

f) O&M fund for Soil Conservation Extension Center and demonstration fields

Minimum maintenance cost of the Center building, and routine O&M requirement consisting of staff salary, vehicle operation, instrument for nursery operation, and other office expenses shall be borne by PENRO through DENR Regional office in principle. Necessary expenses for the extension activities of soil conservation, such as procurement of forest seed/nursery and farm tools, training requirements, and other activities, as well as irrigation cost for nursery shall be provided by the beneficiaries. Meanwhile, the beneficiaries applied Certificate of Stewardship Contract (CSC) are able to utilize the financial support of ISFP system.

g) O&M fund for rural water supply system

Municipal governments and BWSAs are responsible for financial O&M support of the rural water supply system.

3.3 Institutional Framework of O&M Agencies

Constitutional process to establish and strengthen proposed O&M agencies for each project component are described as follows.

1) Irrigation facilities

IAs are responsible for O&M of the irrigation facilities. IAs in the Project area are proposed to establish two associations, viz., Nagcarlan IA and Liliw IA. IAs shall assess its organization set-up with corresponding function of the personnel with managerial assistance by Irrigation Development Officer (IDO), NIA Regional office. NIA Regional office and Municipal governments will assist preparation of seminar implementation, IAs' inventories, etc. Annual post evaluation report shall be prepared by IAs. Re-planning of farming practices and re-organization of system management in relation to the revised duties and responsibilities are simultaneously necessary to maintain IAs' activities. NIA is responsible for coordinate overall IAs' activities in collaboration with Municipal governments. To proceed initial system management by IAs, the following personnel and committees are proposed: Structural organization chart of IAs is shown in Fig. XI.3.3.

I. Personnel	II. Committees
i) President	i) Irrigation Management Committee
ii) Vice President	ii) Training Committee
iii) Secretary	iii) Monitoring and evaluation/planning Committee
iv) Treasurer	
v) Operations manager	

2) Farm to market roads

Proposed roads are composed of the Provincial roads and the Barangay roads. O&M cost for these roads are borne by the governments of Province and Municipalities. Provincial Engineering Office is responsible for supervision and control of the maintenance, improvement and repair works of the Provincial roads, and also exercises technical supervision over all engineering offices of related Municipalities. Municipal Engineering Offices are responsible for the maintenance works of the proposed Barangay roads. Prior to the completion of the road construction works, Provincial and Municipal governments shall estimate and demarcate the necessary O&M funds.

3) Trading posts

Marketing cooperatives shall be registered in line with the Cooperative Law with technical assistance of the Cooperative Development Authority (CDA) prior to the completion of the construction works. In each Municipality, Cooperative Board comprising of representatives of several cooperatives shall be established under the supervision of the present Municipal Agricultural Officer (MAO). MAO is in charge of the coordination of cooperatives' activities and other managerial support for each cooperative. Cooperative Boards is responsible for:

- i) coordination of organizational plan of cooperatives between cooperatives' member and MAO,
- ii) resolution of agreement among marketing cooperatives,
- iii) bargaining of vegetable transaction with traders, provision of marketing information,
- iv) regulation of managerial marketing activities amongst cooperatives, and
- v) negotiation of maintenance plan of trading posts with related Municipal government, etc.

Furthermore, establishment of Cooperative Federation comprising of Cooperative Boards of three relevant Municipalities is recommended with its functional roles of:

- i) resolution of collective agreement in overall Cooperative Boards,
- ii) collective bargaining of vegetable transaction with traders,
- iii) unification of cooperatives' services, e.g., marketing research, exchange of marketing information, and
- iv) formulation of shipping system, etc.

Structural organization of marketing cooperatives, Cooperative Boards and Cooperative Federation is charted in Fig. XI.3.4.

4) Upland Horticulture and Irrigation Technology Center

The proposed Upland Horticulture and Irrigation Technology Center will be operated and maintained by DA Region IV office with close cooperation of the related Municipal governments, UPLB, NIA and NGOs. DA Region IV office will organize following unit for proper operation and maintenance:

a) Agricultural training/extension unit

The unit is responsible for training of agricultural extension works, extension and transferring of appropriate farming practice, and introduction of suitable vegetable varieties, etc., to the farmers. Multiplication of vegetable seeds and soil tests are also conducted by the unit.

b) Irrigation training unit

The unit is responsible for introduction of modern on-farm irrigation methods through a training of agricultural extension works, operation and maintenance of proposed irrigation system in the demonstration farm and green houses, etc.

c) Monitoring unit

The unit is responsible for monitoring and evaluation of farmers' activities. In addition, the unit determines the operational direction of the Center in conformity with beneficiaries' needs. Meteorological data collection and analysis are also conducted by the unit.

The unit member is composed of permanent and temporary engineers/specialists from DA Regional office, including its staff Bureau of Agricultural Research (BAR), UPLB (Department of Horticulture), Provincial Agricultural Office (PAO), Municipal Agricultural Offices (MAOs) and NIA.

The activities in the proposed Center are expected to accelerate lead roles of state colleges and universities (SCUs), e.g., UPLB and Laguna State Polytechnique College in technology generation, and also to strengthen DA research and extension organizational structure, to maintain linkages with Non-Governmental Organizations (NGOs), such as Philippines Uplands Resources Center (PURC). As illustrated in Fig. XI.3.5, managerial organization is composed of Director and engineers/specialists belonging to the said three units. Provincial and Municipal agricultural offices, NIA, UPLB, Laguna State Polytechnique College and NGOs connected to the Project shall occasionally send engineers, specialists and research workers in response to the request of the Center. Total of seven permanent staffs and 500 man/day temporary engineers, specialists and research workers will be required for the O&M of the Center.

5) Soil Conservation Extension Center/demonstration fields

PENRO Laguna is responsible for O&M of the Soil Conservation Extension Center including demonstration field of soil conservation measures. On the other hand, DENR Regional office is responsible for evaluation of environmental impact documents and an application for the critical environmental area.

It is recommended that DENR Regional office promotes soil conservation project, aiming at an acceleration and extension of soil conservation measures in the Project area. At present, PENRO Laguna has already commenced the ISF program in the Public Forest lands in the Municipality of Liliw. The proposed facilities and O&M equipment of the Project are planned in conformity with the requirements of soil conservation and reforestation program of DENR (PENRO). Total of three permanent staffs and 1,250 man/day labor force for nursery operation will be required for the O&M of the Center. Managerial coordination chart between on-going ISF programs by PENRO Laguna, CENRO Los Baños, and proposed Soil Conservation Extension Center including demonstration fields is shown in Fig. XI.3.6.

6) Rural water supply facilities

The proposed rehabilitation works for the rural water supply systems (RWSSs) are to be carried out concentrating on the intake portions of existing facilities of Abo RWSS in Nagcarlan and Gawanán RWSS in Liliw, aiming at the urgent recovering/improvement from present water conveyance and hydraulic malfunctions. Water supply facilities to be rehabilitated are presently maintained by the Municipal governments and BWSAs. Accordingly, Municipal governments and BWSAs will successively undertake the O&M activities of the water supply systems.

Existing rural water supply systems have common problems such as water leakage and malfunction of flow control devices, that further improvement, such as pipe replacement of the whole water systems should be undertaken by the BWSAs and the Municipal governments. Because of the poor financial backbone of BWSAs, hence, Municipal governments should provide technical and financial supports to conduct the said improvement works for BWSAs.

Required personnel for prospective O&M activities are summarized in Table XI.3.1.

Table XI.3.1

Required Personnel for O&M

(1/2)

Irrigation	Required Personnel	IAs		NIA Regional Office	Municipalities
		Nagcarlan IA	Liliw IA		
	Irrigation Board			1 (Irrigation dev't officer and irrigation engineers)	Engineering officers
	President	1	1		
	Vice President	1	1		
	Secretary	1	1		
	Treasurer	1	1		
	Operation Manager	1	1		
	Committees - Irrigation Management - Training - Monitoring and Evaluation Planning	representative from each Barangays			

All of expenditures for O&M activities shall be borne by IAs. All labor works are voluntarily provided. Personnel expenditures of NIA and Municipalities are borne by each office allocated from annual ordinary budget.

Roads	Road classification	Province	Municipalities
	Provincial roads	Provincial Engineering officers	
	Barangay roads		Municipal Engineering officers of each Municipality

Personnel expenditures shall be borne by each government, and allocated from annual ordinal budget. Additional fund and engineers for periodical works are not required.

Trading posts					
	Required personnel	Marketing Cooperatives		Municipalities	CDA
		(A)	(B)		
	Chair man	1		Municipal Agricultural Officers (MAOs)	Cooperative Officer
	Vice Chairman	1	1		
	Manager	1			
	Assistant Manager		1		
	Staff				
	Clerk	1			
	Cashier	1			
	Book Keeper	1			
	Training Staff	2	2		
	Marketing Staff	2	2		
	Committees				
	Audit & Inventory	2			
	Credit & Collection	2			
	Planning & Training	2			
	Election	2			
	Marketing		3		
	(Labors)	<u>5x60days</u>	<u>5x60days</u>		

Necessary expenses for O&M activities of cooperatives shall be borne by cooperative dues. Personnel expenditures for technical assistance for cooperatives by governmental officers shall be borne by each government, and additional fund and officer are not required. Personnel expenditure for marketing staff and labor, which are underlined, shall be paid, while other personnel are voluntarily assist the cooperatives works.

Table XI.3.1 Required Personnel for O&M

(2/2)

Upland Horticulture and Irrigation Technology Center			
Required personnel	DA Regional Office	Related governmental agencies	
Director	<u>1</u>	Provincial government Municipal governments NIA UPLB NGOs	
Unit Engineers			
Agricultural training	<u>2</u>		
Irrigation training	<u>2</u>		
Monitoring	<u>2</u>		
Administrative staff	<u>2</u>		
Trainer/lecturer	<u>5(x100days)</u>	Trainer/lecturer	occasionally
(Labors: demo-farm care)	<u>6(x250days)</u>		

All of personnel expenditure and office expenses shall be paid by DA Regional office.

Soil Conservation Extension Center			
Required personnel	PENRO (CENRO)	DENR Regional Office	Municipality
Director	<u>1</u>	Planning & extension engineers	Agricultural officers
Agricultural engineer	<u>1</u>		
Extension engineer	<u>2</u>		
Administrative staff	<u>1</u>		
(Labors: nursery care)	<u>5(x200days)</u>		

All of the personnel expenditure, which is underlined, and office expenses shall be paid by DENR Regional office. DENR Regional office and Municipal governments shall provide representatives to EEU. Necessary fund for EEU activities, including personnel expenditure shall be properly allocated from annual ordinary budget of each government.

- (A) Marketing cooperatives newly established
- (B) Marketing cooperatives combined in existing cooperatives, such as multi-purpose cooperatives, etc.

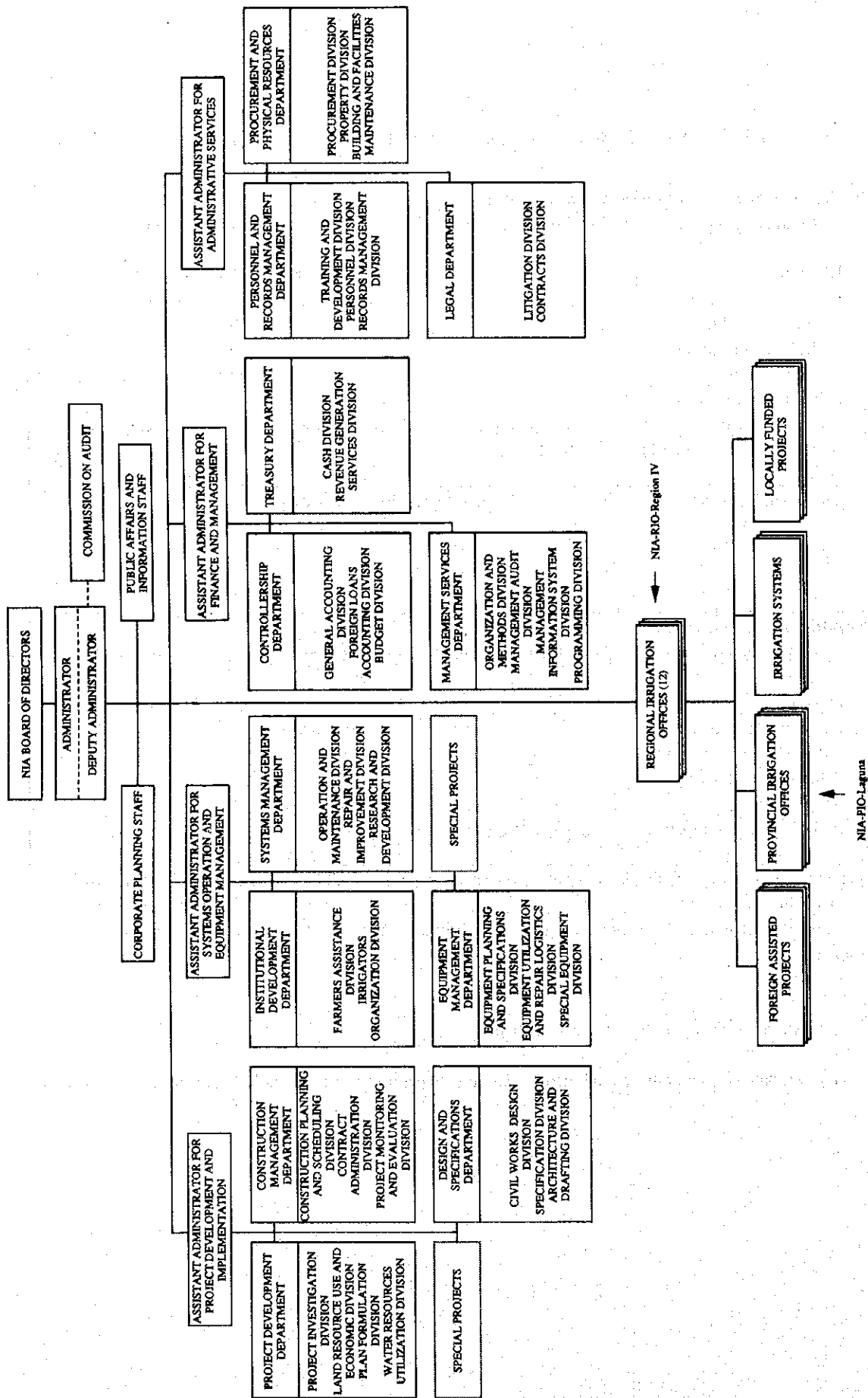


Fig. XI.1.1 Organization Chart of National Irrigation Administration

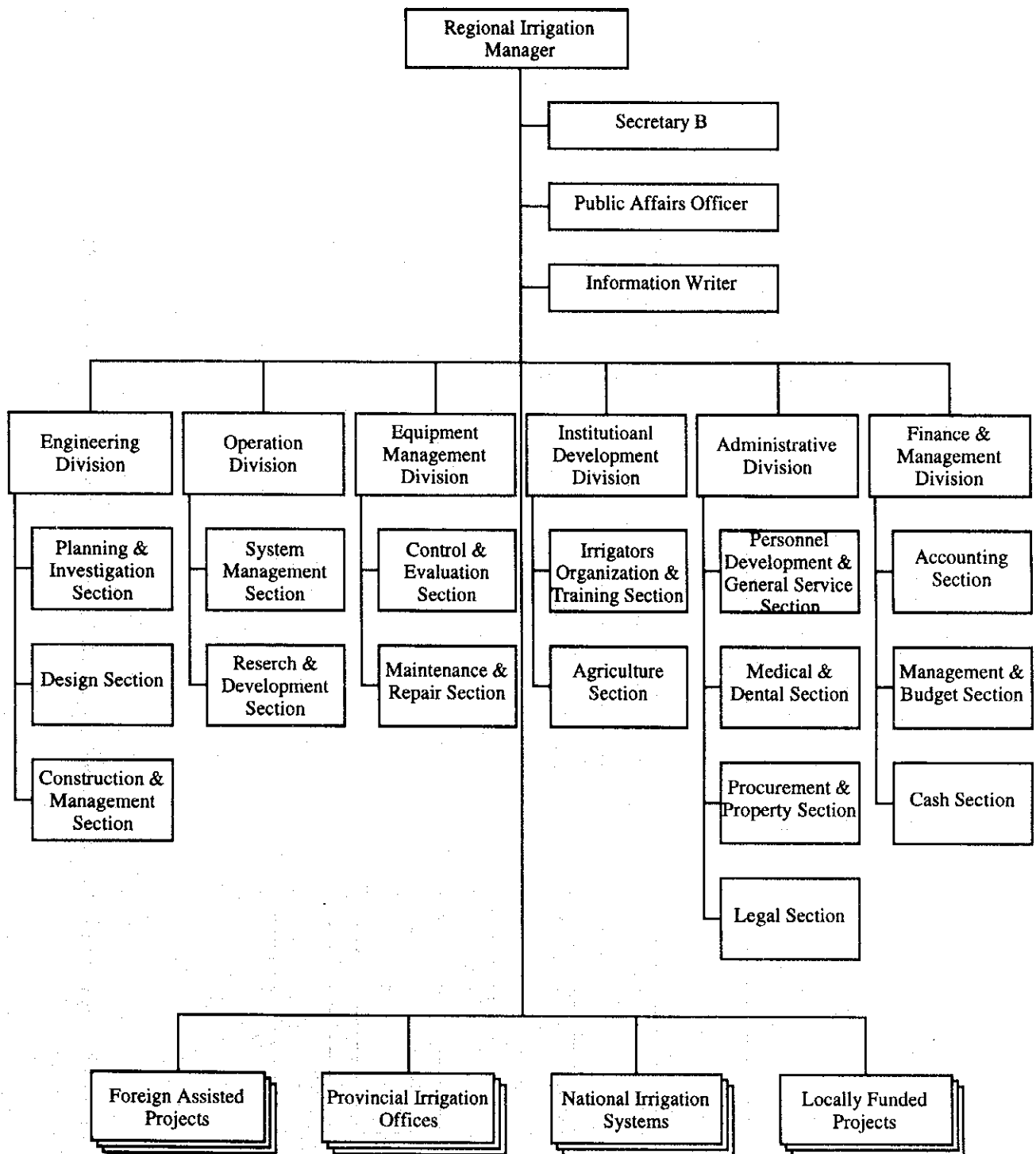


Fig. XI.1.2 Organization Chart of Regional Irrigation Office of National Irrigation Administration Office

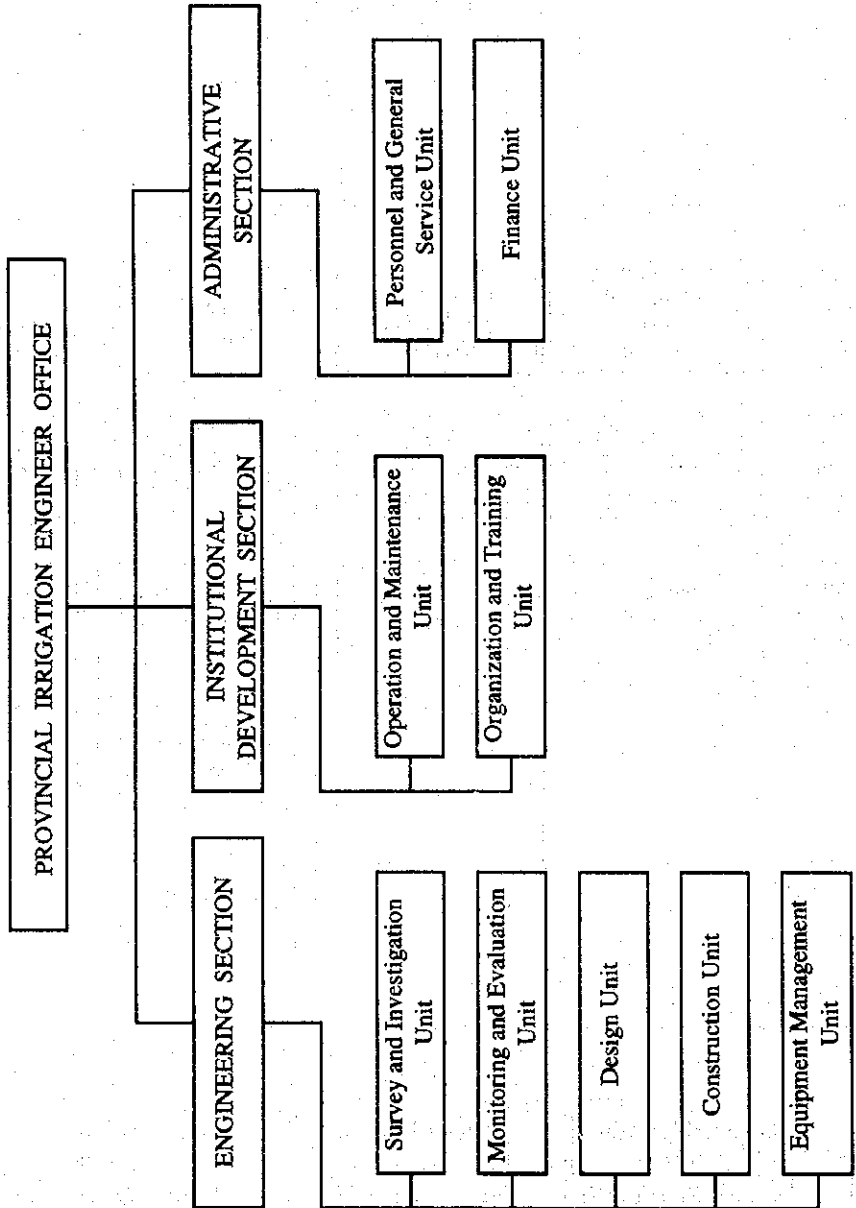
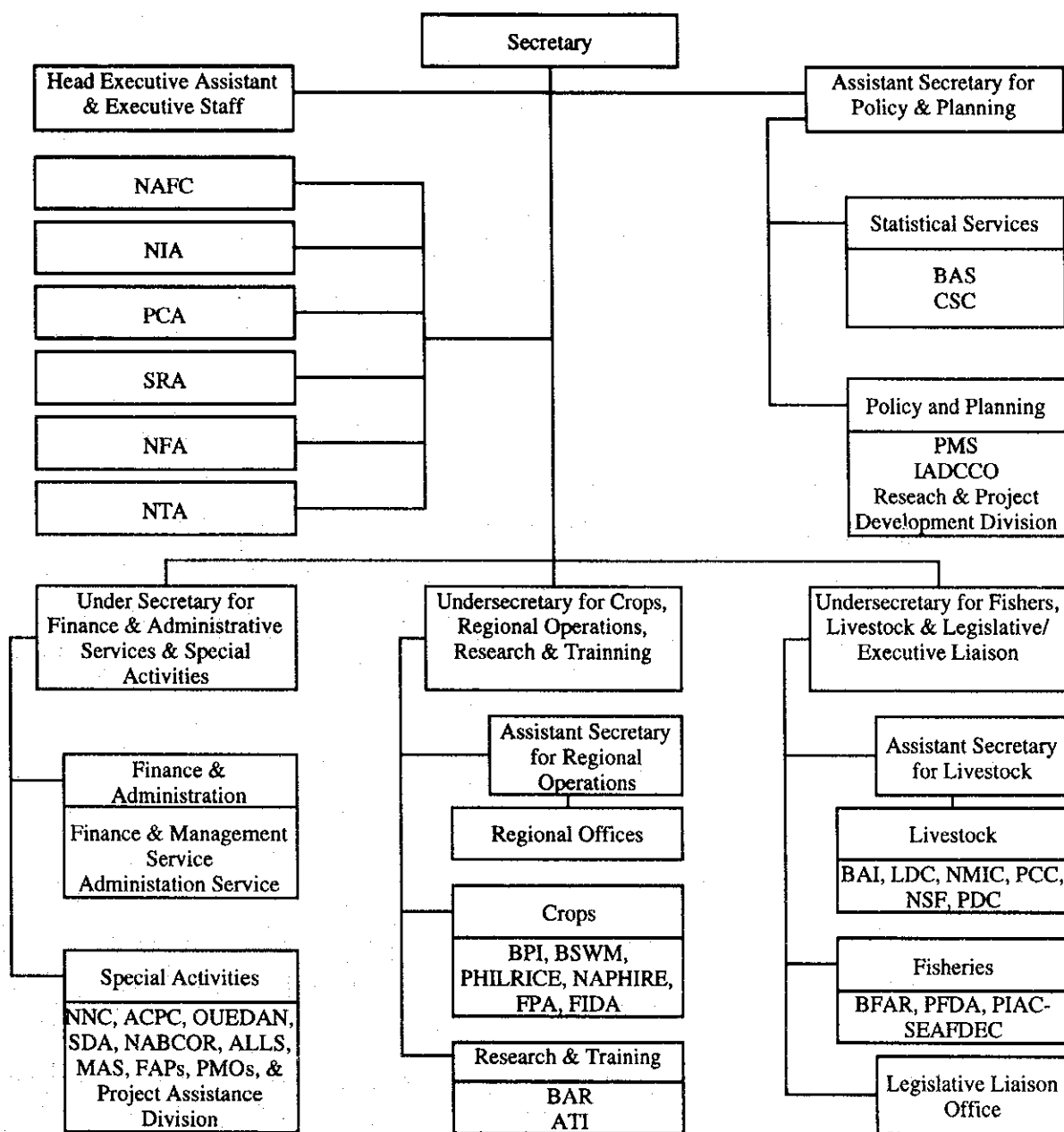


Fig. XI.1.3 Organization Chart of Provincial Irrigation Office of national Irrigation Administration Office



Acronyms

ACPC	Agricultural Credit Policy Council	NAPHIRE	National Post Harvest Institute for Research and Extension
ATI	Agricultural Training Institute	NFA	National Food Authority
AHS	Agribusiness Investment Information Service	NIA	National Irrigation Administration
BAI	Bureau of Animal Industry	NMIC	National Meat Inspection Commission
BAR	Bureau of Agricultural Research	NNC	National Nutrition Council
BAS	Bureau of Agricultural Statistics	NSF	National Stud Farm
BFAR	Bureau of Fisheries and Aquatic Resources	NTA	National Tobacco Administration
BPI	Bureau of Plant Industry	PAD-SCO	Project Assistance Division-Special Concerns Office
BSWM	Bureau of Soils and Water Management	PCA	Philippine Coconut Authority
CSC	Computer Service Center	PDC	Philippine Dairy Corporation
FIDA	Fiber Industry Development Authority	PFDA	Philippine Fisheries Development Authority
FPA	Fertilizer Pesticide Authority	PHILCOTTON	Philippine Cotton Corporation
IADCCO	International Agricultural Affairs Division	PHILRICE	Philippine Rice Research Institute
LDC	Livestock Development Council	PMS	Planning and Monitoring Service
LLO	Legislative Liaison Office	PTAC-SEAFDCEC	Southeast Asian Fisheries Development Center
MAS	Marketing Assistance Service	QRCGB	Quedan and Rural Credit Guarantee Corporation
NABCOR	National Agribusiness Corporation	SACOBIA SACOBIA	Development Authority
NAFC	National Agriculture and Fishery Council	SRA	Sugar Regulatory Administration

Fig. XI.1.4 Organization Chart of Department of Agriculture

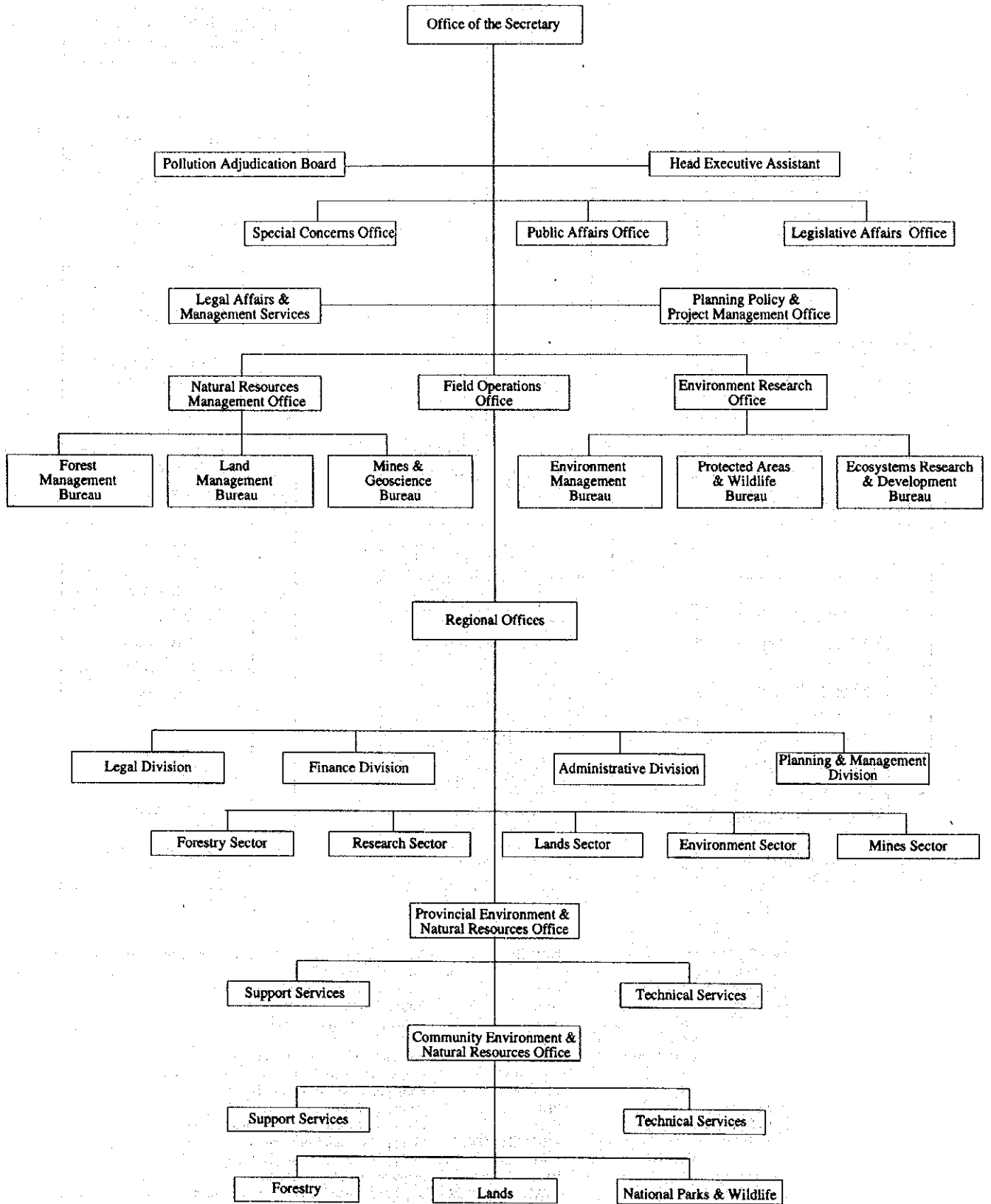


Fig. XI.1.5 Organization Chart of Department of Environmental and Natural Resources

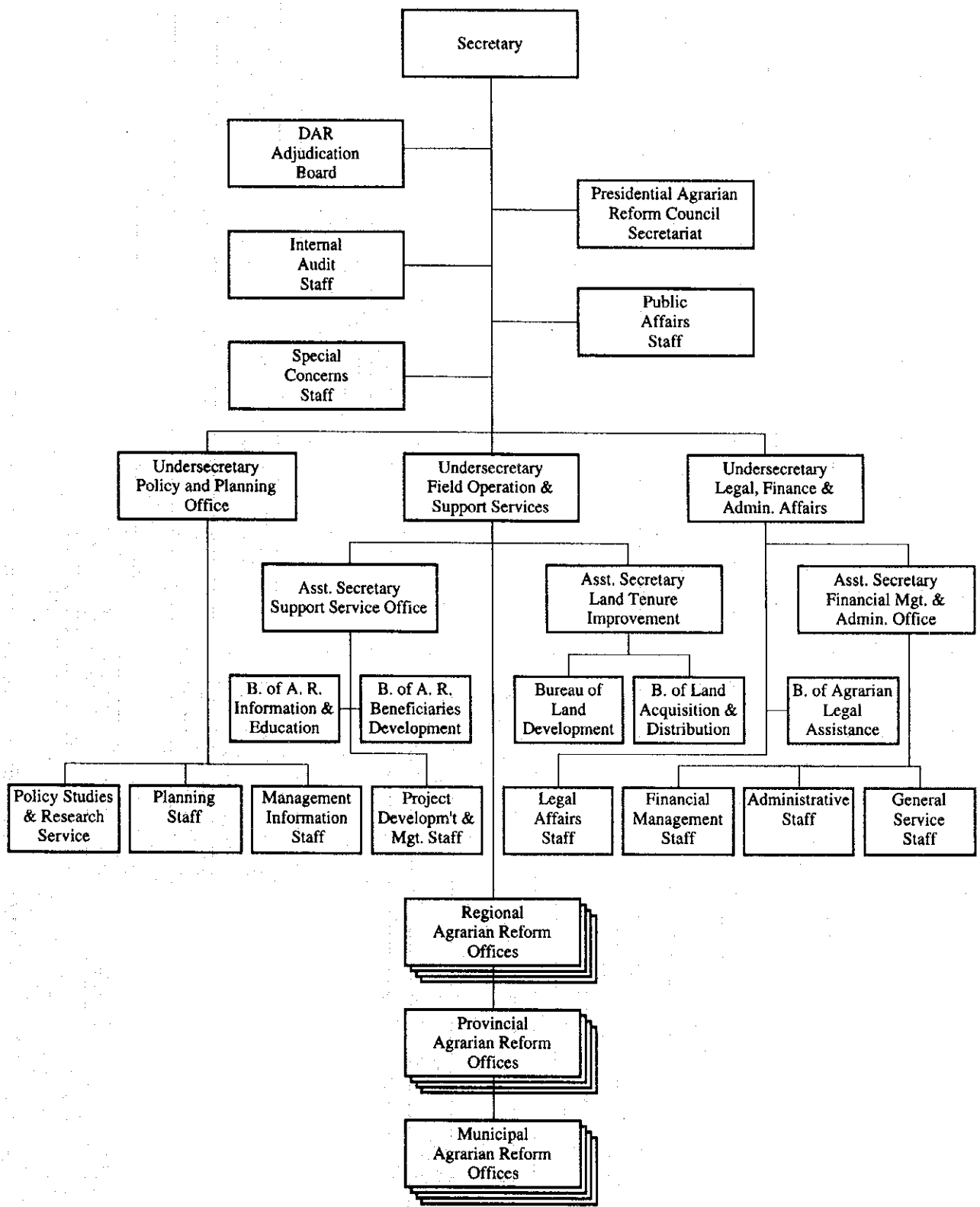


Fig. XI.1.6 Organization Chart of Department of Agrarian Reform

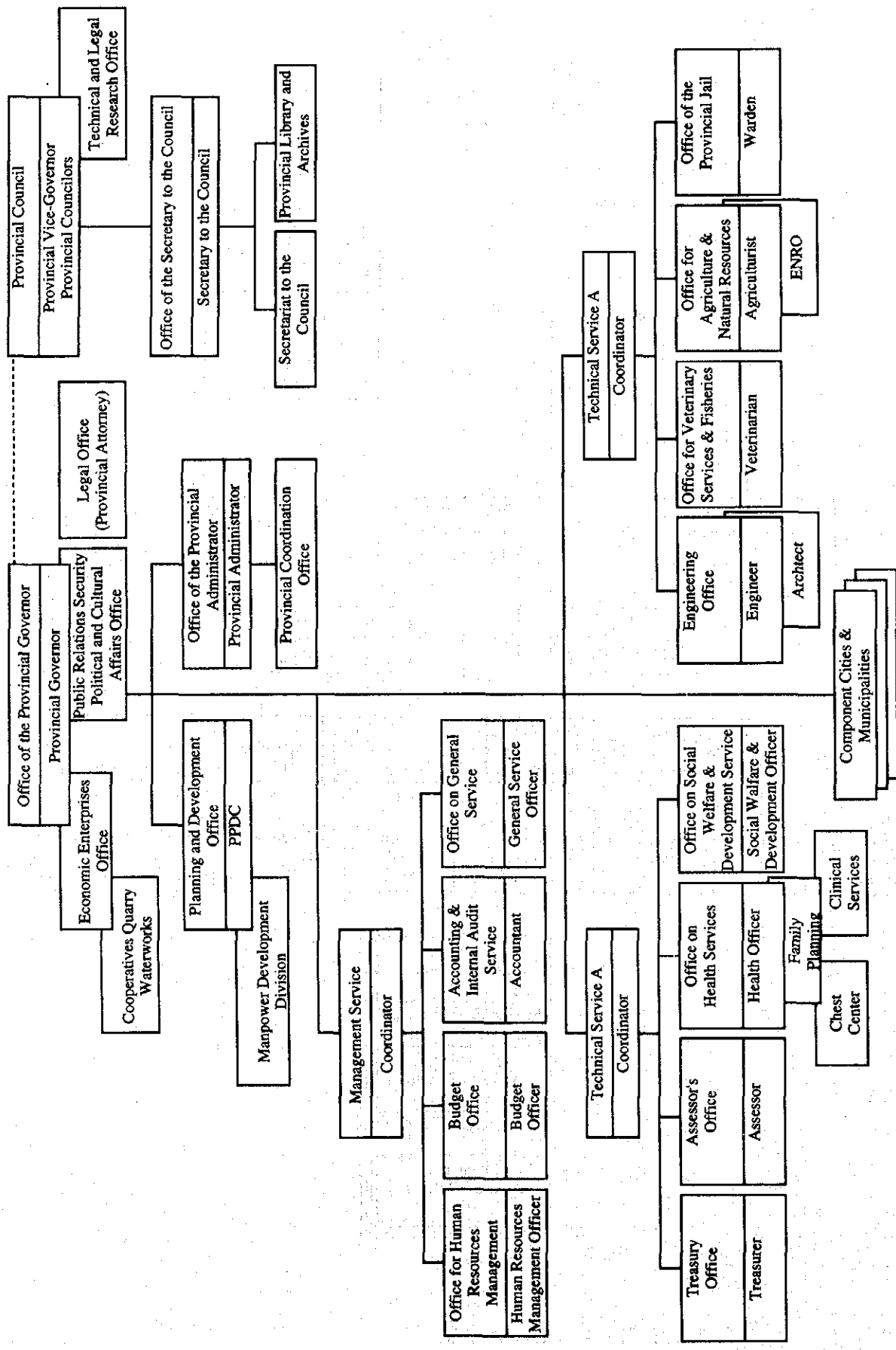


Fig. XI.1.7 Organization Chart of the Provincial Government of Laguna

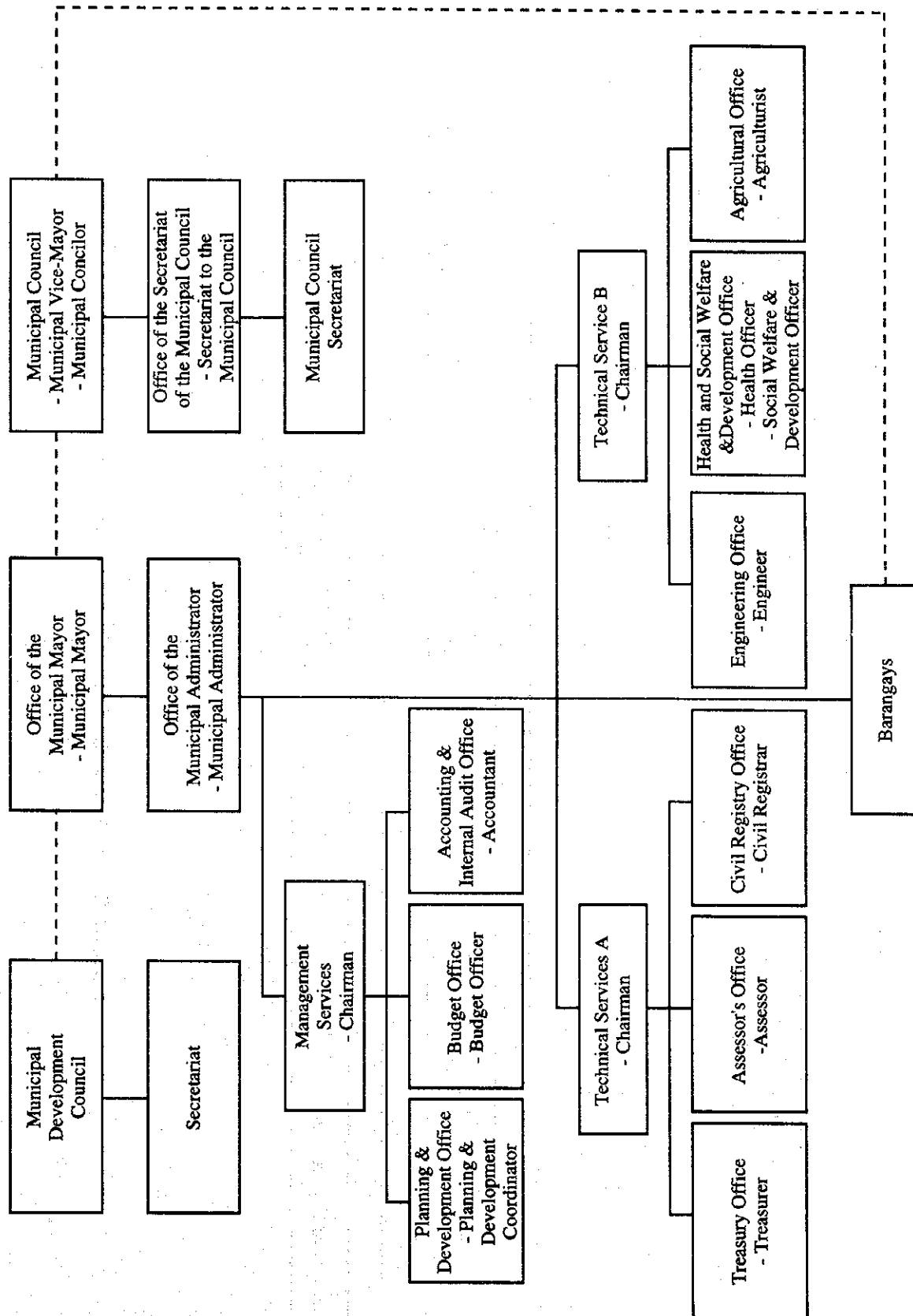


Fig. XI.1.8 (1) Organization Chart of Municipal Government of Nagcarlan, Laguna

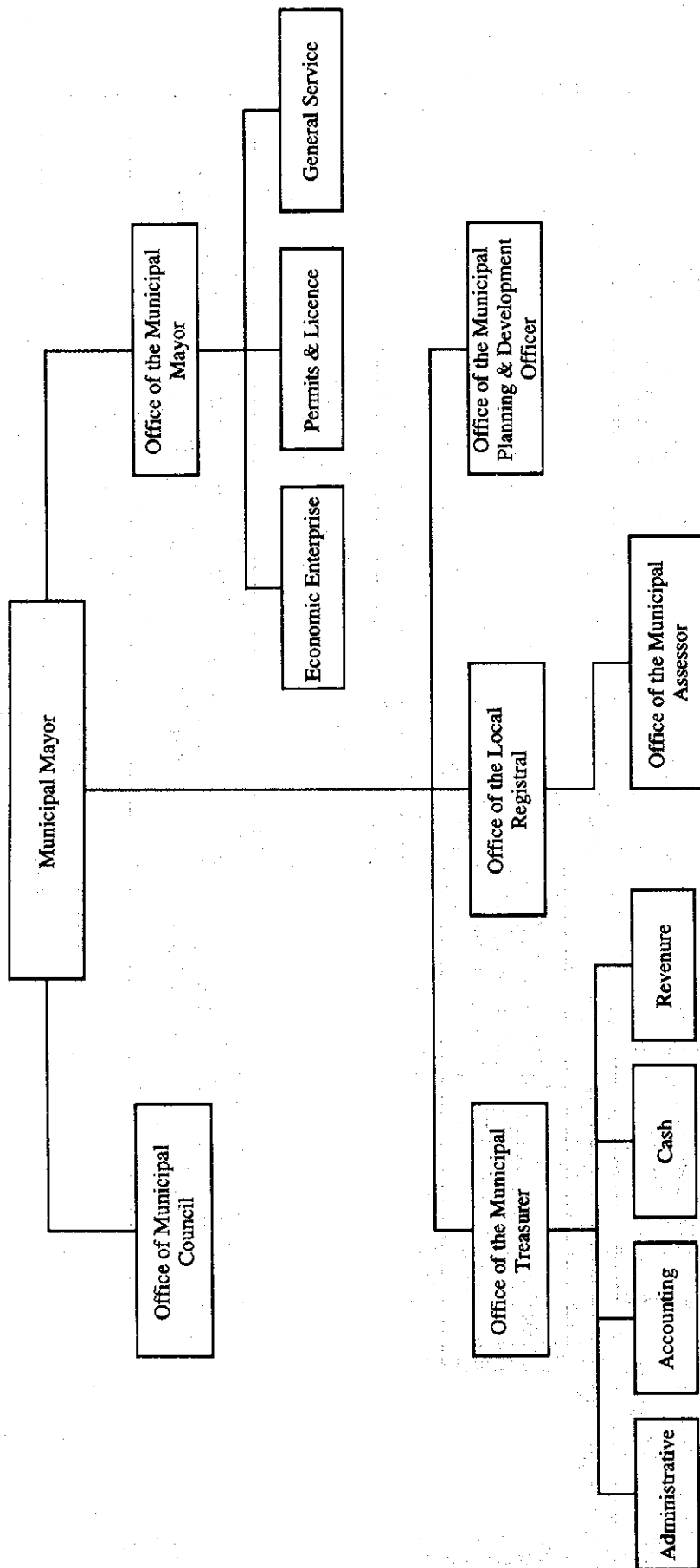


Fig. XI.1.8 (2) Organization Chart of Municipal Government of Liliw, Laguna

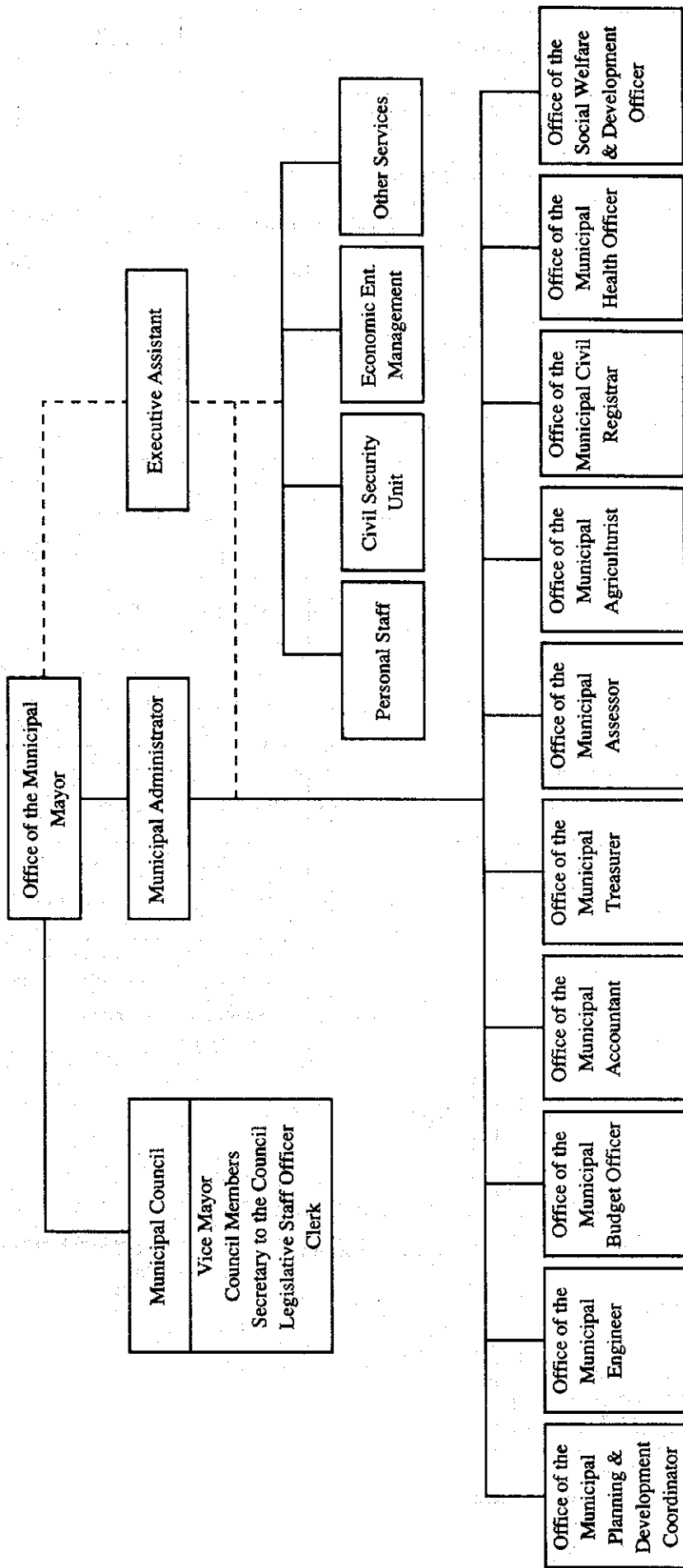


Fig. XI.1.8 (3) Organization Chart of Municipal Government of Majayjay, Laguna

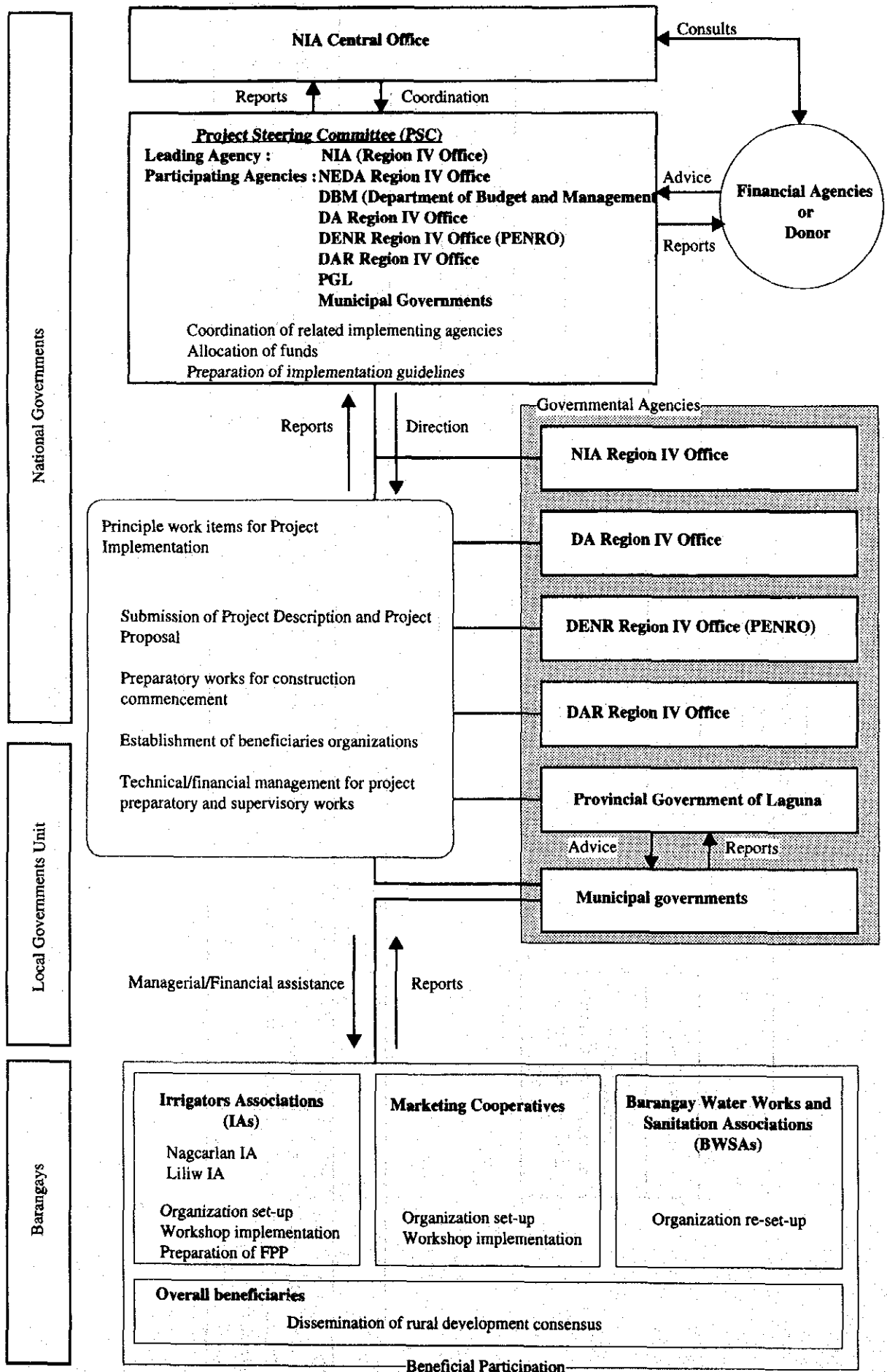


Fig. XI.2.1 Managerial Organization Structure for Project Implementation

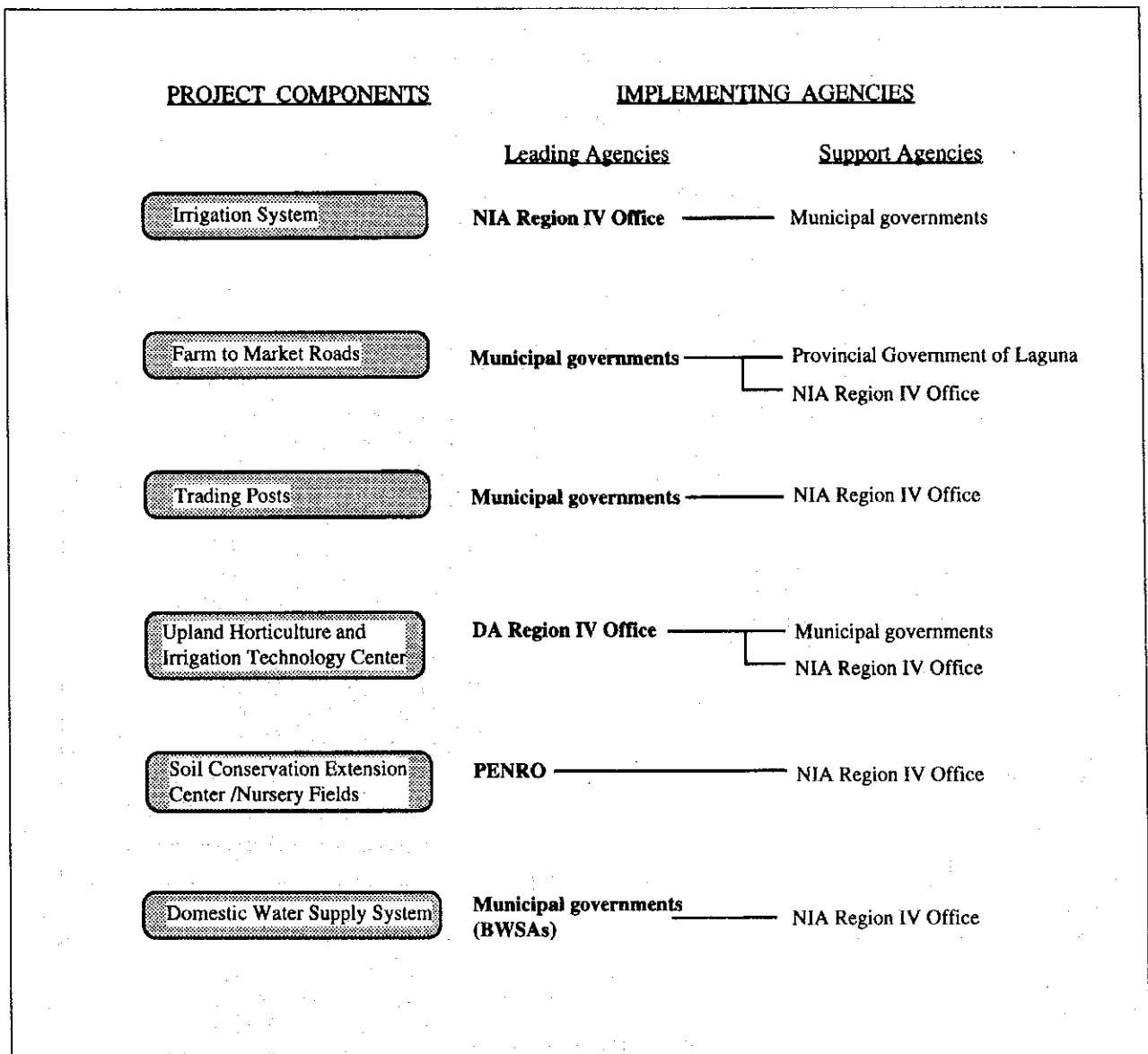


Fig. XI.2.2 Project Components and Implementing Agencies

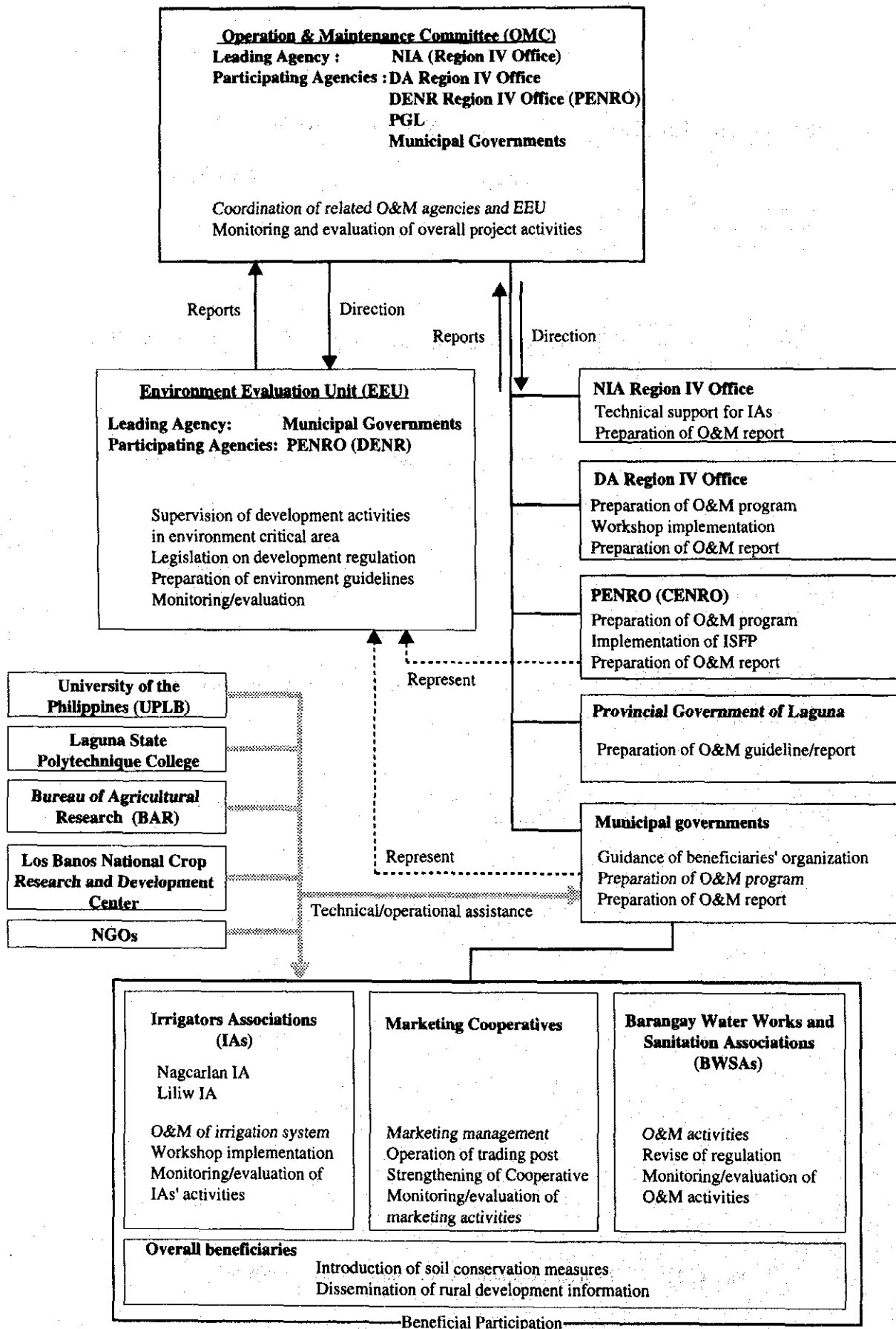


Fig. XI.3.1 Functional Organization Chart for O&M

PROJECT FACILITIES	RESPONSIBLE AGENCIES FOR O&M	OWNERSHIP OF FACILITIES
Irrigation Facilities	Irrigators Associations (IAs)	
Farm to Market Roads	Provincial Government of Laguna	
	Municipal government of Nagcarlan, Liliw, Majayjay	
Trading Posts	Marketing Cooperatives	Municipal government of Nagcarlan, Liliw, Majayjay
Upland Horticulture and Irrigation Technology Center	DA Region IV Office	
Soil Conservation Extension Center /Nursery Fields	PENRO	
Soil Coservation Demenstration Fields	Beneficiaries	
Domestic Water Supply System	Barangay Water Works and Sanitation Associations	

Fig. XI.3.2 Project Components and Responsible Agencies for O&M

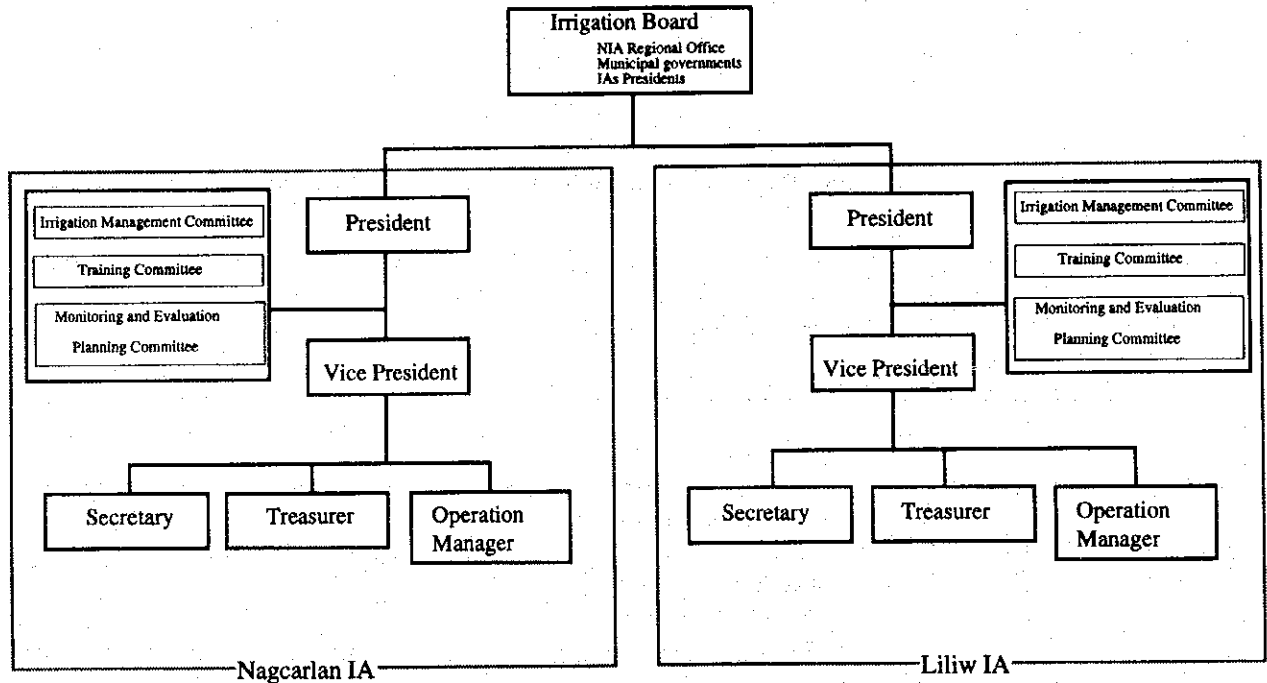


Fig. XI.3.3 Structural Organization Chart of IAs

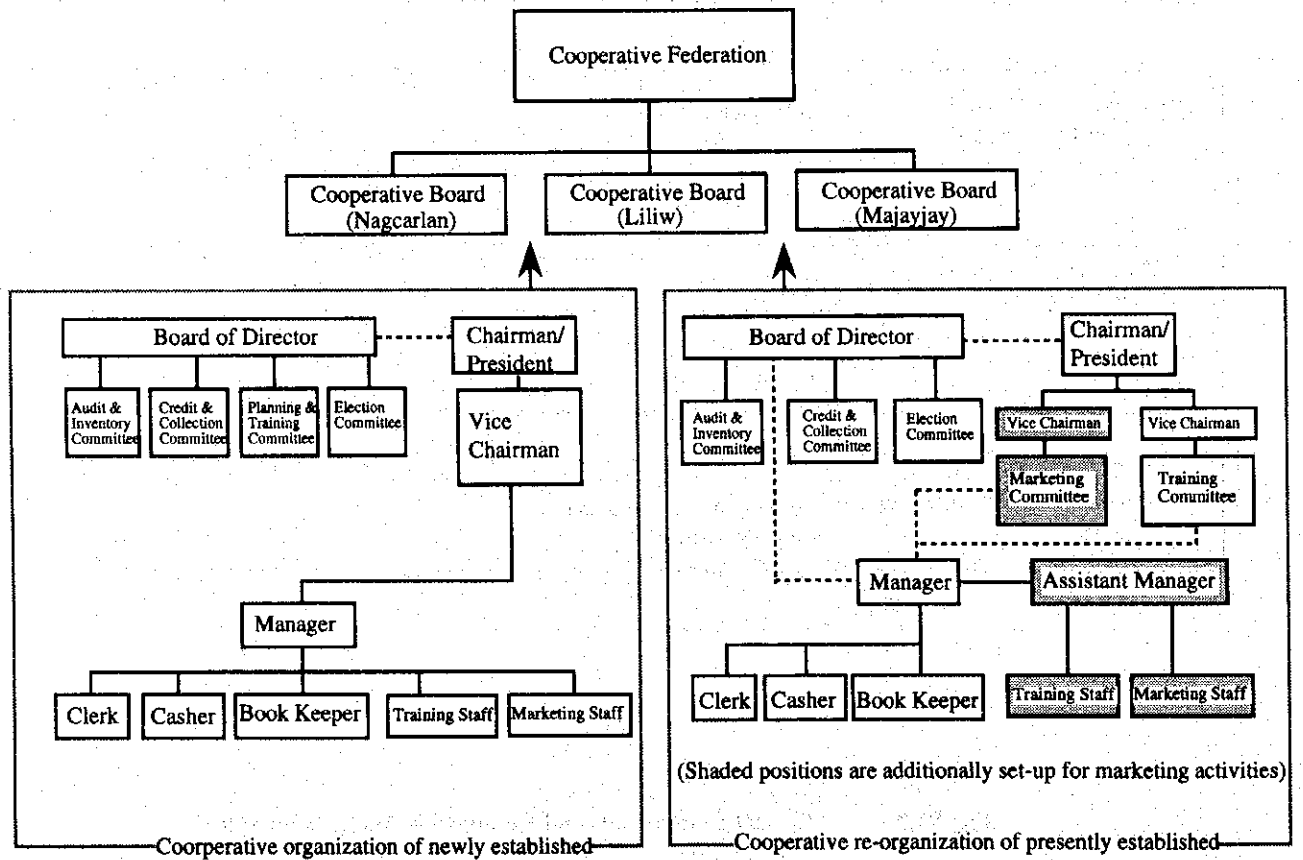


Fig. XI.3.4 Structural Organization Chart of Marketing Cooperatives

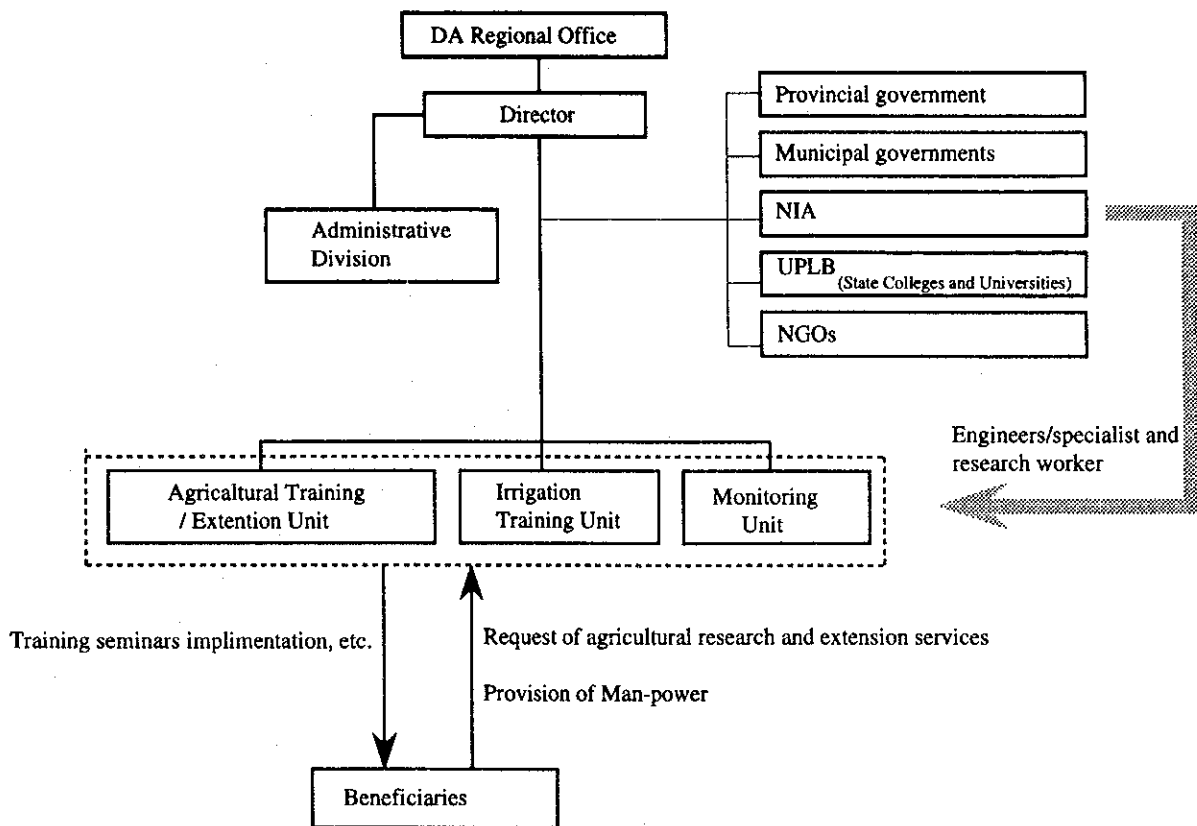


Fig. XI.3.5 Managerial Organization Chart of Upland Horticulture and Irrigation Technology Center

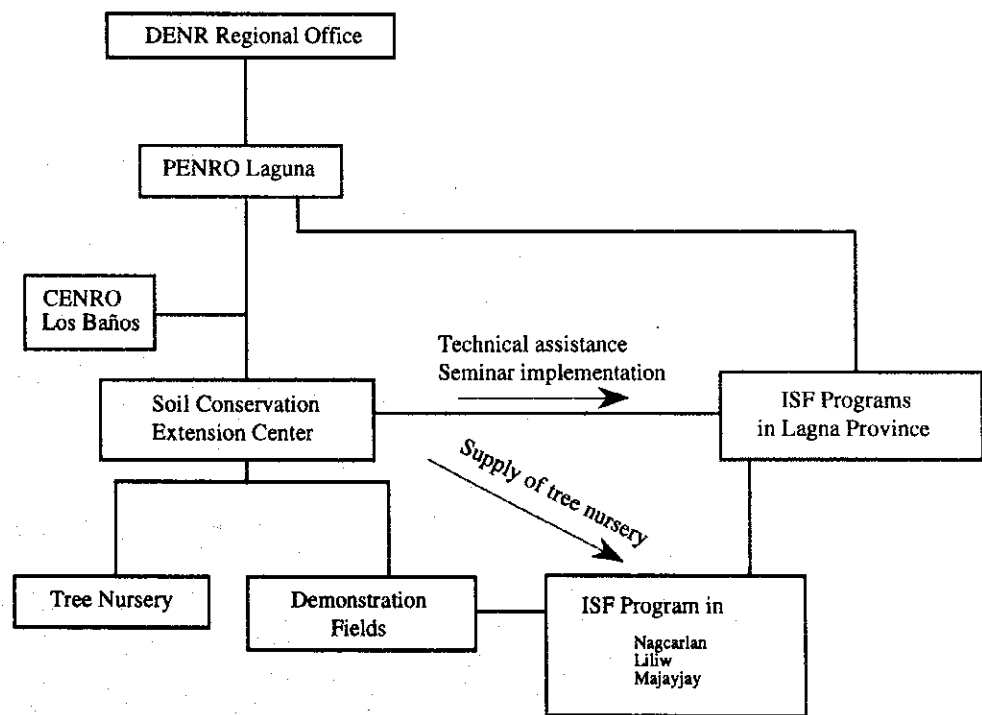


Fig. XI.3.6 Managerial Coordination Chart of Soil Conservation Extension Center

**FEASIBILITY STUDY ON
THE UPLAND IRRIGATION AND
RURAL DEVELOPMENT PROJECT
IN SOUTHERN LUZON**

APPENDIX-XII

PROJECT JUSTIFICATION

**FEASIBILITY STUDY
ON
THE UPLAND IRRIGATION AND RURAL DEVELOPMENT PROJECT
IN SOUTHERN LUZON**

**APPENDIX-XII
PROJECT JUSTIFICATION**

Contents

	<u>Pages</u>
1. General	XII - 1
2. Economic Evaluation.....	XII - 1
2.1 Basic Assumption	XII - 1
2.2 Economic Benefits.....	XII - 2
2.2.1 Outline	XII - 2
2.2.2 Irrigation benefits.....	XII - 3
2.2.3 Benefits from the improvement of farm-to-market roads.....	XII - 4
2.3 Economic Costs.....	XII - 5
2.4 Annual O&M Costs	XII - 6
2.5 Economic Evaluation	XII - 7
2.5.1 EIRR, net present value and benefit-cost ratio.....	XII - 7
2.5.2 Sensitivity analysis	XII - 7
3. Risk Analysis.....	XII - 8
4. Project Impact on Future Farm Income.....	XII - 9
5. Socio-economic Impacts.....	XII - 9
6. Environmental Impacts	XII - 10

List of Tables

	<u>Pages</u>
Table XII.2.1	Farmgate Prices of Agricultural Inputs XII - 11
Table XII.2.2	Farmgate Prices of Agricultural Outputs..... XII - 12
Table XII.2.3	Import Parity Prices for Fertilizers (as Of 1994)..... XII - 14
Table XII.2.4	Gross and Net Economic Production Values under Future Condition without Project (1,320 ha) XII - 15
Table XII.2.5	Gross and Net Economic Production Values under Future Irrigated Condition with Project (320 ha) XII - 16
Table XII.2.6	Gross and Net Economic Production Values under Future Rainfed Condition with Project (930 ha) XII - 17
Table XII.2.7	Incremental Economic Benefits of Crop Production..... XII - 18
Table XII.2.8	VOC Saving by Improvement of Farm-to-Market Road..... XII - 19
Table XII.2.9	Maintenance Cost Saving XII - 20
Table XII.2.10	Estimates of Economic Cost XII - 21
Table XII.2.11	Cost and Benefit Stream of the Project XII - 22

APPENDIX-XII PROJECT JUSTIFICATION

1 General

This Appendix was prepared for the project justification, which was made through an assessment of the project feasibility in view of economic, financial, socio-economic and environmental aspects. The evaluation methodology and the results are presented hereinafter.

2 Economic Evaluation

2.1 Basic Assumption

The Economic Internal Rate of Return (EIRR) of the proposed Project was estimated based on the estimated project costs and incremental project benefits. The estimation was carried out for the proposed Project as a whole. Major assumptions for the estimation of EIRR are summarized below :

(1) Project life

The economic life of the Project is assumed to be until the year 2025, or 30 years from the start of implementation.

(2) Price level

All commodity prices are given as of mid-1994 Philippine Peso value throughout the analysis. Price data before mid-1994 are updated using GDP deflator for local currency and the manufacturing unit value index for foreign currency. The exchange rate of US\$ 1.00 = ₱ 27.00 = ¥ 100.00 as of mid-1994 is used.

(3) Conversion Factors

A standard conversion factor (SCF) of 0.80 and a commodity specific conversion factor (CSCF) of 0.82 were applied referring to the recent study by ADB (Economic Parameters for the Appraisal of Investment Projects: Bangladesh, Indonesia and the Philippines, Harvard Institute for International Development, Dec. 1993). SCF is used in adjusting all benefits and costs in local currency, while the construction costs are adjusted by CSCF.

(4) Economic Prices

Economic prices of all non-tradable goods including vegetables and locally produced farm inputs like chicken manure are estimated by domestic prices multiplied by the SCF. Tradable goods are valued by the border prices after adjusting domestic costs for transportation and handling. Financial and economic prices of farm inputs and outputs are listed in Table XII.2.1 and Table XII.2.2. Import parity prices of chemicals are also estimated based on the IBRD's price projection as shown in Table XII.2.3.

2.2 Economic Benefits

2.2.1 Outline

The following benefits are expected from the implementation of the proposed Project; however, only direct benefits accrued from the upland irrigation development and the improvement of the existing farm-to-market road were counted in the calculation of EIRR for the conservative estimate of EIRR:

- 1) Upland irrigation development (Irrigation area: 320 ha)
 - Increase in unit yield of crops,
 - Increase in cropping intensity, and
 - Diversification of cropping from low value crops to high value crops.
- 2) Improvement of Existing Farm-to Market Road (Influence area 930 ha)
 - Savings of vehicle operation costs (VOC),
 - Savings of costs for routine road maintenance and periodic repairs,
 - Enhancement of conversion in land use from less profitable coconuts to profitable vegetable plantation (development effects), and
 - Reduction in post-harvest losses during the transportation of farm products.
- 3) Agricultural Training and Extension (through the operation of the proposed "Upland Horticulture and Irrigation Technology Center")

The area to benefit from this component covers both the irrigation area and the road influence area with a total of 1,250 ha; however, the direct benefits of this component were not separately estimated, because the proposed Technology Center is one of the essential components and the overall benefits already include the benefit of the Center.

- 4) Construction of Trading Posts
 - Improvement of ex-trading post prices by strengthening of bargaining power of the beneficiaries through organization of marketing cooperatives at the trading posts,
 - Reduction of post-harvest losses by improved packing of products, and
 - Improvement of quality by proper washing, weighing, packing and storing.

The trading posts will have manifold benefits; however, direct benefit of this component was not separately estimated, because the estimated project benefits from irrigation and road components already include the benefit of the trading posts.

- 5) Soil Conservation Works (through the operation of the proposed "Demonstration Center for Soil Erosion Measures")

- Attainment of sustainable agriculture in the Project area, and
- Preservation of environmental resources in the Project area.

Estimating the direct benefits for this component is difficult due to lacking in various parameters. It is assumed that the direct benefits of this component are already included in the estimated project benefits.

6) Rehabilitation of Rural Water Supply System

- Savings of costs for routine road maintenance and periodic repairs, and
- Increase of the beneficiaries in rural water supply.

The direct benefits of this component are not estimated, because the investment for this component occupies only less than 1% of the total investment and the expected benefits are negligibly small.

Therefore, only the benefits from the irrigation and road components were considered in the calculation of EIRR. Estimations of the benefits are described in the following sections.

2.2.2 Irrigation benefits

Benefits accrued from the irrigation development are estimated by an increase in crop yield and cropping intensity. The anticipated crop yield under the irrigated condition is set out referring to the average unit yields under irrigated condition in Cavite (Second Laguna de Bay Irrigation Project-Vegetable Component) and Benguet (Highland Agricultural Development Project in La Trinidad). Increase in cropping intensity from 130 % under the existing rainfed conditions to 300 % under the future irrigated condition is assumed based on the actual performances in Cavite and Benguet. Crop production costs under the irrigated condition are estimated on the basis of the actual cost data in Cavite and Benguet after adjusting the price data to the mid-1994 level. Farmers' expenditures for O&M of marketing cooperatives, on-farm irrigation practices and prevention devices from rainfall for the wet season cultivation are included in the crop production costs.

Gross and net crop production values under future condition without the Project are estimated at ₱24,965/ha as shown in Table XII.2.4, while these values will greatly increase up to ₱210,498/ha under with project condition as shown in Table XII.2.5. Incremental benefits by irrigation development will be ₱185,533/ha, or ₱59,370 thousand in total for an irrigation area of 320 ha. The incremental irrigation benefits are presented in Table XII.2.6 and summarized as below.

Net Incremental Irrigation Benefits

Items	Without Project	With Project	Increment
Irrigation Area: 320 ha			
1) Project Area (ha)	320	320	0
2) Average NPV per ha (₱)	24,965	210,498	185,533
3) Total NPV (₱ thousand)	7,989	67,359	59,370

It is assumed that the benefits increase year by year and attain the maximum level in five years after completion of the construction works.

2.2.3 Benefits from the improvement of farm-to-market roads

Estimating direct benefits for road component is difficult for want of various parameters. In the analysis, the road benefits are estimated by (1) vehicle operation cost (VOC) saving due to improved road condition, (2) saving of routine road maintenance and periodical repairs due to pavement of the roads, (3) increased production value resulting from a shift from non-profitable coconut plantation to commercial vegetable production and (4) increased production in the existing vegetable farms due to improved road condition. Unit savings of VOC are assumed to be ₱0.75 /km for tricycle and ₱2.13/km for jeepney. Road maintenance cost savings are based on the difference in the routine maintenance and repair costs between with and without the Project. The unit maintenance cost savings are estimated at ₱82.29/m per annum. It is assumed that the existing coconuts plantation of 600 ha within the road influence area (RIA) will shift to commercial vegetable production. Future crop production in the RIA is estimated on the basis of the cropping intensity of 200 %. It is also assumed that the road improvement will contribute only 50 % of such incremental benefits.

Incremental benefits accrued from the improvement of farm-to-market roads are estimated at ₱28,888 thousand in total, comprising ₱3,809 thousand from VOC savings, ₱1,525 thousand from maintenance cost savings, ₱3,458 thousand from crop production increase in the existing non-irrigated vegetable farms (330 ha), and ₱20,097 thousand from the shift from the existing coconut plantation to vegetable production (600 ha). The future crop production values in the non-irrigated farms are estimated at ₱70,886/ha (see Table XII.2.7) on an average; however, only 50 % or ₱ 35,443 /ha are counted as the net benefits attributable to the Project. VOC savings and maintenance cost savings are estimated as shown in Table XII.2.8 and Table XII.2.9.

Net Incremental Road-Related Benefits

Items	Without Project	With Project	Increment
1) Road Influence Area (ha)			
- Existing rainfed vegetable farm	330	330	0
- Shift from coconuts to vegetable	600	600	600
Coconuts	600	-	-600
Vegetables	-	600	600
2) Average NPV per ha (₱)			
- Existing rainfed vegetable farm	24,965	35,443	10,478
- Shift from coconuts to vegetable	1,949	35,443	33,494
Coconuts	1,949	-	-1,949
Vegetables	-	35,443	35,443
3) Total NPV (₱ thousand)			
- Existing rainfed vegetable farm	8,238	11,696	3,458
- Shift from coconuts to vegetable	1,169	21,266	20,097
Coconuts	1,169	0	-1,169
Vegetables	0	21,266	21,266
- Total NPV (₱ thousand)	<u>9,408</u>	<u>32,962</u>	<u>23,554</u>
4) VOC Saving (₱ thousand)			
- Agricultural traffic	471	234	237
- Non-agricultural traffic	203	101	102
- Passengers traffic	6,848	3,378	3,470
- Total VOC Saving (₱ thousand)	<u>7,522</u>	<u>3,713</u>	<u>3,809</u>
5) Maintenance Costs Saving (₱ thousand)	<u>1,571</u>	<u>46</u>	<u>1,525</u>
Total Incremental benefits (₱ thousand)			<u>28,888</u>

It is assumed that the benefits from crop production increase year by year and attain the maximum level in 10 years after completion of the construction works.

2.3 Economic Costs

The financial project costs excluding the transfer payment and price contingencies consist of (1) construction cost for project works, (2) O&M equipment, (3) administration costs, (4) engineering services, (5) land acquisition and (6) physical contingencies. The financial costs were converted to the economic costs by applying a commodity specific conversion factor (CSCF) of 0.82 for local currency portion. The economic cost is estimated at ₱ 274.7 million in total as summarized below (see Table XII.2.10):

Economic Project Cost

(Unit: ₱ 1,000)

Item	Financial Costs			Economic Costs
	F/C	L/C	Total	
1. Detailed Design	10,034	4,819	14,853	13,986
2. Construction Works	106,406	108,192	214,598	195,123
- Irrigation Works	43,626	31,664	75,290	69,590
- Farm-to-Market roads	53,537	59,594	113,131	102,404
- Trading Posts	4,761	7,192	11,953	10,658
- Training and Extension Center	2,597	5,898	8,495	7,433
- Soil Conservation works	657	3,179	3,836	3,264
- Rural Water Supply system	1,228	665	1,893	1,773
3. O&M Equipment	10,021	2,210	12,231	11,833
4. Administration Cost	72	2,870	2,942	2,425
5. Engineering Services	20,790	4,740	25,530	24,677
6. Land Acquisition	0	2,065	2,065	1,693
7. Physical Contingencies	14,732	12,489	27,221	24,973
8. Price Contingencies	16,885	30,517	47,402	-
Total	178,940	167,902	346,842	274,710

Notes: Funds for preparatory works for project implementation in 1995 are excluded from economical project cost because the funds are disbursed from annual fiscal budget of the governments.

2.4 Annual O&M Costs

The annual operation and maintenance costs consist of (1) salaries of project staff, (2) project office expenses, (3) operation and maintenance costs of facilities and equipment. The financial O&M costs were converted to the economic costs by applying CSCF of 0.82 for local currency portion. The annual economic O&M costs are estimated at ₱ 5.4 million as below:

Annual O&M Cost

(Unit: ₱ 1,000)

Components	Financial Costs			Economic Costs
	F/C	L/C	Total	
Irrigation facilities	592	378	970	902
Rural roads	60	60	120	109
Trading Posts	655	1,215	1,870	1,651
Horticulture/Irrigation Center	1,115	1,055	2,170	1,980
Soil Conservation Center	470	400	870	798
Total	2,892	3,108	6,000	5,440

2.5 Economic Evaluation

2.5.1 EIRR, net present value and benefit-cost ratio

Based on the above assumptions, economic costs and benefits are computed for the period 1996 - 2025 (30 years) as shown in Table XII.2.11. The Economic Internal Rate of Return (EIRR) of the overall project is estimated at 18.5 %.

2.5.2 Sensitivity analysis

In order to evaluate soundness of the Project against possible adverse changes, sensitivity analysis is made for the following cases:

- Case-1: 20% project cost increase due to unforeseen geological and topographical conditions, unexpected increases of material costs, increase in costs for environmental restoration attributed to improper construction methods
- Case-2: 20% project benefit decrease due to unexpected low price of farm products partly attributed to inactive marketing cooperatives and low crop yield resulted from inactive extension services
- Case-3: Two years overrun of construction period due to unexpected inefficiency of contractors, improper implementation arrangement, and unforeseen reasons
- Case-4: Combination of Cases-1 and -2
- Case-5: Combination of Cases-1 and -3
- Case-6: Combination of Cases-2 and -3
- Case-7: Combination of Cases-1, -2, and -3

The effects of these changes on EIRR are summarized as shown below:

Result of Sensitivity Analysis

Case	EIRR (%)
Original Case	18.5
Case 1: Project cost overrun by 20%	17.2
Case 2: Benefit decrease by 20%	15.3
Case 3: Delay in construction for 2 years	14.9
Case 4: Combination of Case 1 and 2	14.2
Case 5: Combination of Case 1 and 3	14.0
Case 6: Combination of Case 2 and 3	12.6
Case 7: Combination of Case 1, 2 and 3	11.7

3 Risk Analysis

Various recommendations or proposals are made on operation and maintenance of the Project as well as environmental preservation of the area. They are prerequisites for the attainment of the anticipated project benefits and will adversely influence the project feasibility, if not implemented properly, as shown in the previous section. They are reemphasized below:

- (1) Employment of environmental mitigation measures and restoration of environment damaged by construction activities.
- (2) Provision or reinforcement of extension services to encourage farmers adopting soil erosion control measures and improved farming practices.
- (3) Establishment and strengthening of marketing cooperatives to enable farmers to gain bargaining power and governmental support for it.
- (4) Establishment of Irrigators' Associations for sustainable operation and maintenance of the facilities and governmental support for them.
- (5) Allocation of necessary budgets for the activities of concerned governmental agencies and cooperation and coordination between them.
- (6) Implementation arrangement within and between concerned agencies for smooth project implementation and early attainment of expected project benefits.

4 Project Impact on Future Farm Income

The impact of the Project on beneficiary farmers was examined by analyzing an increase in farm income for typical farms. Two types of farmers are recognized in this Project: those who have vegetable farms to be irrigated under the Project and those who have farms to be continuously under rainfed condition but be benefited by road improvement. Farm budget analyses were made for the typical farmers both under with and without project conditions. The results of the analyses are given below. The details are presented in Appendix-IV.

Farm Budget Analysis for Typical Farmers

Items	Without Project	With Project	
		Irrigated area	Rainfed area
Average farm size	-	0.46 ha	0.62 ha
1. Household Income (A)	<u>50,000</u>	<u>146,200</u>	<u>88,600</u>
- Vegetables	21,400	140,100	70,500
- Coconut / Fruit crops	6,100	6,100	6,100
- Livestock	1,500	0	1,500
- Non-farm incomes	21,000	0	10,500
2. Expenses (B)	<u>43,100</u>	<u>85,700</u>	<u>62,900</u>
3. Payment Capacity (C = A - B)	<u>6,900</u>	<u>60,500</u>	<u>25,700</u>
4. Payment to be required (D)	<u>200</u>	<u>5,000</u>	<u>1,900</u>
- O&M costs for irrigation facilities	0	1,300	0
- Cooperative fee	200	3,700	1,900
5. Surplus (C - D)	<u>6,700</u>	<u>55,500</u>	<u>23,800</u>

The result of the analysis indicates that the financial condition of the farmers could be improved considerably after the project implementation. Farm income will show threefold increase for the typical farm income in irrigated area, from ₱ 50,000 to ₱ 146,200, while the typical farm income in rainfed area will increase to ₱ 88,600. Necessary expenses in the future, operation and maintenance costs of the project facilities as well as the cooperative fee being proposed in the Project, correspond to less than 10% of the payment capacity in both farm categories. It is concluded, therefore, that the improvement in farmers' income will enable farmers to bear the necessary expenses and create a large surplus.

5 Socio-economic Impacts

In addition to direct benefit counted in the economic and financial evaluations, various secondary and intangible benefits are expected from the Project. Major socio-economic impacts are as follows:

(1) Environmental preservation

The Project can not only prevent further deterioration of land resources in the Study area but also improve agricultural land productivity by encouraging farmers to adopt soil erosion control measures. This will result in the preservation of remaining natural forests in Mt. Banahaw- San Cristobal National Park and Public Forest Lands.

(2) Environmental protection in downstream area

Promotion of soil conservation and environmentally friendly farming practices by the Project will result in improving water quality in the downstream area, including Laguna Lake.

(3) Increase in employment opportunity

The project implementation will increase employment opportunity in the Study area in terms of farm labors and construction workers. In addition, enhancement of marketing activities will also generate the employment in the related sectors.

(4) Improvement of local transportation

The local transportation within the Study area will be improved considerably by the improvement of the existing barangay roads. This will not only enhance the marketing activities of vegetables but also contribute to the improvement of accessibility and communication between villages at high altitudes and nearby towns.

(5) Constant supply of vegetable to Metro Manila

The Project area is located near the large market in Metro Manila as well as blessed with favorable natural condition for vegetable production. The Project will enable the area constantly supply high-demand vegetables to Manila, particularly during off season.

6 Environmental Impacts

Soil erosion and destruction of natural vegetation are typical environmental impacts of irrigation development and road improvement in the uplands. However, the Project was formulated paying much attention to avoiding or minimizing such adverse impacts by employing mitigation measures that could impose significant environmental impacts. It is predicted, therefore, that the Project would not cause significant adverse impacts on the environment. Reversely, the Project would encourage farmers to perform sustainable agriculture through extension services of soil conservation practices to be provided by the Project. Appendix-X explains the process of "environmental consideration" in project formulation and proposed soil conservation practices.

Table XII.2.1

Farmgate Prices of Agricultural Inputs

Items	Unit	Financial Price	Economic Price
1. Seeds			
Tomato	Kg	12,500.00	12,250.00
Cabbage	Kg	7,440.00	7,291.00
Raddish	Kg	240.00	192.00
Baguio Beans	Kg	200.00	160.00
Sweet Potato	Kg	20.00	16.00
Califlower	Kg	3,560.00	3,489.00
Celery	Kg	3,360.00	3,293.00
Chinese Cabbage	Kg	3,850.00	3,778.00
Lettuce	Kg	2,520.00	2,470.00
Sitao (snap beans)	Kg	120.00	96.00
Carrots	Kg	560.00	550.00
2. Fertilizer			
14-14-14*	Kg	7.20	4.92
Urea*	Kg	6.90	5.41
Chiken Manure	Kg	1.20	0.96
TSP*	Kg	5.50	6.02
Muiate of Potash*	Kg	4.50	5.68
3. Agro-chemicals			
Benrate	Kg	1,200.00	1,176.00
Malathion	lit.	177.00	173.46
Selecron	lit.	743.00	728.14
Decis	lit.	869.00	851.62
Lannate	lit.	286.00	280.28
Tamaron	lit.	450.00	441.00
Dithane	Kg	200.00	196.00
Thiodan	Lit.	164.00	160.72
Dipel	Kg	586.00	574.28
Folidol	lit.	308.00	301.84
4. Labor			
Hired (male)	day	100.00	70.00
Hired (female)	day	80.00	56.00
Animal (horse)	day	150.00	105.00
5. Materials			
PVC pipes	m	1.00	0.80
Stakes/Pole	100pcs	150.00	120.00
Trellis	ha	5,000.00	4,000.00
Nylon ropes	roll	90.00	72.00
Tying materials	roll	55.00	44.00

* : Import parity prices as of 1994 (see Table XII.2.3)

Table XII.2.2

Farmgate Prices of Agricultural Outputs (1/2)

Items	Unit	Financial Price	Economic Price
1. Without Project			
<u>Dry season</u>			
Tomato (Apr/May)	P/Kg	4.18	3.34
Cabbage (May)	P/Kg	7.93	6.34
Raddish (Apr/May)	P/Kg	4.85	3.88
Bagio beans (Apr/May)	P/Kg	8.41	6.73
<u>Wet season</u>			
Cabbage (Oct)	P/Kg	9.92	7.94
Sweet potato (Nov/Dec)	P/Kg	4.77	3.82
2. With Project (Rainfed Condition)			
<u>Pattern-1</u>			
Tomato (May)	P/Kg	4.61	3.69
Sweet potato (Dec.)	P/Kg	5.18	4.14
<u>Pattern-2</u>			
Tomato (May)	P/Kg	4.61	3.69
Cabbage (Oct./Nov.)	P/Kg	10.00	8.00
<u>Pattern-3</u>			
Cabbage (May)	P/Kg	7.93	6.34
Sitao (Nov.)	P/Kg	10.22	8.18
<u>Pattern-4</u>			
Raddish (May)	P/Kg	5.58	4.46
Sitao (Nov.)	P/Kg	10.22	8.18
<u>Pattern-5</u>			
Raddish (Apr.)	P/Kg	5.58	4.46
Lettuce (Oct./Nov.)	P/Kg	22.26	17.81
<u>Pattern-6</u>			
Baguio beans (Apr./May)	P/Kg	8.41	6.73
Carrot (Nov.)	P/Kg	16.18	12.94

Ex-trading post prices derived from 5-year average of wholesale prices at Divisoria (see Appendix-IV)

Table XII.2.2

Farmgate Prices of Agricultural Outputs (2/2)

Items	Unit	Financial Price	Economic Price
3. <u>With Project (Irrigated Condition)</u>			
<u>Pattern-1</u>			
Sitao (Mar.)	P/Kg	9.44	7.55
Tomato (July)	P/Kg	7.46	5.97
Carrots (Nov.)	P/Kg	16.18	12.94
<u>Pattern-2</u>			
Celery (Feb.)	P/Kg	17.62	14.10
Cabbage (June)	P/Kg	7.76	6.21
Lettuce (Oct./Nov.)	P/Kg	22.26	17.81
<u>Pattern-3</u>			
Chinese cabbage (Mar.)	P/Kg	13.10	10.48
Tomato (July)	P/Kg	7.46	5.97
Sweet potato (Nov.)	P/Kg	4.35	3.48
<u>Pattern-4</u>			
Baguio beans (Mar.)	P/Kg	9.05	7.24
Cabbage (June/July)	P/Kg	7.36	5.89
Cauliflower (Nov.)	P/Kg	28.50	22.80
<u>Pattern-5</u>			
Sitao (Feb./Mar.)	P/Kg	9.05	7.24
Raddish (June)	P/Kg	6.96	5.57
Cabbage (Oct.)	P/Kg	8.41	6.73
<u>Pattern-6</u>			
Chinese cabbage (Feb./Mar.)	P/Kg	12.31	9.85
Cabbage (June)	P/Kg	7.76	6.21
Sweet potato (Nov.)	P/Kg	4.35	3.48

Ex-trading post prices derived from 5-year average of wholesale prices at Divisoria (see Appendix-IV)

Table XII.2.3

Import Parity Prices for Fertilizers (as of 1994)

Items	Unit	Import Parity Price
Exchange Rate (1994)	Peso/US\$	27.00
A Urea		
1. Actual world price of Urea (46%N)	US\$/ton	107.00
2. Freight and Insurance	+ US\$/ton	20.00
3. CIF Manila	= US\$/ton	127.00
4. CIF Manila in Peso	= P/ton	3,429.00
5. Manila Port handling	+ P/ton	32.00
6. Transportation costs, Manila-Laguna	+ P/ton	800.00
7. Handling and dealer costs	+ P/ton	350.00
8. Transportation cost to farm (P0.8/kg)	+ P/ton	800.00
9. Economic farmgate price of Urea	= P/ton	5,411.00
10. Economic farmgate price of Nitrogen (N)	= P/ton	11,763.00
B Triple Super Phosphate (TSP)		
1. Actual world price of TSP (46%P2O5)	US\$/ton	111.00
2. Freight and Insurance	+ US\$/ton	38.50
3. CIF Manila	= US\$/ton	149.50
4. CIF Manila in Peso	= P/ton	4,036.50
5. Manila Port handling	+ P/ton	32.00
6. Transportation costs, Manila-Laguna	+ P/ton	800.00
7. Handling and dealer costs	+ P/ton	350.00
8. Transportation cost to farm (P0.8/kg)	+ P/ton	800.00
9. Economic farmgate price of Urea	= P/ton	6,018.50
10. Economic farmgate price of P2O5	= P/ton	13,083.00
C Muriate of Potash (KCl)		
1. Actual world price of KCl (55%K2O)	US\$/ton	107.00
2. Freight and Insurance	+ US\$/ton	30.00
3. CIF Manila	= US\$/ton	137.00
4. CIF Manila in Peso	= P/ton	3,699.00
5. Manila Port handling	+ P/ton	32.00
6. Transportation costs, Manila-Laguna	+ P/ton	800.00
7. Handling and dealer costs	+ P/ton	350.00
8. Transportation cost to farm (P0.8/kg)	+ P/ton	800.00
9. Economic farmgate price of Urea	= P/ton	5,681.00
10. Economic farmgate price of K2O	= P/ton	10,329.00
D Derived Price of Compound 14-14-14 (estimated from price of N, P2O5 and K2O)		
	P/ton	4,924.50

Table XII.2.4 Gross and Net Economic Production Values under Future Condition without Project (1,320 ha)

(1) Existing Vegetable Farm (720 ha)

Crops	Cultivation Area (ha)	Unit Yield (ton/ha)	Production (ton)	Unit Price (P/kg)	Gross Value (P1,000)	Production Cost		Net Value (P1,000)	
						Unit (P/ha)	Total (P1,000)		
<u>Dry season</u>									
Tomato	435	10.0	4,350	3.34	14,529	20,720	9,013	5,516	
Cabbage	145	7.0	1,015	6.34	6,435	15,106	2,190	4,245	
Raddish	70	9.0	630	3.88	2,444	12,900	903	1,541	
Baguio Beans	70	6.0	420	6.73	2,827	17,828	1,248	1,579	
Sweet Potato	-	-	-	-	-	-	-	-	
Sub-total	720	-	6,415	-	26,235	-	13,355	12,881	
<u>Wet season</u>									
Tomato	-	-	-	-	-	-	-	-	
Cabbage	70	5.0	350	7.94	2,779	18,433	1,290	1,489	
Raddish	-	-	-	-	-	-	-	-	
Baguio Beans	-	-	-	-	-	-	-	-	
Sweet Potato	145	10.0	1,450	3.82	5,539	13,333	1,933	3,606	
Sub-total	215	-	1,800	-	8,318	-	3,224	5,094	
Total	935	-	8,215	-	34,553	-	16,578	17,975	
Net Production Value per ha (Pesos/ha)							=		24,965

Vegetable farm includes areas under multi-storied cropping with coconuts/tree crops.

(2) Coconuts Plantation in Road Influence Area (600 ha)

Crops	Cultivation Area (ha)	Unit Yield (nuts/ha)	Production (1,000 nuts)	Unit Price (P/nut)	Gross Value (P1,000)	Production Cost		Net Value (P1,000)	
						Unit (P/ha)	Total (P1,000)		
Coconuts	600	3,600	2,160	1.6	3,456	3,811	2,287	1,169	
Net Production Value per ha (Pesos/ha)							=		1,949

Table XII.2.5

Gross and Net Economic Production Values under Future Irrigated Condition with Project (320 ha)

Crops	Cultivation Area (ha)	Unit Yield (ton/ha)	Production (ton)	Unit Price (p/kg)	Gross Value (P1,000)	Production Cost		Net Value (P1,000)	
						Unit (P/ha)	Total (P1,000)		
Pattern-1	30%								
Sitao	96	10.3	989	7.55	7,465	24,664	2,368	5,098	
Tomato	96	14.7	1,411	5.97	8,425	34,376	3,300	5,125	
Carrots	96	12.6	1,210	12.94	15,652	52,923	5,081	10,572	
Sub-total	288	-	-	-	31,543	-	10,748	20,794	
Pattern-2	10%								
Celery	32	12.6	403	14.10	5,685	58,777	1,881	3,804	
Cabbage	32	17.6	563	6.21	3,497	35,963	1,151	2,347	
Lettuce	32	11.9	381	17.81	6,782	70,378	2,252	4,530	
Sub-total	96	-	-	-	15,965	-	5,284	10,681	
Pattern-3	20%								
Chinese cabbage	64	13.9	890	10.48	9,323	47,664	3,050	6,273	
Tomato	64	14.7	941	5.97	5,617	34,376	2,200	3,417	
Sweet potato	64	15.4	986	3.48	3,430	18,175	1,163	2,267	
Sub-total	192	-	-	-	18,369	-	6,414	11,956	
Pattern-4	10%								
Baguio beans	32	6.7	214	7.24	1,552	20,118	644	908	
Cabbage	32	17.6	563	5.89	3,317	35,963	1,151	2,166	
Cauliflower	32	9.4	301	22.62	6,804	60,123	1,924	4,880	
Sub-total	96	-	-	-	11,674	-	3,719	7,955	
Pattern-5	20%								
Sitao	64	10.3	659	7.24	4,773	24,664	1,578	3,194	
Raddish	64	15.3	979	5.57	5,454	21,093	1,350	4,104	
Cabbage Wet	64	10.6	678	8.00	5,427	48,095	3,078	2,349	
Sub-total	192	-	-	-	15,654	-	6,007	9,647	
Pattern-6	10%								
Chinese cabbage	32	13.9	445	9.85	4,381	47,664	1,525	2,856	
Cabbage	32	17.6	563	6.21	3,497	35,963	1,151	2,347	
Sweet potato	32	15.4	493	3.46	1,705	18,175	582	1,123	
Sub-total	96	-	-	-	9,584	-	3,258	6,326	
Total	960	-	-	-	102,788	-	35,429	67,359	
Average Net Production Value per ha (Pesos/ha)								=	210,498

Table XII.2.6 Gross and Net Economic Production Values under Future Rainfed Condition with Project (930 ha)

Crops	Cultivation Area (ha)	Unit Yield (ton/ha)	Production (ton)	Unit Price (p/kg)	Gross Value (P1,000)	Production Cost		Net Value (P1,000)	
						Unit (P/ha)	Total (P1,000)		
Pattern-1	30%								
Tomato	279	12.0	3,348	3.69	12,354	27,964	7,802	4,552	
Sweet potato	279	12.0	3,348	3.82	12,789	16,430	4,584	8,205	
Sub-total	558	-	-	-	25,143	-	12,386	12,758	
Pattern-2	20%								
Tomato	186	12.0	2,232	3.69	8,236	27,964	5,201	3,035	
Cabbage Wet	186	8.4	1,562	8.00	12,499	31,745	5,905	6,595	
Sub-total	372	-	-	-	20,735	-	11,106	9,629	
Pattern-3	20%								
Cabbage	186	8.4	1,562	6.34	9,906	21,650	4,027	5,879	
Sitao	186	8.2	1,525	8.18	12,476	30,269	5,630	6,846	
Sub-total	372	-	-	-	22,382	-	9,657	12,725	
Pattern-4	10%								
Raddish	93	10.8	1,004	4.46	4,480	16,176	1,504	2,975	
Sitao	93	8.2	763	8.18	6,238	30,269	2,815	3,423	
Sub-total	186	-	-	-	10,718	-	4,319	6,398	
Pattern-5	10%								
Raddish	93	10.8	1,004	4.46	4,480	16,176	1,504	2,975	
Lettuce	93	9.5	884	17.81	15,735	54,400	5,059	10,676	
Sub-total	186	-	-	-	20,215	-	6,564	13,651	
Pattern-6	10%								
Baguio beans	93	6.3	586	6.73	3,943	18,563	1,726	2,217	
Carrot	93	10.1	939	12.94	12,155	38,798	3,608	8,546	
Sub-total	186	-	-	-	16,098	-	5,335	10,763	
Total	1860	-	-	-	115,291	-	49,366	65,924	
Average Net Production Value per ha (Pesos/ha)								=	70,886

Table XII.2.7

Incremental Economic Benefits of Crop Production

(Unit: P 1,000)

Items	Unit	without Project	with Project	Difference
1. Irrigation (320 ha)				
a. Change in land use				
- Rainfed	ha	320	0	-320
- Irrigated	ha	0	320	320
b. Unit NPV per ha				
- Rainfed	P/ha	24,965	0	-
- Irrigated	P/ha	0	210,498	-
c. Total NPV	P1,000	7,989	67,359	59,371
2. Farm-to-Market Road (Influence area : 930 ha*)				
a. Change in land use				
- Existing vegetable farm	ha	330	330	0
- Existing coconut farm	ha	600	0	-600
- newly reclaimed farm	ha	-	600	600
b. Unit NPV per ha**				
- Existing vegetable farm	P/ha	24,965	35,443	10,478
- Existing coconut farm	P/ha	1,949	0	-1,949
- newly reclaimed farm	P/ha	0	35,443	35,443
c. Total NPV				
- Existing vegetable farm	P1,000	8,238	11,696	3,458
- Existing coconut farm	P1,000	1,169	0	-1,169
- newly reclaimed farm	P1,000	0	21,266	21,266
Total	P1,000	9,408	32,962	23,554
Total NPV		17,397	100,321	82,925

Remarks : * The existing vegetable farm of 70 ha in the National Park was excluded from the economic evaluation. Therefore, the road influence area will be 930 ha in total.

** It is assumed that the development benefits by the improvement of farm-to-market road contribute to only 50% of the expected net production values with the Project.

Table XII.2.8 VOC Saving by Improvement of Farm-to-Market Road

Items / Roads	Nagcarlan			Kanlurang Lazaan-Bukal	Liliw Novaliches- Luquin	Ibabang Sungil- Ilayang Sungi	Majayjay Pangil- Bukal	Total
	San Francisco-Bukal	Sinipian-Silangan Lazaan	Malinao-Kanlurang Lazaan					
Road Length (km)	6.0	0.8	1.5	2.1	3.2	1.0	3.9	18.6
Ave. Distance for Transportation (km)	4.8	0.6	1.2	1.7	2.6	0.8	3.1	14.8
Agricultural Traffic								
Present Farm Production (ton/year)								
Vegetables	2,809	80	114	628	2,968	913	674	8,186
Coconut (Tree crops)	1,696	272	140	1,000	808	392	328	4,636
Total	4,505	352	254	1,628	3,776	1,305	1,002	12,822
No. of Jeepneys Required for Transportation of Farm Products (cars/year) (Average Loading: 0.7 ton/car)								
Vegetables	4,013	114	163	897	4,240	1,304	963	11,694
Coconut (Tree crops)	2,423	389	200	1,429	1,154	560	469	6,623
Total	6,436	503	363	2,326	5,394	1,864	1,431	18,317
Traffic Volume-Distance of Jeepneys for Farm Products (car-km/year)								
Total	61,783	603	871	7,907	28,050	2,983	8,875	111,072
VOC Savings* of Jeepneys for Farm Products (P/year)								
Total	131,597	1,285	1,855	16,843	59,747	6,354	18,903	236,584
Non-Agricultural Traffic								
No. of Jeepneys for Transportation of Commodities (cars/day)**								
	5,894	4,444	606	1,179	3,014	1,416	1,729	18,282
Traffic Volume-Distance of Jeepneys for Commodities (car-km/year)								
	28,291	2,666	727	2,004	7,836	1,133	5,360	48,018
VOC Savings* of Jeepneys for Commodities (P/year)								
	60,260	5,679	1,549	4,269	16,692	2,413	11,417	102,279
Passengers Traffic								
Number of Tricycles Required for Transportation of Passengers (cars/year) **								
	567,867	428,145	58,473	113,661	290,394	136,437	166,659	1,761,636
Traffic Volume-Distance of Tricycles for Passengers (car-km/year)								
	2,725,762	256,887	70,168	193,224	755,024	109,150	516,643	4,626,857
VOC Savings* of Tricycles for Passengers (P/year)								
	2,044,321	192,665	52,626	144,918	566,268	81,862	387,482	3,470,143
Total VOC Savings (P/year)	2,236,179	199,630	56,030	166,030	642,707	90,629	417,802	3,809,006

* : It is assumed that vehicle operating costs (VOC) can be saved by the improvement of rural roads from 4.24 P/km to 2.11 P/km for jeepney and 1.48 P/km to 0.73 P/km for tricycle.

** : Estimated on the basis of actual traffic survey conducted by JICA study team on Feb. 23 - 24, 1994

Table XII.2.9 Maintenance Cost Saving

Road	Total Length (m)	without Project			with Project		Maintenance Cost Saving (Pesos/year)	
		Length* (m)	Length* (m)	Unit cost (Pesos/m)	Total (Pesos/year)	Unit cost (Pesos/m)		Total (Pesos/year)
Nagcarlan								
San Francisco-Bukal	6,039	20	1,570	264.58	415,428	2.55	15,419	400,009
Sinipian - Silangan Lazaan	764	10	176	264.58	46,492	2.41	1,838	44,654
Malinao - Kanlurang Lazaan	1,523	20	396	264.58	104,768	2.41	3,663	101,105
Kanlurang Lazaan - Bukal	2,144	80	943	264.58	249,594	2.41	5,157	244,437
Sub-total	10,470		2,094		816,282		26,077	790,205
Liliw								
Novaliches - Luquin	976	80	429	264.58	113,621	2.41	2,348	111,274
Ibabang Sungai - Ilayang Sungai	3,210	20	835	264.58	220,818	2.70	8,663	212,155
Sub-total	4,186	100	2,093		334,440		11,011	323,429
Majayjay								
Pangil - Bukal	3,883	70	1,592	264.58	421,219	2.41	9,340	411,880
Total	18,539	170	5,779		1,571,941		46,427	1,525,514

Remarks : **Without Project**

Length* : Total length of roads requiring annual maintenance and re-gravelling

Road maintenance costs under without project condition was estimated :
Unit maintenance and regravelling cost (P295/m) x total length of roads requiring annual maintenance and re-gravelling (depending upon the condition of each road)

With Project

Construction costs of concrete paved road was estimated to be P3,202/m for 5 m roads and P2,586/m for 4 m road. It is also assumed that the re-pavement will be made for 0.1% of total length annually as maintenance work.

Maintenance costs both with and without project are converted to economic term using a commodity specific conversion factor of 0.82 (CSCF) in adjusting the local currency portion.

Table XII.2.10

Estimates of Economic Cost

(Unit : P1,000)

Items	Financial Cost			Economic Cost
	Foreign	Local	Total	
1. Detailed Design	10,058	5,165	15,223	14,293
2. Construction Works				
(1) Irrigation Works	43,626	31,664	75,290	69,590
(2) Farm-to-Market Road	53,537	59,594	113,131	102,404
(3) Trading Posts	4,761	7,192	11,953	10,658
(4) Training and Extension Center	2,597	5,898	8,495	7,433
(5) Soil Conservation Works	657	3,179	3,836	3,264
(6) Rural Water Supply System	1,228	665	1,893	1,773
Sub-total	106,406	108,192	214,598	195,123
3. O&M Equipment	10,021	2,210	12,231	11,833
4. Administration	72	2,870	2,942	2,425
5. Engineering Services	20,790	4,740	25,530	24,677
6. Land Acquisition	0	2,065	2,065	1,693
Sub-total (3+4+5)	30,883	11,885	42,768	40,629
Sub-total (1+2+3+4+5+6)	147,347	125,242	272,589	250,045
7. Physical Contingencies	14,735	12,524	27,260	25,005
Sub-total (1+2+3+4+5+6+7)	162,082	137,766	299,849	275,050
8. Price Contingencies	16,858	30,621	47,479	-
Total	178,940	168,387	347,328	275,050

Conversion from financial costs to economic costs :

= (F/C portion* x 1.0) + (L/C portion* . x commodity specific conversion factor (CSCF) of 0.82)

= **P275,050 (Economic Cost)**

* excluding transfer payment and price contingencies

Table XII.2.11 Cost and Benefit Stream of the Project

(Unit : P1.000)

Year	Project Investment	O&M Costs	Irrigation Benefits	Farm-to-Market Road Benefit			Total Incremental Benefits	Net Benefits	
				VOC Saving	O&M Saving	Development benefits			
1	1996	122,789	0	0	0	0	0	-122,789	
2	1997	151,921	0	0	0	0	0	-151,921	
3	1998		5,440	11,874	3,809	1,526	2,355	19,565	14,125
4	1999		5,440	23,748	3,809	1,526	4,711	33,794	28,354
5	2000		5,440	35,623	3,809	1,526	7,066	48,024	42,584
6	2001		5,440	47,497	3,809	1,526	9,422	62,253	56,813
7	2002		5,440	59,371	3,809	1,526	11,777	76,483	71,043
8	2003		5,440	59,371	3,809	1,526	14,132	78,838	73,398
9	2004		5,440	59,371	3,809	1,526	16,488	81,194	75,754
10	2005		5,440	59,371	3,809	1,526	18,843	83,549	78,109
11	2006		5,440	59,371	3,809	1,526	21,199	85,905	80,465
12	2007		5,440	59,371	3,809	1,526	23,554	88,260	82,820
13	2008		5,440	59,371	3,809	1,526	23,554	88,260	82,820
14	2009		5,440	59,371	3,809	1,526	23,554	88,260	82,820
15	2010		5,440	59,371	3,809	1,526	23,554	88,260	82,820
16	2011		5,440	59,371	3,809	1,526	23,554	88,260	82,820
17	2012		5,440	59,371	3,809	1,526	23,554	88,260	82,820
18	2013		5,440	59,371	3,809	1,526	23,554	88,260	82,820
19	2014		5,440	59,371	3,809	1,526	23,554	88,260	82,820
20	2015		5,440	59,371	3,809	1,526	23,554	88,260	82,820
21	2016		5,440	59,371	3,809	1,526	23,554	88,260	82,820
22	2017		5,440	59,371	3,809	1,526	23,554	88,260	82,820
23	2018		5,440	59,371	3,809	1,526	23,554	88,260	82,820
24	2019		5,440	59,371	3,809	1,526	23,554	88,260	82,820
25	2020		5,440	59,371	3,809	1,526	23,554	88,260	82,820
26	2021		5,440	59,371	3,809	1,526	23,554	88,260	82,820
27	2022		5,440	59,371	3,809	1,526	23,554	88,260	82,820
28	2023		5,440	59,371	3,809	1,526	23,554	88,260	82,820
29	2024		5,440	59,371	3,809	1,526	23,554	88,260	82,820
30	2025		5,440	59,371	3,809	1,526	23,554	88,260	82,820

Economic Internal Rate of return (EIRR) = 18.5%

JICA