TABLE E-7. CLASSIFICATION OF ASSIGNMENT FOR DATA MANAGEMENT

Description	O/M Head Office	Dam & R. District		District Office I-IV		
		Hydro-logist	GK	Hydro-logist	AE/WM	GK
Irrigation Area						
Collection	-	-	o	-	o	o
Arrenge & Submission	-	o	-	-	o	-
Totalizing						
Special Points	o	-	-	-	-	-
B.Ps. of Irri-Block	o	-	-	-	-	-
Points within Irri. Block	-	o	-	-	o	-
Programmed Discharge						
Special Points	o	-	-	-	-	-
B.Ps. of Irri. Block	o	-	-	-	-	-
Points within Irri. Block	-	o	-	-	o	-
Gate Operation						
Record of Gate Operation	-	-	o	-	-	o
Review of Gate Operation	-	o	-	-	o	-
Discharge Measurement						
Check of Delivered Discharge	-	o	-	o	-	-
Adjustment of Rating Table	-	o	-	o	-	-
Standardization of R.T.	o	-	-	-	-	-
Hydrological Data						
Collection & Arrengement	-	o	-	o	-	-
Analysis	o	-	-	-	-	-
O/M of Hydrological Equipment	-	o	-	o	-	-

FIGURE E-1. ORGANIZATION OF WATER MANAGEMENT

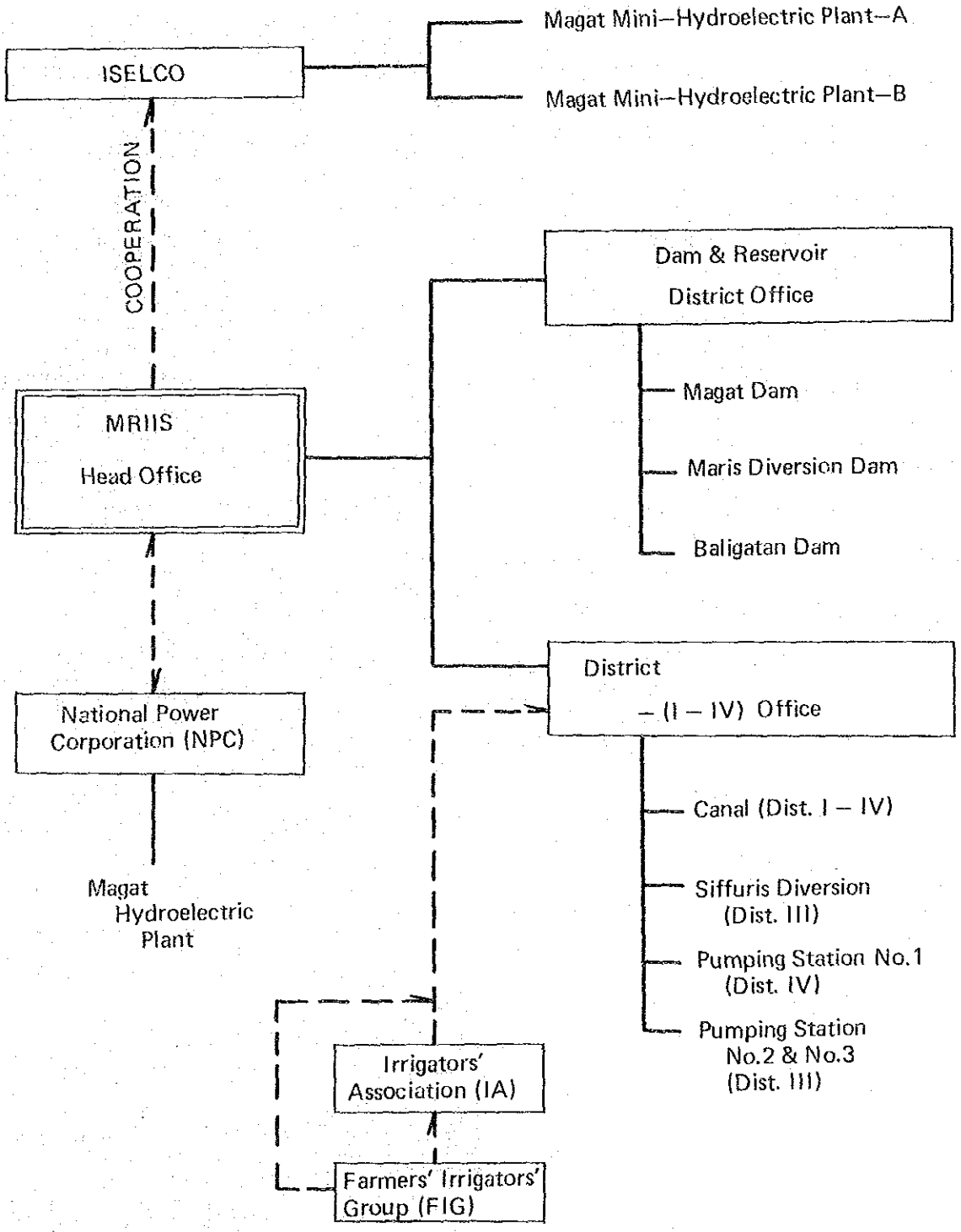
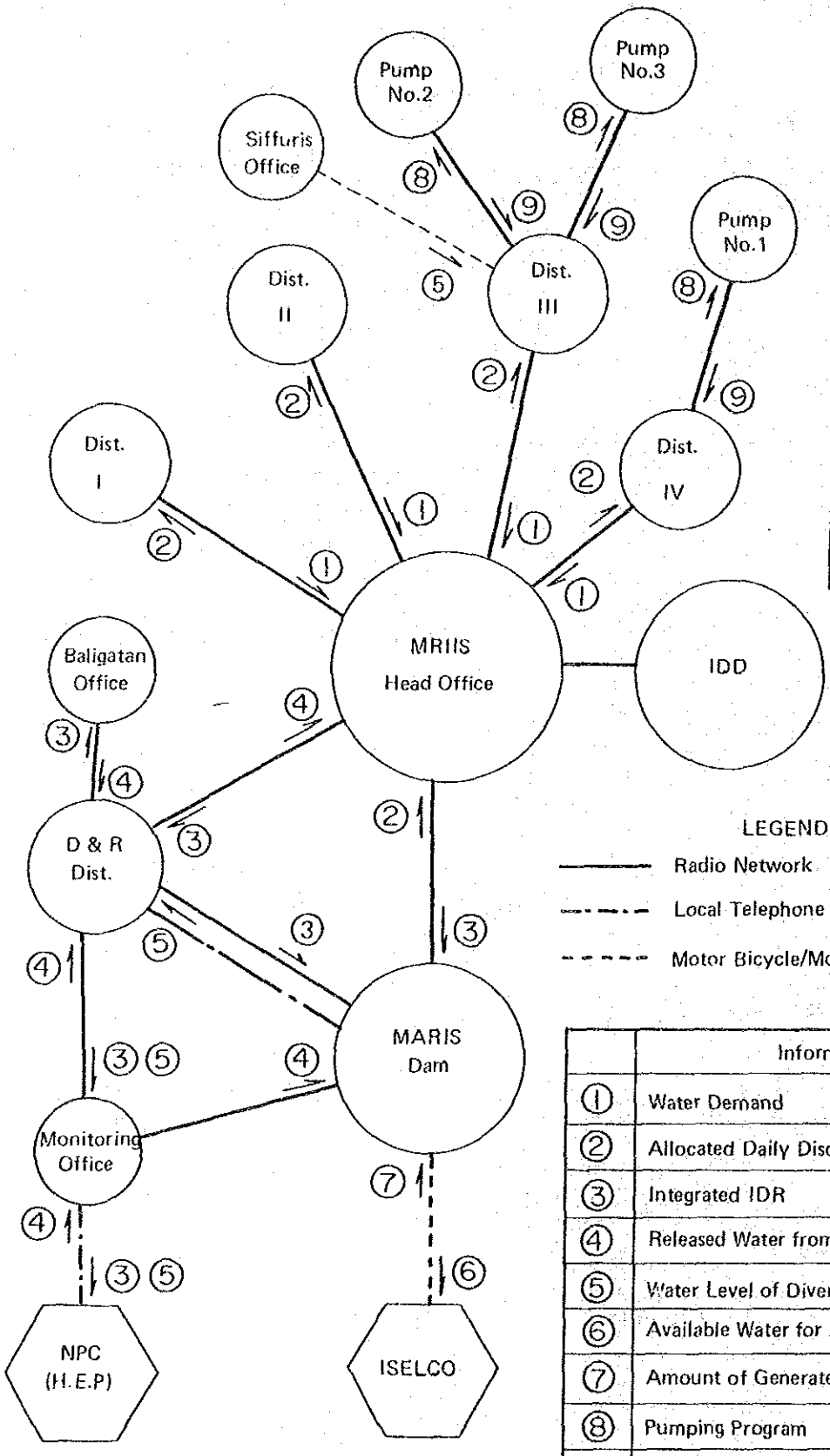


FIGURE E-2. MONITORING NETWORK FOR WATER MANAGEMENT IN MRIIS



Number-of Existing Mobil Radio

Office	Total Nos.
MRIIS Head	3
Dist. I	3
Dist. II	4
Dist. III	4
Dist. IV	5
D. & R. DIST.	4

LEGEND

——— Radio Network

—·—·— Local Telephone Network

- - - - - Motor Bicycle/Motor car

	Information
①	Water Demand
②	Allocated Daily Discharge
③	Integrated IDR
④	Released Water from Dam & Generated Power
⑤	Water Level of Diversion Dam
⑥	Available Water for Power Generation
⑦	Amount of Generated Power
⑧	Pumping Program
⑨	Operated Record

FIGURE E-3. WATER MANAGEMENT ACTIVITY IN DISTRICT LEVEL

Items	Nos. of Staff	Tues.	Wed.	Thu.	Fri.	Sat.	San.	Mon.
1. District Manager	1	(AM) / (PM)						
2. Supervising Engineer	1							
3. Hydrologist	1							
4. Area Engineer	2							
5. Water Master (WH)	25							
6. Gate Keeper (GK) & Ditch Tender (DT)	65							

Legend: Office Work Field Work

Note: Method of Information

1. Supervising Eng. & Area Eng. ..... Vehicle with mobil radio
2. Hydrologist ..... Vehicle
3. W.M. ..... Moter Bicycle
4. G.K/D.T ..... Moter Bicycle/Bicycle

FIGURE E-4. FLOW CHART OF WATER REQUEST AND ALLOCATION

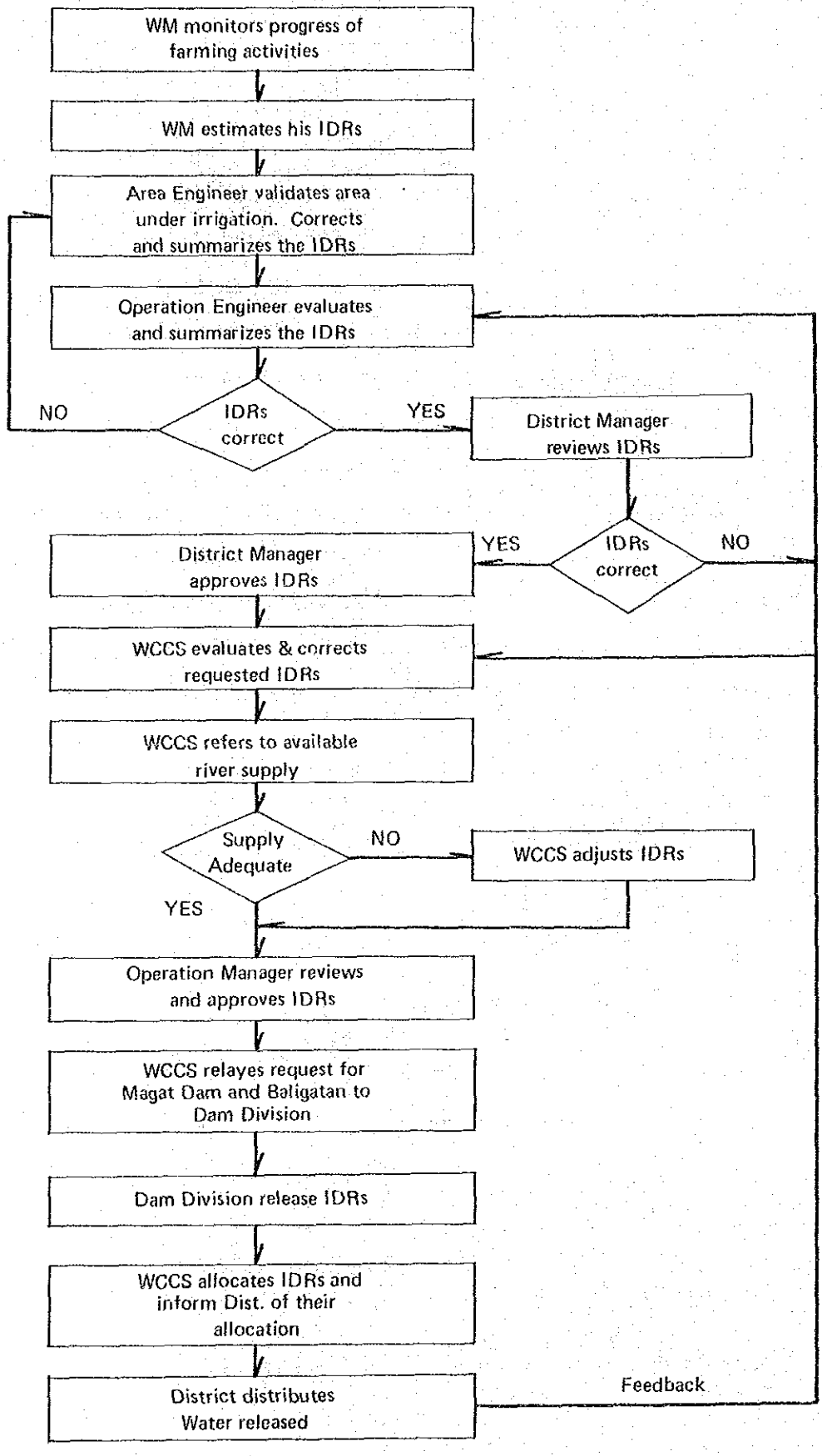
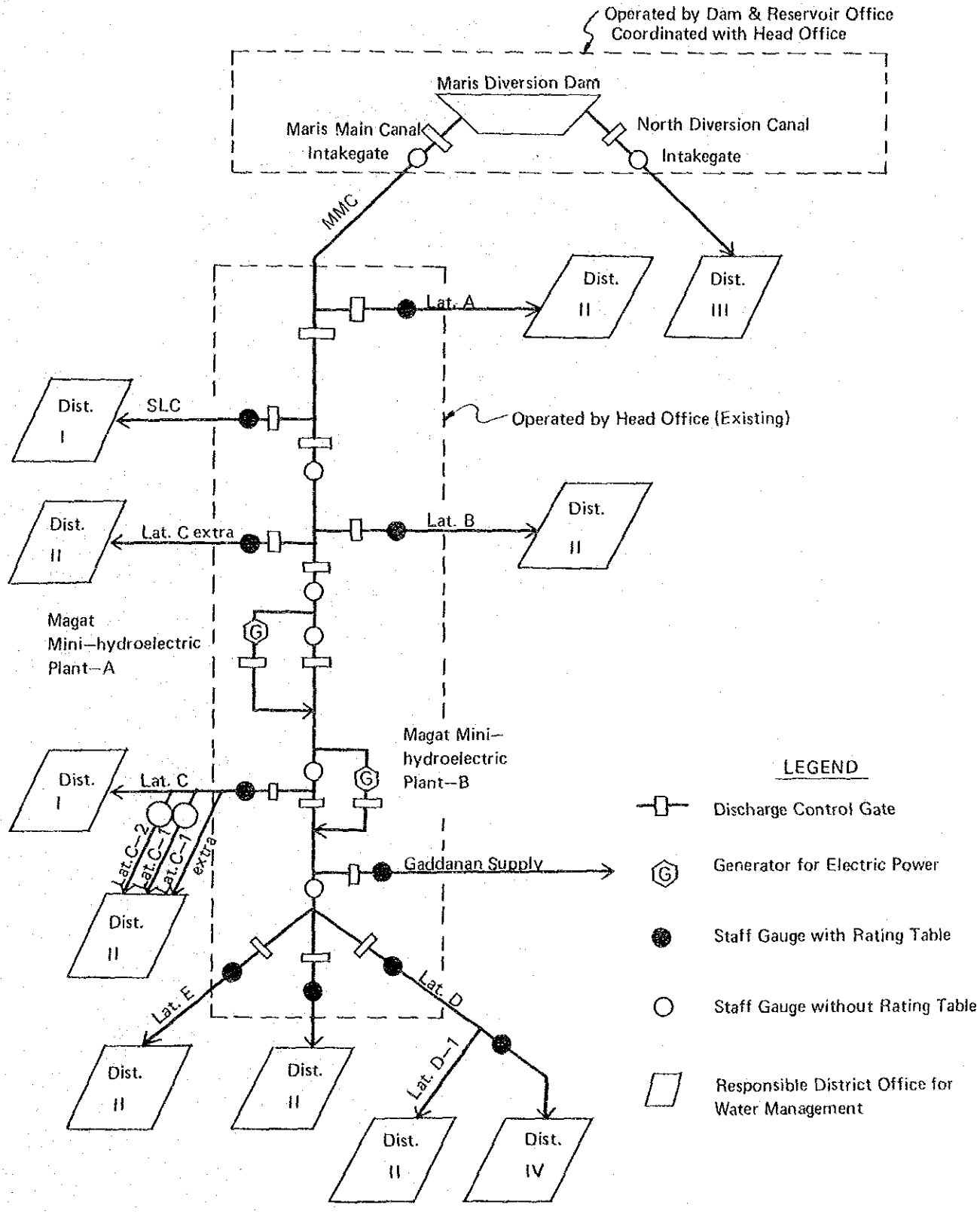


FIGURE E-5. ASSIGNMENT OF WATER MANAGEMENT AT UPSTREAM SECTION OF MARIS MAIN CANAL



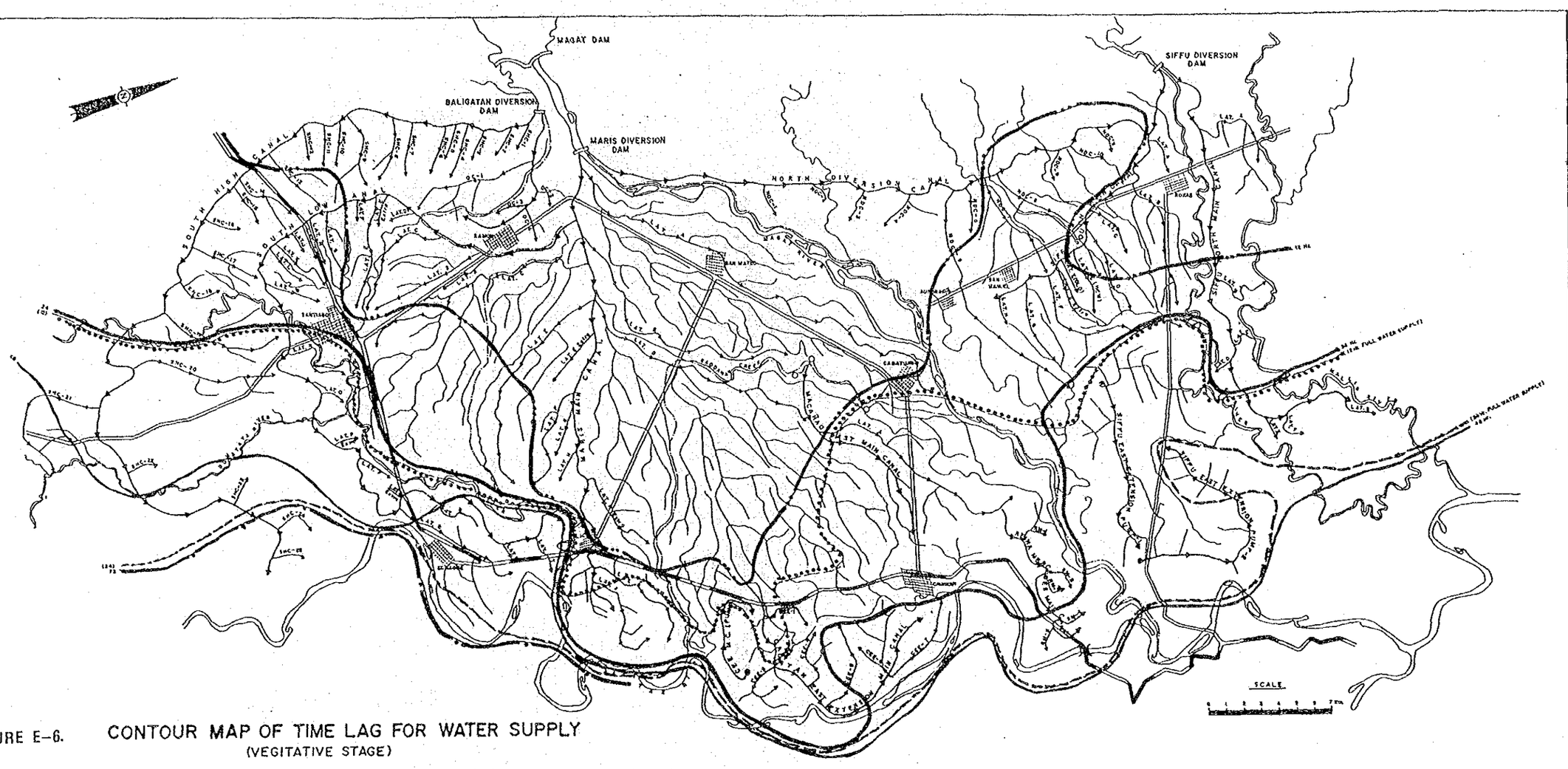
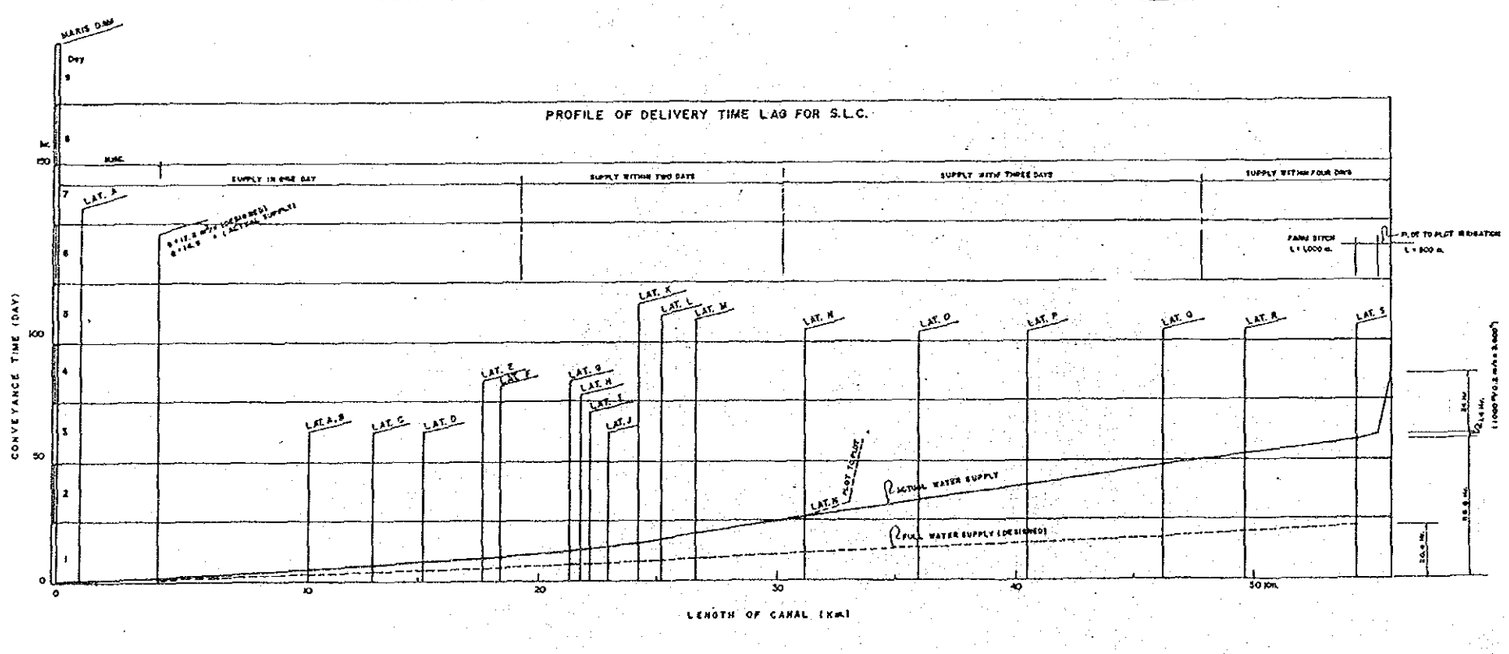


FIGURE E-6. CONTOUR MAP OF TIME LAG FOR WATER SUPPLY
(VEGITATIVE STAGE)



LEGEND

ACTUAL (Measured)

- 12 hrs. AFTER INTAKE
- 24 hrs. – " –
- 48 hrs. – " –
- 72 hrs. – " –

DESIGNED

- 12 hrs. AFTER INTAKE
- 24 hrs. – " –

FIGURE E-7. VARIATION OF MMC-INTAKE WATER

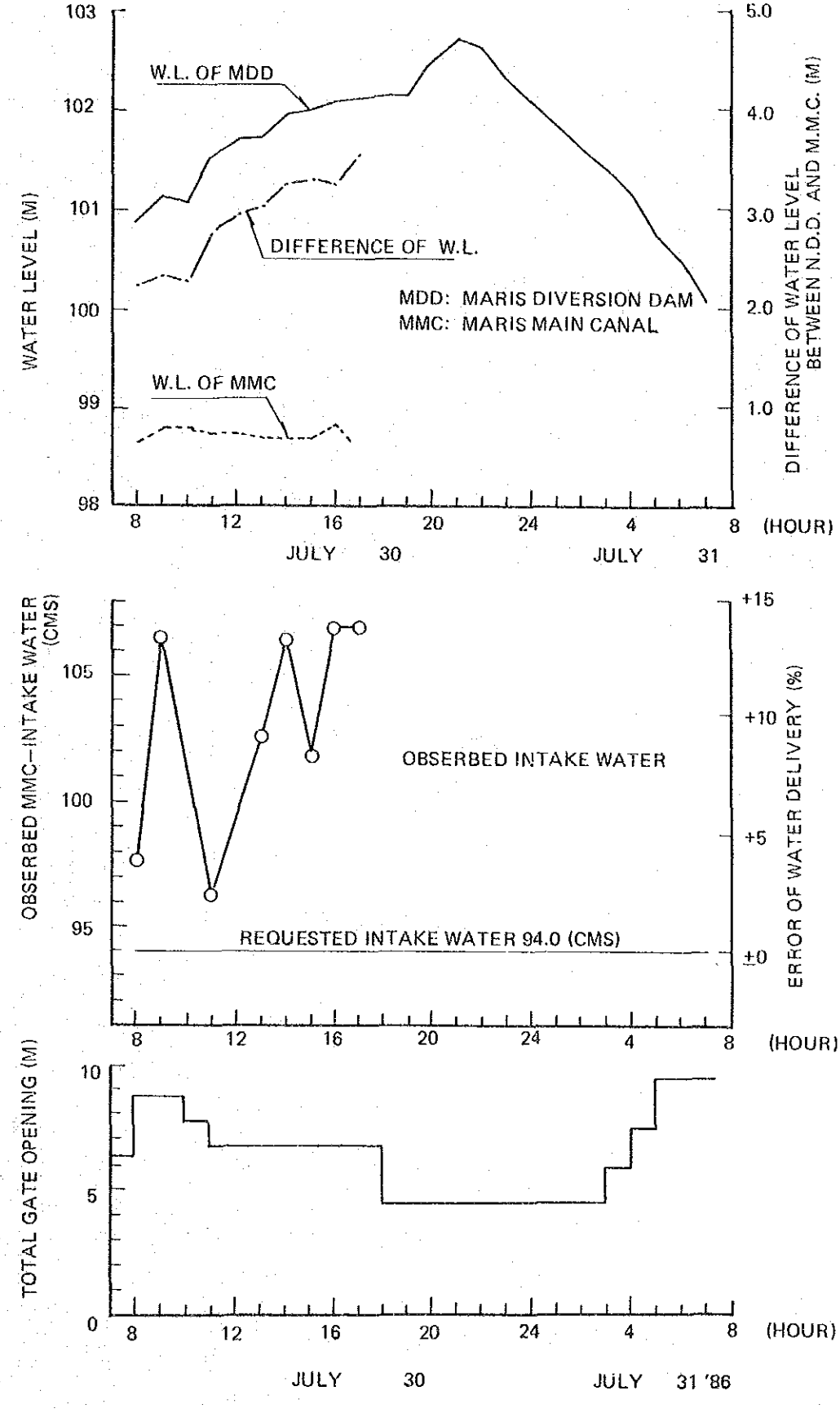


TABLE E-8. ACHIEVEMENT RATIO OF WATER ALLOCATION AT UPSTREAM SECTION OF MARIS MAIN CANAL

Name of Gate	June 9			July 23			July 30		
	I.D.R. (1) (cms)	O.D. (2) (cms)	(2)÷(1) (%)	I.D.R. (3) (cms)	O.D. (4) (cms)	(4)÷(3) (%)	I.D.R. (5) (cms)	O.D. (6) (cms)	(6)÷(5) (%)
Intake Water	98.8	83.5	85	90.1	104.3	116	92.2	97.7	106
Lat. A	32.0	30.9	97	28.0	33.0	118	28.0	35.7	128
South Low	14.0	13.4	96	14.0	16.0	114	14.0	16.0	114
Lat. B	3.6	3.9	108	3.5	1.6	46	3.8	-	-
Lat. C-Ext	0.2	0.2	100	0.1	0.03	30	0.1	0.03	30
Lat. C	6.9	7.7	112	6.4	6.8	106	6.4	6.8	106
Gaddanan Sup.	3.0	-	-	2.5	1.9	76	2.5	-	-
Lat. D	27.8	29.6	106	25.0	23.2	93	26.8	-	-
Lat. E	2.8	2.0	71	2.5	1.3	52	3.0	-	-
MCBLD	6.8	4.0	59	6.5	9.5	146	6.5	-	-

Note: I.D.R.: Irrigation Diversion Requirement
O.D. : Observed Discharge

TABLE E-9. WATER RESOURCES FOR SERVICE AREA OF MAJOR CANAL

Name of Canal	Maris Diversion Dam (ha)	Baligatan Diversion Dam (ha)	Siffuris Diversion Dam (ha)	Macanao Diversion Dam (ha)	Lodeco Diversion Dam (ha)	Total (ha)
1. Maris System						
Lat. A	7,447	-	-	-	-	7,447
Lat. A-Ext	100	-	-	-	-	100
Lat. B	1,483	-	-	-	-	1,483
Lat. C-Ext	70	-	-	-	-	70
Lat. C	7,079	-	-	-	-	7,079
Lat. D	21,999	-	-	-	-	21,999
Lat. E-J	5,935	-	-	-	-	5,935
MCTO	1,856	-	-	-	-	1,856
2. South Low	7,920	-	-	-	-	7,920
Sub-total	53,889	0	0	0	0	53,889
3. North Diversion	14,314	-	-	-	-	14,314
	(21,500)					(21,500)
4. Oscariz	-	3,100	-	-	-	3,100
5. South High	-	9,580	-	-	-	9,580
6. Siffu South	-	-	7,520	-	-	7,520
			(334)			(334)
7. Siffu North	-	-	2,959	-	-	2,959
8. Macanao East	-	-	-	4,902	-	4,902
9. Macanao West	-	-	-	171	-	171
10. Ladeco	-	-	-	-	967	967
Total	68,203 (70%)	12,680 (13%)	10,479 (11%)	5,073 (5%)	967 (1%)	97,402 (100%)
	(75,389)(77%)	(12,680)(13%)	(3,293)(4%)	(5,073)(5%)	(967)(1%)	(97,402)(100%)

Note: Numbers in ( ) are service area in the period of water shortage of Siffu river.

3. WATER MANAGEMENT IN DIVERSION DAM

3.1. Maris Diversion Dam

(1) Present Outflow Control

The outflow for the irrigation to the Maris main and North Diversion canals is controlled by the intake gate operation at the left and right banks in the Maris diversion dam in corresponding to the irrigation demand in the service area on weekly basis.

This outflow control however, has not always been made properly, and the discharge in the canal fluctuates hourly and daily by the following reasons;

- The re-regulation of the peak discharge for power generation at the diversion dam shall be made based on its amount and releasing hours as well as the daily irrigation demand. However, information on the amount, time and operating hours of peak discharge is not given in advance to the MRIIS O/M Office from the NPC, so that the plan for the regulation of the irrigation water is not properly made.
- Since the water level in the Maris diversion dam considerably fluctuates depending on the amount of peak discharge released from the power plant, the present gate operation can not follow its fluctuation and the releasing water to the canal also fluctuates. (See Figure E-8, 9, 10)
- The difference in water head between diversion dam and canal, which is the basis of discharge control, is not measured accurately due to absence of proper measurement devices, so that adequate gate operation is rather difficult to correspond to the water head and irrigation demand.

(2) Automatic Control System

- The automatic control system is operated in depending on the fluctuating water level and IDR for the main canal shall be introduced by Maris intake gate equipped with new

FIGURE E - 8 (1) YEALY FLUCTUATION OF WATER LEVEL OF MARIS DIVERSION DAM

YEAR ; 1985

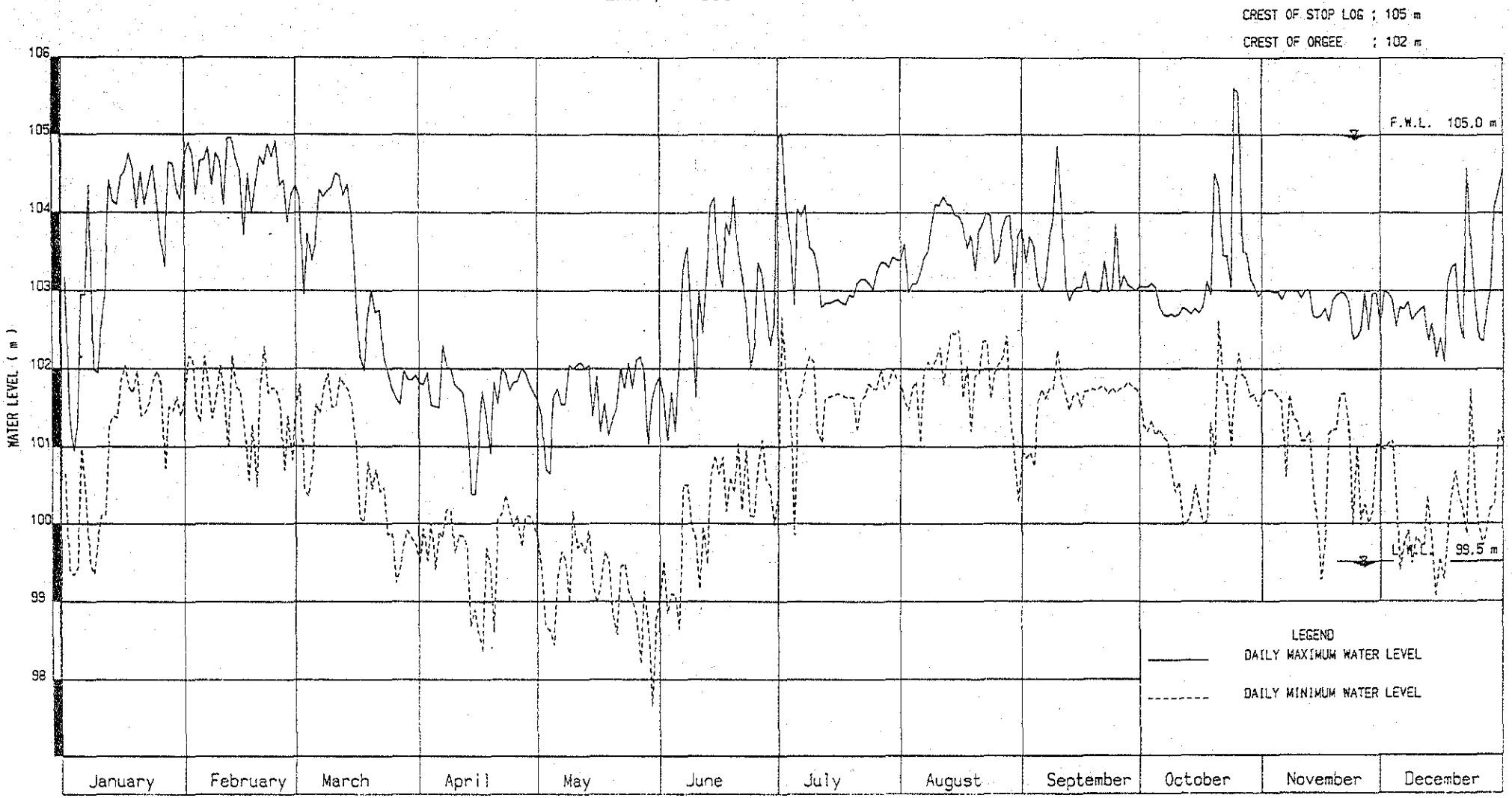


FIGURE E - [illegible] YEALY FLUCTUATION OF WATER LEVEL OF MARIS DIVERSION DAM

YEAR ; 1986

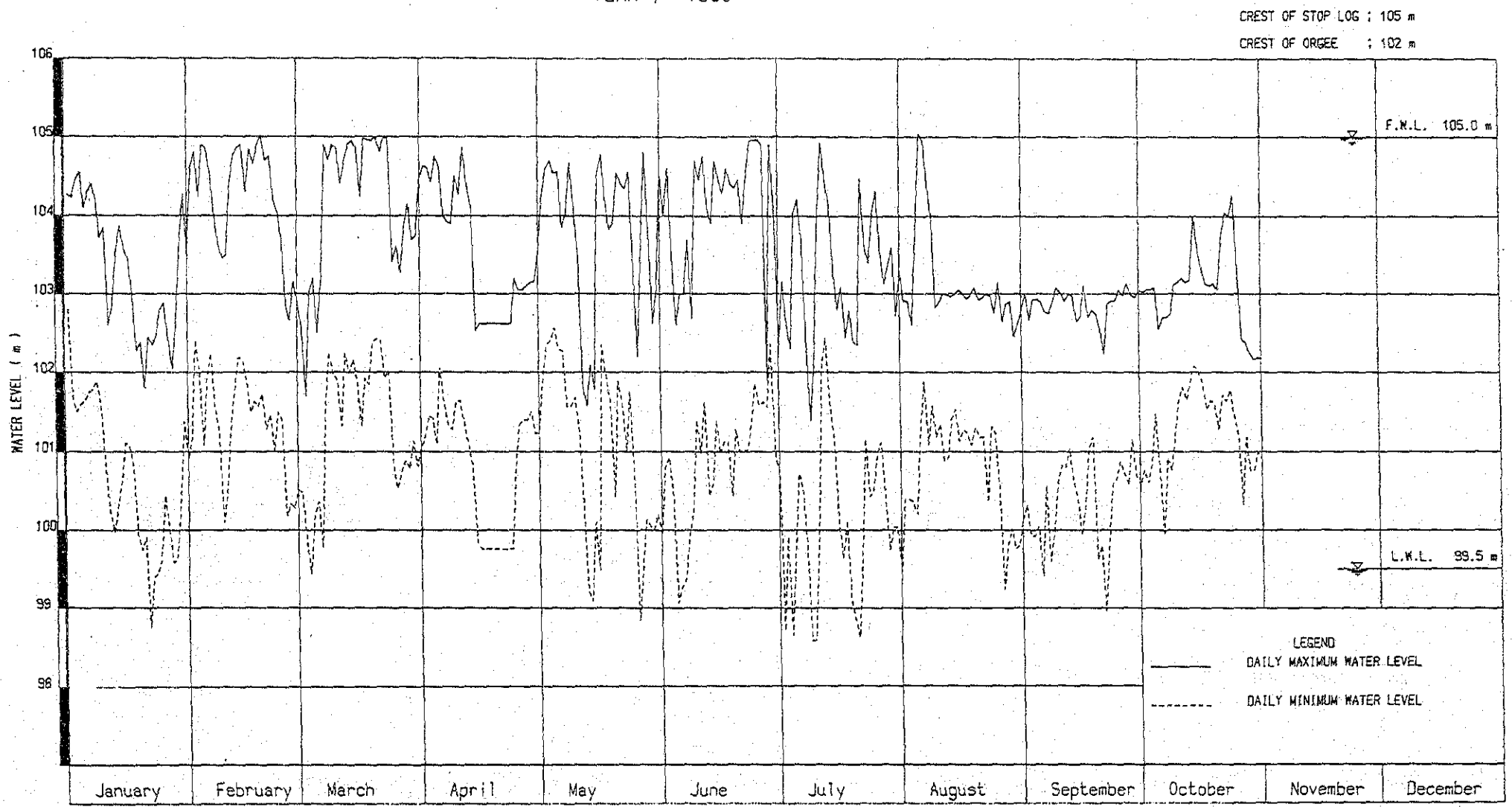


FIGURE E-9. VARIATION OF MARIS MAIN CANAL INTAKE WATER

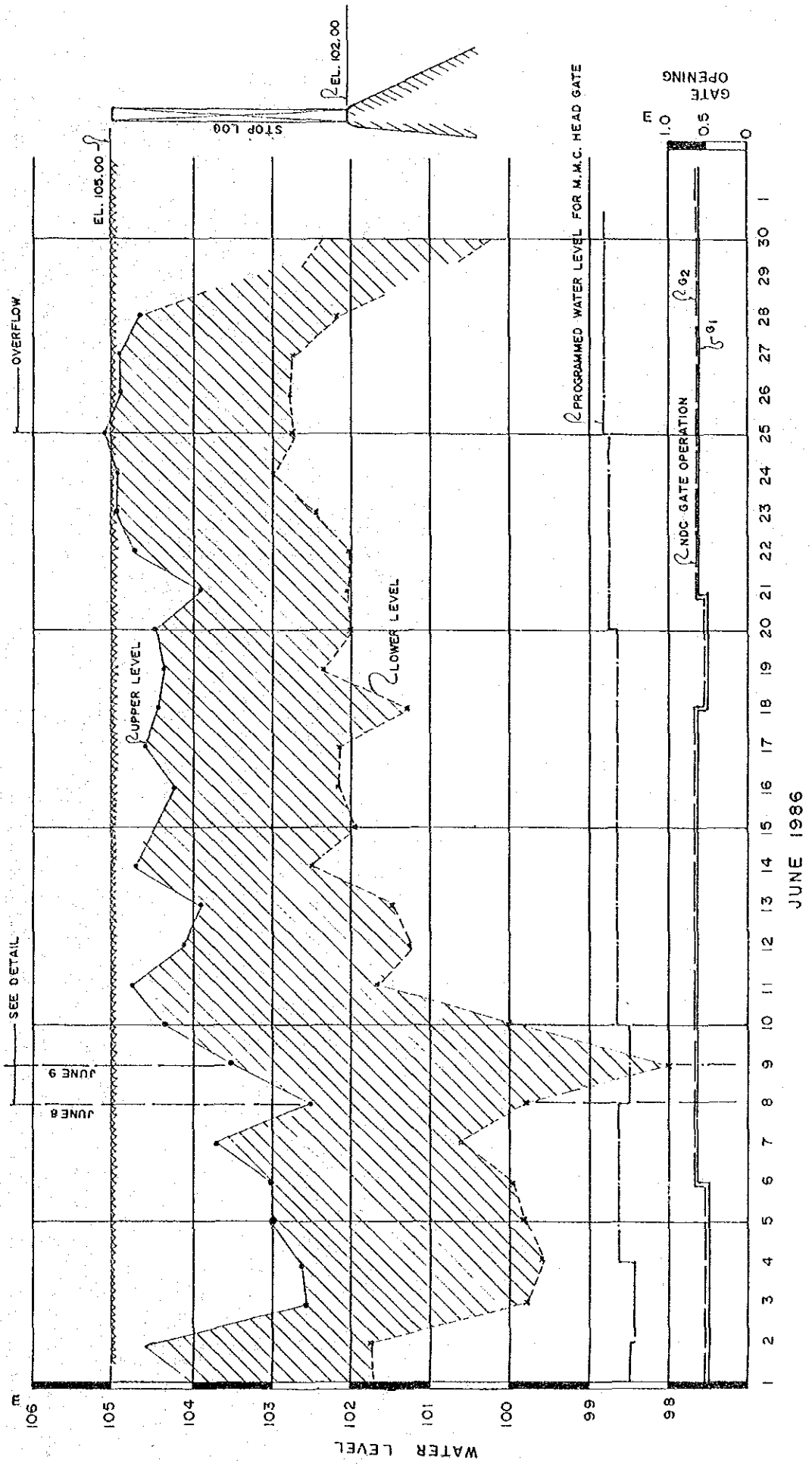
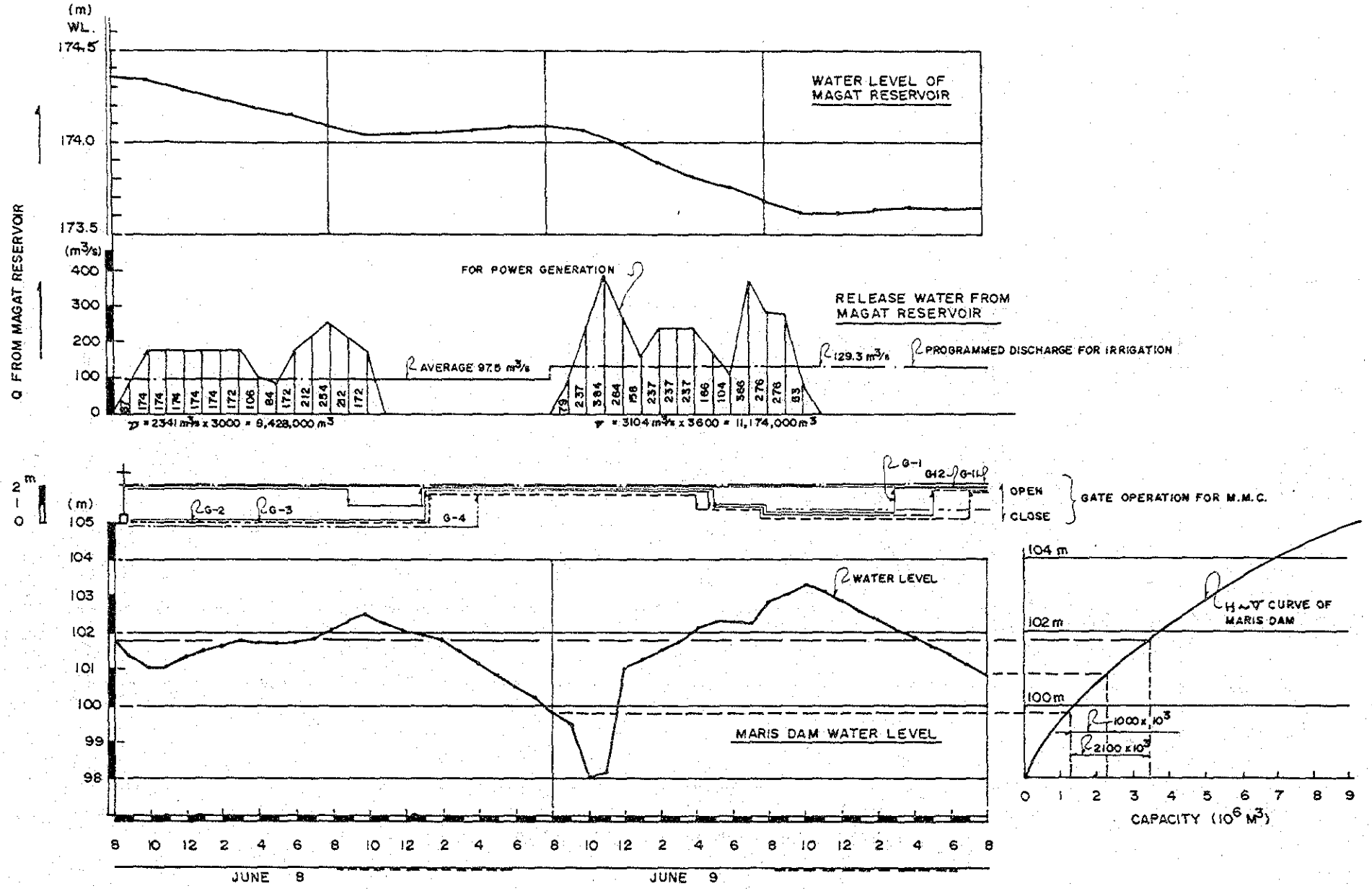


FIGURE E-10. MARIS DIVERSION DAM OPERATION (8, 9TH JUNE, 1986)



control systems. The layout of the automatic control system is shown in the O/M Drawings No. 46. The intake gate can be operated automatically and remotely according to the indication on the water level measured automatically the devices in the system, and can release the water exactly to the canals in accordance with the necessary irrigation demand.

- This system shall include the automatic and remote control devices for the check and head gates installed at the distribution points of Lateral "A", "B", "C", "D" and "E" in the Maris main canal in order to distribute the diverted water at the Maris diversion dam to each canal exactly and on time in accordance with the irrigation demand of the lateral canals. The devices are installed at the control house to be newly constructed in the right bank of diversion dam and can control the intake gate at the left bank, as well as the check and head gates in the Maris main canal remotely.

- This system will play a vitally important rule to improve the water management for not only Maris diversion dam but the related canal systems.

3.2. Siffu Diversion Dam

(1) Present Water Management

The Siffu diversion dam has a function to introduce the river runoff through both intake gates at the left and right banks of the diversion dam and to supply it to the Siffu North and South canals covering the area of about 11,000 ha.

The present water control and gate operation have the following problems;

- The scouring sluiceway gates installed in the both side of dam are broken and have malfunctioned scouring sediments trapped in the front of intake gates.

- The intake gate is operated manually and cannot be operated quickly and accurately in corresponding to the fluctuation of water level in the river and the water demand by the irrigation areas, so that the discharge released to the canals can also fluctuate.

- The intake gate at the left bank cannot be operated at the right bank due to absence of operation bridge crossing the river, so that the gate operation at the left bank is made by using the road in the downstream with a long distance from the right bank where operator is staying.

- The discharge taken at the intake is not measured exactly due to lack of proper measuring devices for the water level in the river and difference in water head between the river and the irrigation canals.

(2) Improvement Works

The following improvement works are required with the gates for the smooth operation.

- Improvement of gate mechanism at the left and right intake gates to carry out the electrical operation and remote control at the left bank.

- Replacement of scouring sluiceway gates at the both banks so as to carry out the scouring of sedimentation in the front of the intake gates.

- Installation of automatic water level gauge and measuring devices at the river and canals.

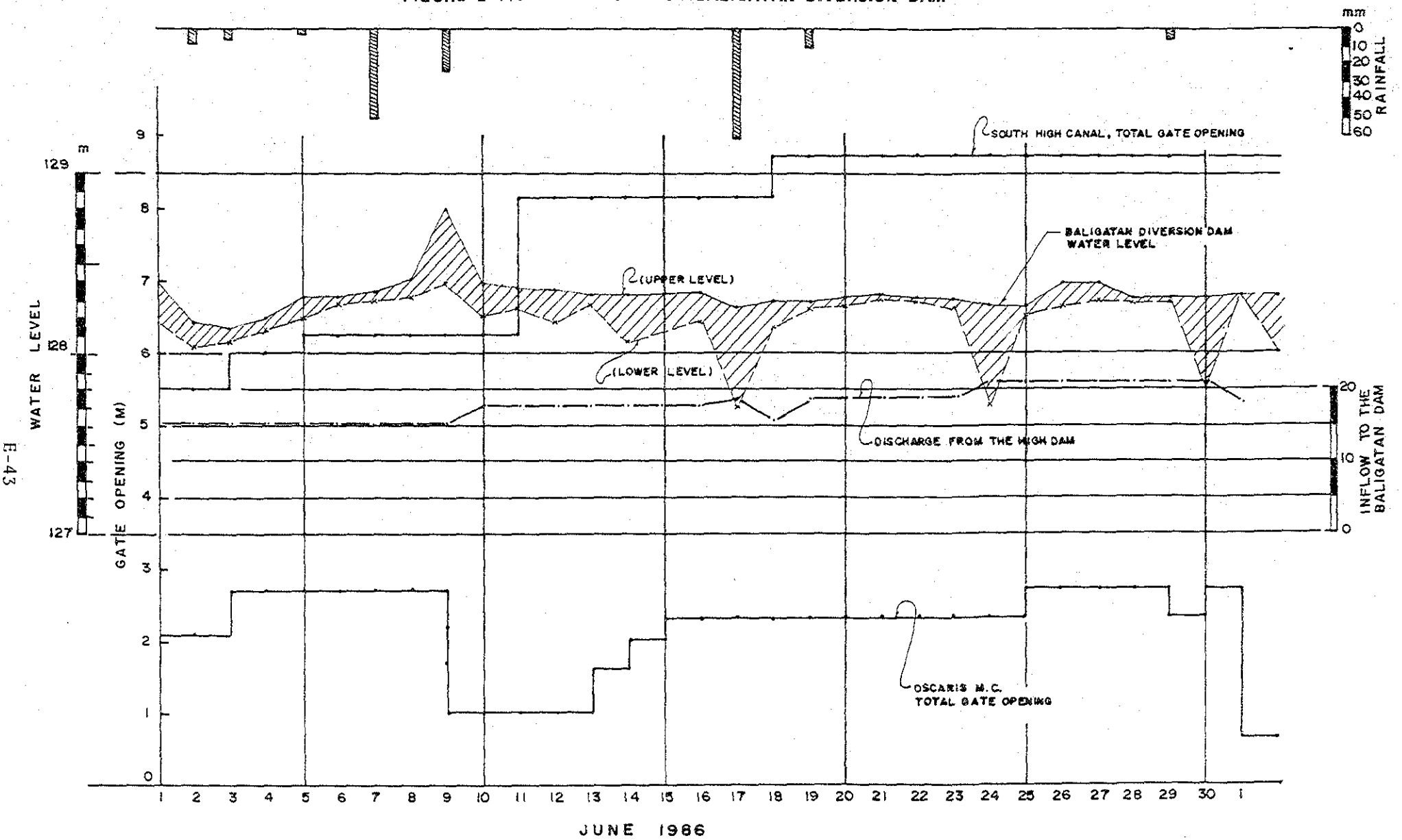
- Frequent discharge measurement shall be made at the beginning point of the Siffu South main canal and the relevant data shall be transferred to the control house in the Maris diversion dam in order to adjust the discharge to the North Diversion canal from the Maris diversion dam.

3.3. Baligatan Diversion Dam

The Baligatan diversion dam has a function to divert the water released from the Baligatan outlet to the South High and Oscariz canal. Since the present water control at the both intakes in the diversion dam is practised without any problems on gate operation mechanism, improvement works are not made in this diversion dam.

The data of the water level, the released discharge, etc. will be transmitted to the proposed control house for providing the control schedule in the Maris diversion dam.

FIGURE E-11. OPERATION OF BALIGATAN DIVERSION DAM



4. IMPROVEMENT OF ON-FARM FACILITIES

The major on-farm facilities consist of turn-outs, main and supplementary farm ditches, farm drains, and farm roads. These on-farm facilities in the proposed service area of about 97,400 ha are not provided at all, except those in a part of the area, and the average intensities of equipped on-farm facilities are far lower than those of NIA's standards as shown below. Such situation in the area is one of the reasons to make trouble of in adequate and in timely water distribution at on-farm level, occurrence of time-lag between up-and downstream areas, difficulty for transportation of agricultural crops and production materials.

Present On-Farm Facilities

District	Service Area (ha)	Farm Ditch Length (km)	Farm Ditch Intensity (m/ha)	Farm Drain Length (km)	Farm Drain Intensity (m/ha)	Farm Road Length (km)	Farm Road Intensity (m/ha)
I	24,054	502.2	20.9	124.1	5.2	68.6	2.8
II	24,468	997.8	42.1	235.9	9.9	98.7	4.2
III	24,793	433.9	19.1	144.2	6.4	99.6	4.4
IV	24,087	507.1	25.8	210.5	8.7	92.4	3.8
Total	97,402	2,441.3	25.1	714.7	7.3	359.3	3.7

Note: 1) Number of turn-out and average size of rotation area:

District	I	:	804 places	(29.9 ha/turn-out)
	II	:	856 "	(28.6 ")
	III	:	537 "	(46.2 ")
	IV	:	701 "	(34.3 ")
	Total	:	2,898 Places	(33.6 ")

2) NIA's standard criteria of on-farm facilities;

Farm ditch	:	60 m/ha
Farm drain	:	40 m/ha
Farm road	:	20 m/ha

In order to exercise rationalized water and farm management, on-farm facilities should be provided in accordance with the criteria of NIA's standards. The construction of on-farm facilities

should be carried out in principle by Irrigators' Associations. However, NIA and other governmental agencies concerned should assist Irrigators' Associations technically and financially, so as to construct smoothly the on-farm facilities.

The actual condition of water supply in the sample paddy fields and improvement plan of on-farm facility are shown in the Figure E-12 and Table E-10.

FIGURE E-12. IMPROVEMENT OF ON-FARM FACILITIES

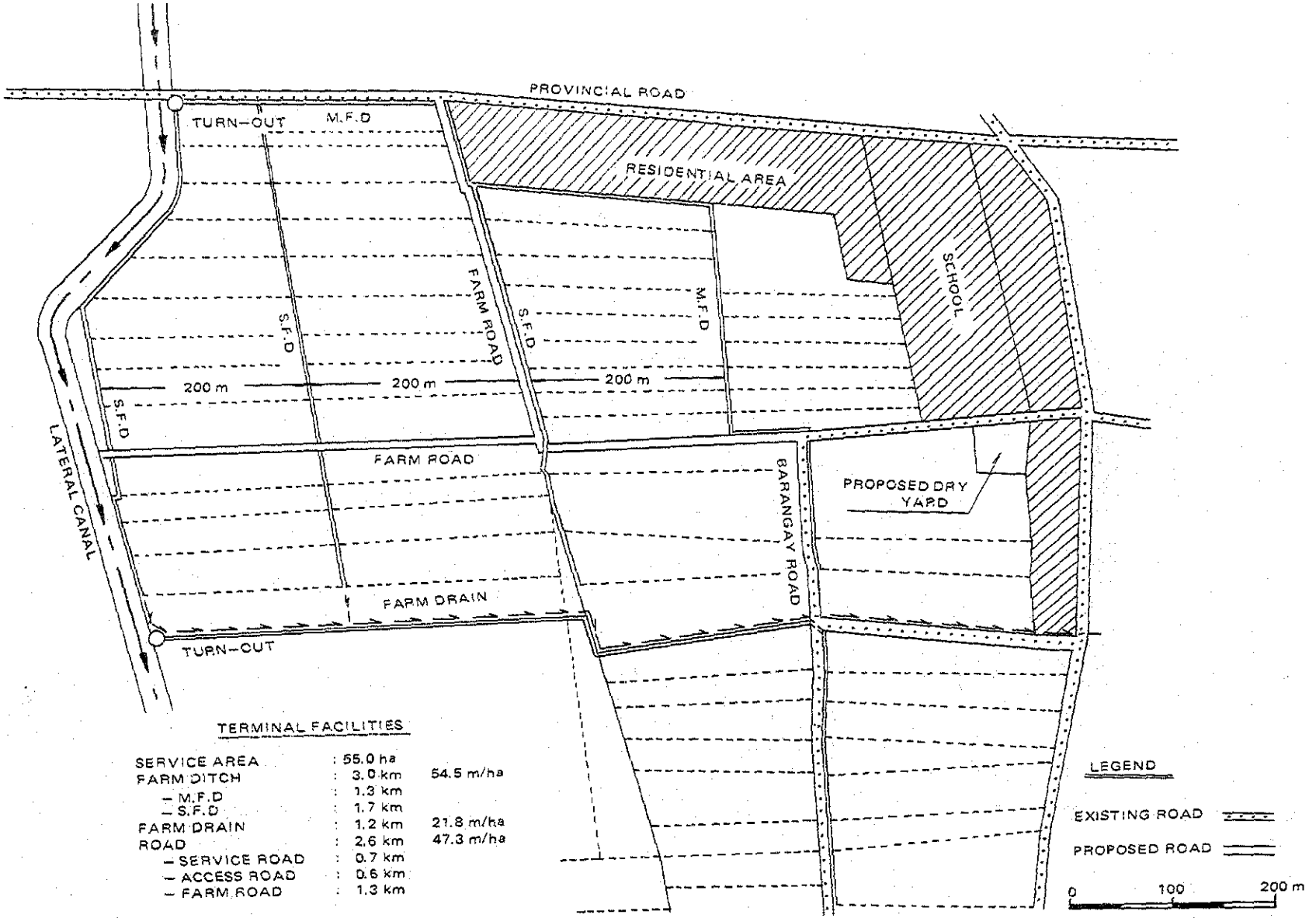


TABLE E-10. ACTUAL CONDITION OF WATER SUPPLY IN SAMPLED PADDY FIELD

Items \ Sample Plot	(1)	(2)	(3)	(4)	Average
1. District	I	II	III	IV	
2. Name of Canal	Lat. C	Lat. A-2a-5	NDC 7	D-4b	
3. Owner or Tenant (Number)	8	4	1	1	3-4
4. Planting Method	Transplanting & Direct Seeding	Transplant	Direct Speed	Transplant	
5. Total Area, ha	4.52	1.88	0.95	2.52	2.47 ha
6. Number of Plot	93	18	26	105	60 plots
7. Average Plot Area, m^2	486 22m x 22m	1,046 62m x 17m	365 20m x 18m	240 15m x 16m	534 m^2 30m x 17m
8. Width of Notch, mm	200	300	100	200	200 mm
9. Intake Capacity, liter/sec.	2	3-5	3	3	3 l/s
10. Longitudinal Length of Sample plot	510 m	280 m	145 m	540 m	370 m
11. Slope of Field	1/500	1/1000	1/180	1/210	1/470
12. Period to be filled-up by the water					
- for Land Soaking (day)	7	2	3	5-7	4.5 days
- for Land Soaking (day/ha)	2.3	1.1	3.2	2.4	2.25 d/ha
- for Irrigation (day)	1-2	1	1	2-3	1.5 days
Observation	June 20	July 1	July 7	July 2	

ANNEX F

PROJECT FACILITIES

F. PROJECT FACILITIES

LIST OF TABLES

1. DAM AND DIVERSION DAM

The Magat Reservoir Dam completed in 1982 under the fund of the World Bank. It is located on the Magat river at Barangay Oscariz. The outline of the Dam is shown in Table F-1.

The Maris diversion dam, located at Barangay Oscariz about six kilometer downstream from the Magat Resrvoir Dam, was constructed in 1957 as ogee type concrete dam. It was elevated 6.5 meter with concrete and stoplog type flood gate in 1979 by the Magat River Multi-purpose Project. By the reinforcement of the diversion dam, two barrels are added at the right intake for the Maris Main Canal and two new intake barrels are newly constructed for the North Diversion Canal.

The Baligatan Diversion Dam is located on the North Baligatan creek about three kilometer downstream of the Magat Dam. It is a combined type dam with concrete ogee crest and fill dam.

The Siffuris Diversion Dam was constructed in 1960 and enheightened on the old dam in 1979. It is the ogee type concrete dam.

The outline of those Diversion Dams is shown in Table f-2.

2. IRRIGATION CANAL

The Magat River Integrated Irrigation System is composed of fifteen sub-systems. Each sub-system has a main canal and the total length of them is 321 km. And each main canal has several lateral and sub-lateral canals. The total length of laterals is about 1,150 km.

The outline of main and lateral canals are shown in Table F-3 and F-4.

3. PUMPING STATION

Three pumping stations are existing in the Service Area. The outline of them is indicated in Table F-5.

TABLE F-1. OUTLINE OF MAGAT DAM AND RESERVOIR

1. Reservoir

Drainage	4.200 km^2
Annual Mean Runoff	6.500 MCM
Full Water Level	193 m
High Water Level	197 m
Low Water Level for Power	160 m
Low Water Level for Irrigation	150 m
Total Reservoir Surface Area	45 sq km
Total Reservoir Capacity H.W.L.197	1.250 MCM
Effective Capacity at L.W.L. 160	820 MCM
Effective Capacity at L.W.L. 150	932 MCM

2. Dam

Dam Type	Fill and Concrete combine Dam
Maximum Height	114 m
Total Crest Length	4.160 m
Crest Elevation	201 m
Dam Embankment Volume	Fill 18 MCM, Concrete 1.0 MCM

3. Outflow Capacity

For Magat Power Plant (L.W.L. 160)	480 cu.m/sec
For Baligatan Power Plant (L.W.L. 160)	33.7 cu.m/sec
For Irrigation only (L.W.L. 150)	350 cu.m/sec

4. Spillway

Design Flood Capacity	30.600 cu.m/sec
Type of Spillway	Overflow with Gate Control
Crest Elevation	174 m
Gates on EL 174	Radial Gates, 16.5 x 19.05 x 7 units
Gates on EL 147	Radial Gates, 6.0 x 12.5 x 2 units

TABLE F-2. OUTLINE OF DIVERSION DAMS

Item	Unit	Maris	Baligatan	Siffuris
1. Reservoir				
Drainage Area	sq km	4.285	46	686
Annual Mean Runoff	MCM	-	-	-
Full Water Level	m	105	128.4	65
Low Water Level	m	99.5	-	-
Regulating Capacity	MCM	7.3	0	0
2. Diversion Dam				
Dam Type		Ogee concrete w/stop log (12.0 x 3.0 x 16)	Ogee concrete	Ogee concrete
Dam Height	m	13.5	13.0	5.2
Dam Length	m	293.5	270	100
Crest Elevation	m	102	128.4	65
3. Intake Capacity				
Right Bank	cu.m/sec	121.5	7.7	14.1
Left Bank	cu.m/sec	59.0	26.0	5.2
4. Intake Gate				
Type		Slide gate	Slide gate	Slide gate
Right Bank		2.1x1.8x10 3.5x2.7x 2	1.45x1.45x6	1.68x2.13x3
Left Bank		3.5x2.4x 2	1.45x1.45x2	1.68x2.13x1
5. Sand Sluiceway Gate				
Type at Right Bank		Wheel gate	Slide gate	Slide gate
Type at Left Bank		- do -	Wheel gate	Roller gate
Size & No at Right Bank		5.5x5.0x 2	5.25x3.8x1	4.89x4.12x1
- do - at Left Bank		3.5x4.0x 1	-	2.44x2.44x1

TABLE F-3. OUTLINE OF MAIN CANAL

Name of Canal	Service Area (ha)	Canal Length (km)	Design Discharge (m^3/s)	Average Slope	Average Velocity (m/s)	No. of Laterals	No. of Check (pcs)	No. of Turn-out (pcs)	No. of Structure (pcs)
MARIS	40,496	27.4	121.50	0.0002	1.0-0.4	123	14	85	35
Oscariz	3,100	11.8	7.66	0.0002	0.6	12	11	31	49
South High	9,580	59.6	26.04	0.0002	0.8-0.3	42	32	82	180
South Low	7,920	48.6	17.56	0.0002	0.8-0.4	33	32	104	108
North Diversion	(21,500)								
	7,718	36.0	59.00	0.0002	1.0-0.5	27	10	40	128
Siffu South	7,520	27.0	14.06	0.0002	0.7-0.3	17	3	20	75
Siffu North	2,959	25.0	5.23	0.0002	0.6-0.4	12	6	27	63
Macanao East	3,126	12.0	11.95	0.00025	0.8-0.3	6	7	40	16
Ladeco	967	8.0	3.08	0.0002	0.5	3	-	3	20
Reina Mercedes	1,776	11.5	4.65	0.0002	0.6-0.3	6	3	28	41
Cauayan EE	3,806	19.8	8.06	0.0002	0.7-0.3	18	7	31	32
C.EE (Pump)	1,667	7.9	3.44	0.0002	0.5-0.3	5	3	28	24
Siffu EE 1	3,596	10.2	16.60	0.0002	0.7-0.6	16	5	4	29
Siffu EE 2	3,000	13.6	7.40	0.0002	0.7-0.3	12	6	18	37
Macanao West	171	3.0	0.48	0.0004	0.6-0.4	-	1	7	6
TOTAL	97,402	321.4				332	140	548	843

NOTE: Total covering area of North Diversion Canal is 21,500 ha inclusive Siffu South and Siffu South Extension Area.

TABLE F-4. OUTLINE OF LATERAL CANAL

Name of Canal	Service Area (ha)	Canal Length (km)	Design Discharge (M^3/Sec)	No. of Laterals	No. of Head Gate (pcs)	No. of Check Gate (pcs)	No. of Turnout (pcs)	No. of Structure (pcs)
1. MARIS System								
Lot A	7,447	150.2	22.09	30	33	32	326	297
Lot B	1,483	18.9	4.53	2	2	1	65	37
Lot C	7,079	119.4	10.96	27	19	13	178	105
Lot D	21,999	175.4	35.00	39	33	32	444	389
Lot E-J	5,935	92.0	9.00	25	16	3	200	164
Sub-Total	43,943	555.9	81.58	123	103	81	1,213	992
2. Oscariz	2,239	40.7	5.21	12	8	7	68	68
3. South High	7,337	104.8	20.25	42	35	10	243	245
4. South Low	5,429	93.7	11.30	33	26	-	207	294
5. North Diversion	13,475	99.6	46.40	27	25	11	168	187
6. SIFFURIS South	5,710	54.5	9.21	17	19	4	97	114
7. SIFFURIS North	2,117	35.4	3.11	12	9	5	47	140
8. Macanao East	3,850	27.9	9.37	6	5	3	60	57
9. Ladeco	552	9.5	1.74	3	-	-	-	33
10. Reina Mercedes	(1,081)	10.0	(3.07)	6	5	-	25	33
11. Cauayan E.E.	(2,900)	42.3	(6.58)	18	16	8	93	116
12. Cauayan (Pump)	(716)	8.8	(1.62)	5	4	1	13	25
13. Siffu E.E. 1	(3,171)	38.7	(7.97)	16	7	5	79	102
14. Siffu E.E. 2	(2,483)	26.0	(6.21)	12	12	5	37	56
TOTAL	84,652	1,147.8	188.17	332	274	140	2,350	2,462

NOTE: Numbers in ( ) are overlapping with others

TABLE F-5. OUTLINE OF PUMPING STATION

Pumping Station	No. 1	No. 2	No. 3
Pump Type	Vertical Mixed Flow	- do -	- do -
Number of Pump	3	5	5
Bore	800 mm	1,350 mm	900 mm
Unit Capacity	1.15 M^3/S	3.32 M^3/S	1.48 M^3/S
Total Design Head	17 m	9.5 m	16 m
Speed	710 RPM	445 RPM	590 RPM
Lubrication	Oil Grease	- do -	- do -
Motor Type	Induction	- do -	- do -
Number of Motor	3	5	5
Unit output	350 Hp	550 Hp	430 Hp
Frequency	60 HZ	60 HZ	60 HZ
Voltage	2.4 KV	2.4 KV	2.4 KV
Phase	3	3	3
Poles	10	16	12
Main Transformer			
Rated Voltage	13.8/2.4 KV	- do -	- do -
Phase	3	3	3
Frequency	60 HZ	60 HZ	60 HZ
Type of Cooling	OA/FA	OA/FA	OA/FA
Rated KVA	OA 1200/FA 1500 KVA	- do -	- do -
Connection	Delta-Delta	- do -	- do -
Unit	1	1	1
Transmission line	13.8 KV 11 Km	13.8 KV 35 Km	13.8 KV 21 Km
Irrigation Facilities			
Service Area	1,667 has	3,600 has	3,000 has
Location	Villa Domingo	Malasin	Furao
Town	Angadanan	Burgos	Gamu
Municipalities Covered	Angadanan Cauayan Alicia	Burgos Gamu	Gamu Burgos
Maximum Discharge	3.44 M^3/S	16.60 M^3/S	7.40 M^3/S
Main Canal	7.78 Km	10.16 Km	13.57 Km
Laterals	8.14 Km	38.68 Km	26.05 Km

TABLE F-6. SUMMARY OF HEAD GATE CONDITION

District and Canal System	Number of Structure	Number of Gate	Grade of Gate A	B	C	D
District I						
DC #1 (SHC)	36	41	35	5	1	0
DC #2 (SLC)	27	26	25	0	0	1
MARIS	13	14	7	0	2	5
OSCARIZ	5	6	6	0	0	0
Sub-total	81	87	73	5	3	6
District II						
MARIS	65	96	78	11	0	7
OSCARIZ	4	4	4	0	0	0
MACANAO	1	1	1	0	0	0
Sub-total	70	101	83	11	0	7
District III						
NDC	26	30	30	0	0	0
SIFFU S.	20	25	25	0	0	0
SIFFU N.	10	10	5	1	0	4
SIFFU EE #1	8	23	23	0	0	0
SIFFU EE #2	13	12	9	3	0	0
Sub-total	77	100	92	4	0	4
District IV						
MARIS	26	27	2	7	1	17
MACANAO E.	6	11	2	2	0	7
R. MERCEDES	6	7	3	1	0	3
CAUAYAN EE	16	16	3	2	0	11
CAUAYAN EE (P)	4	4	3	1	0	0
Sub-total	58	65	13	13	1	38
Total	286	353	261	33	4	55

Note: Grade of gate - A: Functional, B: Need Repair,
C: Need Replacement, D: Need New Gate Installation

TABLE F-7. SUMMARY OF CHECK GATE CONDITION

District and Canal System	Number of Structure	Number of Gate	Grade of Gate A	B	C	D
District I						
DC #1 (SHC)	42	66	60	6	0	0
DC #2 (SLC)	32	72	40	5	7	22
MARIS	8	16	1	0	0	15
OSCARIZ	7	7	7	0	0	0
Sub-total	89	161	108	11	5	37
District II						
MARIS	64	157	78	12	2	65
OSCARIZ	11	14	12	0	0	2
MACANAO W.	1	1	0	0	0	1
Sub-total	76	172	90	12	2	68
District III						
NDC	21	46	46	0	0	0
SIFFU S.	7	17	17	0	0	0
SIFFU N.	11	11	9	0	0	2
SIFFU EE #1	10	5	4	1	0	0
SIFFU EE #2	11	12	8	3	0	1
Sub-total	60	91	84	4	0	3
District IV						
MARIS	23	39	0	2	0	37
MACANAO E.	10	35	8	15	0	12
R. MERCEDES	3	4	2	0	0	2
CAUAYAN E.E.	15	18	6	3	0	9
CAUAYAN E.E. (P)	4	4	2	0	0	2
Sub-total	55	100	18	20	0	62
Total	280	524	300	47	7	170

Note: Grade of gate - A: Functional, B: Need Repair,
C: Need Replacement, D: Need New Gate Installation

TABLE F-8. SUMMARY OF TURN-OUT

District	Main/ Lateral	Class of Turn-out N	S	D	Status of T.O. Gate F	R	C	Total
I	MARIS Lat. C	17	54	57	103	10	15	128
	DC# 1	2	79	1	71	9	2	82
	Lat.	27	185	28	206	13	25	243
	DC# 2	14	48	35	88	3	13	104
	Lat.	29	73	105	135	45	27	207
	OMC	-	2	-	2	-	-	2
	Lat.	3	32	3	34	1	3	38
	Sub-total	92	473	229	638	81	85	804
II	MARIS MC	19	14	71	55	11	19	85
	Lat. A	17	12	266	235	29	17	281
	Lat. B	5	-	65	55	5	5	65
	Lat. C	11	25	25	39	1	10	50
	Lat. D	14	5	100	71	21	14	106
	Lat. E	33	31	46	34	10	33	77
	Lat. F-J	30	25	98	81	12	30	123
	OMC	1	12	17	26	2	1	29
	Lat.	7	14	16	20	3	7	30
	MWMC	-	-	7	6	1	-	7
	LADECO	-	-	3	3	-	-	3
	Sub-total	137	138	714	625	95	136	856
III	NDC MC	3	5	32	34	3	3	40
	Lat.	19	27	122	120	28	20	168
	SSMC	1	10	9	13	6	1	20
	Lat.	13	28	56	56	26	15	97
	SNMC	2	4	21	22	3	2	27
	Lat.	2	8	37	33	10	4	47
	SEMC# 1	-	3	1	4	-	-	4
	Lat.	1	63	15	74	4	1	79
	SEMC# 2	2	-	16	16	-	2	18
	Lat.	2	2	33	35	-	2	37
	Sub-total	45	150	342	407	80	50	537
IV	MARIS Lat. A	11	-	45	26	8	11	45
	Lat. D	37	53	276	251	41	46	338
	MAC. MC	-	-	40	40	-	-	40
	Lat.	-	1	59	44	14	2	60
	RM MC	1	1	27	27	-	1	28
	Lat.	7	1	24	18	-	7	25
	CEE MC	-	3	28	28	1	2	31
	Lat.	14	10	69	77	2	14	93
	CEE PMC	2	25	1	21	5	2	28
	Lat.	2	11	-	6	5	2	13
	Sub-total	74	105	569	538	76	87	701
	Total	348	866	1,854	2,208	332	358	2,898

Note: Class of Turn-Out - N: No Gate Available, S: Single gated.
D: Double gated.
Status of Turn-Out Gate - F: Functional, R: Need Repair
C: Need Installation.

TABLE F-9. DRAINAGE IN MRIIS

District	Creek Length (Km)	Service Area (ha)	Dencity (m/ha)
District I	222.8	24,054	9.2
II	277.5	24,468	11.3
III	201.7	24,793	8.1
IV	171.7	24,087	7.1
Total	873.7	97,402	9.0

TABLE F-10. O/M ROAD IN MRIIS

District	Road Length (Km)			Service Area (ha)	Dencity (m/ha)
	Access Road	Service Road	Total		
District I	157.2	311.6	468.8	24,054	19
II	110.2	456.0	566.2	24,468	23
III	67.0	364.3	431.3	24,793	17
IV	106.4	251.0	357.4	24,087	15
Total	440.8	1,382.9	1,823.7	97,402	19

ANNEX G

HYROELECTRIC POWER

G. HYDROELECTRIC POWER

LIST OF TABLES

LIST OF FIGURES

1. HYDROELECTRIC POWER PLANT

1.1. Magat Hydroelectric Power Plant

(1) Role of Magat Hydroelectric Power Plant

The Magat hydroelectric power plant (Magat HEP) started its operation at No.1 unit, No.2 unit and No.3 unit, in August, September and October 1983, respectively, and then come to have the maximum installed capacity of 360 MW at present with the completion of No.4 unit in December 5th 1983, and have a plan to provide facilities of additional two units (90 MW x 2).

The plant plays an important role in Luzon Power Supply System, namely the maximum installed capacity of 360 MW corresponds to 8.8 percent in gross installed capacity of 4,101 MW, and 29.6 percent in a gross hydroelectric installed capacity of 1,215 MW in Luzon Island as of 1985. Major features of the Magat Plant are shown in Table G-1.

The plant is functioning as a peak load power plant in dry season (November to June) and a base load power plant in wet season (July to October) of the power loading curve in Luzon Island. According to the data supplied by NPC, the summary of power plant loading on typical month in Luzon Island is shown in following table.

Power Plant Loading Factor

Season	Magat H.E.P. Expected Energy to be generated	Luzon Island Gross Generating Energy	Luzon Island Gross Generating Energy on H.E.P.	(A)/(B)	(A)/(C)	(D)/(E)	(D)/(E)
Wet Season (Sep.)	(A) 7,920 MWH (330MWx24hrs)	(B) 43,060 MWH	(C) 17,758 MWH	% 18.3	% 44.6		
Dry Season (Apr.)	(A) 850 MWH (D) Peak Load 170 MW (p.m. 7)	(B) 46,016 MWH (E) Peak Load 2,220 MW (p.m. 7)	(C) 5,949 MWH (F) Peak Load 501 MW (p.m. 7)	% 1.8	% 6.8	% 7.7	% 33.9

TABLE G-1. OUTLINE OF HYDROELECTRIC POWER PLANT

Item	Magat Plant	Baligatan Plant
1. Reservoir		
Max. Operation Level (F.S.W.L.)	EL.193.0 m	EL.193.0 m
Min. Operation Level (M.S.W.L.)	EL.160.0 m	EL.172.0 m
Rated Operation Level (R.S.W.L.)	EL.185.0 m	EL.185.0 m
Gross Storage Volume	1,090 MCM (1,250 MCM) 1/	Not defined
Active Storage Volume	820 MCM (833 MCM) 1/	Not defined
2. Discharge and Head		
Max. Plant Discharge	480 cu.m/sec (120 cu.m/sec x 4 units)	23.78 cu.m/sec (23.78 cu.m/sec x 1 unit)
Ave. Tailwater Level	EL.103.0 m	EL.154.0 m
Rated Design Head	81.0 m	30.0 m
3. Installed Capacity		
Max. Installed Capacity	360 MW 2/ (90 MW x 4 units)	6 MW (6 MW x 1 unit)
Ave. Annual Energy in Planning	1,200 GWH	18.55 GWH
Ave. Annual Plant Factor in Planning	38.1 %	35.3 %
4. Turbine		
Type	Francis Turbine	Kaplan Turbine
Rated Capacity	126,000 H.P.	8,450 H.P.
5. Manufacturer		
Turbine	VA (Austria)	SICHUAN (China)
Generator	TIEB (Italy)	SICHUAN (China)
6. Operation Date		Sep. 1986 3/

Note:
1/: Figures in parenthesis give the storage volume shown in the Feasibility Report.
2/: Additional two penstocks with same capacity are installed.
3/: Scheduled starting date of operation for Baligatan plant is September, 1986.

TABLE G-2. OUTLINE OF MINI-HYDROELECTRIC POWER PLANT

Item	Magat (A)	Magat (B)
Maximum Plant Discharge	54.0 cu.m/sec (13.5 cu.m/sec x 4 units)	41.0 cu.m/sec (13.5 cu.m/sec x 3 units)
Rated Design Head	3.5 m	3.5 m
Installed Capacity	1,440 kW (360 kW x 4 units)	1,080 kW (360 kW x 3 units)
Minimum Power Generated	180 kW (360 kW x 0.5)	180 kW (360 kW x 0.5)
Manufacturer of Turbine and Generator	Neyrpic (France)	Neyrpic (France)
Operation Date	Feb. 1984	Feb. 1985

Note: Magat (C) plant is under planning to be constructed at the upstream of Magat (A) plant.

(2) Daily Peak Load Control

Typical daily loading of the Magat Hydroelectric Power Plant in 1985 is shown in Table G-3.

(3) Generating Energy

Monthly generated energy outputs of the plant (August, 1983 - May, 1986) are shown in Table G-4, in which the annual produced energy in 1984 and 1985 is indicated as the figures of 1,132 GWH and 1,027 GWH, respectively.

The summary of the generating energy of this Study is as follows;

- Average annual generating energy : 1,066 GWH (1953 - 1985: 30 years)
- - ditto - : 1,131 GWH (1958 - 1972: 15 years)
- Annual generating energy : 1,091 GWH (1984)
- - ditto - : 1,109 GWH (1985)
- Monthly firm output (continuous) : 26 MW

The energy output of this Study is a little bigger than that of the pre-planning and the record of operation, and there is no great difference among the figures in all cases according to the review on the irrigation condition in this Study.

1.2. Baligatan Hydroelectric Power Plant

(1) Role of Baligatan Hydroelectric Power Plant

Operation and maintenance of the Baligatan Hydroelectric Power Plant, of which major features are shown in Table G-1 will be carried out by NIA.

TABLE G-3. AVERAGE POWER REQUIREMENT TO MAGAT HYDROELECTRIC POWER PLANT IN 1985

(unit: MW)

Hour	Jan.	Feb.	Mar.	Apr.	May.	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1	0	0	0	0	0	0	170	255	340	225	170	0
2	0	0	0	0	0	0	170	255	340	225	170	0
3	0	0	0	0	0	0	170	255	340	225	170	0
4	0	0	0	0	0	0	170	255	340	225	170	0
5	0	0	0	0	0	0	170	255	340	225	170	0
6	0	0	0	0	0	0	170	255	340	225	170	0
7	0	0	0	0	0	0	170	255	340	225	170	0
8	100	100	50	50	50	50	170	255	340	225	170	100
9	150	150	50	50	50	80	170	255	340	225	170	150
10	180	150	100	100	150	120	170	255	340	225	170	200
11	180	150	100	150	180	180	170	255	340	225	170	200
12	180	150	50	50	60	120	170	255	340	225	170	200
13	80	120	50	0	60	120	170	255	340	225	170	200
14	80	120	50	0	60	120	170	255	340	225	170	200
15	80	120	50	0	60	80	170	255	340	225	170	200
16	80	120	0	0	60	80	170	255	340	225	170	200
17	80	120	0	0	60	80	170	255	340	225	170	200
18	180	180	0	0	60	180	170	255	340	225	170	200
19	180	180	180	150	180	240	170	255	340	225	170	200
20	180	180	180	150	150	180	170	255	340	225	170	200
21	80	100	120	50	50	50	170	255	340	225	170	150
22	0	0	0	0	0	0	170	255	340	225	170	0
23	0	0	0	0	0	0	170	255	340	225	170	0
24	0	0	0	0	0	0	170	255	340	225	170	0
Total	1,810	1,940	980	750	1,230	1,680	4,080	6,120	8,160	5,400	4,080	2,600
Average	75.4	80.8	40.8	31.3	51.3	70.0	170.0	255.0	340.0	225.0	170.0	108.3

Note: Above power requirement is provided by NPC.

TABLE G-4. MONTHLY GENERATED OUTPUT AT MAGAT HYDROELECTRIC POWER PLANT

(unit: GWH)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	July	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1983	-	-	-	-	-	-	-	8,045	44,596	39,397	90,462	39,259	221,759
1984	45,504	40,994	31,925	25,940	128,616	155,265	110,246	146,964	143,260	104,392	116,236	83,214	1,132,556
	(61.2)1/	(58.9)	(42.9)	(36.0)	(172.9)	(215.6)	(148.2)	(197.5)	(199.0)	(140.3)	(161.4)	(111.8)	
1985	56,691	45,447	29,272	17,982	40,612	51,014	126,705	130,213	188,879	112,990	145,380	81,570	1,026,755
	(76.2)	(67.6)	(39.3)	(25.0)	(54.6)	(70.9)	(170.3)	(175.0)	(262.3)	(151.9)	(201.9)	(109.6)	
1986	57,900	60,940	57,564	27,749	42,851	56,195	49,076	124,156	105,250	195,826			
	(77.8)	(90.7)	(77.4)	(38.5)	(57.5)	(78.0)	(66.0)	(166.9)	(146.2)	(263.2)			
Typical Loading	75	80	40	30	50	70	170	255	340	225	170	108	1,183

Note: 1/ Figures in parenthesis show monthly average output based on generated monthly energy output.
- Installed capacity : 90,000 kW/unit x 4 units = 360,000 kW = 360 MW
- Used rate for max. capacity is 35.9% in 1984 and 33.0% in 1985.

The produced energy is sent to the Luzon Grid and the Cagayan Valley Power Supply System through the Santiago Substation.

The maximum installed capacity of the plant corresponds to the maximum operation power of about 6,000 KW required for NIA's three pumping stations in the Project area, and so, NIA will be able to save high operation costs of pumping station by mutual interchange of the energy with NPC.

The summary of the agreement on the interim interconnection of NIA's hydropower plant with NPC is as follows;

- The interchange point shall be at the Santiago substation.
- NPC shall impute the transmission fee of 10 percent to the energy delivered by NIA.
- NPC shall buy the energy but not used by NIA at 80 percent of unit price in the lowest-priced block.

The produced energy of the plant is not good electricity, because it is subjected by the irrigation water demand in the discharge and the water level of the reservoir in the head (impossible to generate energy lower than EL.172 m of water level). In other words, the produced energy is very unstable both in time and quantity to be generated.

However, the construction costs and the energy to be generated in the planning stage of the plant are 27.3 million pesos (including the transmission line) and 18.55 GWH, respectively. Therefore, the cost per KWH is a very cheap value of ₱1.47/KWH.

(2) Generating Energy

Monthly energy output at the plant in planning stage is shown in Table G-5. There is no great difference between energy output in the planning stage of 18.55 GWH and those figures (19.30 GWH) in this Study.

TABLE G-5. MONTHLY ENERGY OUTPUT AT BALIGATAN HYDROELECTRIC POWER PLANT IN PLANNING STAGE

(unit: GWH)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Total	Used Rate for Maximum Capacity
1958	1.26	0.0	1.14	4.20	2.25	0.0[1/]	1.03	0.44	0.0	0.0	0.0	0.92	11.25	21.4
1959	0.75	0.0	0.32	4.32	3.61	1.47	0.0	0.0	0.0	0.36	2.17	0.0	13.00	24.7
1960	0.93	0.0	0.96	4.11	3.42	0.0	0.0	0.64	0.0	0.72	4.32	1.97	17.07	32.5
1961	0.72	0.0	0.39	3.75	2.54	0.0	0.0	0.0	0.0	0.0	0.37	3.20	10.98	20.9
1962	0.73	0.0	0.89	4.11	3.73	1.07	0.45	0.0	0.0	1.52	0.0	1.25	13.76	26.2
1963	0.91	0.0	0.78	2.03	2.52	0.50	0.26	0.60	0.0	3.06	4.32	0.51	15.49	29.5
1964	0.0	0.0	0.59	4.14	2.72	0.95	1.70	0.0	0.0	4.46	4.32	0.0	18.88	35.9
1965	0.53	0.0	1.45	4.31	4.46	1.74	0.34	0.0	2.28	0.0	3.01	0.64	18.76	35.7
1966	2.05	0.0	1.35	3.85	1.42	1.64	0.60	1.22	1.61	0.94	0.0	0.37	15.05	28.6
1967	1.32	0.0	1.37	2.78	3.76	2.20	1.08	1.13	4.32	4.46	4.32	3.80	30.46	58.0
1968	1.34	0.0	1.87	3.58	4.46	1.03	0.83	0.0	4.32	3.19	4.32	3.19	28.13	53.5
1969	1.19	0.0	0.52	1.07	1.09	0.41	0.0	0.63	0.0	0.74	2.77	2.93	11.35	21.6
1970	0.0	0.0	1.37	4.26	2.68	2.24	1.88	0.0	0.0	4.46	4.32	0.49	21.69	41.3
1971	0.0	0.0	0.50	3.87	4.12	0.33	0.0	0.0	4.32	4.46	4.32	4.46	26.38	50.2
1972	0.0	0.0	0.91	1.62	2.01	2.27	4.47	4.46	0.47	2.84	2.62	3.32	25.99	49.4
Ave.	0.78	0.0	0.98	3.47	2.99	1.06	0.84	0.61	1.15	2.08	2.74	1.80	18.55	35.3
Min.	0.0	0.0	0.32	1.07	1.09	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.98	58.0
Max.	2.05	0.0	1.91	4.32	4.46	2.27	4.46	4.46	4.32	4.46	4.32	4.46	30.46	20.9

1/ No power generation due to low reservoir water level

Since the Kaplan is adopted as a type of turbine due to the big variation on the discharge and the head, the minimum output and the efficiency of the turbine shall be confirmed after starting operation.

1.3. Mini-Hydroelectric Power Plants, Magat(A) and (B)

(1) Role of Mini-Hydroelectric Power Plants, Magat(A) and (B)

The Magat(A) and (B) plants were planned and constructed by NEA and their operation and maintenance were taken over by ISELCO-I in 1984 and 1985.

According to the operation records of these plants in 1984 and 1985, the plant factor was small value of 36 percent (50 percent in the planning stage), and the maximum installed capacity has not been nearly generated.

Furthermore, no-operation period is found in more or less 100 days in a year. The reasons of a low plant factor are as follows:

- Small irrigation water requirement in April and May.
- Suspension of power plant operation by frequent shutdown of electric current served by NPC.
- Low plant efficiency caused by invading trash in the canal.
- Line fault by the broken insulator from poles

In addition to these problems, the sequence of starting and shutdown of the plants cause the rapid fluctuation of water level in the Maris main canal, resulting in scouring canal embankment, because after the shutdown of the power plants, about 30 to 60 minutes will be needed for a gate operation by manual to release water flow in the canal.

As mentioned above, the following subjects shall be considered in case that a mini-hydroelectric power plant is to be constructed in a irrigation canal.

- Cooperation between irrigation and power plant facilities
  - ° Concrete lining works shall be executed at the upstream of the intake and the downstream of the tailrace to a sufficient extent, in order to protect the canal embankment from scouring caused by fluctuation of water level in the canal and the turbulent flow in the intake and tailrace.
  - ° Mobilization of the canal gates and/or automatic spillway with a sufficient capacity shall be executed to minimize the fluctuation of flow in the canal.
  - ° Intensification of the trash rack shall be executed.
- Power plant scheme of the optimum scale

Judging from the operation records of the plant and the interests between irrigation and power plant facilities on the operation and maintenance, Magat(A) and (B) must be schemed as three units (existing; 4 units) and two units (existing; 3 units), respectively.

The escalation of the power costs will be made by the intensification of facilities, and the power costs of the plants at present are estimated as ₱0.60 - 0.65/KWH by the cordial treatment of concerning laws, as only reference.

(2) Generating Energy

Monthly generated energy at the plants is shown in Table G-6. The energy output in 1985 of the plants is 8.1 GWH and about 73.6 percent compared with the energy in planning stage of 11.0 MW.

TABLE G-6. MONTHLY GENERATED OUTPUT AT MINI-HYDROELECTRIC POWER PLANT OF MAGAT (A) AND (B)

(unit: MWH)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Total	Plant Factor
Magat A														
1984		220.6	0.0 2/	0.0 2/	70.3	533.1	521.1	527.7	588.1	291.6	458.4	599.3	3,830.2	33.1%
		(328.2) 1/	(0.0)	(0.0)	(94.5)	(768.2)	(700.4)	(709.3)	(816.8)	(391.9)	(636.7)	(805.5)		Max. Power: 1,020 kW
														Min. Power: 252 kW
1985	534.2	484.9	385.3	294.5	355.5	359.1	420.8	460.3	287.2	383.8	456.8	481.5	4,903.9	38.9%
		(721.6) 1/	(517.9)	(409.0)	(477.8)	(498.8)	(565.6)	(618.7)	(398.9)	(515.9)	(634.4)	(647.2)		Max. Power: 1,067 kW
														Min. Power: 130 kW
Magat B														
1985		369.5	348.9	257.4	251.8	237.5	248.1	350.9	232.6	221.7	259.5	406.0	3,183.9	36.3%
		(549.9) 1/	(469.0)	(357.5)	(338.4)									Max. Power: 964 kW
														Min. Power: 181 kW

Note: 1/ Figures in parenthesis show monthly average output based on generated monthly energy output

2/ Power production will change based on the flow discharge of Maris main canal

3/ Installed capacity Magat (A): 360 kW/unit x 4 units = 1,440 kW
Magat (B): 360 kW/unit x 3 units = 1,040 kW

4/ Estimating energy in Feasibility Study: 11,025 MWH (A + B), Plant Factor = 50%

2. TRANSMISSION AND DISTRIBUTION LINES

2.1. Transmission Line

The transmission line networks and substations which were connected with the Luzon Grid at the existing Ambukulao power plant, were constructed and started its operation in the Cagayan Valley by NPC in 1981, in order to intensify the electric power supply system in the Valley.

Mutual power exchange between the Luzon Grid and the Cagayan Valley Power Supply System has been carried out through the Santiago substation in the Project area.

The Magat hydroelectric power plant was connected with the Santiago Substation by a transmission line of 230 KV in August 1983, and the Baligatan hydroelectric power plant was connected with it by a transmission line of 69 KV in November 1986.

The outline of major equipments on transmission line networks and substations is shown in following table and Figure G-1.

Transmission Networks of NPC

Transmission Line	Voltage (KV)	Circuit	Type of Supporting	Line Length (KM)
Ambukulao - Santiago	230	DC	ST 1/	106.0
Santiago - Magat	230	DC	ST	14.5
Santiago - Baligatan	69	SC	WP 2/	14.0
Santiago - Tugegarao	230	SC	ST	116.3
Santiago - Cauayan	69	SC	WP	41.5
Cauayan - Ilagan	69	SC	WP	30.9
Roxas - Gum Service Point	69	SC	WP	31.8

Note: 1/... Steel tower 2/ ... Wooden pole

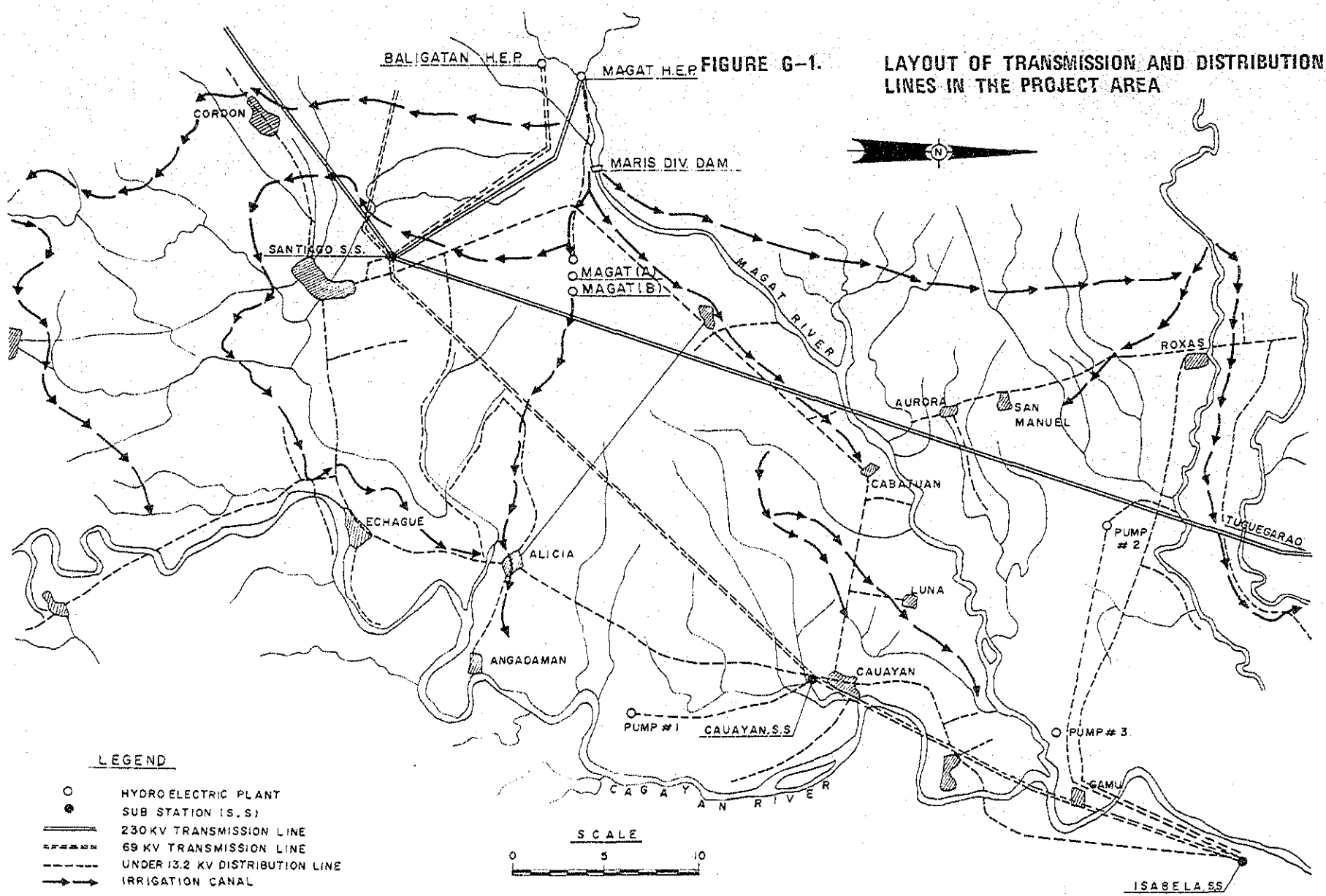


FIGURE G-1. LAYOUT OF TRANSMISSION AND DISTRIBUTION LINES IN THE PROJECT AREA

Substation (S.S) of NPC

Substation	Rating	Voltage	Connected Transmission Line
Santiago S.S	40 MVA 15 MVA 15 MVA	230/69/13.8 KV	to Ambukulao H.E.P to Magat H.E.P to Baligatan H.E.P to Tugegarao S.S to ISELCO-I Feeder to Vulacan Mines
Cauayan S.S.	15 MVA	69/13.8 KV	to Santiago S.S to ISELCO-I Feeder to NIA's No.1 Pumping Station
Ilagan S.S	15 MVA	69/13.8 KV	to Cauayan S.S to ISELCO-II Feeder to NIA's No.2, No.3 Pumping Station
Roxas S.S	15 MVA	69/13.8 KV	to Gum Service Point to ISELCO-II Feeder

As mentioned above, the key transmission lines in the Project area is relatively consolidated. However, the wooden supports of 69 KV transmission line shall be expected to be replaced with steel supports one by one, in order to reduce accidents of lines to the utmost, and perform the stable power supply.

2.2. Distribution Line

The electric power in the Project area has been supplied by ISELCO-I in Southern district of the Magat river, by ISELCO-II in Northern district of the Magat river, and by QUIRLECO in the southern extremity zone in the Project area, respectively.

The outlines of distribution lines are shown in the following table and Figure G-1.

Distribution Line

Electric Co-operative Inc.	Line Length in the Project Area	Note
ISELCO-I	218 km	3 phase class
ISELCO-II	86 km	less than 13.8 KV
Total	304 km	

Major subjects to be solved in connection with the distribution lines are to decrease the system losses of 33 percent in the lines on the record in 1985, which are caused by the following reasons.

- Pilferage of electricity
- Grouding loss by touching tree
- Long length of distribution lines

Then, ISELCO-I intends to take countermeasures to install the outdoor-typed electrodynamometer in closed type for the problem (i), and install special equipments (capacitor, oil circuit, and recloser) for the problem (iii) in order to check and improve voltage drops, system losses and blow down of electricity.

The operation power for No.2 and No.3 pumping stations is received at the service point of the Ilagan Substation through the NIA's transmission line of 69 KV (length; about 35 km), but major problems in the operation is caused by voltage drops.

The reasons of voltage drops is observed in the functions at the services point that is constituted by the same distribution board for two kinds of consumers, NIA's pumping stations and the coverage area of ISELCO-II.

In other words, the voltage requires to receive more than 13.8 KV to avoid voltage drops in the pumping stations, and of 13.2 KV by ISELCO-II, for the distribution system, and it is impossible to arrange both requirements, because of the functions at the service point.

The radical countermeasures of these problems are to provide individual service systems for both consumers and NIA pump stations.

As mentioned above, regarding the distribution lines in the Project area, it is expected to improve the relationship between NIA and ISELCO through strengthening facilities.

ANNEX H

OPERATION AND MAINTENANCE

H. OPERATION AND MAINTENANCE

LIST OF TABLES

LIST OF FIGURES

1. ORGANIZATION AND ACTIVITIES OF MRIIS

1.1 Organization and Function

(1) Transition of MRIIS Organization

The operation and maintenance for the MRIIS after completion of Stage Ia had been carried out dividing the project area into three Divisions paralleling with the construction of Stage 1b, Stage II and Stage III under MRMP.

The synthetic organization for the MRIIS O/M was established in 1984 after completion of the major implementation works of MRMP, which consists of Dam and Reservoir Division and three Divisions from I to III in service area under the Head Office.

In 1985 the organization for the MRIIS O/M was modified to five Districts. The District IV was newly organized dividing former Division II area into two of District II and IV. In October 1986, the Institutional Development Division (IDD) and the corresponding four sections for each District were organized. And the new organization for the MRIIS O/M was approved by the Government.

(2) Function of the MRIIS Organization

The new organization consists of a Head office, a Dam and Reservoir District for the O/M works of the Magat Dam as well as the Maris and Baligatan diversion dams, and four Districts for the O/M works of the irrigation facilities.

The detailed organization is shown in the Figure H-1. As of November 1986, about 910 MRIIS staff, about 70 contructual employee and about 140 organized IAs by contract are engaging for the MRIIS O/M works. The present operation and maintenance works of MRIIS are itemized as following categories:

- Reservoir operation, water management and irrigation service fee collection as well as operation of the Baligatan hydroelectric power plant which will be operational in the near future,
- Maintenance of system facilities,
- Assistance to farmers for on-farm facilities development, and,
- Establishment of irrigators' associations (IA).

(3) Head Office

The Head office consists of four Divisions under the Operation Manager; Engineering and Operation Division, Institutional Development Division, Equipment Division and Administrative Division. The Organization and staffing is shown in the Figure H-2.

The office of Operation Manager comprises the Operation Manager and his staff to assist the manager in the field of specific activities and experties.

The Engineering and Operation Division has four sections, Engineering Section, Operation Section and Water Control Coordinating Section, which takes charge of operation and maintenance function in the system level. The activity of each section is specified as follows;

- Engineering Section: monitoring and evaluation of system facilities on their functions, preparation/execution of budget for Districts, and other engineering and rehabilitation works,
- Operation Section: planning, implementation and monitoring of the irrigation plan, monitoring/evaluation of irrigation fee collection, monitoring/evaluation of field performance of WM and, preparation of monitoring curve,
- Water Control Coordinating Section: the most important organization taking charge of water management; planning, monitoring and scheduling of irrigation water delivery in

all supply canal; monitoring and evaluating of daily discharges, local flows, rainfall, weekly progress of farming activities and allocation of weekly irrigation requirement to all canals; preparation and revision of rating curve for major canal sections and lateral head gates; reservoir operation analysis and regulation; and direct water management along the Maris main canal down to the Lateral D head gate.

The Equipment Division has two sections, Utilization & Control Section and Repair & Maintain Section, taking charge of general control for heavy equipment and vehicles, as well as management of vehicles of the Head Office and major repair works of heavy equipment.

The Institutional Development Division is lately organized instead of Agricultural Development Division (ADD) for MRMP comprises Farmers' Organization Section and Farmers' Assistant Section. Each section is in charge of the following activities:

- Farmers' Organization Section: planning, monitoring and evaluation of IA organizing activities as well as IA activities, and training of farmers,
- Farmers' Assistance Section: planning, monitoring on farmers' assistance activities and agro-economic study and data collection and utilization.

The Administrative Division consists of Personnel Section, Accounting Section, Cashiering Section, Property and Procurement Section, and General Service Section, which is in charge of all administrative services for the Head Office together with for the system level.

(4) Dam and Reservoir District

The Dam and Reservoir District is in charge of operation and maintenance works for Magat Dam and Reservoir, the Maris and Baligatan Diversion Dams, as well as Baligatan hydroelectric power plant which will be operational in the near future.

The District is organized with four sections under the District Manager; Civil Works Section, Instrumentation Section, Mechanical/Electrical Section, and Administrative Section. The detailed organization and the staffing is shown in the Figure H-3.

The each section is divided into units according to the specific works as required. The present organization and function of each section are as follows;

Civil works Section is in charge of maintenance works of civil works, camp facilities as well as operation and maintenance of heavy equipments and vehicles. The Section consists of following three Units:

- The Civil Works Unit in charge of maintenance works of the dam and reservoir, the Maris and Baligatan diversion dams, the Magat park, air strip and service roads in the compound,
- The Camp Facilities Maintenance & Communication Unit in charge of maintenance works of the camp facilities in the Magat dam compound,
- Equipment Unit for operation and management of heavy equipments and vehicles for the civil works and general services.

The Instrumentation Section is responsible for the observation and data management on the behavior of dam and appurtenant structures as well as hydro-meteorological and seismological data management by means of various instruments, and the maintenance works for these instruments. The Section is divided into the following three units;

- Drainage Galleries, Embankment & Interface Piezometer Monitoring Unit,
- Surface Settlement, Deflection Survey & Double Fluid Settlement Devise Monitoring Unit,
- Hydrology Seismology Unit which consists of two different groups, the one is Hydrology group in charge of

developing/revicing of various discharge rating curves for gates and valves of the Dam structures, programing of water release and monitoring of reservoir water level hydro-meteorological data management as well as operation and maintenance of flood early warning system and hydro-meteological telemeter system. And the other is Seismology group in charge of operation and maintenance of seismographs and data collection by these instruments.

The Mechanical/Electrical Section conducts operation and maintenance of mechanical/electrical installations for the Dam and diversion dams. The outflow control from the dam and diversion control from two diversion dams are carried out by the Section under the direction of the Head Office. The section is divided into three Units described as follows:

- Baligatan Outlet & Power Plant Unit which is in charge of outflow control of the Baligatan outlet as well as the Baligatan power plant,
- Spillway Power Intake Diversion Tunnel Unit which is in charge of spillway, power intake and gantry crane as well as diversion tunnels and galleries, and
- Underground Mechanical/Electrical Installations Unit.

(5) Districts in Service Area

The all four Districts in the service area consists of the uniformed organization structures and staffing pattern. Each District comprises four Sections under a Operation Manager with his staffs, which is shown in the Figure H-4. The function for each organization is described as follows:

- The staff of Operation Manager: comprising a supervising engineer, a hydrologist and an engineering aide conducts general control, coordination and assistance for the O/M works of District,
- The Operation and Maintenance Section controls and assists the O/M activities by O/M personnels in each Water Master (WM) Division. The Section is headed by two Area Engineers for Area I and II respectively dividing the District into two Areas,

The Section keeps technical staffs consisting of a construction foreman, a carpenter, a mason and geodetic engineers for the maintenance works in the canal system as well as assistance for the terminal facilities development to be conducted by farmers,

- Equipment Section takes charge of operation and maintenance of heavy equipments and vehicles as well as management of the motor pool and shop kept by each District,

- Institutional Development Section managed by IDD, Head Office engages in farmers assistance works, organizing and developing of Irrigators Association.

The service area is divided into WM Divisions as the terminal organization for operation and maintenance works in canal system. The routine operation and maintenance works for the canal system is practiced by the O/M staff assigned to the WM Division.

The service area of District is divided into 22 to 28 WM Divisions depending on the local/historical situation of each District. The WM is responsible for monitoring for farming activities, water management along canal networks, irrigation fee collection and routine maintenance activities along the canal system in his Division, and assistance for IAs/FIGs activity.

The area of WM Division is divided into Sections for Ditch Tender/Gate Keeper (DT/GK) along canals. The CK/DT practices routine O/M works in his Section under the direction of the WM. The standard length of a Section is 3.5 km for DT and 1.5 km for GK respectively under the NIA criteria. The works for DT/GK in their Section specified by the NIA criteria are as follows:

- Water supply/control along supply/distribution canal under the direction of WM,

- Manipulation of turnout gates for the irrigation water supply to farms,

- Clearing of canal inside slope and minor repair/desilting works along canal section,

- Diversion control for major lateral canals at the head gates which is specified for the CK in his Section, and

- Assisting WM in other O/M activity within each section.

1.2. Present O/M Activities for MRIIS

(1) Water Control for the Whole Area of MRIIS

The Water Control Coordination Section (WCCS) in Head Office has been carrying out the water control for the whole MRIIS area in accordance with the control rule stipulated in the O/M Manual.

Flow chart of the water control procedures are shown in Figure E-4 and summarized as follows:

- Unit irrigation water requirements depending on the four succeeding cultivation and cropping stages, land soaking, land preparation, crop maintenance and reproductive stages are defined on monthly and lateral canal basis in the O/M Manual.

- WM monitors the progress of farming activities in his Division and estimates proposed irrigation area divided into the four farming stages for the next week.

- The diversion requirement at turnout commanding area is estimated by the Hydrologist in District Office depending on the area reported by WM and the unit diversion requirement defined in the Manual, and then informed to the O/M Head Office after approval of the District Manager.

- Head Office reviews the diversion requirement reported by each District Manager in balance for the remaining storage capacity available in the Magat reservoir, and decides the total amount of diversion requirement for irrigation by each District and for outflow at the Magat Power Plant on the weekly basis. The case that the diversion requirement in each District is changed by the Head Office, the proposed diversion requirement in each lateral is adjusted accordingly by District Office.

- The diversion requirement in a week is instructed on Monday to each District and is delivered to each lateral starting the following Tuesday.

This water control rule is really ideal and important to manage the water properly. However, the actual amount of water distributed in the canal system is not corresponding to the amount decided on the rule.

(2) Water Control in Upstream Section of the Maris Main Canal

The Maris main canal has about 55,000 hectares of the command area and supplies water into the area of District I, II and IV as shown in figure E-5.

In this connection, water management of Maris main canal between the section from the head gate to Lateral D head gate is conducted by WCCS of Head Office.

(3) O/M Activities by Contracted IAs

As the result of IA organizing activity, about 620 km out of about 1,500 km in the length of canal section is transferred to IAs' as shown in the Table H-1 to H-4, and is presented a big difference in the degree of accomplishment among Districts from 71% for District I to 32 & of District II and III as shown in the following table.

Status of Lateral Turnover in Length

Dist.	No. of Divi.	Total Length	%	NIA Section Length	%	IA Section Length	%	Other Sec. Length	%
I	128	429 km	100	125 km	29	244 km	57	60 km	14
II	118	410 km	100	298 km	73	108 km	26	4 km	1
III	103	357 km	100	243 km	68	107 km	30	7 km	2
VI	85	293 km	100	199 km	68	85 km	29	9 km	3
Total	434	1,489 km	100	865 km	58	544 km	37	80 km	5

As the result of accomplishment for lateral turnover, the total number of O/M personnel assigned to WM Divisions are 371 of NIA staff including 13 vacant post and the total of 165 DT sections are

transferred to IAs, Barangay Associations (BA) and other individuals by contract. The decrease in number of O/M staff by the lateral turnover scheme is of use for reduction of personnel requirement in the O/M budget. The number of O/M staff in the WM Divisions, the number of contracted IA and others is summerized as following table.

Number of O/M Staff in Division

Dist.	No. of Div.	No. of Sect.	No. of NIA Staff			No. of Contracted Unit	
			WM	DT	GK	IA	Other
I	26	128	26	22 (7)	18	61	16
II	29	118	29	80	8	29	1
III	23	103	21 (2)	68 (2)	2	29	2
VI	24	85	23 (1)	55 (1)	6	21	2
Total	102	434	99 (3)	225 (10)	34	140	21

Note: The figures in the parenthesis show the number of vacant posts.

The routine maintenance of canal sections which are transferred to IAs or BAs is practiced by members in their cooperating works, and canal sections are kept in fair conditions in general. On the contrary, water management along the canal in the transferred sections meets many problems in equal water distribution and timely water supply by the following reasons:

- Water intake at each turnout in the transferred sections is entrusted to Farm Irrigators' Group (FIG) due to lack of budget,
- The lack of knowledge of the FIG members for systematic water management due to lack of experience and training.

(4) Institutional Development Activity

During the MRPM implementation, an Agricultural Development Division (ADD) had been established with the purposes to establish and develop strong farmers organizations for the cooperation with NIA in the O/M activities, as well as to assists farmers in the field of irrigated farming development.

The number of ADD staff of MRMP was reduced at the late stage of project construction and only limited number of staff are kept as of this year.

The MRIIS Head Office felt that the MRIIS still needs an organization for institutional development activities, and requested the Government through NIA Central Office to organize the Institutional Development Division (IDD), taking the place of former ADD organization of MRMP.

As the result, the IDD organization for MRIIS O/M was finally approved by the Government in October 1986 by the conterminous with five year agricultural development program.

(5) Data Management at Head Office

The Engineering and Operation Division of the MRIIS Head Office has collected following three kinds of data directly concerned with the operation activities;

- Water supply/control in the reservoir, diversion dams and canal system, rainfall in the drainage area of the reservoir and service area, and irrigation water requirement on weekly base which are collected by Water Control Coordinating Sector.
- Monitoring on the progress of farming activities in major canal system, that is so called Monitoring curve collected by Operation Section.
- Actual record on irrigation practice at farm-lot level that is so called LIPA collected by Operation Section.

The data management on the water control and monitoring of irrigation practice/farming progress has been carried out manually by only limited staff. And collected data was not so enough and not always accumulate as to utilize for the data management.

The MRMP acquired a computer system in 1983 for various data management in MRIIS O/M. And had been developed various programs on water management, reservoir operation, hydro-meteorological data processing, and billing operation.

At present the computer system is mainly utilized for billing of irrigation fee collection and hydro-meteorological data management.

Actual billing by the computer came into operation since 1984, expanded the area coverage steadily in every cropping, and in 1986, the operation was able to cover over the fill irrigated area of MRIIS. However various problems such as irregular supply of electricity, mechanical trouble of equipment and irregular submission of LIPA sometimes cause poor performance of computer billing.

1.3. Improvement of MRIIS O/M Organization

The present O/M works in MRIIS meets several kinds of problems to be improved, especially in the field of water management in canal system and on farm; rehabilitation of project facilities and farmers' training, so that the future organization shall be improved taking into account the scale of O/M activity required of the improvement works.

(1) Organization of Head Office

The Organization of Head Office is not changed in principle except for the followings;

- The WCSS will have the most important function for water management to allocate adequate water demand of each service area; to control the outflow of the dam and diversion dams; and also to control the distribution in major canal system. In addition, the WCCS will have a function for data management for hydrology, diversion

requirement outflow and distribution.
In this connection, the WCCS should have more staff and adequate facilities for water and data management,

- The engineering section will also be strengthened a little taking into account the plan and design for the improvement works of project facilities,

- Institutional Development Division (IDD) will also be expanded taking into account new field to carry out the technical guidance for farming practices in addition to the present function which will promote the establishment of IAs and FIGs.

(2) Dam and Reservoir District

The function of the District in the outflow/diversion water control and hydrology management should be integrated into one organization corresponding to proposed improvement works and water management activities.

The water supply control works along the Maris main canal in the upper section, which is presently in charge of the WCCS in the MRIIS Head Office, should be transferred to the District in view of one continuous water management from the outflow control of the dam to water diversion control in the Maris.

The outflow control Section will be organized under the District Manager. The Section is in charge of reservoir operation and the diversion flow control for all Districts under the direction of the WCCS of Head Office. Proposed functions for the Section will be as follows;

- Reservoir operation, monitoring and data management on inflow of the reservoir and outflow discharge through power plants, and release of water from the dam spillway,

- Diversion control/outflow control at Maris and Baligatian diversion dams, and data collection concerned,

- Water distribution control along the Maris main canal in the upper section which is presently in charge of WCCS, in the MRIIS Head Office,

- Hydro-meteorology data management in the drainage area of reservoir, management of flood warning system, as well as maintenance works of these equipments.

The operation and maintenance work for the Baligatan electric hydropower plant will be practiced by the existing Electrical Mechanical Section without increase in number of staff.

(3) Organization of District Offices

The organization of District Offices will not change except for that at WM Division level, which is proposed as follows;

- The water management will be restored from farmers in order to establish adequate and on time water delivery rule to meet the improved water allocation conducted by the Head Office,
- Two GKs will be assigned under a WM of each Division to conduct water supply/distribution along canal in WM Division level, as well as routine maintenance works for various gates and these controllers.
- The new roll of GK will be; water supply control by the cooperation with GKs in the next Divisions; water delivery control from farm turnout; gauging and recording; assist WM in the work of institutional development and farm level water management and others.
- The manual O/M works for canal section by DT will be transferred to IAs organized along canal in view of manpower utilization in the O/M works. The surplus DT staff by this scheme will be utilized for other O/M works to assist WM in overall activities in Division.
- The O/M works for GK and DT could be substituted gradually by IA personnels depending on the accomplishment and degree of the improvement operation.

Proposed number of O/M staff for WM Division is shown in the following table, in comparison with present staffing. Proposed DT position remained in the scheme will be gradually transferred to the proposed IA Federations which are to be established at each District level.

Number of Organization and Staff

Items	WM	Sec.	DT	GK	Turn Over Section
Present	105	434	360	40	34
Proposed	105	420	105	210	420
Balance	0	-14	-255	170	386

2. O/M EQUIPMENT

2.1. Present Status of O/M Equipment

(1) Existing O/M Equipment

During the MRMP implementation period, the project procured a number of heavy equipments for the construction works. The routine maintenance works of equipments had been carried out by force account at mechanical shop in the motor pool of former Division offices, and major repair had been practiced by the mechanical shop in Head Office.

After the MRMP Project, most of the heavy equipments and shop facilities was left at each Division office and the Head Office as it is without overhauling.

These heavy equipment were transferred to the MRIIS for the O/M use with the first priority, the remaining equipments have been kept in the MRIIS motor pool under the control of NIA Central Office for the use of other NIA Offices.

The existing O/M equipments at the District Offices are shown in table H-5, all of which are transferred from the MRMP. These equipments distributed equally among Districts are considered to be sufficient with regard to the number.

However, the most of all these equipment is too old and heavy to use for future O/M works in view of expected working conditions.

As these equipments have been transferred from the MRMP as it is some of these equipments require to overhaul and major repair prior to make use for the O/M works.

(2) Operation and Maintenance Condition

At present most of all equipment is not used effectively for the system maintenance due to following reasons:

- The O/M budget allocated to MRIIS is not sufficient to share it with that for the maintenance works by heavy equipments and vehicles,
- The maintenance budget allocated for equipment and vehicle operation is mostly used for vehicles operation with the first priority, and then for the heavy equipment operation with less priority,
- As the result, the heavy equipment is not used for maintenance work except for only urgent maintenance works.

As for the present status on farm level facilities, about 20,000 hectares of unirrigated area remains in the MRIIS service area. NIA has responsibility to develop main farm ditches and drains.

In this connection, the MRIIS requested for NIA Central Office to allocate the necessary budget for the main farm level facilities since the new O/M organization was established.

However, the NIA Central Office has not made special allocation to the MRIIS O/M budget for this purpose due to the insufficient budget at the national level.

2.2. Improvement of O/M Equipment

Existing heavy equipment will be utilized for proposed rehabilitation works by force account as well as contract.

After the rehabilitation work, annual maintenance work at District level will require budget at not more than 20 million pesos annually for the operation of the new equipments procured in the proposed project.

The following table shows the kind and number of equipments proposed in the proposed rehabilitation.

Recommendable Construction and O/M Equipment

Kind of Equipment	Specification	Number of Equipment For Construction	Number of Equipment For O/M
Backhoe	0.7 M	4	-
Backhoe	0.3 M	-	4
Crane/Dragline	0.8 M	2	-
Crane	0.8 M	-	2
Bull Dozer	75 HP	-	4
Bull Dozer	90 HP	8	-
Dump Track	11 Ton	16	-
Loader	2 Ton	-	8
Motor Grader	125 HP	4	-
Pick-up	3 Ton	4	-
Pick-up with Mobile Station	135 HP	8	4
Steake Track	195 HP	4	-
Shop Track	9.0 Ton	2	-
Concrete Mixer	1 Bagger	5	-
Motor Cycle		-	110
Service Behicle w/ Mobile Station	Station Wagon	6	-
Radio Tranciever		-	23
Weed Cutter		-	120
Current Meter		-	6

3. IRRIGATION SERVICE FEE

3.1. Status Irrigation Service of Fee collection

(1) Rate of Irrigation Service Fee

The MRIIS Office provides different rates of irrigation fee for gravity and pump irrigations, as well as for the wet and dry seasons as shown in the following table.

Kind of Irrigation System	Wet Season	Dry Season
- Gravity Irrigation System	2 cavans	3 cavans
- Pump Irrigation		
(1) 1st dry and wet crop	3 cavans	4 cavans
(2) old rate until 1986 dry crop	6 cavans	8 cavans
(3) current rate	5 cabans	7 cabans

The rate of irrigation service fee for pump system was initially decided in 1984 through the mutual agreement between the MRIIS and the IAs concerned for pump operation by the MRIIS and the irrigation service fee for 1985 crop was collected at the rates of three and four cavans per hectare.

In 1986, the IAs organized in the pump irrigation service area requested NIA to alleviate the rate for pump irrigation then on August 16 1986, with the presence of the new Administrator, NIA and IAs reached an agreement on the reduced rate by one caban in the both season crops as shown in the above table.

The irrigation service fee is collected by the District Offices, storing in the compound for the sale to NFA or private dealers time to time at the current price in case of irrigation fee collection in kind. In this case, the final amount of the collected irrigation service fee could be found correctly after the selling.

(2) Collecting Amount of Irrigation Service fee

The irrigation service fee collected in the MRIIS area during 1975 to 1985 is shown in Table H-7.

The efficiency of irrigation fee collection is as low as from 60 to 70 percent of the total collectible, especially, it is considerably low in the wet season. The reason of low efficiency is caused by the low income of farmers due to high production costs.

Actual amount of collected irrigation fee for 1985 crop at WM Division level is shown in Tables from H-8 to H-11. The sum of collected irrigation fee is 11.2 million pesos and 18.0 million pesos in the wet and dry season respectively as shown in the following table; and presents a big difference between both season.

Collected Irrigation Service fee (1985)

(unit: 1,000 pesos)

Dist.	Collectible Irrig. Fee			Collected Irrigation Fee					
	Wet	Dry	Total	Wet	%	Dry	%	Total	%
I	5,043	5,568	10,611	3,260	65	4,220	76	7,480	70
II	6,912	8,045	14,957	2,786	40	5,843	72	8,629	72
III	5,943	6,862	12,785	3,044	51	4,246	51	7,290	57
IV	5,118	5,814	10,932	2,115	41	3,723	64	5,838	53
Total	23,016	26,389	49,405	11,205	49	18,032	68	29,237	59

Note: 1. The amount of fee in kind is estimated by the current supporting price during the collection.
2. The collected amount for third crop and the one by Head Office is excluded.

The rate of irrigation service fee in cash is counted on the base of NFA current supporting price for dry paddy. The Proportion of fee collection in kind has increased in 1986 because the selling price of paddy to private dealers is lower than NFA supporting price during the harvest period.

Table H-12 shows the mothly collection in the MRIIS from November 1985 to October 1986. According to the table, the ratio of collected fee in cash is decreasing abruptly as summarized in the following table.

Status of Irrigation Fee Collection for Latest Twelve Month

(unit: pesos)

Collection Period	Collected in Kind			Collected in Cash	
	Kgs	Amount	%	Amount	%
Nov. to Dec. 1985	1,163,377	4,071,819	48	4,412,723	52
Jan. to June 1986	3,284,059	11,494,207	65	6,206,060	35
July to Oct. 1986	1,620,536	5,671,876	84	1,054,204	16
Total Amount	6,067,972	21,237,902	65	11,672,987	35

Note: the collected amount on the basis of the supporting price of NFA which is assumed to be 3.5 pesos/kg.

The table H-12 shows the loss between the collected and sold amount. The loss of collected paddy in the wet season is larger those in dry season as shown in the following table,

The Loss of Paddy for Latest Twelve Months

Collection Period	Collected	Loss	Rate (%)
Nov. to Dec. 1985	1,163,377	26,293	2.3
Jan. to June 1986	3,284,059	17,582	0.5
July to Oct. 1986	1,626,536	102,587	6.3
Total	6,067,972	146,462	2.4

The loss in the collected paddy is caused by the lack of efficient post harvest facilities of the MRIIS.

3.2. Improvement of Irrigation Service Fee Collection

There are two major reasons for the low collection efficiency in the MRIIS, the one is inadequate irrigation service due to

timeworn facilities and improper water management, and the other is low income of farmers due to high production cost in the service area.

The following improvement activity have to take into account for the former reason:

- An adequate and equitable water distribution which is proposed in the Master Plan,
- Proposed rehabilitation and improvement works of the MRIIS facilities,
- An adequate water management along canal by the Gate Keeper to be increased at WM Division level which is proposed in the Master plan,
- Optimum maintenance and rehabilitation works for facilities to maintain the performance of facilities,
- Technical assistance to farmers with training for the improvement of water management at on-farm level, and
- Assistance to farmers for development and maintenance of farm level facilities.

As a short term of improvement subject on paddy collection it is required to increase the capacity of post harvest facilities of District offices which is provided with only conventional drying pavement and space for the collected paddy.

4. INCOME AND EXPENDITURE

4.1. Income

The income source of MRIIS O/M is categorized as irrigation service fee, NPC cost share, Baligatan power generation, NEA electric bill, equipment rental and others. The kind of income and present status as well as future collection estimated are described in the following articles.

(1) Irrigation Service Fee

The irrigation service fee is essential and the most important source of income for MRIIS O/M. The amount of annual collection of MRIIS has increased year by year due to increase of the irrigated area as shown in Table H-7.

However, the collection efficency in the MRIIS is still as low as at 60 to 70 percent of the collectible amount. The sum of collected irrigation fee for 1985 is about 29.5 million.

The amount of irrigation service fee collected at 1985 is not balanced with expenditure for the MRIIS O/M.

The amount of collected irrigation service fee at the full development is estimated at about 75 million pesos as shown in the following table, provided the annual irrigated area is about 90,000 ha, and the rate of collection is to be 80 percent and 90 percent for wet and dry season crop respectively.

Target for Irrigated Area and Fee Collection

(unit: ₱ 1,000)

Irrigation System	Irrigated Area (ha)	Wet Season(80%) Cav.	Wet Season(80%) Collection	Dry Season(90%) Cav.	Dry Season(90%) Collection	Total Collection
Gravity System	82,350	2	23,058	3	38,910	61,968
Pump System	7,440	5	5,208	7	8,203	13,411
Total	89,790		28,266		47,113	75,379

(2) NPC Cost Share

The NPC cost share means the amount of payment by NPC to NIA for O/M expenditure of the Magat dam and reservoir. The current agreement between NIA and NPC on the cost allocation was made in the contract on April 29, 1985.

In the agreement, the cost is allocated evenly for common facilities of dam and appurtenant structures as shown in the following Table.

Rate of Cost Share for O/M of Magat Dam and Related Structures

Items	Rate of Share (%)
Power Intake Gate, Control House and Civil Structures	50
Spillway Gates, Orifice Gates Control Chamber & Shutter	50
Tailrace and River Channel	50
Instrumentation and Records	50
Project Access Roads	50
Diversion Tunnel and Low-level Outlet Gates	50
Magat Dam Drainage and Vegetation Control	50
Air Strip	50
Magat Park	50
Security Checkpoint	50
Watershed and Reservoir Maintenance	by separate agreement
Domestic Water Supply	on consumption basis

The particulars for the cost allocation as shown in the above cover the most of all dam structures, although the actual payment amount by NPC in 1985 was only about three million pesos out of the sum of about 14 million pesos for the Dam District. Accordingly the current cost sharing should be revised as follows;

- The O/M cost for MRIIs diversion dam, which has a function of after-bay reservoir for power generation, should be included in the cost share,
- The overhead expenses for Dam Operation should be included,

- The O/M personnel in the Head Office who are in charge of water control coordination as well as the overhead expenses should be included.

(3) Baligatan Power Generation

The Baligatan electric power plant which was constructed under MRRP will be operated in the near future by the organization of MRIIS.

The generated power will be utilized by NIA pump irrigation system within the Cagayan Valley area, or sold to NPC in case of surplus generation. Currently the agreement between NIA and NPC on the transmission and selling of generated power was made in September 1985.

The agreement on the power transmission and selling are described in the contract as follows;

- NPC shall allow the NIA Baligatan hydropower plant to connect with its Luzon grid,
- NIA can draw the power transmitted through NPC facilities from any point within the Cagayan Valley area,
- NPC shall input a transmission factor of 10 percent to the energy delivered by NIA,
- NPC shall buy the energy delivered but not used by NIA at 80 percent of the unit price in the lowest price block of the energy utility rate for that grid.

The generated power by Baligatan power plant will be utilized not only for the pump operation in MRIIS but also for other existing pump systems in the Region III with the reasonable transmission factor.

The volume and value of power to be generated by the power plant at the full development in the South High and the Oscariz main canal area is shown in the following Table which is estimated from the selling price of 1.05 pesos, the current price from NEA to NPC.

Power Income by Baligatan Electric Plant

Unit: 1,000 pesos

Month	Days	Hourly Output (MW/hr)	Monthly Output (GW/Hr)	Sell Price (₱)	Income (₱'000)
Jan.	31	3.58	2.664	1.05	2,797
Feb.	28	4.13	2.753	1.05	2,891
Mar.	31	3.67	2.730	1.05	2,867
Apr.	30	0.78	0.562	1.05	590
May	31	0.83	0.618	1.05	649
Jun.	30	3.19	2.297	1.05	2,412
Jul.	31	2.34	1.741	1.05	1,828
Aug.	31	1.28	0.952	1.05	1,000
Sep.	30	1.26	0.907	1.05	952
Oct.	31	0.53	0.394	1.05	414
Nov.	30	0	0	1.05	-
Dec.	31	2.81	2.090	1.05	2,195
Total	365	2.03	17.708		18,595

(4) NEA Electric Power Bill

Isabela Electric Cooperative (ISELCO-I) under the control of National Electrification Administration (NEA) has been operating two electric mini-hydroelectric power plants of Magat-A and B in the Maris main canal to use the flow for power generation. The electric power bill means the water service fee which is chargeable to NEA' account in return to operations of these two mini-hydroelectric power plants.

The ISELCO-I pays MRIIS Office the water service fee at the rate of 1.23 centabos per hour in accordance with generated kilowatt hours and the sum of payment to NIA in 1985 amounts about 99 thousand pesos, which is shown in the following table.

Power Bill of Magat Mini-Hydro Electric Plant in 1985

Billing Period	Amount (₱)
January	6,570
February	10,508
March	9,031
April	6,788
May	7,470
June	7,338
July	8,228
August	9,978
September	6,394
October	7,447
November	8,811
December	10,916
Total	99,479

(5) Equipment Rental

The equipment rental means the income from lease of heavy equipments which are kept by the MRIIS, and the rate of rental fee has been ruled by the NIA Central Office under the equipment utilization program in National level.

The rental rate regulated by the program is classified in the following three categories;

- Schedule A: for rehabilitation by force account, operation and maintenance of NIA irrigation systems, Regional Offices and the Central Office.
- Schedule B: for NIA Projects under force account work or administration,
- Schedule C: for private contractors of NIA Projects and other government agencies; and by other government agencies and private entities.

The equipment rental in the past operation of MRIIS was mostly from other construction works of NIA Projects, rather than terminal facilities development/rehabilitation in the service area.

In 1985 O/M operation, MRIIS Office received about 0.5 million pesos for the equipment rental.

The heavy equipment kept in MRIIS should be utilized more for the terminal facilities development in the service area.

4.2. Expenditure

(1) Particular of O/M Expenditure

Annual O/M budget of national irrigation systems are allocated by NIA Central Office from of the NIA corporate fund approved by the government. The O/M expenditure for the national irrigation system is itemized into four particulars of, personnel services, maintenance and other services, power cost for irrigation pumps, and others, which is described as follows;

- The personnel service includes salaries and wages, allowances and insurances of NIA employee worked for the system. In addition, the payment for the contracted O/M services with IAs canal section is also included in this items.
- The maintenance and other services includes general O/M expenditures such as travelling expenditures, office supplies and materials, fuel and oil for vehicles/equipments, office maintenance cost, collection expense, equipment repair and spare parts, etc.
- The power cost for irrigation pumps is paid to the NPC central office by the NIA Central Office at the account of the MRIIS O/M budget.
- The others includes special O/M works such as rehabilitation of system facilities, drainage improvement, road maintenance works, repair/development of terminal facilities, major repair of equipments, etc.

(2) O/M Budget of MRIIS for 1986

The O/M budget of MRIIS for 1986 year is about 42 million pesos for the programed irrigation area of about 82 thousand hectares which is shown in table H-14, and summarized in the following table.

O/M Budget Allocation of MRIIS for 1986

(unit: ₱ 1,000)

Particulars	Head Office	Districts in System	Dam & Res. District	Total Budget Amount	Total Budget %
Personnel Services	3,885	17,652	6,252	27,789	66
Other O/M Services	730	3,509	2,849	7,088	17
Power for Pumps	-	7,190	-	7,190	17
Other Services	-	-	-	-	0
Total Budget (%)	4,615(11)	28,351(67)	9,101(22)	42,067(100)	100

The O/M budget of MRIIS for 1986 operation as shown in the above table shows the such financial problems as described as follows:

- The personnel service covers the most part of O/M expenditure, which amounts to 80 percent for the total budget exclusive of power cost for irrigation pump,
- The budget of other O/M services is too small to maintain the system adequately. The system is needed much more budget,
- The O/M cost for Dam and reservoir District is also too small to maintain facilities properly and NIA should allocate much more budget for the maintenance works,
- The power cost of pump operation in 1986 is estimated at about 2,400 pesos per hectare in the service area of about 3,000 hectares on the average for wet and dry crops, and it is recognized that the power cost of pump is extremely high.

(3) Improvement for O/M Expenditure

NIA should allocate enough budget for MRIIS O/M for the proper maintenance service. In this connection the followings should be taken into account for the future allocation of O/M budget:

- After proposed improvement project, NIA should allocate an adequate maintenance budget corresponded to increase of collected irrigation fee,

- The depreciation cost for O/M equipment should be counted in the annual budget to renew aged equipments,

- The O/M budget for the Magat dam and appurtenant structures should be allocated adequately so as to meet the cost for the present staffing and work items. In this connection, NIA should acquire much more budget through the cost allocation from NPC.

4.3. Proposed Income and Expenditure

(1) Status of Present Income and Expenditure

The O/M income and expenditure of MRIIS for 1985 balanced in case of those for the Head Office and four Districts, on the other hand, the total amounts included those for Dam and reservoir District shows considerable amount of deficit in income as in the following table and Table H-13.

Actual Income and Expenditure for MRIIS 1985 O/M

(unit: ₱1,000)

Particulars		Irrig. Fee	NPC Share	Others	Total
Income	Head Office	11	-	2,227	2,238
	4 Districts	29,508	-	313	29,821
	Sub-total	29,519	-	2,540	32,059
	Dam Dist.	-	3,036	316	3,352
	Total	29,519	3,036	2,856	35,411

Particulars		Personnel	Pump Power	Others	Total
Expense	Head Office	2,477		3,041	5,518
	4 Districts	15,196	5,167	4,688	25,031
	Sub-total	17,673	5,167	7,729	30,569
	Dam Dist.				14,561
	Total				45,130

(2) Proposed Income and Expenditure

The estimated income and expenditure for MRIIS O/M after the proposed improvement project implementation is summarized in the following table. The table shows that the system will be managed properly with the balanced income and expenditure amounts, although it will be still difficult to maintain the system with the collected irrigation fee only.

Proposed Income and Expenditure for MRIIS O/M

(unit: ₱000)

Particulars	Head Office	Dam & Reservoir	4 Dist.	Total
Income				
Irrigation Service Fee	-	-	75,400	75,400
NPC Cost Share	-	7,300	-	7,300
Baligatan Power	-	18,600	-	18,600
Others	-	500	2,200	2,700
Total Income	-	26,400	77,600	104,000
Expenditure				
Personnel Service	3,100	6,100	18,800	28,000
Administration and General expenditure	1,890	1,840	4,770	8,500
Depreciation and Repair Cost	190	880	7,830	8,900
Fuel and Oil	70	80	720	870
Maintenance of Facilities	1,000	4,500	14,470	19,970
Power Cost for Pump	-	-	16,330	16,330
Contingency	550	1,300	5,580	7,430
Total Expenditure	6,800	14,700	68,500	90,000

TABLE H-1. STATUS OF LATERAL CANAL TURNOVER IN DISTRICT I AREA AS OF JUNE 1986

Division No.	No. of Section	Service Area (ha)	Canal Length (m)	No. of O/M Personnel/IA, etc.						Canal Length of Each Section (m)					
				WM	DT	GK	IA	Barangay	Others	NIA	(%)	IA	(%)	Others	(%)
I- 1	3	803	10,659	1	2	-	1	-	-	7,154	67	3,505	33	-	-
2	5	826	16,174	1	2	1	1	-	-	9,174	56	7,000	44	-	-
3	4	900	14,648	1	2	-	1	-	1	7,002	48	3,500	25	4,146	28
4	4	808	10,533	1	-	1	2	-	-	-	0	10,533	100	-	-
5	3	855	10,603	1	3	-	-	-	-	10,603	100	-	-	-	-
6	4	955	14,473	1	3	-	1	-	-	10,973	76	3,500	24	-	-
7	7	1,035	23,568	1	1	2	4	-	-	7,600	32	15,968	68	-	-
8	5	1,049	18,603	1	2	-	2	-	-	3,500	19	15,103	81	-	-
9	6	1,241	17,350	1	-	2	4	-	-	3,020	17	14,330	83	-	-
10	7	1,173	23,527	1	-	1	5	-	-	1,500	6	22,027	94	-	-
11	7	861	19,862	1	-	1	6	-	-	-	0	19,862	100	-	-
12	4	1,001	12,619	1	1	1	2	-	-	5,381	43	7,238	57	-	-
13	6	765	19,192	1	1(2)	1	1	-	1	12,132	63	3,562	19	3,498	18
14	5	796	16,742	1	1	1	3	-	-	5,674	34	11,068	66	-	-
Sub-total	70	13,068	228,373	14	18(2)	11	33	-	2	83,533	37	137,196	60	7,644	3
II- 1	4	899	13,041	1	1	1	1	-	1	5,006	38	4,500	35	3,541	27
2	3	961	13,412	1	-	-	2	-	1	-	0	9,572	71	3,840	29
3	4	734	12,292	1	-	1	1	-	2	1,580	13	3,712	30	7,000	57
4	3	828	8,781	1	-	1	2	-	-	1,500	17	7,281	83	- -	
5	4	800	12,708	1	-	1	3	-	-	1,604	13	11,104	87	- -	
6	4	904	14,824	1	1	-	2	-	1	3,636	25	7,469	50	3,791	25
7	3	603	10,630	1	-	-	2	-	1	-	0	7,106	67	3,524	33
8	5	795	17,188	1	1	1	3	-	-	5,697	33	11,491	67	-	-
9	4	791	14,058	1	-	-	2	-	1	2,500	25	7,058	50	3,500	25
10	8	869	24,425	1	-(2)	1	3	-	2	6,381	26	10,974	45	7,070	29
11	6	1,736	23,723	1	-	-	4	-	2	-	0	14,163	60	9,560	40
12	10	1,066	34,891	1	-(3)	1	3	-	3	12,290	35	12,061	35	10,540	30
Sub-total	58	10,986	199,973	12	4(5)	7	28	-	14	41,188	21	106,491	53	52,294	26
Total	128	24,054	428,345	26	22(7)	18	61	-	16	124,721	29	243,687	57	59,938	14

Source: MRIIS Office

Note: ( ) number of vacant section

TABLE H-2. STATUS OF LATERAL CANAL TURNOVER IN DISTRICT II AREA AS OF JUNE 1986

Division No.	No.of Section	Service Area (ha)	Canal Length (m)	No. of O/M Personnel/IA, etc.						Canal Length of Each Section(m)					
				WM	DT	GK	IA	Barangay	Others	NIA	(%)	IA	(%)	Others	(%)
I- 1	6	815	19,726	1	3	1	2	-	-	9,220	47	10,506	53	-	-
2	5	978	17,602	1	3	-	2	-	-	10,974	62	6,628	48	-	-
3	6	791	18,430	1	2	1	3	-	-	7,794	42	10,636	58	-	-
4	6	948	21,694	1	4	-	2	-	-	14,322	66	7,372	34	-	-
5	6	909	18,767	1	3	1	2	-	-	10,985	59	7,782	41	-	-
6	4	845	15,060	1	3	-	1	-	-	11,541	77	3,519	23	-	-
7	5	820	18,504	1	4	-	1	-	-	14,904	81	3,600	19	-	-
8	5	902	18,075	1	3	-	2	-	-	10,924	61	7,149	39	-	-
9	4	666	15,325	1	4	-	-	-	-	15,325	100	-	-	-	-
10	3	726	10,500	1	3	-	-	-	-	10,500	100	-	-	-	-
11	3	719	9,358	1	2	-	1	-	-	5,858	63	3,500	27	-	-
12	3	833	10,670	1	3	-	-	-	-	10,670	100	-	-	-	-
13	3	863	11,100	1	2	-	1	-	-	7,400	67	3,700	33	-	-
14	4	750	12,080	1	4	-	-	-	-	12,080	100	-	-	-	-
15	3	729	9,952	1	3	-	-	-	-	9,952	100	-	-	-	-
Sub-total	66	12,292	226,821	15	46	5	17	-	-	162,429	72	64,392	28	-	-
I-16	5	1,040	19,218	1	4	-	1	-	-	15,566	81	3,652	19	-	-
17	4	958	15,666	1	4	-	-	-	-	15,666	100	-	-	-	-
18	3	805	12,069	1	3	-	-	-	-	12,069	100	-	-	-	-
19	3	760	10,794	1	2	1	-	-	-	10,794	100	-	-	-	-
20	2	778	7,831	1	2	-	-	-	-	7,831	100	-	-	-	-
21	4	830	14,191	1	3	-	1	-	-	10,466	74	3,725	26	-	-
22	3	716	8,516	1	2	1	-	-	-	8,516	100	-	-	-	-
23	3	898	10,960	1	2	-	-	-	1	7,260	66	-	-	3,700	34
24	4	815	14,260	1	3	-	1	-	-	10,760	75	3,500	25	-	-
25	3	914	12,200	1	1	-	2	-	-	4,000	33	8,200	67	-	-
26	4	830	14,580	1	3	-	1	-	-	11,760	81	2,820	19	-	-
27	5	855	15,392	1	2	1	2	-	-	7,896	51	7,496	49	-	-
28	5	737	17,320	1	3	1	1	-	-	13,620	79	3,700	21	-	-
29	4	1,240	10,565	1	-	1	3	-	-	-	-	10,565	100	-	-
Sub-total	52	12,176	183,562	14	34	5	12	-	1	136,204	74	43,658	24	3,700	2
Total	118	24,468	410,383	29	80	8	29	-	1	298,633	73	108,050	26	3,700	1

Source: MRIIS Office

TABLE H-3. STATUS OF LATERAL CANAL TURNOVER IN DISTRICT III AREA AS OF JUNE 1986

Division No.	No.of Section	Service Area (ha)	Canal Length (m)	No. of O/M Personnel/IA, etc.						Canal Length of Each Section (m)					
				WM	DT	GK	IA	Barangay	Others	NIA	(%)	IA	(%)	Others	(%)
I- 1	7	737	19,576	1	6	-	1	-	-	15,896	81	3,680	19	-	-
2	4	843	12,589	1	3	-	1	-	-	8,119	64	4,470	36	-	-
3	4	1,019	12,292	1	4	-	-	-	-	12,292	100	-	0	-	-
4	3	1,186	10,780	1	1	-	2	-	-	3,580	33	7,200	67	-	-
5	4	1,089	14,181	1	4	-	-	-	-	14,181	100	-	-	-	-
6	3	1,062	10,906	1	1	-	2	-	-	3,311	30	7,595	70	-	-
7	3	1,283	10,903	1	2	-	1	-	-	7,253	67	3,650	33	-	-
8	5	1,143	18,388	1	1	-	4	-	-	3,531	19	14,857	81	-	-
9	5	1,176	17,556	-(1)	3	-	2	-	-	10,532	60	7,024	40	-	-
10	7	1,500	25,050	1	3	-	4	-	-	10,726	43	14,324	57	-	-
11	4	1,500	13,684	-(1)	2(2)	-	-	-	-	13,684	100	-	-	-	-
Sub-total	49	12,538	165,905	9(2)	30(2)	-	17	-	-	103,105	62	62,800	38	-	-
II- 1	3	1,088	10,795	1	2	-	1	-	-	7,017	65	3,778	35	-	-
2	4	981	12,987	1	4	-	-	-	-	12,987	100	-	-	-	-
3	4	1,041	14,759	1	4	-	-	-	-	14,759	100	-	-	-	-
4	3	1,029	11,092	1	3	-	-	-	-	11,092	100	-	-	-	-
5	4	925	15,249	1	3	-	1	-	-	11,279	74	3,970	26	-	-
6	4	1,076	15,463	1	2	1	1	-	1	7,991	52	3,697	24	3,775	24
7	5	1,180	17,909	1	4	-	-	-	1	14,109	79	-	-	3,800	21
8	6	1,010	18,080	1	5	1	-	-	-	18,080	100	-	-	-	-
9	4	1,028	15,261	1	2	-	2	-	-	8,093	53	7,168	47	-	-
10	7	1,058	22,520	1	5	1	1	-	-	19,223	85	3,297	15	-	-
11	4	879	14,616	1	1	-	3	-	-	3,500	24	11,116	76	-	-
12	6	960	22,748	1	3	-	3	-	-	11,386	50	11,362	50	-	-
Sub-total	54	12,255	191,479	12	38	2	12	-	2	139,516	73	44,388	23	7,575	4
Total	103	24,793	357,384	21(2)	68(2)	2	29	-	2	242,621	68	107,188	30	7,575	2

Source: MRIIS Office Note: ( ) Number of vacant sections

TABLE H-4. STATUS OF LATERAL CANAL TURNOVER IN DISTRICT IV AREA AS OF JUNE 1986

Division No.	No. of Section	Service Area (ha)	Canal Length (m)	No. of O/M Personnel/IA, etc.						Canal Length of Each Section (m)					
				WM	DT	GK	IA	Barangay	Others	NIA	(%)	IA	(%)	Others	(%)
I- 1	3	1,080	8,504	1	1	1	1	-	-	4,927	58	3,577	42	-	-
2	4	1,111	15,260	1	2	-	2	-	-	5,301	35	9,959	65	-	-
3	2	1,095	7,525	1	1	-	1	-	-	3,807	51	3,718	49	-	-
4	2	918	7,168	1	2	-	-	-	-	7,168	100	-	-	-	-
5	4	1,104	12,251	1	4	-	-	-	-	12,251	100	-	-	-	-
6	3	1,044	12,854	1	1	-	2	-	-	3,808	26	9,046	74	-	-
7	3	1,153	11,195	1	3	-	-	-	-	11,195	100	-	-	-	-
8	3	993	10,554	1	3	-	-	-	-	10,554	100	-	-	-	-
9	5	1,200	17,631	1	4	-	1	-	-	14,110	80	3,521	20	-	-
10	4	1,224	19,104	1	1	-	3	-	-	3,626	19	15,478	81	-	-
11	8	1,190	17,451	1	6	1	-	-	1	14,931	86	-	-	2,520	14
12	3	1,667	16,009	1	-	-	3	-	-	6,481	40	9,528	60	-	-
13	(Transferred to WM No. 12)			(1)											
Sub-total	44	13,779	155,506	12(1)	28	2	13	-	1	98,159	63	54,827	35	2,520	2
II-14	3	850	10,700	1	3	-	-	-	-	10,700	100	-	-	-	-
15	4	918	14,210	1	4	-	-	-	-	14,210	100	-	-	-	-
16	3	850	11,509	1	2	-	1	-	-	7,359	64	4,150	36	-	-
17	3	898	9,621	1	2	1	-	-	-	9,621	100	-	-	-	-
18	4	950	12,256	1	2	-	2	-	-	7,280	59	4,976	41	-	-
19	5	1,000	17,351	1	2	1	2	-	-	8,352	48	8,999	52	-	-
20	6	1,138	16,465	1	4	-	1	-	-	12,888	78	3,577	22	-	-
21	4	900	14,063	1	4	-	-	-	-	14,063	100	-	-	-	-
22	3	1,028	10,118	1	-	1	1	-	1	1,500	15	4,956	49	3,662	36
23	3	888	10,972	1	2	-	1	-	-	7,352	67	3,620	33	-	-
24	3	888	10,332	1	2(1)	-	-	1	-	7,101	169	-	-	3,231	31
Sub-total	41	10,308	137,597	11	27(1)	4	8	1	1	100,426	73	30,278	15	6,893	5
Total	85	24,087	293,103	23(1)	55(1)	6	21	1	2	198,585	68	85,105	29	9,413	3

Source: MRIIS Office

Note: ( ) Number of vacant sections

TABLE H-5. HEAVY EQUIPMENT FOR O/M WORKS DISTRIBUTED TO DISTRICTS

Name of Equipment	No. of unit	Capacity	Number of Heavy Equipment					
			Dist I	Dist II	Dist III	Dist IV	Dam	Total
Crowler Backhoe	19	0.35 cu.m.	3	3	3	-	-	9
		0.45 cu.m.	-	-	-	3	-	3
		0.70 cu.m.	2	2	1	2	-	7
Crowler Dozer	11	75 HP	-	-	-	1	-	1
		90 HP	3	1	-	-	1	5
		140 - 150 HP	-	1	2	-	2	5
Fork Lift	1	3,000 kg	-	1	-	-	-	1
Wheel Loader	7	1.34 cu.m.	-	-	2	-	-	2
		1.53 cu.m.	2	1	-	1	1	5
Motor Grador	6	110 - 130 HP	-	1	1	-	1	3
		145 HP	2	-	-	1	-	3
Trailer	4	25,000 kg	1	1	1	1	-	4
Crowler Crane	4	25,000 kg	1	1	1	1	-	4
Mobile Crane	1	20,000 kg	-	-	-	1	-	1
Dump Track	25	5 cu.m.	6	6	5	5	3	25
Stake Track	9	135 HP	-	-	1	-	-	1
		195 HP	2	2	1	2	1	8
Shop Track	2	190 HP	-	-	1	1	-	2
Fuel Track	2	9,000 kg	1	-	1	-	-	2
Lube Track	3	9,000 kg	1	1	1	-	-	3
Water Track	3	8,000 ℓ	1	1	-	-	1	3
Road Roller	2	3,000 kg	1	1	-	-	-	2
Concrete Mixer	2	1 Bagger	-	1	1	-	-	2

Source: MRIIS Office

TABLE H-6. KIND AND PROCURED YEAR OF HEAVY EQUIPMENT USED FOR O/M WORKS

Name of Equipment	No. of unit	Type/Model	Capacity	Year Procured	No. of unit
Crowler Backhoe	19	Mitsubishi MS-110-2	0.35 cu.m.	1980	9
		IHI IS-04	0.45 cu.m.	1977	3
		Mitsubishi MS-180	0.70 cu.m.	1980	7
Crowler Dozer	11	Caterpillar D40	75 HP	1977	1
		Komatsu D50-A	90 HP	1975	5
		Caterpiller D-60	140 HP	1977	2
		Caterpiller D-60	140 HP	1980	2
		Fiat Allis 14-C	150 HP	1980	2
Fork Lift	1	Komatsu	3,000 kg	1975	1
Wheel Loader	7	Caterpiller L-930	1.34 cu.m.	1977	2
		Fiat Allis 545	1.53 cu.m.	1980	4
		Furukawa	1.50 cu.m.	1980	1
Mortor Grador	6	Mitsubishi LG-2H	130 HP	1980	3
		Komatsu GD-40	145 HP	1975	3
Trailer	4	Hino HH230	25,000 kg	1975	2
		Nissan UD	25,000 kg	1980	2
Crowler Crane	4	Link Belt Crane LS-78	25,000 kg	1980	4
Mobil Crane	1	Kobe P&H, KW-30	20,000 kg	1980	1
Dump Track	25	Hino KB-212	5 cu.m.	1978	3
		Hino KB-212	5 cu.m.	1980	8
		Isuzu TD-50	5 cu.m.	1980	14
Stake Track		Toyota D-2	135 HP	1975	1
		Isuzu TD-72	195 HP	1980	7
		Hino		1981	1
Shop Track	2	Mitsubishi	207 HP	1978	1
		Nissan TK20 IIL	190 HP	1980	1
Fuel Track		Hino KB-222	9,000ℓ	1975	3
Lube Track		Fuso FD117JI	9,000ℓ	1978	1
Water Track	3	Fuso FP117JI	8,000ℓ	1978	2
		Fuso FP	8,000ℓ	1982	1
Road Roller		Ingersol Road Vibrator	3,000 kg	1977	2
Concrete Mixer	2		1 Bagger	unknown	

Source: MRIIS Office

TABLE H-7 RECORD OF IRRIGATION FEE COLLECTION IN MRIIS AREA

(1) Historical Irrigation Fee Collection (Unit: Pesos)

Year	Irrigated Area ha (Wet & Dry)	Total Collectible (Wet & Dry)(P)	Collections (Wet & Dry)(P)	Collection Efficency (%)
1975	26,451	1,925,781	1,533,243	79.6
1976	54,239	3,894,625	3,303,429	94.2
1977	73,229	9,487,075	5,548,084	65.0
1978	70,601	9,467,816	6,023,546	70.7
1979	61,040	9,201,870	6,612,990	79.9
1980	82,137	13,029,572	8,226,380	70.2
1981	74,936	13,170,758	8,342,696	70.4
1982	87,480	16,472,177	9,992,456	67.4
1983	85,480	17,223,806	12,099,030	78.1
1984	116,481	36,481,827	18,573,633	56.6
1985	136,388	49,598,587	29,518,903	66.1

(2) Irrigation Fee Collection for 1985 Crop Year (Unit: Pesos)

District	Irrigated Area (Wet & Dry)	Total Collectible (Wet & Dry)	Collections (Wet & Dry)	Efficiency (%)
I	29,681	10,803,540	7,560,650	77.8
II	40,552	14,991,147	9,235,325	68.5
III	36,588	12,850,587	6,984,510	60.4
IV	29,567	10,953,213	5,727,613	58.1
Head Office	-	-	10,805	-
Total	136,388	49,598,587	29,518,903	66.1

Source: MRIIS Office

TABLE H-8. STATUS OF IRRIGATED AREA AND FEE COLLECTION IN DISTRICT I AREA FOR 1985 CROP YEAR

Division No.	Projected Service Area (ha)	Irrigated Area (ha)			Benefited Area (ha)			Collectible Irri. Fee (₱)			Collected Irrigation Fee (₱)					
		Wet	Dry	Total	Wet	Dry	Total	Wet	Dry	Total	Wet	(%)	Dry	(%)	Total	(%)
I- 1	803	663	660	1,323	630	660	1,290	220,488	277,537	498,025	120,959	55	193,477	70	314,436	63
2	826	664	596	1,260	628	596	1,224	219,919	224,906	444,825	140,484	64	143,011	64	283,495	64
3	899	663	612	1,275	644	612	1,256	225,318	243,248	468,556	117,021	52	117,172	48	234,193	50
4	808	661	661	1,322	617	661	1,278	216,162	259,442	475,604	137,919	64	200,336	77	338,255	71
5	855	763	725	1,488	737	725	1,462	257,979	288,100	546,079	95,102	35	228,634	79	323,736	57
6	955	635	669	1,304	611	669	1,280	213,956	265,955	479,911	129,832	61	144,938	54	274,770	57
7	1,036	826	814	1,640	806	814	1,620	282,079	323,509	605,588	148,258	53	290,695	90	438,953	72
8	1,049	940	922	1,862	914	922	1,836	319,832	366,560	686,392	188,406	59	241,209	66	429,615	63
9	1,241	939	912	1,851	928	912	1,840	324,682	362,406	687,088	206,942	64	288,756	80	495,698	72
10	1,173	835	846	1,681	819	846	1,665	286,519	336,245	622,764	175,952	61	262,954	78	438,906	70
11	861	737	658	1,395	728	658	1,386	229,906	235,423	465,329	197,577	86	219,741	93	417,318	90
12	1,001	422	400	822	421	400	821	147,519	159,091	306,610	106,390	72	150,814	95	257,204	84
13	765	572	523	1,095	564	523	1,087	197,228	208,152	405,380	134,931	68	166,434	80	301,365	74
14	796	506	562	1,068	483	562	1,045	168,936	223,399	392,335	111,802	66	154,120	70	265,922	68
Sub-total	13,068	9,826	9,560	19,386	9,530	9,560	19,090	3,310,523	3,773,973	7,084,496	2,011,575	61	2,802,291	74	4,813,866	68
II- 1	899	499	383	882	488	383	871	131,037	115,162	246,199	83,060	63	106,242	92	189,302	77
2	961	507	383	890	491	383	874	167,251	152,168	319,419	102,150	61	134,019	88	236,169	74
3	734	348	282	630	348	282	630	100,541	96,008	196,549	61,821	61	63,079	66	124,900	64
4	828	607	552	1,159	607	552	1,159	206,952	215,517	422,469	156,036	74	187,222	87	343,258	81
5	800	510	413	923	510	413	923	132,976	118,027	251,003	108,606	82	116,611	99	225,217	90
6	904	443	419	862	443	419	862	136,164	143,411	279,575	92,895	68	127,265	89	220,160	79
7	603	454	437	891	439	437	876	153,606	173,628	327,234	134,293	87	113,940	66	248,233	76
8	795	689	670	1,359	666	670	1,336	233,147	266,298	499,445	168,001	72	210,937	79	378,938	76
9	790	286	267	553	286	267	553	95,116	106,371	201,532	58,422	61	89,245	84	147,667	73
10	869	267	291	558	233	291	524	81,600	115,743	197,343	47,500	58	87,321	75	134,821	68
11	1,736	683	652	1,335	672	652	1,324	235,048	258,999	494,047	203,055	86	160,577	62	363,632	74
12	1,067	169	83	252	169	83	252	59,138	32,898	92,036	32,834	56	21,896	67	54,730	60
Sub-total	10,986	5,462	4,832	10,294	5,352	4,832	10,184	1,732,626	1,794,230	3,526,856	1,248,673	72	1,418,354	79	2,667,027	76
Total	24,054	15,288	14,392	29,680	14,882	14,392	29,274	5,043,149	5,568,203	10,611,357	3,260,248	65	4,220,645	76	7,480,893	70

Note : Third crop and other crops are excluded.

Source: MRIIS District - I Office

TABLE H-9↓ STATUS OF IRRIGATED AREA AND FEE COLLECTION IN DISTRICT II AREA FOR 1985 CROP YEAR

Division No.	Projected Service Area (ha)	Irrigated Area (ha)			Benefited Area (ha)			Collectible Irri. Fee (₱)			Collected Irrigation Fee (₱)					
		Wet	Dry	Total	Wet	Dry	Total	Wet	Dry	Total	Wet	(%)	Dry	(%)	Total	(%)
I- 1	813	793	772	1,565	793	772	1,565	227,660	306,798	534,458	56,988	25	310,481	100	367,469	69
2	978	682	616	1,297	681	616	1,297	238,519	244,836	483,355	133,429	56	192,243	79	325,672	67
3	791	744	747	1,491	738	747	1,485	258,361	297,133	555,494	152,087	59	272,205	92	424,292	76
4	948	712	643	1,355	665	643	1,308	232,640	255,510	488,150	80,976	35	206,111	81	287,087	56
5	909	903	906	1,809	899	906	1,305	314,503	360,107	674,610	129,640	41	305,850	85	435,490	65
6	845	838	836	1,674	833	836	1,669	291,616	332,335	623,951	75,688	26	247,761	95	323,499	52
7	820	787	798	1,585	785	798	1,583	274,698	317,069	591,767	174,447	64	286,441	90	460,888	78
8	902	846	825	1,671	840	825	1,665	293,920	328,115	622,035	130,881	45	282,043	86	412,929	66
9	666	573	522	1,095	573	522	1,095	200,603	207,411	408,014	172,610	86	297,371	95	369,981	91
10	726	692	715	1,407	687	710	1,397	240,460	282,402	522,862	149,640	62	228,835	81	387,475	74
11	719	713	708	1,421	713	708	1,421	249,528	281,344	530,872	112,792	45	232,355	83	345,147	65
12	853	581	489	1,070	581	489	1,070	203,490	194,330	397,820	113,990	56	131,550	68	245,540	62
13	863	504	419	923	504	419	923	176,284	166,701	342,985	67,241	38	134,955	81	202,196	59
14	750	702	713	1,415	702	713	1,415	245,734	283,317	529,051	20,729	8	177,800	63	198,529	38
15	729	694	686	1,380	676	685	1,361	236,583	272,300	508,883	53,758	23	253,515	93	307,273	60
Sub-total	12,292	10,764	10,395	21,158	10,670	10,389	21,059	3,684,599	4,129,708	7,814,307	1,624,896	47	3,459,516	84	5,084,412	65
II-16	1,040	916	914	1,830	894	914	1,808	313,006	363,320	676,326	206,704	57	342,586	94	549,290	81
17	958	712	806	1,518	712	806	1,518	249,317	320,427	569,774	83,432	26	215,826	67	299,258	53
18	805	753	756	1,509	736	756	1,492	257,651	300,514	558,165	56,517	22	166,250	55	222,767	40
19	760	685	678	1,363	675	678	1,353	236,237	269,401	505,638	80,698	34	200,159	74	280,857	56
20	778	714	729	1,443	712	726	1,438	249,073	289,669	538,742	80,853	32	154,278	53	235,131	44
21	830	755	759	1,514	732	759	1,491	256,204	301,604	557,808	117,379	55	212,062	70	329,941	59
22	716	581	622	1,203	520	622	1,142	181,861	247,382	429,243	28,097	15	147,727	60	175,824	41
23	898	715	770	1,485	630	770	1,400	220,566	306,152	526,718	110,665	50	159,620	52	270,285	51
24	815	676	655	1,331	623	649	1,272	218,077	257,884	457,961	76,128	35	142,298	55	218,426	48
25	914	722	737	1,459	722	736	1,458	252,671	292,830	545,501	72,663	29	147,299	84	219,962	40
26	830	619	612	1,231	619	612	1,231	216,684	243,770	460,454	35,049	16	91,940	38	126,989	28
27	855	567	572	1,139	557	572	1,129	194,987	227,254	422,241	5,659	3	154,379	68	160,038	38
28	737	577	682	1,259	552	682	1,234	193,181	271,099	464,280	69,997	36	120,816	45	190,813	41
29	1,240	545	564	1,109	539	564	1,103	188,467	224,116	412,583	137,427	73	128,318	57	265,745	64
Sub-total	12,176	9,537	9,856	19,393	9,223	9,846	19,069	3,227,982	3,914,922	7,142,904	1,161,271	36	2,383,555	61	3,544,826	50
Other collection															(606,686)	
Total	24,468	20,301	20,251	40,551	19,893	20,235	40,128	6,912,581	8,044,630	14,957,211	2,786,167	40	5,843,071	72	8,629,238	58

Note : Third crop and other collection are excluded.

Source: MRIIS District-II Office

TABLE H-10. STATUS OF IRRIGATED AREA AND FEE COLLECTION IN DISTRICT III AREA FOR 1985 CROP YEAR

Division No.	Projected Service Area (ha)	Irrigated Area (ha)			Benefited Area (ha)			Collectible Irri. Fee (₱)			Collected Irrigation Fee (₱)					
		Wet	Dry	Total	Wet	Dry	Total	Wet	Dry	Total	Wet	(%)	Dry	(%)	Total	(%)
I- 1	737	668	638	1,306	615	610	1,225	214,200	242,873	457,073	149,606	70	152,727	63	302,322	66
2	843	782	764	1,546	712	754	1,466	249,200	299,715	548,915	115,949	46	186,608	63	300,557	55
3	1,019	699	683	1,382	627	679	1,301	217,700	269,902	487,602	140,312	64	208,870	77	349,182	72
4	1,186	1,007	1,004	2,011	830	945	1,775	290,500	375,638	666,138	156,121	54	229,546	61	385,667	56
5	1,089	950	938	1,888	564	805	1,369	197,400	319,987	517,389	108,536	55	184,095	58	292,631	57
6	1,062	885	873	1,758	612	828	1,400	214,200	329,130	543,330	81,057	38	193,091	59	274,148	50
7	1,283	846	785	1,631	775	770	1,545	437,655	465,764	903,419	250,841	57	388,518	83	639,359	71
8	1,143	813	694	1,507	727	648	1,375	435,855	434,706	870,561	272,170	62	359,133	83	631,303	73
9	1,176	329	322	651	318	322	640	-	-	-	-	-	-	-	-	-
10	1,500	1,134	795	1,929	1,026	712	1,738	583,125	375,240	958,365	278,549	48	258,325	69	536,874	56
11	1,500	-	-	-	-	-	-	-	-	-	27,505	-	44,959	-	72,464	-
Sub-total	12,538	8,113	7,496	15,609	6,801	7,073	13,877	2,830,855	3,112,955	5,943,810	1,578,647	51	2,205,871	71	3,784,518	64
II- 1	1,088	888	848	1,736	683	683	1,366	238,700	271,095	509,750	74,012	31	147,493	54	221,505	43
2	981	933	890	1,823	787	850	1,637	275,450	337,875	613,325	119,054	43	190,137	56	530,691	87
3	1,041	883	868	1,751	746	835	1,581	261,100	311,913	573,013	129,465	42	220,709	71	350,174	61
4	1,029	748	677	1,425	569	620	1,189	199,150	246,450	445,600	70,668	29	142,362	58	213,030	48
5	925	809	781	1,590	756	772	1,528	264,600	306,870	571,470	138,785	45	180,690	59	319,475	56
6	1,076	995	1,010	2,005	670	909	1,579	234,500	361,327	595,827	111,739	51	190,988	53	302,727	51
7	1,180	1,146	1,147	2,293	1,043	1,144	2,187	365,050	455,138	820,188	82,077	18	157,984	35	240,061	29
8	1,010	990	972	1,962	853	891	1,744	298,550	354,172	652,722	105,012	30	210,655	59	315,667	48
9	1,028	892	881	1,773	787	837	1,624	275,450	332,708	608,158	92,586	28	176,106	53	268,692	44
10	1,058	818	825	1,643	700	757	1,457	245,000	300,907	545,907	146,981	60	174,955	58	321,936	59
11	879	818	799	1,617	775	773	1,548	271,250	307,268	578,518	242,023	89	191,694	62	433,717	75
12	960	706	726	1,432	525	360	885	183,750	143,100	326,850	153,462	84	55,988	39	209,450	64
Sub-total	12,255	10,626	10,424	21,050	8,894	9,431	18,325	3,112,550	3,728,823	6,841,373	1,465,864	47	2,039,761	54	3,505,625	51
Total	24,793	18,739	17,920	36,659	15,695	16,504	32,199	5,943,405	6,861,778	12,785,183	3,044,510	51	4,245,635	62	7,290,145	57

Note : Third crop and other crops are excluded.

Source: MRIIS District-III Office

TABLE H-11. STATUS OF IRRIGATED AREA AND FEE COLLECTION IN DISTRICT IV AREA FOR 1985 CROP YEAR

Division No.	Projected Service Area (ha)	Irrigated Area (ha)			Benefited Area (ha)			Collectible Irri. Fee (₱)			Collected Irrigation Fee (₱)					
		Wet	Dry	Total	Wet	Dry	Total	Wet	Dry	Total	Wet	(%)	Dry	(%)	Total	(%)
I- 1	1,080	776	763	1,539	776	763	1,539	271,584	303,399	574,983	122,017	45	277,719	92	399,736	70
2	1,111	794	801	1,595	789	801	1,590	281,635	318,359	599,994	146,901	52	208,350	65	355,251	59
3	1,095	501	494	955	501	494	995	138,580	196,171	334,751	28,762	21	80,861	41	109,623	33
4	918	544	557	1,011	544	557	1,011	193,574	221,464	415,038	38,941	20	147,118	66	186,059	45
5	1,104	689	705	1,394	689	705	1,394	241,164	280,028	521,192	58,359	24	146,772	52	205,131	39
6	1,044	653	661	1,314	653	661	1,314	228,484	257,768	486,252	46,553	20	137,813	53	184,366	38
7	1,155	557	591	1,148	557	591	1,148	195,932	245,864	430,796	81,729	42	142,389	61	224,118	52
8	993	560	562	1,122	560	562	1,122	195,766	224,331	420,097	53,825	27	84,863	38	138,688	33
9	1,200	622	460	1,082	507	460	967	181,947	183,036	364,983	83,538	46	45,444	25	128,982	35
10	1,234	680	665	1,345	680	665	1,345	215,046	264,437	479,483	57,998	27	172,753	65	230,751	48
11	1,190	712	768	1,480	712	718	1,430	249,120	291,059	540,179	108,660	44	192,499	66	301,159	56
12	1,667	287	212	499	283	201	484	154,113	106,530	260,643	63,614	41	89,509	84	153,123	59
13	(Transferred to WM No. 12)															
Sub-total	13,779	7,375	7,239	14,614	7,251	7,178	14,429	2,546,945	2,881,446	5,428,391	890,897	35	1,720,090	60	2,610,987	48
II-14	850	693	711	1,404	693	711	1,404	242,416	282,814	525,230	84,168	35	211,645	75	295,813	56
15	918	824	826	1,650	823	826	1,649	287,979	330,905	618,882	144,206	50	208,147	63	352,353	57
16	850	750	767	1,517	750	751	1,501	262,398	301,078	563,476	55,479	21	212,061	70	267,540	47
17	898	801	789	1,590	773	775	1,548	270,696	313,769	584,465	143,893	53	169,731	54	304,624	52
18	960	764	740	1,504	725	740	1,465	253,780	291,768	545,548	119,679	47	198,014	68	217,693	40
19	1,000	593	569	1,162	590	569	1,159	206,422	226,090	432,512	171,573	83	135,041	36	306,614	71
20	1,138	1,032	1,038	2,070	970	1,006	1,976	339,515	400,564	740,079	133,785	39	243,139	61	376,924	51
21	900	718	723	1,441	705	723	1,428	246,955	284,341	531,296	126,153	51	258,946	91	385,099	72
22	1,028	736	764	1,500	717	761	1,478	251,079	302,287	553,366	118,963	47	253,757	84	372,720	67
23	888	332	} 511	843	328	} 500	828	114,637	} 197,341	409,207	47,786	42	} 112,465	57	238,270	58
24	888	272		272	272		272	95,229			78,019	82				
Sub-total	10,308	7,515	7,438	14,953	7,346	7,362	14,708	2,571,104	2,932,957	5,504,061	1,223,704	45	2,002,946	68	3,226,650	59
Total	24,087	14,890	14,677	29,567	14,597	14,540	29,137	5,118,049	5,814,403	10,932,452	2,114,601	41	3,723,036	64	5,837,637	53

Note : Third crop and other crop are excluded.

Source: MRIIS District-IV Office.

TABLE H-12. STATUS OF IRRIGATION FEE COLLECTION IN MRIIS FOR LATEST 12 MONTH
(Nov., 1985 to Oct., 1986)

(unit: Pesos)

Month	Collected Irrigation Fee in Kind - Kgs						Collected Fee in Cash	Total Cash Income
	Stock from Last Month	Collected	Sold	Loss	Stock for Next Month	Cash Income		
Nov., 1985	4,081	507,619			511,701		1,757,069	1,757,069
Dec.	511,701	655,758	695,803	26,294	445,362	3,538,294	2,655,654	6,193,948
Sub-Total	-	1,163,377	695,803	26,294	-	3,538,294	4,412,773	7,951,017
Jan., 1986	445,362	47,899	255,396	12,097	245,768	742,422	225,699	968,121
Feb.	245,768	7,405	76,006	-	177,168	237,908	185,116	423,024
Mar.	177,168	45,379	53,213	-	169,334	115,911	358,848	514,759
Apr.	169,334	815,926	239,781	-	745,478	761,222	1,142,782	1,904,004
May	745,478	1,554,754	417,457	5,486	1,877,309	701,879	2,318,721	3,020,600
Jun.	1,877,309	812,695	961,965	-	1,728,039	4,084,937	1,974,894	6,059,831
Sub-Total	-	3,284,058	1,983,798	17,583	-	6,684,279	6,206,060	12,890,339
Jul., 1986	1,728,040	58,331	520,434	10,436	1,255,500	1,843,368	303,948	2,147,316
Aug.	1,255,500	8,976	749,078	49,927	465,471	1,708,764	88,569	1,797,333
Sep.	465,471	64,069	426,722	6,249	96,569	2,193,399	197,552	2,390,951
Oct.	96,569	1,489,160	8,023	35,974	1,541,733	24,069	464,135	488,204
Sub-Total	-	1,620,535	1,704,257	102,586	-	5,769,600	1,054,204	6,823,804
Total	-	6,067,970	4,383,858	146,463	-	15,992,173	11,672,987	27,665.160

Source: MRIIS Office

TABLE H-13. ACTUAL INCOME AND EXPENSES OF MRIIS FOR 1985 OPERATION

Particulars	Head Office	District I	District II	District III	District IV	Sub-Total	Dam Dist	Total
Income								
1) Irrigation Fee	10,805	7,560,650	9,235,325	6,984,510	5,727,613	29,518,903		
2) Equipment Reutal	385,410	4,495	45,438	20,507	-	455,850		
3) NPC Cost Share							3,035,630	
4) Electric Bill of Iselco-I	99,480					99,480		
5) Building Rental	192,054	59,914	1,290	9,830	-	263,088		
6) Others	1,550,333	74,387	47,698	36,299	12,598	1,721,315	316,509	
Total	2,238,082	7,699,446	9,329,751	7,051,146	5,740,211	32,058,636	3,352,139	35,410,775
Expenses								
1) Personnel Services								
Salary and Wages	1,333,140	1,783,105	2,151,639	1,619,699	1,068,756	7,956,339		
Allowances	744,739	1,210,390	1,896,534	1,347,578	673,631	5,872,872		
GSIS	129,987	219,983	272,050	170,543	95,223	887,786		
Constractual Services	-	414,695	208,951	187,762	94,419	905,827		
Others	266,606	472,590	622,825	362,829	322,401	2,047,251		
Sub-total	2,474,472	4,100,763	5,151,999	3,688,411	2,254,430	17,670,075		
2) Maintenance and Other Services								
Traveling Expenses	42,707	6,854	12,345	3,158	4,565	69,629		
Supply and Materials	2,131,593	603,251	1,361,075	957,194	913,843	5,966,956		
Other Expenses	866,417	62,832	186,478	127,491	429,656	1,672,874		
Sub-total	3,040,717	672,937	1,559,898	1,087,843	1,348,064	7,709,459		
3) Power for Irrigation Pumps	-	-	-	4,268,592	898,302	5,166,894		
Total Expenses	5,515,189	4,773,700	6,711,897	9,044,846	4,500,796	30,546,428	14,561,482	45,107,910

TABLE H-14. O/M BUDGET ALLOCATION OF MRIIS FOR 1986 OPERATION

(Unit: 1,000 Pesos)

Particulars	Head Office	O/M Budget for MRIIS Districts of Service Area						Dam & Res. District	Grand Total
		Dist I	Dist II	Dist III	Dist IV	Retained at H.O.	Sub-total		
1. Personnel Services	3,884,750	3,500,726	4,168,218	3,801,000	3,497,923	1,341,777	16,309,678	6,252,285	26,446,713
2. Constractual Services		563,876	223,946	216,000	337,950	-	1,341,772	-	1,341,772
3. Collection Expenses							550,000	-	550,000
4. Power Expenses						7,190,000	7,190,000	-	7,190,000
5. Other O/M Expenses	729,791	719,735	716,515	670,329	696,825	156,245	2,959,649	2,848,979	5,808,628
a. Traveling Expenses		25,000	25,000	25,000	25,000	24,860	124,860	20,000	
b. Representation Allowance		3,000	3,000	3,000	3,000	7,205	19,205		
c. Supply and Materials		120,000	120,000	120,006	120,000	-	480,006	100,000	
d. Gasolin and Oil		402,525	402,525	402,525	402,525	-	1,610,100	420,000	
e. Uniform Allowance		7,900	7,200	6,000	2,400	-	23,500	13,100	
f. Motorcycle Allowance		66,070	66,050	33,558	63,660	-	229,330		
g. Insurance and Resistration		40,000	37,500	25,000	25,000	-	171,680	192,056	
h. Other Service		55,240	55,240	55,240	55,240	80,000	300,960	2,103,823	
6. Total Expenses	4,614,541	4,784,337	5,108,679	4,687,329	4,532,698	9,238,056	28,351,099	9,101,264	42,066,904