APPENDIX X

IMPLEMENTATION SCHEDULE AND COST ESTIMATE

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CHAPTER 1 ORGANIZATION FOR THE PROJECT EXECUTION

The National Irrigation Administration (NIA) is given responsibilities for planning, developing, operating and managing all national irrigation systems in the country. NIA's activities are managed by a Board of Directors and an Administrator; the latter is assisted by four Assistant Administrators.

The NIA will become the executive agency for the implementation of the Project. It will be responsible for design, construction of project works and supervision of the Project. The Assistant Administrator for operations will be responsible for overall execution of the Proposed Project, and will coordinate activities of all relevant governmental agencies in connection with implementation of the Project.

The new project execution office in the field will not be established. The UPRIIS Office proposed in Appendix VII will execute the proposed project. Further Design and Construction Supervision Division will be newly established for reinforcement of the UPRIIS Office during construction period. After completion of the project, this division will be phased out. The Operations Manager of the UPRIIS Office will manage all field works assisted by six supporting divisions and four district offices. The proposed organization for the project execution is shown in Fig. 10.1. In addition to UPRIIS staff, necessary staff will be employed during construction period for the smooth and efficient project execution.

The number of staff required is estimated paying due attention to work quantities, implementation schedule and characteristics of this project as follows:

Item	Required Man-Month	
	Detail Design	Construction Supervision
1. Engineering Consultants		
1.1 Foreign Consultant	160	200
1.2 Local Consultant	170	240
2. NIA-UPRIIS Staff	1,400	2,200

The detail breakdown of the required man-month is shown in Table 10.1.

The detailed design works will be carried out by the NIA-UPRIIS engineering staff with assistance of the consultants, in principal. The period of 30 months is required for the detailed design works including the review of the feasibility study, the additional surveys and investigations and the preparation of the detailed design and tender documents.

All the construction works would be executed by full contract basis. The NIA-UPRIIS staff will supervise all the construction works during the period of 102 months. The engineering assistant services by the consultants will be carried out during the period of major construction works excluded the improvement works of on-farm level. The period is estimated 60 months (5 years) according to the implementation schedule shown in Fig. 10.2.

CHAPTER 2 IMPLEMENTATION SCHEDULE

The implementation schedule is shown in Fig. 10.2. The project works will be divided into three categories such as i) the preparatory works, ii) the construction works and iii) the installation of centralized monitoring system. All construction works will be executed on the contract basis. The total construction period for the project will be required for 10 years from 1985 to 1994.

2.1 Preparatory Works

The preparatory works comprises the mapping, surveys and tests, detail design, tendering and so on.

The following mapping and survey works are essentially required before and through conducting detail design:

1) Map in scale of 1/10,000 with 1.0 m contour interval for the UPRIIS area of about 1,000 km^2

2) Longitudinal and cross section survey on the diversion canals of 47 km, main canals of 236 km, major laterals of about 400 km, drainage creeks of 100 km and the Talavera river of 44 km.

3) Plain table survey on the existing eight diversion dams and the major related structures of about 1,600 numbers

The detail design works will be conducted for about three years from 1985 to 1987 as follows:

Year	Design Works for
1985	- Irrigation improvement for District III and District IV (PEÑRIS ext'n) - Drainage improvement - CMS
1986	- Irrigation improvement for District IV (PEÑRIS proper) and District I (SAE and TRIS upper) - River improvement
1987	- Irrigation improvement for District I (TRIS lower, SDA) and District II

2.2 Construction Schedule for Improvement Works of Irrigation, Drainage and River

2.2.1 General

The construction and implementation works comprise the rehabilitation and improvement of the irrigation facilities for about 111,200 ha, improvement of drainage creeks of about 68.7 km and, improvement of the Talavera river for about 41.9 km including two tributaries.

The major construction works excluding on-farm improvement works will be carried out from 1986 to 1990 under the four contracts as follows:

Contract	Construction Works for
A	Irrigation improvement for District III and IV
B	Drainage improvement
C	River improvement
D	Irrigation improvement for District I and II

Major facilities of the rehabilitation and improvement for irrigation are as follows:

Item	District I	II	III	IV	Total
Diversion dam (nos.)	2	4	1	1	8
Diversion canal (km)	6	14	27	-	47
Main canal (km)	53	51	71	61	236
Lateral canal (km)	276	296	365	344	1,281
Related facilities					
Re-use structure (nos.)	6/1	3	4	3	16
Head gate structure (nos.)	36	41	35	16	128
Other structures (nos.)	312	441	459	320	1,532

/1: Include 5-Bay

Most of the proposed works are earth works, concrete works and gate replacement and installation. Total volume of these works are summarized as follow. The rehabilitation of maintenance road along canals is included in the rehabilitation works of canals.

Quantity of Civil Work

Item	District I	II	III	IV
1. Earth work (10^3 m^3)				
Excavation	205	288	382	204
Embankment	96	103	203	89
2. Concrete work (m^3)				
Concrete	1,800	6,100	48,900	3,200
3. Gate works (nos.)				
Replacement (large)	102	120	159	177
Replacement (small)	699	709	724	760

Large gate: Gate area more than 1.5 m x 1.5 m
Small gate: Gate area less than 1.5 m x 1.5 m

As for the Talavera river improvement and drainage creek improvement, major works are earth works such as embankment of river bank, widening of creek section, short-cut of the winding reaches etc. Quantities required for these improvement works are as follows:

Item	River Improvement	Drainage Improvement
1. Improvement Length (km)	41.9	68.7
2. Earth Work (10^3 m^3)		
Excavation	1,140	2,690
Embankment	1,400	1,320
3. Structures (nos.)		
Gate	4	-
Bridge	1	10
Drainage Inlet	-	44

2.2.2 Basic Method of Construction Works

The greater part of the above construction works is the earth works. Large quantity or scale of earth moving will be executed by heavy construction equipment. However, smaller scaled earth works such as face smoothing, desilting of smaller canals will be executed by manpower with use of hand tools. Following heavy duty equipments will be basically applied for the earth moving works:

Earth Works	Proposed Equipment
Excavation	Bull-dozer Back-hoe shovel
Loading	Back-hoe shovel Tractor shovel for excavated materials gathered by bull-dozer
Hauling	Dump truck
Spreading	Bull-dozer
Compacting	Vibration-roller Compactor

2.2.3 Construction Schedule

The construction works for the rehabilitation and improvement of the irrigation facilities will be executed in accordance with each irrigation system as a construction unit.

The construction schedule is formulated from the basic considerations that the cease period of irrigation water supply will be minimized and effect of improvement will be realized as early as possible. The proposed construction schedule is shown in Fig. 10.2.

In the Fig. 10.2, the construction works are expressed in terms of area and canal length. The construction of the canal consist of works of major canals and facilities such as diversion canals, main canals, lateral canals, diversion dams, head gate structures, and so on. Area expresses the construction works of smaller canals and structures such as sub-lateral canals, main farm ditches and related structures.

The construction works will be started from the tail portion of canals or the downstream portion of area. Accordingly the construction will be started from those systems in the District III and IV in the first phase. The TRIS upper system in the District I is regarded as independent as the construction works will not affect to the downstream. So that construction of the TRIS upper system will be started prior to the other systems in District I.

As for the progress of construction works, the maximum capacity of construction works is set at five irrigation systems in parallel at the same time.

As for the improvement works of drainage creeks and the Talavera river, the construction schedule can be prepared independently with the irrigation systems. The construction works for drainage creeks and the river will require about 5 years of construction period.

As a result, the total construction period for the project will be required for 9 years from 1986 to 1994.

2.3 Implementation Schedule for Management System

According to the construction schedule of the irrigation improvement works, the centralized monitoring system (CMS) will be introduced in the UPRIIS.

The CMS comprises the central station, five base stations and forty-eight field stations as follows:

Office	Station (Nos.)		
	Central	Base	Field
UPRIIS	1	1	-
Pantabangan Dam	-	1	-
District I	-	1	9
District II	-	1	13
District III	-	1	15
District IV	-	1	11
Total	1	5	48

The installation of equipments for the CMS and the construction of field stations will be carried out by District. The establishment of the central office and the Pantabangan dam station will take place prior to the implementation of the base station and the field station.

The implementation schedule for the centralized monitoring system is shown in Fig. 10.2.

2.4 Farmers' Organization Set-up

2.4.1 Strategy of Implementation

The program of the organization and development of Irrigation Associations will be implemented by "Irrigation Association Organizers" (IAOs), newly posted in the Farmers' Assistance Division (Former Agriculture Division) and O&M field personnel in the District Offices.

To establish a closer coordination link among the personnel involved, the IAOs and O&M field personnel will work as a team in selected programmed areas and a monthly coordination meeting with the District Chief will be conducted. Further discussion on the problems and assessment of the progress of program implementation will be made in the UPRIIS staff meeting.

It is scheduled that one Farmer-Irrigation Association will be organized during a period of 24 months in general. The implementation program for all FIA set-up in the UPRIIS will be planned to be completed within ten (10) years. Annual targets of the organization and development of FIAs are shown in Table 10.2.

This program will be carried out in four stages as follows:

1) Preparation

2) Pre-organization

3) Organization

4) Development

Prior to the step of preparation, IAOs and O&M personnel concerned will be disciplined in the mechanics of the program and the process of the organization and development of irrigation association.

This program will be revised upon ample deliberation between the Irrigation Association Organizer (IAO), O&M field personnel and potential farmer-leaders (PFL) who are selected during the period of preparation work according to the specific local conditions.

The strategy and procedure of the program are outlined in Fig. 10.3.

2.4.2 Manpower Development

It is planned to set-up 3,008 FIGs and about 865 FIAs during a period of ten (10) years.

Manpower required for the implementation of this program is estimated at 50 IAOs under the assumption that one IAO will set up annually 6 FIGs and 1.7 FIAs on an average.

Additionally, in order to serve as a reliable pipe-line between IAO and farmers in the process of organization and development of FIAs, it is proposed to assign, for a certain period, one well-educated farmer as an Association Worker (AW) in each FIA who will be selected jointly by the potential farmer-leaders and UPRIIS. After set-up of viable organization, AW will be incorporated into Irrigation Association.

2.5 Program of Tapering and Reshuffle in UPRIIS Office

In accordance with the staffing pattern proposed in Appendix VII, the superfluous personnel in UPRIIS Office consists of 38-Water Management Technologist and 203-Ditchtender. On the other hand new posts comprise 20-Gatekeeper and 50-Irrigation Association Organizer.

In implementing the reorganization, it is recommended for the UPRIIS to adopt, as their principle, the following measures:

1) Relocation of the superfluous personnel to new posts

2) Tapering trimming of the retirable personnel and not filling up new hands, especially in ditchtender

3) Arrangements for assigning the personnel concerned to the marginal posts such as Common Irrigator and Association Worker in the FIAs

Considering the limited reshuffle only within the UPRIIS, it is proposed that the superfluous personnel will be relocated as follows:

1) All of superfluous Water Management Technologists and 12 among superfluous Ditchtenders will be incorporated in the Famrers' Assistance Division (FAD) as Irrigation Association Organizers (IAOs).

2) 20 of the superfluous Ditchtenders will be appointed to the new post of Gatekeeper.

The remaining superfluous Ditchtenders will be appointed to the new their age and/or service period requirements for retirement are satisfied.

Implementation program for tapering the 171-superfluous Ditchtenders will be carried out during the period of 9 years, because drastic change of organization will adversely affected the present O&M functions of UPRIIS.

The program on retirement of Ditchtenders is presented below.

Retirement at Age 55 and after 20 Years of Service

	1984	1985	1986	1987	1988	1989	1990	1991	1992	Total
No. of Retirable Ditchtenders	32	3	21	26	12	17	23	29	8	171

CHAPTER 3 COST ESTIMATE

3.1 General

In this chapter, the project cost for project implementation, operation and maintenance costs and replacement cost are estimated. The following assumptions are made for the cost estimate of the project:

1) The exchange rate used in the estimate is:

   US$1.0 = ₱11.0 = ¥240

2) The construction works would be executed on the contract basis. The construction machineries and equipments for the construction works would be provided by the contractors themselves. Therefore, depreciation cost of machineries and equipments is considered in the estimate of the construction cost.

3) The construction cost comprises foreign currency and local currency portions. Local currency portion is estimated on the basis of the current prices in the Philippines in August 1983 and foreign currency portion is estimated based on the CIF prices at the project site.

   The currency is classified into foreign and local portions according to the NIA's criteria as follows:

(Unit: %)

Item	F/C	L/C
Cement	50	50
Steel	100	0
Hardware	20	80
Lumber	0	100
Aggregate	20	80
Boulder	20	80
Labor	0	100
Fuel & Oil	50	50
Depreciation Cost of Machinery	80	20
Gate		
More than 1.5 x 1.5 m	100	0
Less than 1.5 x 1.5 m	20	80

4) The physical contingency related to the construction quantities is set at about 15% of the direct cost. The price contingency is assumed at 7.5% in 1984, 7.0% in 1985 and 6.0% in and after 1986 per annum for the foreign currency portion and 12% per annum for the local currency portion.

5) Breakdown of construction cost is calculated using detailed unit costs. Each unit cost is composed of the basic unit cost and working rate of labor and/or construction machinery.

   Basic cost of labor and materials are basically quoted from the unit cost officially used by the government of the Philippines.

   Unit cost is calculated in accordance with a standard of the government of the Philippines and/or Japanese standard modified to the condition in the project site.

3.2 Project Cost

The project cost comprises the direct construction cost, implementation cost of centralized monitoring system, procurement cost of O & M equipments, engineering and administration cost, institutional cost and physical contingency. The project cost is estimated based on the detail unit cost analysis and quantity calculation of the project works.

The basic rate for cost estimate and the unit prices for major work items are shown in Table 10.3 and Table 10.4 respectively. The unit cost by using construction equipments is listed in Table 10.5.

The total project cost is estimated to be ₱916.2 million consisting of ₱554.1 million equivalent to foreign currency and ₱362.1 million of local currency portion.

The breakdowns of the construction costs for the irrigation improvement, drainage improvement and river improvement are presented in the relevant Appendixes II, III and IV respectively.

The breakdowns of implementation cost of CMS and procurement cost of O & M equipments are also explained in Appendix VI. The engineering and administration cost comprises the remuneration for consultants, the direct cost, mapping cost, personnel expense and so on. The breakdown of this cost is shown in Table 10.6. As for the institutional cost, the detail is explained in Appendix IX.

The project cost is shown in Table 10.7 and summarized as below.

Item	Cost (₱10⁶)
Direct Construction Cost	515.49
Centralized Monitoring System	103.72
O & M Equipments	40.75
Engineering and Administration Cost	108.00
Institutional Cost	32.87
Physical Contingency	115.37
Total	916.20

3.3 Fund Requirement

The annual fund requirement for the project execution is worked out based on the implementation schedule and the price escalation factor as follows:

(Unit: ₱10⁶)

Year	Foreign Currency	Local Currency	Total
1985	37.3	14.8	52.1
1986	178.1	112.4	290.5
1987	161.7	116.6	278.3
1988	109.3	72.9	182.2
1989	74.1	84.6	158.7
1990	123.7	83.4	207.1
1991	18.1	59.8	77.9
1992	30.2	72.7	102.9
1993	16.0	59.0	75.0
1994	4.0	17.3	21.3
Total	752.5	693.5	1,446.0

The annual fund requirement by each project cost is presented in Table 10.8.

3.4 Operation and Maintenance Cost

Annual operation and maintenance cost in the fall stage of the project is estimated at ₱32.68 million comprising salaries and wages of staff and labours, office expenses, operation cost of vehicles and O&M equipments and repairing cost of the project facilities, etc. The breakdown of annual O&M cost is shown in Table 10.9.

3.5 Replacement Cost

Gates, equipments for centralized monitoring system (CMS) and O&M equipments are to be replaced at a certain time within 50 years of the project life. The useful life is assumed to be 20 years for the gates, 5 years for the equipments of CMS and 10 years for the O&M equipments, respectively. The replacement costs and the useful lives of these facilities are listed in Table 10.10.

Table 10.1 REQUIRED MAN-MONTH

I) Engineering Staff

(Unit: M/M)

Speciality	Foreign Consultant		Local Consultant	
	Detail Design	Construction Supervision	Detail Design	Construction Supervision
1. Project Director	2	2	-	-
2. Team Leader	30	60	30	60
3. Irrigation Planning Engineer	5	-	5	-
4. Irrigation Design Engineer	40	30	50	60
5. Hydrologist	4	-	6	-
6. River Engineer	4	-	4	-
7. Soil Mechanical Engineer	3	-	3	-
8. Engineering Geologist	3	-	4	-
9. Institutional Expert	4	6	6	6
10. Metal Work Engineer	4	5	4	5
11. Computer Expert	6	10	6	-
12. Survey Supervisor	18	-	36	-
13. Construction Planner	4	-	4	-
14. Cost Estimate Expert	4	-	4	-
15. O & M Expert	4	8	4	7
16. Construction Engineer	-	50	-	60
17. Equipment Engineer	4	6	4	6
18. Quantity Measurement Engineer	-	-	-	60
19. Specification Writer	4	-	-	-
20. Specialist as required	12	15	-	-
21. Home Support Engineer	5	8	-	-
Total	160	200	170	240

II) NIA-UPRIIS Staff (Additional Staff only)

(Unit: M/M)

Speciality	Detail Design	Construction Supervision
1. Design & Construction Supervision Division Manager	30	94
2. Irrigation Engineer	120	216
3. Design Engineer	240	216
4. Construction Engineer	-	432
5. Construction Supervisor	-	432
6. Surveyor	360	-
7. Other Staff		
- Draftsman	240	216
- Typist	90	108
- Field labor	320	486
Total	1,400	2,200

Table 10.2 ANNUAL TARGETS FOR THE ORGANIZATION & DEVELOPMENT OF IRRIGATION ASSOCIATION AND COST ESTIMATE

Year	Stage of Development			Institutional Cost (₱10³)
	Organization of FIG	Organization of FIA	Turn-over of O&Ms to FIA	
1985	300	-	-	-
1986	300	56	56	2,128
1987	300	146	146	5,548
1988	300	105	105	3,990
1989	300	105	105	3,990
1990	300	116	116	4,408
1991	300	111	111	4,218
1992	300	113	113	4,294
1993	300	97	97	3,686
1994	308	16	16	608
Total	3,008	865	865	32,870

Table 10.3 BASIC RATE FOR COST ESTIMATE

Unit Cost of Labour

(Unit: ₱)

No.	Item	Cost	Foreign Currency	Local Currency
1.	Construction Foreman	53.82	-	53.82
2.	Mason Worker	38.06	-	38.06
3.	Carpenter	40.62	-	40.62
4.	Driver	43.45	-	43.45
5.	Heavy Equipment Operator	46.56	-	46.56
6.	Labourer	30.06	-	30.06
7.	Engineering Assistant B	55.82	-	55.82

Material Cost

(Unit: ₱)

No.	Item	Unit	Cost	Foreign Currency	Local Currency
1.	Cement	bag	38.00	19.00	19.00
	- do -	t	950.00	475.00	475.00
2.	Steel Bars (RSB)	kg	4.50	4.50	-
	- do -	t	4,500.00	4,500.00	-
3.	Hardware	kg	7.25	1.45	5.80
4.	Lumber	m^3	1,984.00	-	1,984.00
5.	Sand	m^3	39.47	7.89	31.58
6.	Gravel	m^3	39.47	7.89	31.58
7.	Boulder	m^3	80.40	16.08	64.32
8.	Gasoline (regular)	ℓ	5.32	2.66	2.66
9.	Diesel	ℓ	3.50	1.75	1.75

Table 10.4 LIST OF UNIT COST

(Unit: ₱)

No.	Item	Unit	Unit Cost	Currency	
				Foreign	Local
1.	Excavation by Manpower				
	- Sand	m^3	9.7	-	9.7
	- Normal Soil	m^3	16.2	-	16.2
	- Clayey Soil	m^3	19.8	-	19.8
	- Gravel	m^3	22.2	-	22.2
2.	Excavation by Manpower W/H Pick Hummer				
	- Weathered Rock	m^3	142.0	81.2	60.8
3.	Hauling by Manpower				
	- L = 20 m	m^3	8.9	-	8.9
	- L = 40 m	m^3	11.7	-	11.7
	- L = 60 m	m^3	13.7	-	13.7
	- L = 80 m	m^3	16.2	-	16.2
	- L = 100 m	m^3	17.0	-	17.0
	- L = 200 m	m^3	17.4	-	17.4
4.	Compacting				
	- Compacting by Manpower	m^3	11.3	-	11.3
	- Compacting by Compactor	m^3	11.2	3.3	7.9
5.	Smoothing of Face Excavated or Filled Up	m^2	12.2	-	12.2
6.	Concrete Mixed by Portable Mixer				
	- Plain Concrete	m^3	475.7	184.6	291.1
	- Reinforced Concrete	m^3	529.2	212.2	317.0
	- Lean Concrete	m^3	505.3	143.4	361.9
	- Lining Concrete	m^2	37.8	15.0	22.8
7.	Mortal	m^3	644.1	279.1	365.0
8.	Form for Concrete				
	- Wooden Form	m^3	162.3	0.6	161.7
9.	Processing and Assembling of Reinforced Iron Bar	t	7,497.0	6,270.8	1,226.2
10.	Stone Masonry (Wet)	m^3	592.3	135.4	456.9
11.	Sod Facing	m^3	19.5	-	19.5
12.	Wooden Scaffolding	m^3	205.9	0.6	205.3
13.	Laying RC Pipe (ø450)	m	247.7	49.6	198.1
14.	Laying RC Pipe (ø1,000)	m	1,151.5	217.0	934.5
15.	Stone Masonry (Dry)	m^3	184.6	29.9	154.7

Table 10.5(1) LIST OF UNIT COST BY USING CONSTRUCTION EQUIPMENT

(Unit: ₱)

No.	Item	Unit	Unit Cost	Currency	
				Foreign	Local
1.	Excavation by Bulldozer (11 ton)				
	- Sand	m^3	8.6	6.3	2.3
	- Normal Soil	m^3	10.1	7.4	2.7
	- Clayey Soil	m^3	12.2	8.9	3.3
	- Gravel	m^3	12.2	8.9	3.3
2.	Excavation by Bulldozer (21 ton)				
	- Sand	m^3	6.5	4.4	2.1
	- Normal Soil	m^3	7.6	5.1	2.5
	- Clayey Soil	m^3	9.1	6.1	3.0
	- Gravel	m^3	9.1	6.1	3.0
	- Excavation Rock	m^3	13.0	8.7	4.3
3.	Excavation by 15 ton Ripper				
	- Weathered Rock	m^3	7.0	5.2	1.8
4.	Excavation by Back-hoe Shovel (0.35 m^3)				
	- Sand	m^3	12.1	8.9	3.2
	- Normal Soil	m^3	13.0	9.6	3.4
	- Clayey Soil	m^3	15.5	11.4	4.1
	- Gravel and Weathered Rock	m^3	17.0	12.5	4.5
	- Excavated Rock	m^3	33.9	25.0	8.9
5.	Excavation by Back-hoe Shovel (0.7 m^3)				
	- Sand	m^3	10.1	7.6	2.5
	- Normal Soil	m^3	10.8	8.1	2.7
	- Clayey Soil	m^3	12.8	9.6	3.2
	- Gravel and Weathered Rock	m^3	14.2	10.6	3.6
	- Excavated Rock	m^3	28.5	21.3	7.2
6.	Loading by Tractor Shovel (1.2 m^3)				
	- Sand	m^3	11.4	8.4	3.0
	- Normal Soil	m^3	11.4	8.4	3.0
	- Clayey Soil	m^3	11.4	8.4	3.0
	- Gravel and Weathered Rock	m^3	13.0	9.6	3.4
	- Excavated Rock	m^3	13.0	9.6	3.4
7.	Loading by Tractor Shovel (1.8 m^3)				
	- Sand	m^3	11.0	8.1	2.9
	- Normal Soil	m^3	11.0	8.1	2.9
	- Clayey Soil	m^3	11.0	8.1	2.9
	- Gravel and Weathered Rock	m^3	12.8	9.2	3.6
	- Excavated Rock	m^3	12.8	9.2	3.6

Table 10.5(2) LIST OF UNIT COST BY USING CONSTRUCTION EQUIPMENT

(Uint: ₱)

No.	Item	Unit	Unit Cost	Currency Foreign	Currency Local
8.	Loading by Tractor Shovel (2.2 m3)				
	- Sand	m3	11.2	8.4	2.8
	- Normal Soil	m3	11.2	8.4	2.8
	- Clayey Soil	m3	11.2	8.4	2.8
	- Gravel and Weathered Rock	m3	12.8	9.6	3.2
	- Excavated Rock	m3	12.8	9.6	3.2
9.	Hauling by Dump Truck (5 - 6 ton)				
	- Sand	m3	0.0053L + 11.2	0.0036L + 7.6	0.0017L + 3.6
	- Normal Soil	m3	0.0050L + 10.6	0.0034L + 7.2	0.0016L + 3.4
	- Clayey Soil	m3	0.0056L + 12.0	0.0038L + 8.1	0.0018L + 3.9
	- Gravel and Weathered Rock	m3	0.0059L + 12.6	0.0040L + 8.5	0.0019L + 4.1
	- Excavated Rock	m3	0.0078L + 16.7	0.0053L + 11.3	0.0025L + 5.4
10.	Hauling by Dump Truck (8 - 11 ton)				
	- Sand	m3	0.0021L + 4.6	0.0014L + 3.1	0.0007L + 1.5
	- Normal Soil	m3	0.0023L + 4.9	0.0015L + 3.3	0.0007L + 1.6
	- Clayey Soil	m3	0.0025L + 5.2	0.0016L + 3.5	0.0008L + 1.7
	- Gravel and Weathered Rock	m3	0.0026L + 5.5	0.0017L + 3.7	0.0008L + 1.8
	- Excavated Rock	m3	0.0034L + 7.2	0.0023L + 4.8	0.0011L + 2.4
11.	Hauling by Dump Truck (15 ton)				
	- Sand	m3	0.0079L + 16.5	0.0055L + 11.7	0.0023L + 4.8
	- Normal Soil	m3	0.0074L + 15.6	0.0052L + 11.0	0.0021L + 4.5
	- Clayey Soil	m3	0.0083L + 17.5	0.0059L + 12.4	0.0024L + 5.1
	- Gravel and Weathered Rock	m3	0.0088L + 18.5	0.0062L + 13.1	0.0025L + 5.4
	- Excavated Rock	m3	0.0116L + 24.5	0.0082L + 17.2	0.0033L + 7.1

Table 10.5(3) LIST OF UNIT COST BY USING CONSTRUCTION EQUIPMENT

(Unit: ₱)

No.	Item	Unit	Unit Cost	Currency	
				Foreign	Local
12.	Spreading by Bulldozer				
12.1	(11 ton Bulldozer)				
	- Sand	m^3	4.5	3.3	1.2
	- Normal Soil	m^3	4.9	3.6	1.3
	- Clayey Soil	m^3	5.0	3.7	1.3
	- Gravel and Weathered Rock	m^3	4.1	3.0	1.1
	- Excavated Rock	m^3	3.8	2.8	1.0
12.2	(21 ton Bulldozer)				
	- Sand	m^3	5.0	3.4	1.6
	- Normal Soil	m^3	5.6	3.8	1.8
	- Clayey Soil	m^3	5.7	3.8	1.9
	- Gravel and Weathered Rock	m^3	4.6	3.1	1.5
	- Excavated Rock	m^3	4.3	2.9	1.4
13.	Compaction by Tire Roller (10 - 19 ton)				
	- Random Materials	m^3	1.3	0.9	0.4
14.	Compaction by Vibration Roller (3 ton)				
	- Soil Materials	m^3	6.7	4.7	2.0
15.	Transportation by Truck (10 ton)				
	- 1 way	way	1,000.7	689.2	311.4
	- 1 ton	ton	100.0	68.9	31.1
16.	Transportation by Trailor (32 ton)				
	- 1 way	way	2,415.3	1,631.2	784.0
	- 1 ton	ton	241.5	163.1	78.4
17.	Lifting by Truck W/L 3 ton Crane	d	957.0	647.5	309.5
18.	Maintenance of Construction Road by Motor Grader (3.1 m)	d	2,401.3	1,707.7	693.6

Table 10.6 ENGINEERING AND ADMINISTRATION COST

(Unit: ₱10⁶)

Item	Foreign Currency	Local Currency	Total
I) Engineering Cost			
1. Remuneration			
1.1 Foreign Consultant	38	0	38
1.2 Local Consultant	13	0	13
2. Direct Cost	5	16	21
3. Special Equipments	1	0	1
4. Mapping Cost	10	0	10
Total	67	16	83
II) Administration Cost			
1. Personnel Expense	0	15	15
2. Direct Cost	0	10	10
Total	0	25	25
Total	67	41	108

Table 10.7 SUMMARY OF PROJECT COST

(Unit: ₱10³)

Item	Foreign Currency	Local Currency	Total
1. Cosntruction Cost	281,820	233,670	515,490
1.1 Irrigation Improvement	190,520	193,660	384,180
(1) District I	29,560	27,390	56,950
(2) District II	38,560	38,050	76,610
(3) District III	76,610	81,250	157,860
(4) District IV	45,790	46,970	92,760
1.2 Drainage Improvement	54,840	23,980	78,820
1.3 River Improvement	36,460	16,030	52,490
2. Centralized Monitoring System	96,790	6,930	103,720
3. O&M Equipments	36,150	4,600	40,750
4. Engineering and Administration Cost	67,000	41,000	108,000
5. Institutional Cost	-	32,870	32,870
Sub-total	(481,760)	(319,070)	(800,830)
6. Physical Contingency	72,340	43,030	115,370
Total	554,100	362,100	916,200
(US$10³)	50,370	32,920	83,290
(¥10⁶)	12,089	7,900	19,989

Conversion Rate: US$1 = ₱11 = ¥240

Table 10.8 ANNUAL DISBURSEMENT SCHEDULE OF FUND REQUIREMENT

(Unit: ₱10³)

Item	1990		1991		1992		1993		1994	
	FC	LC	FC	LC	FC	LC	FC	LC	FC	LC
1. Construction Cost	28,570	22,328	9,626	14,321	15,174	16,045	7,600	11,318	1,782	2,794
1.1 Irrigation Improvement	16,416	16,985	9,626	14,321	15,174	16,045	7,600	11,318	1,782	2,794
1) District I	4,002	4,220	4,781	5,311	4,781	5,311	3,156	3,748	-	-
2) District II	8,523	7,466	2,669	5,390	8,217	7,114	2,268	3,950	697	995
3) District III	1,715	1,679	-	-	-	-	-	-	-	-
4) District IV	2,176	3,620	2,176	3,620	2,176	3,620	2,176	3,620	1,085	1,799
1.2 Drainage Improvement	-	-	-	-	-	-	-	-	-	-
1.3 River Improvement	12,154	5,343	-	-	-	-	-	-	-	-
2. Central Monitoring System	35,299	2,629	-	-	-	-	-	-	-	-
3. O&M Equipments	-	-	-	-	-	-	-	-	-	-
4. Engineering and Administration Cost	6,000	4,000	-	3,000	-	3,000	-	2,000	-	1,000
5. Institutional Cost	-	4,408	-	4,218	-	4,294	-	3,686	-	608
Sub-total	69,869	33,365	9,626	21,539	15,174	23,339	7,600	17,004	1,782	4,402
6. Physical Contingency	10,481	4,345	1,444	2,601	2,276	2,861	1,140	1,996	268	568
Total	80,350	37,710	11,070	24,140	17,450	26,200	8,740	19,000	2,050	4,970
7. Price Contingency	43,350	45,690	7,030	35,660	12,750	46,500	7,260	40,000	1,950	12,330
Grand Total	123,700	83,400	18,100	59,800	30,200	72,700	16,000	59,000	4,000	17,300

Remarks: FC: Foreign Currency
LC: Local Currency

(Unit: ₱10³)

Item	Total		1985		1986		1987		1988		1989	
	FC	LC	FC	LC	FC	LC	FC	LC	FC	LC	FC	LC
1. Construction Cost	281,820	233,670	-	-	70,348	58,887	72,661	52,483	38,672	26,185	37,387	29,309
1.1 Irrigation Improvement	190,520	193,660	-	-	47,861	49,034	50,175	42,631	16,652	16,566	25,234	23,966
1) District I	29,560	27,390	-	-	-	-	3,362	2,044	6,723	4,087	2,755	2,669
2) District II	38,560	38,050	-	-	-	-	-	-	-	-	16,186	13,135
3) District III	76,610	81,250	-	-	40,829	42,954	22,196	23,216	7,753	8,859	4,117	4,542
4) District IV	45,790	46,970	-	-	7,032	6,080	24,617	17,371	2,176	3,620	2,176	3,620
1.2 Drainage Improvement	54,840	23,980	-	-	22,487	9,853	22,486	9,852	9,867	4,275	-	-
1.3 River Improvement	36,460	16,030	-	-	-	-	-	-	12,153	5,344	12,153	5,343
2. Central Monitoring System	96,790	6,930	-	-	25,631	1,101	19,146	1,765	16,714	1,435	-	-
3. O&M Equipments	36,150	4,600	8,150	3,200	14,000	700	7,000	350	7,000	350	-	-
4. Engineering and Administration Cost	67,000	41,000	20,000	7,000	17,000	7,000	10,000	5,000	7,000	4,500	7,000	4,500
5. Institutional Cost	-	32,870	-	-	-	2,128	-	5,548	-	3,990	-	3,990
Sub-total	481,760	319,070	28,150	10,200	126,979	69,816	108,870	65,146	69,386	36,460	44,387	37,799
6. Physical Contingency	72,340	43,030	4,270	1,580	19,061	10,164	16,333	8,954	10,404	4,880	6,663	5,081
Total	554,100	362,100	32,420	11,780	146,040	79,980	125,140	74,100	79,790	41,340	51,050	42,880
7. Price Contingency	198,400	331,400	4,880	3,020	32,060	32,420	36,560	42,500	29,510	31,560	23,050	41,720
Grand Total	752,500	693,500	37,300	14,800	178,100	112,400	161,700	116,600	109,300	72,900	74,100	84,600

Remarks: FC: Foreign Currency
LC: Local Currency

Table 10.9 ANNUAL OPERATION AND MAINTENANCE COST

(Unit: ₱10⁶)

Year	Personnel Expense	Central Monitoring System	Oil & Gasoline	Maintenance Cost for Gates	Material Cost	Office Expense	Travel Expense	Other Expense	Total
1985	27.12	0.46	1.30	0.22	3.00	0.29	0.27	1.04	33.70
1986	27.08	0.46	1.30	0.59	3.00	0.29	0.27	1.04	34.03
1987	26.78	0.46	1.30	0.87	3.00	0.29	0.27	1.04	34.01
1988	26.40	0.46	1.30	0.87	3.00	0.29	0.27	1.04	33.63
1989	26.23	0.46	1.30	1.22	3.00	0.29	0.27	1.04	33.81
1990	25.99	0.46	1.30	1.23	3.00	0.29	0.27	1.04	33.58
1991	25.66	0.46	1.30	1.23	3.00	0.29	0.27	1.04	33.25
1992	25.24	0.46	1.30	1.23	3.00	0.29	0.27	1.04	32.83
1993	25.09	0.46	1.30	1.23	3.00	0.29	0.27	1.04	32.68
1994	⋮	0.46	1.30	1.23	3.00	0.29	0.27	1.04	⋮
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
2034	25.09	0.46	1.30	1.23	3.00	0.29	0.27	1.04	32.68

Table 10.10 REPLACEMENT COST AND USEFUL LIFE

Item	Useful Life (year)	Replacement Cost (₱10⁶)
1. Gate		
1.1 Gate installed or rehabilitated in this project.	20	(201.19)
- for irrigation improvement	20	199.62
- for river improvement	20	1.57
1.2 Gate installed in UPRP and non-rehabilitated in this project	10/1	45.46
2. Equipments of Centralized Monitoring System	5	(11.60)
- rain gage and water gage	5	2.44
- other equipments	5	9.16
3. O & M Equipments	10	37.81

/1: Useful life of 10 years is applied for the existing gate. After first replacement, useful life of 20 years is applied.

Fig. 10.1 PROPOSED ORGANIZATION FOR PROJECT EXECUTION

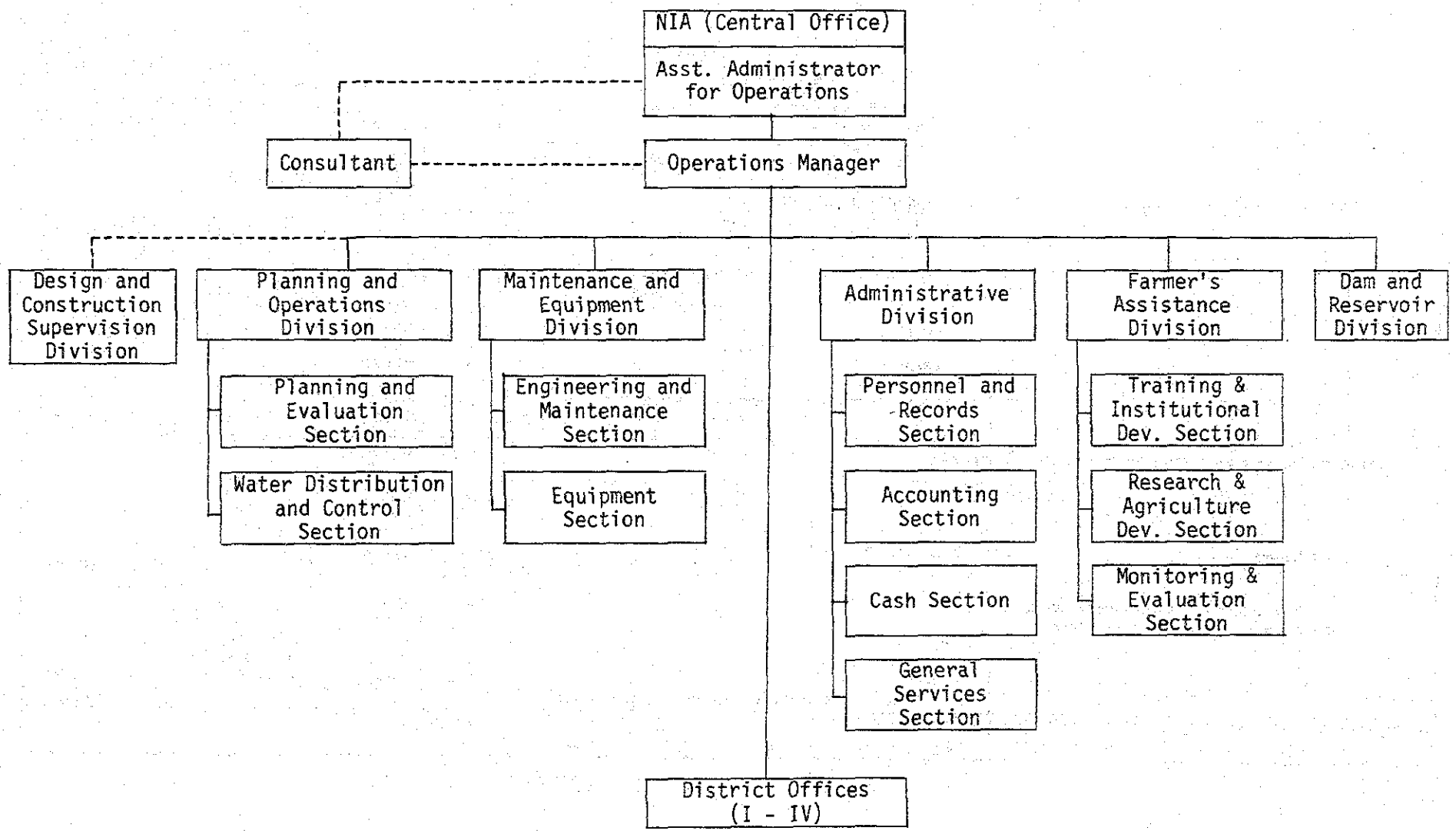
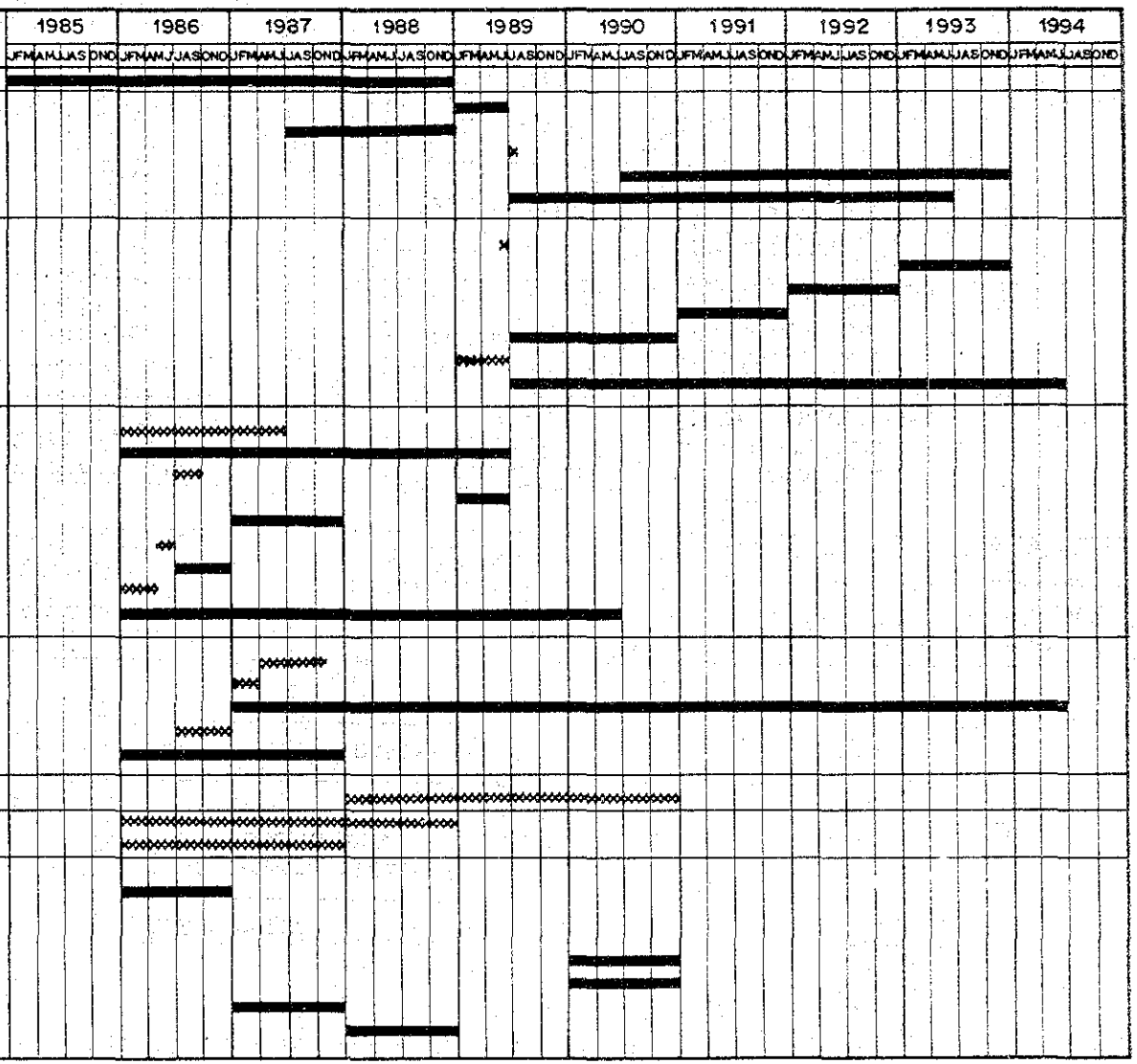


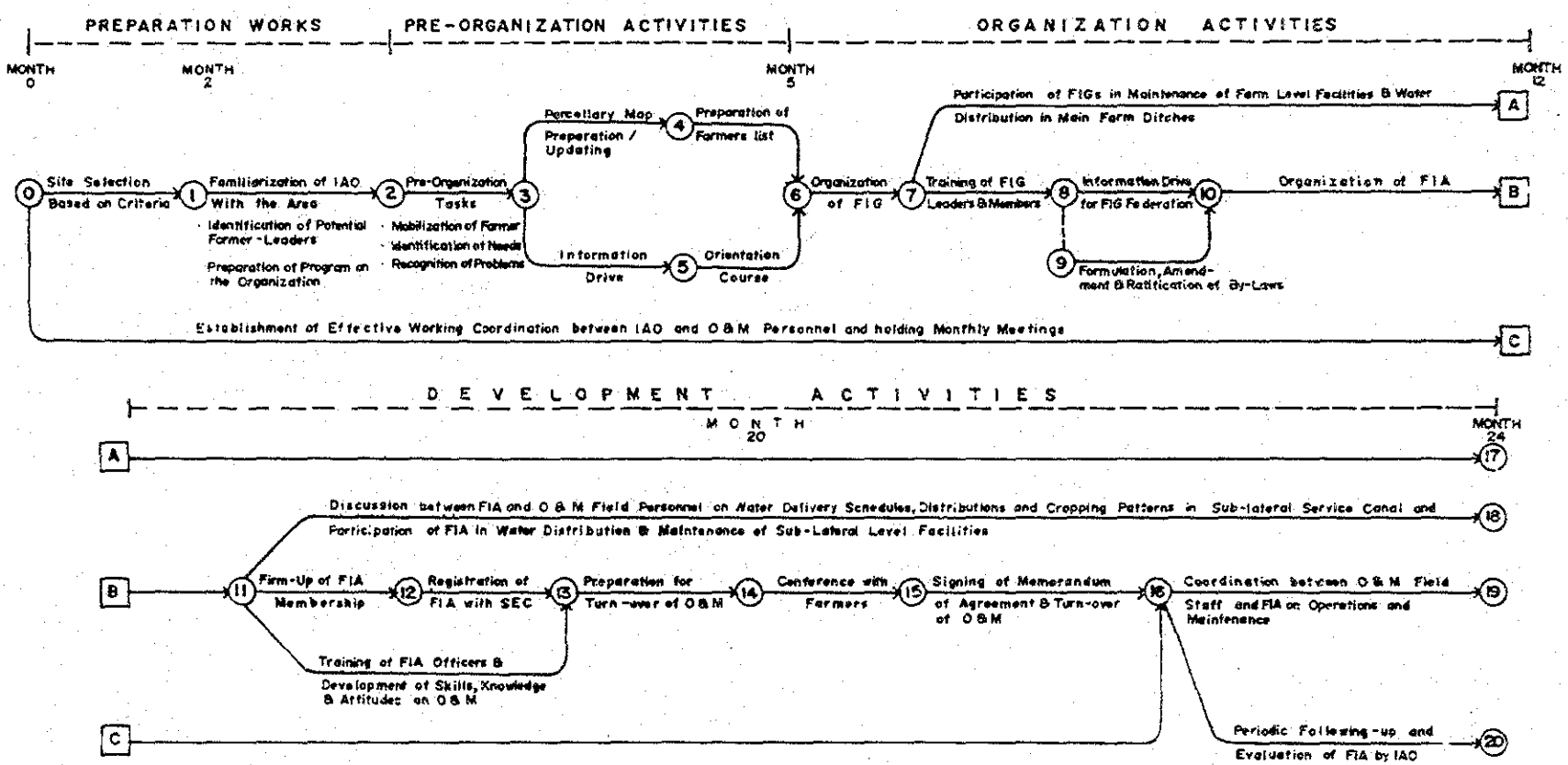
Fig. 10.2 IMPLEMENTATION SCHEDULE

			Area ($\times 10^3$ ha)	Length (km)
PREPARATORY WORKS				
District I	SAE	AREA	0.8	
	TRIS Upper	AREA	3.9	
	TRIS Lower	CANAL		5.6
		AREA	9.8	
	SDA	AREA	12.2	
District II	RMA	CANAL		11.4
		AREA	2.6	
	LTRIS	AREA	2.7	
	VCIS	AREA	2.4	
	MCIS	AREA	5.0	
	PRIS	CANAL		24.5
		AREA	13.6	
District III	PBRIS Pro.	CANAL		25.6
		AREA	10.4	
	PLATERO	CANAL		15.8
		AREA	1.0	
	ALIAGA	AREA	5.3	
	PCCA	CANAL		10.8
		AREA	1.3	
	PBRIS Ext'n	CANAL		16.4
		AREA	13.1	
District IV	PEÑRIS Pro.	CANAL		41.9
		CANAL		13.8
		AREA	21.6	
	PEÑRIS Ext'n	CANAL		27.1
		AREA	5.5	
River Improvement	TALAVERA	RIVER		43.5
Drainage Improvement	SAN ANTONIO			53.0
	NORTH CANDABA			46.0
Central Monitoring System	Control Office & Diversion Dam			
	District I			
	District II			
	District III			
	District IV			



X-F.3

Fig. 10.3 FRAMEWORK ON THE ORGANIZATION & DEVELOPMENT OF IRRIGATION ASSOCIATIONS IN SUB-LATERAL SERVICE CANALS



APPENDIX XI

EVALUATION

APPENDIX XI EVALUATION

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APPENDIX XI EVALUATION

CHAPTER 1 GENERAL

The project for the improvement of operation and maintenance of the UPRIIS comprises the development plans such as i) agriculture, ii) irrigation, iii) drainage, iv) river improvement, v) management of operation and maintenance, vi) UPRIIS organization and vii) farmers' organization set-up.

These development plans aim to improve system efficiency through a good system wide irrigation management with principle emphasis on i) efficient and optimum use of water resources, ii) sufficient supply of irrigation water and its equitable distribution, iii) realization of higher efficiency of irrigation service fee collection, iv) rationalization of management with balanced finance and v) improvement of living conditions of the farmers in the UPRIIS through increasing agricultural production.

An evaluation of the proje-t is carried out in view of economic aspect, financial aspect and project effect. With the economic aspect, the internal rate of return and benefit-cost ratio are examined and sensitivity analysis is executed by effects due to unexpected changes of construction costs and benefits. From the financial aspect, analyses of farm budget for the typical farmers in the project area and assessment of financial status of the UPRIIS Office by preparation of cash flow statement were done. As for the project effects, actual effects accruing from the implementation of the project are examined with respect to incremental rice production, promotion of job opportunity, stabilization of peoples' livelihood and increase of farmers' income.

CHAPTER 2 ECONOMIC EVALUATION

2.1 Economic Benefit

Benefit accrued from the project consists of irrigation and drainage benefit, river improvement benefit, benefit derived from reduction of personnel expenses in operation and maintenance cost and negative benefit.

2.1.1 Irrigation and Drainage Benefit

Irrigation and drainage benefit to be expected is defined as the difference of net return for crop between with project and without project conditions. On the basis of the estimated production cost and gross income, net return per hectare for crop is calculated both on future without and with project conditions as follows. Details are explained in Appendix V, Agriculture and Agro-Economy.

(Unit: ₱/ha)

Item	With Project			Without Project		
	Gross Income	Production Cost	Net Return	Gross Income	Production Cost	Net Return
Irrigated Land						
Wet Season Paddy:						
transplanting-paddy	9,203	3,830	5,373	7,771	3,429	4,342
direct seeding-paddy	9,203	3,580	5,623	7,771	3,187	4,584
Dry Season Paddy:						
transplanting-paddy	10,634	4,258	6,376	8,794	3,676	5,118
direct seeding-paddy	10,634	4,023	6,611	8,794	3,449	5,345
Rainfed Land						
Wet Season Paddy:						
transplanting-paddy	4,908	2,629	2,279	4,908	2,629	2,279

Applying net return per hectare estimated above to crop area, total net returns for irrigation and drainage project are estimated both on future without and with project conditions. Based on this result, irrigation and drainage benefit is calculated. The benefit will be expected to increase linearly year by year and reach the full benefit in and after three years after the implementation of the facilities. The irrigation and drainage benefit will be produced according to the implementation schedule and the benefit at the full stage is estimated at about ₱400 million. Table 11.1 shows the flow of the benefit during the project life.

2.1.2 River Improvement Benefit

As mentioned in Appendix IV "River Improvement", the river improvement with 10-year design flood is determined as the most optimum scale of the project.

The river improvement benefit is defined as decrease in flood damages by the river improvement project. Based on the inundation area and affected houses under without project conditions, decreases in the flood damages by the river improvement project are estimated on the basis of the results of hydraulic analysis and damage value per ha or unit.

The flood damages to be reduced by the project will be expected to comprising damage to farm crops, private property, public properties and indirect losses. The damage value per ha is estimated as follows:

1) Damages per ha for farm crops are estimated on the basis of the following: Details on gross income and production cost is shown in Appendix V, Agriculture and Agro-Economy.

Irrigated Land

a) Transplanting Area

Gross Income	3.8 t/ha x 2,045 ₱/t =	7,771 (₱/ha)
Production Cost		3,429
Net Return		4,342

b) Direct Seeding Area

Gross Income	3.8 t/ha x 2,045 ₱/t =	7,771 (₱/ha)
Production Cost		3,187
Net Return		4,584

Rainfed Area

Gross Income	2.4 t/ha x 2,045 ₱/t =	4,908 (₱/ha)
Production Cost		2,629
Net Return		2,279

In the irrigated land, transplanting type area accounts for 70% of the land and direct seeding area 30%. Accordingly damages for crops per ha in the irrigated land is estimated at ₱4,412.

2) There are no reliable data and information on unit price of flood damages for private property. It is assumed that the unit price of damage to private property is estimated at ₱3,000 per house in the project area, referring to the data used in the feasibility report on the Pampanga Delta Development Project.

3) 300% of damage to private property was assumed as damages to public property in the project area.

4) 5% of direct damages was assumed as indirect losses.

Based on the above assumption, decreases in flood damages with river improvement project are estimated as follows:

Item	Unit	Q'ty	Unit Price (₱)	Amount (₱10⁶)
Damage to crops				14.89
Irrigated land	ha	1,945	4,412	8.58
Rainfed area	ha	2,767	2,280	6.31
Damage to private property	house	3,734	3,300	11.20
Damage to public property				33.60
Indirect losses				2.98
Total				62.67

Based on the above results, annual equivalent damages or river improvement benefit are estimated at ₱7.08 x 10^6. Details are explained in Appendix IV River Improvement.

2.1.3 Benefit Derived from Reduction of Personnel Expenses

As mentioned in Appendix VII UPRIIS Organization, reduction of the field staff in operation and maintenance of UPRIIS will be expected by introduction of computerized systems on monitoring and recording systems, strengthening work load of the field staff, etc. with project condition. The reduction of the field staff and personnel expenses is shown in Table 11.2. The benefit derived from reduction of personnel expenses is estimated at ₱2.49 million at the full stage.

2.1.4 Negative Benefit

The project of irrigation and drainage will be implemented over a period of ten years including preparatory works.

According to the implementation schedule, irrigation and drainage facilities will be completed annually for the area corresponding to construction year by year as shown in the following table on page XI-6.

It is expected that irrigation farming will not be carried out during the period of the construction.

Accordingly loss of the agricultural crop in the area under construction is evaluated as negative benefit.

The negative benefit per ha is calculated as follows: Details in net return is explained in Appendix V.

Item	Net Return (₱/ha)	Area (ha)	Total Net Return (₱10⁶)
Irrigated dry season paddy (84,900 ha)			
- Transplanting type	4,920	25,470	125.3
- Direct seeding type	5,110	59,430	303.7
Irrigated wet season paddy (91,800 ha)			
- Transplanting type	1,960/1	64,260	125.9
- Direct seeding type	2,140/2	27,540	58.9
Total negative benefit			613.8
Negative benefit per ha/3			(5.52 x ₱10³)

The negative benefit during the period of the implementation is estimated as follows:

/1: Net return of irrigated transplanting type wet season paddy - Net return of rainfed wet season paddy.

/2: Net return of irrigated direct seeding type wet season paddy - Net return of rainfed wet season paddy.

/3: 613.8 x 10^6/111,200

Year	Area Under Construction (10³ ha)	Negative Benefit per ha (₱10³)	Total Negative Benefit (₱10⁶)
1985	0	5.52	0
1986	10.3	5.52	-56.85
1987	16.0	5.52	-88.32
1988	13.7	5.52	-75.62
1989	13.7	5.52	-75.62
1990	15.1	5.52	-83.35
1991	14.4	5.52	-79.49
1992	14.7	5.52	-81.14
1993	12.6	5.52	-69.55
1994	0.7	5.52	-3.86
1995	0	5.52	0
1996	0	5.52	0
1997	0	5.52	0
⋮	⋮	⋮	⋮
Total	111,200		-613.80

2.1.5 Total Benefit

Total benefit except benefit derived from reduction of personnel expenses and their flow is shown in Table 11.3.

2.2 Economic Cost

2.2.1 Economic Project Cost

Economic construction cost for the project was estimated taking into consideration deducing tax and contractor's profit for project cost. Total economic project cost is estimated at ₱855.19 million as shown in Table 11.4 comprising ₱794.59 million for irrigation and drainage project including monitoring computerized system and ₱60.6 million for the river improvement project, respectively.

2.2.2 O&M Cost

O&M cost of the project comprises expenses for personnel, centralized monitoring system, oil and gasoline, gate maintenance, material, travel, water & power services and so on. Economic O&M cost for future without and with project conditions has been estimated. The economic O&M cost during the period of project useful life is shown in Table 11.5. The O&M cost in the future with project condition will decrease year by year due to reduction of ditchtenders and reaches ₱32.68 million at the full development stage. The O&M cost in the future without project condition is assumed to be ₱33.34 million equivalent O&M of UPRIIS in 1983.

2.2.3 Replacement Cost

Some of the project facilities will have to be at a certain time within 50 years of the project useful life. The durable periods of the gates, centralized monitoring system and O&M equipments are assumed to be 20 years, 5 years and 10 years, respectively.

Frequencies for replacement within 50 years and replacement cost on each facility are as follows:

Item	Frequency	Replacement Cost (₱10⁶)
Gate	2	227.01
Centralized Monitoring System	8 - 9	11.60
O&M Equipment	4	37.45

2.3 Economic Evaluation

2.3.1 Internal Rate of Return

Based on the benefits and economic project costs, economic evaluation that the project life is 50 years. The flow of costs and benefit during the project life is shown in Table 11.6.

Based on the above table, internal rate of return of the project is calculated at 19.3%. The value of the internal rate of return indicates that the project is economically feasible.

Since the project is composed of irrigation & drainage sector and river improvement sector, internal rate of return for each sector is also calculated. The flow of benefit and cost for each sector is shown in Tables 11.7 and 11.8. As a result, the internal rate of return is expected to be 19.6% for irrigation & drainage sector and 9.7% for river improvement sector.

2.3.2 Benefit Cost Ratio

In addition to the internal rate of return, economic evaluation by using benefit-cost ratio was conducted as a comparative study. The benefit-cost ratio for various discount rates for the project, only irrigation & drainage sector and river improvement sector is shown as follows:

Discount Rate	Benefit/Cost Ratio		
	Project	Irrigation & Drainage Sector	River Improvement Sector
(%)			
2	8.33	7.80	2.68
4	6.19	5.81	1.98
6	4.65	4.36	1.51
8	3.54	3.33	1.20
10	2.75	2.58	0.97
12	2.17	2.03	0.81
14	1.73	1.62	0.69
16	1.40	1.30	0.60
18	1.14	1.06	0.53
20	0.93	0.87	0.47

2.3.3 Sensitivity Test

Project sensitivity is analysed with respect to change in project benefits and the costs.

The results of sensitivity test are summarized in Table 11.9.

The above table indicates that the project is still expected to become economically feasible even if there are considerably increased project costs and or a decrease of benefits.

CHAPTER 3 FINANCIAL EVALUATION

3.1 General

Financial evaluation of the project is examined from farmers' economic view point and management of UPRIIS Office.

Analysis on farmers' economy is conducted to assess whether the project provides sufficient incentive to the farmers in the irrigation service area and brings enough increase in income for the farmers.

Assessment for Management of UPRIIS Office is examined to clarify whether UPRIIS Office can be financially managed by revenue from irrigation service fee after implementation of the project or not.

3.2 Farmers' Economy

In order to assess the project from farmers' economic view point, farmers' economy is examined by farm budget analyses under the future without and with project conditions.

After implementation of the project, year round irrigation will permit double cropping of paddy per annum in the most of the irrigation service area of 111,200 ha and increase unit yield of paddy from present low yield to 4.5 ton per ha for wet season paddy and 5.2 ton per ha for dry season paddy, respectively. As a result, drastic increase in farm income in the future with project condition can be expected. On the other hand, substantial increase in farm income will be expected in the future without condition.

Farm budgets were prepared for the typical farmers by land tenure and farm size in both future without and with project conditions as follows: Details are explained in Appendix V Agriculture and Agro-Economy.

a) Without Project Condition

(Unit: ₱10³)

Item	Below 1.0 ha	1.0 - 2.0 ha	2.0 - 3.0 ha	Above 3.0 ha
Owner Operator				
(Average farm size (ha))	(0.63)	(1.14)	(2.77)	(3.42)
- Gross income	14.4	21.7	45.4	58.0
- Gross outgo	11.8	16.7	30.7	38.3
- Net reserve	2.6	5.0	14.7	19.7
(Irrigation fee)	(0.3)	(0.6)	(1.4)	(1.7)
Amortizing Owner Operator				
(Average farm size (ha))	(0.58)	(1.40)	(2.45)	(3.10)
- Gross income	13.5	23.3	36.6	43.5
- Gross outgo	12.9	19.9	29.2	32.1
- Net reserve	0.6	3.4	7.4	11.4
(Irrigation fee)	(0.3)	(0.7)	(1.2)	(1.6)
Lessee				
(Average farm size (ha))	(0.59)	(1.34)	(2.29)	(3.32)
- Gross income	15.4	23.1	37.2	51.5
- Gross outgo	14.9	21.6	31.6	41.2
- Net reserve	0.5	1.5	5.6	10.3
(Irrigation fee)	(0.3)	(0.7)	(1.2)	(1.7)

b) With Project Condition

(Unit: ₱10³)

Item	Below 1.0 ha	1.0 - 2.0 ha	2.0 - 3.0 ha	Above 3.0 ha
Owner Operator				
(Average farm size (ha))	(0.63)	(1.14)	(2.77)	(3.42)
- Gross income	15.9	24.4	51.9	66.0
- Gross outgo	12.2	17.5	32.5	40.5
- Net reserve	3.7	6.9	19.4	25.5
(Irrigation fee)	(0.3)	(0.6)	(1.4)	(1.7)
Amortizing Owner Operator				
(Average farm size (ha))	(0.58)	(1.4)	(2.45)	(3.10)
- Gross income	14.9	26.5	42.3	50.8
- Gross outgo	13.3	20.8	30.8	34.1
- Net reserve	1.6	5.7	11.5	16.7
(Irrigation fee)	(0.3)	(0.7)	(1.2)	(1.6)
Lessee				
(Average farm size (ha))	(0.59)	(1.34)	(2.29)	(3.32)
- Gross income	16.7	26.3	42.6	59.4
- Gross outgo	15.2	22.5	33.1	43.3
- Net reserve	1.5	3.8	9.5	16.0
(Irrigation fee)	(0.3)	(0.7)	(1.2)	(1.7)

Net reserve or capacity to pay with project condition will be expected to increase 1.29 to 3 times of that of without project condition as shown below:

(Unit: %)

Item	Below 1.0 ha	1.0 - 2.0 ha	2.0 - 3.0 ha	Above 3.0 ha
Without Project	100	100	100	100
With Project				
- Owner Operator	142	138	132	129
- Amortizing Owner Operator	267	168	155	146
- Lessee	300	253	170	155

Further the table of farm budgets indicates that any typical farmers will be able to have sufficiently net reserve for paying irrigation service fee after the implementation of the project.

3.3 Management of UPRIIS Office

Taking into consideration annual revenue from irrigation fee and expenditure for operation and maintenance and replacement, cash flow analysis for management of UPRIIS Office under with project condition is conducted. It is considered in this analysis that personnel expenses for the UPRIIS Head Office are provided by the Government subsidy.

Cash flow statements are prepared for the case of 75% and 80% of irrigation service fee collection efficiency under the assumption that irrigation service fee rate remains same at present and price of paddy is ₱1.7 per kg. The results are shown in Table 11.10.

It is concluded from the tables that UPRIIS Office will be managed at marginal level if 75% of irrigation service fee is collected. It is therefore considered that an efficiency rate of 80% irrigation fee collection will be required for a sound financial management status of the UPRIIS Office.

CHAPTER 4 PROJECT EFFECT

After the completion of the project, the following major effects will be expected.

4.1 Incremental Rice Production

The project will provide a basis for increasing unit yield of paddy and expansion of irrigated land through provision of irrigation and drainage facilities and river improvement. After the implementation of the project, incremental paddy of 293 x 10^3 ton will be expected from the irrigation service area. These incremental amounts of paddy will play an important role in self-sufficiency of rice in the project area as well as supply to Metro Manila. Further these incremental amounts of paddy will activate commercial activities such as milling, processing, fertilizer & agricultural chemical undertaking.

4.2 Employment Opportunity

The project will generate job opportunity of 1.8 million man-days during an implementation period. Most of the manpower will be supplied from land less workers and farmers in and around the project area. In addition the project will create a demand for farm labor requirement accrued from increased farm activities due to intensive use of the land and high productivity. The annual incremental farm labor requirement is estimated at 4.9 million man-days at the full stage of the project.

4.3 Farmer's Income

The farmer's income will be expected to improve considerably as a result of the increase of rice production. Accordingly farmers' net return or capacity to pay will increase considerably. As mentioned in Section 3.2, net reserve for the farmers in UPRIIS with project condition will be expected to increase 1.9 to 3 times that of without project condition. The project will effect farm economy and give great incentives especially to lessee and amortizing owner operator having smaller farm size.

4.4 Stabilization of People's Livelihood

At present flood damage occurs annually. Many houses and farm lands suffer from floods. After the implementation of the project, about 6,000 ha of farm land and about 3,700 houses will be free from flood damages.

4.5 Improvement of Rural Development

The project will improve the farm road net work, which will contribute not only to marketing of products but also to improvement of infrastructures for rural development.

CHAPTER 5 ASSESSMENT OF THE PROJECT

The project will be expected to provide greater benefits and effects to the people in and around the project area.

The results of the studies indicate that the project is technically sound and economically feasible. Further the project is financially justifiable from the standpoint of farmer's economy and financial status of the UPRIIS Office with an irrigation service fee collection efficiency rate of over 75%.

Table 11.1 IRRIGATION AND DRAINAGE BENEFIT

Year	Benefited Area (10^3 ha)	Irrigation & Drainage Benefit (₱10^6)
1985	0	0
1986	0	0
1987	7.3	8.76
1988	26.3	40.32
1989	40.0	88.32
1990	53.7	144.00
1991	68.8	195.00
1992	83.2	246.84
1993	97.9	299.88
1994	110.5	349.92
1995	111.2	383.52
1996	111.2	399.48
1997	111.2	400.37
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.	.	.
2034	111.2	400.37

Table 11.2 BENEFIT DERIVED FROM REDUCTION OF PERSONNEL EXPENSES

Year	No. of Ditchtender to be Reduced	Annual Personnel Expenses per DT	Total Annual Personnel Expenses (₱10⁶)	Accumulated Annual Personnel Expenses (₱10⁶)
1984	32	14,338	0.46	0.46
1985	3	14,338	0.04	0.50
1986	21	14,338	0.30	0.80
1987	26	14,338	0.38	1.18
1988	12	14,338	0.17	1.35
1989	17	14,338	0.24	1.59
1990	23	14,338	0.33	1.92
1991	29	14,338	0.42	2.34
1992	11	14,338	0.16	2.49
1993	0	14,338	0	2.49
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2034	0	14,338	0	2.49

Table 11.3 BENEFIT FLOW FOR THE PROJECT

(Unit: ₱10⁶)

Year	Irrigation Benefit	River Improvement Benefit	Negative Benefit	Total Benefit
1985	0	0	0	0
1986	0	0	-56.85	-56.85
1987	8.76	0	-88.32	-79.56
1988	40.32	0	-75.62	-35.30
1989	88.32	0	-75.62	12.70
1990	144.00	0	-83.35	60.65
1991	195.00	7.08	-79.49	122.59
1992	246.84	7.08	-81.14	172.78
1993	299.88	7.08	-69.55	237.41
1994	349.92	7.08	-3.86	353.14
1995	383.52	7.08	0	390.60
1996	399.48	7.08	0	406.56
1997	400.37	7.08	0	407.45
.	.	.	.	.
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.	.	.	.	.
2034	400.37	7.08	0	407.45

Table 11.4 ECONOMIC PROJECT COST

(Unit: ₱10^6)

Item	Total Amount
1. Construction Cost	462.96
- Irrigation improvement	348.52
- Drainage improvement	68.57
- River improvement	45.87
2. Centralized Monitoring System	103.72
3. O & M Equipment	40.38
4. Engineering/Administration	108.00
5. Institutional Cost	32.87
6. Physical Contingency	107.26
Total	855.19

Table 11.5 ECONOMIC O&M COST

(Unit: ₱10⁶)

Year	Personnel Expenses at Present/1	Reduction of Personnel Expenses/2	With Project			Without Project/5	Increment (with-without)
			New Personnel Expenses/3	Other O&M Cost/4	Total		
	(1)	(2)	(3)	(4)	(5) = (3) + (4)	(6)	(7) = (5) - (6)
1985	27.58	0.46	27.12	6.58	33.70	33.34	0.36
1986	27.58	0.50	27.08	6.95	34.03	33.34	0.69
1987	27.58	0.80	26.78	7.23	34.01	33.34	0.67
1988	27.58	1.18	26.40	7.23	33.63	33.34	0.29
1989	27.58	1.35	26.23	7.58	33.81	33.34	0.47
1990	27.58	1.59	25.99	7.59	33.58	33.34	0.24
1991	27.58	1.92	25.66	7.59	33.25	33.34	-0.09
1992	27.58	2.34	25.24	7.59	32.83	33.34	-0.51
1993	27.58	2.49	25.09	7.59	32.68	33.34	-0.66
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
2034	27.58	2.49	25.09	7.59	32.68	33.34	-0.66

Remarks: /1: Personnel expenses in O&M cost in 1982

/2: See Table 11.2

/3: Personnel expenses for UPRIIS Office under with project conditions

/4: Including costs of oil'gasoline, material costs, travel expenses, maintenance cost of computerized monitoring systems & gates, water & power services, etc.

/5: O&M costs under without project condition are assumed at O&M cost of UPRIIS in 1983

Table 11.6 ECONOMIC COST AND BENEFIT FLOW FOR THE PROJECT

(Unit: ₱10^6)

Year in Order	Year	Capital Cost	Replacement Cost	O & M Cost	Total Cost	Total Benefit
1	1985	43.68	0	0.36	44.04	0
2	1986	209.26	0	0.69	209.95	-56.85
3	1987	184.34	0	0.67	185.01	-79.56
4	1988	114.15	0	0.29	114.44	-35.30
5	1989	86.78	0	0.47	87.25	12.70
6	1990	112.21	0	0.24	112.45	60.65
7	1991	32.48	0	-0.09	32.39	122.59
8	1992	40.12	2.90	-0.51	42.51	172.78
9	1993	25.55	2.90	-0.66	27.79	237.41
10	1994	6.62	0	-0.66	5.96	353.14
11	1995	0	16.78	-0.66	16.12	390.60
12	1996	0	52.78	-0.66	52.12	406.56
13	1997	0	9.52	-0.66	8.86	407.45
14	1998	0	9.52	-0.66	8.86	407.45
15	1999	0	0	-0.66	-0.66	407.45
16	2000	0	5.80	-0.66	5.14	407.45
17	2001	0	0	-0.66	-0.66	407.45
18	2002	0	2.90	-0.66	2.24	407.45
19	2003	0	2.90	-0.66	2.24	407.45
20	2004	0	0	-0.66	-0.66	407.45
21	2005	0	16.78	-0.66	16.12	407.45
22	2006	0	81.55	-0.66	80.89	407.45
23	2007	0	61.45	-0.66	60.79	407.45
24	2008	0	9.52	-0.66	8.86	407.45
25	2009	0	65.67	-0.66	65.01	407.45
26	2010	0	7.34	-0.66	6.68	407.45
27	2011	0	0	-0.66	-0.66	407.45
28	2012	0	2.90	-0.66	2.24	407.45
29	2013	0	2.90	-0.66	2.24	407.45
30	2014	0	0	-0.66	-0.66	407.45
31	2015	0	16.78	-0.66	16.12	407.45
32	2016	0	52.78	-0.66	52.12	407.45
33	2017	0	9.52	-0.66	8.86	407.45
34	2018	0	9.52	-0.66	8.86	407.45
35	2019	0	0	-0.66	-0.66	407.45
36	2020	0	5.80	-0.66	5.14	407.45
37	2021	0	0	-0.66	-0.66	407.45
38	2022	0	2.90	-0.66	2.24	407.45
39	2023	0	2.90	-0.66	2.24	407.45
40	2024	0	0	-0.66	-0.66	407.45
41	2025	0	16.78	-0.66	16.12	407.45
42	2026	0	81.55	-0.66	80.89	407.45
43	2027	0	61.45	-0.66	60.79	407.45
44	2028	0	9.52	-0.66	8.86	407.45
45	2029	0	65.67	-0.66	65.01	407.45
46	2030	0	7.34	-0.66	6.68	407.45
47	2031	0	0	-0.66	-0.66	407.45
48	2032	0	2.90	-0.66	2.24	407.45
49	2033	0	2.90	-0.66	2.24	407.45
50	2034	0	0	-0.66	-0.66	407.45

Table 11.7 ECONOMIC COST AND BENEFIT FLOW FOR RIVER IMPROVEMENT SECTOR

(Unit: ₱10⁶)

Year in Order	Year	Capital Cost	Replacement Cost	O & M Cost	Total Cost	Total Benefit
1	1985	0	0	0	0	0
2	1986	0	0	0	0	0
3	1987	0	0	0	0	0
4	1988	20.20	0	0	20.20	0
5	1989	20.20	0	0	20.20	0
6	1990	20.20	0	0	20.20	0
7	1991	0	0	0.46	0.46	7.08
8	1992	0	0	0.46	0.46	7.08
9	1993	0	0	0.46	0.46	7.08
10	1994	0	0	0.46	0.46	7.08
11	1995	0	0	0.46	0.46	7.08
12	1996	0	0	0.46	0.46	7.08
13	1997	0	0	0.46	0.46	7.08
14	1998	0	0	0.46	0.46	7.08
15	1999	0	0	0.46	0.46	7.08
16	2000	0	0	0.46	0.46	7.08
17	2001	0	0	0.46	0.46	7.08
18	2002	0	0	0.46	0.46	7.08
19	2003	0	0	0.46	0.46	7.08
20	2004	0	0	0.46	0.46	7.08
21	2005	0	0	0.46	0.46	7.08
22	2006	0	0	0.46	0.46	7.08
23	2007	0	0	0.46	0.46	7.08
24	2008	0	0	0.46	0.46	7.08
25	2009	0	0	0.46	0.46	7.08
26	2010	0	1.54	0.46	2.00	7.08
27	2011	0	0	0.46	0.46	7.08
28	2012	0	0	0.46	0.46	7.08
29	2013	0	0	0.46	0.46	7.08
30	2014	0	0	0.46	0.46	7.08
31	2015	0	0	0.46	0.46	7.08
32	2016	0	0	0.46	0.46	7.08
33	2017	0	0	0.46	0.46	7.08
34	2018	0	0	0.46	0.46	7.08
35	2019	0	0	0.46	0.46	7.08
36	2020	0	0	0.46	0.46	7.08
37	2021	0	0	0.46	0.46	7.08
38	2022	0	0	0.46	0.46	7.08
39	2023	0	0	0.46	0.46	7.08
40	2024	0	0	0.46	0.46	7.08
41	2025	0	0	0.46	0.46	7.08
42	2026	0	0	0.46	0.46	7.08
43	2027	0	0	0.46	0.46	7.08
44	2028	0	0	0.46	0.46	7.08
45	2029	0	0	0.46	0.46	7.08
46	2030	0	1.54	0.46	2.00	7.08
47	2031	0	0	0.46	0.46	7.08
48	2032	0	0	0.46	0.46	7.08
49	2033	0	0	0.46	0.46	7.08
50	2034	0	0	0.46	0.46	7.08

Table 11.8 ECONOMIC COST AND BENEFIT FLOW FOR IRRIGATION AND DRAINAGE SECTOR

(Unit: ₱10⁶)

Year in Order	Year	Capital Cost	Replacement Cost	O&M Cost	Total Cost	Total Benefit
1	1985	43.68	0	0.36	44.04	0
2	1986	209.26	0	0.69	209.95	-56.85
3	1987	184.34	0	0.67	185.01	-79.56
4	1988	93.95	0	0.29	94.24	-35.30
5	1989	66.58	0	0.47	67.05	12.70
6	1990	92.01	0	0.24	92.25	60.65
7	1991	32.48	0	-0.55	31.93	115.51
8	1992	40.12	2.90	-0.97	42.05	165.70
9	1993	25.55	2.90	-0.12	28.33	230.33
10	1994	6.62	0	-1.12	5.50	346.06
11	1995	0	16.78	-1.12	15.66	383.52
12	1996	0	52.78	-1.12	51.66	399.48
13	1997	0	9.52	-1.12	8.40	400.37
14	1998	0	9.52	-1.12	8.40	400.37
15	1999	0	0	-1.12	-1.12	400.37
16	2000	0	5.80	-1.12	4.68	400.37
17	2001	0	0	-1.12	-1.12	400.37
18	2002	0	2.90	-1.12	1.78	400.37
19	2003	0	2.90	-1.12	1.78	400.37
20	2004	0	0	-1.12	-1.12	400.37
21	2005	0	16.78	-1.12	15.66	400.37
22	2006	0	81.55	-1.12	80.43	400.37
23	2007	0	61.45	-1.12	60.33	400.37
24	2008	0	9.52	-1.12	8.40	400.37
25	2009	0	65.67	-1.12	64.55	400.37
26	2010	0	5.80	-1.12	4.68	400.37
27	2011	0	0	-1.12	-1.12	400.37
28	2012	0	2.90	-1.12	1.78	400.37
29	2013	0	2.90	-1.12	1.78	400.37
30	2014	0	0	-1.12	-1.12	400.37
31	2015	0	16.78	-1.12	15.66	400.37
32	2016	0	52.78	-1.12	51.66	400.37
33	2017	0	9.52	-1.12	8.40	400.37
34	2018	0	9.52	-1.12	8.40	400.37
35	2019	0	0	-1.12	-1.12	400.37
36	2020	0	5.80	-1.12	4.68	400.37
37	2021	0	0	-1.12	-1.12	400.37
38	2022	0	2.90	-1.12	1.78	400.37
39	2023	0	2.90	-1.12	1.78	400.37
40	2024	0	0	-1.12	-1.12	400.37
41	2025	0	16.78	-1.12	15.66	400.37
42	2026	0	81.55	-1.12	80.43	400.37
43	2027	0	61.45	-1.12	60.33	400.37
44	2028	0	9.52	-1.12	8.40	400.37
45	2029	0	65.67	-1.12	64.55	400.37
46	2030	0	5.80	-1.12	4.68	400.37
47	2031	0	0	-1.12	-1.12	400.37
48	2032	0	2.90	-1.12	1.78	400.37
49	2033	0	2.90	-1.12	1.78	400.37
50	2034	0	0	-1.12	-1.12	400.37

Table 11.9 SENSITIVITY TEST

(Unit: IRR %)

Assumptions		Overall Project	Irrigation & Drainage Project	Rive-Improvement Project
Cost Up (%)	Benefit Down (%)			
0	-10	18.3	18.6	8.7
0	-20	17.1	17.4	7.6
+10	0	18.4	18.7	8.8
+10	-10	17.3	17.6	7.8
+10	-20	16.2	16.5	6.8
+20	0	17.5	17.8	8.0
+20	-10	16.5	16.8	7.0
+20	-20	15.3	15.7	6.1
0	0	19.3	19.6	9.7

Table 11.10 CASH FLOW STATEMENT OF UPRIIS OFFICE

(1) Irrigation fee collection efficiency: 75%

(Unit: ₱10⁶)

Year	Revenue from Irr. Fee	O & M Cost	Replacement Cost	Balance	Accumulated Amount
1985	33.7	26.74	0	6.96	6.96
6	30.5	27.07	0	3.43	10.39
7	29.3	27.05	0	2.25	12.64
8	31.3	26.67	0	4.63	17.27
9	32.2	26.85	0	5.35	22.62
1990	32.7	26.62	0	6.08	28.70
1	32.6	26.29	0	6.31	35.01
2	34.9	25.87	2.90	6.13	41.14
3	36.5	25.72	2.90	7.88	49.02
4	41.0	25.72	0	15.28	64.30
5	41.2	25.72	17.15	-1.67	62.63
6	41.2	25.72	58.69	-43.21	19.42
7	41.2	25.72	9.52	5.96	25.38
8	41.2	25.72	9.52	5.96	31.34
9	41.2	25.72	0	15.48	46.82
2000	41.2	25.72	5.80	9.68	56.50
1	41.2	25.72	0	15.48	71.98
2	41.2	25.72	2.90	12.58	84.56
3	41.2	25.72	2.90	12.58	97.14
4	41.2	25.72	0	15.48	112.62
5	41.2	25.72	17.15	-1.67	110.95
6	41.2	25.72	86.36	-70.88	40.07
7	41.2	25.72	65.44	-49.96	-9.89
8	41.2	25.72	9.52	5.96	-3.93
9	41.2	25.72	70.52	-55.04	-58.97
2010	41.2	25.72	7.37	8.11	-50.86
11	41.2	25.72	0	15.48	-35.38
12	41.2	25.72	2.90	12.58	-22.80
13	41.2	25.72	2.90	12.58	-10.22
14	41.2	25.72	0	15.48	5.26
15	41.2	25.72	17.15	-1.67	3.59
16	41.2	25.72	58.69	-43.21	-39.62
17	41.2	25.72	9.52	5.96	-33.66
18	41.2	25.72	9.52	5.96	-27.70
19	41.2	25.72	0	15.48	-12.22
2020	41.2	25.72	5.80	9.68	-2.54
21	41.2	25.72	0	15.48	12.94
22	41.2	25.72	2.90	12.58	25.52
23	41.2	25.72	2.90	12.58	38.10
24	41.2	25.72	0	15.48	53.58
25	41.2	25.72	17.15	-1.67	51.91
26	41.2	25.72	86.36	-70.88	-18.97
27	41.2	25.72	65.44	-49.96	-68.93
28	41.2	25.72	9.52	5.96	-62.97
29	41.2	25.72	70.52	-55.04	-118.01
2030	41.2	25.72	7.37	8.11	-109.90
31	41.2	25.72	0	15.48	-94.42
32	41.2	25.72	2.90	12.58	-81.84
33	41.2	25.72	2.90	12.58	-69.26
34	41.2	25.72	0	15.48	-53.78

(2) Irrigation fee collection efficiency: 80%

(Unit: ₱10⁶)

Year	Revenue from Irr. Fee	O & M Cost	Replacement Cost	Balance	Accumulated Amount
1985	35.9	26.74	0	9.16	9.16
6	32.6	27.07	0	5.53	14.69
7	31.3	27.05	0	4.25	18.94
8	33.4	26.67	0	6.73	25.67
9	34.3	26.85	0	7.45	33.12
1990	34.9	26.62	0	8.28	41.40
1	34.7	26.29	0	8.41	49.81
2	37.2	25.87	2.90	8.43	58.24
3	38.9	25.72	2.90	10.28	68.52
4	43.7	25.72	0	17.98	86.50
5	43.9	25.72	17.15	1.03	87.53
6	43.9	25.72	58.69	-40.51	47.02
7	43.9	25.72	9.52	8.66	55.68
8	43.9	25.72	9.52	8.66	64.34
9	43.9	25.72	0	18.18	82.52
2000	43.9	25.72	5.80	12.38	94.90
1	43.9	25.72	0	18.18	113.08
2	43.9	25.72	2.90	15.28	128.36
3	43.9	25.72	2.90	15.28	143.64
4	43.9	25.72	0	18.18	161.82
5	43.9	25.72	17.15	1.03	162.85
6	43.9	25.72	86.36	-68.18	94.67
7	43.9	25.72	65.44	-47.26	47.41
8	43.9	25.72	9.52	8.66	56.07
9	43.9	25.72	70.52	-52.34	3.73
2010	43.9	25.72	7.37	10.81	14.54
11	43.9	25.72	0	18.18	32.72
12	43.9	25.72	2.90	15.28	48.00
13	43.9	25.72	2.90	15.28	63.28
14	43.9	25.72	0	18.18	81.46
15	43.9	25.72	17.15	1.03	82.49
16	43.9	25.72	58.69	-40.51	41.98
17	43.9	25.72	9.52	8.66	50.64
18	43.9	25.72	9.52	8.66	59.30
19	43.9	25.72	0	18.18	77.48
2020	43.9	25.72	5.80	12.38	89.86
21	43.9	25.72	0	18.18	108.04
22	43.9	25.72	2.90	15.28	123.32
23	43.9	25.72	2.90	15.28	138.60
24	43.9	25.72	0	18.18	156.78
25	43.9	25.72	17.15	1.03	157.81
26	43.9	25.72	86.36	-68.18	89.63
27	43.9	25.72	65.44	-47.26	42.37
28	43.9	25.72	9.52	8.66	51.03
29	43.9	25.72	70.52	-52.34	-1.31
2030	43.9	25.72	7.37	10.81	9.50
31	43.9	25.72	0	18.18	27.68
32	43.9	25.72	2.90	15.28	42.96
33	43.9	25.72	2.90	15.28	58.24
34	43.9	25.72	0	18.18	76.42