries constitute predominantly landless poor farm households with small land holdings. Landowners constitute less than half of the Project beneficiary families and more than three fourths of the farms are small: 1.5 ha or less. More than two thirds of the beneficiary families are below the poverty line, and about one third are below the subsistence line. While the Project will improve the farm family income of all beneficiaries including those below the poverty line, its impact will be more pronounced on households below the subsistence level.

## **E. Implementation Arrangements**

### **1. Project Executing Agency**

81. NIA will be the EA of the Project. With frequent consultation with, and effective participation of the Project beneficiaries, NIA will undertake design supervision and coordination of all Project activities. NIA will be directly responsible for execution of the civil works related to improvement of irrigation, drainage, and roads; construction of IA/ISC offices and postharvest facilities; institutional development; and procurement of equipment and consulting services. NIA will coordinate with LGUs for execution of the activities related to construction and improvement of barangay and access roads, as well as agricultural extension; and with DENR and PNOC for procurement of equipment for and establishment of an environmental laboratory, environmental monitoring, and implementation of community-based forest management programs in catchment areas under PNOC's jurisdiction. NIA will also coordinate with DA for the provision of the necessary training and demonstration activities in agricultural improvement; with DOH for procurement of equipment and molluscicides, and improvement of drainage and application of molluscicides for schistosomiasis control; and with DPWH for procurement of equipment required for rehabilitation of seven stream gauging stations.

### **2. Project Management and Interagency Coordination**

82. A Project Management Office will be established in Tacloban to direct, supervise and coordinate all Project activities. The Project Management Office will be headed by the Regional Irrigation Manager for Region 8, who will act as Project Manager and will be assisted by an Assistant Project Manager.

83. An interagency Project Steering Committee (PSC) will be created in the NIA Central Office in Manila to monitor the progress of Project implementation. NIA's Assistant

Administrator for Systems Operation and Equipment Management will be Chairman of the PSC, to be assisted by NIA's Manager, Systems Management Department, who will act as Project Coordinator to coordinate Project-related activities at the NIA Central Office. The PSC will include the Project Manager, the Project Coordinator, and representatives of all participating or coordinating agencies including DENR, PNOC, DOH, DA, DPWH, the Provincial Government of Leyte, and LGUs in the Project area. The PSC will also coordinate with related agencies, including LBP and the Cooperative Development Authority. The PSC will meet at least once every quarter in Tacloban to permit effective involvement of the LGUs in the Project area.

84. The beneficiaries will play a key role during Project implementation by (i) assisting in the delineation of RUG boundaries, (ii) coordinating in scheduling improvement works with minimum interruption to the currently irrigated areas, and (iii) undertaking minor civil works through small package contracts. After Project completion, the beneficiaries will undertake O&M of the systems and assist NIA in ISF collection. The reforestation activities to be coordinated by the Project (see para. 75) also demand strong beneficiary participation. The responsibilities of the beneficiaries and other relevant agencies, therefore, need to be spelled out and agreed upon before the start of major implementation activities. An MOA will be entered into between NIA and each IA/ISC in the Project area stipulating, among other things, that (i) the IA/ISC or its members will furnish the right of way for all farm ditches; (ii) after completion of the improvements, a management turnover agreement will be entered into between NIA and the IA/ISC providing that the O&M of the lateral canal and all irrigation facilities, including the lateral canal service road, will become the responsibility of the IA/ISC, while O&M of the diversion works, main canal, and service road and water delivery to the IA/ISC will remain the responsibility of NIA; (iii) the IAs/ISCs will assist NIA in ISF collection, and the collection will be shared between NIA and the IA/ISC according to a formula to be negotiated between them, reflecting their shared responsibilities for O&M; (iv) procedures will be established to ensure mutual financial transparency with respect to ISF collection and O&M expenditures of both the IA/ISC and NIA; (v) the construction cost of the IA/ISC office, warehouse, and concrete solar drier will be repaid without interest to NIA by the IA/ISC over a period of up to 50 years in accordance with provisions to be agreed upon between NIA and the beneficiary organizations before the start of construction of these facilities; and (vi) the IA/ISC will have priority in the award of contracts for earthwork in the lateral canal and other works within its area.

85. Before the commencement of road improvement/construction, or the training of MAO staff, in any municipality, an MOA will be entered into between NIA and the municipality stipulating, among other things, that (i) the municipality and relevant constituent barangays will maintain the barangay and access roads improved or constructed under the Project using equipment leased by NIA, materials (including fuel) provided by the municipality, and labor provided by the barangay; (ii) NIA will maintain the drainage facilities improved under the Project; (iii) the municipality will cooperate in the training of MAO staff and farmers under the Project, and will provide appropriate agricultural extension services to farmers during the remainder of the Project and thereafter; and (iv) municipal ordinances for the regulation of water use within the municipality will be proposed for adoption by the municipal assembly (*Sangguniang Bayan*) within one year after the signing of the MOA.

86. Within six months after the effectiveness of the loans, NIA and DENR will enter into an MOA with PNOC providing, among other things, for (i) the identification, survey, and appraisal of at least 3,000 ha in the catchment areas under PNOC's jurisdiction suitable for reforestation



under the Bank's Loan Nos. 1191/1192 (SF)-PHI; (ii) the reforestation by PNOC under its own reforestation program of an additional 2,000 ha in the catchment areas under its jurisdiction during the Project implementation period, and an additional 1,000 ha by 2004; (iii) PNOC's cooperation in the provision of planting materials and agricultural extension services to farmers located in the catchment areas under its jurisdiction; (iv) PNOC's cooperation with the Project consultants in connection with their review of its operations, and consideration of the consultants' recommendations, if any, for improvements in the environmental aspects of PNOC's activities; and (v) subject to the agreement of other members of the MMT, the addition of NIA, the Regional Health Office for Region 8, and the Leyte Metropolitan Water District to the MMT.

### **3. Implementation Schedule**

87. The Project is scheduled to commence in the last quarter of 1995 and to be implemented over a period of seven years. Project implementation will take place in two overlapping stages. In Stage I, during the first two years of Project implementation, rotational irrigation and institutional development will be implemented fully in one pilot area of each Project system, covering about 10 percent of the total irrigation service area. At the end of Stage I, a midterm review will be conducted in full consultation with the beneficiaries to review the experience gained and lessons learned from implementation in the pilot areas. The findings of this review will be used to modify, as required, the level of beneficiary involvement; the design and implementation of infrastructure; as well as the implementation of design, construction, and institutional development activities in the remaining Project area during Stage II. The planning for Stage II implementation (including the formation and strengthening of IAs and ISCs in the Stage II areas) will commence during Stage I, and will be modified as appropriate based on the findings of the midterm review of Stage I implementation.

88. To ensure effective organization of the RUGs, TSA groups and IAs/ISCs, lead time of at least six months will be provided for institutional and beneficiary involvement in the planning of improvements and new construction within each irrigation system. In addition, NIA will be required to enter into an appropriate MOA with each concerned IA or ISC before commencing improvements or new construction in the related service area.

89. During Stage I, in addition to development and improvements in pilot service areas, the Project will concentrate on surveys, investigations, and construction of new Guinarona diversion works; emergency repairs of the Daguitan and Binahaan supply works; and improvement of a small section of the main canal serving a pilot lateral canal in each system.

90. To avoid delay in Project design and implementation, the Bank has approved the Government's request for advance action with respect to consultant selection and procurement (see para. 93). The building, office equipment, and vehicles provided under the project preparatory TA for the Project will be available to serve the initial needs of the Project Management Office. The Project implementation schedule is shown in Appendix 8.

#### 4. Procurement

##### a. Equipment, Vehicles, and Civil Works

91. The procurement of goods and services (other than consulting services) financed by the Bank under the Project will be in accordance with the Bank's *Guidelines for Procurement*. Equipment costing \$500,000 equivalent or more will be procured through international competitive bidding procedures, while equipment and vehicles costing less than \$500,000 equivalent will be procured through international shopping procedures. Small supply contracts for construction materials, which are unlikely to be of interest to international bidders, but which are locally available at competitive prices, will be procured on the basis of local competitive bidding (LCB) procedures acceptable to the Bank or through direct purchase. A tentative packaging of the civil works to be undertaken under the Project is given in Appendix 9. NIA will be responsible for all procurement under the Project, but will coordinate with ATI-NTC for the procurement of materials for agricultural training activities, with DOH for the procurement of schistosomiasis-related equipment and chemicals, with DENR for the procurement of equipment for the environmental laboratory to be established at Tacloban, and with DPWH for the procurement of equipment and supplies to rehabilitate river gauging stations.

92. The civil works required under the Project are relatively simple and labor-intensive, and are dispersed widely over the Project area, and therefore it is unlikely that international contractors will be interested in bidding. However, local contractors are available that can perform the civil works efficiently and at reasonable cost. Therefore, the major civil works under the Project will be carried out on the basis of LCB procedures acceptable to the Bank. Minor civil works may also be carried out by NIA either through small package contracts or force account. Civil works contractors and NIA will be required to hire unskilled labor from the Project area.

##### b. Advance Action

93. To expedite Project implementation, the Bank has approved the Government's request for advance action in the solicitation of technical proposals from consultants and bids for supply of some equipment and vehicles. Contracts will be awarded only after the effectiveness of the loans. In addition, NIA has agreed to undertake certain pre-implementation activities, including (i) temporary repairs to the diversion works for the Daguitan, Binahaan, and Bao irrigation systems; (ii) surveys and designs for the new diversion structure on the Guinarona River; (iii) coordination with DENR and PNOC to identify<sup>1</sup> areas for reforestation; (iv) concurrent low-flow gauging at 15 specified sites on the rivers feeding the Project systems; (v) institutional development activities in the pilot areas; and (vi) coordination with municipal governments in the pilot areas to seek their inputs. Advance recruitment of consultants will be in accordance with the Bank's *Guidelines on the Use of Consultants*, and advance procurement action for civil works will be in accordance with the Bank's *Guidelines for Procurement*.

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<sup>1</sup> 3,000 ha under the Forestry Sector Project and 2,000 ha under PNOC's own reforestation program.

## 5. Consulting Services

94. In view of limited local experience in rotational irrigation, provisions for international consulting services are necessary for assisting and training the staff of the EA and the domestic consultants in Project design; its related institutional, water management, operational, and environmental aspects; and Project implementation, mainly during Stage I, covering the first two years of Project implementation. In addition, there is a need to bring in international experience on river training, which is becoming critical for some diversion structures of the Project systems. The Project has provided for 33 person-months of international consultants in this regard: team leader/construction, planning and supervision engineer (10), river training engineer (1), irrigation engineer (7), hydraulic structures engineer (4), institutional/BME specialist (2), water management and operations specialist (5), environmental (geothermal) expert (2) and unallocated (2). Associated with this is a domestic consulting services input of 62 person-months, which comprises deputy team leader/construction management specialist (31), institutional and training specialist (16), geotechnical/materials testing engineer (3), agronomist (3), watershed soil conservation specialist (4), and marketing specialist (5). This main consulting services package will be provided by an international consulting firm in association with a local consulting firm to be engaged by NIA in accordance with the Bank's *Guidelines on the Use of Consultants*. It is envisaged that, with the experience gained during Stage I, the staff of the EA will be able to undertake all design, institutional development, and implementation activities during Stage II with assistance from domestic consultants.

95. There is also a need, during the early years of Project implementation, for international advisory support to assist the EA in reviewing the performance of the international and domestic consultants. Therefore, under the second contract, the International Irrigation Management Institute (IIMI) will be engaged to provide a total of seven person-months of specialist assistance as follows: irrigation management expert (3) and institutional/BME expert (4). The IIMI experts will assist the EA not only in reviewing the main consultants' performance but also in developing appropriate strategies to introduce rotational irrigation and ensure beneficiary participation in the Project systems. Considering IIMI's worldwide experience in irrigation management in general and rotational irrigation in particular, the Bank has approved its direct selection to provide the advisory services under the Project.

96. Some successful beneficiary organizations already exist in the Project systems. The managers of such organizations can provide useful advice on institutional development, which is the key to successful implementation and sustainability of the Project. Therefore, under the third contract for local advisory services, an input of six person-months will be provided by managers of successful beneficiary organizations operating in the Project area.

97. The schedule of consultant inputs under the three consulting services packages is given in Appendix 10.

## 6. Disbursements, Accounts, Audits, and Reports

98. To facilitate the timely release of funds for the purpose of making payments in local currency under the Project, portions of the proceeds of the loans will be disbursed through imprest accounts (one for each loan) to be established promptly after effectiveness of the loans. The imprest accounts will consist of advances from the Bank for eligible expenditures. The initial

amount to be deposited will be based on an estimate of expenditures to be incurred during the first six months of Project implementation. The imprest accounts will be established in accordance with the Bank's *Guidelines on Imprest Fund and Statement of Expenditures Procedures* and other procedures agreed upon between the Government and the Bank. The Bank's statement of expenditures procedures will be used for reimbursement of certain expenditures and for the liquidation of advances to the imprest accounts.

99. NIA will maintain separate accounts and financial statements for the Project, which will be audited annually by independent auditors acceptable to the Bank. Certified copies of the audited financial statements will be furnished to the Bank within nine months after the end of the fiscal year to which they relate.

100. NIA will furnish the Bank with quarterly progress reports on Project implementation, to be submitted within one month after the end of the quarter to which they relate, and such other reports and information relating to the Project as the Bank may reasonably request. In addition, within three months after physical completion of the Project, NIA will submit to the Bank a project completion report detailing, among other things, information on the implementation of the Project, the use of the proceeds of the loans, and the extent to which the objectives of the Project have been accomplished.

## **7. Midterm Review**

101. At the end of Stage I, the Bank will undertake with NIA a detailed review of the Project and its implementation status. In particular, the review will examine the effectiveness of beneficiary participation; implementation of rotational irrigation and institutional development activities in the pilot areas of the Project systems; and the effectiveness of the design, implementation, and operation of the systems relative not only to technical standards but also to beneficiary satisfaction. The experience gained and lessons learned from implementation in the pilot areas will be used to modify, as required, beneficiary participation as well as the design and implementation arrangements in the remaining Project area during Stage II implementation. The review will also deal with outstanding procurement problems, should there be any, and with financing, scheduling, and coordination matters.

## **F. Environmental and Social Measures**

### **1. Environment**

102. The Project has been classified as environmental category B. Accordingly, an initial environmental examination (IEE) was conducted by the Government. The IEE concluded that the Project would cause no major adverse environmental impacts, since most of the Project components consist of rehabilitation works. Although the construction of some new service and barangay roads may have minor environmental impacts, appropriate mitigation measures have been incorporated in the Project design and impact monitoring will be carried out. A full environmental impact assessment (EIA) is therefore not required. However, NIA and other agencies implementing the Project will need to comply with all applicable environmental requirements in accordance with the Government's own regulations to obtain the necessary environmental clearances from DENR prior to construction, and to undertake environmental monitoring throughout the implementation period. A summary IEE is given in Appendix 11.

103. The Project will also formulate the adoption of IPM, including the training of farmers in alternative pest control methods, which will also have a highly positive impact on the environment of the Project area.

104. PNOC has already undertaken forest management activities in 1,200 ha within the Leyte Geothermal Reservation, which include rattan planting within residual forests and reforestation in degraded areas. PNOC plans to expand these activities to a further 3,000 ha by 2004. To complement PNOC's efforts to reforest the critical watersheds in the Project area, DENR plans to undertake reforestation of an additional 3,000 ha that also fall within PNOC's concession area under the Bank-financed Forestry Sector Project. The combined efforts of PNOC and DENR, with a targeted area of 7,200 ha, will eventually reforest the most critical areas in the degraded upper watersheds of the Project area. This will substantially improve the quality and volume of water available to the Project irrigation systems.

105. The Project will also improve the environmental monitoring capability of MMT by establishing an environmental laboratory at the DENR Regional Office in Tacloban and rehabilitating seven gauging stations on major rivers in the Project area. In addition, to avoid any negative environmental impact in the future, the Project consultants will assist PNOC in reviewing its operations, including design criteria, standard operating procedures, environmental impact mitigation measures, monitoring program, contingency plan, and watershed management plan.

## **2. Social Analysis**

106. The Project will directly improve the socioeconomic status of about 12,000 beneficiary households comprising about 62,400 persons living in the Project area. Currently, about 72 percent of the farm households in the Project systems live below the poverty threshold, mainly because of underemployment. In the presently irrigated area about 70 percent live below the poverty line and in the rainfed areas that do not currently receive irrigation supplies about 75 percent live below the poverty line. The Project will increase employment through increased cropping intensity and higher inputs: person-days will be increased by 16 percent above the present irrigated levels and by 24 percent above the present rainfed levels, and returns per person-day will increase by 10 percent and 17 percent, respectively. In addition, the Project will improve beneficiary skills through organization and training of IA/ISC members to undertake postharvest activities, marketing, and systems O&M; and will assist NIA in ISF collection. The Project will also increase off-farm employment opportunities for Project area farmers. Leaseholders and share-tenant farmers, as well as landowners, will have equal opportunities to participate in IAs and ISCs, and in Project activities. The Project will also facilitate the control of schistosomiasis, thus improving the health standards of the beneficiaries.

107. The Project will increase women's participation in development activities. In irrigation, female farmers and wives of male farmers will be included as members of the RUGs and will be encouraged to participate in IA/ISC postharvest activities, marketing, ISF collection, credit, and management. Potential women leaders in beneficiary groups will be identified and included in leadership training programs and extension services. Special training programs will be undertaken to meet women's requirements, including those in home gardening, IPM and income-generating skills. About 18 qualified persons will be hired by NIA as institutional development officers, with at least one woman institutional development officer for each Project

system, whose responsibilities will include identification of women's needs and opportunities under Project implementation.

### **G. Technical Assistance**

108. The Government has requested advisory TA for Environmental Evaluation of Swamps and Marshlands to be provided in conjunction with the Project. The TA will assist NIA in preparing plans for the optimal use of the swamps and marshlands located within and adjacent to the Project area that will minimize the impact of development on habitat and wildlife. The TA will be executed during the second year of Project implementation and will be completed in five months. The total cost of the TA is \$124,000 equivalent, of which \$100,000 equivalent will be financed by the Bank on a grant basis. The TA will provide for 18 person-months of domestic consultants. Terms of reference for the consultants and other details of the TA are given in Appendix 12. The cost of the TA will be charged to the Bank-financed TA program.

## **V. PROJECT JUSTIFICATION**

### **A. Financial/Economic Analysis**

#### **1. Project Benefits and Beneficiaries**

109. The quantified economic benefits of the Project are the value of increased agricultural production net of the increased production costs and Project development and O&M costs. Beneficiaries' contributions in the forms of labor and material, equivalent to \$2.551 million, are included in the economic costs. Increased production will result from (i) an increase in the presently irrigated area from 8,583 ha to 13,458 ha, (ii) a 9 percent increase in average irrigated paddy yields, and (iii) an increase in average cropping intensity to 190 percent.

110. During the wet season almost all of the 12,649 ha of irrigation service area of the Project systems is sown to paddy — 63 percent to irrigated and the remaining 37 percent to rainfed paddy. During the dry season about 58 percent of the area receiving good irrigation supplies is sown to irrigated paddy, while 15 percent is sown to rainfed paddy and 6 percent to corn. Therefore, in the without-Project case, economic analysis is based on an overall cropping intensity of 179 percent — 121 percent irrigated and 58 percent rainfed cropping.<sup>1</sup> In the with-Project case, the overall cropping intensity of 190 percent has been assumed — 180 percent irrigated paddy and 10 percent rainfed crops. Following a conservative approach, a modest yield target of 4.1 t/ha has been projected for paddy compared with the present yields of 3.2-4.1 t/ha (average 3.75 t/ha) in irrigated areas and 2.75 t/ha in rainfed areas. No yield increases are assumed due to the Project for corn, root crops, or vegetables.

111. As a result of the Project, paddy production will increase by 39,300 t/year; root crop and vegetable production will increase by 1,620 and 3,230 t/year respectively; and corn production will remain unchanged. Increased paddy production, which is equivalent to about 25,500 t of milled rice, will help make up the regional rice shortage currently estimated at

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<sup>1</sup> Evaluation uses data specific to each system to reflect differences between them accurately rather than applying a generalized averaged case to all systems.

20,000 t. The increased production of root crops and vegetables will improve farm families' diet and supply the growing urban centers of Ormoc, Tacloban, and Abuyog.

112. The nonquantified benefits of the Project include (i) increased self-reliance of farmers through cooperative and marketing activities; (ii) additional income generation through on-farm and off-farm activities; (iii) better returns to produce with the use of postharvest facilities; (iv) reduction in transportation costs and increased mobility with improved rural roads; (v) better and timely farm operations because of improved drainage; and (vi) improved public health because of control of schistosomiasis.

## **2. Financial Analysis**

113. The average annual household income will increase from about ₱28,900 to over ₱44,800 compared with the poverty threshold of ₱31,945. The labor input requirements will increase by about 24 percent for the currently rainfed lands and by about 16 percent for the currently irrigated land. In addition, returns per labor day will increase to ₱148 — a 17 percent increase over current returns in rainfed paddy and a 10 percent increase over returns in currently irrigated paddy. Details of the financial analysis are given in Appendix 13.

## **3. Economic Analysis**

114. The Project is economically viable, with an overall EIRR of 17.3 percent (Appendix 13). The EIRRs of individual systems, with full Project costs allocated, range from 14.8 percent in Daguitan to 21.7 percent in Binahaan South. These EIRRs reflect (i) the nature of the Project as rehabilitation and improvement of existing systems, which makes possible an increase in effectively irrigated area at relatively low incremental unit costs; and (ii) the specific systemic advantages of the proposed rotational irrigation in substantially improving irrigation efficiency, permitting a much greater than usual increase in effectively irrigated area as a result of the improvement. Costs of rehabilitation and remodelling the systems for rotational irrigation are estimated at about \$3,500/ha.<sup>1</sup>

## **4. Economic Sensitivity Analysis**

115. The results of economic sensitivity analyses are summarized in Table 3. Sensitivity indexes (SIs) for development costs, O&M costs, irrigated area, and cropping intensity are less than one. The SI for future with-Project yields is 1.45, but the switching values (SVs) to produce an EIRR of 12 percent require future with-Project yields of 3.26 t/ha, below present irrigated area yields of 3.75 t/ha. Thus, it is improbable that adverse yield changes will make the Project nonviable. However, the viability of the Project is vulnerable to a change in output price. The SI for output prices is 1.27 and the SV 21 percent. At the lowest commodity prices within the probability distribution at 70 percent confidence interval of the World Bank's forecast, the EIRR

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<sup>1</sup> In the Irrigation Sector Project (Loan No. 667-PHI), implemented over 1983-1993, the average cost of rehabilitation was \$1,875/ha at 1994 prices ranging from \$800/ha to \$3,375/ha, while the average cost of developing new systems was \$3,000/ha, ranging from \$700/ha to \$5,400/ha. The estimated Project costs at \$3,500/ha is close to the upper limit of the rehabilitation range, reflecting the additional costs of remodelling systems for rotational irrigation.

would be 9.9 percent. In general, a combination of significant adverse changes in the benefits and costs would be required to make the Project nonviable.

**Table 3: Economic Sensitivity Analysis**

<b>Case</b>	<b>EIRR (%)</b>	<b>SI</b>	<b>SV (%)</b>
<b>A. Base Case</b>	17.3		
<b>B. Cost Increases</b>			
1. Development cost increased 10 percent	16.1	0.69	60
2. O&M cost of irrigation systems increased 100 percent	15.9	0.08	394
<b>C. Benefit Decreases</b>			
1. Irrigated area reduced 10 percent	15.6	0.98	28
2. Irrigated cropping intensity reduced 10 percent	16.0	0.75	34
3. Output prices reduced 10 percent	15.1	1.27	21
4. Output prices at lowest in 70% probability band	9.9		
5. With-Project yields reduced 10 percent	14.8	1.45	20
6. Benefits delayed by 1 year	15.4		
<b>D. Combined Adverse Variances</b>			
1. Benefits delayed by 1 year and development costs increased 10 percent	14.7		
2. As D.1, and irrigated area reduced 10 percent	13.3		
3. As D.2, and cropping intensity reduced 10 percent	11.8		
4. As D.3, and output prices reduced 10 percent	10.8		
5. As D.4, and with yields reduced 10 percent	8.6		

Source: Staff estimates

## 5. Project Risks

116. There are general country risks such as poor availability of counterpart funds, natural calamities, and peace and order problems. The first two risks — poor availability of counterpart funds and damage by typhoons, floods, and other natural calamities — will be specifically addressed under the Project. Assurances have been given by the Government regarding availability of funds for 1995 expenditures by reallocating NIA funds and inclusion of counterpart funding requirements in the 1996 General Appropriations Act. In addition, the Government has assured high priority to the Project for budgetary allocations and timely release of funds throughout the implementation period. The improvements in physical infrastructure provided under the Project will enable the structures to withstand many natural calamities. The Government will instruct NIA to review the fiscal provisions that need to be made to ensure adequate and timely repairs to the Project infrastructure.

117. Four Project-specific risks have also been identified. The major Project risk is failure to implement and operate rotational irrigation, thus greatly reducing irrigated areas. A large adverse change in irrigated area would make the Project much more vulnerable to other risk factors. To ensure successful implementation of rotational irrigation, the input of international consultants has been provided, and appropriate institutional development measures have been incorporated to involve beneficiaries in planning, implementation, and operation. The establishment and operation of rotational irrigation will be fully tested during the first two years of Project implementation, and lessons learned will be reviewed to adjust Project design before



full implementation thereafter. Increased production, due to the rotational system, will also increase the willingness of the beneficiaries to pay the ISF.

118. The second risk is inadequate maintenance of the irrigation systems. To minimize this risk, the Project provides for full recovery of O&M expenditures from ISF collection through improvements in collection procedures and involvement of the beneficiaries in ISF collection, devolution of O&M activities below the main canals to the beneficiaries, and a reduction in NIA's administrative expenses. In case ISF collection falls short of O&M expenditures, the Government has given an assurance to make up the shortfalls from its other revenue sources.

119. The third risk is inability of the farmers to achieve the projected yields because of inadequate agricultural input supplies and support services. However, yield targets under the Project are modest, just 9 percent above the average yield of currently irrigated areas, and have been fixed considering the physical and socioeconomic conditions of the Project area. Adequate physical and institutional support, including training for LGU extension workers and farmers, will be provided by the Project. In addition, the organization and training of the farmer-irrigators will facilitate farmers' access to institutional credit, which will enable them to invest in more productive inputs.

120. The fourth risk is delay in Project implementation resulting in delayed benefits and increased costs. To avoid implementation delays, adequate and timely provision of consulting services for construction supervision has been made. Advance action for procurement of construction equipment, vehicles and consulting services and establishment of a Project Management Office prior to the effectiveness of the loans will help to avoid implementation delays. The Project Manager has already been appointed, and the Project Management Office established, which will further ensure timely implementation of the Project.

121. Sensitivity analysis, taking account of the above risks, indicates that the Project will remain viable even under adverse conditions.

## **B. Environment**

122. The Project is not expected to have any significant adverse impact on the environment because of its rehabilitation nature. The improvement of irrigation and drainage infrastructure and the implementation of rotational irrigation will facilitate more efficient utilization of water resources and prevent environmental degradation in the future. Beneficiary organization, training, and their involvement in system O&M and ISF collection will result in a higher standard of O&M which will prevent system degradation and facilitate sustainability of the benefits and the environment. To minimize any adverse effects of increased use of inorganic fertilizers and pesticides, the Project has provided for agricultural extension services to advise on correct application rates for fertilizers, judicious use of pesticides, and promotion of IPM. For schistosomiasis control, the Project will promote the use of vegetative measures and drainage, while the use of molluscicides to kill the host snail will be kept to minimum. Promotion of better soil and water conservation techniques in the cultivated areas and reforestation, through coordination with other agencies, of an additional 6,000 ha will reduce soil erosion in the catchment area of the Project systems and improve the flow pattern in the rivers of the Project systems. Improvements in environmental monitoring capabilities through rehabilitation of river gauging stations and provision of an environmental laboratory will facilitate better monitoring of

water quality and quantity, and will forewarn of any environmental hazard. Effective coordination among various agencies provided under the Project will facilitate implementation of environmental mitigative measure, if required. The provision of TA for Environmental Evaluation of Swamps and Marshlands will assist the Government in preparing plans for the optimal use of the swamps and marshlands located in and around the Project systems with due regard to environmental considerations.

### **C. Social Dimensions**

123. The Project will directly benefit some 62,400 people in some 12,000 households. At present, 72 percent of the households in the Project area are below the poverty threshold; the Project will reduce this to about 42 percent. The Project impact will be greatest on the poorest farmers — those dependent on small arable plots of rainfed or poorly irrigated land for most of their incomes. At present, about 22 percent of the farmers — those with the smallest farm size and least productive land — have incomes below ₱10,000, about one third of the poverty threshold. The Project will reduce this to about 4 percent by increasing their incomes by over 200 percent.

124. While the owner farmers, who constitute about 48 percent of the Project beneficiaries will receive the entire incremental income due to the Project, the proportion of incremental income to the leaseholders and share-tenants will also be substantial. The leaseholders, who constitute about 18 percent of the beneficiaries, will receive about 80 percent of the incremental income despite an increase in the payment, reflecting the upgrading of the land productivity. Similarly, the share-tenants, who constitute about 34 percent of the Project beneficiaries, will secure about 67 percent of the incremental income.

## **VI. ASSURANCES**

### **A. Specific Assurances**

125. The Government has given the following assurances, in addition to the standard assurances, which have been incorporated in the Loan Agreements:

- (i) For the duration of Project implementation, the Project will be accorded high priority for the purpose of budgetary allocations, and the counterpart funds budgeted under the Project will be made available to NIA on a timely basis.
- (ii) NIA, in consultation with NEDA, the Department of Budget and Management, and other concerned Government agencies, will review the adequacy of existing emergency funding mechanisms for repairing damage from natural disasters, and will take steps to improve NIA's access to adequate and timely funding for this purpose.
- (iii) NIA will ensure that all Project beneficiaries (leaseholders, share-tenants, as well as landowners, including women in the Project area) have equal opportunity to participate in the IA/ISC for the area, and are appropriately represented in training and other activities under the Project.

- (iv) Within six months after effectiveness of the loans, NIA and DENR will enter into an MOA acceptable to the Bank with PNOC covering the matters described in para. 86.
- (v) The Government will ensure that DOH implements an effective schistosomiasis control program in the Project area during the implementation period and following Project completion.

## **B. Condition of Disbursement**

126. Prior to any disbursements for improvements to barangay roads or training of MAO staff in a municipality, NIA will enter into an MOA acceptable to the Bank with that municipality covering the matters described in para. 85.

## **VII. RECOMMENDATION**

127. I am satisfied that the proposed loans would comply with the Articles of Agreement of the Bank and recommend that the Board approve:

- (i) the loan of \$15.0 million to the Republic of the Philippines for the Second Irrigation Systems Improvement Project (the Project) from the Bank's ordinary capital resources, with interest to be determined in accordance with the Bank's pool-based variable lending rate system for US dollar loans and with an amortization of 27 years, including a grace period of 7 years and such other terms and conditions as are substantially in accordance with those set forth in the draft Loan Agreement (Ordinary Operations) and Project Agreement presented to the Board; and
- (ii) the loan in various currencies equivalent to Special Drawings Rights 9,631,000 to the Republic of the Philippines for the Project, with a service charge at the rate of 1 percent per annum and with an amortization of 35 years, including a grace period of 10 years and such other terms and conditions as are substantially in accordance with those set forth in the draft Loan Agreement (Special Operations) and Project Agreement presented to the Board.

MITSUO SATO  
President

1 August 1995

**APPENDIXES**

<b>Number</b>	<b>Title</b>	<b>Page</b>	<b>Cited on (page, para.)</b>
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**CORE**

1.	Annual per Capita Poverty Threshold and Incidence of Poverty, 1988 and 1991	37	1,4
2.	Agroeconomic Statistics of the Project Irrigation Systems	38	5,15
3.	The Bank's Assistance to the Irrigation Sector in the Philippines	40	12,40
4.	Social Profiles of Beneficiary Communities by Municipality	42	15,54
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6.	Operation and Maintenance Arrangements	46	18,64
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8.	Project Implementation Schedule	53	25,90
9.	Tentative Packaging of Civil Works	54	26,91
10.	Schedule of Consulting Services	55	27,97
11.	Summary Initial Environmental Examination	56	28,102
12.	Technical Assistance for Environmental Evaluation of Swamps and Marshlands	66	30,108
13.	Economic and Financial Analysis of the Project	70	31,113

**SUPPLEMENTARY**

(available if required)

A.	Organization Structure of the National Irrigation Administration
B.	Relevant Project Completion Reports
C.	Relevant Postevaluation Reports
D.	Details of Project Components
E.	Equipment and Materials to be Procured
F.	Gauging Sites for Low-Flow Measurements
G.	Project Implementation Organization
H.	Pilot Areas: Profile of Irrigators' Associations
I.	Terms of Reference for Consulting Services
J.	Detailed Tables of Project Costs
K.	Detailed Tables of Economic and Financial Analysis

**ANNUAL PER CAPITA POVERTY THRESHOLD AND  
INCIDENCE OF POVERTY, 1988 AND 1991**

Region	1988			1991		
	Annual per Capita Poverty Threshold <sup>a</sup> (Pesos)	Magnitude of Population <sup>b</sup>	Incidence <sup>c</sup> of Poverty (percent)	Annual Per Capita Poverty Threshold <sup>a</sup> (Pesos)	Magnitude of Population <sup>b</sup>	Incidence <sup>c</sup> of Poverty (percent)
Philippines	4,777	25,005,345	45.5	7,212	27,600,505	44.5
National Capital Region (NCR)	6,576	1,909,886	25.2	9,286	1,439,613	16.7
Areas Outside NCR	4,489	23,095,459	48.7	6,877	26,160,892	49.0
Cordillera Autonomous Region (CAR)	5,116	536,434	50.7	6,457	505,065	41.5
Region I	4,934	1,650,993	51.7	8,060	1,928,391	55.3
Region II	4,573	961,787	44.6	7,035	1,156,072	48.9
Region III	5,242	1,835,976	33.8	8,173	2,239,856	35.5
Region IV	4,832	3,085,179	46.6	8,075	3,579,228	43.2
Region V	4,144	2,430,346	61.4	6,385	2,707,612	61.3
Region VI	4,344	2,864,736	56.6	6,403	2,964,722	52.9
Region VII	3,711	2,154,799	52.1	5,585	2,071,808	46.7
Region VIII	3,818	1,654,830	54.7	5,138	1,532,526	47.1
Region IX	3,793	1,258,269	43.7	5,976	1,521,924	48.0
Region X	4,523	1,618,657	50.2	6,433	2,092,823	57.4
Region XI	4,876	1,933,694	48.9	6,544	2,240,911	51.6
Region XII	4,147	1,109,761	41.0	6,893	1,619,953	56.0

- <sup>a</sup> The annual per capita income required or the amount to be spent to satisfy the nutritional requirements (2,000 calories per day) and other basic needs.
- <sup>b</sup> The number of individuals in families (population) whose annual per capita income falls below the annual per capita threshold.
- <sup>c</sup> The percentage of population whose annual per capita income falls below the annual per capita poverty threshold.

Source: 1994 Philippine Statistical Yearbook, National Statistical Coordination Board, Philippines.

## AGROECONOMIC STATISTICS OF THE PROJECT IRRIGATION SYSTEMS

Item	Irrigation System									Totals/ Averages
	Bao	Mainit	Tibak	Binahaan			Guina- rona	Dagui- tan	Bito	
Location/Municipality	1 Ormoc City	2 Alang- Alang, San Miguel	3 Palo, Sta. Fe	4 Sta. Fe, Alang- Alang, Pastrana	5 Pastrana, Dagami, Alang- Alang, Palo	6 Dagami, Tabon- Tabon, Tansuan	7 Dagami, Tabon- Tabon	8 Barawan, Julieta, Dulag	9 Abuyog, Javier	
Irrigation Superintendent	Bao RIS			BSTG-MP RIS			G-D RIS		Bito RIS	
Source(s) of water supply (rivers and creeks)	Bao, Baleon, Cabigao Mas-in	Mainit, Caba- yugan, Lukay	Mairong Basilion Maslog	Binahaan, Dapdap, Malebi- nahean, Hubas	Binahaan, Tingib	Binahaan, Tingib	Guinarona	Dagutan	Bito	
Year of completion	1971	1976	1951	1960	1968	1968	1958	1978	1974	Totals
Design service area, ha	3,366	3,500	1,760	2,220	3,600	1,580	800	3,700	3,500	24,026
Current service area, ha	1,917	1,384	1,630	1,801	1,810	1,200	646	850	1,411	12,649
% of design service area	57	40	93	81	50	76	81	23	40	53
Presently irrigated area										
During wet season, ha	1,801	897	1,062	1,390	941	248	386	673	1,185	8,583
as % of current service area	94	65	65	77	52	21	60	79	84	68
During dry season, ha	1,787	822	1,008	1,255	961	217	334	530	1,126	8,040
as % of current service area	93	59	62	70	53	18	52	62	80	64
Irrigated cropping intensity, %	187	124	127	147	105	39	111	142	164	131
Presently benefited area <sup>a</sup>										
During wet season, ha	1,392	863	1,048	1,358	932	248	353	655	1,135	7,984
as % of current service area	73	62	64	75	51	21	55	77	80	63
During dry season, ha	1,587	779	958	1,154	922	187	282	475	944	7,288
as % of current service area	83	56	59	64	51	16	44	56	67	58
Benefited cropping intensity, %	155	119	123	139	102	36	98	133	147	121
Planned increase in area irrigated										
Within present irrigated area, ha <sup>b</sup>	609	77	64	133	48	30	85	73	232	1,351
Area currently unirrigated, ha	116	487	568	411	869	952	260	177	226	4,066
Expansion of service area, ha	186	38	158	90	211	60	0	66	0	809
Future service area, ha	2,103	1,422	1,788	1,891	2,021	1,260	646	916	1,411	13,458
Irrigation efficiency										Averages
Designed	55 percent									55 %
Current	30 to 50 percent									30-50 %
Average paddy yields, t/ha										
Wet season : Service area avg	3.0	3.1	3.2	3.3	2.8	2.5	2.9	2.7	3.1	3.0
benefited area avg	3.7	4.1	4.0	3.9	3.8	3.8	3.9	3.2	3.5	3.8
potential avg with improvement	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
Dry season : Service area avg	3.4	3.5	3.8	3.6	3.4	3.5	3.3	3.0	3.0	3.4
benefited area avg	3.8	3.9	4.1	3.8	3.6	3.7	3.8	3.2	3.4	3.7
potential avg with improvement	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
ISF income and O&M expenditure (1987-1994) peso/ha										
ISF income	846	468	459	485	381	154	188	226	656	429
O&M expenditure	763	561	522	534	981	339	488	673	599	606
ISF income/O&M expenditure	1.11	0.83	0.88	0.91	0.39	0.45	0.39	0.34	1.10	0.71
										Totals
No. of farms	2,059	1,439	1,929	1,964	1,055	411	1,423	1,423	2,519	14,222
No. of farm households	1,433	1,509	1,731	1,630	1,783	1,278	807	927	1,056	12,154
Irrigators' associations (IAs)										
Number of IAs	2	5	4	5	3	2	1	5	11	38
IAs with contracts	2	5	4	3	1	0	0	5	11	31
Area covered (ha)	1,888	955	878	1,562	1,133	488	646	728	1,410	9,688
No. of farmers in area covered	1,287	1,014	827	1,347	1,000	495	807	737	1,056	8,570
Members of IAs	1,224	799	117	62	n.a.	n.a.	n.a.	144	528	n.a.

<sup>a</sup> Benefited area is that which is irrigated and achieves harvested yields in excess of 2 t/ha, considered "effectively irrigated", and thus liable for ISF payments. Data for irrigated and benefited areas are based on averages for 1985-1993.

<sup>b</sup> Increased benefited ha/year if irrigation effectiveness is increased so irrigated is wholly benefited.

<sup>c</sup> Principally receipts from equipment rental.

Source: Feasibility Study data

**AGROECONOMIC STATISTICS OF THE PROJECT IRRIGATION SYSTEMS**  
(continued)

Item	Irrigation System									Totals/ Averages
	Bao	Mainit	Tibak	Binahean			Guina- rona	Dagui- tan	Bito	
				North	South	Lower				
Location/Municipality	1	2	3	4	5	6	7	8	9	
	Ormoc City	Alang- Alang, San Miguel	Palo, Sta. Fe	Sta. Fe, Alang- Alang, Pastrana	Pastrana, Dagami, Palo, Alang- Alang	Dagami, Tabon- Tabon, Tanauan	Dagami, Tabon- Tabon	Barawan, Julieta, Dulag	Abuyog, Javier	
Current service area, ha	1,917	1,384	1,630	1,801	1,810	1,200	646	850	1,411	Totals 12,649
No. of farms	2,059	1,439	1,929	1,964	1,055	411	1,423	1,423	2,519	14,222
No. of farm households	1,433	1,509	1,731	1,630	1,783	1,278	807	927	1,056	12,154
Av. annual household income, P	41,664	21,230	26,649	34,409	27,825	25,042	22,829	28,864	24,232	Averages 28,893
% of households with income: *										
10,000 and below	4	29	24	8	16	23	30	24	29	22
10,001 – 20,000	23	37	29	16	30	33	32	20	28	28
21,001 – 31,945	24	16	28	28	28	25	18	29	22	22
31,946 – 40,000	13	7	11	20	7	10	7	10	7	12
Above 40,000	35	11	9	28	19	10	14	17	13	16
% of households below poverty line	52	82	80	52	74	81	80	73	80	72
Land tenure status (%)										
Owner	54	36	49	49	42	42	45	63	54	48
Leaseholder	23	31	17	11	14	21	26	7	12	18
Share-tenant	23	33	34	40	44	37	30	30	35	34
Average farm size (ha)	0.93	0.96	0.84	0.92	1.72	2.92	0.45	0.60	0.56	0.89
% of farms with size (ha)										
<= 0.50	24	45	22	20	23	31	30	23	26	27
0.51–1.00	42	31	28	41	25	37	36	36	33	35
1.01–1.50	13	14	22	15	21	12	9	13	20	16
1.51–2.00	6	6	11	11	15	8	8	10	9	8
Above 2.00	15	4	17	15	16	13	16	19	12	14
Irrigators' associations (IAs)										
Number of IAs	2	5	4	5	3	2	1	5	11	38
IAs with contracts	2	5	4	3	1	0	0	5	11	31
Area covered (ha)	1,888	955	878	1,562	1,133	488	646	728	1,410	9,688
No. of farmers in area covered	1,287	1,014	827	1,347	1,000	495	807	737	1,056	8,570
Members of IAs	1,224	799	117	62	n.a.	n.a.	n.a.	144	528	n.a.

\* Based on the sociotechnical profiles prepared during TA studies.

\* Poverty threshold for the province of Leyte in 1994 was estimated at Peso 31,945.00 per annum.

Source: Feasibility Study data

# THE BANK'S ASSISTANCE TO THE IRRIGATION SECTOR IN THE PHILIPPINES

## A. Technical Assistance (as of 30 June 1995)

Sector/Project	TA Amount (\$'000)			Status
	PP	A&O	Total	
1. Water Management	-	105.0	105.0	Completed
2. Water Management - Extension	-	102.0	102.0	Completed
3. Angat and Magat Irrigation	183.0	-	183.0	Completed
4. Laguna de Bay Water Resources Development	1,284.3	-	1,284.3	Completed
5. Davao del Norte Irrigation	27.0	-	27.0	Completed
6. Agusan del Sur Irrigation	49.5	-	49.5	Completed
7. Pulangui Irrigation	49.0	-	49.0	Completed
8. Mindanao Irrigation Study	100.0	-	100.0	Completed
9. Laguna de Bay Development	100.0	-	100.0	Completed
10. Mindanao Irrigation Study II	150.0	-	150.0	Completed
11. Aerial Mapping for Mindanao Irrigation Study II	-	200.0	200.0	Completed
12. Palawan Integrated Area Development	650.0	-	650.0	Completed
13. Palawan Integrated Area Development	-	350.0	350.0	Completed
14. Sorsogon Integrated Area Development	350.0	-	350.0	Completed
15. Mindanao Irrigation Study IV	150.0	-	150.0	Completed
16. Highland Agricultural Development	225.0	-	225.0	Completed
17. Land Use and Regional Development	248.0	-	248.0	Completed
18. Study on Irrigation Management for Crop Diversification	-	250.0	250.0	Completed
19. Institutional Development of NACIAD	-	260.0	260.0	Completed
20. Study on Irrigation Management for Diversified Crops II	-	350.0	350.0	Completed
21. Sorsogon Integrated Area Development Update	75.0	-	75.0	Completed
22. Irrigation Systems Improvement	350.0	-	350.0	Completed
23. Bicol River Basin Flood Control & Irrigation Development	3,753.0	-	3,753.0	Completed
24. Irrigation Systems Improvement	400.0	-	400.0	Completed
25. Community Mobilization and Development	-	100.0	100.0	Completed
26. Palawan Integrated Area Development II	355.0	-	355.0	Completed
27. Institutional Strengthening of National Irrigation Administration	-	350.0	350.0	Completed
28. Kabunian Irrigation and Area Development	600.0	-	600.0	Completed
29. Second Irrigation Systems Improvement	600.0	-	600.0	Completed
30. Second Highland Agricultural Development	550.0	-	550.0	Completed
<b>Total</b>	<b>10,248.8</b>	<b>2,067.0</b>	<b>12,315.8</b>	



**THE BANK'S ASSISTANCE TO THE IRRIGATION SECTOR IN THE PHILIPPINES**  
(continued)

**B. Loans (as of 30 June 1995)**

Project / Program	Date Approved	Status Closed/ Schedule Completion	Investment (\$ million)
1. Cotabato Irrigation	18 Nov 1969	Closed	2.50
2. Angat-Magat Integrated Agricultural Development	28 Jun 1973	Closed	9.60
3. Davao del Norte Irrigation	22 Nov 1973	Closed	4.20
4. Agusan del Sur Irrigation	18 Dec 1974	Closed	5.80
5. Pulangui River Irrigation	26 Jun 1975	Closed	13.50
6. Laguna de Bay Development	9 Dec 1975	Closed	27.50
7. Second Davao del Norte Irrigation <sup>a</sup>	7 Dec 1976	Closed	15.00
8. Tago River Irrigation	1 Sep 1977	Closed	22.00
9. Allah River Irrigation <sup>a</sup>	11 May 1978	Closed	23.50
10. Second Agusan Irrigation <sup>a</sup>	31 Oct 1978	Closed	14.00
11. Bukidnon Irrigation <sup>a</sup>	26 Jul 1979	Closed	15.00
12. Third Mindanao Irrigation Study	26 Jul 1979	Closed	1.70
13. Bicol River Basin Irrigation Development	25 Oct 1979	Closed	41.00
14. Second Laguna de Bay Irrigation	25 Sep 1980	Closed	20.00
15. Palawan Integrated Area Development	29 Sep 1981	Closed	47.00
16. Third Davao del Norte Irrigation <sup>a</sup>	2 Sep 1982	Closed	45.30
17. Special Assistance for Selected Bank- Financed Projects	19 May 1983	Closed	17.70 <sup>b</sup>
18. Irrigation Sector	12 Dec 1983	Closed	36.80
19. Fourth Mindanao Irrigation Study	12 Dec 1983	Closed	1.50
20. Allah River Irrigation (Supplementary)	20 Dec 1984	Closed	27.90
21. Special Project Implementation Assistance	7 Apr 1986	Closed	30.18 <sup>b</sup>
22. Highland Agricultural Development	25 Nov 1986	Closed	18.80
23. Sorsogon Integrated Area Development <sup>a</sup>	3 Nov 1988	Aug 96	24.10
24. Second Palawan Integrated Area Development	27 Sep 1990	Jun 97	58.00
25. Irrigation Systems Improvement <sup>a</sup>	8 Nov 1990	Jun 96	29.00
26. Kabulnan Irrigation and Area Development <sup>a</sup>	28 Nov 1991	Jun 98	48.00
27. Mt. Pinatubo Damage Rehabilitation	23 Apr 1992	Dec 96	6.00 <sup>b</sup>
28. Rural Infrastructure Development	10 Nov 1994	Dec 2000	4.08 <sup>b</sup>
<b>TOTAL</b>			<b>609.66</b>

<sup>a</sup> Projects with schistosomiasis control as a component.

<sup>b</sup> Portion of the loan amount applied to irrigation projects.

## SOCIAL PROFILES OF BENEFICIARY COMMUNITIES BY MUNICIPALITY

Municipality	Ormoc City	San Miguel	Alang-Alang	St Fe	Palo	Pastrana	Dagami	Tabon-Tabon	Tana-un	Burauen	Dulag	Julita	Javier	Abuyog
Data Year	1993	1991	1991	1991	1991	1991	1991	1989	1992	1991	1992	1991	1991	1989
<b>Infrastructure:</b>														
<b>Irrigation Systems</b>			Mainit		Tibak			Lower Binahaan						Bito
	Bao		Binahaan N.		Bn N.		Guinarona			Daguitan				
			Bn S.		Binahaan South									
<b>Roads:</b>														
National km	-	-	-	-	26.3	-	26.7	-	16.5	-	-	-	-	-
Provincial km	71.8	15.0	18.4	8.0	31.0	16.5	3.9	9.7	28.5	15.1	19.2	12.4	17.7	8.8
Municipal km	33.0	38.0	17.7	4.6	14.0	6.3	9.2	4.8	25.5	16.7	10.6	3.3	4.5	16.4
Barangay km	244.3	23.1	79.4	33.6	86.1	34.6	142.1	35.7	98.0	57.8	96.8	40.0	42.4	82.9
Total km	349.1	76.1	115.5	46.1	157.4	57.4	181.9	50.1	168.5	89.6	126.6	55.7	64.7	108.0
<b>Socioeconomic</b>														
Barangays, no.	110	21	54	20	33	29	65	16	54	77	46	26	28	63
Households, no	23,330	2,377	6,843	2,120	9,900	5,764	5,007	1,850	7,278	8,777	6,563	2,221	3,383	8,220
Rural household, %	88%	88%	75%	76%	73%	82%	85%	89%	68%	70%	80%	75%	76%	78%
Preschool														
Malnutrition, % (2° + 3°)	23%	26%	14%	21%	26%	22%	20%	8%	19%	16%	25%	17%	17%	17%
Households with :														
Sanitary toilet, %	43%	52%	81%	72%	82%	74%	75%	72%	61%	80%	85%	82%	84%	82%
Safe water, %	82%	63%	76%	73%	77%	72%	78%	65%	72%	77%	65%	71%	79%	81%
Agric labor force, %	n.a.	77%	n.a.	n.a.	54%	76%	73%	n.a.	n.a.	70%	n.a.	94%	57%	75%
<b>Agriculture</b>														
<b>Agricultural Land Use (ha)</b>														
Total	31,781	7,954	10,455	3,408	5,397	5,673	2,347	2,426	6,000	22,708	7,199	4,138	4,415	12,365
Rice : Irrigated	4,808	652	3,810	1,195	1,137	1,285	1,647	661	610	1,840	1,015	224	)	)
Rainfed	629	1,806	285	623	1,461	n.a.	300	779	2,239	n.a.	670	890	1,400	2,450
Coconut	2,611	2,435	3,476	536	2,135	2,969	-	492	1,648	20,000	2,982	950	2,900	9,115
Sugarcane	22,727	-	-	-	-	-	-	-	-	-	-	-	-	-
Corn	368	689	250	125	0	22	300	302	108	500	295	288	45	800
Camote	)	72	)		40	)	25	)		)	)	)		
Cassava	)	34	65	)	331	)	50	)	75	75	)	64	586	)
Gabi	)	50	)		10	)	10	)		)	)	)		
Legumes	9									20				
Fruit trees	337	94	1,816		100	146		48	244	18	185	85	40	
Vegetables	218	69	210		9			10	137	10		28	30	
Other crops					406				427					
<b>Rainfed Cropping Pattern</b>														
Arable Crops	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%		
Rice	49%	63%	26%	83%	93%	0%	42%	67%	73%	0%	60%	55%		
Corn	30%	27%	23%	17%	0%	23%	42%	26%	4%	60%	26%	18%		
Rootcrops	3%	7%	31%	0%	6%	77%	15%	6%	19%	36%	14%	26%		
Legumes	1%	0%	0%	0%	0%	0%	0%	0%	0%	2%	0%	0%		
Vegetables	17%	3%	20%	0%	1%	0%	0%	1%	4%	1%	0%	2%		
<b>Share of Total (including irrigated crops)</b>														
Arable crops	19%	56%	48%	78%	51%	30%		77%	61%	12%	40%	64%	65%	26%
Perennial crops	81%	44%	52%	22%	42%	70%		23%	32%	88%	60%	36%	35%	74%
<b>Yields mt/ha</b>														
Rice : Irrigated	4.25			3.50	3.38	3.50	3.60	3.00	3.58	4.09	)	)	)	)
Rainfed	2.75			2.00	1.51		2.74	2.00	2.55		3.15	2.75	3.27	
Corn (White)	2.25			1.50	4.71	1.00	2.50				1.44	1.10		
(Yellow)							3.00							
Camote	)				5.50		6.00	)						
Cassava	)	4.50					4.00	)	5.00					
Gabi	)						4.00	)						
Vegetables	4.00							4.00						
Leafy vegetables									25.30					

Source: Provincial and Municipal Socioeconomic Profiles.

## THE PROJECT FRAMEWORK STATEMENT

Design Summary	Project Targets	Project Monitoring Mechanisms	Assumptions
<p><b>1. Project Goals:</b></p> <p>To reduce poverty in Leyte Province.</p>	<p>Annual average farm family income in the Project systems increased from ₱26,900 in 1994 to over ₱44,800 by 2005. Incidence of poverty reduced from 72 percent to below 42 percent.</p>	<p>Socioeconomic surveys under monitoring and evaluation component.</p> <p>Bank review missions.</p>	<p>No major economic setback due to natural disaster(s) during the implementation period.</p> <p>Government's support in overall regional development continues.</p>
<p><b>2. Objective / Purpose:</b></p> <p>To increase farm production.</p>	<p>Annual production from Project systems increased. Production target for 2005 is 99,320 t of paddy.</p> <p>Paddy yield increased to 4.1 t/ha, cropping intensity increase to 190 percent (paddy 180 percent; and diversified crops 10 percent).</p>	<p>Field observations by the Project staff and consultants and periodic progress reports.</p> <p>Project monitoring and evaluation.</p> <p>Ministry of Agriculture statistics.</p>	<p>Competitive marketing of agricultural commodities.</p> <p>Government's pricing and other policies supportive.</p> <p>Adequate O&amp;M of farm-to-market roads.</p>
<p><b>3. Project Components/Outputs:</b></p> <p><b>3.1 Physical Infrastructure</b></p> <p>Existing irrigation systems improved and irrigation service area increased.</p> <p>Existing roads improved and new ones constructed.</p>	<p>Irrigation service area increased to 13,458 ha, with following improved facilities for rotational irrigation system:</p> <p>On main canals: new; 20 fall structures, 21 other structures, and 18 measuring flumes; and 72 checks to be replaced.</p> <p>On lateral canals: 27 fall structures, 33 other structures, and 85 measuring flumes, and 264 checks to be replaced.</p> <p>Following structures constructed for each 50-ha turnout service area: 1 km lined main farm ditch, 2 km earthen supplementary farm ditch, 1 km farm drain, 1 turnout structure, 5 main farm ditch checks, 6 secondary farm ditch checks, and 2 crossings.</p> <p>Following drainage works completed: 27.2 km new drains, 48.6 km drains improved, 33 road crossings, and 7 drain outlets.</p> <p>Along main canals and laterals: 176 km roads improved and 181 km new roads constructed. Barangay roads: 136 km roads improved and 36 km new roads constructed.</p>	<p>Field observations by the Project staff and consultants and periodic progress reports.</p> <p>Project Monitoring and evaluation.</p> <p>Bank review missions.</p> <p>Field observations by the Project staff and consultants and periodic progress reports, Project Monitoring and evaluation, and Bank review missions.</p>	<p>Agricultural support supplies and services adequately provided.</p> <p>Satisfactory O&amp;M practices.</p> <p>Farmers accept and successfully operate the rotational irrigation.</p> <p>Barangays cooperate during implementation period and in O&amp;M.</p>

## THE PROJECT FRAMEWORK STATEMENT (continued)

Design Summary	Project Targets	Project Monitoring Mechanisms	Assumptions
<b>3.2 Institutional Development</b>  Irrigators' service cooperatives (ISC) organized and farmers trained.  NIA staff trained.  Postharvest facilities provided.	47 ISC organized and trained and their members given 41,700 person-days of training.  4,100 person-days of training provided for NIA O&M and Institutional Development staff including 240 person-days of overseas training.  47 sets of postharvest facilities, one for each ISC provided. Each set will consist of an office, 420 sq m solar dryer, and a warehouse of 400 sq m area.	Field observations by the Project staff and consultants and periodic progress reports, Project monitoring and evaluation and Bank review missions.  Field observations by the Project staff and consultants and periodic progress reports, Project monitoring and evaluation and Bank review missions.	Farmers of the Project area cooperate and participate in Project activities.  Farmers of the Project area cooperate and participate in Project activities.
<b>3.3 Agricultural Improvement</b>  Agricultural extension services strengthened and staff trained.  Research-cum-demonstration plots established and used as extension tools.	Agricultural extension staff provided with equipment and 13 municipal agriculture officers, 66 agricultural technicians and 50 turnout service area (TSA) contact farmers trained in advanced production technologies, proper use of fertilizers and insecticides and, pest management.  45 demonstration plots established.	Field observations by the Project staff and consultants and periodic progress reports, Project monitoring and evaluation and Bank review missions.  Field observations by the Project staff and consultants and periodic progress reports, Project monitoring and evaluation and Bank review missions.	Department of Agriculture and local government units extend full cooperation.  Exemplary performance of demonstration farms attained and sustained.
<b>3.4 Environmental and Social Improvement and Monitoring</b>  Watersheds rehabilitated and protected.  Schistosomiasis controlled.	Community-based forest management programs covering 3,000 ha area completed out of provisions of Forestry Sector Project and reforestation of another 3,000 ha by PNOC; improved farming practices in watershed area implemented; and Philippine National Oil Company (PNOC) design criteria and implementation standards made more environment friendly.  Snail colonies destroyed in 6 systems.	Review missions of the Forestry Sector Project.  Environmental monitoring.  Discharge and sediment measurement records.  Field observations by the Project staff and consultants and periodic progress reports, Project monitoring and evaluation, and Bank review missions.	PNOC and communities in the catchment cooperate with DENR.  Close coordination with and support from Forestry Sector Project.  Schistosomiasis from surrounding areas does not infect the Project systems.
<b>4. Activities</b>  <b>4.1 Physical Infrastructure</b>  Survey and detailed design for irrigation and drainage facilities and roads.  Improvement of existing and construction of new irrigation and drainage facilities and roads.  Rehabilitation of existing and construction of new roads.	\$27.600 million for civil works for irrigation and drainage including: \$ 1.553 million for civil works for roads. \$ 0.985 million for engineering support and administration. \$ 1.457 million for equipment and vehicles. \$ 0.470 million for consultancy services (22 person-months of international and 34 person-months of domestic consultants).	Project quarterly monitoring reports and Bank review missions.	No delay in commencement of the Project and hiring of consultants.  Farmers extend their cooperation.
<b>4.2 Institutional Development</b>  Organization and training of ISCs.  Training of ISC members.  Training of NIA staff.	\$ 2.322 million for civil works. \$ 0.341 million for equipment. \$ 2.280 million for training and extension. \$ 0.339 million of consultancy services (7 person-months of international and 16 person-months of domestic consultants, 7 person-months of international advisory consultants and 6 person-months of domestic advisory consultants)	Project quarterly monitoring reports and Bank review missions.	Suitably qualified consultants available to undertake training.  Farmers extend their cooperation.

### THE PROJECT FRAMEWORK STATEMENT (continued)

Design Summary	Inputs	Project Monitoring Mechanisms	Assumptions
<p><b>4.3 Agricultural Improvement</b></p> <p>Institutional strengthening of agricultural extension services and training of staff.</p> <p>Establishment of research-cum-demonstration plots.</p>	<p>\$ 0.033 million for equipment. \$ 0.199 million for materials \$ 0.850 million for training and extension. \$ 0.093 million for surveys and studies. \$ 0.065 million for consultancy services (6 person-months of domestic consultants).</p>	<p>Project quarterly monitoring reports and Bank review missions.</p>	<p>Agriculture staff willing to undergo training and extend the required level of support to the Project systems.</p> <p>Farmers extend their cooperation.</p>
<p><b>4.4 Environmental and Social Improvement and Monitoring</b></p> <p>Implementation of community-based forest management programs.</p> <p>Formulation of recommendations for improving design and operational practices of PNOC.</p> <p>Environmental monitoring.</p> <p>Improvement of drainage and use of biological methods and chemicals for eradication of snails.</p>	<p>Funds from Forestry Sector Project. \$ 0.102 million for civil works. \$ 0.904 million for equipment. \$ 0.013 million for training and extension. \$ 0.124 million for monitoring. \$ 0.090 million of consultancy services (2 person-months of International and 4 person-months of domestic consultants).</p> <p>\$0.259 for equipment \$0.511 for chemicals</p> <p>Total Project cost = \$46.884 million (including \$1.751 million for Project management and \$3.980 million for interest and other charges during construction). In addition, the Project will benefit from reforestation activities in the catchment areas of the Project systems financed from other projects — PNOC's Leyte-Luzon Geothermal Project and Bank-financed Forestry Sector Project.</p>	<p>Project quarterly monitoring reports and Bank review missions.</p> <p>Project quarterly monitoring reports and Bank review missions.</p>	<p>PNOC agrees to intervention into the catchments by DENR staff and consultants.</p> <p>PNOC accepts recommendations.</p> <p>Effective interagency coordination.</p>

## **OPERATION AND MAINTENANCE ARRANGEMENTS**

### **A. NIA's Responsibilities**

1. Under the terms of the Memorandum of Agreement (MOA) between National Irrigation Administration (NIA) and each Irrigators' Association (IA) or Irrigators' Service Cooperative (ISC) in the Project area, following the completion of improvements to the related irrigation systems, NIA will be responsible for operating and maintaining the headwork structures, the main canal down to and including lateral canal offtake structures, the main and secondary drainage systems, the road system along the main canal, and all equipment and vehicles procured for NIA use under the Project. This work will be carried out in close consultation with the IAs/ISCs involved, and will be financed by NIA's share of the irrigation service fee (ISF) specified in the MOA. Although a small portion of the ISF share may be used to defray NIA's general administrative costs, the balance will be spent on the facilities of the systems from which the ISF was collected. The MOA between each IA/ISC and NIA will also clearly specify the services and quantum of work that will be provided by NIA in return for its ISF share. The MOA between NIA and each municipality in the Project area will delineate NIA's and the municipality's shared responsibility for maintenance of the drainage systems improved under the Project.

2. The ongoing responsibility for major repairs to the Project systems following typhoon damage needs to be satisfactorily resolved, so that Project benefits are fully realized. This is not a matter justifying Project provisions, being part of the general responsibility of the Government to respond to natural disasters. NIA will review the adequacy of current emergency-response funding mechanisms, assess the amount of support likely to be needed to respond to natural disasters within the Project area, and undertake to ensure access to adequate levels of funding for these purposes.

### **B. Beneficiary Responsibilities**

3. Following completion of improvements to a Project system, the beneficiaries, through their IA/ISC, will be responsible for operation and maintenance (O&M) of the lateral canals and structures, the main and supplementary farm ditches and associated structures, and the service roads constructed along the lateral canals. This work will be financed from the IA/ISC share of the ISFs collected within the system, and by the equitable contribution of farmer labor as determined by the concerned IA/ISC. O&M responsibility for the turnouts, and the portions of the systems below the turnouts including the main farm ditches will be delegated to the rotational unit groups (RUGs).

### **C. Municipalities' Responsibilities**

4. Access and barangay roads constructed or restored under the Project will be maintained by the appropriate municipality with equipment leased by NIA and labor provided by the respective barangays. While NIA will be responsible for the maintenance of drainage systems improved under the Project, the municipalities will facilitate coordination with other relevant agencies for maintenance of main drains beyond the Project area.

**D. DENR's Responsibilities**

5. The Department of Environment and Natural Resources (DENR) will be responsible for O&M of the environmental monitoring laboratory established under the Project.

**E. DPWH's Responsibilities**

6. The Hydrology Section of the regional office of the Materials Quality Control and Hydrology Division of Department of Public Works and Highways (DPWH) will be responsible for O&M of the seven stream gauging stations restored under the Project.

**F. Current O&M Funding**

7. The current O&M expenditure of the nine Project systems averages (1987-1994) some ₱606 per ha, with a range of ₱339-981 per ha. These expenditures include a disproportionate amount for NIA administration. Based on 1994 NIA expenditures over the nine river irrigation systems (RISs), 74 percent was for salaries and 19 percent was for other operating costs. These administrative costs are not even covered by current ISF collections. Over the period 1987-1994, ISF collections in the Project area averaged ₱429 per ha. Only a small portion of the ISF collections was actually spent on physical maintenance works — on average only 7 percent of total costs. The situation described is hence unsustainable, and is characterized by three key elements: (i) ISF collection is insufficient to meet NIA's expenditure; (ii) most of NIA's expenditure is devoted to salaries and nonworks operating activities; and (iii) little of the ISF collected is spent on actual works. If irrigation systems are to be maintained satisfactorily, the actual O&M requirements of the systems must be matched by ISF revenues.

**G. Proposed O&M Funding**

8. Based on the O&M budget<sup>1</sup> for a typical well-maintained 1,400 ha RIS, the annual O&M costs for the works that will be the responsibility of NIA following Project completion are estimated to be ₱860 per ha, and the costs for the works that will be the responsibility of the IAs/ISCs are estimated to be ₱450 per ha, yielding a total estimated O&M cost of some ₱1,310 per ha. Under these estimates, salaries and other operating costs represent 29 and 20 percent of NIA's total O&M costs, respectively, with the remaining 51 percent allocated for actual maintenance works. At the same time, 92 percent of the estimated O&M cost for IAs and ISCs is proposed to be allocated for physical works, with the remaining 8 percent reserved for IA/ISC administrative costs.

**H. Reduction in Administration Expenses**

9. The revised O&M costs outlined in the previous paragraph assume that reductions are made in NIA's administrative expenses and that the responsibility for ISF collection is assumed primarily by IAs and ISCs. The reductions of NIA's expenses will be achieved by decreasing the number of responsibility centers for the Project systems from the current five to

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<sup>1</sup>

Needs-based budgets prepared by TA No 1882-PHI: Second Irrigation Systems Improvement Project approved for \$600,000 on 11 May 1993.

three, with a commensurate reduction in staff. Under these new arrangements, NIA's salaries and other operating costs can be reduced from ₱688 per ha to ₱421 per ha. The proposed RISs to be included in each of the three new responsibility centers are: (i) Bao; (ii) Mainit, Tibak, and the three Binahaan systems; and (iii) Bito, Daguitan, and Guinarona. Further administrative efficiencies will be realized by shifting responsibility for ISF collection to IAs and ISCs, initially under Type II contracts and eventually under the ISF sharing arrangement to be followed by NIA and each IA/ISC after Project completion.

#### **I. Improvements in ISF Collection**

10. Measures to be taken by NIA to improve ISF collections in the Project area include (i) improvement of billing and collection procedures, (ii) implementation in Region 8 of the revised Viability Incentive Grant<sup>1</sup>, and (iii) enhancement of incentives for ISF collection under Type II contracts with IAs and ISCs in the Project area. In addition, it is expected that farmers will become more willing and able to pay ISFs as a result of the improvements in irrigation service and crop yield expected under the Project. Based on the O&M costs estimated above, ISF collection efficiency is expected to improve from the current 45-50 percent to 80-85 percent by the end of the Project, with an average ISF billing rate of around ₱1,500 per ha, in cash or kind, which should be sufficient to operate and maintain the restored irrigation facilities satisfactorily. It is noted that two IAs in the Project area — LAMRAG in Daguitan RIS and ONDIMCO in Bao RIS — have achieved 80-90 percent ISF collections over the last three years.

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<sup>1</sup>

Circulated vide NIA MC No. 30 series of 1992 but has not been implemented yet.



# **DETAILED PROJECT COSTS AND FINANCING PLAN**

**Table 1: Summary of Project Costs by Component**

Item	(Peso '000)			(\$ '000)			Foreign Exchange (% of total)	Total Cost as % of Base Cost
	Local Cost	Foreign Cost	Total Cost	Local Cost	Foreign Cost	Total Cost		
<b>1. Physical Infrastructure</b>								
Irrigation and Drainage	404,714	249,876	654,590	16,189	9,995	26,184	38	74
Barangay and Access Roads	14,697	15,921	30,618	588	637	1,225	52	3
Subtotal Physical Infrastructure	419,411	265,797	685,208	16,776	10,632	27,408	39	77
<b>2. Institutional Development</b>	89,687	19,020	108,707	3,587	761	4,348	17	12
<b>3. Agricultural Improvement</b>	22,826	2,591	25,417	913	104	1,017	10	3
<b>4. Environmental and Social     Improvement and Monitoring</b>	9,144	16,855	25,999	366	674	1,040	60	3
<b>5. Project Management</b>	32,792	10,965	43,756	1,312	438	1,750	25	5
<b>Total Baseline Costs</b>	<b>573,859</b>	<b>315,228</b>	<b>889,087</b>	<b>22,954</b>	<b>12,609</b>	<b>35,563</b>	<b>35</b>	<b>100</b>
Physical Contingencies	50,875	30,049	80,924	2,035	1,202	3,237	37	9
Price Contingencies	64,720	38,370	103,090	2,589	1,535	4,124	37	12
<b>Baseline Costs + Contingencies</b>	<b>689,454</b>	<b>383,647</b>	<b>1,073,101</b>	<b>27,578</b>	<b>15,346</b>	<b>42,924</b>	<b>36</b>	<b>121</b>
Interest and Other Charges During Construction	-	98,997	98,997	-	3,960	3,960	100	11
<b>TOTAL PROJECT COSTS</b>	<b>689,454</b>	<b>482,644</b>	<b>1,172,098</b>	<b>27,578</b>	<b>19,306</b>	<b>46,884</b>	<b>41</b>	<b>132</b>

- = magnitude zero

Source: Staff estimates

**Table 2: Summary of Project Costs by Expenditure Account**

Item	(Peso '000)			(\$ '000)			Foreign Exchange (% of total)	Total Cost as % of Base Cost
	Local Cost	Foreign Cost	Total Cost	Local Cost	Foreign Cost	Total Cost		
<b>Investment Costs</b>								
A. Civil Works	433,340	240,545	673,885	17,334	9,622	26,955	36	76
B. Land Acquisition	1,034	-	1,034	41	-	41	-	0
C. Equipment and Vehicles	10,726	47,703	58,429	429	1,908	2,337	82	7
D. Materials	3,080	1,017	4,096	123	41	164	25	0
E. Training and Extension	62,375	1,681	64,056	2,495	67	2,562	3	7
F. Surveys and Studies	1,904	-	1,904	76	-	76	-	0
G. Environmental Monitoring	2,500	-	2,500	100	-	100	-	0
H. Project Administration	46,731	2,083	48,814	1,869	83	1,953	4	5
I. Consultancy Services	12,170	22,199	34,369	487	888	1,375	65	4
<b>Total Baseline Costs</b>	<b>573,859</b>	<b>315,228</b>	<b>889,087</b>	<b>22,954</b>	<b>12,609</b>	<b>35,563</b>	<b>35</b>	<b>100</b>
Physical Contingencies	50,875	30,049	80,924	2,035	1,202	3,237	37	9
Price Contingencies	64,720	38,370	103,090	2,589	1,535	4,124	37	12
<b>Baseline Costs + Contingencies</b>	<b>689,454</b>	<b>383,647</b>	<b>1,073,101</b>	<b>27,578</b>	<b>15,346</b>	<b>42,924</b>	<b>36</b>	<b>121</b>
Interest and Other Charges During Construction	-	98,997	98,997	-	3,960	3,960	100	11
<b>TOTAL PROJECT COSTS</b>	<b>689,454</b>	<b>482,644</b>	<b>1,172,098</b>	<b>27,578</b>	<b>19,306</b>	<b>46,884</b>	<b>41</b>	<b>132</b>

- = magnitude zero

Notes: 1. Cost estimates in this appendix include farmers' in-kind contributions estimated at \$2.551 million.

2. Totals may not add due to rounding in Tables 1-5.

Source: Staff estimates

Table 3: Expenditure Accounts by Components - Base Costs

Item	(Peso '000)						Total
	Irrigation and Drainage	Barangay and Access Roads	Institutional Development	Agricultural Improvement	Environment and Social Improvement and Monitoring	Project Management	
<b>Investment Costs</b>							
A. Civil Works	593,290	30,618	46,953	-	2,024	1,000	673,885
B. Land Acquisition	-	-	1,034	-	-	-	1,034
C. Equipment and Vehicles	31,230	-	7,184	750	19,265	-	58,429
D. Materials	-	-	-	4,060	36	-	4,096
E. Training and Extension	-	-	46,446	17,337	273	-	64,056
F. Surveys and Studies	-	-	-	1,904	-	-	1,904
G. Environmental Monitoring	-	-	-	-	2,500	-	2,500
H. Project Administration	20,066	-	-	-	-	28,748	48,814
I. Consultancy Services	10,005	-	7,090	1,366	1,901	14,008	34,369
<b>Total Baseline Costs</b>	<b>654,590</b>	<b>30,618</b>	<b>108,707</b>	<b>25,417</b>	<b>25,999</b>	<b>43,756</b>	<b>889,087</b>
Physical Contingencies	57,648	3,062	10,735	2,504	2,600	4,376	80,924
Price Contingencies	74,284	5,138	13,388	3,099	2,279	4,903	103,090
Interest and Other Charges During Construction							98,997
<b>TOTAL PROJECT COSTS</b>	<b>786,521</b>	<b>38,818</b>	<b>132,830</b>	<b>31,020</b>	<b>30,877</b>	<b>53,035</b>	<b>1,172,098</b>

Item	(\$ '000)						Total
	Irrigation and Drainage	Barangay and Access Roads	Institutional Development	Agricultural Improvement	Environment and Social Improvement and Monitoring	Project Management	
<b>Investment Costs</b>							
A. Civil Works	23,732	1,225	1,878	-	81	40	26,955
B. Land Acquisition	-	-	41	-	-	-	41
C. Equipment and Vehicles	1,249	-	287	30	771	-	2,337
D. Materials	-	-	-	162	1	-	164
E. Training and Extension	-	-	1,858	693	11	-	2,562
F. Surveys and Studies	-	-	-	76	-	-	76
G. Environmental Monitoring	-	-	-	-	100	-	100
H. Project Administration	803	-	-	-	-	1,150	1,953
I. Consultancy Services	400	-	284	55	76	560	1,375
<b>Total Baseline Costs</b>	<b>26,184</b>	<b>1,225</b>	<b>4,348</b>	<b>1,017</b>	<b>1,040</b>	<b>1,750</b>	<b>35,563</b>
Physical Contingencies	2,306	122	429	100	104	175	3,237
Price Contingencies	2,971	206	536	124	91	196	4,124
Interest and Other Charges During Construction							3,960
<b>Total Project Costs</b>	<b>31,461</b>	<b>1,553</b>	<b>5,313</b>	<b>1,241</b>	<b>1,235</b>	<b>2,121</b>	<b>46,884</b>

- = magnitude zero

Source: Staff estimates

Table 4: Project Components by Year - Base Costs

Item	(Peso '000)								Total
	1995	1996	1997	1998	1999	2000	2001	2002	
<b>1. Physical Infrastructure</b>									
Irrigation and Drainage	3,756	93,746	86,595	132,714	151,907	123,955	43,110	18,807	654,590
Barangay and Access Roads	-	-	3,062	-	7,654	7,654	7,654	4,593	30,618
Subtotal Physical Infrastructure	3,756	93,746	89,657	132,714	159,562	131,610	50,764	23,400	685,208
<b>2. Institutional Development</b>	1,015	23,333	10,576	21,042	24,808	14,729	9,436	3,768	108,707
<b>3. Agricultural Improvement</b>	-	5,471	4,576	4,355	3,571	3,616	3,090	737	25,417
<b>4. Environmental and Social Improvement</b>	-	11,046	11,091	454	1,169	982	982	274	25,999
<b>5. Project Management</b>	3,200	10,260	7,368	7,368	5,515	4,001	4,001	2,042	43,756
<b>Total Baseline Costs</b>	<b>7,971</b>	<b>143,855</b>	<b>123,269</b>	<b>165,933</b>	<b>194,625</b>	<b>154,938</b>	<b>68,273</b>	<b>30,222</b>	<b>889,087</b>
Physical Contingencies	709	13,402	11,702	15,243	17,024	14,244	5,577	3,022	80,924
Price Contingencies	289	8,452	10,195	17,365	25,334	23,817	10,881	6,757	103,090
IDC and Other Charges During Construction	2,168	2,291	4,989	8,050	11,454	16,250	20,245	33,550	98,997
<b>TOTAL</b>	<b>11,137</b>	<b>168,001</b>	<b>150,155</b>	<b>206,592</b>	<b>248,436</b>	<b>209,249</b>	<b>104,976</b>	<b>73,551</b>	<b>1,172,098</b>

Item	(\$ '000)								Total
	1995	1996	1997	1998	1999	2000	2001	2002	
<b>1. Physical Infrastructure</b>									
Irrigation and Drainage	150	3,750	3,464	5,309	6,076	4,958	1,724	752	26,184
Barangay and Access Roads	-	-	122	-	306	306	306	184	1,225
Subtotal Physical Infrastructure	150	3,750	3,586	5,309	6,382	5,264	2,031	936	27,408
<b>2. Institutional Development</b>	41	933	423	842	992	589	377	151	4,348
<b>3. Agricultural Improvement</b>	-	219	183	174	143	145	124	29	1,017
<b>4. Environmental and Social Improvement</b>	-	442	444	18	47	39	39	11	1,040
<b>5. Project Management</b>	128	410	295	295	221	160	160	82	1,750
<b>Total Baseline Costs</b>	<b>319</b>	<b>5,754</b>	<b>4,931</b>	<b>6,637</b>	<b>7,785</b>	<b>6,198</b>	<b>2,731</b>	<b>1,209</b>	<b>35,563</b>
Physical Contingencies	28	536	468	610	681	570	223	121	3,237
Price Contingencies	12	338	408	695	1,013	953	435	270	4,124
Interest and Other Charges During Construction	87	92	200	322	458	650	810	1,342	3,960
<b>TOTAL PROJECT COSTS</b>	<b>445</b>	<b>6,720</b>	<b>6,006</b>	<b>8,264</b>	<b>9,937</b>	<b>8,370</b>	<b>4,199</b>	<b>2,542</b>	<b>46,884</b>

- = magnitude zero

Source: Staff estimates

Table 5: Expenditure Accounts by Year - Base Costs

Item	(Peso '000)								Total
	1995	1996	1997	1998	1999	2000	2001	2002	
<b>Investment Costs</b>									
A. Civil Works	1,235	89,948	88,927	131,403	141,858	137,510	52,090	30,913	673,885
B. Land Acquisition	-	198	66	132	220	220	132	66	1,034
C. Equipment and Vehicles	1,763	18,335	9,231	2,570	24,725	950	570	285	58,429
D. Materials	-	690	723	672	672	657	657	27	4,096
E. Training and Extension	840	11,138	9,317	15,430	15,018	6,207	5,167	939	64,056
F. Surveys and Studies	-	526	130	526	130	346	30	216	1,904
G. Environmental Monitoring	-	375	375	375	375	375	375	250	2,500
H. Project Administration	4,134	6,867	6,867	6,867	6,867	6,867	6,867	3,476	48,814
I. Consultancy Services	0	15,778	8,973	6,323	3,124	172	0	0	34,369
<b>Total Baseline Costs</b>	<b>7,971</b>	<b>143,855</b>	<b>124,609</b>	<b>164,298</b>	<b>192,990</b>	<b>153,303</b>	<b>65,888</b>	<b>36,172</b>	<b>889,087</b>
Physical Contingencies	709	13,402	11,702	15,243	17,024	14,244	5,577	3,022	80,924
Price Contingencies	289	8,452	10,195	17,365	25,334	23,817	10,881	6,757	103,090
IDC and Other Charges During Construction	2,168	2,291	4,989	8,050	11,454	16,250	20,245	33,550	98,997
<b>TOTAL</b>	<b>11,137</b>	<b>168,001</b>	<b>151,495</b>	<b>204,956</b>	<b>246,801</b>	<b>207,615</b>	<b>102,591</b>	<b>79,501</b>	<b>1,172,098</b>

Item	(\$ '000)								Total
	1995	1996	1997	1998	1999	2000	2001	2002	
<b>Investment Costs</b>									
A. Civil Works	49	3,598	3,557	5,256	5,674	5,500	2,084	1,237	26,955
B. Land Acquisition	-	8	3	5	9	9	5	3	41
C. Equipment and Vehicles	71	733	369	103	989	38	23	11	2,337
D. Materials	-	28	29	27	27	26	26	1	164
E. Training and Extension	34	446	373	617	601	248	207	38	2,562
F. Surveys and Studies	-	21	5	21	5	14	1	9	76
G. Environmental Monitoring	-	15	15	15	15	15	15	10	100
H. Project Administration	185	275	275	275	275	275	275	139	1,953
I. Consultancy Services	-	631	359	253	125	7	-	-	1,375
<b>Total Baseline Costs</b>	<b>319</b>	<b>5,754</b>	<b>4,984</b>	<b>6,572</b>	<b>7,720</b>	<b>6,132</b>	<b>2,636</b>	<b>1,447</b>	<b>35,563</b>
Physical Contingencies	28	536	468	610	681	570	223	121	3,237
Price Contingencies	12	338	408	695	1,013	953	435	270	4,124
Interest and Other Charges During Construction	87	92	200	322	458	650	810	1,342	3,960
<b>TOTAL PROJECT COSTS</b>	<b>445</b>	<b>6,720</b>	<b>6,060</b>	<b>8,198</b>	<b>9,872</b>	<b>8,305</b>	<b>4,104</b>	<b>3,180</b>	<b>46,884</b>

- = magnitude zero

Source: Staff estimates

**Table 6: Financing Plan**  
(\$ '000)

Item	Government		Farmers		Bank (ADF)		Bank (OCR)		Total	
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%
I. Foreign Exchange	-	-	-	-	9,653	50.0	9,653	50.0	19,306	41.2
II. Local Costs (excluding Taxes)	10,741	44.8	2,551	10.7	5,347	22.3	5,347	22.3	23,986	51.2
III. Taxes and Duties	3,592	100.0	-	-	-	-	-	-	3,592	7.7
<b>TOTAL</b>	<b>14,333</b>	<b>30.6</b>	<b>2,551</b>	<b>5.4</b>	<b>15,000</b>	<b>32.0</b>	<b>15,000</b>	<b>32.0</b>	<b>46,884</b>	<b>100.0</b>

- = magnitude zero

Source: Staff estimates

**Table 7: Expenditure Accounts by Financiers**  
(\$ '000)

Item	Government		Farmers		Bank (ADF)		Bank (OCR)		Total		Foreign Exchange	Local (excluding Taxes)	Duties and Taxes
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%			
<b>Investment Costs</b>													
A. Civil Works	12,028	36.9	2,500	7.7	9,021	27.7	9,021	27.7	32,569	69.5	11,831	17,741	2,998
B. Land Acquisition	-	-	51	100.0	-	-	-	-	51	0.1	-	46	5
C. Equipment and Vehicles	410	15.0	-	-	-	-	2,327	85.0	2,737	5.8	2,234	230	274
D. Materials	121	60.0	-	-	-	-	80	40.0	201	0.4	50	131	20
E. Training and Extension	469	15.0	-	-	2,655	85.0	-	-	3,124	6.7	82	2,955	86
F. Surveys and Studies	9	10.0	-	-	84	90.0	-	-	93	0.2	-	84	9
G. Environmental Monitoring	12	10.0	-	-	111	90.0	-	-	124	0.3	-	111	12
H. Project Administration	958	40.0	-	-	1,437	60.0	-	-	2,395	5.1	100	2,154	141
I. Consultancy Services	326	20.0	-	-	1,141	70.0	163	10.0	1,630	3.5	1,049	534	47
Interest and Other Charges During Construction	-	-	-	-	551	13.9	3,409	86.1	3,960	8.4	3,960	-	-
<b>Total Disbursement</b>	<b>14,333</b>	<b>30.6</b>	<b>2,551</b>	<b>5.4</b>	<b>15,000</b>	<b>32.0</b>	<b>15,000</b>	<b>32.0</b>	<b>46,884</b>	<b>100.0</b>	<b>19,306</b>	<b>23,986</b>	<b>3,592</b>

- = magnitude zero

Note: Each expenditure account includes contingencies.

Source: Staff estimates

## PROJECT IMPLEMENTATION SCHEDULE

PROJECT COMPONENT	Project Year Quarter	1				2				3				4				5				6				7			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Pilot Project Area Development						STAGE I																							
Remaining Project Area Development																		STAGE II											
1. PHYSICAL INFRASTRUCTURE																													
<u>Preconstruction</u>																													
Consultant Recruitment																													
NIA Mobilization																													
Surveys and Investigation																													
Design and Works																													
Contract Documentation/ Tendering																													
<u>Construction</u>																													
Headworks Infrastructure																													
Main Canal/Structures																													
Lateral Canal/Structures																													
TSA Development																													
Main Drains/Structures																													
Secondary Drains/Structure																													
Roads																													
2. INSTITUTIONAL DEVELOPMENT																													
Training of NIA Staff																													
Training IAs/Members																													
Establishment of IAs/ISCs																													
Benefit Monitoring and Evaluation																													
3. AGRICULTURAL IMPROVEMENT																													
Training MAOs/ATs																													
Farmer Training																													
Training of Women																													
Implementation /New Initiatives																													
4. ENVIRONMENTAL AND SOCIAL IMPROVEMENT AND MONITORING																													
Schistosomiasis Control																													
Catchment Control																													
Environmental Improvement/ Monitoring																													
5. PROCUREMENT OF MATERIALS AND EQUIPMENT																													
Repairs Existing Equipment																													
New Equipment/Materials																													

## TENTATIVE PACKAGING OF CIVIL WORKS

Component	Number of Contracts	Tentative Value (P '000) Base Cost	Component	Number of Contracts	Tentative Value (P '000) Base Cost
<b>A. Domestic Contracts (exceeding P5 million)</b>			<b>B. Local Minor Contracts (not exceeding P5 million)</b>		
1. Bao River Irrigation System (RIS)			1. Bao RIS		
(i) Headworks	1	5,334	(i) Lateral canals (one contract per lateral) earthworks, concrete lining, and structures	18	20,547
(ii) Main canal: earthwork, concrete lining, and structures	1	15,714	(ii) Drainage improvement and structures	1	914
(iii) Canal service roads and barangay roads	1	24,377			
2. Mainit RIS			2. Mainit RIS		
(i) Headworks	1	6,245	(i) Lateral canals (one contract per lateral) earthworks, concrete lining, and structures	10	9,979
(ii) Main canal: earthwork, concrete lining, and structures	1	15,208	(ii) Drainage improvement and structures	1	873
(iii) Canal service roads and barangay roads	1	15,236			
3. Binahaan (North, South and Lower) and Tibak RISs			3. Binahaan and Tibak RISs		
(i) Headworks	2	37,278	(i) Lateral canals (one contract per lateral) earthworks, concrete lining, and structures	37	38,102
(ii) Main canals (one contract for each system) earthworks, concrete lining, and structures	4	55,092	(ii) Drainage improvement and structures	4	10,668
(iii) Canal service roads and barangay roads (one contract for each system)	4	40,802			
4. Guinarona and Daguitan RISs			4. Guinarona and Daguitan RISs		
(i) Headworks (Guinarona and Daguitan+Bito)	2	30,839	(i) Lateral canals (one contract per lateral) earthworks, concrete lining, and structures	10	11,916
(ii) Main canals (one contract for each system) earthworks, concrete lining, and structures	2	24,299	(ii) Drainage improvement and structures	1	2,466
(iii) Canal service roads and barangay roads (one contract for each system)	2	19,481			
5. Bito RIS			5. Bito RIS		
(i) Main canal: earthwork, concrete lining, and structures	1	8,125	(i) Lateral canals (one contract per lateral) earthworks, concrete lining, and structures	13	13,514
(ii) Canal service roads and barangay roads	1	11,182	(ii) Drainage improvement and structures	1	1,941
<b>Total by Domestic Contracts</b>	<b>24</b>	<b>309,212</b> <b>51%</b>	<b>Total by Local Minor Contracts</b>	<b>77</b>	<b>110,920</b> <b>18%</b>
			<b>C. Force Account Works and Small Package Contracts</b>		
			1. Bao RIS		
			Level 2 turn-out service area development		21,781
			2. Mainit RIS		
			Level 2 turn-out service area development		14,728
			3. Binahaan and Tibak RISs		
			Level 2 turn-out service area development		72,084
			4. Guinarona and Daguitan RISs		
			Level 2 turn-out service area development		16,478
			5. Bito RIS		
			Level 2 turn-out service area development		14,614
			6. Institutional Development		
			(i) Irrigators' Service Cooperative offices and warehouses		44,603
			(ii) Solar dryers		4,935
			7. Schistosomiasis control		
			Construction of footbridges		1,944
			<b>Total by Force Account Works and Small Package Contracts</b>		<b>191,187</b> <b>31%</b>

Source: Staff estimates

Activity/Specialist	Project Year Quarter	1				2				3				4				Total Person- months	Total Trips
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4		
<b>1. RECRUITMENT/MOBILIZATION</b>																			
Project Consultants																			
Advisory Consultants																			
<b>2. PROJECT CONSULTANTS</b>																			
<b>2.1 Main Consulting Services</b>																			
<b>2.1.1 International Consultants</b>																			
a) Team Leader / Construction, Planning and Supervision Engineer																		10	5
b) River Training Engineer																		1	1
c) Irrigation Engineer																		7	2
d) Hydraulic Structures Engineer																		4	1
e) Institutional/BME Specialist																		2	2
f) Water Management and Operations Specialist																		5	4
g) Environmental (Geothermal) Expert																		2	1
h) Unallocated (various)																		2	2
<b>Subtotal (2.1.1)</b>																		<b>33</b>	<b>18</b>
<b>2.1.2 Domestic Consultants</b>																			
a) Deputy Team Leader/Construction Management Specialist																		31	2
b) Institutional and Training Specialist																		16	6
c) Geotechnical/Materials Testing Engineer																		3	3
d) Agronomist																		3	3
e) Watershed Soil Conservation Specialist																		4	3
f) Marketing Specialist																		5	3
<b>Subtotal (2.1.2)</b>																		<b>62</b>	<b>20</b>
<b>Total (2.1.1 + 2.1.2)</b>																		<b>95</b>	<b>38</b>
<b>2.2 International Advisory Consulting Services</b>																			
International Staff (from IIMI)																			
a) Irrigation Management Expert																		3	3
b) Institutional/BME Expert																		4	4
<b>Subtotal (2.2)</b>																		<b>7</b>	<b>7</b>
<b>2.3 Local Advisory Consulting Services</b>																			
Cooperative Development Advisory Specialist(s)																		6	4
<b>Subtotal (2.3)</b>																		<b>6</b>	<b>4</b>
<b>Total (1 + 2)</b>																		<b>13</b>	<b>11</b>
<b>International</b>																		<b>40</b>	
<b>Domestic</b>																		<b>68</b>	
<b>GRAND TOTAL</b>																			

## SUMMARY INITIAL ENVIRONMENTAL EXAMINATION

### A. Introduction

1. The purpose of the initial environmental examination (IEE) is to provide the Bank and the Philippine Environmental Management Bureau (EMB) with information on environmental concerns that need to be taken into account during project design, appraisal, and implementation. The Project is classified as environmental category B, since most of the components are rehabilitation of existing facilities. No major environmental impacts are anticipated, and the mitigation measures are easily prescribed.

2. In compliance with the Bank's requirement, an IEE was conducted. For the initial screening, the Bank's *Checklist of Environmental Parameters for Projects in Irrigation* was used. This was followed by the identification of potential major impacts or benefits of the Project and an analysis of whether or not a further study was warranted (for instance, the need for a detailed Environmental Impact Assessment [EIA] or additional studies on particular aspects).

3. The IEE study was carried out in March 1994. Field visits were made during that period, and close coordination/interaction with specialists responsible for the individual project components, i.e., agriculture, irrigation and drainage, flood protection, socioeconomics, public health, watershed management and soil conservation, institutional development, and hydrometeorology.

### B. Description of the Project

4. The Project is located in the Province of Leyte, Eastern Visayas (Region 8). The Leyte Province is an area of agricultural and social importance, heavily dependent on irrigated agriculture. Dependent communities are socioeconomically affected by the degradation of the irrigation systems. In addition, because of poor drainage facilities, schistosomiasis, a chronic disease, is prevalent in certain areas.

5. Nine irrigation systems are encompassed by the Project area, namely Bao, Mainit, Tibak, Binahaan (North, South, and Lower), Guinarona, Daguitan, and Bito. Of the original total design service area (about 24,000 ha), the currently confirmed service area is 12,649 ha. Of this, about 8,583 ha is presently irrigated. The service area after rehabilitation will increase to 13,458 ha including 4,066 ha of restored irrigation area and 809 ha of rainfed area. Thus an increase of about 50 percent will be achieved in irrigated production area. The Project will directly benefit about 12,000 farm households in the area.

6. The Project will replace the existing continuous irrigation system with a more efficient rotational irrigation system. The Project scope will include rehabilitation and improvement of irrigation and drainage facilities, improvement of agricultural support services, and beneficiary organization and training.

7. The improvement of the nine irrigation systems will lead to poverty reduction, economic growth, improved food supply, and improved public health in the Project area. It is expected that the Project, including detailed design and construction/rehabilitation activities, will be implemented over a period of seven years.



## **C. Description of the Environment**

### **1. Physical Resources**

8. A mountain range runs in the northwest-southeast direction through the central part of Leyte, dividing the province into two areas with different climatic conditions. The morphology of the mountain range is characterized by steep slopes with deeply incised valleys and some narrow gorges, alternating with small flat to gently sloping areas on some of the watershed divides (Binahaan-Bao divide). The general elevation of the mountain range is about 600 - 700 m above mean sea level, with some peaks (Alto Peak) reaching elevations up to 1,200 m. The partly volcanic origin of the range is reflected by Lake Danao, which is a former volcanic crater turned lake at an altitude of 620 m. The depth of the lake is reported to be about 130 m.

9. The central mountain range consists mainly of igneous and metamorphic rocks of pre-Tertiary age covered by Quaternary volcanics. Recent alluvial plains extend from the mountain range towards the sea.

10. The major soil types found in the service areas consist of a silty-clay-loam and a silty-sand-loam in the lowlands, and clay-loam in the upland areas. The lowland soils are acidic (average pH of 5.2-5.5). They are generally poorly drained. Yellow streaks and stunting of the seedlings point towards zinc deficiency.

11. The river bed slopes in the Project area are steep (unmatured) in the upper reaches of the watersheds, flattening considerably (meandering) in the alluvial plains where the irrigation systems are developed. The drainage pattern is dendritic.

12. Two of the four main types of climate that occur in the Philippines prevail in Leyte, i.e., climate Type II, with no real dry season and a very pronounced maximum rainfall from November to January, found in the eastern side of the province; and climate Type IV, represented by more or less evenly distributed rainfall throughout the year, found in the western side of the province. Average annual rainfall is 2,000-2,400 mm in the service areas and around 2,800 mm in the central mountain range.

13. Annual average temperature ranges from 26 to 28° C and mean monthly relative humidity ranges from 74 percent in March to about 84 percent from July to October. On top of the already abundant rainfall throughout the year, the Project area is frequented by typhoons up to five times a year. The typhoons generally last 1-2 days and can cause flash floods.

14. The groundwater table, which is near or at the surface during the wet season, fluctuates down to about 1 m below surface in the dry season. The aquifers are mainly exploited as a source of domestic water supply.

15. Analyses of groundwater and surface water (river, estuarine, and coastal waters) in the Project area indicate that the water quality is generally within the national standards. In the Bao River, however, boron concentrations are near or at the 2 ppm limit currently set by the Department of Environment and Natural Resources (DENR) for Class D water downstream of geothermal projects.

16. Water rights in the Project area have been granted to several private individuals as well as some Government agencies. The National Irrigation Administration (NIA) has been granted by far the largest volume for irrigation purposes, i.e., 28,340 l/s. This represents about 92 percent of the total allocated volume.

## **2. Ecological Resources**

17. The terrestrial and aquatic ecosystems in the area provide habitats for a large variety of species, including some rare and/or endangered species like the Philippine tarsier, flying lemur, spotted sambar deer, as well as the rufous hornbill and blue-naped parrot, which are still found abundantly in the watershed forests. Common freshwater species caught are eel, gobies, tilapia, crabs, and shrimps.

18. Considerable areas of tidal flats and mangrove wetlands are still found along Carigara Bay and Ormoc Bay, which provide important habitats for native and migratory birds. The inland wetlands (e.g., Kapirawan) have been continuously reclaimed by local farmers and are presently reduced to small isolated marshy patches, where probably little of the original natural habitats or species diversity remains. There is very little information available on the fauna or flora of these remaining patches.

19. The dominant forest types in the watersheds are the mossy, dipterocarp, and molave forests. At elevations below the dipterocarp and molave forests, understorey species occur, e.g., rattan, palms, herbs, ferns, shrubs, and woody lianas. These are followed by coconut and sugarcane plantations on the footslopes.

## **3. Demographic Characteristics**

20. The 149 barangays served by the nine irrigation systems comprise 24,120 households, equivalent to a population of about 123,710 or 9 percent of the population of the province. The average household size is 5.2 compared with the national household average of 5.6. The estimated number of farmer beneficiaries is about 12,000. Farm sizes range from less than 0.5 ha to more than 2 ha.

21. The net out-migration rate of the region was 2.6 percent during 1975-1980, resulting from an in-migration rate of 1 percent against an out-migration rate of 3.6 percent. About 40 percent of the workforce is underemployed, and the poverty incidence in the region is estimated at about 47 percent.

22. Agriculture, fishery, and forestry accounted for 45.6 percent of the gross regional domestic product in 1989. Of this, agricultural crops were 55.9 percent, fishery 26.9 percent, livestock and poultry 14.8 percent and forestry 2.36 percent. The last, however, has decreased considerably since a logging moratorium was imposed in 1989.

## **4. Land Use**

23. Woodlands, consisting of old growth and residual forest stands, are found mainly on the upper slopes of the central mountain range. Woodland areas make up 9 percent of Leyte's land

area. The forest landscape gives way to shrubs and grasslands along the midslopes. Shrubland areas cover about 11 percent of the province, and grasslands about 4 percent.

24. Further down on the footslopes and floodplains are the agricultural areas, cultivated mainly with coconut, sugarcane, and rice. About 56 percent of the province is agricultural area. Of this area, 63 percent is planted with coconut (cash crop). Rice is the next largest crop (staple crop) in terms of area covered, comprising about 25 percent of the agricultural area. Sugarcane comes third, covering about 6 percent of the agricultural area.

## **5. Energy Development**

25. Energy supply in the region is provided by the 112.5 MW Tongonan Geothermal Plant which services Leyte and Samar Islands. The Philippine National Oil Company (PNOC) has the concession to explore and develop geothermal sources in the reservation area of 107,600 ha extending from Kananga and Carigara in the northwest down to Baybay and Mayorga in the southwest. PNOC has jurisdiction, control, and management of the area, and is responsible for the protection, development, and rehabilitation of the watershed areas (Executive Order No. 223/1987). This reservation area covers most watersheds in the central mountain range including those of the Project.

26. An additional 640 MW of generating capacity is planned to be installed in the Tongonan area by the end of 1997. To the south of the geothermal reserve are additional potential development areas. Exploration in these areas is foreseen to take place in the near future.

## **6. Public Health**

27. Schistosomiasis is prevalent in 24 municipalities of Leyte, of which 12 are in the service areas. Reduction in prevalence from 23 percent to 9 percent during the first half of the 1980s could be attributed partly to the schistosomiasis control program of the World Bank-financed National Irrigation Systems Improvement Project. That Project provided funds for case finding, treatment for infected individuals, and health education. However, program funding ended in 1985.

28. Interviews with local health officials suggest that from 1990 to 1993, the prevalence rate in Leyte went down from about 9 percent to about 5 percent after a program funded by the World Bank was implemented. This suggests that the program has been quite effective. Concern has been raised over how to sustain the program's activities, particularly the treatment of infected individuals after funding stops in 1995.

## **D. Screening of Potential Impacts and Mitigation Measures**

### **1. Effects Due to Project Location**

29. There will be no disruption of hydrology. The rehabilitation of the irrigation structures will improve the hydrological conditions in the service areas. The riverine ecosystem will not be affected beyond its natural variation, which includes occasional flooding.

30. The local farmers have already reclaimed about 90 percent of the inland wetlands. Justification for the preservation of the remaining wetlands still has no strong basis, as there is

almost no information available on their ecological value. On the other hand, the preservation of wetlands may cause health risks as eradication of schistosomiasis becomes more difficult. It is therefore recommended to carry out an environmental evaluation of swamps and marshlands to gather sufficient detailed information on the ecological profile of the swamps and marshlands to be able to assist NIA in deciding whether or not to develop the wetlands.

31. There will be no impediment to the movement of wildlife, cattle, and people, as (i) there is no known wildlife within the Project area that could be affected by severance of areas due to construction of irrigation and drainage canals, and (ii) adequate crossings already exist or else will be provided for cattle and people.

32. No flood/drainage hazards will be caused by the Project. Hazards to the Project areas will always remain to a certain extent with respect to major typhoons and floods such as those of in 1979, 1991, and 1993. The Project will, however, improve the operating system, which will greatly contribute to safeguarding the service structures.

33. There is no resettlement required in this Project. There are also no historical, cultural, or archaeological monuments found within the area. The Project will not cause conflicts on water rights, as these have already been established.

## **2. Effects Relating to Design**

34. Although most of the catchment areas of the Project systems are still covered with primary and secondary growth forests in their upper reaches, the present forest cover is not considered satisfactory, with many logged-over areas. Soil erosion is still within acceptable limits. However, erosion may increase because of road construction activities. It is recommended that NIA participate in the already existing Multipartite Monitoring Team (MMT) consisting of staff of the Environmental Management and Protected Area Service (EMPAS) of DENR, PNOC, the National Economic Development Authority (NEDA), a provincial nongovernment organization (NGO) and local government units (LGUs). This team has already been set up to monitor the geothermal development in the reservation area.

35. Between the watershed erosion and erosion/scouring along river banks and beds, the latter is currently the more significant source of material that silts up the main diversion structures (weirs and intakes), especially during floods. The services of a river training specialist have been provided under the Project to study the process of river scouring along the banks and to devise suitable measures to check it. Riverbank protection will be a part of the physical improvements of the infrastructure provided under the Project. As this concern will be attended to by the Project, it is not likely to cause any significant issue.

36. Water quality downstream of the service areas is not expected to be affected significantly. Diversion of the dry season flow has been done for the last 20-30 years. It may cause some seawater intrusion, but this will probably not exceed the natural variations of the existing situation. Contamination by pesticides is not expected to be significant because of implementation of integrated pest management (IPM) in the Project systems.

37. The irrigation water supply quality may become impaired by boron contamination from geothermal development. Well development and exploration must therefore be done in such

a way that water containing boron is disposed of in compliance with Environmental Compliance Certificate (ECC) provisions. The MMT (including NIA) will monitor the water quality downstream of all existing and newly developed geothermal wells in the reservation area. There will be no use of groundwater for irrigation purposes.

38. Improvement of the water distribution system is one of the Project's main design objectives, therefore, the Project will have a beneficial effect by promoting equitable water distribution. In addition, as providing adequate drainage for the existing systems is one of the components of the Project, maintenance of the existing structures is expected to produce positive effects, particularly in solving localized waterlogging problems and controlling schistosomiasis.

39. Land tenure will not be a problem, as most irrigated areas are occupied by smallholders who own their farms, or are agrarian reform beneficiaries. Besides, there are no conflicts anticipated with other land uses such as cattle grazing or aquaculture, as none of these exist in the Project area or downstream thereof.

40. The institutional arrangements for giving access to credit among farmers in the service areas appear adequate. Further improved access to credit will result from the Project's proposed upgrading of irrigators' associations (IAs) into and formulation of new irrigators' service cooperatives (ISCs). Because the IAs from which the ISCs will be formed are existing organizations with 10-15 years of existence, their potential viability as service cooperatives is expected to be high. Furthermore, as existing IAs will be upgraded, there will be no disruption of existing cooperative systems as a result of the Project.

41. An institutional development component is incorporated into the Project, and this is expected to ensure that ISCs' capability to assume greater management responsibilities for the maintenance of the irrigation systems will be significantly improved.

42. The envisioned adoption of IPM during Project implementation will reduce further the already low use of agricultural chemicals and offset any potential increase caused by an increase in production area. Thus the impact from the use of agricultural chemicals is expected to be insignificant.

43. A number of existing irrigation canals are not well maintained. Weed growth, siltation, or eroded embankments occur in numerous sections. These operation and maintenance (O&M) problems will be addressed by the Project. Scouring hazards will be prevented with appropriate designs. Consequently, they are not expected to be of any significance.

44. To minimize contact between farmers/residents and possibly schistosomiasis-infected waters in the canals, adequate passageways (e.g., foot bridges) will be provided by Project. There are no wildlife migration or access paths that will require special passageways or corridors.

### **3. Effects During Construction Stage**

45. The construction plan will be finalized during the detailed design stage and will provide adequate provision for control of erosion from, and for proper rehabilitation of, exposed cut-and-fill areas. Slope cuts from these areas will have to be stabilized, e.g., through vegetative measures. Thus no significant adverse soil erosion impacts are expected.

46. The rehabilitation of irrigation structures involves standard designs and construction specifications, and it is not expected that the construction activities will pose significant risks to workers or local residents. As most workers employed for construction activities will be from the area itself, there will be no expected influx of workers. Thus no slum, cultural or socioeconomic hazards or imported communicable diseases are expected.

47. The Project construction plan will provide for monitoring of schistosomiasis infection risk to workers, particularly those working on the canals and creeks.

#### **4. Effects Relating to Operation**

48. Adverse soil modification (land subsidence, acidification) in reclaimed wetland areas with soils having high organic content will not be important as long as these areas remain rice fields and are not further drained or used for diversified crops.

49. Depending on the depth of the drainage system, lowering of the water table may be expected to a certain extent. However, natural fluctuations of up to at least 1 m already occur, and the impacts of the drainage system will most probably remain within this range.

50. Schistosomiasis is prevalent in the Project area. The effect of the Project through its proposed environmental program, including schistosomiasis control and environmental modification measures, will be significantly positive.

51. IPM will reduce application of agrochemicals to a minimum; hence occupational health hazards among farmers as a result of exposure to chemical pesticides will be lessened. Fertilizer runoff is also not expected to become a hazard to the environment.

52. Environmental controls to prevent schistosomiasis are proposed as an integral part of the Project. The Project should include in the program those areas adjacent to the service areas to prevent future reinfection that might spread from these outlying unsanitized areas. This entails a target area of 255 barangays in 24 municipalities.

53. Except for Lake Bito, and areas along the coast which are utilized for fishponds, there is no significant aquaculture in the inland areas.

#### **E. Institutional Requirements and Environmental Monitoring Program**

##### **1. Farmer Beneficiary Involvement**

54. Unless a local capability is left behind to ensure sustained maintenance of the systems, they will again deteriorate, leading to a resurgence of the same problems that the Project aims to solve.

55. To a significant extent, capability building will require expansion and strengthening of existing IAs, including an integrated support system capable of providing the IAs with needed inputs and services to maximize benefits from the irrigation and drainage systems. At present, operations management capability is limited for most IAs.

56. The thrust of the Project's institutional development component is to enhance the roles and responsibilities of farmer-beneficiaries, through their IAs, with regard to system management. This institutional development objective is to be pursued in partnership with NIA and appropriate supporting agencies.

## **2. Interagency Coordination**

57. The MMT, consisting of staff of EMPAS-DENR, PNOC, NEDA, a provincial NGO, and LGUs, has already been set up to monitor specifically the compliance by PNOC with provisions set forth in the ECC issued by DENR in connection with the ongoing geothermal development. At present NIA is not a member of MMT, and its participation as a concerned party is recommended.

58. The inclusion of NIA will strengthen MMT's monitoring objectives. To strengthen monitoring capabilities, the Project will provide laboratory facilities to DENR Region 8, as part of the loan, for the monitoring of water quality owing to geothermal exploration and operation in the upper catchments and for general environmental monitoring of the Project.

## **3. Integrated Watershed Management**

59. An integrated watershed management scheme will necessitate closer institutional linkages among PNOC, DENR, NIA, and DAR.

60. Coordination among PNOC, DENR, NIA, and possibly DAR in respect to protecting watersheds and quality of irrigation water supply needs to be set up in a systematic and formal way. With PNOC, particularly, the ongoing geothermal works may significantly have an impact on the Project in the coming years unless measures are taken to avoid them.

## **4. Integrated Pest Management Training Program**

61. An IPM training program will be carried out under the Project. It will utilize the full season (four months) training design now in use by the Regional Crop Protection Center in Tacloban. In this approach, trainees undergo a four-month course, set in the farm itself, and timed with the crop calendar (i.e., start at seed selection and end at harvesting). The frequency of contact during the four-month course varies with the type of trainee.

62. The target trainees are (i) 78 agricultural technicians in the municipalities covered by the Project, (ii) 150 farmer trainers, and (iii) about 8,000 farmer beneficiaries throughout the Project area.

63. The comprehensive IPM training program will be undertaken during the entire period of Project implementation. The cost of the agricultural technicians' training, farmer trainers' training and farmers' training will be provided for by the Project.

## **5. Environmental Monitoring**

64. The monitoring activities recommended are already an integral part of the responsibilities of the identified institutions. Hence no costs are foreseen by the Project. The monitoring should continue at least 5 years after completion of the Project.

65. Environmental concerns that should be monitored are:
- (i) watersheds for activities that might impair irrigation water supply, particularly geothermal development activities in the upper catchments;
  - (ii) schistosomiasis prevalence, including testing of irrigation and drainage canals for presence of snail colonies;
  - (iii) soil fertility, particularly the reclaimed swamp areas;
  - (iv) pesticide residues in Lake Bito and downstream of the irrigation systems; and
  - (v) floods (levels and duration) in the reclaimed swamps as well as in areas downstream of the drainage creeks and rivers.
66. Monitoring of the geothermal development activities in the upper watershed, and enforcing ECC provisions to prevent adverse downstream impacts (boron contamination and siltation hazards) will be done by the MMT.
67. Monitoring of schistosomiasis prevalence will be done by the regional office of the Department of Health, while the testing of waterways for snail colonies will be done by the Snails and Engineering Sections of the Schistosomiasis Research Center in Palo in coordination with NIA field staff.
68. Monitoring of soil fertility status, particularly in the reclaimed swamp areas, will be done by the Regional Bureau of the Soils and Water Management Office in Tacloban.
69. Monitoring of pesticide build-up in Lake Bito will be done by the local Municipal Agriculture Office. The sampling of river water downstream of the river irrigation systems will be done by NIA. The monitoring has to be carried out twice a year. Subsequently, NIA will coordinate with the Regional DENR office to ensure compliance with the existing Water Quality Standards.
70. The monitoring of flood depth, area affected, and flood duration in inundation-prone areas inside the irrigation systems will be monitored by the respective NIA irrigation field offices.
71. NIA will consolidate the results of the monitoring program described in the previous section, and prepare a summary of the monitoring results, also identifying problems encountered and proposed solutions, and will submit these as part of the annual progress reports to be submitted to the Bank during the course of Project implementation.

## **F. Findings and Recommendations**

72. The Project aims at improving existing systems that at present are in various degrees of deterioration. The impacts on the environment will therefore be mostly beneficial in nature. Only a few potential negative impacts are expected, and these should be of small significance, if any. These environmental concerns are, furthermore, attended to in detail by the individual Project components. Consequently, no detailed additional environmental studies or EIA are required.



73. A brief overview of the main findings and recommendations follows:

- (i) The current state of the watersheds is not considered satisfactory. In addition, taking the pace of geothermal development into consideration, especially with regard to the construction of roads, increased erosion can be expected if control measures are not maintained. Also, contamination of river water by boron (originating from geothermal fluids) may exceed the standard if mitigation measures during drilling of new wells are not properly implemented. Therefore, a review of PNOC operations will be undertaken to provide detailed recommendations on environmentally sound geothermal exploration and operation. The recommendations will also be used as a guide for MMT to undertake proper monitoring activities.
- (ii) It is recommended that NIA be made a member of the MMT. NIA should also participate in reviews of new developments in the watershed areas.
- (iii) Encroachment onto wetlands has already taken place such that most (about 90 percent) of the original 800 ha of swamps and marshes within the services areas has already been reclaimed by local farmers; only a few small patches remain. Considering the contradictory situation in which preservation of the wetlands may also cause health risks, an environmental evaluation of swamps and marshlands should be undertaken to gather sufficient detailed information on the ecological profile of the wetlands to allow a proper decision whether or not to develop the wetlands.
- (iv) If preservation the of wetlands is warranted, the remaining areas will be delineated on maps and in the field, and NIA will be responsible for protecting and preserving these areas from any further human influences. The boundary delineation work will be an integral part of the overall surveying and mapping work and will, therefore, be financed by the Project.

#### **G. Conclusions**

74. Implementation of the Project will have a generally beneficial effect on the environment in the Project area. The Project will lead to improved public health and improved O&M of the systems. Adoption of integrated pest management, improved water distribution, and strengthening of the institutional capabilities of existing IAs are some of the main positive effects of the Project.

75. The screening process did not identify environmental impacts of major or moderate significance. Mitigation measures will be adopted to ensure that the environmental impacts caused by the Project will be within acceptable levels. Consequently, a detailed EIA study is not required.

## **TECHNICAL ASSISTANCE FOR ENVIRONMENTAL EVALUATION OF SWAMPS AND MARSHLANDS**

### **A. Objectives**

1. The overall objective of the TA is to assist the Government in determining the optimal land use of the swamps and marshlands in and around the Project area, considering the impact of the proposed land use on public health, habitats, and wildlife. This will be achieved by gathering detailed information on the ecological profile of the swamps and marshlands, including, inter alia, soil characteristics, hydrology, identification and mapping of vegetation, species inventory, and distribution of flora and fauna; and carrying out studies on the impact of various land uses. The outcome of the TA will be the identification of recommended land use options for the swamps and marshlands, and monitoring programs needed to achieve environmental objectives.

### **B. Location**

2. The TA will cover the Project site, with detailed fieldwork concentrated on the swamps and marshlands of Kapiroawan in the Tibak river irrigation system (RIS), Sab-a Basin in Mainit RIS, and other similar areas in South Binahaan RIS and Daguitan RIS.

### **C. Terms of Reference**

3. The terms of reference (TOR) will include, but not necessarily be limited to, the following:

- (i) Collect all relevant and necessary Project-specific data on the biophysical, flora and fauna resources of the area from Government and nongovernment organization sources, and from relevant literature.
- (ii) Collect, collate, and evaluate available information regarding the development of wetlands for agricultural purposes.
- (iii) In coordination with NIA and the Project consultants, delineate the boundary where Project activities may have an impact on the wetlands, if any.
- (iv) Evaluate the natural dynamics of the wetland environment in regard to areal extent over time, by a study of all available information.
- (v) Collect and evaluate data on soil and hydrology of the swamp and marshlands, and prepare maps showing land use.
- (vi) Carry out vegetation surveys, including inventory of species, vegetation sampling, and mapping of vegetation associations in the swamp and marshlands; and establish permanent plots of adequate size suitable for long-term vegetation survey and monitoring (if warranted).

- (vii) Carry out surveys on aquatic fauna and ecologically important species (such as resident and migrant birds), estimate population numbers and abundance (whenever possible), and identify protected and/or endangered species (if any).
- (viii) Study the potential of swamps and marshlands as habitats of snails, particularly in regard to snails that are associated with the transmission of schistosomiasis.
- (ix) Study the habitat requirements and key ecological factors that may affect the environmental stability of the swamps and marshlands.
- (x) Based on the results of the survey/study:
  - (a) evaluate the ecological value and long-term prospect of biodiversity conservation of swamp and marshlands species;
  - (b) do a detailed analysis of the risks and benefits of preserving swamps and marshlands, especially the health risk and the expected benefit from biodiversity conservation;
  - (c) do a detailed analysis of the risks and benefits of draining the land for agricultural development; and
  - (d) make recommendations on the proper use of the swamps and marshlands.
- (xi) If conservation of the swamps and marshlands is warranted:
  - (a) delineate areas for legal protection to better ensure habitat and biodiversity conservation; facilitate the process, (i) delineate the proposed boundary of the protected areas on a map with adequate scale and advise the Government of these proposed protected areas (to avoid the area being further converted to agricultural land); and (ii) prepare a management plan for the conservation of the swamps and marshlands in consultation with the National Irrigation Administration (NIA), Department of Environment and Natural Resources (DENR) Region 8, Environment Management Bureau (EMB), Department of Agriculture (DA), and other relevant government agencies;
  - (b) recommend future flora/fauna and swamp/marshlands monitoring programs following the irrigation systems improvement; and
  - (c) recommend measures to reduce health risks arising from schistosomiasis infection.
- (xii) If development of the swamps and marshlands is warranted:
  - (a) recommend measures to mitigate/minimize the environmental impacts of the conversion of swamps and marshlands to agricultural land use; and

- (b) in collaboration with DOH Region 8 and the Schistosomiasis Research Center in Palo, recommend measures to minimize health risks and prepare a schistosomiasis eradication program.
  - (xiii) Prepare an environmental awareness program to support the protection of natural habitats important to the fauna and flora and for the conservation of ecologically important species, including the preparation of posters, leaflets, and brochures that may enhance public awareness of the need for protection of species and their habitats.
  - (xiv) Prepare a final report detailing the findings of the investigation.
4. The investigation should be finalized within five months from commencement, while the management and monitoring plan should be available soon thereafter.

#### **D. Consultants**

5. The Philippines has a well-developed local consulting market in the environmental sciences and should be able to field adequate consultants for the tasks nominated. Several former high-level officials from Government environmental agencies as well as prominent academics are now acting as consultants, some of whom have been used by the Bank for previous consulting assignments.

6. The Bank will engage a suitably qualified local consulting firm to provide the services in accordance with the TOR given above. The Project will require a total of 18 person-months with the breakdown as follows: zoologist/wildlife ecologist (3 person-months), botanist/plant ecologist (3 person-months), soil/hydrology expert (2 person-months), health ecology specialist (1 person-month), malacologist (2 person-months), agronomist (1 person-month) and research assistants (6 person-months). The consultants will be selected following the Bank's *Guidelines on the Use of Consultants*.

#### **E. Implementation Methodology and Arrangements**

7. The key thing to stress is that the consultants will undertake fieldwork, taking care to avoid contact with contaminated water likely to cause schistosomiasis. The fieldwork which could include mist nets as well as observation, should take place in the wet season when migratory birds have been observed. The location of each site should be carefully mapped, with the position accurately located by a geographic positioning system. The significance of each site should be according to the methodology used by the Asian Wetland Bureau.

8. NIA will be the Executing Agency for the TA. A steering committee consisting of representatives of the regional offices of NIA, DENR, DOH, EMB, and DA will be responsible for supervision of the TA and will review the draft final report at the end of the studies. NIA will be responsible for the provision of all support services to the consultants including office space, support staff, transportation, and computer facilities.

## F. Implementation Schedule, Reports, and Documents

9. The study will be conducted during the second year of Project implementation. The fieldwork will be completed in about three months. The consultants will submit a draft final report within one month after completion of the fieldwork. The report will be discussed in a tripartite meeting attended by representatives of the Government, the Bank, and the consultants. The consultants will revise the draft report in the light of comments and discussions during the tripartite meeting and will submit the final report within one month after the tripartite meeting. The tentative schedule for the TA is:

Services commence	1 September 1996
Fieldwork completed	End-November 1996
Submission of draft final report	Mid-December 1996
Tripartite meeting	Mid-January 1997
Submission of final report	End- January 1997

10. The consultants will submit five copies of the report to NIA; three copies to the Bank; and two copies each to DENR, DOH, EMB, and DA. The report will also be provided in disk form, with the disks suitably indexed and documented.

## G. Estimated Cost of the Technical Assistance

11. The total cost of the TA is estimated at \$124,000 equivalent, with the breakdown given in Table 1.

**Table 1: Environmental Evaluation of Swamps and Marshlands**

Component	Amount in \$ equivalent
<u>Bank-financed Portion</u>	
Remuneration of Local Consultants	72,000
Per diem of Local Consultants	20,000
Travel of Local Consultants	2,000
Communications, Reports and Reproduction	2,000
Office Supplies	2,000
Contingencies	<u>2,000</u>
Subtotal	100,000
<u>Government-financed Portion</u>	
Office Space	12,000
Support Staff	4,000
Transportation and Computer Facilities	<u>8,000</u>
Subtotal	24,000
<b>Total</b>	<b>124,000</b>

## ECONOMIC AND FINANCIAL ANALYSIS OF THE PROJECT

### A. Economic Analysis

1. The economic analysis has been carried out for the Project as a whole and for individual irrigation systems in accordance with the Bank's *Guidelines for Economic Analysis of Projects*. Summary tables relevant to economic and financial analysis are attached to this appendix. The calculation of the economic internal rate of return (EIRR) for each system includes all direct costs related to the system, including system-specific Project staff, canal service roads, and incremental operation and maintenance (O&M) costs; the EIRR of the irrigation and drainage (IRD) component includes all joint costs related to the component. Full-cost EIRRs for each system include total project costs allocated to systems pro rata to their service area. Project EIRR includes the cost of all Project components. Only the quantifiable benefits of the irrigation component have been included. Agricultural and institutional components will substantially support the achievement of irrigation benefits and give additional benefits from improved rainfed agriculture and postharvest activities undertaken by Project beneficiaries, but these additional benefits have not been included. Barangay and access roads will also support the achievement of irrigation benefits and give additional benefits. Review of existing data and sampling of traffic flows in the Project areas suggest that any quantification of these additional benefits would be speculative and, therefore, estimates for these benefits have not been included in Project benefits.

2. The total Project life, including the seven-year implementation period, has been taken as 30 years. Prices for traded goods, at import parity, are based on World Bank price projections of November 1994 (Table 1).<sup>1</sup> Values given in 1990 constant prices are converted to 1994 constant prices by multiplying with the G-5 manufacturing unit value index of 107.32. For nontraded goods and services, the standard conversion factor (SCF) of 0.802<sup>2</sup> has been applied. A shadow wage rate of ₱54 per day is used for the economic farm labor wage instead of the prevailing hired farm labor wage of ₱60 per day.<sup>3</sup> An exchange rate of ₱25.00 per dollar has been applied as that prevailing during the period of the Appraisal Mission. Strengthening of the peso would be detrimental to Project benefits through reduction in the border parity prices of farm outputs, but the sensitivity analysis for price movements suggests that exchange rate changes will not significantly influence basic Project viability. Project costs are converted into economic prices by subtracting price contingencies and transfer payments such as duties and taxes, and applying the SCF to the local currency portion.

3. Irrigated areas have declined in each of the Project systems, but National Irrigation Administration (NIA) records do not provide a statistically significant time series trend for projection of future decline. Conservatively, therefore, the future without Project (FWO) scenario

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<sup>1</sup> World Bank, *Commodity Markets and the Developing Countries*, November 1994.

<sup>2</sup> Based on the study by the Harvard Institute for International Development for EDRC/ADB *Economic Parameters for the Appraisal of Investment Projects: Bangladesh, Indonesia and Philippines* Dec. 1993 as proposed prior to Fact-Finding.

<sup>3</sup> Based on the minimum wage rate of ₱47 per day in 1993 reported by the Department of Labor and Employment after adjusting for regional inflation rate of 7 percent per annum (source: NEDA Regional Office, Regional Statistics).

assumes that no further decline takes place. NIA data distinguish between irrigated area and "benefited area," the latter defined as having been "effectively irrigated" and achieving yields in excess of 2 t/ha, compared with rainfed yields of 2.75 t/ha. Benefit calculations, therefore, treat the irrigated but not benefited area as effectively rainfed land along with the restoration and expansion areas. The areas used for each system and the whole Project are summarized in Appendix 2. An exception has been made in the case of Guinarona river irrigation system (RIS), the diversion structure for which was destroyed in July and December 1994, and the whole system is now not irrigated. A new permanent diversion structure will be provided under the Project, and the FWO case assumes that the whole area is rainfed. However, the viability of Guinarona RIS is not dependent on this assumption, the EIRR for the system being 17.3 percent in the base case and 14.6 percent even if previous average irrigation levels are projected.

4. The crop budgets used are summarized in Table 2. Three cases for the present and FWO irrigated cases are considered. Yields for individual farmers range from as little as 2 t/ha to in excess of 5 t/ha and the Project seeks to raise the average within this range by increasing the effectiveness of irrigation and cultural practices. In two systems, Mainit and Tibak, the average yield achieved in benefited areas is high and an average of 4 t/ha is assumed. In the other systems an average of 3.7 t/ha appears representative, though this may be high for Daguitan RIS. The future with project (FW) average yield is projected at 4.1 t/ha, which is only slightly higher than the present averages of Mainit and Tibak systems and much lower than yields achieved by the "best farmers", and, on the average, representing yield increases of some 9 percent. Project viability is, however, not dependent on yield increases in the benefited area. The sensitivity analysis concludes that at present yields the EIRR would be about 15 percent because of (i) increased cropping intensity in existing irrigated areas, and (ii) both cropping intensity and yield increases in present rainfed areas to be restored to irrigation or newly included in the service area.

5. Rainfall distribution permits significant rainfed dry season cultivation, and the rainfed cropping pattern assumes 100 percent wet season paddy, 35 percent dry season paddy, and 15 percent dry season corn, a total cropping intensity of 150 percent. The FWO irrigated cropping intensities are assumed to be the same as in present situation given in Appendix 2. Based on benefited irrigation areas for each system, these range from 36 percent in Lower Binahaan to 155 percent in Bao, with an overall 121 percent consisting of 63 percent in wet season and 58 percent in dry season. When irrigation is insufficient, it is assumed that rainfed cultivation is undertaken within the service area with the same cropping pattern and intensity as the wholly rainfed land. Thus, the overall cropping intensity is 179 percent by addition of 37 percent of wet season rainfed cropping and dry season rainfed on half the 42 percent unirrigated dry season areas. The FW case projects a 180 percent irrigated cropping intensity and 10 percent rainfed cropping to give a total cropping intensity of 190 percent. The 10 percent rainfed cropping consists of 6 percent corn and 2 percent each of root crops and vegetables.

6. The Eastern Visayas Region is food deficient, and currently about 20,000 t of milled rice is shipped in annually from the neighboring regions. The additional annual paddy production is estimated at 33,900 t which is equivalent to about 25,500 t of milled rice. Therefore, all additional paddy production will be effectively consumed within the region. In the Project area, the total production of corn will be substantially unchanged. The 4 percent of the cropping pattern devoted to root crop and vegetable production should improve diets in the rural areas and any surplus may be sold in the urban areas of Ormoc and Tacloban.

7. The Project is economically viable, with an overall EIRR of 17.3 percent (Table 3). The EIRRs of individual systems, with full Project costs allocated, range from 14.8 percent in Daguitan to 21.7 percent in Binahaan South. Thus, even with full allocation of indirect and overhead Project costs each individual system remains viable, with an EIRR in excess of 14 percent. These EIRR reflect (i) the general nature of the Project as rehabilitation and improvement of existing systems, thus being able to increase effectively irrigated area at relatively low incremental unit costs, and (ii) the specific systemic advantages of the proposed rotational irrigation in substantially improving irrigation efficiency, permitting a much greater than usual increase in effectively irrigated area as a result of the improvement.

8. Sensitivity indexes (SIs) for development costs, O&M costs, irrigated area, and cropping intensity are less than 1. SIs for FW yields are 1.45 overall, but the switching values (SVs) to produce an EIRR of 12 percent require FW yields overall of 3.26 t/ha, which is below the present yields of 3.75 t/ha. Thus, while the EIRR is sensitive to yields, it is improbable that adverse yield changes will make the Project nonviable. SI for output prices is sensitive at 1.27, and the SV is 21 percent. Adopting the lowest price within the 70 percent probability band in the World Bank's price projections gives an EIRR of 9.9 percent,<sup>1</sup> which indicates the vulnerability of the Project to a large adverse change in output prices. In general, combinations of significant adverse changes in benefits and costs would be required to make the Project nonviable.

9. The Project focuses on increased irrigation efficiency through rotational irrigation, and the increased irrigated area is dependent on its success. Failure to implement and sustain rotational irrigation could reduce the benefited area by 25 percent or more, while the SV to the decrease of irrigation area is 28 percent. A large adverse change in irrigated area would make the Project much more marginal and sensitive to small changes in other factors, suggesting that the irrigated area is a major Project risk element, in addition to output prices, because of its dependence on rotational irrigation.

## **B. Financial Analysis**

10. To assess the poverty reduction impact of the Project, data from the sociotechnical profile (STP) have been used for income distribution and farm size in the present irrigated and rainfed cases. The crop budgets in Table 2 have been applied but using 1994 financial prices and using hired labor and animal power for only 20 percent of the requirement. The financial farm model allows for income from perennial crops (coconut), irrigation service fees, and real property tax by land category and quality payable to the local government. The analysis is subdivided by income groups within the Project beneficiary population rather than irrigation systems within the Project area. Cropping patterns are based on those used in the economic analysis but allow for the fact that individual farmers lands include perennial as well as arable crops and that arable land need not be exclusively either irrigated or rainfed. The STP divided income groups by bands of ₱10,000 and the boundary at ₱31,945 annual household income per year, approximates the present poverty threshold for a household of about five people.

11. For farmers who already have assured access to irrigation water and apply appropriate cultural practices, Project benefits will be negligible, and they probably already have incomes in excess of the poverty threshold. Incomes of households above the poverty level in

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<sup>1</sup> The decrease rate of corn price is applied to sweet potato and vegetables, because projections are not available for them.



existing systems should increase by 20-40 percent. Project impact will be greatest on the poorest farmers, dependent on small arable plots of rainfed or poorly irrigated land for most of their incomes. For those with household incomes presently below ₱10,000 the increases in irrigated area, cropping intensity, and yield should increase incomes by over 200 percent. This focuses Project impact on the poorest households, so that the poverty reduction impact is increased.

12. The large difference in income per unit area of various income groups under the FWO condition can be explained by the status of current irrigation supplies. Most of the low-income farmers are located in areas where irrigation is inadequate, while higher income farmers enjoy better irrigation supplies. Therefore, both yields and cropping intensities are higher for areas with better irrigation supplies. In the case of currently rainfed areas, high-income farmers are considered to have larger off-farm incomes from perennial crop areas (the farm size does not include perennial crop areas, which constitute mainly coconut plantations).

13. At present, differences in per hectare income from the farms located in the irrigation service areas are due mainly to variations in the irrigation supplies in terms of quantity and timeliness. Under the FW scenario, all Project areas are expected to be adequately irrigated. Therefore, under the FW conditions, the differences in per hectare incomes will reduce.

14. At present, 72 percent of households in the Project area are below the poverty threshold; the Project will reduce this to some 42 percent. At present, 22 percent have incomes below ₱10,000, one third of the poverty threshold; the Project would reduce this to about 4 percent — those on the smallest plots and least productive land. Incomes of tenant (lease holders and share-tenant) farmers, which account for 52 percent of total farmers, will also increase substantially. The income of an average size farm of 1.2 ha is estimated to increase by 25-65 percent depending upon the type of the tenurial arrangements and the current state of irrigation supplies. While the owner farmers will receive the entire incremental income due to the Project, the leaseholders will receive about 80 percent and the share-tenants about 67 percent of the incremental income.

Table 1: Economic Prices of Outputs and Inputs, 1994–2005, at 1994 Prices

RICE (@ import parity)					UREA (@ import parity)				
	Units	1995	2000	2005		Units	1995	2000	2005
WB price (1990 constant) <sup>a</sup>	\$/t	298	271	268	WB price (1990 constant) <sup>f</sup>	\$/t	135	144	140
WB price (1994 constant) <sup>a</sup>	\$/t	320	291	28	WB price (1994 constant) <sup>f</sup>	\$/t	145	155	150
Quality factor <sup>b</sup>		0.80	0.80	0.80	Freight, insurance etc.	\$/t	53	53	53
Quality adjusted price	\$/t	256	233	230	CIF Manila	\$/t	198	208	203
Freight, insurance etc.	\$/t	37	37	37	CIF Manila (in pesos) 25.00	P/t	4,947	5,189	5,081
CIF Manila	\$/t	293	270	267	Plus handling	P/t	79	79	79
CIF Manila (in pesos) 25.00	P/t	7,321	6,742	6,677	Freight to Tacloban market	P/t		261	261
Plus handling	P/t	79	79	79	Tacloban price	P/t	5,288	5,529	5,422
Freight to Tacloban market	P/t	261	261	261	Transport & dealer's margin	P/t	372	382	378
Local market price	P/t	7,662	7,082	7,018	Farmgate price of urea	P/t	5,680	5,911	5,799
Transport mill to market	P/t	80	80	80	Farmgate price of urea	P/kg	5.66	5.91	5.80
Ex-mill price	P/t	7,582	7,002	6,938	Farmgate price of nitrogen	P/kg	12.58	13.14	12.89
Less milling costs & margin	P/t	642	642	642					
Mill price	P/t	6,940	6,360	6,296	TSP (@ import parity)				
Processing ratio = 0.65	P/t	4,511	4,134	4,092		Units	1995	2000	2005
Plus value of by products <sup>c</sup>	P/t	315	315	315	WB \$ price (1990 constant) <sup>g</sup>	\$/t	124	133	129
Equivalent price of paddy	P/t	4,826	4,449	4,407	WB \$ price (1994 constant) <sup>g</sup>	\$/t	133	143	138
Less handling to mill	P/t	48	48	48	Freight, insurance etc.	\$/t	54	54	54
Farmgate price of paddy	P/t	4,778	4,401	4,359	CIF Manila	\$/t	187	197	192
Farmgate price of paddy	P/kg	4.78	4.40	4.36	CIF Manila (in pesos) 25.00	P/t	4,677	4,918	4,811
CORN (@ import parity)					Plus handling	P/t	79	79	79
	Units	1995	2000	2005	Freight to Tacloban market	P/t	261	261	261
WB price (1990 constant) <sup>d</sup>	\$/t	98	99	91	Tacloban price	P/t	5,017	5,259	5,152
WB price (1994 constant) <sup>d</sup>	\$/t	105	106	98	Transport & dealer's margin	P/t	362	371	367
Freight, insurance etc.	\$/t	54	54	54	Farmgate price of TSP	P/t	5,379	5,630	5,518
CIF Manila	\$/t	159	160	152	Farmgate price of TSP	P/kg	5.38	5.63	5.52
CIF Manila (in pesos) 25.00	P/t	3,979	4,006	3,792	Farmgate price of P <sub>2</sub> O <sub>5</sub>	P/kg	11.95	12.51	12.26
Plus handling	P/t	79	79	79					
Freight to Tacloban market	P/t	261	261	261	Muriate of Potash (@ imp. parity)				
Local market price	P/t	4,320	4,347	4,132		Units	1995	2000	2005
Transport mill to market	P/t	80	80	80	WB price (1990 constant) <sup>h</sup>	\$/t	99	107	103
Price at market	P/t	4,400	4,427	4,212	WB price (1994 constant) <sup>h</sup>	\$/t	106	115	111
Transport to market	P/t	128	128	128	Freight, insurance etc.	\$/t	54	54	54
Farmgate price of corn	P/t	4,272	4,299	4,084	CIF Manila	\$/t	160	169	165
Farmgate price of corn	P/kg	4.27	4.30	4.08	CIF Manila (in pesos) 25.00	P/t	4,006	4,221	4,113
SUGAR (@ import parity)					Plus handling	P/t	79	79	79
	Units	1995	2000	2005	Freight to Tacloban market	P/t	261	261	261
WB price (1990 constant) <sup>e</sup>	\$/t	243	254	262	Tacloban price	P/t	4,347	4,561	4,454
WB price (1994 constant) <sup>e</sup>	\$/t	261	273	281	Transport & dealer's margin	P/t	335	343	339
Freight, insurance etc.	\$/t	54	54	54	Farmgate price of MP	P/t	4,681	4,905	4,793
CIF Manila	\$/t	315	327	335	Farmgate price of MP	P/t	4.68	4.90	4.79
CIF Manila (in pesos) 25.00	P/t	7,870	8,165	8,379	Farmgate price of K <sub>2</sub> O	P/kg	8.51	8.92	8.71
Freight Ormoc – Manila	P/t	241	241	241					
Ex-mill price	P/t	7,629	7,924	8,139	ECONOMIC PRICE OF				
Less milling costs & margin	P/t	2,080	2,161	2,219	14–14–14	Units	1995	2000	2005
Mill price : Sugar : mt	P/t	5,549	5,763	5,920	Compound : 14–14–14 <sup>i</sup>	P/kg	5.09	5.32	5.22
Mill price : Sugar : pical	P/t	351	365	374					
Mill price : Cane @ 8.5%	P/t	470	488	502	ECONOMIC PRICES OF PESTICIDES				
Less handling to mill	P/t	40	40	40		Units	1995	2000	2005
Farmgate price of cane	P/t	430	448	462	OPEC Oil price per barrel <sup>j</sup>	\$/bbl	14	18	17
Farmgate price of sugar	P/t	5,076	5,290	5,446	index : 1994 = 100		99.29	125.00	121.43
					Agrochemical Index		91.82	101.08	99.79

<sup>a</sup> White, milled, 5 percent broken, Government standard, Board of Trade posted export price, f.o.b. Bangkok.

<sup>b</sup> Based on prices of 35 percent broken, f.o.b. Bangkok. Reference price as of end of January 1995 was about \$220/t, while that of 5 percent broken was about \$280/t.

<sup>c</sup> Includes broken rice (1 percent of paddy) and bran (10 percent).

<sup>d</sup> US No. 2 yellow, f.o.b. Gulf ports.

<sup>e</sup> Any origin, bagged, f.o.b. N.W. Europe.

<sup>f</sup> Bulk, f.o.b. Vancouver.

<sup>g</sup> Based on per kg costs of N, P<sub>2</sub>O<sub>5</sub>, K<sub>2</sub>O with an additional 10 per cent for mixing

<sup>h</sup> Average OPEC prices: OPEC spot prices weighted by OPEC export volumes.

<sup>i</sup> Notes: 1. All domestic costs are adjusted by SCF of 0.802.

2. World Bank's projections are available for 1994, 1995, 1996, 2000, and 2005. Exponential extrapolation was used in the intervals 1997–1999 and 2001–2004.

Source: Staff estimates

Table 2: Crop Budgets for One Hectare

Item		Paddy														
		Present and FWO												Future Irrigated		
		Rainfed			Irrigated											
					Low			Medium			High					
		Phys	Finan	Econ	Phys	Finan	Econ	Phys	Finan	Econ	Phys	Finan	Econ	Phys	Finan	Econ
		Units	Peso	Peso	Units	Peso	Peso	Units	Peso	Peso	Units	Peso	Peso	Units	Peso	Peso
Output																
Yield	kg	2,750	13,750	11,988	3,200	16,000	13,950	3,700	18,500	16,129	4,000	20,000	17,437	4,100	20,500	17,873
Costs																
Fertilizer																
Urea	kg	25	138	145	50	275	290	100	550	580	100	550	580	100	550	580
Complete	kg	50	260	281	100	520	522	100	520	522	150	780	782	150	780	782
Pesticides	P	200	200	200	400	400	399	800	600	599	800	800	798	800	800	798
Seeds	kg	75	500	401	75	500	401	75	500	401	75	500	401	75	500	401
Labor																
Plowing	p.a.d	8	182	731	8	182	731	8	182	731	8	182	731	8	182	731
Harrowing	p.a.d	7	160	640	7	160	640	7	160	640	7	160	640	7	160	640
Leveling	p.a.d	4	91	366	4	91	366	4	91	366	4	91	366	4	91	366
Seeding estab.	pd	4	43	173	4	43	173	4	43	173	4	43	173	4	43	173
Transplanting	pd	20	216	866	22	238	953	24	259	1,039	25	270	1,083	25	270	1,083
Tending	pd	30	324	1,299	30	324	1,299	33	356	1,429	35	378	1,516	37	400	1,802
Harvest/Thresh	pd	20	216	866	24	259	1,039	26	281	1,126	28	302	1,213	30	324	1,299
Total	pd	93	1,232	4,942	99	1,297	5,202	106	1,373	5,505	111	1,427	5,721	115	1,470	5,895
Hired Labor	%	20%			20%			20%			20%			20%		
Total Costs			2,330	5,948		2,992	8,813		3,543	7,606		4,056	8,283		4,100	8,456
Net Returns			11,420	6,040		13,008	7,136		14,957	8,523		15,944	9,154		16,400	9,417
Returns/Person-day			128	108		135	116		148	124		148	126		148	125
		Corn			Sugar			Sweet Potato			Vegetables					
Item											Tomato			Squash		
		Phys	Finan	Econ	Phys	Finan	Econ	Phys	Finan	Econ	Phys	Finan	Econ	Phys	Finan	Econ
		Units	Peso	Peso	Units	Peso	Peso	Units	Peso	Peso	Units	Peso	Peso	Units	Peso	Peso
Output																
Yield	kg	2,500	11,250	10,210	55,000	38,538	25,389	6,000	19,200	19,200	12,000	60,000	60,000	12,000	38,400	38,400
Costs																
Fertilizer																
Urea	kg	100	550	580	250	1,375	1,450	100	550	580	200	1,100	1,160	100	550	580
Complete	kg	100	520	522	250	1,299	1,304	100	520	522	300	1,559	1,565	100	520	522
Pesticides	P	400	400	399	300	300	299	0	0	0	3,000	3,000	2,994	1,400	1,400	1,397
Shelling	P	600	600	481												
Seeds	kg/cut	20	700	561	7,500	1,875	1,504	0	0	0	20	3,000	2,406	20	3,000	2,406
Labor																
Plowing	p.a.d	8	182	731	Tractor	1,000	802	10	228	914	20	456	1,829	10	228	914
Harrowing	p.a.d	6	137	549	Tractor	1,000	802	6	137	549	10	228	914	6	137	549
Furrowing	p.a.d	2	46	183	Tractor	250	201	2	22	183	10	108	914	2	22	183
Planting	pd	10	108	433	8	86	432	22	238	953	35	378	1,516	22	238	953
Tending	pd	30	324	1,299	90	972	4,860	30	324	1,299	65	702	2,815	30	324	1,299
Harvesting	pd	15	162	650	31	335	1,674	30	324	1,299	40	432	1,732	30	324	1,299
Total	pd	71	959	3,845	129	3,643	8,771	100	1,272	5,197	180	2,304	9,720	100	1,272	5,197
Hired Labor	%	20%			20%			20%			20%			20%		
Total Costs			3,729	6,388		8,493	13,327		2,342	6,298		10,963	17,845		6,742	10,102
Net Returns			7,521	3,822		30,046	12,061		16,858	12,902		49,037	42,155		31,658	28,298
Returns/Person-day			108	96		261	161		172	171		275	278		320	325

- Notes : 1. Abbreviations used : pd = person day, p.a.d. = person/animal day, cut = cuttings.  
2. Sugar is based on 3 ratoon crops and land preparation costs are averaged over 4 years.  
3. Crop budgets other than paddy are unchanged between FW and FWO cases.

Source: Staff estimates based on World Bank, Commodity Markets and the Developing Countries, November 1994.

Table 3: Economic Returns  
(Peso million)

Year	Bao			Mainit			Tibak			Binahaan North			Binahaan South		
	Incremental Benefits	Project Costs	Net Benefits	Incremental Benefits	Project Costs	Net Benefits	Incremental Benefits	Incremental Benefits	Project Costs	Net Benefits	Incremental Benefits	Project Costs	Net Benefits	Project Costs	Net Benefits
1995	0.00	1.05	(1.05)	0.00	0.76	(0.76)	0.00	0.82	(0.82)	0.00	0.86	(0.86)	0.00	0.91	(0.91)
1996	0.00	17.92	(17.92)	0.00	11.96	(11.96)	0.00	12.34	(12.34)	0.00	14.61	(14.61)	0.00	13.30	(13.30)
1997	0.00	13.84	(13.84)	0.00	9.88	(9.88)	0.00	9.35	(9.35)	0.00	11.27	(11.27)	0.00	9.24	(9.24)
1998	0.00	25.41	(25.41)	0.00	16.63	(16.63)	0.00	14.43	(14.43)	0.00	18.78	(18.78)	0.00	15.33	(15.33)
1999	2.29	30.08	(27.79)	1.05	20.82	(19.77)	2.20	22.14	(19.94)	2.32	27.64	(25.33)	2.06	20.75	(18.69)
2000	2.29	24.75	(22.46)	1.05	17.00	(15.95)	2.20	17.81	(15.60)	2.31	22.77	(20.46)	2.06	16.02	(13.96)
2001	5.43	10.47	(5.04)	4.89	7.22	(2.33)	7.38	9.37	(2.00)	6.65	9.28	(2.63)	8.03	10.10	(2.07)
2002	15.79	6.16	9.63	12.07	4.33	7.74	16.20	5.78	10.42	15.85	5.53	10.32	18.23	6.05	12.17
2003	24.47	1.20	23.27	17.87	0.81	17.06	23.13	1.02	22.11	23.53	1.08	22.45	26.56	1.15	25.41
2004	31.04	1.20	29.84	21.90	0.81	21.09	28.09	1.02	27.07	29.31	1.08	28.23	32.88	1.15	31.73
2005	34.47	1.20	33.27	24.18	0.81	23.37	30.62	1.02	29.61	32.39	1.08	31.31	36.17	1.15	35.02
2006	34.47	1.20	33.27	24.18	0.81	23.37	30.62	1.02	29.61	32.39	1.08	31.31	36.17	1.15	35.02
2007	34.47	1.20	33.27	24.18	0.81	23.37	30.62	1.02	29.61	32.39	1.08	31.31	36.17	1.15	35.02
2008	34.47	1.20	33.27	24.18	0.81	23.37	30.63	1.02	29.61	32.39	1.08	31.31	36.17	1.15	35.02
2009	34.47	1.20	33.27	24.18	0.81	23.37	30.63	1.02	29.61	32.39	1.08	31.31	36.17	1.15	35.02
2010	34.47	1.20	33.27	24.18	0.81	23.37	30.63	1.02	29.61	32.39	1.08	31.31	36.17	1.15	35.02
2011	34.47	1.20	33.27	24.18	0.81	23.37	30.63	1.02	29.61	32.39	1.08	31.31	36.17	1.15	35.02
2012	34.47	1.20	33.27	24.18	0.81	23.37	30.63	1.02	29.61	32.39	1.08	31.31	36.17	1.15	35.02
2013	34.47	1.20	33.27	24.18	0.81	23.37	30.63	1.02	29.61	32.39	1.08	31.31	36.17	1.15	35.02
2014	34.47	1.20	33.27	24.18	0.81	23.37	30.63	1.02	29.61	32.39	1.08	31.31	36.17	1.15	35.02
2015	34.47	1.20	33.27	24.18	0.81	23.37	30.63	1.02	29.61	32.39	1.08	31.31	36.17	1.15	35.02
2016	34.47	1.20	33.27	24.18	0.81	23.37	30.63	1.02	29.61	32.39	1.08	31.31	36.17	1.15	35.02
2017	34.47	1.20	33.27	24.18	0.81	23.37	30.63	1.02	29.61	32.39	1.08	31.31	36.17	1.15	35.02
2018	34.47	1.20	33.27	24.18	0.81	23.37	30.63	1.02	29.61	32.39	1.08	31.31	36.17	1.15	35.02
2019	34.47	1.20	33.27	24.18	0.81	23.37	30.63	1.02	29.61	32.39	1.08	31.31	36.17	1.15	35.02
2020	34.47	1.20	33.27	24.18	0.81	23.37	30.63	1.02	29.61	32.39	1.08	31.31	36.17	1.15	35.02
2021	34.47	1.20	33.27	24.18	0.81	23.37	30.63	1.02	29.61	32.39	1.08	31.31	36.17	1.15	35.02
2022	34.47	1.20	33.27	24.18	0.81	23.37	30.63	1.02	29.61	32.39	1.08	31.31	36.17	1.15	35.02
2023	34.47	1.20	33.27	24.18	0.81	23.37	30.63	1.02	29.61	32.39	1.08	31.31	36.17	1.15	35.02
2024	34.47	1.20	33.27	24.18	0.81	23.37	30.63	1.02	29.61	32.39	1.08	31.31	36.17	1.15	35.02
2025	34.47	1.20	33.27	24.18	0.81	23.37	30.63	1.02	29.61	32.39	1.08	31.31	36.17	1.15	35.02
	EIRR = 15.9%			EIRR = 16.4%			EIRR = 19.7%			EIRR = 17.5%			EIRR = 21.7%		
Year	Lower Binahaan			Guinarona			Daguitan			Bito			Total Project		
	Incremental Benefits	Project Costs	Net Benefits	Incremental Benefits	Project Costs	Net Benefits	Incremental Benefits	Incremental Benefits	Project Costs	Net Benefits	Incremental Benefits	Project Costs	Net Benefits	Project Costs	Net Benefits
1995	0.00	0.96	(0.96)	0.00	0.54	(0.54)	0.00	0.47	(0.47)	0.00	0.79	(0.79)	0.00	7.16	(7.16)
1996	0.00	22.60	(22.60)	0.00	15.42	(15.42)	0.00	10.89	(10.89)	0.00	11.35	(11.35)	0.00	130.40	(130.40)
1997	0.00	20.65	(20.65)	0.78	11.54	(10.77)	0.00	10.10	(10.10)	0.00	9.03	(9.03)	0.78	104.91	(104.14)
1998	0.00	13.63	(13.63)	0.76	9.16	(8.39)	0.00	16.56	(16.56)	0.00	14.57	(14.57)	0.76	144.49	(143.73)
1999	1.78	16.69	(14.91)	2.54	8.24	(5.70)	2.00	15.70	(13.71)	1.15	17.83	(16.68)	17.39	179.92	(162.53)
2000	4.14	13.28	(9.14)	3.67	6.74	(3.07)	2.50	12.23	(9.74)	1.15	14.33	(13.18)	21.38	144.93	(123.55)
2001	8.48	6.12	2.36	5.79	2.25	3.54	5.20	4.80	0.40	3.90	9.48	(5.58)	55.75	69.10	(13.34)
2002	14.69	3.55	11.14	8.84	1.29	7.54	9.42	2.94	6.48	10.69	5.73	4.96	121.78	41.37	80.41
2003	19.75	0.72	19.03	11.31	0.37	10.95	12.88	0.52	12.35	16.63	0.80	15.82	176.13	7.67	168.46
2004	23.60	0.72	22.88	13.20	0.37	12.83	15.49	0.52	14.97	21.04	0.80	20.23	216.55	7.67	208.88
2005	25.56	0.72	24.85	14.16	0.37	13.79	16.86	0.52	16.34	23.53	0.80	22.73	237.95	7.67	230.28
2006	25.56	0.72	24.85	14.16	0.37	13.79	16.86	0.52	16.34	23.53	0.80	22.73	237.95	7.67	230.28
2007	25.56	0.72	24.85	14.16	0.37	13.79	16.86	0.52	16.34	23.53	0.80	22.73	237.95	7.67	230.28
2008	25.56	0.72	24.85	14.16	0.37	13.79	16.86	0.52	16.34	23.53	0.80	22.73	237.95	7.67	230.28
2009	25.56	0.72	24.85	14.16	0.37	13.79	16.86	0.52	16.34	23.53	0.80	22.73	237.95	7.67	230.28
2010	25.56	0.72	24.85	14.16	0.37	13.79	16.86	0.52	16.34	23.53	0.80	22.73	237.95	7.67	230.28
2011	25.56	0.72	24.85	14.16	0.37	13.79	16.86	0.52	16.34	23.53	0.80	22.73	237.95	7.67	230.28
2012	25.56	0.72	24.85	14.16	0.37	13.79	16.86	0.52	16.34	23.53	0.80	22.73	237.95	7.67	230.28
2013	25.56	0.72	24.85	14.16	0.37	13.79	16.86	0.52	16.34	23.53	0.80	22.73	237.95	7.67	230.28
2014	25.56	0.72	24.85	14.16	0.37	13.79	16.86	0.52	16.34	23.53	0.80	22.73	237.95	7.67	230.28
2015	25.56	0.72	24.85	14.16	0.37	13.79	16.86	0.52	16.34	23.53	0.80	22.73	237.95	7.67	230.28
2016	25.56	0.72	24.85	14.16	0.37	13.79	16.86	0.52	16.34	23.53	0.80	22.73	237.95	7.67	230.28
2017	25.56	0.72	24.85	14.16	0.37	13.79	16.86	0.52	16.34	23.53	0.80	22.73	237.95	7.67	230.28
2018	25.56	0.72	24.85	14.16	0.37	13.79	16.86	0.52	16.34	23.53	0.80	22.73	237.95	7.67	230.28
2019	25.56	0.72	24.85	14.16	0.37	13.79	16.86	0.52	16.34	23.53	0.80	22.73	237.95	7.67	230.28
2020	25.56	0.72	24.85	14.16	0.37	13.79	16.86	0.52	16.34	23.53	0.80	22.73	237.95	7.67	230.28
2021	25.56	0.72	24.85	14.16	0.37	13.79	16.86	0.52	16.34	23.53	0.80	22.73	237.95	7.67	230.28
2022	25.56	0.72	24.85	14.16	0.37	13.79	16.86	0.52	16.34	23.53	0.80	22.73	237.95	7.67	230.28
2023	25.56	0.72	24.85	14.16	0.37	13.79	16.86	0.52	16.34	23.53	0.80	22.73	237.95	7.67	230.28
2024	25.56	0.72	24.85	14.16	0.37	13.79	16.86	0.52	16.34	23.53	0.80	22.73	237.95	7.67	230.28
2025	25.56	0.72	24.85	14.16	0.37	13.79	16.86	0.52	16.34	23.53	0.80	22.73	237.95	7.67	230.28
	EIRR = 15.7%			EIRR = 16.2%			EIRR = 14.8%			EIRR = 16.8%			EIRR = 17.3%		

Source: Staff estimates