APPENDIX VI

MANAGEMENT OF OPERATION AND MAINTENANCE

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CHAPTER 1 GENERAL

The UPRIIS is the largest national irrigation system in the Philippines. The potential irrigation service area of the UPRIIS is about 116,900 ha. The UPRIIS Office owns all irrigation facilities in the area and is responsible for maintenance and repair of the facilities. With regard to operation, the UPRIIS Office has responsibility for the area above irrigation rotational area and water users are in charge of operation work within the irrigation rotational area in principle.

To ensure the efficient system management, the UPRIIS Office is responsible for the operation and maintenance and other services as follows:

1) Operation and maintenance of following irrigation facilities to distribute irrigation water properly to the service area

- Pantabangan dam & reservoir	
- Diversion dams	8 nos.
- Diversion canal	47 km
- Main canal	236 km
- Lateral canal	1,281 km
- Headgate & turnout	3,230 nos.
- Check structures	353 nos.
- Syphon	131 nos.
- Drainage culvert	213 nos.

2) Collection of irrigation service fees

3) Data processing and recording

4) Various irrigation services such as training extension for water users

In this Appendix VI, constraints on above works which UPRIIS Office has encountered were clarified and analyzed with respect to i) scheduling and control of irrigation delivery, ii) monitoring and communication, iii) procedure of irrigation service fee collection, iv) data processing and recording systems, v) facilities for operation and maintenance and vi) maintenance and repair of the system.

In order to solve such constraints on operation and maintenance in UPRIIS, management plan for operation and maintenance will be formulated under the following strategies:

1) Introduction of computerized telecommunication system

2) Establishment of operation rule

3) Irrigation service fee collection

4) Equipment for maintenance

The institutional study on UPRIIS organization for system management is carried out in Appendix VII, UPRIIS ORGANIZATION.

CHAPTER 2 PRESENT CONDITION

General irrigation system management of the UPRIIS is outlined in Fig. 6.1.

2.1 Planning of Irrigation Schedule

The Water Control Coordinating Center (WCCC) was organized under the Operations Manager of UPRIIS on December 1975 to handle the responsibility for the preparation of the irrigation water delivery operation plan, monitoring and evaluation of delivery and coordinating the activities of the District offices in matters pertaining to water delivery.

The Provincial Development Committee (PDC) and Agricultural Development Coordinating Council (ADCC) were established on 1977 integrating services of all government agencies involved in the irrigated agriculture in the UPRIIS. The provincial governor of Nueva Ecija is the chairman of PDC and honorary chairman of ADCC. The Operations Manager of UPRIIS is the chairman of ADCC.

The plan of irrigation schedule prepared by the WCCC is to be approved by the PDC & ADCC. The general procedure of planning in the present system is as follows:

1) The WCCC solicits from the four Districts the area they propose to be irrigated for the next cropping season about 2 months prior to the start of irrigation. The report from the every District will indicate the informations of area to be irrigated by system, kind of crop to be planted and the possible start date of water delivery.

2) Based on the reports, the WCCC will prepare the tentative plan of water allocation for the whole area considering the available storage in the reservoir and other water resources.

3) The tentative plan will be reviewed and checked by the Districts.

4) The reviewed plan will be finalized by the WCCC and submitted to the PDC & ADCC for approval.

5) The approved final program of water delivery schedule will be provided to all Districts, office of Dam and Reservoir Division and to the other government and private agencies, several weeks or possibly a month before the start of irrigation delivery.

The WCCC functioning as a centralized control and monitoring center, the valuable data of operation and hydrology are accumulated. Problems noted are the deficiencies in data processing and filing.

2.2 Control of Irrigation Water Delivery

For the control and monitoring of the irrigation water delivery, the guidelines were set-up by the WCCC.

At WCCC level, the decisions for irrigation water release from the reservoir and for control of diversion points under the WCCC, are made daily based on the following informations submitted by the Districts:

1) Weekly progress of farming activity report. This report contains the hectarage under land soaking, land preparation, normal irrigation, terminal drainage and the area harvested.

2) A daily record of discharges at major diversion points and rainfall.

3) A daily camp site report. It includes the daily release from the reservoir, inflow to reservoir and daily weather condition. All data are to be sent through radio communication network in a corded form.

At District level, the same procedures are practiced daily based on the weekly farming activity report, submitted by the Zone Engineer to the district Operations Engineer, and daily discharge records obtained through radio network.

The major problems in the operation and control of irrigation water are, as discussed before, the physical defects of control structures and measurement devices and insufficient communication network.

In addition to this, it should be noted that the hierarachy of operational staff is considered many such as from Ditchtender to the District Operations Engineer through AWMT, WMT and through Zone Engineer.

The quick and accurate operational action would be hindered through many steps of operational supervisions.

This indicates that the field personnel has tenuous connection with the operational staff in the office. The low irrigation efficiency in wet season also suggests dull or delayed response at field in spite of effort of office staff. The operational organization should be as simple as possible. Regarding the guidelines of WCCC, the detailed operational rule of daily, weekly and monthly is not clear.

It should also be noted that the operation relating to drainage is most neglected in the present operation. Excessive irrigation water is noticeable at field observation especially in wet season. The measurement of waste water from the tail of system is not practiced.

Constraints in the management and control of irrigation water delivery are explained in Fig. 6.2.

One of the constraining factors in the UPRIIS irrigation water delivery control is time-lag. Since the UPRIIS covers wide service area, the irrigation canal extends long conveyance length.

For the analysis of time-lag in the conveyance channel, the unsteady flow simulation method is adopted. The status of flow in the channel is simulated by converting the hydraulic insteady flow formula into the computerized numerical differentiation.

Field experiment was executed to obtain the representative value of the equivalent roughness coefficient for analysis selecting the canal of C-9 in the Peñaranda irrigation system.

Adopting the value of 0.035 as a representative roughness coefficient, the time-lag for each major canals and laterals is simulated. Necessary characteristics of canal such as canal gradient, bed width and side slope are obtained from the design drawings or construction drawings available. Discharge of canal for simulation is set at 1.2 ℓ/sec/ha.

The time-lag in the river or creeks is calculated assuming the flow velocity at about 0.5 m/sec. Based on the result of simulation, the longest time-lag is found between the Pantabangan dam and the terminal of the Peñaranda main canal at 65 hours or about 3 days equivalent to the average velocity of 0.45 m/sec. The longer time-lag will be certainly expected for the smaller discharge.

It is clear that the time-lag is one of the constraints inherent in the UPRIIS.

2.3 Monitoring and Radio Network

2.3.1 Hydrological Measurement

Staff gage and parshall flume are the measurement devices installed in the irrigation canals. The absence of workable control structures and lack of measurement devices even at major stream points were already reported in the "UPRIIS operation evaluation report 1975" prepared by WCCC. Evaluating from the conditions of existing measuring devices, there is no evidence of substantial and positive maintenance practiced for measurement devices. Accurate measurement is fundamental and indispensable factor for the proper operation of irrigation system.

Major flow points of measurement are presented in Table 6.1, and summarized as follows.

Hydrometeorological Stations

District	Station		Existing Instruments	
	Functional	Abandoned	Functional	Non-functional
I	11*	0	13 (11)	10 (5)
II	13	1	16 (12)	19 (10)
III	2	6	3 (2)	3 (2)
IV	9	0	16 (9)	0 (0)

( ): Nos. of raingage

* : Two stations under supervision of PAGASA and MRRTC

Discharge Measurement Stations

District	No. of Station		Functional Devices	
	Functional	Non-functional	Staff Gage	Parshall Flume
I	47	8	29	19
II	46	26	2	44
III	12	24	4	8
IV	104	2	80	24

2.3.2 Radio Network

Fig. 6.3 shows the existing communication radio network in UPRIIS. The micro wave tele-communication system connects Central Station (UPRIIS Office in Cabanatuan) with NIA Office (Quezon City) and Pantabangan Dam Site. Besides, VHF radio network is established between four (4) base stations (Districts I, II, III & IV), thirteen (13) field base stations (located in the main structure points such as diversion dams, radial gates and diversion points of canals) and three (3) mobile stations mounted in car or jeep. For the communication between field base station and portable station, the handy-VHF system (46 walkie-talkie) is used. Details are shown in Table 6.2.

However, the communication through the radio network is not always functionable because the radio network apparatuses are not well maintained. It is desired to increase the number of local stations so as to accomplish more smooth and efficient operation.

2.4 Irrigation Service Fee Collection

2.4.1 Rate of Irrigation Service Fee

Collection of irrigation fee is vital to the corporate life of the UPRIIS since it is considered as a major source to cover operation and maintenance cost are derived.

In normal case the rates of irrigation fees on irrigation systems operated and maintained by the National Irrigation Administration are determined under Memorandum Circular #61, Series 1974 as follows:

1) For the rice crops in gravity irrigation systems

   - 2 cavans of paddy per ha for the wet season crop,
   - 3 cavans of paddy per ha for the dry season crop, and
   - 3 cavans of paddy in case of a third crop;

2) For the rice crops in pumping irrigation systems

   - 3 cavans of paddy per ha for the wet season crop,
   - 5 cavans of paddy per ha for the dry season crop, and
   - 5 cavans of paddy per ha in case of a third crop;

3) For annual crops such as sugarcane and bananas, the cash equivalent at prevailing government price to 5 cavans of paddy per ha in gravity irrigation systems and 8 cavans of paddy per ha in pump irrigation systems;

4) For all other crops, the same rates as those for the rice crops shall apply, except that payment shall be made in cash amount equivalent to the rates of paddy at the prevailing government price.

For the UPRIIS, following special rates of irrigation service fee are applied under Board Resolution #2358-74:

1) For rice crop, 2.5 cavans per ha for wet season crop, 3.5 cavans per ha for dry season crop, and 3.5 cavans per ha in case of third crop;

2) For other crops, the same rate as that of rice crop except that payment will be the cash equivalent at prevailing government price;

3) For annual crops, the cash equivalent at prevailing government price to 6 cavans per ha.

2.4.2 Payment and Exemption of Irrigation Service Fee

Payment of irrigation service fee for rice crop is either in paddy or in cash equivalent at the prevailing government support price at the time of payment. For all other crops payment shall be made in cash equivalent at the current prevailing government support price at the time of payment. One cavan is 50 kg in net weight.

The exemption of irrigation fee in UPRIIS is granted in accordance with Republic Act No. 2152. The exemption is authorized by Operation Manager in Board Resolution #3504-80, 1980.

The exemption is applied to water users of whose an average actual harvest is only two (2) tons of paddy or less per ha, as a result of water shortage, calamities such as typhoon, flood, fire, widespread plant pest and rat infestation beyond the control of the water users and the like. However UPRIIS can no longer afford to apply the exemption due to serious financial condition.

2.4.3 Procedure of Irrigation Service Fee Collection

(1) Billing Procedure

Billing procedure necessary for irrigation service fee collection is outlined in Fig. 6.4. Based on the weekly list of irrigated and planted area (LIPA) prepared by Assistant Water Management Technician, Billing Clerk prepares bills for each lot on the said list and enters the bill into the irrigation fee register. Then Billing Clerk prepares statement of account covering back accounts and penalties. After approval by District Chief, bills and statements of account are distributed to the water users. In case that total crop failures occur due to water shortage, typhoon, flood, fire, widespread plant pest and rat infestation beyond the control of the irrigation water users, Assistant Water Management Technician as certains the lot with total crop failure with certification by staff of the Bureau of Agricultural Extension (BAEx) or the Bureau of Plant Industry (BPI) in the field. Assistant Water Management Technician prepares and submits the list of lots with total crop failure (LLTCF) to the District Chief, who verifies it in the field. District Chief approves and forwards the amendments to list of lots planted (ALIP) to the Billing Clerk with the advice to correct or adjust the affected bills concerned. Upon receipt of the advice of cancellation or adjustment, the Billing Clerk cancels or adjusts bills and statement of account accordingly, and prepares list of billed irrigation fee collectibles (LBIFC).

The procedure and paper necessary for billing of irrigation service fee are well prescribed and almost complete. However procedure is very intricate and many formats should be filled up within a short time. Sometimes format is modified in District Office as shown in Table 6.3. However distribution of bills is not alway practiced at the right time - sometimes even after the harvest period - and this

affects seriously irrigation fee collection. Major causes of such delayed distribution of bills are attributable to the following deficiencies:

1) Incomple and outdated land ledger;

2) Many formats necessary for billing procedure to be filled in within a short time;

3) No proper systematic distribution of bills: The results of questionnaire survey for 276 UPRIIS farmers indicate that delivery of fee bill and statement of account to UPRIIS farmers is carried out by various kinds of UPRIIS staffs as follows; and

Kind of Staff	Percentage (%)
Billing Clerk	3.5
Collector	34.9
Water Master	18.7
Gate Keeper	0.7
Ditchtender	18.0
Water Management Technologist	15.2
Water Management Technician	5.9
Others	3.1
Total	100.0

4) Lack of stationery and equipment necessary for bill preparation.

(2) Fee Collection and Remittance Procedure

General procedure of irrigation service fee collection and remittance is illustrated on Fig. 6.5 for cash basis and Fig. 6.6 in kind basis.

In the case of cash basis, bill collectors or deputized collectors collect irrigation service fee from individual water users on the basis of the list of billed irrigation fee collectibles and issues official receipts in numerical sequence for cash collections made in the field. Cashiers or collecting officers issue official receipt to the bill collectors/the deputized collectors for the amounts turned over to the cashiers. The cashiers or collecting officers, receive payment of irrigation fees in the office and remit collections at least once a week or whenever collected amounts reach ₱500 by Philippine National Bank's draft to Treasury Department, National Irrigation Administration Central Office in Quezon.

In the case of kind basis, bill collectors or deputized collectors issue receipts to water users upon receiving payments in paddy from them, and bring the paddy so collected to UPRIIS's collection center or NIA warehouses with hauling certification issued by team leader or his representative. Property custodians receive paddy from the bill collectors or from the collection team leaders and issue paddy payment made in the office. He also keeps and maintains stock cards for all paddy received and released to NFA or private grain trader. NIA representative at NFA acknowledges receipt of paddy from collection team representative or from the property custodian. He takes custody and negotiates the sale of paddy to NFA. The cashiers issue official receipts for payment of paddy sold to NFA or private grain trader.

In collecting paddy for payment of irrigation fee, allowance of six (6) kg per one cavan collected in payment of irrigation fee in kind is applied to compensate for expected shrinkage, impurity and inferior quality of paddy. However this quantity is not enough to cover substantial hauling and storage costs, losses and spoilage and selling expenses for the collected paddy. In addition to quality of paddy, the UPRIIS faces to difficulties in drying, classification, storage and sale.

Though procedures of irrigation fee collection and remittance are as adequate as the billing procedure, the following deficiencies are found:

1) Due to incomple and outdated land ledger and record of payment status of water users, efficiency of irrigation fee collection is often seriously affected.

2) It is considered on the basis of the questionnaire survey on farmers that irrigation fee collection is not always systematically carried out. Actual fee collection is done as follows:

Actual Fee Collector	Percentage (%)
Collector	43.3
Water Master	15.9
Gate Keeper	0.7
Ditchtender	18.7
WMT	13.8
AWMT	5.5
Others	2.1
Total	100.0%

It is noticed that about 60% of fee collection is collected by staff other than collectors.

3) Fee collection is made from individual water users and therefore, volume of collection work is very large.

2.5 Recording

The operation and maintenance of the irrigation service areas in the UPRIIS are carried out through administrative irrigation blocks running from irrigation rotational area, section, division, zone, district to the whole UPRIIS. The monitoring and recording of the operation and maintenance in the UPRIIS are also executed in the same manner as mentioned above through the hierarchy comprising i) Ditchtender, ii) Assistant Water Management Technician, iii) Water Management Technologist, iv) Zone Engineer, v) Operation Engineer, vi) District Chief and vii) Operations Manager.

Ditchtender is responsible for the monitoring and recording of the O&M work in the two rotational irrigation area (100 ha). Assistant Water Management Technician supervises the work at section level (500 - 150 ha) commanded by about five ditchtenders. Likewise Water Management Technologist takes charge of the same work for division level (2,500 ha) and Zone Engineer manages the work at zone level (10,000 ha). Operations Engineer has responsibility for the work at district level under supervision of the District Chief. Operations Engineer supervises such work in the whole UPRIIS area. In short, the monitoring and recording work in the whole UPRIIS is generally carried out through so many steps as seven (7) steps from subordinates, Ditchtender to superior, Operations Manager. Subsequently it takes long time to go through the due steps in the monitoring and recording of the O&M work. In spite of efforts rendered and time spent, delayed submission and inaccuracy of data are sometimes observed, which made proper management of operation in the UPRIIS difficult. For example, delivery of irrigation water is, in principle, carried out by the Water Control Coordinating Center (WCCC) on the basis of the weekly farming activities collected through the said steps. However transmittal of the information on farming activities to WCCC is often delayed. So the irrigation water delivery including operation of Pantabangan dam reservoir is often not executed in accordance with the actual data but the prospective data estimated by the WCCC.

Another problem in operating systems is the large number of documents which must be prepared. In the UPRIIS, many kinds of reports are prepared. In the UPRIIS, many kinds of reports are prepared daily, weekly, monthly, quarterly, semi-annually, annually and occasionally.

Prescribed reports from District offices to Operations Manager and from Operations Manager to Central NIA, Quezon City are listed in Tables 6.4 and 6.5, respectively, which indicate that about one hundred (100) kinds of reports are prepared throughout the year.

In connection with recording and reporting systems for systems management, the following problems are identified:

1) Large volume of paper processing

2) Inaccuracy of data

3) Unstandardized formats for paper processing

To solve such problems, it is requisite to rationalize data processing by the following measures: i) Standardization of processing formats, ii) Simplification of data system and iii) Introduction of computer system.

The conditions of filling and keeping data are not always good. This is mainly due to the shortage of equipment and instruments necessary for filing/keeping systems as well as no proper operational rule of the said systems.

2.6 Communication

Communication in the UPRIIS can be broadly divided into two: i) internal communication and ii) external communication for irrigation water users.

There exist several internal communication methods in the UPRIIS: i) meeting/conference, ii) official written memorandum circulars, iii) bulletin board, iv) public address, v) newsletter such as "Pananaw", vi) micro wave/radio communication systems and vii) others. Among those, meeting and conference systems are the most important for internal communication among the field staffs. The meeting systems in the UPRIIS are illustrated in Fig. 6.7. Fifteen (15) kinds of regular and/or occasional meetings except staff, ADCC and PDC meetings are held among NIA-UPRIIS staffs; from the top "operations manager" to the subordinate "ditchtenders". As indicated in Fig. 6.7, many meetings are held and meeting systems are quite different from districts. Though these meetings provide good internal communication from subordinates to superiors, simplification and standardization of these systems will be required for efficient mutual understandings among the UPRIIS staff.

On the other hand external communication for the irrigation water users is carried out through: i) the personal exchange of ideas in the field, ii) programs such as live-in seminar-workshop for irrigators' group leaders and one-day echo seminar, iii) mass media such as broadcast station of DWNE, iv) printed/written matters and v) others. The face to face communication with farmers is not as good as the UPRIIS staff expected, as mentioned in the later section. As one of the most important factors, poor comprehension between the UPRIIS field staff and farmers is pointed out by the questionnaire survey. And lack of effective transportation also contributes to the wider gap in such communication. With regard to training, the UPRIIS is conducting the training program for farmers as well as their leaders (IGLs). Due mainly

to shortage of fund, training period and contents for such live-in seminar-workshop for IGLs and one-day echo seminar are not always sufficient. The dessimination of informations on irrigation farming, compaign of fee collection, etc. is scarcely carried out through printed/ written matters in the UPRIIS.

2.7 Maintenance and Repair

Maintenance and repair works for irrigation facilities are classified into two (2) categories according to the work required. One is the rehabilitation or improvement of facilities. This requires the construction works and is usually undertaken during non-irrigation period. The other is daily routine works to keep facilities in good operating conditions and to prevent excessive worn-out.

The rehabilitation works greatly depend on the budget availability. In the present status of irrigation facilities, evaluating from the field observation, there are good number of structures to be rehabilitated. Some of those requires urgent rehabilitation.

Problems noted in the field are deficiency of the daily maintenance and minor repairs. Most of the operable gates have no lubricating oil. This will cause difficulties in operation, inexpedient load on lifting mechanism. Vegetation control is not satisfactorily practiced for lower reach of laterals and sub-laterals. Vegegation will disturb the flow capacity and accelerate siltation.

2.8 O & M Facilities

Number of O & M equipments and their condition as of 1983 are listed in Table 6.6.

Out of 59 service vehicles such as jeep, wagon, tamaraw excluding motorcycle, 12 have need of repair in the whole UPRIIS. As to trucks including light and dump trucks, 54 are workable out of 72. Utilization of service vehicles and trucks are efficient.

As for heavy equipments, on the other hand, about 50% of them need repair. Number of workable bulldozer is not sufficient. Compaction machinery is none except 3 compactors which need repair. The list of heavy equipments indicates that the major works of construction and rehabilitation were excavation and hauling and less attention was paid for solid compaction of canal embankment and slope.

2.9 Administrative Work

Functions of the UPRIIS are carried out though its Main Office composed of Office of the Operations Manager and support Divisions, and the District Offices (I - IV). The former provides the necessary administrative supports to achieve optimum irrigation and maintenance, whereas

the latter undertakes the function of operation, maintenance, improvement and rehabilitation of the irrigation systems.

The Administrative Division in the UPRIIS-Main Office deals in principle with the general affairs including personnel & records, accounting, cash general services and property and procurement.

2.10 Other Works

In addition to operation & maintenance and administrative works, UPRIIS executes construction works, organizational set-up of farmers and training and research works.

Activities of construction works include rehabilitation of the facilities damaged by typhoon, improvement of irrigation facilities and structures, the expansion of the irrigation systems in the Aurora Peñaranda Irrigation Project (APIP), project systems development and other small works. Among these activities, expansion of irrigation systems in APIP was the largest works, occupying 61% of total construction works in monetary value in 1982.

With regard to the set-up of farmers' organization, it is reported that except in the extension area of District IV, Farmer-Irrigators' Groups (FIGs) was completely organized. Under the guidance of the UPRIIS and also with the assistance of farmers' organization specialists of Agriculture Division, FIGs are being federated at section level.

However, only 24 staffs actually take charge of research & training for 46,100 beneficiaries-farmers. It means that one staff is responsible for 1,920 farmers. With its staff limited, Agriculture Division (AD) conducts: (1) Live-in training for irrigators group leaders (IGLs), (2) One day echo-seminar for FIG farmer-members and (3) FIA officers training. From 1978 to 1982, 988 IGLs, 34,443 FIG farmer-members and 63 FIA officers attended already the said UPRIIS training programs. The detailed results of training program are given in Table 6.7.

As to research, AD carries out various works through application and demonstration to increase agricultural productivity.

CHAPTER 3 PROPOSED PLAN

3.1 Planning of Irrigation Schedule

The planning procedure being practiced in WCCC at present is evaluated appropriate. In addition to this, the hydrological and statistical analysis will be intensified in the planning process. It is proposed as follows.

Planning of irrigation schedule will be prepared by three stages, long-term plan, yearly plan and seasonal plan and be submitted for the approval of PDC-ADCC.

(1) Long-term Plan

The long-term irrigation plan will be prepared once in 3 to 4 years. This plan will define the targets which all UPRIIS staffs aim to realize by the end of planning year. These targets will include total irrigated area, irrigation efficiency, reservoir volume to be attained at the end of planning year, irrigation fee collection rate, crop production and specified targets of maintenance.

Evaluating from operations and experiences in the previous years, the plan will be prepared based on the predicted water balance studies. The long-term plan will be evaluated at the end of planning period.

(2) Yearly Plan

Before the start of wet season, usually from March to May, the yearly plan will be prepared for coming wet and dry seasons in accordance with the long-term plan. Several alternative statistical studies will be included in this planning procedure. The alternative water balance studies are, for example, to be made for the combinations of proposed irrigated crop area and irrigation schedule against drought year, normal year and rainy year of appropriate probability. The decision on selecting the plan will be based on the estimated reservoir volume at the end of year and calculated risk against probability of occurrence. The long-term weather forecast from PAGASA will be referenced in the said study.

(3) Seasonal Plan

Seasonal plan for wet season will be included in the said yearly plan. Seasonal plan for dry season will be prepared in line with the yearly and long-term plans.

The planning and evaluation will be the responsibility of Planning and Evaluation Section under the Planning and Operations Divisions. A hydrologist is assigned in this section and statistical analysis for previous seasons is included in the evaluation report. The evaluation report will be issued yearly.

3.2 Control of Irrigation Water Delivery

The Water Distribution and Control Section in the central office and the Operation Section in the district office are to be responsible for the delivery and control of irrigation water. An innovative method is proposed here for the management and control of water distribution. It is centralized monitoring system (CMS).

It is considered to be the basic principle for any kind of management that the good management is realized through the preparation of good plan, collection of sufficient and accurate field data, good evaluation and decision for control, quick and accurate practice at the field and through feed back response from the field.

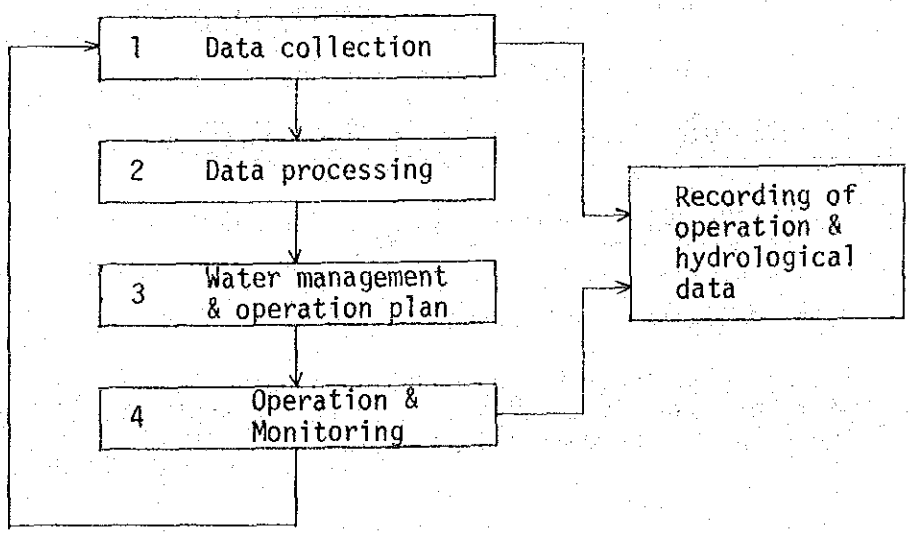
The accurate practice of control of the irrigation water at field will become possible after the implementation of rehabilitation and improvement works of facilities. The CMS and the establishment of operation rule are thus proposed to satisfy the other items of management principle.

3.2.1 Centralized Monitoring System

The purposes of this system are the collection of field data within short time, processing the data, monitoring the field operation and improvement of recording and filing system. The CMS composed of a central station, base stations and field stations connected with the telecommunication network.

(1) Irrigation Water Management System

The irrigation water management system under the centralized monitoring facilities is expressed by the following work flow:

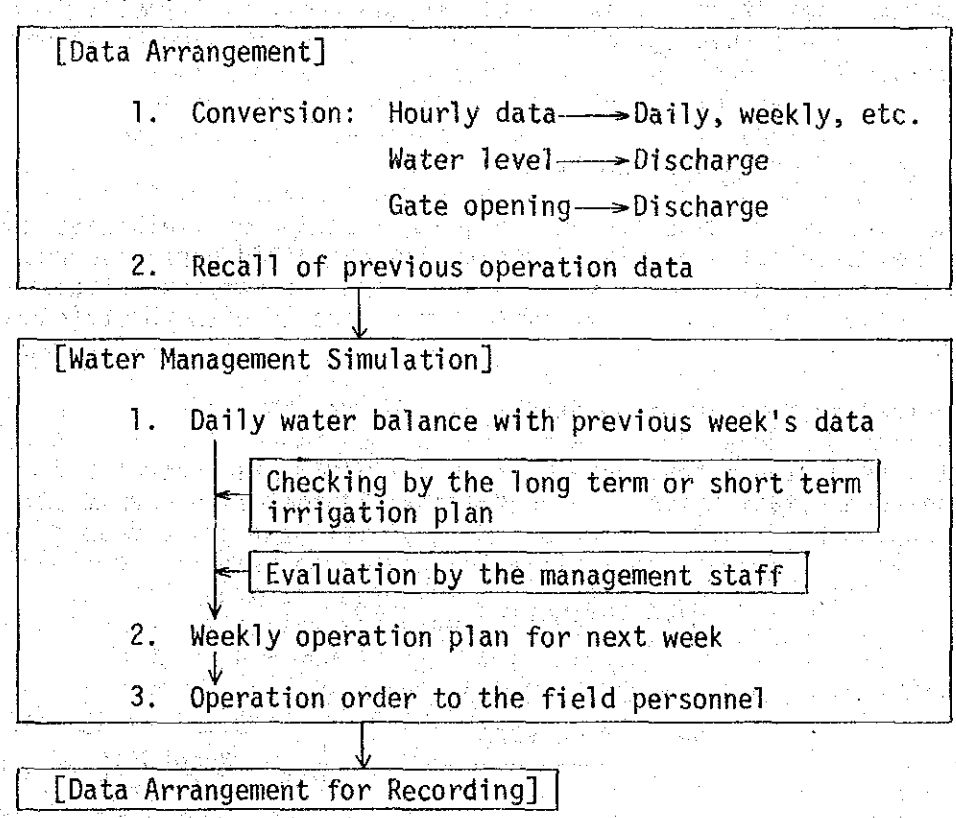


1) Data Collection

This component means the start of irrigation water management. The data required for the operation are farming activity and hydrological data such as hourly rainfall, river water level, canal water level, gate opening, reservoir water level and inflow/outflow from the Pantabangan dam.

2) Data Processing

Major activities of the data processing are composed of three items. These are the conversion of the collected data into the necessary dimensions required for the operation, preparation of operation plan by execution of the water balance simulation and management of operation and hydrological data for recording. The work flow of data processing is expressed as follows:



3) Water Management and Operation Plan

The water management and operation plan will be prepared at each District level in accordance with the seasonal irrigation plan. The plan will be composed as follows:

a) Seasonal Management Plan

In accordance with the seasonal irrigation plan of UPRIIS, each district office will prepare the seasonal management plan by each irrigation system. This plan will clarify the proposed irrigation area, irrigation schedule, cropping calender, etc.

b) Monthly Management Plan

After the irrigation has started, the seasonal plan is always checked and corrected by the daily water balance study and monthly water distribution plan will be prepared for the next month.

c) Weekly Operation Plan

This plan is to be made for the following week's operation from the result of water balance study for the previous week based on the operation monitoring records. The weekly operation plan will indicate the planned amount of irrigation water delivery at each point of the field.

4) Operation and Monitoring

According to the weekly operation plan, the field personnel will set the irrigation facilities to control the irrigation water delivery. It should be noted that the minimum operation term is not a day but week. So that the control facilities will be set at the beginning of the week and will not be changed except in case of the order from the district office. The irrigation water distribution and hydrological features will be monitored by the field personnel and field monitoring station through the telecommunication network.

(2) Monitoring System Layout

The proposed system is to be the Centralized Monitoring System. The centralized monitoring and control system (remote control system) is not proposed considering following reasons:

1) The communication system is limited at wireless network.

2) In case of wireless communication, the response time will be 5 to 10 seconds for one unit action, which is too slow for the remote control.

3) The telephone network is not sufficient and there is no supplemental communication available. The remote control system may be unreliable in case of emergency.

Therefore, the operation system to be proposed in UPRIIS is the remote monitoring system. The control of irrigation facilities will be the manual control by the gatekeeper. The self control system may be introduced for such facilities as diversion dam intake gates, in case the electricy is available. General concept of the monitoring system is shown in Fig. 6.8.

1) Monitoring Station Layout

Central Station

The central station is located at the central office in Cabanatuan. The station will be facilitated with mini-computer, disc-memory, display panel, operation console, display monitor, typewriter, telemeter, receiver/transmitter, interface unit and supplemental machines.

Major functions are:

a) Collection of water management data from the base stations, processing the data, displaying on the panel and monitoring.

b) Computer processing on the water balance, and statistical and other necessary calculations.

c) Storing the water management data in the disc-memory, processing the data and filling through typewriter.

d) Transmitting the management and control order to the base stations.

e) Computer processing on administrative matters including billing, irrigation fee collection and others.

Base Station

The base stations are located at four (4) district offices and the Pantabangan dam office. It will be facilitated with mini-computer, floppy disc-memory, display board, operation console, display monitor, typewriter, telemeter, receiver/transmitter, interface unit and other supplemental machines.

The major functions are as follows except at dam station:

a) Collection of water management data from field stations, displaying on board and typewriter and monitoring.

b) Computer processing on the water balance and other necessary calculations.

c) Storing the water management data, processing the data and filing through typewriter.

d) Transmitting the management and control order to the field personnel and to the field stations.

e) Computer processing on administrative matters including billing, irrigation fee collection and others. The farmers' Assistance Division can use the computer facilities in the base station at District I office.

Field Station

There are two types of field stations, one is the station with operator and the other is without operator. The field stations with operator are such as diversion dam station and major head gate stations where an operator is always stationed. This type of field station will work as the field head quarter which receives the control order from the base station and transmit to the field personnel.

The other type of station is facilitated with the measuring devices such as rainfall and water level gage and telemeter unit. The function of the station is only collecting and transmitting data to the base station by no man control.

The proposed station layout is shown in Fig. 6.9. The list of proposed field stations by District are shown in Table 6.8 and summarized as follows:

Number of Stations

Station	District I	District II	District III	District IV	Pantabagan Dam	Total
1. Base Station	1	1	1	1	1	5
2. Field Station	9	13	15	11	-	48
Diversion dam	2	4	1	1	-	8
Head gate w/operator	4	6	9	7	-	26
Head gate w/o operator	3	3	5	3	-	14
Water level gage	14	20	30	24	2	90
Raingage	3	5	8	3	1	20

2) Telecommunication Network

The telecommunication system is composed of telemeter and communication network. The wireless radio system will be introduced as a communication network to cover the whole irrigation service area considering the small density of telephone network at present. The wireless radio system will be the VHF symplex wireless radio network which is proposed to utilize the following wave frequency:

170.225 MHZ 164.125 MHZ	utilized at present
170.45 MHZ 170.25 MHZ	under application by NIA

The poling system for communication network is recommended in which one main receiver/transmitter at central or base station corresponds to many number of field stations.

The communication between the District III base station and the central station will be connected by wire line. The antenna tower is utilize by both stations. The output power of radio transmitter will be defined by the field examinations.

3.2.2 Hydrological Measurement

Hydrological measurements are the key informations for operation. Re-arrangement of hydrometeorological stations is necessary together with the introduction of telecommunication network. It will be necessary to arrange the communication rule between the UPRIIS Office and other agencies such as PAGASA, CLSU and IRRI concerning the transferring of hydrometeorological data. Automatic raingage is not recommendable for the hydromet stations except for those stations included in the telecommunication network. The most of automatic raingages are non-functional at present, there may be deficiencies in the instrument or difficulties in maintenance.

As for the discharge measurement, rehabilitation works of instrument at the non-functional measurement points shown in Table 6.1 are required. Improvement work such as canal lining will be proposed for major stream gaging points.

The maintenance of accuracy of measurement is the responsibility of the hydrologist at the central office. Physical maintenance such as desilting near by measurement devices is the responsibility of the maintenance section at each District Office. All effort is to be concentrated in the maintenance accuracy through the checking of rating curve by flow measurement.

Hydrometeorological data will be stored in the proposed computer system and be processed as mentioned before.

3.2.3 Proposed Operation Rule

The establishment of the operation rule is aiming at gaining of the higher irrigation efficiency, equitable distribution of irrigation water and same quality of control at each irrigation systems. One of the most critical constraints in the present management of irrigation water distribution exists at the low irrigation efficiency which is caused by deficiencies in operation and control. Such deficiencies are, as being pointed in the previous sections, shown in Fig. 6.2.

The simulation study of water balance for present condition reveals that the low irrigation efficiency as much as 30% in wet season is caused mainly by the ineffective utilization of effective rainfall. Also the study gives the valuable informations for the introduction of optimum operation rule.

The proposed operation rule will be of simple and easy to operate. Followings are the basic principles of the proposed operation rule.

1) It is proposed to set up an unit operation period.

2) It is proposed to fix a certain amount of daily rainfall as a standard value to modify the amount of water supply.

The daily operation simulation study was conducted as presented in Appendix II, and the results gave the optimum operation period at one week and the standard daily rainfall value at 30 mm/day.

The operation rule is, therefore, expressed as follows.

1) Unit operation period is one week. The control structures in a system will be set according to the irrigation schedule on the first day of the week and there will be no change of control within the week unless daily rainfall exceeds 30 mm/day.

2) If the rainfall amount of exceeding 30 mm/day is monitored, the irrigation supply will be stopped for the respective irrigation system from the next day until the end of the week.

3) Checking by Water Balance Calculation

   a) At the beginning of the week, the daily water balance for the previous week will be executed based on the farming activity, daily rainfall and the amount of water supplied.

   b) As for the farming activity record, investigation is required only at the beginning of the season on the following points.

      - actual farming area and variety
      - start and end of transplanting

      The irrigation water requirement will be calculated by applying the above investigations. Modification of farming activity may be made if necessary during the irrigation season.

   c) At the first day of the week after concluding the water distribution, the control order will be transmitted from the district office to the field personnel through telecommunication system. The central office will cordinate with the four districts.

4) The condition of flow and water distribution will be monitored by the patrol of field personnel and through CMS. If the distribution is found skew from the schedule, necessary readjustment will be ordered from the base stations to the field personnel.

5) At the time of closing the irrigation supply during the week and readjustment at the first day of the week, the way and order of gate operation will be finalized through the experimental practice in the field.

The realize this rule, it is necessary to fulfill the several conditions. The daily irrigation water balance is to be calculated to decide the amount of irrigation supply for the next week in accordance with the last week operation. The computer of each district office is to be utilized for this purpose.

The order to control or change the control structures is to be quick and simple. The telecommunication system is to be utilized for this.

It is necessary to make farmers understand that there will be a period of absence of irrigation water supply.

As for the time-lag, the fundamental and complete solution may be given only by having storage functions within the canal system. However, the above operation rule will contribute through the following aspects:

1) The operation is based on one week interval which can absorb the time-lag effect.

2) As the control is practiced with the whole irrigation system at certain fixed day, the check gates will be so operated as to store the water in the canals. This stored water will function to shorten the time-lag.

Emergency Operation:

The emergency operation will be classified into three cases as follows:

1) Typhoon

2) Troubles at main receiver/transmitter

3) Troubles at major control points

It is necessary to establish the operation rules according to the case of emergency.

In case of typhoon, the operation rule will be prepared corresponding to the signal number issued from PAGASA.

In case of machinery trouble, one of the base stations except dam station will take over the troubled station's takes.

As for the third case the detailed operation rule will be prepared assuming possible occurrence of troubles at each major control points such as the Pantabangan dam, diversion dams, etc.

3.3 Proposed Recording System

One of the major purposes to introduce the computer system in the UPRIIS is the simplification of monitoring and recording systems at present. The basic data of operation and administration will be stored and processed through the computer at any time when required. The greater part of effort being paid for preparation of report and for filing will be reduced and the accuracy of data will be reserved.

The major items to be integrated into the computer processing are as follows

(1) Hydrometeorological Data

Rainfall, river discharge, evaporation, etc.

(2) Operation and Control Data

Discharge at major canal points, dam operation, etc.

(3) Fee Collection Data

List of beneficiaries, status of payment, farmer size, etc.

(4) Agricultural Data

Yield, kind of crop varieties, etc.

3.4 Irrigation Service Fee Collection

In view of the present situation of irrigation service fee (ISF) collection explained in Appendix VII, the proposed plan on ISF collection is formulated focussing on the following main points:

(1) Method of Collection

At present, ISFs are collected directly from individual farmers by bill collectors or deputized collectors. But, to alleviate the burden of the NIA-UPRIIS, it is recommended that farmers' organizations be consolidated so as to collect ISFs by themselves and remit them to UPRIIS Office.

(2) Proper Record Keeping

To systematize the record keeping, the list of beneficiaries-farmers, their address, status of payment, etc. which serve as basic data for collection of ISFs will be properly stored and processed by the computer installed in each district office.

(3) Preparation of Billing and Collection Documents

In principle, the documents necessary for ISFs collection will be prepared by the UPRIIS and delivered to beneficiaries-farmers through Farmer Irrigation Associations (FIAs).

(4) Payment of ISFs in Kind

Taking into account various constraints created by collection in kind, it is estimated that allowance of six (6) kg per cav. collected in payment of ISFs in kind is not enough to cover all expenses incurred on the collected palay.

Accordingly, it would be advantageous on the whole to abolish the option to pay ISFs in kind or to increase the allowance more than ten (10) kg to recoup such losses.

(5) Rate of Interest Applied for Imposition of Penalties

Considering the current interest rate on loans (around 24% per annum or 2% a month) and penalties imposed in tax payments (surcharge of 10 - 20% and interests at the rate of 14 - 20% per annum), the present penalty charge of 1% per month for non-payment of ISFs seems too low to discharge effectively the deliquency.

Consequently, to be effective, it is recommended to impose heavier penalty in case of willful neglect.

(6) Exemption from Payment of ISFs

Because of procedural, managerial and financial constraints pointed out in Appendix VII, it seems very hard for the NIA-UPRIIS to carry out the Board Resolution approving exemption from irrigation fees on damaged crop (in case of 40 cav. or less per ha).

Virtually, this kind of problem due to natural calamity which is mostly considered as "force majeure" is often beyond the control and guarantee of one irrigation system.

It is therefore expected that such matter related to the stabilization of livelihood of farmers will be considered with a wise field of vision including various remedial measures such as crop insurance, natural disaster relief fund, accident compensation, etc.

3.5 Maintenance and Repair

The maintenance activity will be reinforced through the improvement of organization and engineering. According to the proposed plan of farmers organization, there will be about 865 of Farmer Irrigation Associations (FIA) to be set-up in UPRIIS. The area covered by one FIA will be under the sub-lateral or approximately less than 200 ha. Minor maintenance and repair works within FIA, that is under sub-lateral, are

to be transferred to FIA farmers. These works will be vegetation control, small scaled desilting, lubrication of turnout gates, etc. The engineering support will be given by the UPRIIS staff. The maintenance works of UPRIIS staff will be concentrated on the major canals.

The engineering staff will be transferred to the maintenance section to strengthen the maintenance activity. It is proposed to intensify the daily maintenance activities with good cooperation between the maintenance section and the operation section. The field operational personnels will be given responsibility over the daily maintenance works. It is always necessary to conduct repair works as early as possible.

3.6 Proposed Operation and Maintenance Facilities

As it is discussed in the previous section, the computer system and telecommunication network are proposed for the operation of the UPRIIS. The periodical maintenance, repair and necessary supply such as paper, ribbon, etc. will be included in the O&M costs explained in Appendix X.

The existing O&M equipments in the UPRIIS offices are listed in Table 6.6. As shown in the table, the present conditions of the equipments are classified into three types; i) A-1: good conditions, ii) A-2: need minor repair and iii) A-3: need major repair.

Additional equipments required for the operation and maintenance (O&M) works are proposed to be procured through the following examination for the utilization of the existing equipments.

1) The equipments of good condition are utilized with provided spare parts.

2) The equipments which need minor repair are also utilized with provided spare parts after repair.

3) As for the equipments which need major repair, they will be replaced if necessary.

4) Evaluating from the existing heavy equipments, most of the equipments are suitable for the construction works but they have overcapacity for the O&M works. Furthermore the compacting equipments are less in number.

5) There are many light equipments such as truck, jeep and motorcycle in the UPRIIS offices. To carry out the proper O&M works, the number of these equipments are not enough and other equipments such as current meter, walkie-talkie and so on are necessary to be procured.

All the equipments including the existing ones will be rearranged to belong to the each district offices and the dam management office. The head office will have no heavy equipments but necessary number of light vehicles such as jeeps and motorcycles for the operation and management.

Required civil works for maintenance of the UPRIIS system will be the responsibility of the district office.

The equipments are rearranged as shown in Table 6.9 and the new equipments to be procured are listed in Table 6.10.

The cost of O&M equipments is estimated based on the repair cost and cost of spair parts for the existing equipments and procurement cost of the new equipments. The cost estimate of the equipments is summarized in Table 6.11.

CHAPTER 4 COST ESTIMATE

Necessary equipments for the centralized monitoring system are summarized as follows in reference with the Fig. 6.8:

(1) Central Station & Base Stations

Equipment	Central Station	Base Station	Pantabangan Dam Station
1. Central Processing Unit	1	1 x 4	1
2. I/O Typewriter	2	2 x 4	1
3.1 Operation Console with Display	2	2 x 4	-
3.2 Operation Console	-	-	1
4.1 Fixed Disc System	1	-	-
4.2 Floppy Disc System	-	1 x 4	1
5. Magnetic Tape System	1	1 x 4	-
6. Graphic Panel	1	1 x 4	-
7. Telemeter Unit	1	1 x 4	1
8. Wireless Radio Unit	1	1 x 4	1
9. Antenna	-	1 x 4	-
10. Battery, Generator Unit	-	1 x 4	1

(2) Field Stations

Equipment	Diversion Dam	Field Stations	
		With Operator	Without Operator
1. Telemeter Unit	1 x 8	1 x 26	1 x 14
2. Wireless Radio Unit	1 x 8	1 x 26	1 x 14
3. Interphase & Antenna Unit	1 x 8	1 x 26	1 x 14
4. Water Level Gage Unit	3 x 8	55	35
5. Raingage	1 x 8	6	14
6. Operator Quarter	-	1 x 26	-

The implementation cost is estimated as shown in Table 6.12. The total implementation cost is about ₱109 million including the cost for the spare parts.

Table 6.1(1) HYDROLOGICAL MEASUREMENT STATIONS

District I. HYDROMETEOROLOGICAL STATIONS

	Location	Exting Instrument	
		Functional	Non-functional
1.	TRIS Dam	Standard raingage	1. Automatic raingage 2. Evaporation pan
2.	Camanacsacan	Standard raingage	1. Automatic rainage 2. Evaporation pan
3.	Tondod		1. Standard rainage 2. Evaporation pan 3. Automatic raingage
4.	Baloc	1. Standard rainage 2. Automatic raingage 3. Evaporation pan	
5.	Quezon	Standard raingage	1. Automatic raingage 2. Evaporation pan
6.	Ilog Baliwag	1. Automatic raingage 2. Standard raingage 3. Evaporation pan	
7.	Comitang	1. Automatic raingage 2. Standard raingage	Evaporation pan
8.	Tabuloc	Standard raingage	
9.	Sapang Kawayan	Standard raingage	
10.	CLSU		
11.	MRRTC		

Remarks: Items 10 & 11 are Agro-meteorological stations, all instruments are functional. Supervision are under PAG-ASA and MRRTC personnel, respectively.

Table 6.1(2) HYDROLOGICAL MEASUREMENT STATIONS

District I. DISCHARGE MEASURING DEVICES

	Location	Type/Size	Condition
1.	TRIS MC Hdgte	Staff gage	functional
2.	LAT A	1.5 m staff gage	-do-
3.	Lat. B	1.0 m staff gage	-do-
4.	Lat. C	1.0 m staff gage	-do-
5.	Lat. D	2.0 m staff gage	-do-
6.	Lat. D-1	1.0 m staff gage	-do-
7.	Lat D-2	-do-	-do-
8.	Lat D-3	-do-	-do-
9.	Lat D-4	-do-	-do-
10.	Lat D-4 (after DC-2)	-do-	-do-
11.	Lat D (after DC-2)	1.5 m staff gage	-do-
12.	Lat D-5	1.0 m staff gage	-do-
13.	Lat D-6	-do-	-do-
14.	Lat E	1.5 m staff gage	-do-
15.	Lat F	2.0 m staff gage	-do-
16.	Lat F-1	2.0 m staff gage	-do-
17.	Lat F1-a	1.0 m staff gage	-do-
18.	Lat F1-a (after DC-2)	1.0 m staff gage	-do-
19.	Lat F (after DC-2)	2.5 m staff gage	-do-
20.	Lat G	Parshall flume	-do-
21.	SAE MC	2.0 m staff gage	non-functional due to siltation
22.	Lat A	staff gage	-do-
23.	Lat A-1	-do-	-do-
24.	Lat A-2	-do-	-do-
25.	Lat A-3	-do-	-do-
26.	Supply to 5 Bay checkgate (SDA)	staff gage	functional
27.	SDA MC	2.5 m staff gage & 5 ft. parshall flume	-do-
28.	Lat A	parshall flume	-do-

(to be continued)

Table 6.1(3) HYDROLOGICAL MEASUREMENT STATIONS

	Location	Type/Size	Condition
29.	Lat A-1	parshall flume &	functional
		1.0 m staff gage	-do-
30.	Lat Ax	staff gage	-do-
31.	Lat B	parshall flume	-do-
32.	Lat B-2	-do-	-do-
33.	Lat B-3	-do-	-do-
34.	Lat B-4	-do-	-do-
35.	Lat B-5	-do-	-do-
36.	Lat B-6	-do-	-do-
37.	Lat B-7	-do-	-do-
38.	Lat B-8	-do-	-do-
39.	MC before Lat B	20 m staff gage	-do-
40.	Lat C	parshall flume	submerged
41.	Lat D	-do-	functional
42.	Lat E	-do-	-do-
43.	Lat F	-do-	-do-
44.	Lat Ex	-do-	-do-
45.	Lat G	-do-	-do-
46.	Lat H	-do-	-do-
47.	Lat I	-do-	submerged
48.	Lat J	-do-	functional
49.	Lat G-1	-do-	non-functional
50.	Lat G-2	1.50 m staff gage	functional
51.	Lat G-3	2.0 m staff gage	-do-
52.	Lat G3-A	staff gage	-do-
53.	Lat G3-B	staff gage	-do-
54.	Lat G3-C	staff gage	-do-

Table 6.1(4) HYDROLOGICAL MEASUREMENT STATIONS

District II. HYDROMET STATIONS

Location	Existing Instruments	
	Functional	Non-functional
1. Rizal Dam	ABANDONED	
IRRI Station*	1. Standard rainage 2. Evaporation pan	
2. Cabucbucan	Standard raingage	1. Evaporation pan 2. Automatic raingage
3. Piñahan	Standard rainage	1. Evaporation pan 2. Automatic raingage
4. Talabutab	Standard raingage	1. Evaporation pan 2. Automatic raingage
5. Mataas na Kahoy	Standard rainage	1. Evaporation pan 2. Automatic raingage
6. Kabulihan (IRRI)*	1. Standard rainage 2. Evaporation pan	
7. Lat. C-1 (IRRI)*	1. Standard raingage 2. Evaporation pan	
8. LTRIS DAM		1. Standard raingage 2. Evaporation pan 3. Automatic raingage
9. Lat F-3, Gen. Ricarte	Standard raingage	1. Automatic raingage 2. Evaporation pan
10. SIBUL (IRRI)*	1. Standard raingage 2. Evaporation pan	
11. VCIS DAM	Standard raingage	1. Evaporation pan 2. Automatic raingage
12. MCIS DAM	Standard raingage	1. Evaporation pan 2. Automatic raingage
13. Bantug DM-9	-do-	1. Evaporation pan 2. Automatic raingage
14. Bibiclat, DM 9C	ABANDONED	

* Under supervision of IRRI Personnel

Table 6.1(5) HYDROLOGICAL MEASUREMENT STATIONS

District II. DISCHARGE MEASURING DEVICES

Location	Type/Size	Condition
PRIS MC	2.0 m Steel S.G.	Functional
Lat C Hdgt	12' P.F.	-do-
Sub Lat C1 Hdgt	10' P.F.	-do-
C1a Hdgt	.41 m P.F.	-do-
C2 Hdgt	.60 m P.F.	-do-
C3 Hdgt	.61 m P.F.	-do-
C4 Hdgt	1.22 P.F.	-do-
C4a Hdgt	1.22 P.F.	-do-
C4b Hdgt	0.30 m P.F.	-do-
C5 Hdgt	1.20 m P.F.	-do-
C5a Hdgt	0.90 m P.F.	-do-
Lat D Hdgt	0.61 m P.F.	-do-
E Hdgt	1.0 m S.G.	Not functional Missing
Bicos Spillway (Murcon	3.0 m S.G.	-do-
Lat F Hdgt supply)	1.6 m Over head P.F.	Functional
F1 Hdgt	0.68 m P.F.	-do-
F2 Hdgt	0.61 m P.F.	-do-
F3 Hdgt	1.22 m P.F.	-do-
F3a Hdgt	1.0 m P.F.	-do-
F4 Hdgt	0.60 m P.F.	-do-
F5 Hdgt	0.61 m P.F.	-do-
F6 Hdgt	0.60 m P.F.	-do-
LTRIS M.C.	10' P.F.	-do-
Lat A Hdgt	1.0 m StG.	-do- absolete no rating table
B Hdgt	0.60 m P.F.	96% submerged
E Hdgt	0.90 m P.F.	-do-
F Hdgt	0.60 m P.F.	-do-
G Hdgt	0.60 m P.F.	Functional
H Hdgt	1.0 m S.G.	-do- absolete no rating table
I Hdgt	1.0 m S.G.	-do- -do-
Sibul Feeder Canal	1.5 m S.G.	-do- -do-
LTRIS SUPPLY (Padlao)	1.0 m S.G.	-do- -do-
RMA (DCI)		
DCI Rad. Gate #1	Radial Gate	Functional
DCI-A Hdgt	0.60 m P.F	-do-
B Hdgt	0.90 m P.F.	-do-
D Hdgt	0.90 m P.F.	-do-
E Hdgt	0.60 m P.F.	-do-
F Hdgt	0.60 m P.F.	-do-
Fx Hdgt	0.90 m P.F.	-do-
G Hdgt	0.60 m P.F.	-do-
GI Hdgt	0.60 m P.F.	-do-
H Hdgt	0.90 m P.F.	Submerged
HI Hdgt	0.60 m P.F.	100% submerged
H2 Hdgt	0.60 m P.F.	90% submerged
VACA Spillway	1.50 m S.G.	Not functional, missing s.g.

(to be continued)

Table 6.1(6) HYDROLOGICAL MEASUREMENT STATIONS

Location	Type/Size	Condition
VCIS		
M.C.	8' P.F.	90% submerged
VC 1	0.90 m P.F.	100% submerged
2	0.58 m P.F.	96% submerged
3	0.90 m P.F.	Functional
3a	0.60 m P.F.	-do-
4	0.60 m P.F.	-do-
5	0.90 m P.F.	96% submerged
MCIS		
M.C.	10' P.F.	Functional
DM 1	1.20 m P.F.	-do-
2	1.5 m P.F.	Missing
3	0.90 m P.F.	Functional
4	0.30 m P.F.	Functional
5	0.60 m P.F.	-do-
6	1.0 m S.G.	Missing
7	0.90 m P.F.	Functional
7a	0.60 m P.F.	-do-
8	0.60 m P.F.	-do-
8a	0.60 m P.F.	-do-
9	1.50 m P.F.	-do-
9a	0.60 m P.F.	-do-
9b	not operational demolished	
9c	0.60 m P.F.	Functional
10	1.22 m P.F.	Free flow
10a	0.60 m P.F.	-do-
11	converted to t.o.	-do-
12	0.60 m P.F.	submerged
CM	1.5 m S.G.	no rating table

Table 6.1(7) HYDROLOGICAL MEASUREMENT STATIONS

District III. HYDROMETEOROLOGICAL STATIONS

Location	Existing Instrument	
	Functional	Non-functional
1. PBRIS Dam	1. Standard raingage 2. Evaporation pan	Automatic raingage
2. Bangad	ABANDONED	
3. Soledad	-do-	
4. Mallorca	-do-	
5. San Juan	-do-	
6. Pamaldan	-do-	
7. Maliolio	1. Standard raingage	1. Automatic raingage 2. Evaporation pan
8. Lambakin	ABANDONED	
9. Cabanatuan	Transferred to CLSU	

Table 6.1(8) HYDROLOGICAL MEASUREMENT STATIONS

District III. DISCHARGE MEASURING DEVICES

Location	Type/Size	Condition
1. PBRIS Hdgt	4 m staff gage	functional
2. Lat A	Parshall flume	-do-
3. Lat B	-do-	-do-, no staff gage
4. Lat Bx	-do-	-do-, no staff gage
5. Lat C		
6. Lat D-1x		
7. Lat D	1 m staff gage	functional
8. Lat D-1		
9. Lat Dx		
10. Lat E	Parshall flume	submerged
11. Lat E4	-do-	-do-
12. Lat Ex		
13. Lat F	Parshall flume	functional
14. Lat F-3	-do-	submerged
15. Lat F-4	-do-	-do-
16. Lat G	-do-	functional
17. Lat Gx		
18. PBRIS spill to Tambo creek		
19. Spill from Tambo checkgate		
20. Tambo supply to BBMC		
21. Supply to BBMC for Lat Gx		
22. Lat J		
23. Lat H		
24. DC #2 Hdgte	2 m staff gage	functional
25. DC #2 after caro/creek	3 m staff gage	-do-
26. Lat DC #2 ax	Parshall flume	submerged
27. Lat DC #2a	-do-	-do-
28. Lat DC #2b	-do-	functional
29. Lat AM Hdgte	Parshall flume	-do-, no staff gage
30. Lat AM-1		

(to be continued)

Table 6.1(9) HYDROLOGICAL MEASUREMENT STATIONS

Location	Type/Size	Condition
31. Lat AM-3	Parshall flume	submerged
32. Lat AM-4	-do-	-do-
33. Lat AM-5	-do-	functional
34. Lat AM-6	-do-	-do-
35. Lat AM-7	-do-	submerged
36. Lat I	-do-	-do-
37. Lat III	-do-	-do-
38. Lat IV	-do-	-do-
39. Lat V	-do-	-do-
40. Lat VII	-do-	functional
41. Lat A	-do-	submerged
42. Lat Ax	-do-	-do-
43. Lat G	-do-	-do-
44. Lat Bx	-do-	functional
45. Lat B	-do-	-do-
46. Lat Cx	-do-	submerged
47. Lat C		
48. Lat F	Parshall flume	submerged
49. Lat D	-do-	functional
50. Lat E	-do-	submerged

Table 6.1(10) HYDROLOGICAL MEASUREMENT STATIONS

District IV. HYDROMET STATIONS

Location	Existing/Functional Instruments
1. PNRIS Dam	Standard Raingage
2. Mangino	1. Standard raingage
	2. Evaporation pan
3. Poblacion	1. Standard raingage
	2. Evaporation pan
4. Concepcion	Standard raingage
5. Bulak	1. Standard raingage
	2. Evaporation pan
6. Mangga	1. Standard raingage
	2. Evaporation pan
7. Salacot	1. Standard raingage
	2. Evaporation pan
8. Minalungao	1. Standard raingage
	2. Evaporation pan
9. Makatolang	1. Standard raingage
	2. Evaporation pan

Table 6.1(11) HYDROLOGICAL MEASUREMENT STATIONS

District IV. DISCHARGE MEASURING DEVICES

	Location	Type/Size	Condition
1.	PNRIS supply from G-2	Staff gage	functional
2.	PNRIS inflow	2 m. staff gage	-do-
3.	PNRIS spill	staff gage	-do-
4.	PNRIS Hdgte	-do-	-do-
5.	Lateral A	-do-	-do-
6.	Lat. B	2 ft. Parshall flume	-do-
7.	Lat. B-1	1 m. staff gage	-do-
8.	Lat B-2	2 ft. Parshall flume	-do-
9.	Lat B-3	1 m. staff gage	-do-
10.	Lat C	12 ft. parshall flume	-do-
11.	Lat C-1	3 ft. parshall flume	-do-
12.	Lat C1-A	1 m. staff gage	-do-
13.	Lat C1-B	1 m. staff gage	-do-
14.	Lat C1-C	-do-	-do-
15.	Lat C1-D	-do-	-do-
16.	Lat C-4	-do-	-do-
17.	Lat C4 X	-do-	-do-
18.	Lat C-5	3 ft. parshall flume	submerged
19.	Lat C-6	1 1/2 m. staff gage	functional
20.	Lat C-7	1 m. staff gage	-do-
21.	Lat C-8	-do-	-do-
22.	Lat C-9	12 ft. parshall flume	-do-
23.	Lat C9-A	1 m. staff gage	-do-
24.	Lat C9-B	-do-	-do-
25.	Lat C9 B-1	-do-	-do-
26.	Lat C9B-2	-do-	-do-
27.	Lat C9C	1 ft. parshall flume	-do-
28.	Lat C9D	2 ft. parshall flume	-do-
29.	Lat C9E	1 m. staff gage	-do-
30.	Lat C9E-1	1 m. staff gage	functional

(to be continued)

Table 6.1(12) HYDROLOGICAL MEASUREMENT STATIONS

	Location	Type/Size	Condition
31.	Lat C9E-2	1 m. staff gage	functional
32.	Lat CX	1 1/2 m. staff gage	-do-
33.	Lat CX-1	1 ft. parshall flume	-do-
34.	Lat CX-2	1 m. staff gage	-do-
35.	Lat. CX-3	-do-	-do-
36.	Lat CX3-A	-do-	-do-
37.	Lat CX3-B	-do-	-do-
38.	Lat CX3-C	-do-	-do-
39.	Lat CX3-E	-do-	-do-
40.	Lat CX-4	-do-	-do-
41.	Lat CX-5	-do-	-do-
42.	Lat CX5-A	-do-	-do-
43.	Lat CX-6	-do-	-do-
44.	Lat CX-7	-do-	-do-
45.	Lat CX-8	-do-	-do-
46.	Lat CX8-A	-do-	-do-
47.	Lat CX8-B	-do-	-do-
48.	Lat CX8-C	-do-	-do-
49.	Lat CX-9	-do-	-do-
50.	Lat CX9-A	-do-	-do-
51.	Lat CX-10	-do-	-do-
52.	Lat CX10-A	-do-	-do-
53.	Lat CX-11	-do-	-do-
54.	Lat CX-12	-do-	-do-
55.	Lat CX-13	-do-	-do-
56.	Lat D	staff gage	-do-
57.	Lat D-1	1 m. staff gage	-do-
58.	Lat D-2	-do-	-do-
59.	Lat D-3	2 ft. parshall flume	-do-
60.	Lat D-4	2 ft. parshall flume	-do-
61.	Lat D-5	-do-	submerged

(to be continued)

Table 6.1(13) HYDROLOGICAL MEASUREMENT STATIONS

	Location	Type/Size	Condition
62.	Lat D-6	1 m. staff gage	functional
63.	Lat D6-A	-do-	-do-
64.	Lat D-7	2 ft. parshall flume	-do-
65.	Lat D-8	-do-	-do-
66.	Lat D-9	1 ft. parshall flume	-do-
67.	Lat D-10	1 m. staff gage	-do-
68.	Lat D-11	-do-	-do-
69.	Lat D11-A	-do-	-do-
70.	Lat D-12	-do-	-do-
71.	Lat EX	-do-	-do-
72.	Lat E	1 ft. parshall flume	-do-
73.	Lat F	3 ft. parshall flume	-do-
74.	Lat F-1	1 ft. parshall flume	-do-
75.	Lat F-2	2 ft. parshall flume	-do-
76.	Lat F-3	1 m. staff gage	-do-
77.	Lat G	2 ft. parshall flume	-do-
78.	Lat H	-do-	-do-
79.	Lat. I	-do-	-do-
80.	Lat J	1 1/2 m. staff gage	-do-
81.	Lat J-1	1 m. staff gage	-do-
82.	Lat J-2	2 ft. parshall flume	-do-
83.	Lat J-3	1 m. staff gage	-do-
84.	Lat J-4	-do-	-do-
85.	Lat K	-do-	-do-
86.	Lat K-1	-do-	-do-
87.	Lat L	2 ft. parshall flume	-do-
88.	Lat M	1 ft. parshall flume	-do-
89.	Lat N	1 ft. parshall flume	-do-
90.	Lat O	staff gage	-do-
91.	Lat P	1 m. staff gage	-do-
92.	Lat Q	-do-	-do-
93.	Linao Feeder canal	1 1/2 m. staff gage	-do-

(to be continued)

Table 6.1(14) HYDROLOGICAL MEASUREMENT STATIONS

Location	Type/Size	Condition
94. Manual south M.C.	1 m. staff gage	functional
95. Manual north M.C.	-do-	-do-
Other discharge measuring devices along creeks/river		
96. Awayan creek	1 m. staff gage	-do-
97. Balante creek	-do-	-do-
98. Cababao creek	-do-	-do-
99. Cambabalo creek	-do-	-do-
100. Kandulian creek	-do-	-do-
101. Garlang river	1 1/2 m. staff gage	-do-
102. Ilog Bulo river	2 m. staff gage	-do-
103. Guimaligan creek	1 m. staff gage	-do-
104. Linao creek	1 1/2 m. staff gage	-do-
105. Manual creek	-do-	-do-
106. Taluate creek	1 m. staff gage	-do-

Table 6.2(1) STATUS OF RADIO COMMUNICATION EQUIPMENTS
(As of July, 1983)

Type	No. of Unit	Location	Condition
A. UPRIIS HEAD OFFICE			
SSB	1	Radio room	G*
Microwave	1	Radio room	O**
VHF (Base)	1	Radio room	G
VHF (Mobile)	2	Operation Manager	G
		Coordinator WCCC	O
B. DISTRICT I			
SSB	1	Radio room	O
VHF (Base)	1	Radio room	G
VHF (Mobile)	1	Division Manager	G
VHF (Sub-base)	4	TRIS dam	G
		Sto. Domingo area	G
		Sta. Rita	G
		Rad. GTE No. 3	O
Walkie-talkie	9	Operation Eng.	G
		Main Eng.	G
		Hydrologist	G
		Zone Eng (Z-1)	G
		Zone Eng (Z-2)	G
		Zone Eng (Z-3)	G
		WMT (Z-1)	O
		WMT (Z-2)	G
		WMT (Z-3)	G
C. DISTRICT II			
VHF (Base)	1	Radio room	O
VHF (Mobile)	2	Radio room	G
		Division Manager	G
VHF (Sub-base)	5	Radio room	G
		Vaca Dam	O
		Murcon Dam	G
		PRIS Dam	O
		Curva, Rizal	O
Walkie-talkie	13	Zone Eng. (Z-1)	G
		Rizal, N.E. (gatekeeper)	G
		Talavera Hydrologist	G
		Cabanatuan, O Manager	G
		Talavera, N.E.	G
		Talavera, Opera. Eng.	G
		WMT	O
		WMT	O
		WMT	O
		WMT	O
		WMT	O
		WMT	O
		Main Eng.	O

(to be continued)

Table 6.2(2) STATUS OF RADIO COMMUNICATION EQUIPMENTS

Type	No. of Unit	Location	Condition
D. DISTRICT III			
VHF (Mobile)	1	Division Manager	G
VHF (Sub-base)	6	Cabanatuan	G
		Cabanatuan	G
		Cabanatuan	G
		Palayan	O
		Jaen	O
		?	O
Walkie-talkie	5	Division Manager	G
		2-Zone Eng.	G
		Irr. Engineer B	G
		Act. Engineer B	G
E. DISTRICT IV			
Microwave	1	Radio room	O
VHF (Base)	1	Radio room	G
VHF (Mobile)	1	Division Manager	O
VHF (Sub-base)	4	Radio room	G
		PENRIS Dam	G
		PENRIS Proper	G
		PENRIS Extension	G
Walkie-talkie	17	Division Manager	G
		Per. Eng.	O
		Maintenance Eng.	G
		Hydrologist	G
		3-Zone Eng.	G
		3-WMT	G
		7-Dist. Office, Gapan	G
F. DAM/RESERVOIR DIVISION			
SSB	2	Pantabangan Dam	G
		Canili Dam	G
Microwave	1	Pantabangan Dam	O
VHF (Base)	2	Pantabangan Dam	G
		Canili Dam	G
Walkie-talkie	2	Masiway	G

Grand total / Type	Condition: good (No.)	Condition: out of order (No.)	Condition: out of order (%)	Total No.
SSB	3	1	25	4
Microwave	0	3	100	3
VHF (Base)	5	1	17	6
VHF (Sub-base)	12	7	37	19
VHF (Mobile)	6	1	14	7
Walkie-talkie	37	9	20	46

Remarks: * G : good condition

** O : out of order

Table 6.3 CHECK LIST OF BILLING AND COLLECTION FORMS

	Forms Stipulated in the Manual	District I	II	III	IV
1.	Irrigation Fee Register	o	o	o	o
2.	Watermaster's/WMT Weekly Report on Planted Area (From B-2)	o	o	o	o
3.	Acknowledgement (From B-2)	x	o	o	o
4.	Bill and Statement of Account (Form B-3)	o		o	o
5.	List of Lots with Total Crop Failure due to Water Shortage, Infestation, Flood, etc. (Form B-4)	o	o	o	o
6.	Amendments to List of Lots Planted (Form B-5)	x	o	x	o
7.	List of Billed Irrigation Fee Collectibles for the _____ Cropping Season Ending _____, 19 _____ (Form B-6)	x	o	o	o
8.	Certification for Exemption (Form E-1)	o	o	o	o
9.	Request for Exemption (Form E-2)	o	o	o	o
10.	Acknowledgement Receipt (Form C-1)	o	o	o	o
11.	Weekly Report of Irrigation Fee in Kind (Form C-2)	o	o	o	o
12.	Summary of Weekly Report of Collection in Kind (Form C-3)	o	o	o	o
13.	Hauling Certification (Form C-4)	o	o	o	o
14.	Delivery Receipt (Form C-5	o	o	o	o
15.	Weekly Report of Irrigation Fee in Kind Purchased by NFA (Form C-6)	x	x	o	x
16.	NIA Remittance Advice (Form R-1)	o	o	o	o
17.	Monthly Summary of Remittance to NIA Corporate Treasurer by Cashiers/Collecting Officers of _____ (Form R-1)	o	x	o	
18.	Irrigation Fee Billing and Collection Work Plan I & II (Form M-1)	x	x	x	o
19.	Monthly Inventory of NIA Palay Stock (Form M-2)	x	x		o
20.	Paly Received during the Month of _____, 19 _____ Schedule I (Form "a) Schedule II (Form M-2b)	o		o	o
21.	Irrigation Fee in Kind Collections for the Month _____, 19 _____ (Form M-3)	x	x	o	o
22.	Irrigation Fee Cash Collections & Remittances (Form M-4)		x		o
23.	Irrig-tion Fee Collectibles (Form M-5)		x		o
24.	List of Deliquent Collectors (Form M-6)	o	o	o	o

Remarks: o: Used
: Modified
x: Not used

Table 6.4 LIST OF PRESCRIBED REPORTS FROM DISTRICT OFFICE TO OPERATIONS MANAGER

Source	Title	Frequency
1. Administration	Cash Utilization	Monthly
	Status of Fund	-do-
	Quarterly Report of Income and Expenses	Quarterly
	Balances of Sub-allotment Advices	Monthly
	Cost Report	-do-
	Obligation Incurred	-do-
	Summary of Disbursement	-do-
	Report of Disbursement	-do-
	Report of Checks Issued and Cancelled	Monthly
	Semi-annual Report of Leaves of Absences, Earned Enjoyed and Balance	Semi-annually
	Monthly Report of Manpower Utilization	Monthly
	Report of Emergency Purchases	-do-
	Inventory of Supplies and Materials	-do-
	Fuel and Electricity Consumption Report	-do-
	Status of Security Unit to PCSUSIA Report	-do-
	Performance Rating	Semi-annually
	Report of Overtime Services	Monthly
	Summary of Every Fifty Bills	-do-
	Evaluation Report of Fuel Consumption	-do-
2. Operation	Summary of Daily Discharge	Daily
	Weekly Farming Activities	Weekly
	Operation and Maintenance Report	Monthly
	Hydrometeorological Report	-do-
	Operation and Maintenance Monitoring Report	Quarterly
	Harvest Report	Semi-annually
	Annual Report of Irrigated and Planted Area	Annually
3. Maintenance	Monthly Progress Report	Monthly
	Quarterly Progress Report	Quarterly
	Fuel Consumption Evaluation Report	Monthly
	Materials and Office Supplies Report	-do-
	Monthly Equipment Utilization Report	-do-
4. Collection	Report of Monthly Collection	Monthly
	Collection Report and Irrigation Collection Status	Weekly

Table 6.5(1) LIST OF PRESCRIBED REPORTS FROM UPRIIS OFFICE TO NIA CENTRAL

	Title of Reports	Frequency	Dep. in Charge
(A)	Engineering and Operation Division		
	1. Monthly Progress Report (const. & rehab.)	Monthly	SMD
	2. Irrigation Fee Collection Report	Monthly	TD
	3. PDC Report	Monthly	Governor, N.E.
	4. Electric & Fuel Consumption Report	Monthly	SMD
	5. Operation and Maintenance Report	Monthly	SMD
	6. Harvest Report	Semi-annually	SMD
	7. Report on Irrigated & Benefited Area	Semi-annually	SMD
	8. Monitoring O & M Plan	Quarterly	SMD
(B)	Equipment Division		
	1. Monthly Summary Report of Operation, Maintenance and Repair Cost	Monthly	EMD
	2. Equipment Utilization Report	Monthly	EMD
	3. Inventory Report of Properties	Annually	EMD
	4. Enercon Report	Monthly	EMD
	5. Inventory & Inspection Report of Unserviceable Property	Occasional	EMD
(C)	Agricultural Division		
	1. Monthly Progress Report	Monthly	IAD
	2. Quarterly Report	Quarterly	IAD
	3. Annual Report	Annually	IAD
(D)	Dam and Reservoir Division		
	1. Hydro-Meteorological Observation & Reading	Daily	SMD
	2. Monthly Progress Report	Monthly	SMD
	3. Quarterly Progress Report	Quarterly	SMD
	4. Annual Report	Annually	SMD
(E)	Administrative Division		
	1. Manpower Utilization Report	Monthly	PMD
	2. Report of Leaves , Enjoyed & Balances	Seasonal	PMD
	3. Monthly Report of Leaves		
	4. Personnel Strength Report	Annually	CSC
	5. Assets and Liabilities of Personnel	Annually	PMD
	6. Performance Rating	Semi-annually	PMD
	7. List of Detailed Employees	Quarterly	PMD
	8. Monthly Procurement Report	Monthly	PPD
	9. Yearly Inventory Report	Annually	PPD
	10. Monthly Report of Accountabilities	Monthly	PPD
	11. Report of Disbursement Paid & Check	Monthly	TD
	12. Report of Checks Issued and Cancelled		TD
	13. Vehicular Accident Report	Occasional	GSD
	14. Issual Work Accident, Illness Exposure Data Report	Occasional	GSD
	15. Claim for Death/Disability Compensation & Hospitalization Claims	Occasional	GSD

(to be continued)

Table 6.5(2) LIST OF PRESCRIBED REPORTS FROM UPRIIS OFFICE TO NIA CENTRAL

Title of Reports	Frequency	Dep. in Charge
16. Other Incident Cases of Fire, Theft, Trouble, Robbery, Typhoons and other Related Disaster	Occasional	GSD
17. Yearly Status of Security Report for UPRIIS	Annually	GSD
18. Training Program Attended by UPRIIS Personnel	Annually	GSD
19. Training Program conducted by UPRIIS	Annually	GSD
20. Trial Balance (with copies of all journal vouchers drawn)	Monthly	CSD
21. Report of Obligations Incurred for Capital Outlay	Monthly	CSD
22. Monthly Collection Efficiency Report	Monthly	CSD
23. Monthly Status of Accounts Receivable	Monthly	CSD
24. Monthly Equipment Rental, Billing and Collection Report	Monthly	CSD
25. Duplicate Copies of Reports of Disbursement by Checks (with copies of journal vouchers closing account 70-790 to reciprocal account 71-100-199)	Monthly	CSD
26. Monthly Report on NFA Collections of Irrigation Fees in Kind	Monthly	CSD
27. Statement of Collecting Offices Account Balances	Quarterly	CSD
28. Statement of Disbursing Officers Account Balances	Quarterly	CSD
29. Statement of Operating Expenses by Responsibility Center		
30. Quarterly Statement of Liquidation of Accounts Payable	Quarterly	CSD
31. Statement of Sub-Allotment Release	Quarterly	CSD
32. Certified True Copy of General Ledger of 71-100-199)	Quarterly	CSD
33. Semi-annual of Accounts Payable	Semi-annually	CSD
34. Semi-annual Statement of Accounts Receivable	Semi-annually	CSD
35. Detailed Statement of Subsidiary Ledger Balances		
36. Aging of Accounts Payable	Semi-annually	CSD
37. Preliminary Trial Balance	Annually	CSD
38. Final Trial Balance	Annually	CSD
(F) WCCC		
1. Evaluation Report for Operation	Annually	SMD
2. Irrigation Operation Plan	Annually	SMD

OM : Operations Manager, UPRIIS
SMD : Systems Management Dep.
EMD : Equipment Maintenance Dep.
PMD : Personnel Management Dep.
CSC : Civil Service Commission
PPD : Procurement Properties Dep.
TD : Treasury Dep.
GSD : General Services Dep.
CSD : Controllership Dep.
FAD : Irrigator's Assistance Dep.

Table 6.6(1) O & M EQUIPMENTS

(As of May 1983)

Type of Equipment	Condition	E.D.	O&M Staff	A.D.	O.R.D.	D-I	D-II	D-III	D-IV	Total	Grand Total
(A) Light Equipment											
1. Toyota Jeep	A-1	2	5	1	6	5	2	5	5	31	
	A-2	0	0	0	1	1	0	2	4	8	39
2. Jeep Nissan Patrol	A-1	0	0	0	0	2	1	0	1	4	4
3. Kaiser Jeep	A-3	0	0	0	0	0	0	1	0	1	1
4. Toyota Station Wagon	A-1	0	1	0	0	0	1	0	0	2	2
5. Toyota Tamaraw	A-1	0	1	2	0	1	0	0	1	5	
	A-2	0	0	0	0	1	1	0	0	2	7
6. Toyota Hi-Lux	A-1	0	1	0	0	0	0	1	2	4	
	A-2	0	0	0	1	0	0	0	0	1	5
7. Volkswagen Car	A-1	0	1	0	0	0	0	0	0	1	1
8. Yamaha or Suzuki Motorcycle	A-1	0	7	11	14	45	59	70	88	294	
	A-2	0	0	2	2	2	10	1	17	34	328
9. Mitsubishi Pick-up	A-1	0	2	0	1	0	2	0	0	5	5
10. Toyota Pick-up	A-1	1	0	0	3	1	3	4	5	17	
	A-2	0	0	0	0	0	3	2	2	7	24
11. Toyota Coaster	A-1	1	0	0	0	0	0	0	0	0	1
12. Isuzu Cargo Truck	A-1	0	0	0	0	0	0	0	2	2	
	A-2	0	0	0	0	0	0	0	1	1	3
13. Stake Truck	A-1	0	0	0	0	3	3	2	0	8	
	A-2	0	0	0	2	0	1	0	0	3	11
14. Dump Truck	A-1	0	0	0	2	3	5	4	7	21	
	A-2	0	0	0	0	1	0	0	3	4	
	A-3	0	0	0	0	0	0	3	0	3	28
(B) Heavy Equipment											
1. Mobile Crane											
- P&H RI25	A-2	1	0	0	0	0	0	0	0	1	
- P&H 4357C	A-2	0	0	0	1	0	0	0	0	1	
- Sumitomo LS78	A-1	0	0	0	0	0	1	2	1	4	
	A-2	0	0	0	0	2	0	0	4	6	12
2. W & Shyo											
- G 660	A-2	1	0	0	0	0	0	0	0	1	
- G 800	A-2	0	0	0	0	1	1	2	1	5	6
3. O&K Forklift V 20	A-2	1	0	0	0	0	0	0	0	1	1

Table 6.6(2) O&M EQUIPMENTS

(As of May 1983)

Type of Equipment	Condition	E.D.	O&M Staff	A.D.	O.R.D.	D-I	D-II	D-III	D-IV	Total	Grand Total
4. Tractor											
- IH	A-1	2	0	0	0	0	0	0	0	2	
- Ford F5000	A-1	0	0	0	1	0	0	0	0	1	
	A-2	0	0	0	2	0	0	0	1	3	6
5. Grader	A-1	0	0	0	1	2	2	2	1	8	
	A-2	0	0	0	0	0	2	2	2	6	14
6. Dozer											
- Komatsu D65A	A-1	0	0	0	1	0	0	0	2	3	
	A-2	0	0	0	0	0	3	0	4	7	
- Komatsu D50P	A-1	0	0	0	0	0	0	1	0	1	
	A-2	0	0	0	0	1	0	2	0	3	
- " D41	A-1	0	0	0	0	0	1	1	1	3	
	A-2	0	0	0	0	0	0	1	0	1	
- Cat D6C	A-1	0	0	0	0	1	0	3	0	4	
	A-2	0	0	0	0	0	1	1	0	2	24
7. Yutani Poclain	A-1	0	0	0	0	1	0	1	1	3	3
8. Air Compressor	A-1	0	0	0	0	0	1	0	0	1	1
9. Cat Loader	A-1	0	0	0	0	2	2	0	1	5	
	A-2	0	0	0	1	1	0	2	1	5	10
10. Allis Chalmers	A-1	0	0	0	0	0	0	0	1	1	
	A-2	0	0	0	0	0	0	0	1	1	2
11. Back Hoe	A-1	0	0	0	0	1	0	1	1	3	
	A-2	0	0	0	0	0	1	0	1	2	5
12. Transit Mixer (Hino)	A-2	0	0	0	0	0	0	0	1	1	1
13. Dynamic Compactor	A-2	0	0	0	0	0	1	0	2	3	3

Remarks: A-1: Good condition
A-2: Need minor repair
A-3: Need major repair
E.D.: Equipment Division
O&M Staff: Operation and Maintenance Staff
A.D.: Agriculture Division
D.R.D.: Dam & Reservoir Division
D-I: District I

Table 6.7 DETAILED RESULTS OF TRAINING PROGRAMS IN THE UPRIIS

a) LIVE-IN TRAINING FOR IGLs

District	Number of Trained Farmers					
	1978	1979	1980	1981	1982	Total
I	80	70	37	39	46	272
II	104	72	28	34	32	270
III	95	73	27	36	38	269
IV	50	32	39	37	19	177
Total	329	247	131	146	135	988

b) ONE DAY ECHO-SEMINAR

District	Number of Attendance					
	1978	1979	1980	1981	1982	Total
I	736	753	788	2,610	2,515	7,402
II	730	756	712	1,892	857	4,947
III	1,381	895	2,282	5,189	5,314	15,061
IV	1,235	911	1,318	2,690	879	7,033
Total	4,082	3,315	5,100	12,381	9,565	34,443

c) FIA OFFICERS TRAINING

District	Attendance	Months Conducted
I	21	Aug. 14 & 18, 1982
II	14	Oct. 1 & 18, 1982
III	28	Sept. 3 & 6, 1982
IV	-	-
Total	63	

Table 6.8(1) LIST OF PROPOSED FIELD STATION

Station	Location	Water Level Gage	Rainfall Station	Remarks
District I				
1. Diversion Dam	Talavera Diversion Dam	3	1	Diversion dam type
	5-Bay Diversion Dam	2	1	- do -
2. Field Station				
TRIS MC	Lateral D HGT	2	1	Station with operator
	Lateral G HGT	2	-	Station without operator
	Sub-lateral G-3 HGT	1	-	- do -
DC-1	Lateral F HGT	1	-	Integrated into one station, without operator
	Lateral F-1 HGT	2	-	- do -
	SDA Supply HGT	2	1	Station with operator
SDA MC	Lateral B HGT	2	-	- do -
	Lateral F HGT	2	1	- do -
District II				
1. Diversion Dam	Pampanga Diversion Dam	3	1	Diversion dam type
	Loner Talavera Diversion Dam	3	1	- do -
	Vaca Diversion Dam	2	1	- do -
	Murcon Diversion Dam	2	1	- do -
2. Field Station				
Pampanga MC	DC-1, PMC HGT	2	-	Station with operator
	Lateral C HGT	2	-	Combined with C-1 station
	Lateral C-1 HGT	2	1	Station with operator
	Murcon Supply HGT	2	1	- do -
	Sub-lateral F-3 HGT	2	-	Station without operator
	Sub-lateral C-4 HGT	2	-	- do -
	Sub-lateral C-7 HGT	2	1	Station with operator
	DC-1 Vaca Supply HGT	2	-	Station without operator
	DC-1 LTRIS Supply HGT	2	1	Station with operator
Murcon MC	Sub-lateral DM-9 HGT	2	1	- do -

Remarks: HGT means head gate.

(to be continued)

Table 6.8(2) LIST OF PROPOSED FIELD STATION

Station	Location	Water Level Gage	Rainfall Station	Remarks
District III				
1. Diversion Dam	PBRIS Diversion Dam	3	1	Diversion dam type
2. Field Station				
DC-2	PBRIS MC HGT	2	-	Station with operator
	AM HGT	2	1	- do -
	AM-3 HGT	2	-	Station without operator
	AM-5 HGT	2	1	- do -
	Lateral A HGT	2	1	Station with operator
	Sub-lateral A-1 HGT	2	-	- do -
	Sub-lateral A-9 HGT	2	1	- do -
	Lateral C HGT	2	1	- do -
	Sub-lateral C-3 HGT	2	1	Station without operator
PBRIS MC	Lateral B HGT	2	-	- do -
	Lateral E HGT	2	1	Station with operator
	Lateral F HGT	2	-	- do -
	Lateral G-2 HGT	2	1	- do -
	Lateral G HGT	2	-	Combined with G-2 HGT
	Tambo HGT	2	-	Station without operator
District IV				
1. Diversion Dam	Peñaranda Diversion Dam	3	1	Diversion dam type
2. Field Station				
PEÑRIS MC	Lateral C HGT	2	1	Station with operator
	Lateral D HGT	2	-	- do -
	Lateral F HGT	2	-	Station without operator
	Lateral J HGT	2	1	Station with operator
	Sub-lateral D-6 HGT	2	1	Combined with D-7 HGT station
	Sub-lateral D-7 CHGT	2	-	Station with operator
Lateral C	Lateral C-EX HGT	2	1	- do -
	Sub-lateral C-9 HGT	2	-	Combined with C-EX HGT station
	Sub-lateral C-9e HGT	2	1	Station without operator
Lateral C-EX	Sub-lateral CX-3 HGT	2	1	Station with operator
	Sub-lateral CX-8 HGT	2	1	- do -
	Sub-lateral CX-9 HGT	2	-	Station without operator

Table 6.9 REARRANGEMENT OF EQUIPMENT

(Unit: no.)

Equipment	Existing Equipment Use	Existing Equipment (Non-use)/1	Procured Equipment	Total	Main Office	District I	District II	District III	District IV	Dam Office
I. Heavy Equipment										
1. Shovel	5	-	8	13	0	3	3	3	4	0
2. Dozer	12	(12)	12	24	0	5	5	6	5	3
3. Grader	14	-	4	18	0	3	5	5	4	1
4. Tractor	1	(5)	0	1	0	0	0	0	0	1
5. Loader	9	(1)	0	9	0	2	2	2	2	1
6. Creane	15	(4)	0	15	0	3	3	4	4	1
7. Compactor	3	-	12	15	0	3	4	4	4	0
8. Roller	0	-	8	8	0	2	2	2	2	0
9. Others	7	-	40	47	0	11	11	11	14	0
Total	66	(22)	(84)	(150)	0	32	35	37	39	7
II. Light Equipment										
1. Truck	40	-	24	64	1	13	15	13	17	5
2. Jeep	44	-	28	72	8	14	13	16	14	7
3. Mortorcycle	358	-	80	438	17	98	97	112	100	14
4. Others	11	-	160	171	6	42	42	40	41	0
Total	453	-	292	745	32	167	167	181	172	26

Remarks: /1: Of the existing equipments, these are not required in the future O&M stage.

Table 6.10 NEW EQUIPMENTS TO BE PROCURED

(Unit: ₱10³)

Equipment	Unit Cost	Required Number: One District	Required Number: Total	Amount
I. Heavy Equipment				
1. Back-hoe Shove, 0.35 m³	570	2	8	4,560
2. Dozer				
- Bull-dozer, 11 ton	600	1	4	2,400
- Bull-dozer, 5 ton	330	2	8	2,640
3. Motor Grader, Blade 3 m	550	1	4	2,200
4. Soil Compactor, 90 kg	15	3	12	180
5. Roller				
- Vibration Roller, 5 ton	190	1	4	760
- Tire Roller, 10 - 20 ton	400	1	4	1,600
6. Others				
- Portable Concrete Mixer, 0.2 m³	25	2	8	200
- Concrete Vibrator, ø32	5	5	20	100
- Submargible Pump, ø150	20	3	12	240
II. Light Equipment				
1. Truck				
- Trailer Truck, 15 ton	520	1	4	2,080
- Dump Truck, 8 ton	280	1	4	1,120
- Dump Truck, 2 ton	90	2	8	720
- Cargo Truck w/crane, 4 ton	220	1	4	880
- Truck, Pickup Type, 2 ton	70	1	4	280
2. Jeep, four wheel drive	90	7	28	2,520
3. Motor Cycle	5	20	80	400
4. Others				
- Current Meter	5	10	40	200
- Walkie-Talkie	3	30	120	360
- Repair Shop Tools	L.S.	-	-	2,000
III. Spare Parts (10% of the above)	L.S.	-	-	2,560
Total				28,000
Local Currency Portion (Inland transportation cost, etc.)				₱1,400x10³
Grand Total				₱29,400x10³

Table 6.11 COST ESTIMATE OF O&M EQUIPMENTS

Item	Existing Equipment		Procured Equipment		Total	
	Nos. /1	Repair Cost	Nos.	Procure-ment Cost	Nos.	Cost
		(₱10³)		(₱10³)		(₱10³)
I. Heavy Equipment						
1. Shovel	5	0	8	4,560	13	4,560
2. Dozer	12	580	12	5,040	24	5,620
3. Grader	14	300	4	2,200	18	2,500
4. Tractor	1	40	0	0	1	40
5. Loader	9	0	0	0	9	0
6. Crane	15	1,630	0	0	15	1,630
7. Compactor	3	5	12	180	15	185
8. Roller	0	0	8	2,360	8	2,360
9. Others	7	515	40	540	47	1,055
10. Spair parts	-	4,830/2	-	2,900	-	7,730
Sub-total	66	7,900	84	17,780	150	25,680
II. Light Equipment						
1. Truck	40	210	24	5,080	64	5,290
2. Jeep	44	80	28	2,520	72	2,600
3. Motor cycle	358	140	80	400	438	540
4. Others	11	40	160	560	171	600
5. Spair parts	-	2,600/2	-	1,660	-	4,260
Sub-total	453	3,070	292	10,220	745	13,290
III. Transportation Cost	-	380	-	1,400	-	1,780
Total	519	11,350	376	29,400	895	40,750/3

Remarks: /1: Exclude the equipments needed major repair.

/2: Procurement cost of spare parts.

/3: Foreign currency = ₱36,150 x 10³
Local currency = ₱4,600 x 10³ (80% of repair cost + Transportation cost)

Table 6.12(1) BREAKDOWN OF IMPLEMENTATION COST FOR CENTRALIZED MONITORING SYSTEM

Work Item	Unit	Quantity	Amount (₱103) Foreign Currency	Local Currency
I. DISTRICT I				
1. Preparation Work			1,098	77
2. Equipment				
2.1 Base Station				
- District office	no.	1	7,900	400
- Dam	no.	1	5,200	300
Sub-total			13,100	700
2.2 Field Station				
- Diversion dam	no.	2	2,100	100
- w/operator	no.	4	1,500	300
- w/o operator	no.	3	1,020	60
- Water level gage	no.	14	1,120	140
- Raingage	no.	3	180	30
Sub-total			5,920	630
Total			19,020	1,330
3. Software and Engineering	L.S.	1	1,000	-
4. Spare Parts	%	10	2,002	133
Total			23,120	1,540
II. DISTRICT II				
1. Preparation Work			973	74
2. Equipment				
2.1 Base Station				
- District office	no.	1	7,900	400
2.2 Field Station				
- Diversion dam	no.	4	4,200	200
- w/operator	no.	6	2,250	450
- w/o operator	no.	3	1,020	60
- Water level gage	no.	20	1,600	200
- Raingage	no.	5	300	50
Sub-total			9,370	960
Total			17,270	1,360
3. Software and Engineering	L.S.	1	500	-
4. Spare Parts	%	10	1,777	136
Total			20,520	1,570

(to be continued)

Table 6.12(2) BREAKDOWN OF IMPLEMENTATION COST FOR CENTRALIZED MONITORING SYSTEM

Work Item	Unit	Quantity	Amount (₱103) Foreign Currency	Local Currency
III. DISTRICT III				
1. Preparation Work			1,925	125
2. Equipment				
2.1 Central Station	no.	1	12,600	700
2.2 Base Station				
- District office	no.	1	7,900	400
2.3 Field Station				
- Diversion dam	no.	1	1,050	50
- w/operator	no.	9	3,375	675
- w/o operator	no.	5	1,700	100
- Water level gage	no.	30	2,400	300
- Raingage	no.	8	480	80
Sub-total			9,005	1,205
Total			29,505	2,305
3. Software and Engineering	L.S.	1	5,500	-
4. Spare Parts	%	10	3,500	230
Total			40,430	2,660
IV. DISTRICT IV				
1. Preparation Work			836	65
2. Equipment				
2.1 Base Station				
- District office	no.	1	7,900	400
2.2 Field Station				
- Diversion dam	no.	1	1,050	50
- w/operator	no.	7	2,625	525
- w/o operator	no.	3	1,020	60
- Water level gage	no.	24	1,920	240
- Raingage	no.	3	180	30
Sub-total			6,795	905
Total			14,695	1,305
3. Software and Engineering	L.S.	1	500	-
4. Spare Parts	%	10	1,519	130
Total			17,550	1,500
Grand Total			101,620	7,270

Fig. 6.1 GENERAL IRRIGATION SYSTEM MANAGEMENT

ANNUAL ACTIVITY NETWORK

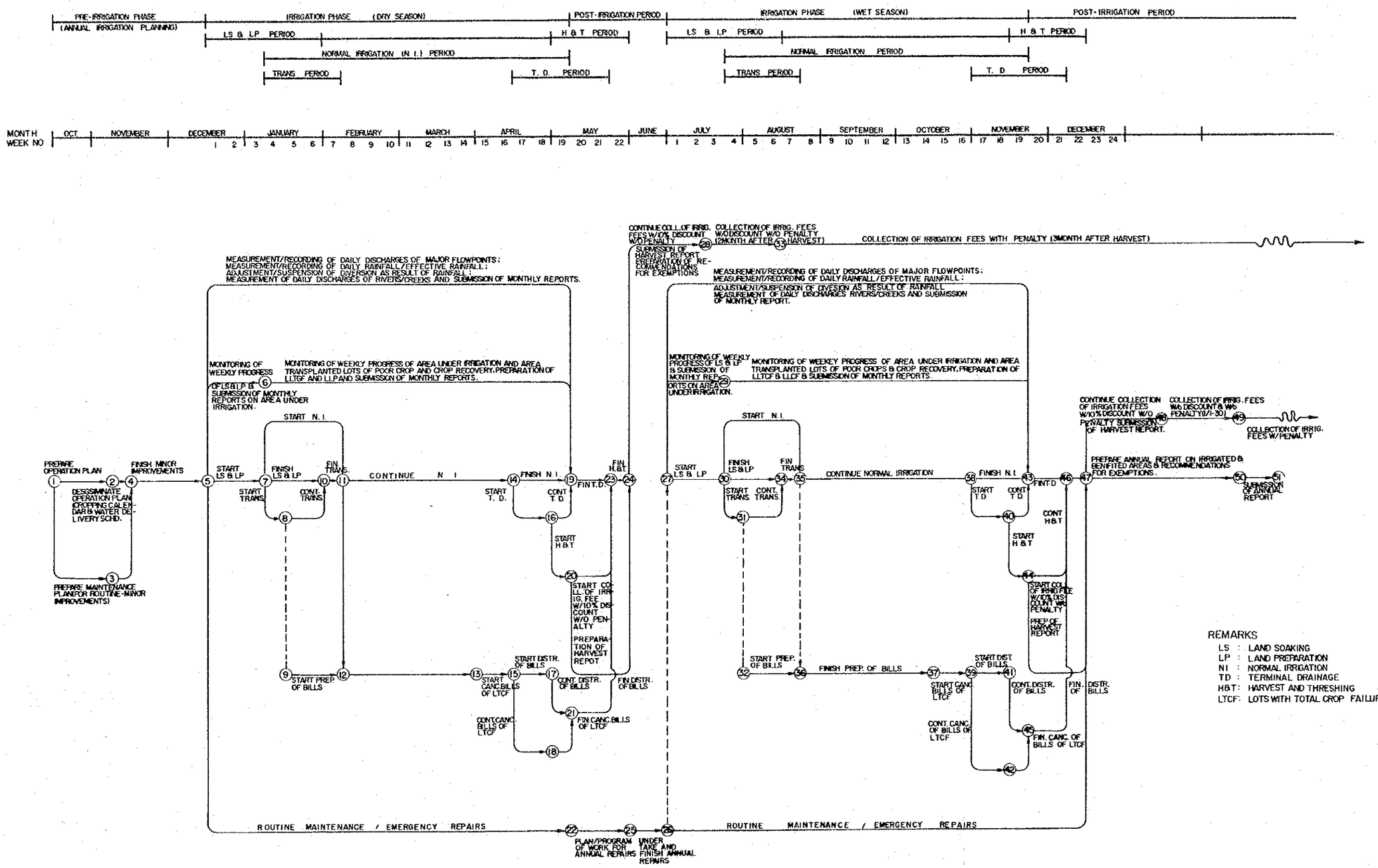
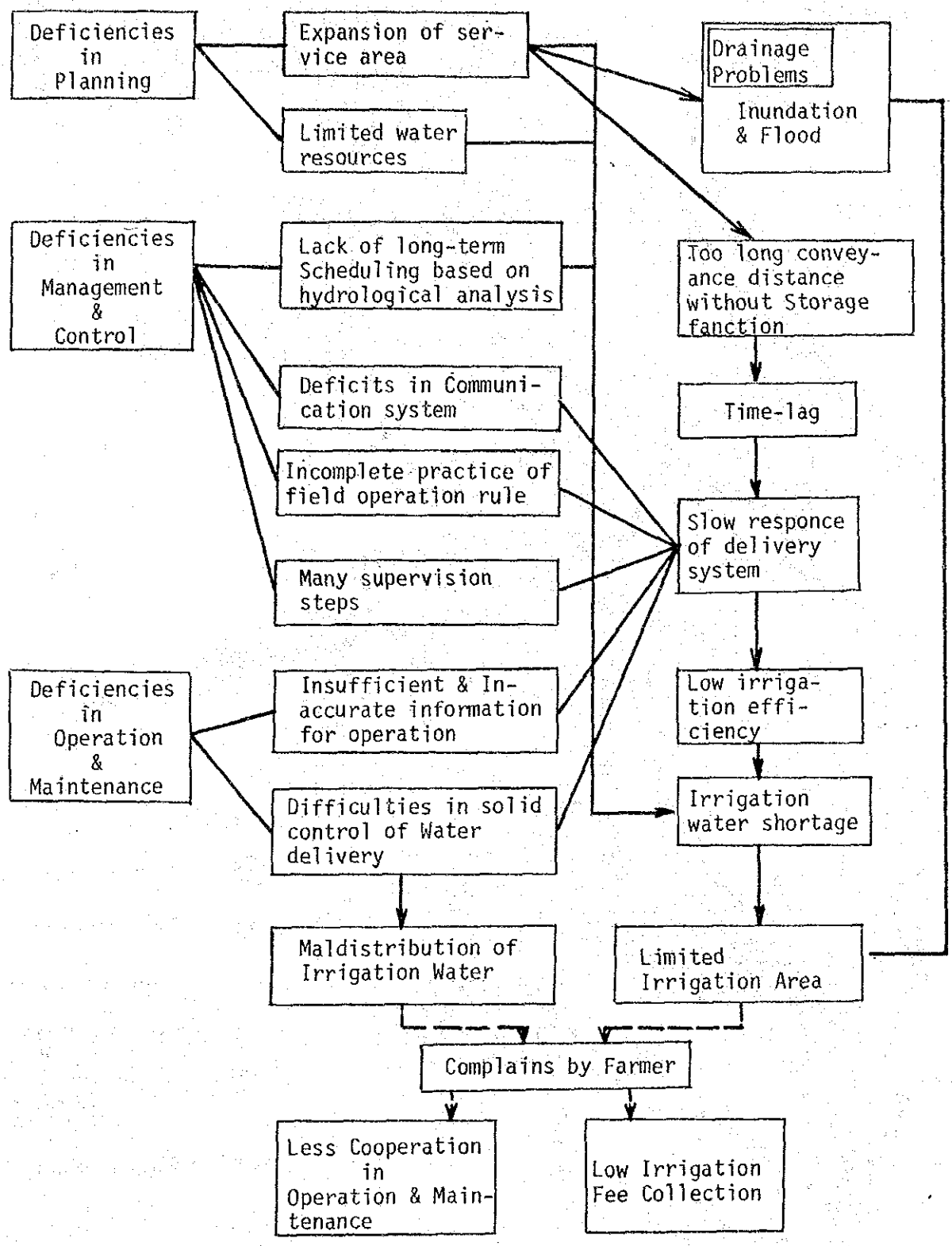


Fig. 6.2 CONSTRAINTS IN WATER MANAGEMENT AND CONTROL



Fog. 6.3 RADIO NETWORK SYSTEM

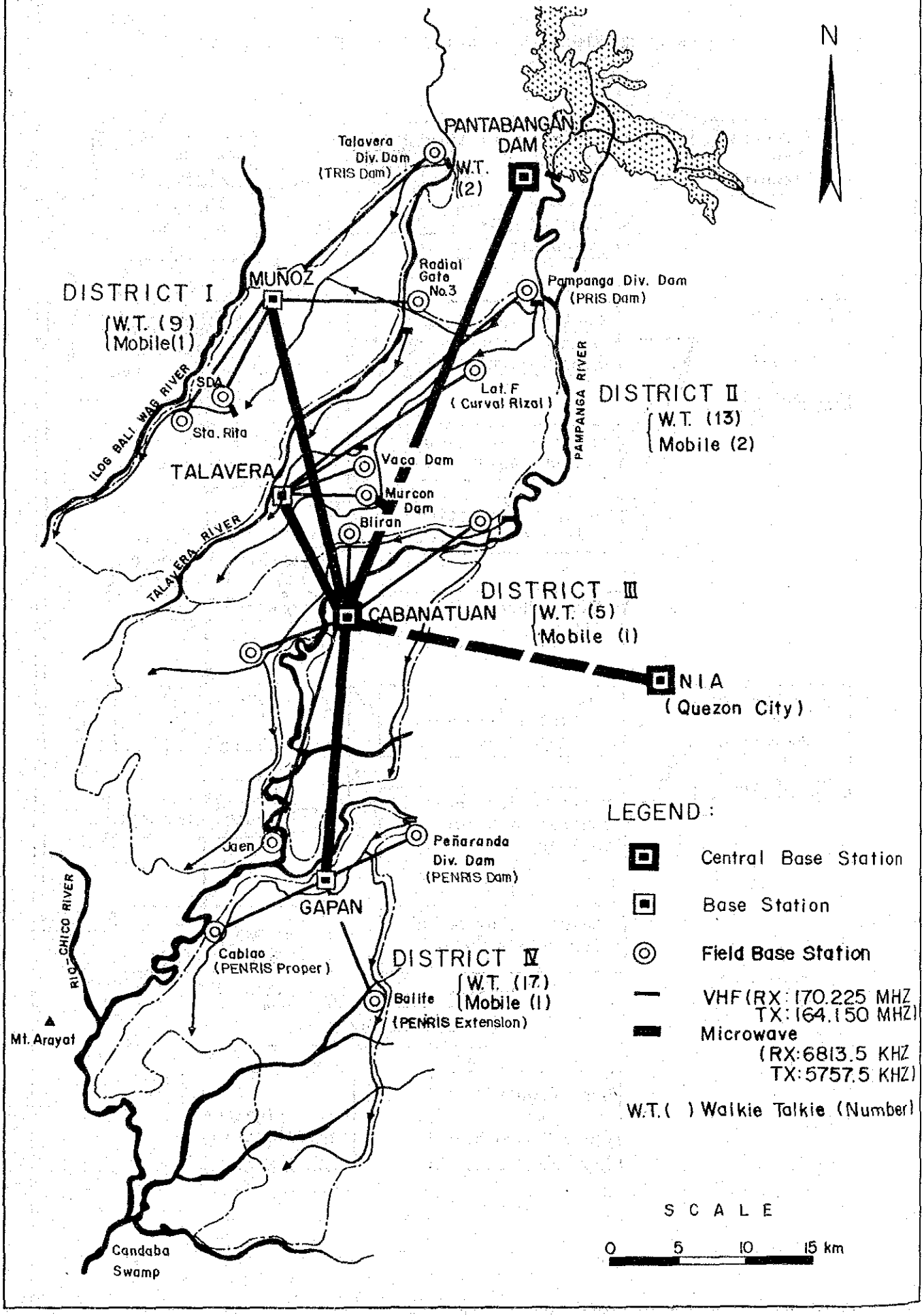


Fig 6.4 FLOW CHART OF BILLING PROCEDURE FOR IRRIGATION FEE

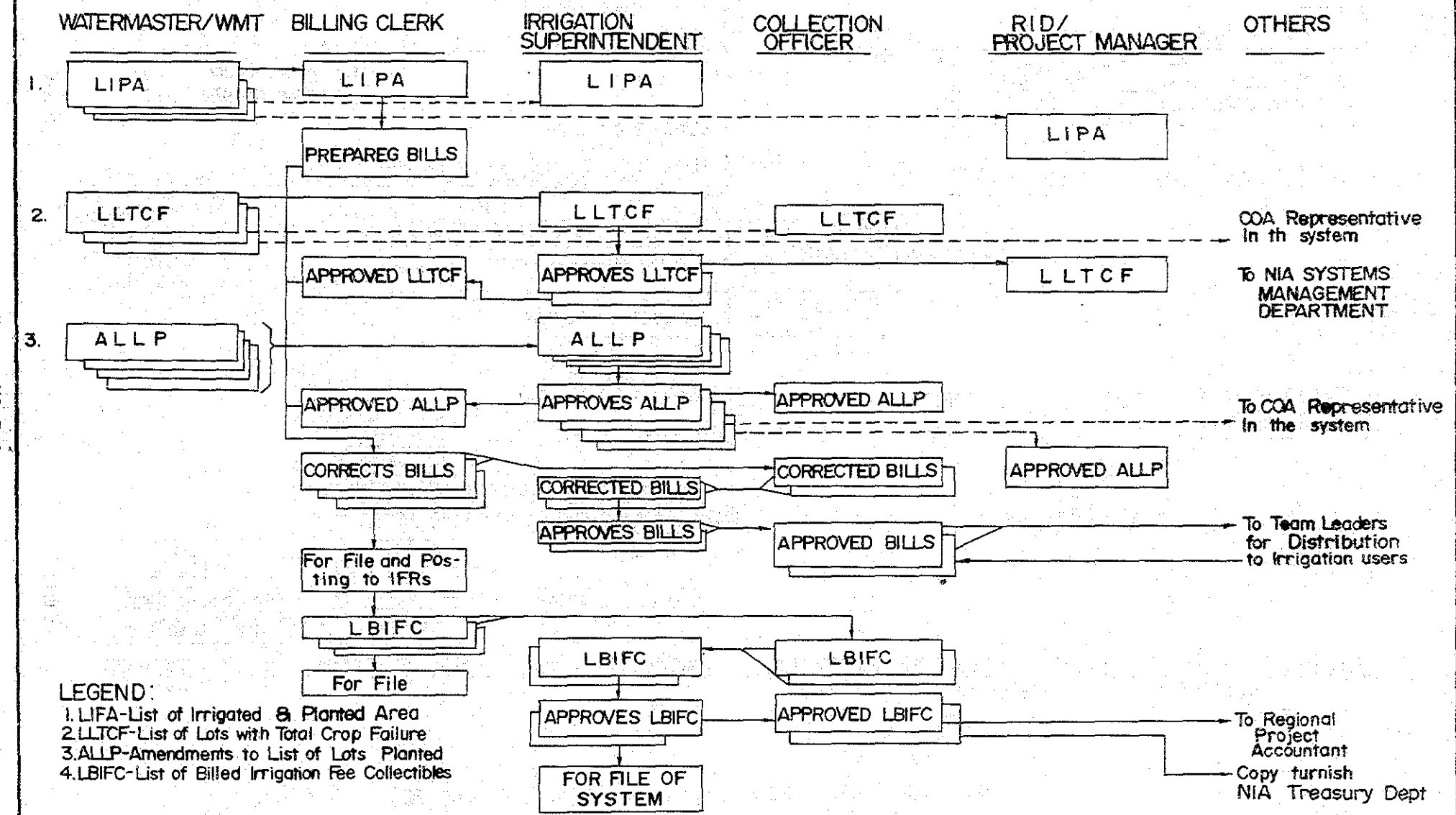


Fig. 6.5 FLOW CHART OF IRRIGATION FEE CASH COLLECTION & REMITTANCE

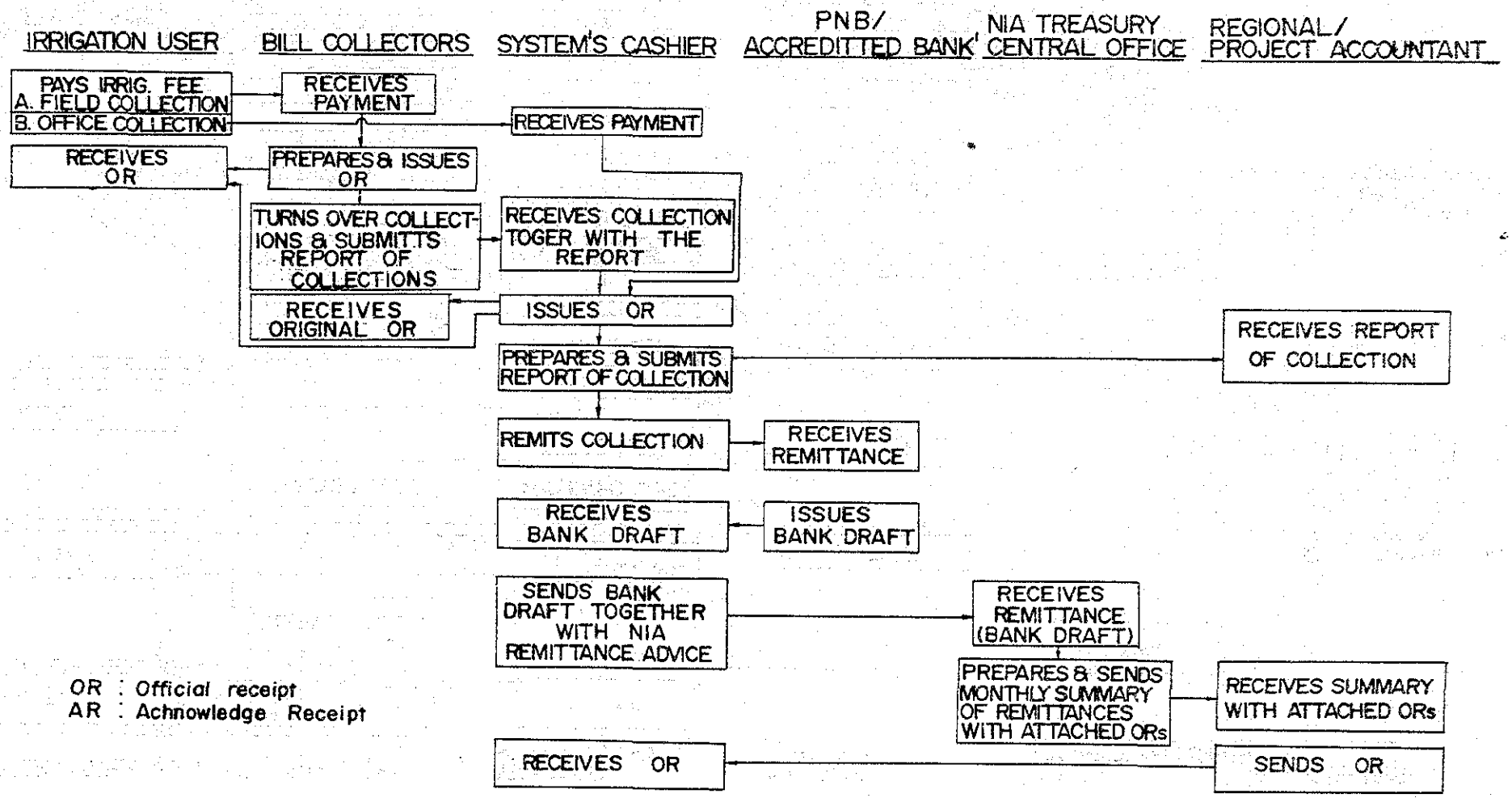
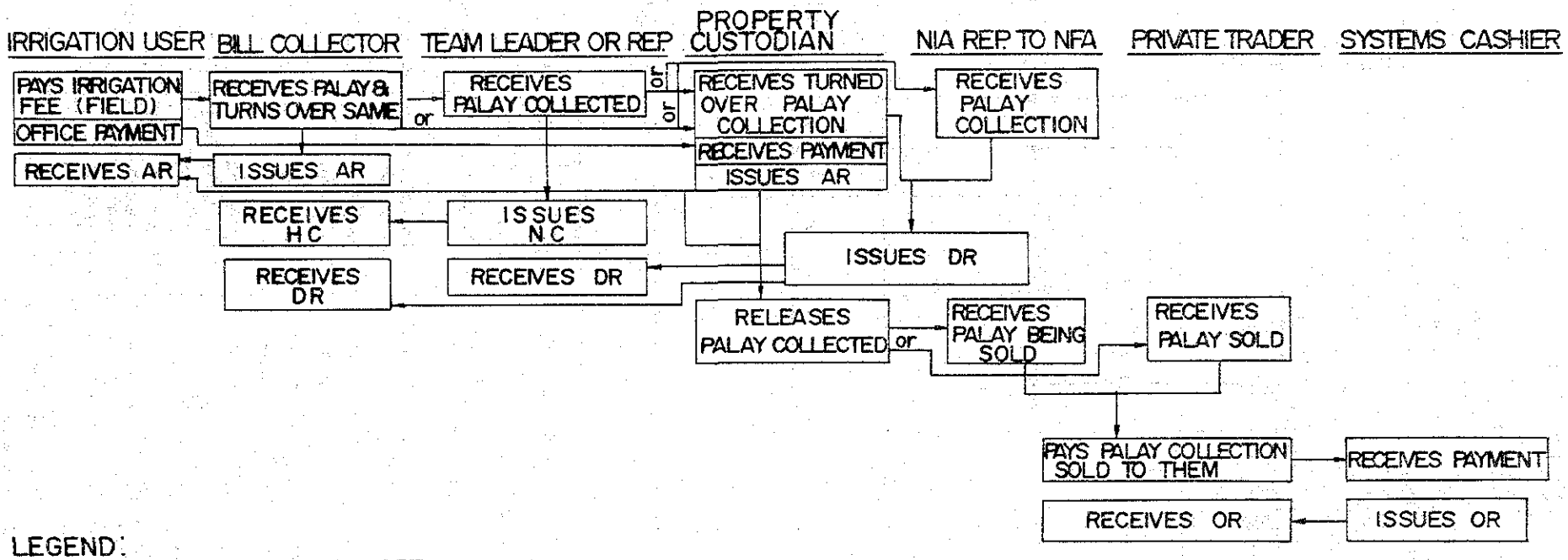
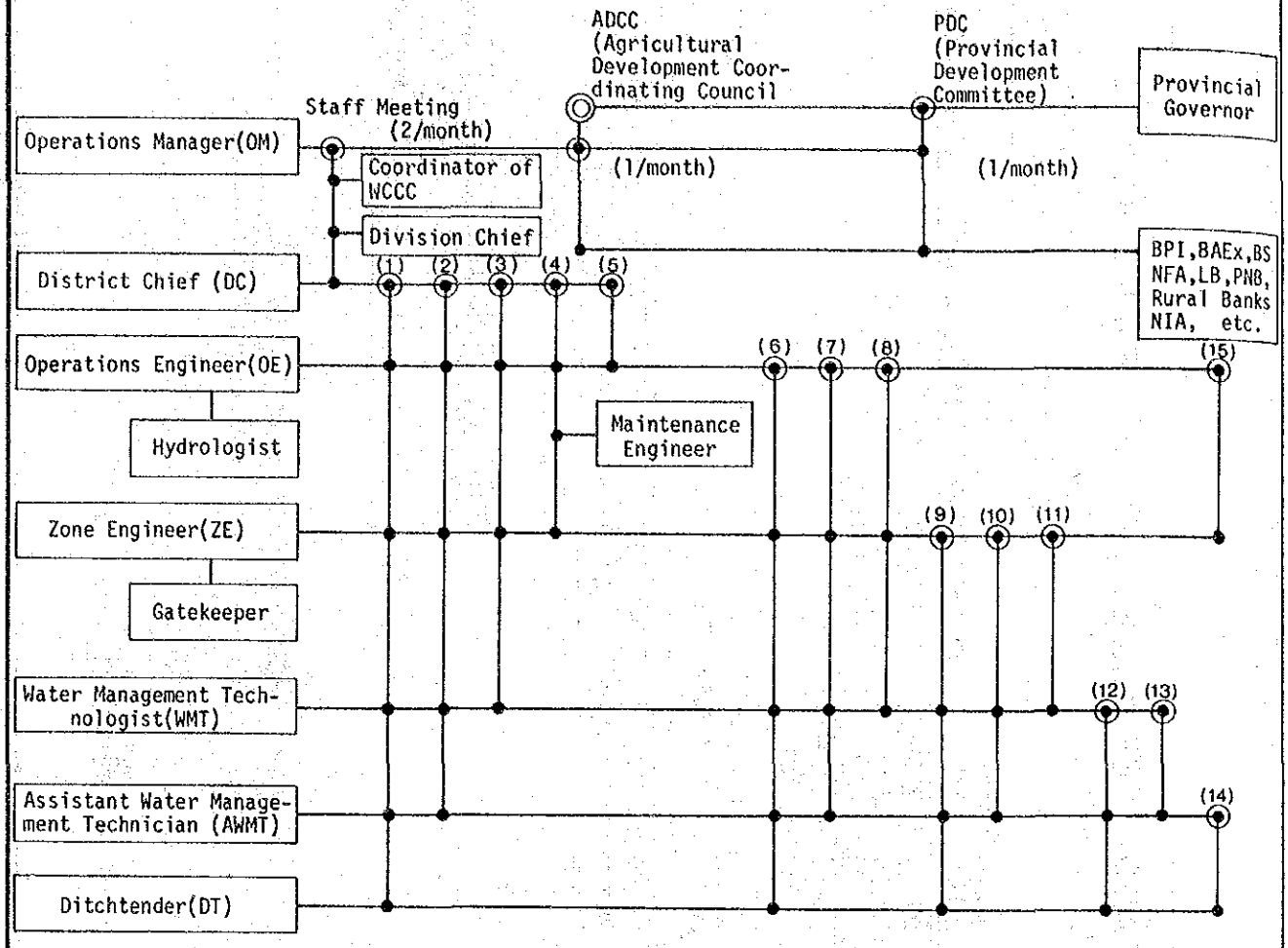


Fig. 6.6 FLOW CHART OF IRRIGATION FEE COLLECTION & REMITTANCE
(IN-KIND)



LEGEND:
AR- ACKNOWLEDGEMENT RECEIPT
HC- HAULING CERTIFICATION
DR- DELIVERY RECEIPT
OR- OFFICIAL RECEPT

Fig. 6.7 MEETING SYSTEM FOR OPERATION AND MAINTENANCE IN THE UPRIIS



Remarks: (1) - (15) Kinds of meeting/ ◉ Chairman/ ◎ Honorable Chairman/ ● Attendant

Meeting \ Dist.	FREQUENCY OF THE MEETING			
	I	II	III	IV
(1)	2/month	4/year	Occasional	Occasional (min. 2/year, Collection season)
(2)	2/week + 2/month (Pay day)	Occasional	1/month + occasional	2/month (Pay day)
(3)	-do-	1/month	2/month(Pay day)	2/month 2nd 84 monday)
(4)	2/week	1/week	1/week	2/month
(5)	Occasional	Occasional	Occasional	Occasional
(6)	"	4/month	"	"
(7)	2/week	Occasional	1/month	"
(8)	Occasional	"	2/month(Pay day)	"
(9)	4/month	1/month	1/month	"
(10)	Occasional	Occasional	"	2/month
(11)	"	"	2/month(Pay day)	"
(12)	2-3/month	4/month	4/month	1 or 2/month
(13)	Occasional	"	Occasional	Occasional
(14)	"	Occasional	4/month	1 or 2/month
(15)	"	"	4/month	Occasional*

* Including Hydrologist and Gatekeeper

N.B. - In principle, meeting places are as follows:
. OM & DC Level - Office
. OE, ZE & WMT Level - Office or field
. WMT, AWMT & DT Level - Field

Fog. 6.8 GENERAL CONCEPT OF MONITORING SYSTEM

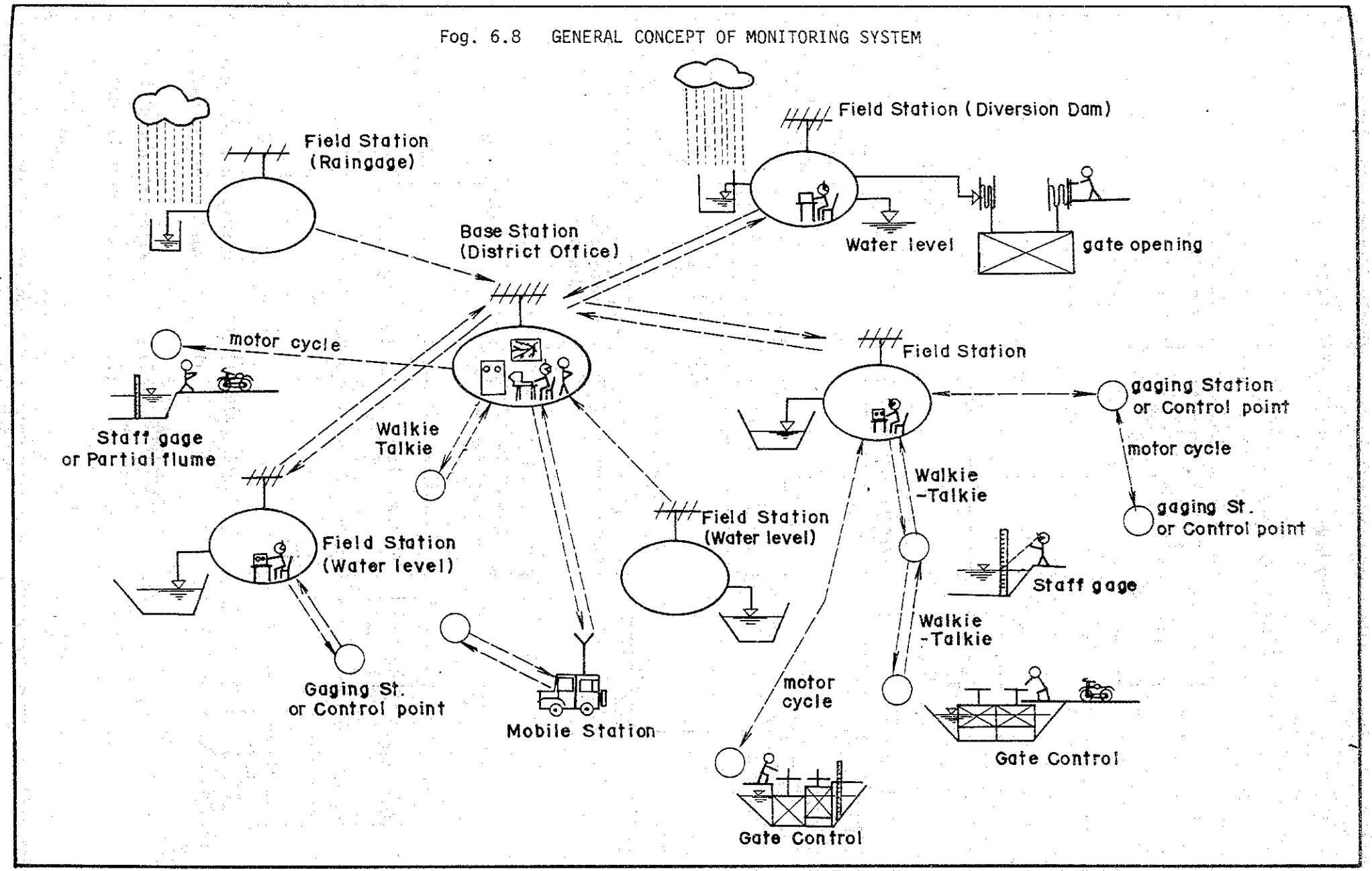
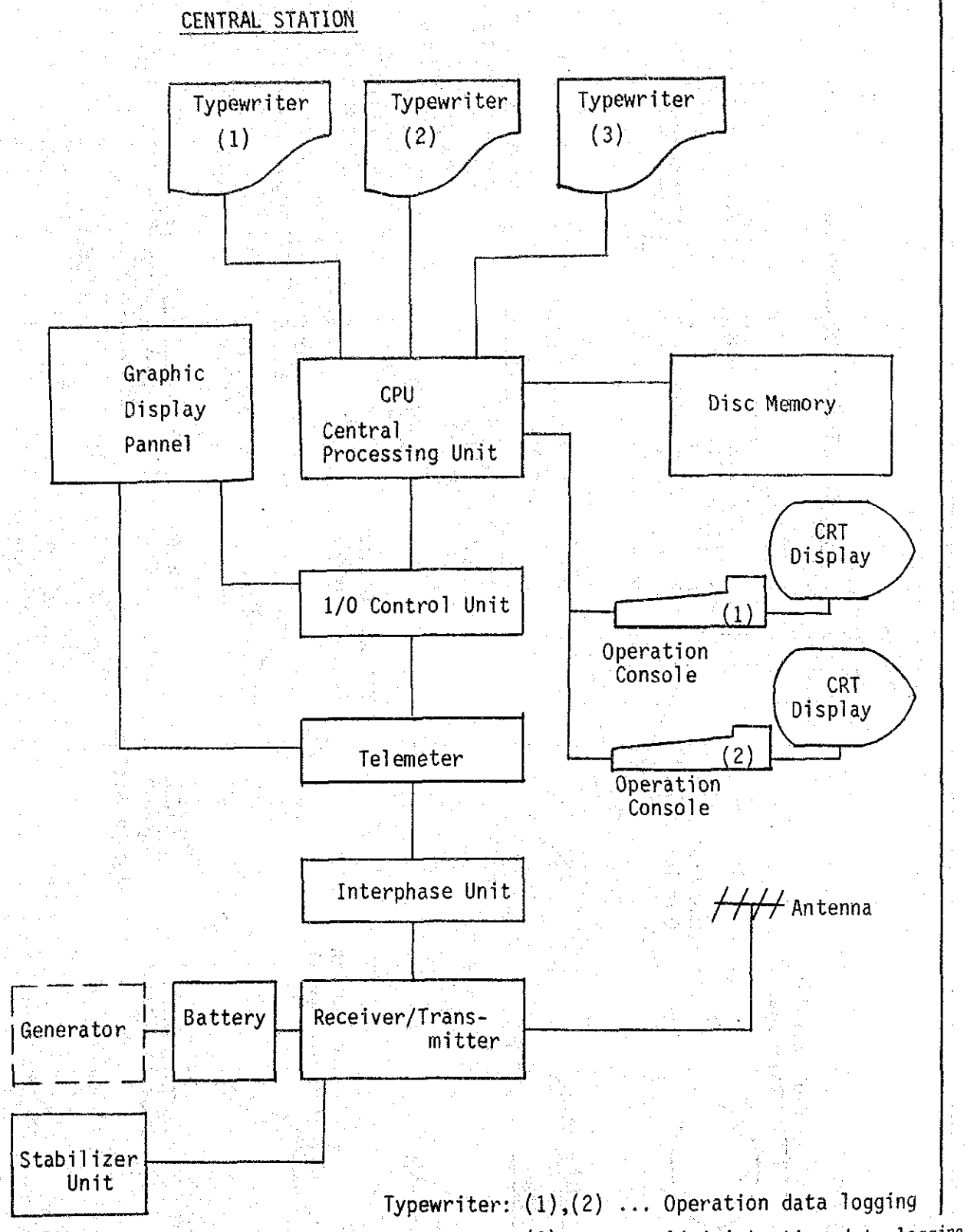


Fig. 6.9(1) PROPOSED STATION LAYOUT

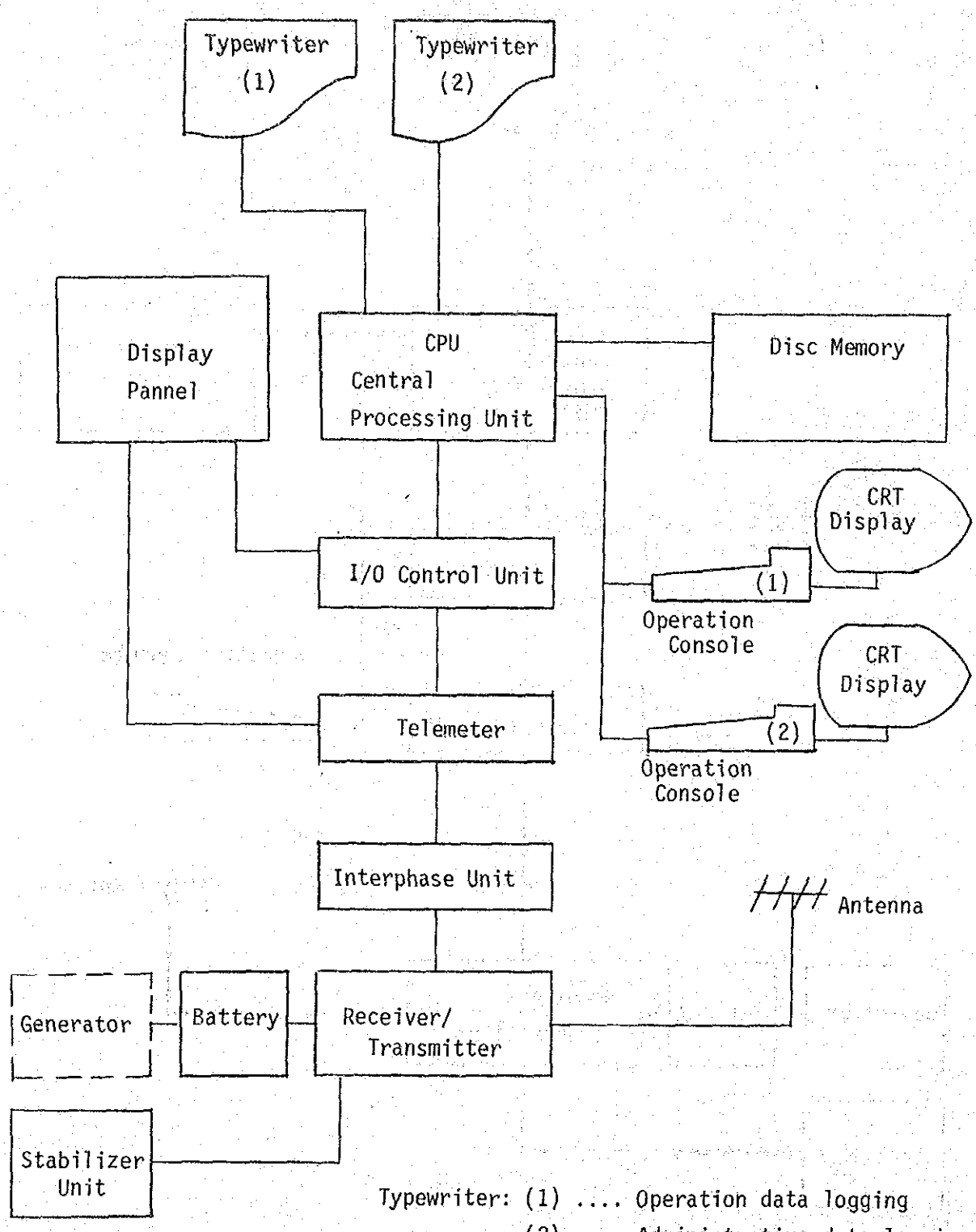


Typewriter: (1),(2) ... Operation data logging
(3) ..... Administrative data logging

Operation Console: (1) ..... Water management use
(2) ..... Administrative use

Fig. 6.9(2) PROPOSED STATION LAYOUT

BASE STATION (District Office)



Typewriter: (1) .... Operation data logging
(2) .... Administrative data logging

Operation Console : (1) .... Water management use
(2) .... Administrative use

Fig. 6.9(3) PROPOSED STATION LAYOUT

BASE STATION (Dam & Reservoir)