MANUAL FOR THE IRRIGATION SYSTEM MANAGEMENT TRAINING OF IRRIGATORS ASSOCIATIONS

International Irrigation Management Institute
Mandala Development Corporation
National Irrigation Administration
United States Agency for International Development

Preface

This Manual for the Irrigation System Management Training of Irrigators Associations (IAs) is divided into the following six modules:

Module I: Overview of Irrigation System Management
Module II: Cropping Calendar and Pattern of Planting
Module III: Delivery and Distribution of Irrigation Water
Module IV: Irrigation Facilities and Structures
Module V: Irrigation Service Fees (ISF) and/or Amortization
Module VI: Information Management for Irrigation Systems

Each module is further sub-divided into three session topics that cover the contents to be imparted to the trainees. The first session topic starts with the basic concepts, fundamentals and knowledge about the module topic. The contents of the succeeding topics deal with how learnings in the first session are used in the skills required to undertake activities relative to the module topic. The last session of the module deals with why those skills are required and how they are used in the management, supervision and implementation of activities throughout a cropping season.

Provided as annex is a general description on how facilitators' guides are developed for experiential learning sessions on knowledge, skills and attitude development. Also included are tabulated descriptions of training materials and outputs that can be appropriately used to enhance the learning processes of trainees during and after the formal portion of the training.

The trainors can use this manual in varied ways:

a. Use all modules in one training program;
b. Review only the initial session of each module and undertake the remaining sessions as a whole; and
c. Use only the modules that the trainees need.

The contents of this manual is a consolidation of experiences in managing irrigation systems by irrigators associations (IAs). As such it does not attempt to discuss the varied experiences at the field level. Instead, it focuses on the core of experiences similar to all situations.

This manual is only a general guide. The trainors can use it as a reference in developing a training program and sessions with substantial addition of their own experiences.

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Dedicated to the memory of Engr. Reynaldo V. Sarmiento, Project Director of the Accelerated Agricultural Production Project -- Irrigation Program, January 1, 1989 to July 6, 1990.

Acknowledgement

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- Dr. Honorato L. Angeles, Dean of the College of Engineering, Central Luzon State University (CLSU), who served as the IIMI Coordinator;
- Mandala Development Corporation (MADECOR) for providing assistance in the packaging and reproduction of this manual;
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- Engrs. Renato S. Gamboa and Bayani P. Ofrecio, staff of NIA's Institutional Development Department (IDD) who reviewed and finalized the manuscript; and
- Dr. Jose A. Galvez, Assistant Administrator for Systems Operation and Equipment Management, for providing the encouragement to pursue the preparation of this manual.

Their invaluable participation helped make this Manual for the Irrigation System Management Training of Irrigators Associations a reality.

JOSE B. DEL ROSARIO, JR.
Administrator

31 July 1991

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Facilitator's Guide

GENERAL GUIDE FOR FACILITATORS

Introduction

When designing any training program and its sessions, as well as facilitating teaching-learning activities, always consider the following:

1. Present knowledge, skills and attitudes of trainees;

2. Convenience of trainees in choosing training-learning methodologies; and

3. Skills and experiences of trainors and facilitators in designing and conducting teaching-learning activities.

This guide was prepared according to these important considerations. It does not provide a rigid step by step procedure in designing a training program and in facilitating teaching-learning sessions. Instead, it is a general and flexible guide for trainors and facilitators on principles, concepts and skills.

In the design and conduct of the training programs and sessions, the extensive use of the Experiential Learning Cycle (ELC) model is recommended. The concept is discussed in detail in the Annex 1.

Manual Modules and Sessions

The Manual for the Irrigation System Management Training of Irrigators Associations consists of six modules. Each module has an introductory portion and three topics. The contents of each topic can be considered as inputs for a training session. Using the contents of each module, learning processes can be designed to follow the sequence of:

i. *knowledge learnings* - consist of basic concepts and principles, and fundamental information on the module coverage;

ii. *skills learnings* - consist of descriptions on how learnings in the first session are used including demonstration and individual practice sessions to further enhance learning; and

iii. *attitude-learnings* - consist of appreciative use of these skills in planning, implementation including monitoring and assessment, and evaluation through small group exercises and workshop.

The modules and their respective topics are presented in Table 1, Annex 2.

Data, Information and Materials

It is important to consider the previous experiences of trainees in preparing data, information and materials for the training sessions. Such experiences must be those in their actual irrigation area. Data, information and material requirements for training sessions of the respective modules are in Table 2, Annex 3.

Recommended Training Methodologies

Prior to preparing the teaching-learning activities for each of the sessions, a critical review of module objectives and specific session objectives is made by all trainors and facilitators. This is to enable them to:

i. Reconcile their understanding of the training program and sessions; and

ii. Design and develop individual teaching-learning activities that complement each other's sessions.

The action terms described in those objectives are chronologically sequenced such that the required training experiences to be provided are as follows:

a. Learnings on the definition of relevant terms, basic concepts, principles and fundamental knowledge;

b. Learnings on how to apply such knowledge to the required skills for the development, preparation, implementation including monitoring and assessment, and evaluation of schedules of related activities; and

c. Learnings on how to manage, supervise and implement the schedule of related activities.

The teaching-learning activities in each module and its sessions could include the sequential methodologies for:

a. *Knowledge acquisition* - includes lectures, open forum, brainstorming, lecturette, small group or panel discussion, case studies and others;

b. *Skills development* - sequential methodology of individual and small group exercises or practice sessions, and small group workshops;

c. *Attitude development* - realization of positive attitude. This can be done by enhancing the trainees' impressions on the relevance of topics covered. They must also be developed to appreciate processes recommended for alleviating personal and group problems they previously experienced.

Expected Outputs

Aside from acquiring adequate knowledge, appropriate skills and positive attitude, the expected outputs of the training program from each of the modules are:

a. The IA's schedule on the:

1. cropping calendar and pattern of planting;

2. delivery and distribution of irrigation water including the methodologies;

3. maintenance and repair of irrigation facilities and structures; and

4. related activities, collection and remittance of irrigation service fees (ISF) and amortization;

b. Set of IA policies, rewards and sanctions relative to the management, supervision and implementation of items a.1 to a.4;

c. IA program targets on items a.1 to a.4; and

d. IA re-entry plans or the set of activities that trainees are to undertake immediately after the training.

Module I

Overview of Irrigation Systems Management

General Objectives

At the end of the module, the trainees shall be able to:

1. Discuss and elaborate on the thrusts, direction and policies of NIA on irrigation system management in the national and communal irrigation systems.
2. Illustrate the organizational structures and define the functions of the organizational units of NIA relative to irrigation systems management and of the irrigators associations (IAs).
3. Define the duties and responsibilities of the NIA staff and officers of the IA relative to irrigation system management and in its different phases.

Introduction to the Module

Years ago, the only concern of a farmer in an irrigation system, whether national or communal, was to irrigate his farm. He would leave the responsibility of managing the movement of irrigation water from the source to the field personnel of NIA or to the officers of their IA (in the case of the communals).

However, due to scarcity of irrigation water and the pressure of increasing production, there is a gradual change on how irrigation systems are managed. Gradually, farmers themselves are now playing a more direct and active role in operation and maintenance (O and M).

These emerging changes highlight the need to train farmers and develop their capabilities in managing O and M activities.

To enhance their learnings, it would be of great help if they take a look at O and M from a vantage point. It is hoped that they can appreciate more the specifics of O and M activities and responsibilities which they may take over in the future. This module introduces the overview of systems management. It deals with relevant information about NIA, its thrusts and related policies, the existing O and M organization of NIA and the IA, and their roles and responsibilities in O and M of irrigation systems.

Facilitator's Guide

Module 1 Overview of Irrigation Systems Management

Session I

NIA Thrusts, Policies and Practices on Irrigation Systems Management

Specific Objectives:

At the end of the session, the trainees shall be able to:

1. Define the thrusts of NIA with respect to the operation and maintenance of national or communal irrigation systems.

2. Discuss and elaborate the present policies of NIA with respect to the operation and maintenance of irrigation systems.

3. Elaborate on present problems on the operation and maintenance of irrigation systems and discuss the agency directions in resolving these problems.

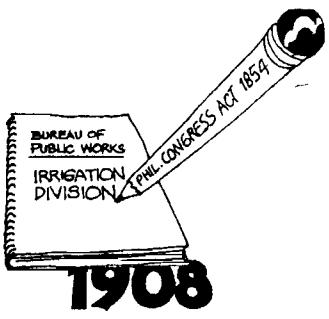
Contents

Introduction

The Philippines has a long history of irrigation that dates back even before the coming of the Spaniards.

Through the years, irrigation development in the country has undergone several changes.

As farmers take more and more direct responsibilities in the O and M of irrigation systems, it is necessary for them to take a look at the brief history of irrigation in the country. This shall provide them a better background in building up their vision of O and M in the future.



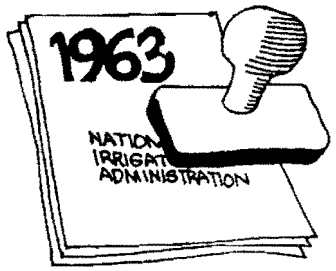
It will also be necessary that they review existing NIA policies and thrusts, including practices in O and M. This enables them to improve and adopt those which they find useful in their gradual take over of the O and M of irrigation systems.

The National Irrigation Administration: A Short History

The National Irrigation Administration (NIA) traces its origin from the Irrigation Division of the old Bureau of Public Works. The Division created by the Philippine Congress Act 1854 in 1908 was empowered to construct irrigation systems in response to requests from provincial boards, municipal councils, or water users.

In 1912, the Irrigation Law was passed giving the Division more authority to manage all the irrigation systems it had built. At the

same time, it was tasked to collect irrigation service fees from water-users to cover the costs of construction, operation and maintenance.



Recognizing the importance of stepping up its irrigation development programs, the government through Republic Act 3601 established the National Irrigation Administration in 1963 as a semi-autonomous corporation. The NIA absorbed the functions of the Irrigation Division. It was further entrusted by the government to investigate, study, improve and administer, including the collection of irrigation service fees from water-users in all national irrigation systems in the country. The Agency was also tasked to investigate all available and possible water resources in the country for irrigation.

Farmers' Involvement in Irrigation Development and Related NIA Policies

In 1974, Presidential Decree (P.D.) 552 was enacted broadening the powers and objectives of NIA. It included the provision that:

NIA is authorized to delegate partial or full management of national irrigation systems to duly organized farmers cooperatives or irrigators associations under such terms and conditions that the NIA Board of Directors may impose.

This provision of PD 552 Section 2 on farmers involvement in irrigation development substantially contributed to the gradual re-orientation of NIA's program. After the pilot projects on farmers' participation in the late 70s, NIA implemented its thrust on farmers' participation in all its irrigation projects at varying degrees.

Communal Irrigation Systems (CIS)

PD 552, instructed farmers through their IAs to get directly involved in all phases of developing communal irrigation systems. These phases include the project feasibility study, pre-engineering and construction to the operation and maintenance of the completed irrigation system. Among the relevant policies of NIA on the CIS are:

i. IAs to contribute 10 percent of the project chargeable costs as equity;

ii. IAs to pay the remaining costs of the project at annual amortization rate of not less than 1 and 1/2 cavans per hectare per year for not more than 50 years at zero interest rate;

iii. There shall be no exemption from the payment of amortization but only

deferment of payment for one year at zero interest rate; and

iv. IAs have the option to avail of 30 percent equity contribution with no amortization for construction costs of not more than P 5,000 per hectare.

National Irrigation Systems

These are fairly large irrigation systems that were constructed and used to be operated and maintained by NIA. With PD 552, there is gradual change in how those systems are now operated and maintained.

In these systems, farmers are charged irrigation service fees (ISF) to cover the cost of operation and maintenance. The type of irrigation systems and the ISF rates are as follows:

i. *run-off-the-river* - the ISF is 2 cavans per hectare for the wet season and 3 cavans for the dry season;

ii. *reservoir type* - the rate is 2 1/2 cavans per hectare for the wet season and 3 1/2 cavans for the dry season; and

iii. *pump irrigation systems* - the rate is higher than those above and is dependent on the cost of energy in the locality.

In case of crop failures due to calamities, natural disasters, or wide spread crop infestations, farmers can be exempted from paying the ISF. These exemptions are granted if the yield is equal or less than 40 cavans per hectare. Requests for exemptions, however, must be submitted as early as possible to enable NIA to conduct the field investigation of the standing crops and to take crop cut samples or monitor yields at the time of harvest.

Starting in the 80s, NIA encouraged the direct participation of farmers in the O and M of NIS. It has turned over to some IAs certain O and M responsibilities within their coverage. The IA takes over those responsibilities by contracting with NIA. The different turn-over contracts and the incentives provided are:

i. *Type I Contract* - This contract is for assisting in the collection of irrigation service fees (ISF). Incentives under the contract is dependent on collection and is a percent of the amount collected. The incentive rates are as follows:

Collection Efficiency in Percent (%)	IA Incentive Percent of Collection
< 50	0
51 - 60	2
61 - 70	5
71 - 90	10
91 - 100	15

ii. *Type II Contract* - This contract is for the IAs take over of the maintenance of the irrigation facilities and structures in the IA area. IAs are provided an incentive of P 1,100 per month per 3 1/2 kilometers of unlined canals or 7 kilometers of lined canals.

iii. *Type III Contract* - The IA assumes full management of the NIS, which are usually marginal and small in size (less than 1,000 hectares). The IAs amortize the cost of construction and/or rehabilitation of the irrigation system according to policies governing the CIS.

Present programs of NIA intend to further enhance farmers participation. Recently enacted is Republic Act No. 6978, the government's Accelerated Irrigation Development Program. It calls for the construction of new irrigation systems in about 1,500,000 hectares in the next 10 years with the direct participation of farmers-beneficiaries.

Furthermore, the present direction of the government such as decentralization and delegation of responsibilities to local government units can have repercussions on the present program of farmers participation. Others such as privitization of the O and M of public infrastructure could also be affected. Those would have significant bearing on the future policies and directions of the Agency.

Problems and Issues on the O and M of Irrigation Systems

Optimizing the use of scarce water resources point out to several problems on the O and M of irrigation systems. These problems are interrelated and interdependent. Unorganized planting in the irrigation systems can generate a set of other related problems. Examples of these problems are:

i. stealing of irrigation water during periods of low water supply which results to

ii. ineffective and inadequate delivery and distribution of irrigation water due to

iii. excessive provision for canal losses resulting to

vi. smaller irrigated area; and

v. conflicts among farmers that escalate the above problems.

These interrelated problems bring to light some critical issues such as:

i. Who shall take control of planting in the irrigated area? If the farmers take control, up to what level can they be effective ?

ii. Up to what level can NIA turnover the O and M of NIS; and

iii. In what way can other government agencies providing support services help ensure that farmers are given credit to enable them to follow irrigation schedules and the planned pattern of planting ?

Facilitator's Guide

Module 1 Overview of Irrigation System Management
Session II
Existing Organizations for Irrigation Systems Management

Specific Objectives: At the end of the session, the trainees shall be able to:

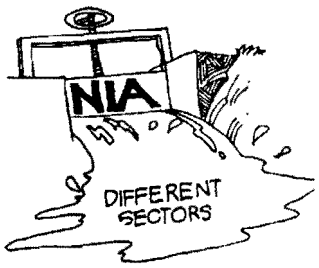
1. Describe and differentiate existing NIA organizational structures and functions.

2. Describe and elaborate on the similarities of the organizational structure and functions of IA organization units for the operation and maintenance of irrigation facilities and structures.

Contents

Introduction

The NIA is a government agency that maintains a fairly large organization with different sectors. Each sector is in charge of certain functions relative to irrigation development. As NIA has a national mandate, it has a multi-tier organization in charge of irrigation development in different geographical areas. This organizational set-up goes down to the level of irrigation systems that are the productive frontline units of the Agency.



IAs relate, coordinate and work closely with those organizational levels and units. Thus, IA officers and TSA (or Sector) leaders must have a good understanding about the levels, units and functions of the NIA organization. In similar manner, a good understanding of the IA organization levels and units is also necessary to enhance the working relationship within the IA and with NIA.

NIA Organization, Its Units and their Functions Relative to the O and M of NIS and CIS

The NIA organization consists of four sectors and three levels as shown in Figure I-1. Its policy making body is the NIA Board of Directors (BOD) that is chaired by the Secretary of the Department of Public Works and Highways. Its sectors are:

i. Project Development and Implementation (PDI);

ii. Systems Operation and Equipment Management (SOEM);

iii. Finance and Management (FM); and

iv. Administrative Services.

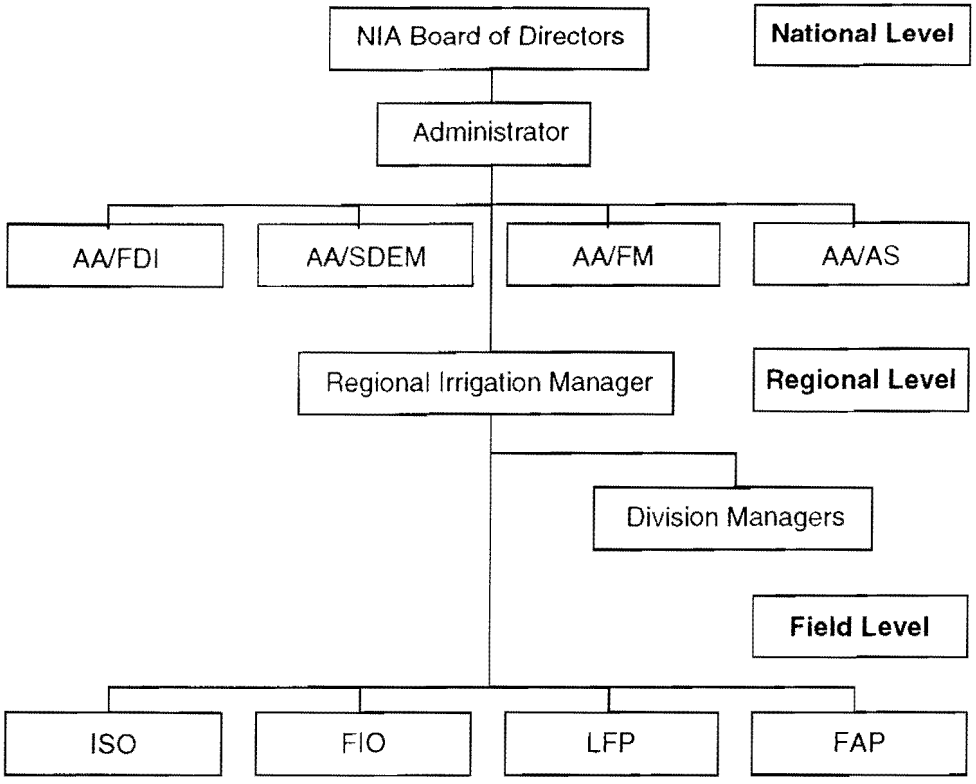


Figure I-1. NIA Organizational Chart

National Level

The NIA is headed by an Administrator assisted by a Deputy Administrator and four Assistant Administrators, one for each of the sectors.

The operation and maintenance of irrigation systems is the responsibility of the Sector for Systems Operation and Equipment Management. In this sector are the following departments:

i. *Systems Management Department* - in charge of the operation and maintenance of national irrigation systems (NIS);

ii. *Institutional Development Department* - in charge of organization, training and provision of assistance to IAs in both the national and communal irrigation systems (NIS and CIS);

iii. *Communal Irrigation Department* - in charge of planning and constructing communal irrigation systems (CIS). The department has overall supervision of all communal irrigation projects, both local and foreign-assisted; and

iv. *Equipment Management Department* - in charge of the management of NIA's equipment for construction, operation and maintenance.

Regional Level

The country is divided into 12 regions. In charge of NIA's responsibility at the regional level is NIA's Regional Irrigation Manager (RIM). The RIM is assisted on the O and M of irrigation systems by Division Managers of the following:

i. *System Management Division* for the O and M of national irrigation systems (NIS);

ii. *Institutional Development Division* for the organization, training and provision of assistance to irrigators associations (IAs);

iii. *Engineering Division* for the planning and construction and rehabilitation of communal irrigation projects; and

iv. *Equipment Management Division* for the maintenance and repair of construction and O and M equipment.

Two big integrated irrigation systems are treated as separate regions with organizational units similar to a region. These integrated irrigation systems are:

i. Upper Pampanga River Integrated Irrigation Systems (UPRIIS) - located in Nueva Ecija and Bulacan; and

ii. Magat River Integrated Irrigation Systems (MRIIS) - located in Isabela.

Field Level

The frontline organizational units of the NIA are the field offices. These are:

i. *Irrigation Systems Offices* - in charge of managing the operation and maintenance of national irrigation systems (NIS). These offices are headed by Irrigation Superintendents (IS);

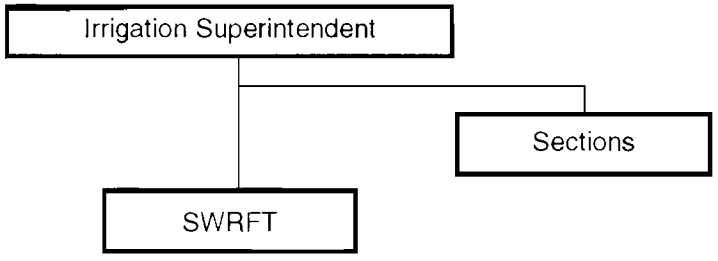
ii. *Provincial Irrigation Offices* - in charge of planning and constructing communal irrigation projects (CIP), and providing assistance to the IA in their O and M of CIS. These offices are headed by Provincial Irrigation Engineers (PIE);

iii. *Project Offices* - in charge of constructing new national irrigation projects (NIP) or rehabilitating, operating and maintaining existing NIS. A project office that is headed by a Project Engineer (PE) or Project Manager (PM) can either be for:

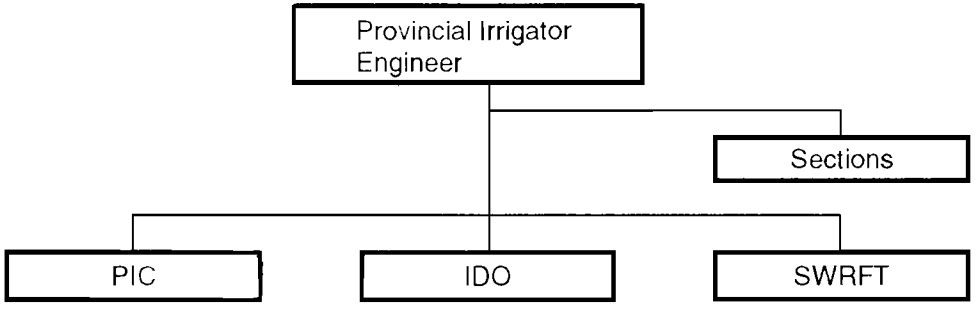
a. *Local Funded Projects (LFP)* - funded out of government local appropriations; and

b. *Foreign Assisted Projects (FAP)* - funded out of foreign loan or grants.

The typical organization charts of an ISO and a PIO are shown in Figure I-2.



a) Irrigation Systems Offices (ISO)



b) Provincial Irrigation Offices (PIO)

PIC - Project-in-Charge
IDO - Institutional Development Officer
SWRFT - Senior Water Resource Facility Technician

Figure I-2. Organization Charts of NIA Field Units

Irrigators Associations (IA): Organization, Its Units and Functions Relative to the O and M of Irrigation Systems

An Irrigators Associations (IAs) is an organization of farmers in a hydrologically bounded irrigation area. The association may cover the whole of an irrigation system, in the case of a communal irrigation system (CIS), or part or whole (for small and marginal) of a national irrigation system (NIS).

These IAs are organized primarily for effective and productive O and M of irrigation systems. The organization of the IAs in both the NIS and CIS are alike. A typical organization chart of the IA is shown in Figure I-3.

Basically, the IA organization consists of two levels:

i. *IA Level* - consists of the IA Board of Directors, and IA officers, and chairpersons and members of the IA standing committees; and

ii. *TSA (or Sector) Level* - consists of leaders and members at the TSA (or Sectors) or irrigation units.

The standing committees of the IA are the following:

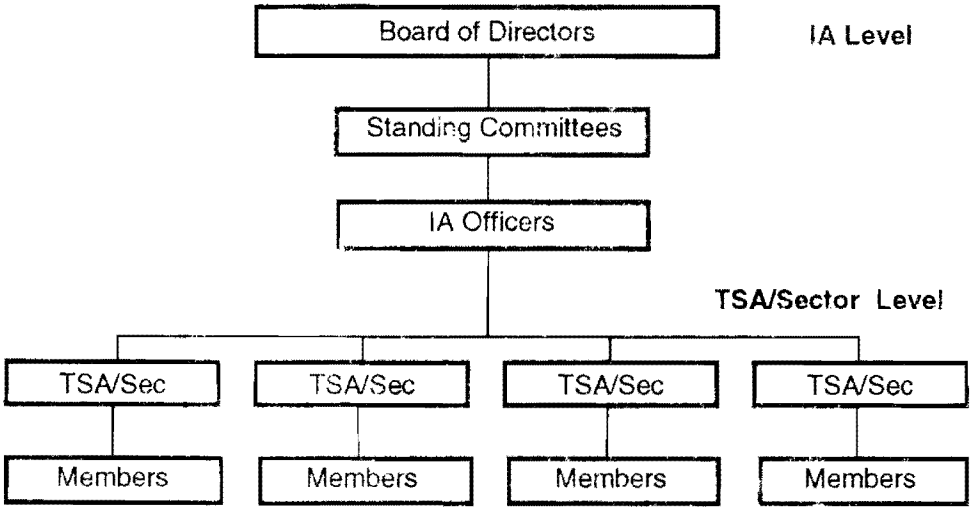


Figure 1-3. Typical IA Organization Chart

i. *Service Committee* - in charge of the O and M activities of the IA and is usually headed by the Vice-President and has members from the same committee at the TSA (or Sector) level.

ii. *Education and Training* - in charge of the training and education of members and is usually headed by the IA Secretary.

iii. *Finance Committ.* - in charge of IA

finances and is usually headed by the IA Treasurer.

iv. *Audit Committee* - in charge of the internal audit of the IA and is usually headed by the IA Auditor.

Other committees are created from time to time, either in ad-hoc or permanent status.

Similarities of IA Organizations in the NIS and CIS

The IA organization in both the NIS and CIS are similar in set-up and functions except for the following:

i. NIS's IAs have larger area of coverage;

ii. Operation and maintenance activities of NIS's IAs are limited to those in their own area;

iii. In their O and M activities, NIS's IAs deal with NIA field personnel operating and managing major irrigation structures; and

iv. The O and M activities in the communal irrigation system are exclusively for the CIS's IAs.

Facilitator's Guide

Module I Overview of Irrigation System Management
Session III
Duties and Responsibilities of NIA and IAs on Irrigation Systems Management

Specific Objectives:

At the end of the session, the trainees shall be able to:

1. Define the meaning of irrigation system management.

2. Discuss and differentiate the different phases of irrigation system management.

3. Enumerate the duties and responsibilities of NIA and IA in the different phases of irrigation system management.

Contents

Introduction

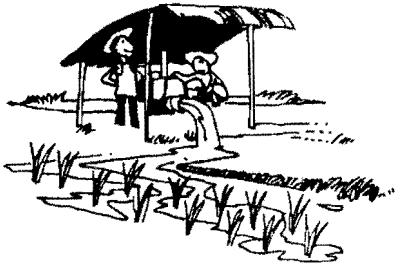
The operation and maintenance activities of NIA or the IA must be organized if benefits are expected from irrigation systems.

For the IA to effectively and efficiently operate and maintain irrigation systems, a good understanding of how it should be managed is necessary. The officers, TSA (or Sector) leaders as well as members should

be knowledgeable about what, when and who to manage or supervise in the O and M of irrigation systems, whether NIS or CIS.

Irrigation System Management

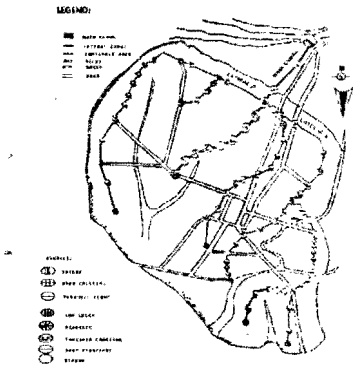
Irrigation system management refers to the operation and management of an irrigation system. Its sub-systems are:



i. *physical system* - structures and facilities for the movement of irrigation water;

ii. *social system* - the people providing the irrigation services and those benefitting from those services;

iii. *resource systems* - the irrigation water and agricultural crops; and



iv. *operational procedures and policies* - rules and regulations that govern O and M activities.

The results obtained from irrigation management are dependent on interactions of these sub-systems.

The following are those that are managed in an irrigation system:

i. *cropping calendar and pattern of planting* - If properly managed, organized planting in the irrigated area simplify the movement of irrigation water from one place to the other;

ii. *delivery and distribution of irrigation water* - When properly managed, conflicts brought about by inadequacy, inequity, and non-reliability of irrigation water are reduced.

iii. *maintenance and repair of irrigation facilities and structures* - Proper management results in better delivery and distribution of irrigation water, prolonged period between major rehabilitation and reduced costs of major repairs; and

iv. *collection and remittance of irrigation service fees (ISF) and amortization* - When properly managed, more funds for repair and capital build-up for the IAs are provided.

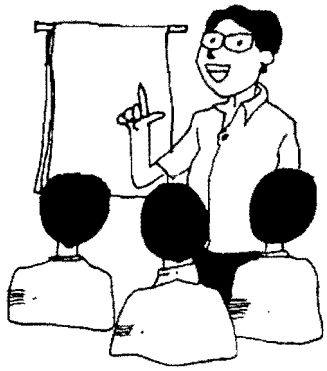
As will be noted in later modules, the management of the last three items are dependent on the cropping calendar and pattern of planting.

Phases of Irrigation System Management

The management of irrigation systems does not only take place during the irrigation period. Management is a collective term for the set of chronological activities relative to the O and M of irrigation systems. Each set of activities is undertaken during the different phases or periods of managing irrigation systems. These phases are (Figure I-4):

i. *Pre-Irrigation Period* is the phase when O and M activities in an irrigation period are planned by NIA, IA officers and TSA (or Sector) leaders prior to the initial delivery of irrigation water in the irrigation area. Results of these exercises are schedules, plans and programs of the IA and the system relative to those aspects enumerated above;

ii. *Irrigation Period* is from initial water delivery to start of terminal irrigation of the last farmer to plant. It is the phase when plans and programs are implemented. NIA, IA officers and TSA (or Sector) leaders manage and supervise the implementation. They also undertake regular monitoring and assessment activities to check on implementation; and



iii. *Post-Irrigation Period* covers the end of irrigation and is when the whole cropping season implementation is evaluated to gather relevant data and information for next season's planning.

As most of the irrigation systems in the country are of the run-off-the-river type and are highly dependent on rainfall, planning before the wet season must include dry season data.

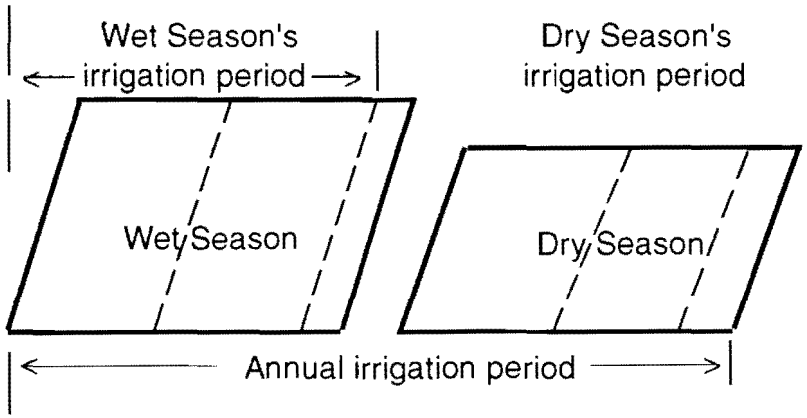


Figure I-4. Phases or Periods of Irrigation System Management

As will be noted later, problems in irrigation during the dry season are generated by problems encountered during the wet season. For example, the pattern of planting in the dry season tends to follow that of the wet season except that the area covered tends to be lesser.

It will be noted, therefore, that post-irrigation evaluation of the wet season and pre-irrigation planning for the dry season can be conducted simultaneously.

Core Duties and Responsibilities Relative to Irrigation

System Management

The core of duties and responsibilities of those concerned in the operation and management of irrigation systems are:

i. *NIA staff* - **overall management and supervision** of the activities in the whole NIS or Provincial Irrigation Office;

ii. *IA Officers* - **manage** the activities within the irrigated area of the IA; and

iii. *TSA (or Sector) leaders* - **supervise** activities within the irrigation area of

the TSA (or Sector) relative to the following:

a. **planning** during the pre-irrigation phase;

b. **implementation including the regular monitoring and assessment** during irrigation phase; and

c. **summative evaluation** during the post-irrigation phase that includes evaluation of the:

   1. cropping calendar and pattern of planting

   2. delivery and distribution of irrigation water;

   3. maintenance and repair of irrigation facilities and structures; and

   4. collection and remittance of irrigation service fees (ISF) and amortization.

Module II
Cropping Calendar and Pattern of Planting

Modular Objectives:

At the end of the module, the trainees shall be able to:

1. Discuss and elaborate on the varietal characteristics and growth stages of the rice crop and some agricultural crops, the farming activities and related irrigation practices.

2. Discuss the information provided by the cropping calendar and the different patterns of planting.

3. Prepare and discuss how to manage the cropping calendar and pattern of planting in the irrigated area of the IA and/or the irrigation system.

Introduction to the Module

Irrigation is an important component in producing agricultural crops. Production of agricultural crops involves certain farming and irrigation practices.These are undertaken to ensure that crops grow vigorously during its different growth stages for optimum yield. Farming practices must be complemented by applying adequate amount of irrigation water at the right time.

To effectively and efficiently deliver and distribute irrigation water, adequate knowledge

and skills on the cropping calendar and patterns of planting and its management are necessary. This will help officers and members of irrigators associations (IAs) and others involved in the O and M of irrigation systems to make decisions and implement actions relative to when, where and how much to irrigate.

The cropping calendar and pattern of planting reflect activities that farmers undertake. Thus, it could also be a useful guide for preparing schedules of delivery and distribution of irrigation water, maintaining and repairing irrigation facilities and structures, and collecting irrigation service fees (ISF) and amortization.

Facilitator's Guide

Module II Cropping Calendar and Patterns of Planting
Session I
Rice and Other Agricultural Crops: Varietal Characteristics, Growth Stages and Related Farming and Irrigation Activities

Specific Objectives: At the end of the session, the trainees shall be able to:

1. Define morphology and illustrate this in at least two to three common agricultural crops.

2. Describe different growth stages of the rice plant and explain how different rice varieties differ in their growth stages.

3. Discuss different farming activities commonly practiced at the different growth stages of the rice plant in terms of applying production inputs such as fertilizers, pesticides and other agro-chemicals.

4. Describe common irrigation practices at the different growth stages and effects of irrigation water deficiency in the growth and yield of the rice crop.

Contents

Introduction

Decisions in the delivery and distribution of irrigation water are made because water is a critical need of agricultural crops. Farmers take care of these agricultural crops and have to make decisions as to when, where and how much to irrigate. Since farms are within an irrigation area, individual decisions have repercussions on the farming and irrigation activities of other farmers.

Therefore, a knowledge of the growth stages and practices in the irrigation of agricultural crops in its isolated environment is necessary to better understand irrigation in a wider area.

What is morphology? What are its uses in irrigation?

Morphology is a biological science that deals with the study of the structure and form of plants and animals including their growth stages.

In the field of agriculture, morphology is used as the basic science in the study of agricultural crops, their growth stages, the required farming and other cultural practices. It is very important in irrigation as it provides information on the irrigation requirement and practices required at the different growth stages of agricultural crops. With this information,

irrigation of a large area planted to a single crop, like those found in our irrigation systems, are made more effective and efficient.

Major Growth Stages of an Agricultural Crop

Agricultural crops are commonly propagated through seed or cuttings. They grow and go through growth processes until such time that they mature and bear fruits that normally serve as food. They may also bear vegetation as food source. Examples of these are vegetables like cabbage, pechay, mustard and other green leafy vegetables. However, they also bear fruits from where seeds are taken for propagation.

Most agricultural crops, specially cereals, are fruit bearing plants. These crops includes corn, sorghum, and other cereal crops.

Whether they are fruit bearing or not, agricultural crops go through major growth stages. These general growth stages are:

a. *seedling or early growth stage* - early growth stage either from seeds or cuttings. A plant makes use of the plant food available in the seed itself and some from the surrounding soil for its initial growth period;

b. *vegetative growth stage* - the crop starts growing vigorously adding more plant components that will later bear fruits;

c. *reproductive growth stage* - the crop starts producing fruits. These fruits are either for producing food for man or seeds for propagating the crop; and

d. *maturity* - the crop's fruits start to mature. At the end of this growth stage, the fruits are harvested.

The Rice Plant

The rice crop follows the growth stages similar to those of most agricultural crops. Major growth stages and approximate period of each growth stage of the rice plant are illustrated in Figure II-1 and are as follows:

a. *seedling stage* - in practice, this stage usually has a period of about four weeks starting from the time the farmers sow the seeds to the time it is transplanted in the field;

b. *vegetative growth stage* - variations in growth stages of the rice crop occur. Early maturing varieties have

shorter vegetative growth stage while late maturing ones have longer vegetative growth stage;

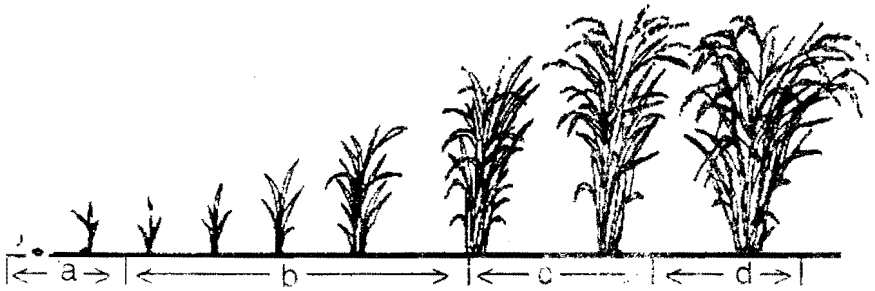


Figure II-1. Major Growth Stages of the Rice Plant

c. *reproductive growth stage* - usually starts at least nine weeks before harvest and has a period of about seven weeks; and

d. *maturing stage* - starts at least two weeks before harvest.

The days to maturity of any rice crop is the total number of days from seedsowing (either on the seedbed or directly at the farm), to vegetative and reproductive growth stages, to maturation.

Farming Activities and Irrigation Practices at Different Growth Stages of the Rice Crop

Seedling Stage. Prior to sowing of seeds, the farm is irrigated for land soaking and the seedbed prepared. The quantity of irrigation water applied is enough to soak the soil to field capacity and with submergence provision to decay the plant and grass materials in the field. The succeeding daily application of irrigation water to the seedbed is to replenish loss of water due to evapotranspiration and percolation.

Seedlings in the seedbed are allowed to grow up to transplanting. Meanwhile, the transplanting area is soaked, its plant and grass materials allowed to decay and is prepared for transplanting. Daily irrigation is enough to replenish the amount lost to evaporation due to atmospheric demand. Percolation due to the action of gravity that causes the water to move through the soil going to the groundwater table is also recovered.

Vegetative and Reproductive Growth Stage. After transplanting, the rice crop undergoes normal crop care. The farming activities are:

a. fertilizer application;

b. weed control; and

c. control of pest and diseases.

The daily irrigation applied during this stage is enough to replenish the amount lost to evaporation (from water surface around the rice plant), transpiration (from the leaves of the rice crops), and percolation (through the soil). As the rice crop undergoes the vegetative growth stage, it multiplies its plant bodies where transpiration takes place. It covers and reduces the water surface where evaporation takes place. However, during the period when fertilizers and other agro-chemicals are applied, the farm is drained of excess irrigation water for sometime.

Some studies and farmers' experiences indicate that inadequacy of irrigation water during the reproductive growth stage significantly affects the yield of the rice crop. During the vegetative growth, inadequacy of irrigation water results in lesser plant bodies that bear the grains.

Maturing Stage. During the start of this stage which is about two weeks before harvest, farms are drained of excess irrigation-water. The rice grain is allowed to mature at the same time the field is allowed to dry for convenience in harvesting the crop.

Studies reveal that the rice plant normally requires about 13 millimeters of irrigation water every day. Such amount includes all losses of which about 5 to 7 milimeters is for evapotranspiration.

Facilitator's Guide

Module II Cropping Calendar and Patterns of Planting
Session II Fundamentals of Cropping Calendar and Patterns of Planting

Specific Objectives: At the end of the session, the trainees shall be able to:

1. Define and differentiate cropping calendar and pattern of planting as applied in the irrigation system.

2. Illustrate different patterns of planting in an irrigated area of the IA and/or an irrigation system.

3. Discuss the implications of such terms in the delivery and distribution of irrigation water between the wet and dry seasons and within each season.

4. Enumerate the different climatic considerations in preparing a cropping calendar and pattern of planting for a given irrigated area of the IA and/or irrigation system; and

5. Discuss steps to institutionalize the use of a cropping calendar and pattern of planting in the irrigated area of the IA and/or irrigation system.

Contents

Introduction

An understanding of the cropping calendar and patterns of planting is important to facilitate O and M of irrigation systems. It likewise provides a good basis for an effective and efficient delivery and distribution of irrigation water in an irrigation unit or area.

Cropping Calendar

A cropping calendar is a graphical presentation on *when* a particular irrigation area will be or is planted to crops. It is an aggregate of horizontal lines representing the growth stages as well as the farming and irrigation activities in the different farm lots (Figure II-2). It only shows the approximate dates or periods but not necessarily the relative location of farm lots.

The *lowest line* represents the growth stages as well as farming and irrigation activities of the *first farmer* while the *topmost line* represents that of the last farmer. The imaginary lines between those two lines represent the farming and irrigation activities of the other farmers. Each of those lines present approximately the same information indicated in Figure II-1.

Figure II-2. A Cropping Calendar

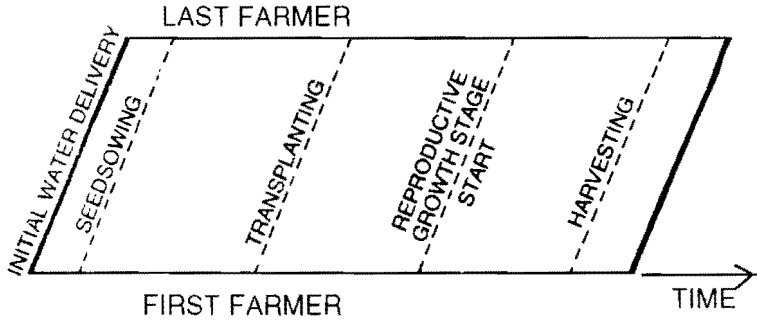
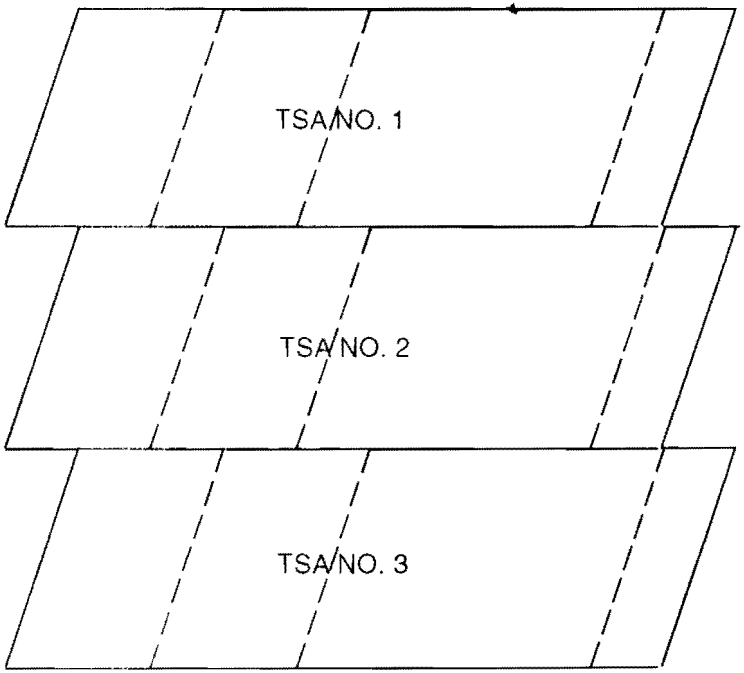


Figure II-3. A Pattern of Planting



Patterns of Planting

A pattern of planting is an aggregate of the cropping calendars representing each of the irrigation units in an irrigation area. It represents *when* a particular irrigation area is to be planted, in *what* irrigation unit and *where* the first planting is to be started (Figure II-3).

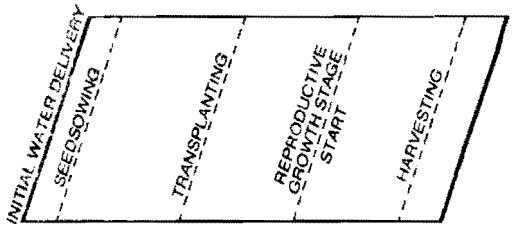
Given a cropping calendar, there are numerous variations of the planting pattern (Figure II-4). The pattern of planting can either be any of the following:

a. *undefined* - one with no definite pattern. An individual farmer makes his own decisions on his farming activities without considering its implications and effects on the activities of other farmers;

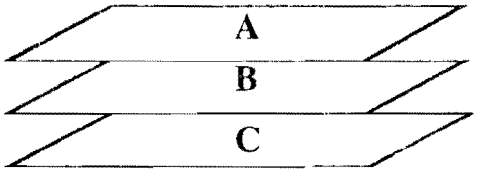
b. *simultaneous* - farming activities are started simultaneously in each of the irrigation units in the irrigation area (Figure 4a);

c. *downstream start* - farming activities are started in the irrigation unit at the downstream portion of the irrigation area followed one after the other. The upstream irrigation unit is the

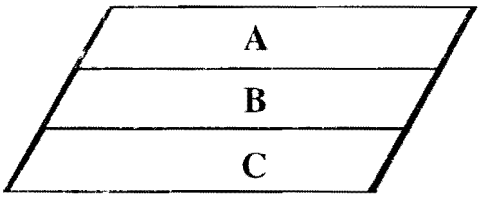
Figure II-4. A Cropping Calendar with Different Patterns of Planting



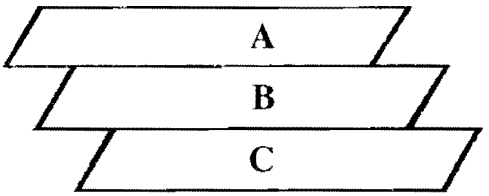
CROPPING CALENDAR



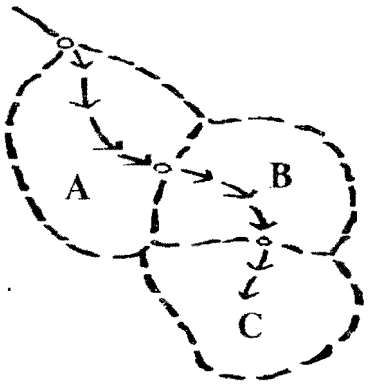
A. SIMULTANEOUS START



B. DOWNSTREAM START



C. UPSTREAM START



MAP OF IRRIGATED AREA

last to start its farming activities (Figure 4b); and

d. *upstream start* - is opposite the downstream start pattern of planting. It is where the farming activities are started in the irrigation unit at the upstream portion of the irrigation area followed one after the other. The most downstream irrigation unit is the last to start its farming activities (Figure II-4c).

Implications on the Delivery and Distribution of Irrigation Water

Given these different patterns of planting, the delivery and distribution of irrigation water in an irrigation area can be anticipated. These can be reviewed in two steps:

a. within a season; and

b. between two succeeding seasons - wet/dry seasons

Within a season. The undefined pattern of planting has a big problem in the delivery and distribution of irrigation water from the initial period of irrigation to terminal drainage.

The simultaneous pattern of planting though organized requires more attention during the later period of irrigation. All the canal network needs to have irrigation water to irrigate the remaining areas in each irrigation unit. A larger volume needs to be stored in canal prisms to ensure that irrigation water can get through the outlets.

The downstream start pattern of planting is also organized. Compared with the simultaneous pattern, it requires limited attention during the later period of irrigation as the irrigation water is concentrated on the upper portion of the irrigation area. A lesser volume needs to be stored in the canal prism to ensure that irrigation water gets through the outlets serving the irrigation unit.

The upstream start pattern of planting is also organized but requires more attention as during the later period the irrigation water is concentrated on the downstream irrigation units. Similar to the simultaneous pattern, a larger volume is needed in the canal prism to ensure that irrigation water gets through the downstream portion of the irrigation area.

Between Two Seasons (Wet and Dry Seasons). In deciding the pattern of planting to be used in an irrigation area, consider the water supply and practices brought about by the type of irrigation system.

Most irrigation systems in the country are run-of-the-river and gravity types. They do not have storage capability and are highly dependent on rainfall and available river flows. Most of its available water supply follows the characteristics shown in Figure II-5. The water supply gradually increases at the start of the wet season and peaks at a certain period. It gradually diminishes at the outset of the dry season with minimum flow occurring at the later period.

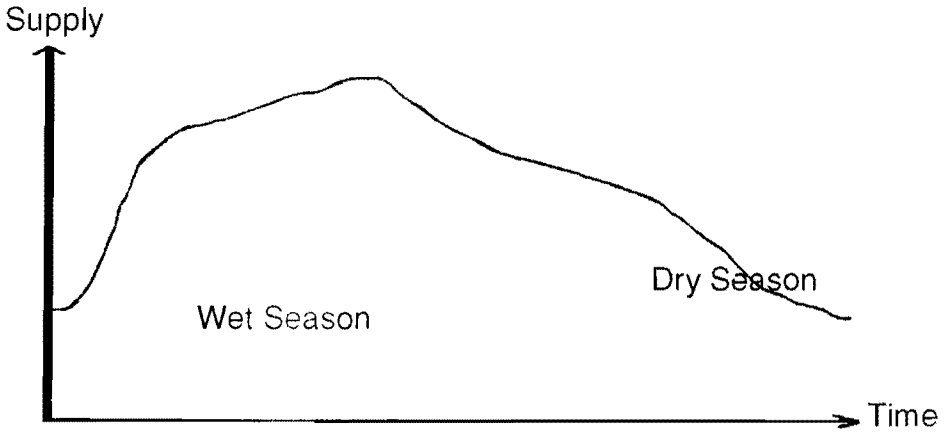


Figure II-5. Typical Time Series Supply of Irrigation Water at the Source

Given this condition in most irrigation systems, the pattern of planting that must be implemented must consider the wet and dry season supply of irrigation water from the source.

Note also that it is a common practice to minimize the *fallow period* between the wet and dry seasons to ensure that two rice crops can be planted in a year with opportunities for a third non-rice crop during the later period of the dry season. This practice points out to the same pattern of planting during the wet and dry seasons.

Therefore, in deciding the pattern of planting to implement, consider both the wet and dry season pattern of plantings given the implication of each within the season.

Hydro-Climatic Considerations in Preparing a Cropping Calendar and Pattern of Planting

In preparing a cropping calendar and pattern of planting, consider the following climatic parameters:

a. discharge record of water source - this historical record minimizes the impact of the periods of low water supply;

b. rainfall pattern - this historical record helps in accelerating farming activities in the irrigation area in conjunction with the available irrigation water from the source;

c. wind pattern - this helps minimize the impact of windy periods specially during the reproductive growth stage of the rice crop when it is more vulnerable to wind action; and

d. sunshine duration - this helps optimize the impact of long sunshine duration in the filling up of the rice grains and the convenience of harvesting and drying of the rice grains.

Preparing the Cropping Calendar and Patterns of Planting

Given the knowledge and information above, the cropping calendar and pattern of planting in an irrigation area can be prepared. The basic requirements are the following:

a. *map of the irrigation area* - information as to the boundaries of the irrigation units, and the area being served in each unit;

b. *information on hydro-climatic records of the vicinity of the irrigation area.*

Such information must include historical records of:

i. flow discharge at the water source;

ii. rainfall pattern;

iii. wind pattern; and

iv. sunshine duration.

c. historical records of the cropping calendar and pattern of planting in the irrigation area, if available.

Having obtained these requirements, information on hydro-climatic records as well as the historical record of the cropping calendar and pattern of planting are drawn in a common time scale (Figure II-6). Given this graphical presentation of the relevant information, the approximate parallelograms representing the cropping calendar and pattern of planting is determined taking into consideration the impact of the different hydro-climatic parameters.

This cropping calendar and pattern of planting is further refined by presenting it to officers and members of IAs for further comments and suggestions.

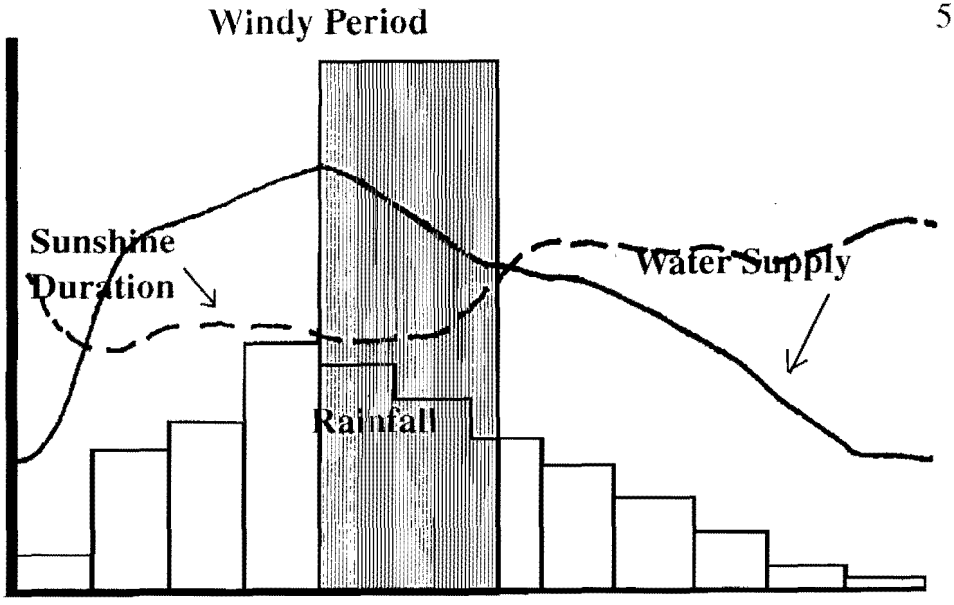


Figure II-6. Graphical Presentation of Hydro-Climatic Information

The biggest challenge confronting people involved in the O and M of irrigation systems is encouraging farmers to follow the cropping calendar and the pattern of planting prepared for the irrigation area. Though relatively easy to prepare, it takes time to successfully implement a cropping calendar and pattern of planting. It may take a lot of cropping seasons to establish one.

The present cropping calendar and pattern of planting represents the collective practices, beliefs or values of the farmers in an irrigation area. These are established ones and may have to be changed with a better alternative if found wanting.

Therefore, introducing a much better cropping calendar and pattern of planting is a continuous effort and must consider previous experiences. Farmers in the irrigation area must realize its need and consequently, its institutionalization.

Institutionalizing the Use of Cropping Calendar and Pattern of Planting

To introduce a better cropping calendar and pattern of planting in an irrigation area, there must be continuous and seasonal efforts from all those involved in the O and M of the system including plain users of irrigation water. Since activities to institutionalize the cropping calendar and pattern of planting is undertaken during each cropping season, it is iterative or repetitive. Hence, the process is improved in each cycle.

The iterative activities to institutionalize the use of cropping calendar and pattern of planting in an irrigation area are as follows:

i. Plan and program the activities related to the cropping calendar and pattern of planting with officers and members of the IA, concerned NIA staff and representatives of other government agencies providing agricultural support services;

ii. Assign the responsibilities relative to activities on the cropping calendar and pattern of planting within a rotation or sector area to the officers and members of the rotation or sector area;

iii. Hold regular meetings of IA officers to assess the cropping calendar and pattern of planting and for making collective decisions on related issues; and

iv. Initiate regular meetings of officers and members of the rotation or sector area to assess the cropping calendar and pattern of planting within the rotation or sector area.

Facilitator's Guide

Module II Cropping Calendar and Pattern of Planting
Session III
Planning, Implementation and Assessment of Cropping Calendar and Pattern of Planting

Specific Objectives:

At the end of the session, the trainees shall be able to:

1. Discuss the chronological activities that officers of irrigators associations (IA) and NIA concerned staff have to undertake in planning, implementing and assessing the cropping calendar and pattern of planting in the irrigation area.

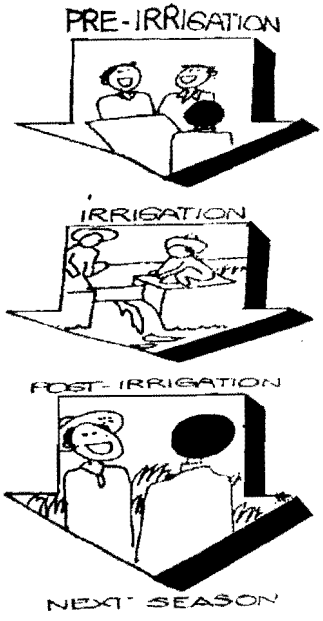
2. Discuss the importance and steps in assessing the cropping calendar and pattern of planting in the irrigation area using suggested record forms.

Contents

Introduction

People involved in the O and M of irrigation system have roles to play in managing the cropping calendar and pattern of planting in their irrigation area.

The following periods are considered:



a. Pre-irrigation - when the cropping calendar and pattern of planting for the irrigation area is prepared, discussed and finalized;

b. Irrigation - when the planned cropping calendar and pattern of planting are implemented and assessed; and

c. Post-irrigation - when the season long implementation and the problems it generated are evaluated and considered for the next season's planning and implementation.

Adequate knowledge and skills in managing the cropping calendar and pattern of planting are necessary for those with direct responsibility in the O and M of irrigation systems. A better understanding of the roles that the other members of the irrigation communities have to play is also needed especially on monitoring and assessment activities.

Such must be well understood by the IA officers and the TSA (or Sector) leaders if they are to effectively manage the cropping calendar and pattern of planting in their irrigation area. Members also need these to enable them to effectively follow related plans and programs of the IA.

Managing Activities on Cropping Calendar and Pattern of Planting

Managing cropping calendar and pattern of planting in an irrigation area does not only happen during the irrigation period. Prior to this period, a set of activities are done to prepare the area for organized irrigation and planting. Another set of activities takes place during the irrigation period and another after irrigation. These serve as a basis for planning for the next planting season and for further improving both organized irrigation and planting.

To complement the set of activities during these periods, the IA must provide policies including sanctions and rewards. These must clearly state the:

i. objectives of the planned cropping calendar and pattern of planting;

ii. rules and regulations that must be followed in its implementation; and

iii. rewards for following rules and sanctions for violations.

The major tasks and inherent duties of IA officers, TSA (or Sector) leaders and the members during these periods are as follows:

Pre-Irrigation Period. A good guide in the successful implementation of any activity is the presence of a plan and program to guide all officers and leaders in their management and supervisory activities. The same should also be known and accepted by the people who are involved and directly benefit from its implementation.

During this period, the major tasks of IA officers and TSA (or Sector) leaders are to:

i. prepare the cropping calendar and pattern of planting for their irrigation area to organize irrigation and planting; and

ii. provide their members adequate information about the planned cropping calendar and pattern of planting.

To accomplish these tasks, their duties are as follows:

i. *IA Officers:*

a. prepare the tentative and final cropping calendar and pattern of planting for their irrigation area;

b. prepare and inform TSA (or Sector) leaders on changes in IA policies, rewards and sanctions relative to the management of the cropping calendar and pattern of planting;

c. initiate meetings of TSA (or Sector) leaders about the cropping calendar and pattern of planting; and

d. initiate the information campaign on the final cropping calendar and pattern of planting for their irrigation area.

ii. *TSA (or Sector) Leaders:*

a. attend the IA meetings on the cropping calendar and pattern of planting;

b. initiate TSA (or Sector) consultative meetings on the tentative plan and program, and changes in related IA policies, rewards and sanctions;

c. prepare the TSA (or Sector) schedule after the consultative

meetings including the list of anticipated implementation problems and issues; and

d. undertake the information campaign relative to the final cropping calendar and pattern of planting in their irrigation unit and area.

iii. *Members:*

a. attend TSA (or Sector) consultative meetings on the tentative plan and program;

b. provide the TSA (or Sector) leaders information on anticipated problems and issues on the implementation; and

c. obtain information from the TSA (or Sector) leaders on the final plan and program with regards the cropping calendar and pattern of planting.

The consultative meetings of IA officers and TSA (or Sector) leaders must also include discussions on the implications of the cropping calendar and pattern of planting, i.e.:

i. delivery and distribution of irrigation water;

ii. maintenance and repair of irrigation facilities and structures;

iii. irrigation service fees (ISF) and/or amortization.

iv. season and year long supply of irrigation water.

Irrigation Period. The presence of plans and programs is not enough for successful implementation. A good one may be implemented repeatedly and improved to make it better and realistic.

The major tasks of IA officers and TSA (or Sector) leaders during the implementation (irrigation period) of the cropping calendar and pattern of planting is to manage and supervise implementation and undertake periodic monitoring and assessment of the status of the cropping calendar and pattern of planting.

To accomplish these tasks, their inherent duties are as follows:

i. *IA Officers:*

a. conduct regular meetings of TSA (or Sector) leaders on the status, problems and issues of the cropping calendar and pattern of planting;

b. manage field implementation of the plans and programs by the TSA (or Sector) leaders;

c. conduct random inspection of implementation at the TSA (or Sector) levels;

d. establish the actual cropping pattern and cropping calendar of the IA irrigation area from the data and information provided by each TSA (or Sector) leader; and

e. consolidate TSA (or Sector) reports and prepare an IA report on the status and related problems and issues.

ii. *TSA (or Sector) Leaders:*

a. conduct regular TSA (or Sector)

meetings on the status, problems and issues on implementation;

b. supervise implementation within his TSA (or Sector);

c. establish the actual cropping calendar at the TSA (or Sector) level from the data and information provided by the members;

d. prepare reports on the status, problems and issues at the TSA (or Sector) level; and

e. attend regular IA meetings on the status, problems and issues at the IA level.

iii. *Members:*

a. provide the TSA (or Sector) leaders with data and information relative to planting in his farm; and

b. attend the TSA (or Sector) meetings on the status, problems and issues of field implementation.

Post-Irrigation Period. During the post-irrigation period, the major tasks and duties of IA officers and TSA (or Sector) leaders follow those in the pre-irrigation period except that collective evaluation of the previous season's implementation is included. This serves as a basis for planning for the next season. As the first season (wet season) planning includes the cropping calendar and pattern of planting for the dry season, the post-irrigation evaluation of the wet season must include an evaluation of the actual cropping and calendar to those planned for the dry season. This may result in adjustments of cropping calendar and pattern of planting for the dry season.

Monitoring Data and Information on Cropping Calendar and Pattern of Planting

As indicated above, the irrigation activities may be divided into two major tasks:

a. implementation - involves managing, supervising and following the agreed plan; and

b. monitoring - involves the gathering of data and information; and its subsequent analysis to assess the level of success in implementation and the need to adjust plans and programs.

As shown in Figure II-7, the most critical period for monitoring and assessing the implementation of the cropping calendar and pattern of planting in an irrigation area is the period from the start of initial water delivery and distribution up to the time the last farmer planted his rice crop.

Note that the cropping calendar and pattern of planting can no longer be altered. The moment seeds are sown it will follow certain chronological growth stages.

Therefore, by the time the last farmer plants his crop, the actual cropping calendar and pattern of planting of the irrigation area can be established. Such information can serve as a useful tool for decision making in the remaining periods of the season.

Data and Information to be Monitored. Relevant data and information needed to assess the implementation of the cropping calendar and pattern of planting are:

1. name of farmer and farmlot number - establishes the relative location of the planted area;

2. irrigated area - provides information on the extent of area to be irrigated in

A very important management responsiblity for the successful implementation of plans, programs, and tools for future planning activities is regular monitoring and assessment.

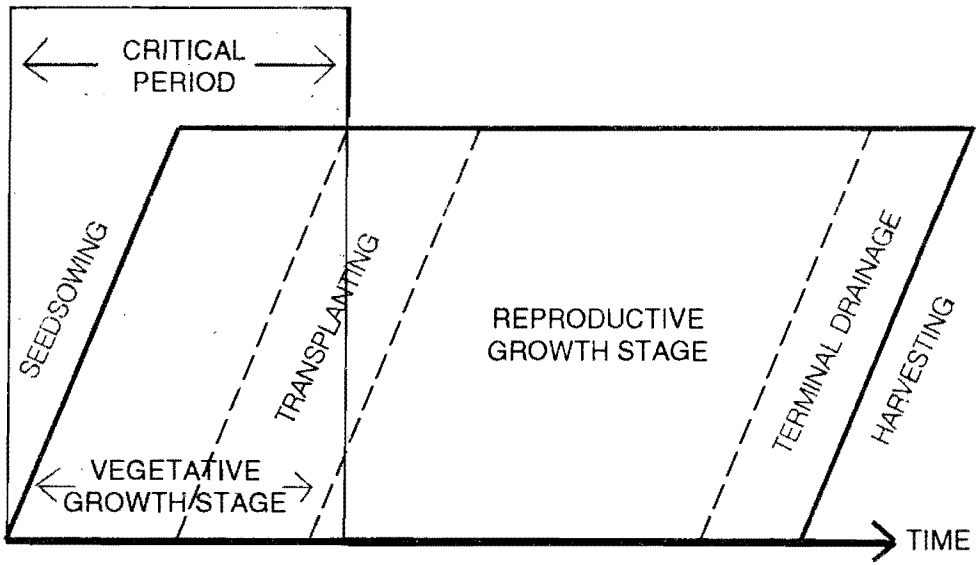


Figure II-7. Critical Period on the Monitoring of Cropping Calendar and Pattern of Planting

the remaining period of the season; and

3. dates of seedsowing and variety of crops planted - provide base information on determining the different growth stages of the crops and projecting how much and where to irrigate during the remaining period of the season and during time of low water supply.

Analysis of Data and Information. To be useful, these data and information have to be gathered and analyzed by the irrigation unit (TSA or Sector). Such analysis results in the actual cropping calendar of the irrigation unit. The format shown in Figure V-2 (Module V) can be used for data and information recording as well as for analysis.

The actual cropping calendar from each irrigation unit when consolidated chronologically from the irrigation unit nearest the water source to the farthest irrigation unit (Figure II-8) represents the pattern of planting in the whole irrigation area.

As indicated in Figure II-7, future farming activities and growth stages of rice crops can be projected. With the vertical axes of the

individual cropping calendar of each irrigation unit as the area measure, the area to be irrigated as well as the growth stages of the crop in each unit can be established. Therefore, the graphical presentation of the cropping calendar provides relevant information necessary for future decisions on the delivery and distribution of irrigation water during the remaining period of the season.

Furthermore, the same graphical presentation presents periods during the season when farmers are not so busy with their farming activities. They can be involved as well as participate in maintaining and repairing irrigation facilities and structures.

It can also provide information about when farmers should submit data and information necessary for preparing irrigation bills and submitting crop damage information. It likewise provides information as to when harvesting should start in an irrigation unit and the proper time to collect irrigation service fees (ISF).

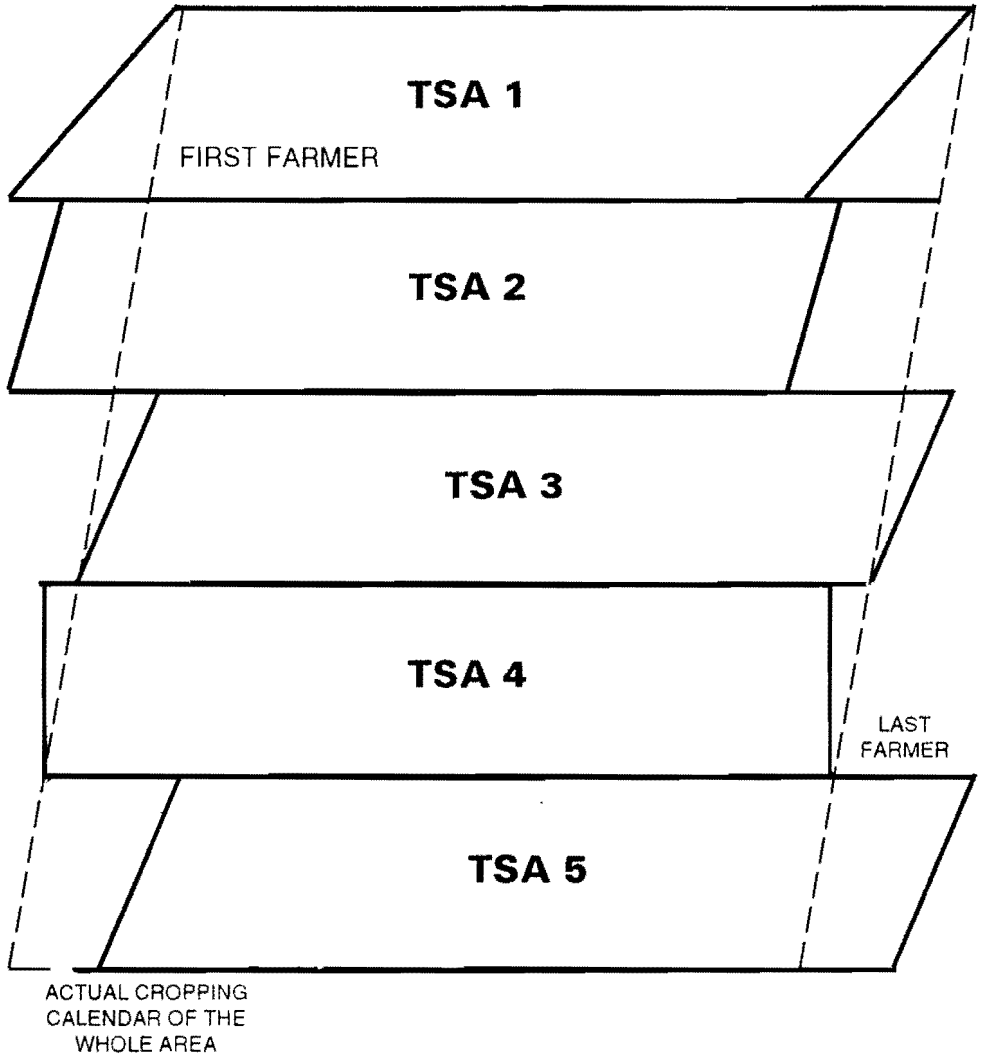


Figure II-8. Actual Pattern of Planting in an IA Area Developed by Consolidating the Cropping Calendar of the TSAs (or Sectors)

Module III

Delivery and Distribution of Irrigation Water

MODULE III : Delivery and Distribution of Irrigation Water

General Objectives:

At the end of the module, the trainees shall be able to:

1. Discuss and elaborate on the basic concepts of irrigation water management.
2. Define and differentiate delivery and distribution as used in irrigation.
3. Enumerate and explain the advantages and disadvantages of the different methods of delivery and distribution.
4. Illustrate how to prepare schedules.
5. Discuss how to manage the delivery and distribution of irrigation water in the irrigated area.

Introduction to the Module

Water supply has decreased in recent years. However, food production has kept in pace with increase in population through irrigation. Thus, the need for better management and efficient use of water resources become very necessary.

Irrigation is one of the biggest users of water resource. Irrigation programs, nowadays, endeavor the direct involvement of water users in managing irrigation water.

It is therefore very important to provide officers and members of irrigators associations (IAs) with knowledge and skills in managing irrigation water. This will make them effective managers in directing the use of water in their own irrigation area.

The module provides basic concepts of water management. It describes how water is used by the crop and its soil-water environment for its growth and production. It also discusses how irrigation water moves from the source to the field where it is eventually used by the rice crops including its losses as it moves along canals and ditches.

Furthermore, it elaborates the different methods of delivering and distributing irrigation water in an irrigation area. It includes season and year long implications on the supply and losses of scarce water resource.

With these different information, the officers, leaders and members of IAs as well as NIA staff involved in irrigation can develop required skills in undertaking their irrigation-related responsibilities.

Facilitator's Guide

Session I
Basic Concepts

Specific Objectives:

At the end of the session, the trainees shall be able to:

1. Define and differentiate monitoring and evaluation as used in irrigation systems management.

2. Discuss the importance of monitoring and evaluation in the operation and maintenance of irrigation systems.

3. Discuss and elaborate on the basic processes of monitoring and evaluating the operation and maintenance performance in the irrigated area.

4. Enumerate and discuss the importance of each data and information monitored and evaluated in the operation and maintenance of the irrigated area.

Contents

Introduction

Supervising activities relative to monitoring and evaluation, particularly in the O and M of irrigation system, is relatively complex.

Irrigation water management refers to the conveyance from the source and application of irrigation water to farm lots in adequate amount at the proper time and interval. This assures optimum growth and production of agricultural crops. The term implies the management of the diversion from the source, conveyance (including the delivery and distribution) and application of irrigation water.

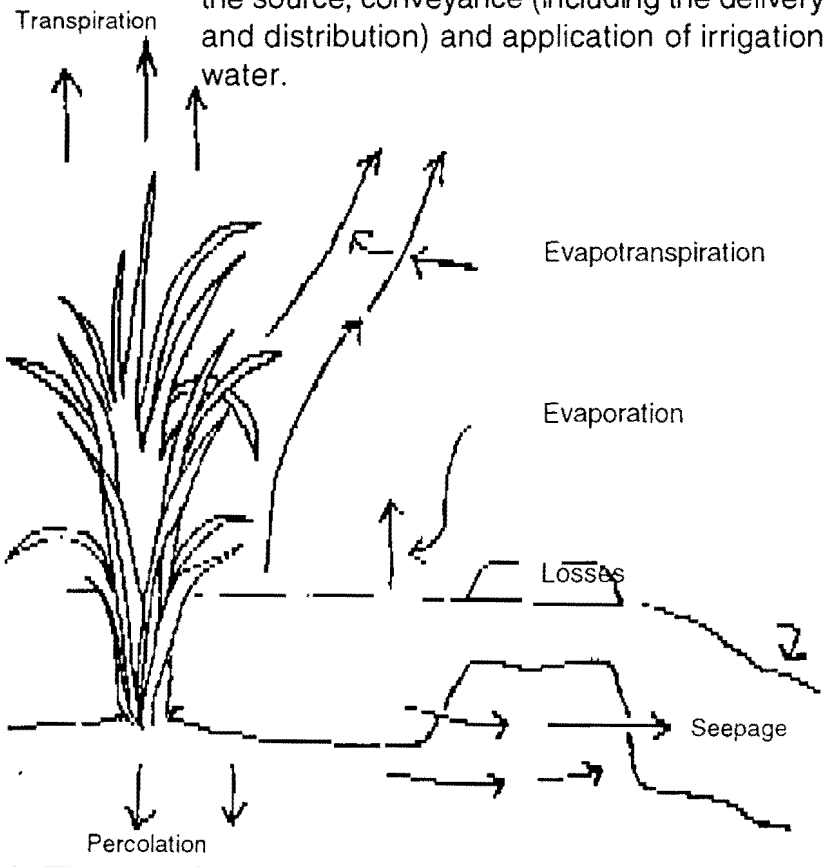


Figure III-1. The Plant-Soil-Water Environment Showing the Different Uses of Irrigation Water

As shown in Figure III-1 representing plant-soil-water, the uses of irrigation water are for:

i. *evaporation* - water released from standing water around the rice plant due to atmospheric demands;

ii. *transpiration* - water released from the leaves and bodies of the rice plant due to atmospheric demands;

iii. *evapotranspiration* - water released from the rice plant and water accumulating outside the plant body. It is also the water demanded by the atmosphere from the plant-water environment;

iv. *percolation* - water movement caused by gravity and is the vertical movement through the soil to the ground water beneath the soil;

v. *seepage* - water movement also caused by gravity and is the horizontal movement through the soil where the rice crop is or through the paddy bunds; and

vi. *losses* - are excesses in the application of irrigation water in the plant-soil-water environment and is given away to the drainage network of the irrigation area.

In the conveyance environment, similar water movement also occurs except that transpiration occurs on vegetation that is within the canal prism. An additional loss called *administrative losses* may occur and are caused by breaks in the canal networks. The conveyance environment of irrigation water from the source down the place of application is shown in Figure III-2.

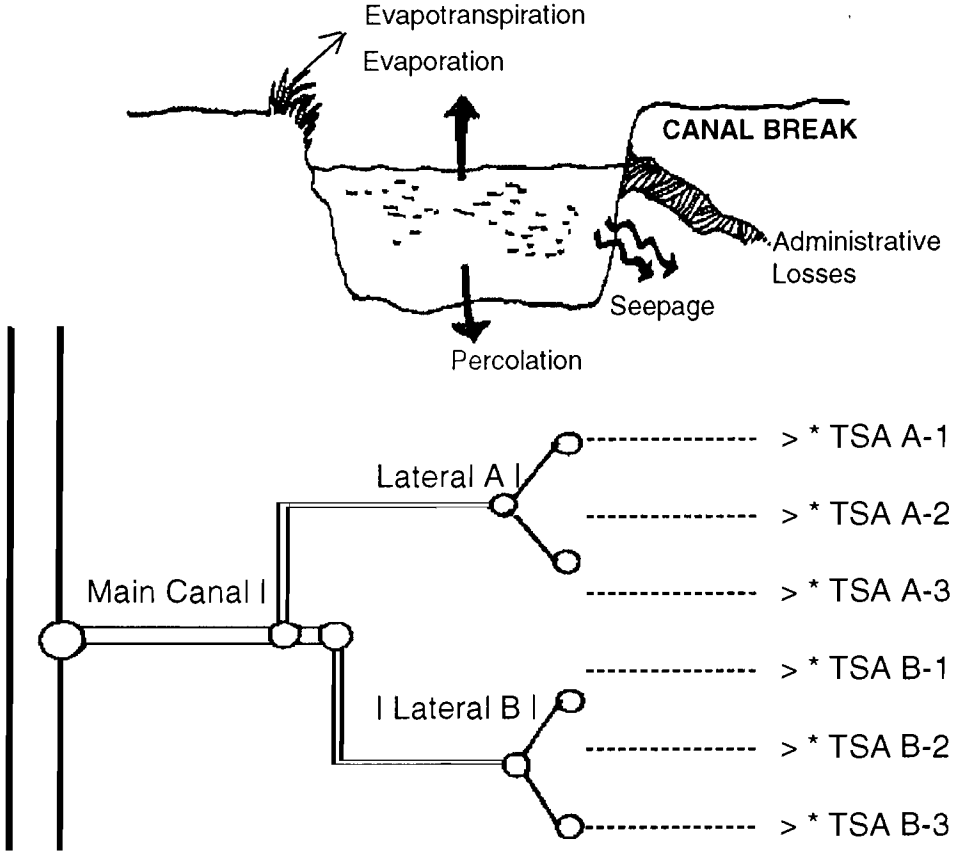
Delivery and Distribution of Irrigation Water

D*elivery* refers to the diversion of irrigation water from the source (river or any control gates such as headgates of main or lateral canals) and its subsequent conveyance to another control gate (control gates such as the headgates of lateral canals or turnouts). It will later be distributed to smaller control points (turnouts or farmlots within the turnout service area).

D*istribution* refers to the allocation or division of irrigation water at the end of a delivery point to the start of the distribution point.

The two terms refer to the conveyance of irrigation water. However, the terms are used to separate and properly define the responsibilities over the movement of irrigation water from the source to the place of application. Such definition and separation of responsibilities are indicated in Figure III-3.

Figure III-2. Movement of Irrigation Water from the Source to the Place of Use



IA officers ensure water delivery at MC headgate and distribute it to the headgates of laterals (A and B); and
TSA (or Sector) leaders ensure delivery at headgates of their lateral and distribute it to their turnouts.

Figure III-3. Delivery and Distribution of Irrigation Water as Related to Responsibilities of People Involved in O and M

WATER MOVEMENT FROM SOURCE TO FARMLOTS

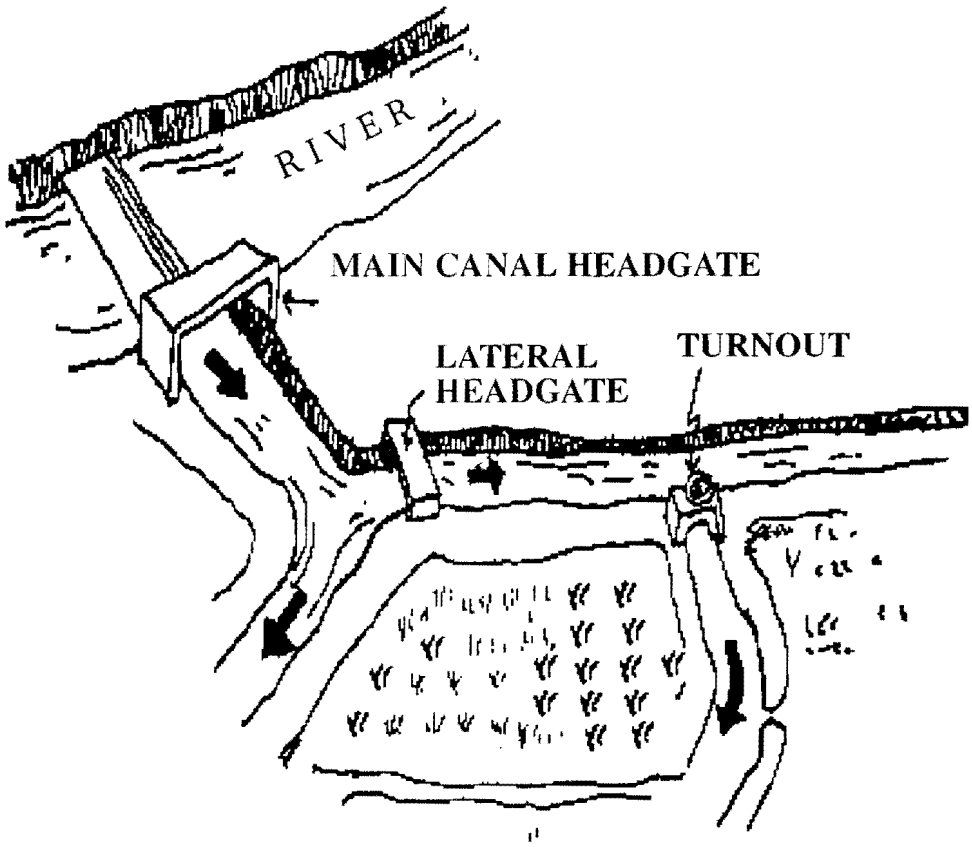


Figure III.

Facilitator's Guide

Session II
Methods of Irrigation Water Delivery and Distribution

Specific Objectives:

At the end of the session, the trainees shall be able to:

1. Enumerate, describe and differentiate different methods of delivery and distribution of irrigation water.

2. Describe and illustrate situations where the different methods apply.

3. Discuss and illustrate the interdependence of the methods of delivery and distribution of irrigation water and the patterns of planting in an irrigated area.

Contents

Introduction

The movement of irrigation water from the source through the canal network in an irrigation area in a day is a complex process. This is even more complex if the movement of irrigation water in a season is considered.

Irrigation water for agricultural production is used throughout the cropping season. Therefore, if the efficient and effective use of irrigation water is desired, the complexity of water movement must be understood.

It is a must for officers and members of the IAs as well as other people involved in the O and M of irrigation systems to acquire basic knowledge on the different methods of delivery and distribution of irrigation water. This will enable them to develop management skills.

Methods for the Delivery and Distribution of Irrigation Water

The methods of delivery and distribution in an irrigation can be divided into two categories, namely:

i. according to desired pattern of planting in the irrigated area of the IA and/or an irrigation system; and

ii. according to the desired scheme of application of irrigation water.

Normally, methods in the first category are used during the *initial period* of irrigation. They establish the desired pattern of planting in an irrigation area. This simplifies the delivery and distribution of irrigation water in the remaining period of the season. The methods under this category may include:

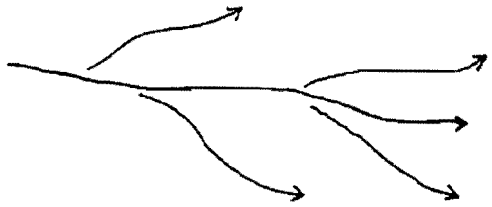
i. *Undefined* - this method is basically unorganized and results is an undefined pattern of planting.

This causes a more complicated delivery and distribution of irrigation water in the remaining period of the cropping season. It can also result in the same pattern of planting in the next cropping season, specially in gravity and run-off-the-river type irrigation systems;

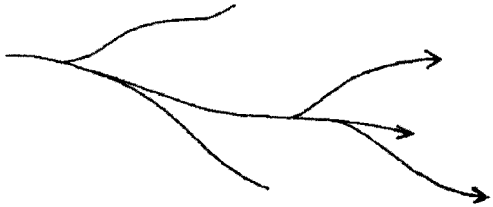
ii. *Simultaneous* - the delivery and distribution of irrigation water starts simultaneously in all control points. It predictively results in the start of farming activities at the same time in all of the irrigation units. Figure III-4a illustrates such a method;

iii. *Downstream start* - the delivery and distribution of irrigation water starts at the irrigation units downstream of the irrigation area. This is intended to result in a pattern of planting starting at the downstream going upstream. Figure III-4b reflects such a method; and

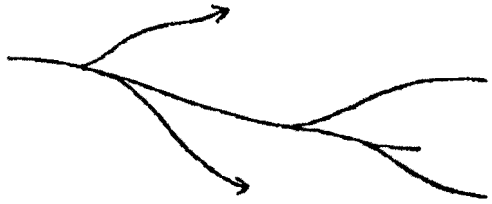
iv. *Upstream start* - the delivery and distribution of irrigation water starts at the irrigation units upstream. This method establishes a pattern of planting that starts at the upstream irrigation units going downstream. Figure III-4c reflects such a method.



a) Simultaneous Start



b) Downstream Start

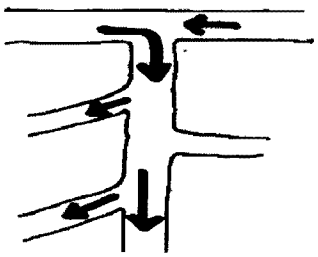


c) Upstream Start

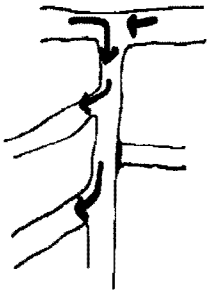
Figure III-4. Methods of Delivery and Distribution of Irrigation Water According to Desired Pattern of Planting.

The duration in applying this method in the early period of irrigation is normally short. It may last a week or two to ensure that the desired pattern of planting has started and has gained momentum. After this, the method applied for normal irrigation is resumed. This category of methods is based on the desired scheme of applying irrigation water.

The methods are as follows:



i. *Continuous or simultaneous* - all canal networks are simultaneously delivering and distributing irrigation water. Technically, this method is used during periods of abundant supply of irrigation water; and



ii. *Intermittent or rotational* - the delivery and distribution of irrigation water is rotated among the canal systems. The method is usually adopted during periods of low irrigation water supply. Rotation may be done on either of the following:

   a. *by section of a main canal or by lateral* - the main canal is divided into sections such that delivery and distribution is rotated among these sections that normally

include one or more lateral headgates.

b. *by section of a lateral or by turnout* - the lateral canal is divided into sections such that delivery and distribution is rotated among these sections that normally include one or more turnouts.

In the intermittent or rotational method, the irrigation requirement of the crops is just enough for one rotation interval. The method is applied either through any of the following:

i. *constant discharge-variable time* - the discharge is constant at the water source while the duration varies in delivering and distributing irrigation water in a section of the conveyance canal. The time duration is a portion of the rotation interval which is proportionate to the area being irrigated in the section to the total area being irrigated through the whole conveyance canal; and

ii. *variable discharge-constant time* - the discharge varies at the water source during the rotation interval. The duration in delivering and

distributing irrigation water in a section of the conveyance canal is constant or the same in each rotation. The variable discharge is set by determining the volume of irrigation requirement of the area being irrigated at a rotation interval.

The adoption of a method in the delivery and distribution of irrigation water is technically dependent on the availability of irrigation water. However, different methods can be applied in different portions of the canal network at the same time.

Besides the availability of irrigation water, other considerations in the adoption of different methods include:

i. *Physical configuration of the conveyance canals of the irrigation area*. Such configuration may be any of the following:

   a. the length of the main canal is longer that the average length of its laterals. In such a situation, rotation may be done by sections of the main canal;

b. the length of the main canal is shorter than the average length of its laterals. In such a situation, rotation may be done by sections of the lateral while delivery and distribution at the main canal level is held continuous; and

c. the length of the main canal is approximately equal to the average length of its laterals. In such a situation, either the continuous or rotational method or a combination of both can be adopted.

ii. *Convenience of IA officers and members in the adoption of the method.* This is a very important consideration as the success in the implementation and subsequent institutionalization of a method is dependent on the people who are going to adopt the method.

It is advisable to implement a method even during periods of abundant water supply. This develops a positive attitude in each individual farmer in the irrigation area that will greatly help institutionalize the method.

Facilitator's Guide

Session III
Planning, Implementation and Assessment of the Delivery and Distribution of Irrigation Water

Specific Objectives: At the end of the session, the trainees shall be able to:

1. Prepare a schedule for the delivery and distribution of irrigation water and discuss its implications on the cropping calendar and pattern of planting.

2. Discuss the importance of assessing the adequacy and reliability of the delivery and distribution of irrigation water in the irrigated area.

3. Explain how to assess the adequacy and equitability of the delivery and distribution of irrigation water in the irrigated area.

4. Discuss the steps in institutionalizing the use of schedules in the delivery and distribution of irrigation water from the start of the wet season to the end of the dry season.

5. Enumerate and elaborate on the chronological activities that IA officers and concerned staff of NIA have to undertake in planning, implementing, and assessing the delivery and distribution of irrigation water in the irrigated area.

Contents

Introduction

Adequate knowledge on the delivery and distribution of irrigation water provides persons involved in the O and M of irrigation systems with enough information to manage such activities.

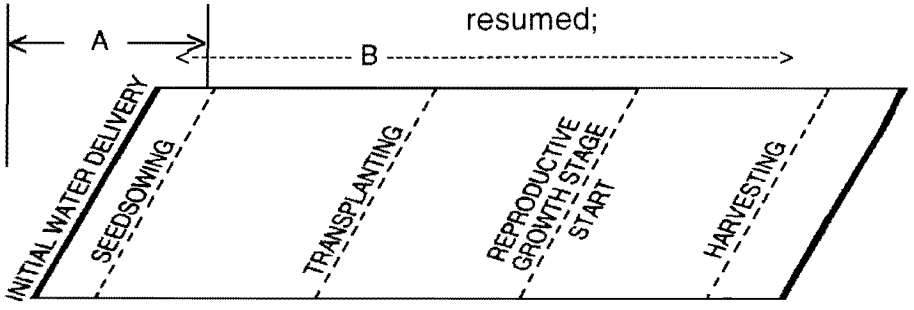
However, it may also be necessary that they learn some basic skills on how to use such knowledge in planning and preparing schedules, implementing including monitoring and assessment, and in the post-irrigation evaluation of the delivery and distribution of irrigation water.

Preparing Schedules of the Delivery and Distribution of Irrigation Water

In any management endeavor, schedules are an important guide for people. This is true in managing the delivery and distribution of irrigation water.

Such a guide includes:

i. *the cropping calendar and pattern of planting* - this is used in determining the period where the different categories and methods in the delivery and distribution can be implemented. As shown in Figure III-5, irrigation is implemented for a period until half of the area in the downstream has started land preparation activities. The normal irrigation method using either or both simultaneous and rotational irrigation method is then resumed;



A - Period when the method based on the the desired pattern of planting is adopted

B - Period when the method based on the scheme of application of irrigation water is applied

Figure III-5. Cropping Calendar and Pattern of Planting and the Periods of Implementing the Different Methods of Irrigation Water Delivery and Distribution

ii. *map of the irrigation unit and/or area* - with detailed information on the irrigation canal networks and structures, it helps decide what method during the normal irrigation period can be implemented in certain sections of the irrigation unit and/or area; and

iii. *schedules of previous seasons* - if available, the information helps establish methods that farmers can appreciate. This is especially helpful if a list of the issues and problems related to irrigation water delivery and distribution during the previous seasons are available.

Given these information, a schedule for the delivery and distribution of water similar to Figure III-6 can be prepared after a series of discussions with the NIA staff and/or the IA officers.

Common Situations in the Delivery and Distribution of Irrigation Water

The objectives of the delivery and distribution of irrigation water are to make it:

i. *reliable* - delivery is timely even if the volume of delivery is sometimes not enough;

ii. *adequate* - the volume of delivery is enough; and

iii. *equitable* - the volume of delivery is proportionately divided among the irrigation units even during period of low water supply.

SCHEDULE OF WATER DELIVERY AND DISTRIBUTION

TSA	Area, ha	Date Start	Date End
TSA A, A-1	60.0	07 July	29 October
TSA B, B-1	19.0	30 June	22 October
TSA C	31.0	30 June	22 October
TSA D	24.0	23 June	15 October
TSA E, E-1, E2	23.0	23 June	15 October
TSA F	55.0	6 June	8 October
TSA G	20.0	9 June	1 October
TSA H	30.0	9 June	1 October

*Regular Rotation Resumption, 23 June 1991

Figure III-6. Example of a Schedule of Irrigation Water Delivery and Distribution

These objectives should be the focus of any decision, action and activity related to the delivery and distribution of irrigation water. The common trend in the delivery and distribution of irrigation water along a stretch of canal is shown in Figure III-7. There is a

tendency of oversupply at the upstream portion and an undersupply at the downstream portion of the canal. Such situations must be continually minimized.

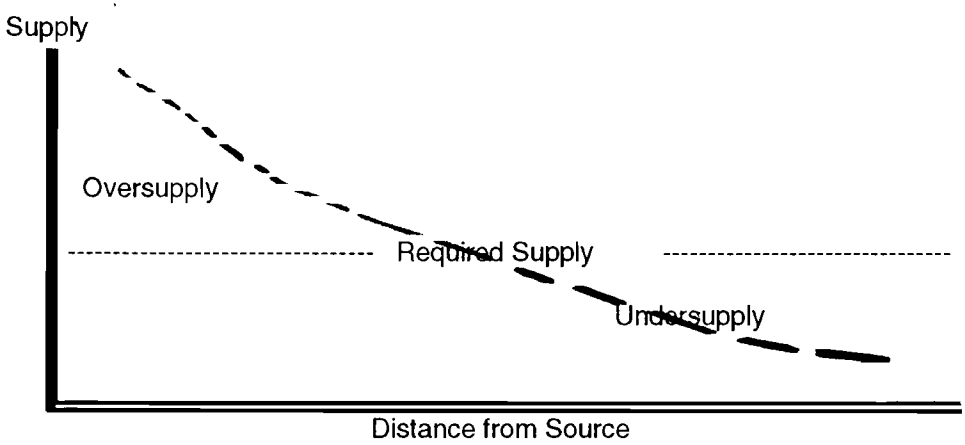


Figure III-7. Trend of Supply of Irrigation Water Along a Stretch of Canal

Assessing the Adequacy and Equitability of the Delivery and Distribution of Irrigation Water

During the irrigation period, the delivery and distribution of irrigation water is basically continuous. There are periods when certain irrigation units receive more than what is required and there are those that receive less. To minimize such situations, periodic assessment of the irrigation situation in the irrigation area must be done. There must be regular monitoring of the discharges at the different delivery and distribution points in the

irrigation area. Monitored data is analyzed as basis for assessing the water situation.

The map of the irrigation area indicating the canal networks and control structures is a useful guide in setting up points to observe discharge flows in an irrigation area. The responsible persons and their observation points for irrigation discharges are:

i. *IA Officers:*

   a. headgate of lateral (or main canal in CIS) - for the discharge on delivery or diversions. The observations obtained at this point provide information on the adequacy of the delivery of irrigation water to the IA irrigation area; and

   b. headgates of sub-laterals or turnouts (or laterals in CIS) for discharges on distribution. The observations obtained at this point provide information on the equity in the distribution of irrigation water among the TSA (or Sector) turnouts of the irrigation area.

ii. *TSA (or Sector) Leaders:*

a. headgate of sub-lateral or turnout (or lateral) in CIS for the discharges on the delivery. The observations obtained at this point provides information on the adequacy of delivery of irrigation water at the TSA (or Sector) turnouts; and

b. turnouts or upstream end of supplementary farm ditches (SFD) for the discharges on the distribution. The observations at this point provides information on the equity of the distribution of irrigation area among the turnouts or the SFD.

IA officers and TSA (or Sector) leaders have responsibilities both in the delivery and distribution of irrigation water. Each is responsible for a delivery point where adequate delivery of irrigation water is assured. Given the volume of delivery, they are also responsible in making sure that the volume delivered is properly allocated and equitably distributed to their respective delivery points.

Institutionalizing the Use of Schedules for the Delivery and Distribution of Irrigation Water

For farmers to follow schedules for the delivery and distribution of water, a lot of time, effort and practice are needed. These are needed not only during a cropping season, but through seasons and year long experience in using such schedules. Suggested processes for institutionalizing the use of schedules for the delivery and distribution of irrigation water are as follows:

i. Plan and program the delivery and distribution of irrigation water with officers and members of the IA, concerned staff of the NIA, and representatives of government agencies providing agricultural support services;

ii. Assign responsibilities relative to the delivery and distribution of irrigation water within the rotation or sector area to its officers and members; and

iii. Hold regular meetings of IA officers to assess reliability, equitability and adequacy, as well as make collective decisions on the delivery and distribution of irrigation water.

Institutionalization is a continuous process where activities are improved in each cycle.

Managing Activities on the Delivery and Distribution of Irrigation Water

Managing the delivery and distribution of irrigation water does not only happen during irrigation time. Prior to the initial delivery of irrigation water, some preparatory activities are done to ensure that all those involved are properly prepared.

The management activities should be supported by IA policies, rewards and sanctions relative to irrigation water delivery and distribution.

To guide IA leaders, TSA (or Sector) leaders and members, clearly state the:

i. objectives in the delivery and distribution of irrigation water;

ii. rules and regulations that must be followed during period of low irrigation; and

iii. the rewards for adhering and sanctions for violating these policies, rules and regulations.

The different periods relative to managing the delivery and distribution of irrigation water are enumerated below.

Pre-Irrigation Period. The major task of IA officers and TSA (or Sector) leaders is to plan and program the delivery and distribution of irrigation water. To accomplish the task, their duties are:

i. *IA Officers:*

a. Prepare the tentative and final schedule of the delivery and distribution of irrigation water at the IA level;

b. Prepare and inform TSA leaders on changes related to policies, rewards and sanctions;

c. Initiate meetings with TSA leaders to discuss tentative schedules and to finalize the same after completing the TSA consultative meetings; and

d. Initiate the information campaign on the final schedule.

ii. *TSA (or Sector) leaders:*

a. Attend IA meetings on the delivery and distribution of irrigation water;

b. Initiate the TSA (or Sector) consultative meetings on tentative schedules and changes on the related policies, rewards and sanctions;

c. Prepare the TSA schedule after the consultative meetings; and

d. Undertake the information campaign relative to the delivery and distribution of irrigation water.

Irrigation Period. The major task of IA officers and TSA (or Sector) leaders is to implement and periodically monitor and assess the status of the delivery and distribution of irrigation water. To accomplish this task, their duties are:

i. *IA Officers:*

a. Conduct regular meetings of TSA (or Sector) leaders on the status, problems, and issues of irrigation water delivery and distribution;

b. Regularly supervise delivery and distribution activities at the IA level;

c. Conduct random inspection of the delivery and distribution activities at the TSA (or Sector) level; and

d. Consolidate TSA (or Sector) reports and prepare IA level report on the status of the delivery and distribution of irrigation water.

ii. *TSA (or Sector) Leaders:*

a. Conduct regular TSA (or Sector) meetings on the status, problems and issues related to the delivery and distribution of irrigation water;

b. Regularly supervise delivery and distribution activities at the TSA (or Sector) level;

c. Conduct random inspection of irrigation water supply at the farm level; and

d. Prepare and submit TSA (or Sector) level reports on the status of the delivery and distribution of irrigation water.

Post-Irrigation Period. The collective tasks of IA officers and TSA (or Sector) leaders are:

i. Conduct evaluation meetings relative to the delivery and distribution of irrigation water in the recently concluded irrigation period;

ii. Review, recommend and initiate through the IA's Board of Directors (BOD) changes in the policies, rewards and sanctions on the delivery and distribution of irrigation water; and

iii. Prepare a consolidated report on the delivery and distribution of irrigation water in the recently concluded irrigation period with recommendations to improve management and supervision in the next season.

Module IV

Irrigation Facilities and Structures

MODULE IV: Irrigation Facilities and Structures

General Objectives:

At the end of the module, the trainees shall be able to:

1. Define and differentiate facilities and structures.
2. Enumerate and explain the uses of the different facilities and structures.
3. Define and differentiate maintenance, repair and rehabilitation.
4. Prepare IA schedules and discuss how to manage maintenance and repair of irrigation facilities and structures.

Introduction to Module IV

Properly maintained and functional irrigation facilities and structures are very important for the efficient delivery and distribution of irrigation water. Thus, thorough knowledge is essential on how these facilities and structures are operated properly to minimize damage.

Furthermore, very relevant for effective control of the delivery and distribution of irrigation water is a good understanding on how to maintain and repair facilities and structures for irrigation. This includes how to effectively manage such related activities with the involvement of IA officers and members.

Facilitator's Guide

Session I

Irrigation Facilities and Structures: Introduction and Uses

Specific Objectives:

At the end of the session, the trainees shall be able to:

1. Define and differentiate facilities and structures as used in irrigation.

2. Enumerate and explain the uses of the different facilities and structures commonly found in the irrigated area.

Contents

Introduction

Facilities and structures for irrigation are basically used to control and regulate the movement of irrigation water in an irrigation area.

IA officers and members are the people who supervise and undertake the O and M activities in the irrigation area. They therefore need to acquire basic knowledge about these facilities and structures. This enables them to develop the necessary skills in manipulating those facilities and structures for the effective and efficient delivery and distribution of irrigation water.

Importance of Irrigation Facilities and Structures

Irrigation facilities and structures are the physical components of an irrigation system. These are constructed to facilitate movement and control the flow of irrigation water from the source to its place of use.

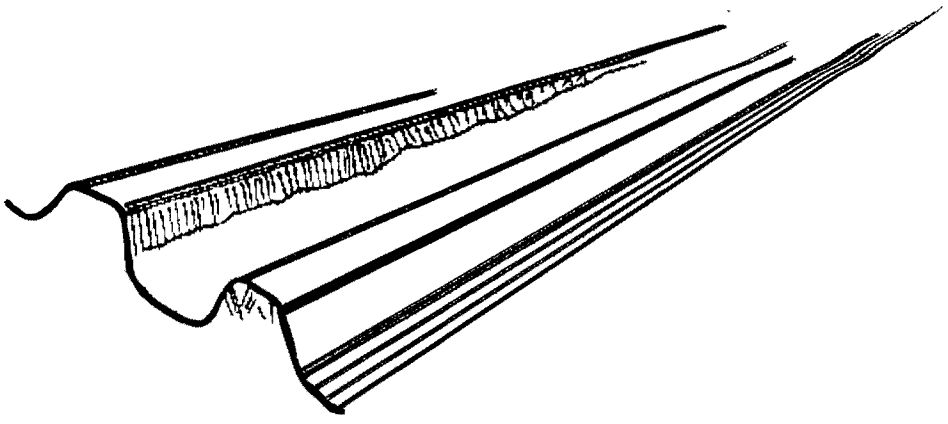
Irrigation facilities are the physical components that are normally made of earth materials. They are used to facilitate the movement or conveyance of irrigation water from the source and from structure to structure down to the place of use. Such facilities commonly consist of two parallel and spaced embankments in which moving irrigation water is confined (Figure VI-1). Being made of earth materials, facilities are subject to overgrowth of grasses and other vegetation, and to erosion.

The facilities include the following canals and ditches:

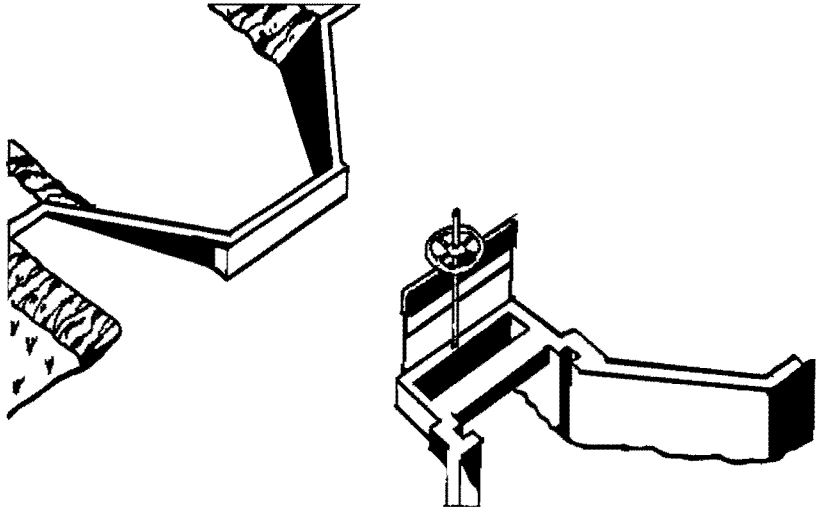
i. canals - include the main and lateral canals (Figure IV-2); and

ii. ditches - include the main, secondary and farm ditches (Figure IV-2).

Irrigation structures are the physical components that are normally made of concrete, reinforcement bars and other steel



a) Example of an Irrigation Facility



b) Example of an Irrigation Structure

Figure IV-1. Facilities and Structures for Irrigation

materials. They are used to regulate and control the flow of irrigation water at the different points of the canal networks in an irrigation system.

Irrigation structures take many forms and their varied uses are to:

i. raise the level of irrigation water inside the canals to enable it to flow through an outlet;

ii. allow water flow and control the volume of irrigation water through another canal;

iii. retard the velocity of irrigation water in certain sections of the canal to prevent scouring of canal embankments; and

iv. allow passage of people, farm implements and machines through the canals from one farm to the other.

To minimize costs, most structures are constructed with a combination of uses. Some control the level and volume of flow and at the same time reduce the velocity of irrigation water immediately downstream.

Irrigation structures are provided with control mechanisms to control level and volume of flowing irrigation water. These can be flashboards and steel or wooden gates which are operated manually or mechanically (Figure IV-1).

The irrigation structures commonly found in an irrigation system include headgates of diversion dams, main canals, lateral canals and others including those that dissipate the energy of flowing water to minimize scouring at critical sections of the canal networks (Figure IV-2).

The functionality of the irrigation facilities and structures deteriorates through continued use. Therefore, they must be properly cared for and regularly maintained and repaired.

Neglect in the repair and maintenance of irrigation facilities and structures results in the continuous decline of its capability. It also escalates damage to the facilities and structures to the point that regular repair is not enough to restore them to their original state.

In such cases, major restoration or rehabilitation has to be done to restore them to their original capacity and functionality.

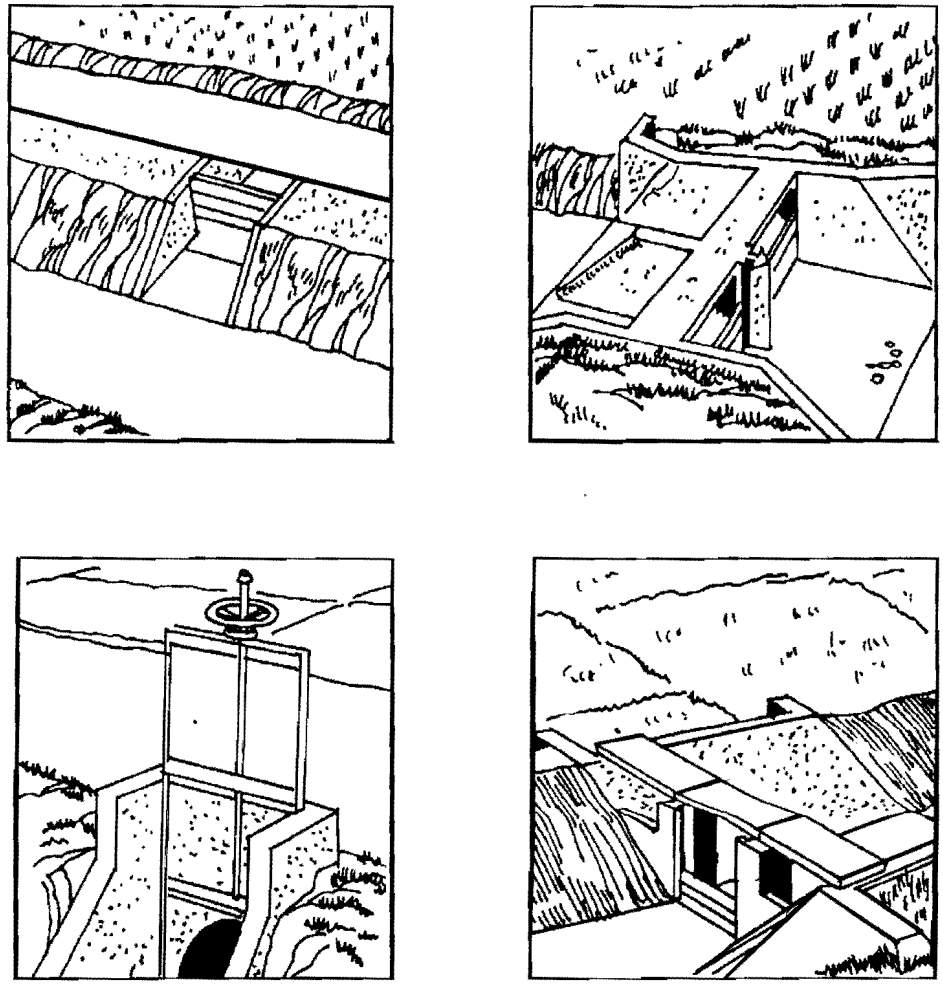


Figure IV-2. Facilities and Structures Commonly Found in an Irrigation System

Facilitator's Guide

Session II : Maintenance, Repair and Rehabilitation of Irrigation Facilities and Structures

Specific Objectives:

At the end of the session, the trainees shall be able to:

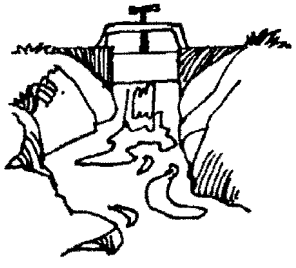
1. Define and differentiate maintenance, repair, and rehabilitation as used in irrigation.

2. Explain the importance of maintenance, repair, and rehabilitation in the efficient delivery and distribution of irrigation water.

3. Discuss the process of institutionalizing the proper care and maintenance of irrigation facilities and structures.

Contents

Introduction



Since irrigation facilities are commonly made of earth materials, their surfaces and embankments are subject to grass growth and erosion. Their functionality easily deteriorates compared with concrete irrigation structures. During the wet season when typhoons are prevalent, facilities are subject to flooding. Structures face excessive accumulation of eroded soil and vegetative debris.

Although made of concrete and steel, irrigation structures are also subject to deterioration. Eroded earth materials and vegetation accumulating in irrigation structures can cause severe damage or even topple structures. Steel components of irrigation structures are also subject to rust and corrosion due to constant contact with irrigation water and the environment.

For effective and efficient delivery and distribution of irrigation water, irrigation facilities and structures must be properly maintained and repaired.

Therefore, IA officers, TSA (or Sector) leaders and members must be knowledgeable about the maintenance, repair and rehabilitation activities to ensure functionality of their irrigation facilities and structures.

Maintenance, Repair, and Rehabilitation and Their Importance

Maintenance refers to the regular upkeep of the irrigation facilities and structures. It includes the following activities:

i. cutting of grasses and other vegetation at canal embankments;

ii. covering of potholes on road embankments;

iii. removal of berms forming at surface of canal embankments;

iv. oiling control mechanisms and painting of gates to minimize corrosion and rust; and

v. removal of eroded soil and vegetative debris in irrigation structures.

For effective delivery and distribution of irrigation water, the following maintenance activities must be regularly undertaken. These activities will help:

i. maintain the capacity of the facilities to convey the required volume of irrigation water; and

ii. maintain the ability of the structure to control the volume of irrigation water being conveyed through the irrigation facilities.

Repair refers to the immediate restoration of irrigation facilities or structures to its functional condition. Besides regular wear and tear from constant use, situations such as floods and overflows over canal embankments cause immediate dysfunctions in some irrigation facilities and structures. In

such cases, their functionality must be immediately restored so as not to jeopardize on-going delivery and distribution of irrigation water. Repair of facilities may take two kinds:

i. in-season repair - maintains the ability of irrigation facilities and structures to convey and control the flow of irrigation water during the season. This minimizes adverse effects of inadequate water in the growth and yield of agricultural crops; and

ii. off-season repair - ensures the readiness of irrigation facilities and structures to convey and control the flow of irrigation water at the start of the season. Farmers would then be able to adhere to the planting schedule, a common source of conflict in the delivery and distribution of water.

Rehabilitation refers to the broad repair of numerous facilities and structures. Due to technical and other problems, regular repair of irrigation facilities and structures may not restore them to their original condition. Through seasons and years, their collective functionality results in reduced capacity of the irrigation system to serve its original irrigated area.

Rehabilitation is resorted to so as to restore the capacity of the irrigation system to serve its original irrigated area. Normally, such activity involves a large amount of budget to undertake. Efforts must be exerted to lengthen the period between two rehabilitations. Hence, regular repair activities must be initiated.

Rehabilitation work is undertaken in regular intervals to:

i. restore the capability of the irrigation facilities and structures to convey and control the flow of irrigation water;

ii. improve the efficiency and effectiveness in the conveyance and control of flow of irrigation water; and

iii. increase the capability of the irrigation facilities and structures to irrigate more areas.

Since rehabilitation of irrigation facilities and structures are expensive undertakings, regular maintenance and repair activities need to be institutionalized. IA officers, TSA (or Sector) leaders and members can initiate this process. At the same time, they can benefit from the use of these functional and effective facilities and structures. The suggested processes in institutionalizing these activities are:

i. Plan and program activities on the repair and maintenance with IA officers and members;

ii. Assign responsibilities on the repair and maintenance of facilities and structures within a rotation area to respective officers and members;

iii. Divide responsibilities on the repair and maintenance of irrigation facilities and structures serving more than one rotation area among officers and members of the different TSA (or Sector);

iv. Involve officers and members of each rotation area in the maintenance and repair of major irrigation facilities and structures;

v. Hold regular meetings of IA officers and TSA to assess maintenance and repair activities and accomplishments; and

vi. Initiate regular meetings of officers and members of rotation areas to assess maintenance and repair activities and accomplishments.

Session III : Planning, Implementation and Assessment of Maintenance and Repair of Irrigation Facilities and Structures

Specific Objectives:

At the end of the session, the trainees shall be able to:

1. Prepare a schedule for the repair and maintenance of irrigation facilities and structures.

2. Enumerate and elaborate on the chronological activities that IA officers and concerned staff of NIA have to undertake in planning, implementing and assessing the repair and maintenance of irrigation facilities and structures.

Contents

Introduction

Regular maintenance and repair must be undertaken by irrigators associations to maintain facilities in their original condition.

IA officers, TSA (or Sector) leaders, and members must be provided adequate knowledge, appropriate skills and proper attitudes to successfully manage and undertake such activities.

Preparation of Schedules of Maintenance and Repair

It is a normal instinct for an individual to give priority to activities that benefit him personally and immediately. The same is true with farmers. Therefore, farming activities must be considered in scheduling activities on the repair and maintenance of irrigation facilities and structures where farmers are to be involved.

There are periods in a cropping season that a farmer is either very busy, not so busy, or does not have any farming activity at all. The busiest period for a farmer is from the initial delivery of irrigation water to the completion of transplanting in his farm. The rest of the time, the farmer is not so busy and sometimes does not even have any farming activity.

The cropping calendar for the unit or area is a very useful guide in preparing the schedule of activities where farmer participation in an irrigation unit or area is needed (Figure IV-3).

From the cropping calendar, it will be noted that farmers in an irrigation unit or area are:

i. *busiest* - from the initial delivery of irrigation water to the first farmer

until transplanting is completed in about half of the total area during each season (represented by A in Figure IV-3);

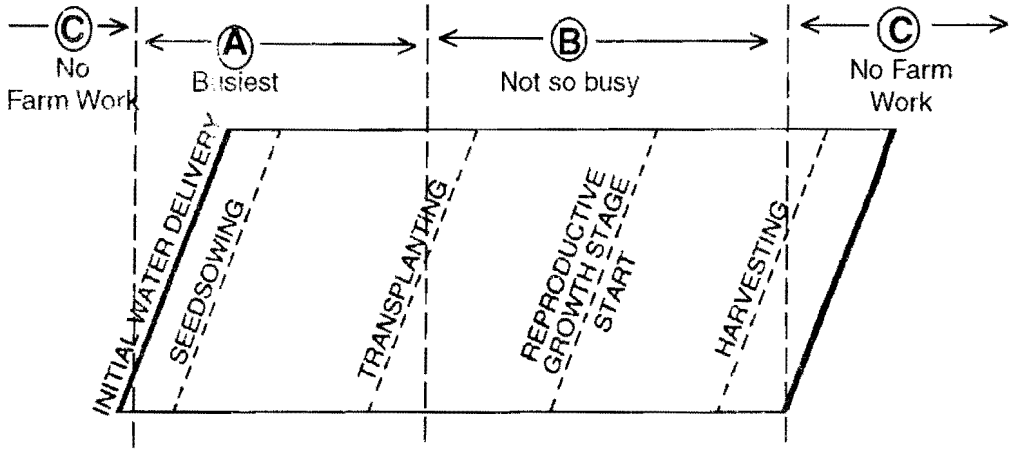


Figure IV-3. Cropping Calendar and its Relationship with Farmers' Availability for Undertaking Maintenance and Repair Activities

ii. *not so busy* - from the completion of transplanting in about half of the total area to the end harvest of the last farmer (represented by B in Figure IV-3);

iii. *no farm work* - from the completion of harvest of the last farmer to the initial delivery of irrigation water to the first farmer for the next season (represented by C in Figure IV-3).

Using these information, a schedule of regular maintenance activities for the facilities and structures within the irrigation units can be prepared by the TSA (or Sector) leaders, and on the major canal networks by the IA officers. An example of such schedule is shown in Figure IV-4.

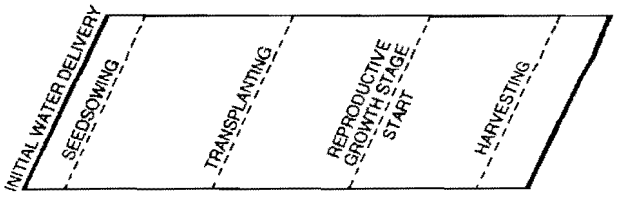
Managing Maintenance and Repair of Irrigation Facilities and Structures

One important component in the maintenance and repair of irrigation facilities is the presence of IA policies, rewards and sanctions for these activities.

To be useful guides for supervisors and implementators in undertaking such activities, policies must clearly state:

i. what should be maintained and repaired by whom;

ii. how frequent maintenance and repair activities are done; and



CROPPING CALENDAR

MAINTENANCE/REPAIR SCHEDULE (BAR CHART)

WORK PARTICULAR	SCHEDULE
MAINTENANCE M.C. Lat. Sub.-Lat.	
REPAIRS: M.C. Lat. Sub.-Lat.	

Figure IV-4. Example of a Schedule of Maintenance and Repair Activities

iii. what measures are needed to complete maintenance and repair work.

Besides these policies, there should also be a set of rewards and sanctions in conducting maintenance and repair activities.

With these basic requirements, the concerned IA officer and TSA (or Sector) leaders are prepared to manage and supervise the maintenance and repair activities. Among their major tasks and duties are:

Planning. The major task of the IA officer and TSA (or Sector) leaders is to undertake the planning and scheduling of the maintenance and repair activities. Their respective set of duties to accomplish the task are:

i. *IA Officers:*

a. Prepare and provide the TSA (or Sector) leaders with information on the changes in IA policies, rewards and sanctions on maintenance and repair;

b. Prepare and provide the TSA (or Sector) leaders with copies of schedule of maintenance and repair of major facilities and structures in the irrigation area; and

c. Initiate meetings of TSA (or Sector) leaders on maintenance and repair and information

campaign relative to policies, rewards, sanctions and schedules.

ii. *TSA (or Sector) Leaders:*

a. Prepare and provide members with information on the schedule of maintenance and repair within the TSA (or Sector) vicinity;

b. Provide members with information on the schedule and the TSA's (or Sector's) participation in the maintenance and repair of major facilities and structures, and changes in related IA policies, rewards and sanctions; and

c. Initiate meetings and undertake information campaign on maintenance and repair.

Implementation. The major task of IA officers and TSA (or Sector) leaders is to manage and supervise implementation, monitoring, and assessment of maintenance and repair activities and accomplishments. Their respective set of duties to accomplish the task are:

i. *IA Officers:*

a. Initiate regular meetings of TSA (or Sector) leaders to assess progress and accomplishment on the maintenance and repair activities;

b. Undertake regular field supervision of maintenance and repair of major facilities and structures;

c. Undertake random inspection of maintenance and repair activities at the TSA (or Sector); and

d. Consolidate TSA reports and prepare overall reports on the maintenance and repair activities and accomplishments, and status of the irrigation facilities and structures.

ii. *TSA (or Sector) Leaders:*

a. Initiate regular TSA meetings of members to assess the progress and accomplishment on maintenance and repair activities;

b. Undertake regular field supervision of maintenance and repair activities; and

c. Prepare and submit reports on progress and accomplishments.

Evaluation. The major task of the IA leaders and TSA (or Sector) leaders is to jointly undertake the evaluation of the season and/or year long maintenance and repair activities and accomplishments. Specifically, their duties are to:

i. Prepare the overall report on the accomplishments on the maintenance and repair activities including the present status and conditions of the irrigation facilities and structures; and

ii. Review, recommend and initiate through the IA Board of Directors (BOD) changes in policies, rewards, and sanctions on the maintenance and repair of irrigation facilities and structures.

Module V

Irrigation Service Fees (ISF) and/or Amortization

MODULE V: Irrigation Service Fees (ISF) and/or Amortization

General Objectives:

At the end of the module, the trainees shall be able to:

1. Discuss the rationale and NIA policies on the collection of irrigation service fees (ISF) and/or amortization.

2. Enumerate the chronology of related activities in preparing a schedule and reports.

3. Discuss how to manage the collection and remittance of ISF and/or amortization.

Introduction

Whether an irrigation system is operated and maintained by a government agency or private organization, it always requires funding to undertake O and M activities. It needs funds for:

a. the services rendered by people in the delivery and distribution of irrigation water;

b. the normal maintenance of irrigation facilities and structures; and

c. the periodic and emergency repair of irrigation facilities and structures.

Generation of funds for these O and M activities is therefore one major function in managing an irrigation system.

Since IAs take over certain O and M responsibilities, IA officers and members must be provided enough information on irrigation service fee (ISF) collection and NIA policies relative to ISF. They also need skills on how to manage activities related to ISF bill preparation and distribution, as well as the collection and remittance of ISF.

Facilitator's Guide

Session I
Rationale, Definitions and Related NIA Policies

Specific Objectives:

At the end of the session, the trainees shall be able to:

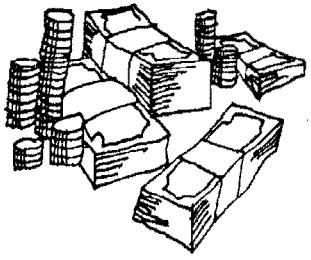
1. Define the thrusts and policies of NIA relative to the recovery of costs in the operation and maintenance or investments in irrigation development.

2. Discuss the rationale in the collection of irrigation service fees (ISF) and/or amortization.

Contents

Introduction

The construction of irrigation systems as well as its operation and maintenance entails the use of a large amount of funds.



Certain sectors of society treat irrigation as a form of service similar to that of roads, health and social services. But other sectors including those that initiated the creation of the National Irrigation Administration (NIA) as a semi-autonomous government corporation do not see it this way.

It is therefore important for IA officers and members to understand and appreciate the rationale and policies on the collection of irrigation service fees (ISF) and/or amortization.

The NIA and Cost Recovery in Irrigation Development

NIA is the government entity mandated to undertake the irrigation development program of the government.

It was created through Republic Act No. 3601 by then President Diosdado Macapagal on June 22, 1963. The powers and objectives of NIA as enumerated in Section 2 of Article 1 include the following:

> *"To collect from the users of each irrigation system constructed by it such fees as maybe necessary to finance the continuous operation of the system and reimburse within a certain period not less than 25 years the cost of construction thereof".*

On September 11, 1974, Presidential Decree (P.D.) 552 amended Section 2 of Article 1 and stipulated the following:

> *"To charge and collect from the beneficiaries of the water from all irrigation systems constructed by or*

under its administration, such fees or administration charges as may be necessary to recover the costs of operation, maintenance and to recover the costs of construction within a reasonable period of time to the extent consistent with government policy; to recover funds or portions thereof expended for the construction and/or rehabilitation of communal irrigation systems which fund shall accrue to a special fund for irrigation development under Section 2 hereof. Unpaid irrigation service fees or administration charges shall be preferred liens, first, upon the land benefited, and then on the crops raised thereon, which liens shall have preference over all other liens except for taxes on the land, and such preferred liens shall not be removed until all fees or administration charges are paid or the property is levied upon and sold by the National Irrigation Administration for the satisfaction thereof. Judicial actions on the collection of unpaid irrigation fees or charges, drainage fees or other charges which the National Irrigation Administration is authorized to impose and collect, shall henceforth be governed by the provisions of other

laws contrary notwithstanding".

These provisions recognize the need to recover costs in irrigation development. They also include a vision of providing funds for future programs of irrigation development and of improving existing ones.What has been collected is returned to those payors by way of repair and rehabilitation, and the construction of new irrigation systems.

Cost Components in Irrigation Development

The costs involved in irrigation development are divided into two major components. These are for costs incurred during the:

i. *Investigation and construction of irrigation projects.* The costs incurred are for the remuneration of personnel and staff involved in undertaking the activities and for materials and supplies used in:

   a. project feasibility studies;

   b. pre-engineering activities; and

   c. project construction.

ii. *Operation and maintenance of*

irrigation systems. During this recurrent phase, costs incurred are for the remuneration of personnel and staff involved in undertaking the activities and for materials and supplies used in:

a. irrigation water delivery and distribution;

b. periodic maintenance of irrigation facilities and structures; and

c. regular and emergency repairs of damaged irrigation facilities and structures.

Cost Recovery in Irrigation Development

To provide funds for the contruction of new irrigation projects, repair and rehabilitation of existing irrigation systems, and operation and maintenance, the NIA collects irrigation service fees (ISF), administration charges and other fees.

Costs recovery programs of NIA cover two categories of irrigation systems, national and communal irrigation systems (NIS) and CIS).

National Irrigation Systems (NIS)

In the NIS, the NIA collects irrigation service fees (ISF) to cover the costs of operating and maintaining the irrigation system. The rates of ISF collected are:

a. 2 cavans per hectare for the wet season; and

b. 3 cavans per hectare for the dry season.

However, for reservoir type, an additional 1/2 cavans per season is charged while for pump irrigation systems the charge is varied and is dependent on the cost of energy in the locality where the irrigation system is located.

For advanced payments of ISF, a 10 per cent incentive is provided while for delays in payment, a one per cent per month surcharge is charged.

NIA also provides exemptions in the payment of irrigation service fees (ISF). The situations that warrant exemptions are crop damages due to typhoons, widespread infestation and other natural disasters. To be exempted, a farmer must have a yield of not more than 40 cavans per hectare. However, crop damages must be reported prior to harvest to enable the NIA staff to undertake field investigation to authenticate the reported crop

damage. The value of exemption is decided based on the results of this investigation.

Communal Irrigation Systems (CIS)

In the CIS, the NIA collects amortization to cover the costs for constructing facilities and structures of the irrigation system. The rate collected is at the rate of 1-1/2 cavans per hectare per year minimum for not more than 50 years.

Normally, the peso equivalent of amortization is held constant and based on the government support price for palay at the time of the turnover of the CIS. No interest rate is charged.

Not all costs in constructing the irrigation system is charged against irrigation beneficiaries. The costs of the access roads as well as the farm to market roads constructed within the irrigation area are not included in the amortization.

In most CIS, the IA collects irrigation service fees (ISF) at a rate higher than the amortization that IA has to pay NIA. The additional fees placed on top of the amortization are for costs involved in operating and maintaining the irrigation system.

NIA allows deferment of amortization payment only for crop damages as a result of typhoons, widespread infestation, and other

natural disasters. They are required to effect the payment within one year after it is due so as not to incur interest payment.

Facilitator's Guide

Session II
Requirements and Procedures on ISF and/or Amortization Related Activities, Collection and Remittances

Specific Objectives: At the end of the session, the trainees shall be able to:

1. Enumerate the chronological set of activities relative to the collection and remittance of ISF and/or amortization.

2. Demonstrate how to prepare required reports and accomplish appropriate forms relative to the collection and remittance of ISF and/or amortization.

Contents

Introduction

Present policies of NIA encourage the direct participation of farmers in managing the O and M of irrigation systems.

O and M of irrigation systems require an operating budget. Thus,the IAs, whether in the NIS or CIS, need a budget if they are to be effective and efficient in undertaking such responsibilities. In the same manner, to ensure that they are also effective and efficient in collecting irrigation service fees (ISF), farmers must be knowledgeable about the processes

and procedures involved in managing such activities.

Activities Related to the Collection and Remittance of Irrigation Service Fees (ISF)

Before the actual collection of ISF, several activities have to be done. These are undertaken at different phases during the irrigation period. Most of these activities relate to the reporting and recording of information and data that serve as a basis for the ISF.

Following the farming activities of one farmer in the irrigation area, the time frame (Figure V-1), and activities related to ISF that are done are as follows:

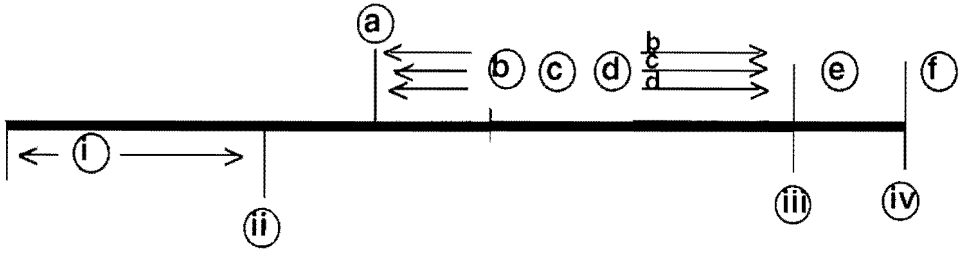
i. *after transplanting* - A short period after this stage, a farmer has to report the information on the extent of area planted and irrigated, the dates of seedsowing, varieties of the rice crop planted, and the approximate dates of harvests. TSA leaders and IA officers take note and keep records of these data and information;

ii. *between end of transplanting to the start of terminal drainage* - As data and information on the crop are submitted, the ISF bills are prepared by concerned IA officers. Farmers whose crops are damaged submit information to TSA leaders who

prepare and submit all reports on crop damage for field investigation. The ISF bills are then rectified based on results of the investigation.

ISF Related Activities:

a. submission of information of cropping
b. preparation of ISF bills
c. reporting of crop damage
d. rectification of ISF bills



e. distribution of ISF bills
f. collection and remittance of ISF payments

Farming Activities:

i. land preparation
ii. transplanting
iii. terminal irrigation
iv. harvesting

Figure V-1. Farming Activities of a Farmer and ISF Related Activities

iii. *between the start of terminal drainage and harvest* - After rectifying the ISF bills, these are distributed to farmers. It is timed prior to harvest to remind them of their responsibilities. It is hoped that it will be relatively easy for them as they are expected to harvest in a very short period of time.

iv. *between the start and a short period after harvest* - During this period, the collection and remittance of ISF payments are undertaken by concerned TSA leaders and IA officers. Official receipts are made for these payments and are duly recorded. Regular audit of collections as well as its records are undertaken more frequently during this period to safeguard payments made by farmers.

Forms for Recording Information Relative to Irrigation Service Fees (ISF)

Records of data and information relative to irrigation service fees (ISF) such as name of farmers, lot numbers, area of farmlots as well as area planted and irrigated, type and varieties of crops, and dates of seedsowing are very important and are treated as official documents. The same is true with official receipts and records for payments made by farmer-members.

Thus, they must be properly recorded and official records properly maintained and kept by responsible IA officers and TSA (or Sector) leaders. Such records are as follows:

i. *List of Irrigated and Planted Area (Figure V-2)* - this official form is for recording the cropping information of each farmer in the irrigation area. The information and data on the forms are provided by farmers themselves and recorded by the responsible TSA (or Sector) leader. Information and data on these forms are provided by the TSA (or Sector) leaders to concerned IA officers on a weekly basis (or on a more frequent rate) from the initial delivery of irrigation water in his TSA. Within a week after the completion of transplanting in the TSA, the TSA (or Sector) leaders prepare three copies of the form and these are distributed as follows:

   a. *IA Secretary/Treasurer* - for the preparation of ISF bills;

   b. *IA Service Committee Chairman* - for analysis and establishment of data and information for the delivery and distribution of

irrigation water and for scheduling farmers' involvement in maintenance and repair activities; and

c. *TSA Leaders' file* - as database for the O and M activities at the TSA level.

ii. *Reports on Crop Damage(Figure V-3)* - the TSA (or Sector) leader lists and maintains records on crop damages based on reports of farmers. Weekly or as frequent as necessary, he provides the following IA officers with necessary information;

a. *IA Secretary/Treasurer* - for rectifying ISF bills after the Chairman of the IA service committee has conducted field investigation and has submitted his report; and

b. *IA Service Committee Chairman* -- for his official reference in conducting the field investigation of the reported crop damage. Based on an investigation, he prepares official reports that are made official attachments to the forms. The information is

transmitted to the TSA (or Sector) leaders and IA Secretary/ Treasurer for their own use.

iii. *ISF Bills, Figure V-4* - this is an official document prepared by the IA Secretary/Treasurer that provides the farmer relevant information on his ISF accounts. The IA Secretary/ Treasurer prepares three copies of this document with a summary (Figure V-4a) for each TSA (or Sector) and the copies are distributed as follows:

a. *IA Secretary/Treasurer's File* - a duplicate of the ISF bills and summary list for his reference in the overall supervision of the collection and remittance of ISF payments;

b. *IA Service Committee Chairman* - a copy of the summary list for his reference in assisting in the supervision of ISF collection activities;

c. *TSA (or Sector) leaders* - a copy of the summary list and each of the ISF bills for his reference in

the collection of ISF from the farmers in his TSA (or Sector) and in the remittance of his collections to the IA Secretary/ Treasurer; and

d. *Farmers* - the original copy of the ISF bills for his reference in the payment of his current and back account on ISF.

iv. *Official ISF Receipts (Figure V-5)* - these are official receipts for ISF payments made by farmers. The TSA Secretary/Treasurer prepares three copies of the official receipt and also three copies of the summary list. These are distributed to the following:

a. *Farmers* - the original copy for his own official file;

b. *TSA (or Sector) leaders* - a copy of the official receipts and a copy of the summary of ISF payments for his official file and audit in the future;

c. *IA Service Committee Chairman* - a copy of the summary list of ISF payments for his reference in

assisting in the supervision of ISF collection activities; and

d. *IA Secretary/Treasurer* - a copy of the official receipts and summary list of ISF payments for his reference in preparing the ISF collection reports and for audit in the future.

The IA officers and TSA leaders should see to it that the record forms described are properly accomplished and kept. These should be kept as official reference for the following activities:

i. Periodic internal and external audit of IA finances;

ii. For settling conflicts arising from the collection and remittance of ISF collections; and

iii. other activities such as for future review or investigation in which these records serve as a valuable reference.

Facilitator's Guide

Session III
Planning, Implementation and Assessment of Activity Schedules Related to ISF and Amortization

Specific Objectives:

At the end of the session, the trainees shall be able to:

1. Prepare a schedule of activities relative to the collection and remittance of ISF and/or amortization.

2. Enumerate the chronological set of actions that officers of the IA and concerned staff of NIA have to undertake in planning, implementing and assessing the schedule of activities relative to the collection and remittance of ISF and/or amortization.

Contents

Introduction

Earlier, the rationale and NIA policies on the collection of irrigation service fees (ISF) and or amortization and the suggested processes and record forms relative to it were tackled. IA officers and members are now ready to undertake activities concerning ISF and/or amortization.

For them to be more effective and efficient in managing such activities, they must also be provided with initial skills that they can hone into perfection.

Furthermore, they will eventually be able to initiate changes in the procedure that will be convenient for their associations.

Schedules of Activities Relative to ISF and/or Amortization

In supervising the implementation of any activity, the presence of a schedule of activities is always a good guide for IA officers, leaders and members. It helps them assess where they are and what adjustments have to be done to ensure that they are always on the right track.

Therefore, planning is necessary to ensure success in implementing activities related to the collection of ISF and/or amortization. This activity results in a schedule of activities that guides both IA officers, TSA (or Sector) leaders and IA members.

Figure V-5 reflects the activities relative to the collection and remittance of ISF and/or amortization. These activities are based on one farmer's experience. However, there are many farmers and activities differ among them. A useful guide in establishing the period in which these activities can be undertaken is

the cropping calendar of the TSA (or Sector).

They can also be guided by the IA pattern of planting if they want to look at the details in each of the TSA (or Sector).

The activities and suggested periods within the season for undertaking such activities at the TSA (or Sector) or IA level are dictated by the farming activities of the first and last farmer in the TSA or in the whole IA irrigation area. These activities and the suggested schedule for each are (Figure V-6):

i. *submission and recording of data and information on the cropping of each farmer* - starts at initial delivery of irrigation water to the first farmer up to the end of transplanting of the last farmer to plant in the irrigation area;

ii. *preparation of ISF bills* - starts at the end of the transplanting of the first farmer to the start of the terminal drainage of the last farmer;

iii. *reporting and investigation of crop damage* - this is similar to the preparation of ISF bills but is undertaken as official information is reported;

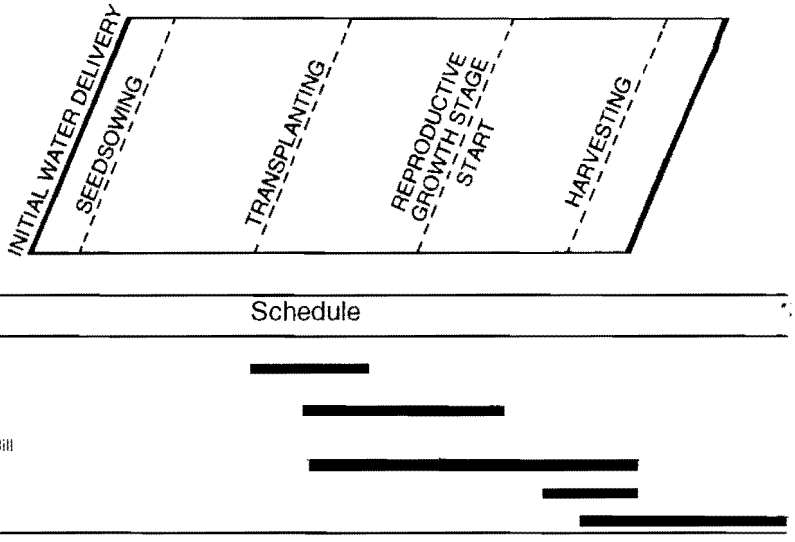


Figure V-6. Cropping Calendar and ISF Related Activities in an Irrigation Unit or Area

iv. *rectification of ISF bills* - also similar to the preparation of ISF bills but are undertaken as official reports on investigations are submitted;

v. *distribution of ISF bills* - starts at the commencement of terminal drainage of the first farmer to end of the terminal drainage of the last farmer;

vi. *collection and remittance of ISF and/ or amortization payments* - starts at the end of harvest of the first farmer to one week after the end of harvest of the last farmer.

Given these suggestions, the schedule for activities is prepared as shown in Figure V-7.

The schedule can be prepared at the same time that the planned cropping calendar and pattern of planting in the area is made. However, note that from the initial delivery and distribution of irrigation water to the completion of transplanting in a TSA (or Sector) and/or IA irrigation area, the actual cropping calendar and pattern of planting is established as a future guide in managing O and M activities.

Therefore, the initially prepared schedule of activities relative to ISF and/or amortization collection must be checked against the actual cropping calendar and pattern of planting. It may be adjusted if necessary.

Activities of IA Officers, TSA (or Sector) Leaders on the Management of ISF and/or Amortization Collection Related Activities

Pre-Irrigation Period. During this period, the TSA (or Sector) leaders prepare the schedule for his TSA (or Sector) using their final cropping calendar as reference. The IA Secretary/Treasurer also prepares the overall schedule using the final IA cropping calendar as his reference.

During the pre-implementation meeting of IA officers and TSA (or Sector) leaders, these schedules are further refined, finalized, and scheduled for information dissemination to TSA (or Sector) members to be undertaken by the TSA (or Sector) leaders.

Irrigation Period. During the early stage of this period, the TSA (or Sector) leaders and IA officers review and check their actual cropping calendar against the schedule of activities on the ISF and/or amortization collection. Adjustments are made if necessary.

The IA officers supervise the implementation of the schedule of activities. They also initiate discussions and reporting of implementation status at the TSA (or Sector) level during regular O and M meetings.

The TSA (or Sector) leaders implement the schedule of activities and initiate discussions on the adherence of members to

the schedule. They likewise organize action to enforce on track implementation, and list down related issues and problems during the TSA (or Sector) regular O and M meeting.

Post-Irrigation Period. At the early stage of this period, IA officers and TSA (or Sector) leaders prepare the list of issues and problems in implementing schedules as well as reports on results of undertaking the activities. They also prepare a list of alternatives to the identified issues and problems.

During the post-irrigation meeting, IA officers and TSA (or Sector) leaders initiate discussions on the:

i. results of schedule of implementation in terms of amount of collectibles, actual collection and collection efficiency by TSA (or Sector) and within the irrigation area of the IA;

ii. problems and issues on the implementation of schedules and suggested solutions; and

iii. course of action and schedule of its implementation to minimize the identified problems and issues during the succeeding season.

Module VI

Information Management for Irrigation Systems

MODULE VI: Information Management for Irrigation Systems

General Objectives:

At the end of the module, the trainees shall be able to:

1. Define and differentiate monitoring and evaluation.
2. Discuss what management information system (MIS) is.
3. Explain and differentiate the interdependence of Irrigation Management Information System (IMIS) and Irrigators Associations Management Information System (IAMIS).
4. Enumerate the parameters or information relevant to IMIS and IAMIS.
5. Discuss how to settle conflicts in the delivery and distribution of irrigation water.

Introduction

In the successful management of any program, plan or set of activities, monitoring and evaluation of data and information always play a significant role. When processed, additional data and information are generated

that serve as a guide in making decisions and corrective action to ensure that implementation is on track.

Operation and maintenance of irrigation system is basically a management function. Similar with other management endeavors, successful management of O and M activities is greatly enhanced with the use of data and information from monitoring and evaluation activities.

Furthermore, O and M of irrigation systems involves many people, the IA officers, TSA (or sector) leaders and members. Conflict is thus a regular feature in the O and M undertaking. Data and information when used properly in decision making minimize conflict besides providing official information on settling them.

Therefore, IA officers, TSA (or Sector) leaders, and members must be provided with basic concepts of monitoring and evaluation, and how its resulting data and information is used in making decisions and undertaking action. They also need information on settling conflicts in the O and M of irrigation systems.

With these initial knowledge, they are expected to develop appropriate skills to continually improve the management of conflict in their irrigation area.

Facilitator's Guide

Session I
Basic Concepts

Specific Objectives:

At the end of the session, the trainees shall be able to:

1. Define irrigation water management.
2. Define and differentiate terms used in irrigation water management and illustrate where they are used given a map of an irrigated area.
3. Define and differentiate delivery and distribution in a given irrigated area.

Contents

Introduction

Basic knowledge on the use of irrigation water by the rice crop and its soil-water environment must be well understood. These information serves as the basis for effecting better understanding of the complicated processes of irrigation water movement from its source to the place where it is used.

Irrigation Water Management Defined and its Basic Parameters

Irrigation water management refers to the conveyance from the source and application of irrigation water to farm lots in adequate amount at the proper time and interval.

To better understand its complexity, it is necessary that basic concepts be first understood. These basic concepts will provide the necessary background to understand the complexities of monitoring and evaluation required in the effective and efficient O and M of irrigation system.

Definitions

The two important terms in information management systems for irrigation systems are:

i. *monitoring* - refers to the gathering and recording of data and information; and

ii. *evaluation* - refers to the assessment, processing of these data and information to generate another set of information for decision making and future action.

Importance of Monitoring and Evaluation

Monitoring provides a set of raw data and information which when subjected to evaluation provides a new set of data. These data are useful in:

i. assessing adherence to plans, programs or schedules;

ii. making changes in plans, programs or schedules in anticipation of problems;

iii. settling conflicts; and

iv. providing information during future planning.

Data and Information

The set of data and information gathered or monitored for managing the O and M of irrigation are enumerated below. The processing, analysis or evaluation of these data result in new sets of data and information. These sets of data and information are:

i. *farming activities and cropping.* These include the names of farmers, lot numbers, area planted, kind and variety of crops planted, and dates of seedsowing and planting.

When processed and analyzed, these data provide the actual cropping calendar of an irrigation unit that provide information and data on:

a. area to be irrigated including the crop growth stage on a weekly

basis during the remaining period of the cropping season;and

b. start and end of the different farming activities, growth stages of crops, terminal drainage, and harvesting in an irrigation unit or area of the IA.

ii. *the delivery and distribution of irrigation water.* The set of data and information includes the discharge measurements at the source, major control points such as headgates of main canals and laterals, and turnouts, as well as data on rainfall and evaporation.

This set of data and information when processed and analyzed provides information on:

a. estimated discharge flow at the source;

b. estimates on the use of irrigation water during the previous week;

c. adequacy and equitability of the delivery and distribution in the

different irrigation units during the previous weeks; and

d. irrigation units to be provided additional irrigation water to minimize the effects of previous inadequate supply.

iii. *the condition of irrigation facilities and structures.* This set of data includes data and information on the number of structures, kind, extent, and measurements of damages, and conditions of irrigation facilities and structures.

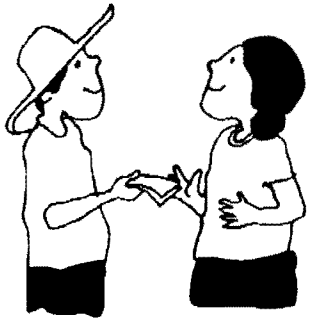
When processed and analyzed these data provide information on:

a. estimates on the costs of repair of the damaged facilities and structures;

b. structures and facilities that need immediate repair and those that need to be changed;

c. the repair work that can be done by the farmers themselves and those that will require technical guidance from NIA; and

d. reduction of the capacities of the facilities and structures in servicing the irrigation area.



iv. *collection and payment of ISF and/or amortization.* This includes data and information on ISF collectibles and actual collection on current and back accounts by TSA (or Sector). Records of these data and information for the previous seasons are also kept including the processed and anaiyzed data.

When processed and analyzed, data provide information on:

a. efficiencies on the collection of current and back accounts on ISF;

b. improvement of collection at the different TSA (or Sector) area; and

c. estimates of IA income from the collection of ISF.

Facilitator's Guide

Session II
Information Management for Irrigation Systems - Systems Level (IMIS) and IA Level (IAMIS)

Specific Objectives:

At the end of the session, the trainees shall be able to:

1. Explain what irrigation management information system (IMIS) means relative to an irrigation system.

2. Explain what Irrigators Associations' Management Information System (IAMIS) means relative to the irrigated area of the IA.

3. Explain the relationship and interdependence of the IMIS and IAMIS.

4. Enumerate the duties and responsibilities of IA officers and concerned staff of NIA at the different periods of irrigation system management relative to the management information system.

Contents

Introduction

Operation and maintenance activities in an irrigation system are undertaken not only by the NIA personnel but also by IA officers,

TSA (or Sector) leaders and farmers.

Although activities undertaken are different in each level, data and information are needed to assure effectivity and efficiency. In each level, therefore, a management information system (MIS) has to be developed. The activities in those different levels affects the same irrigation area and farmers.

The MIS for each level is interdependent for they make use of the same set of raw data and information. These sets, when processed and analyzed, provide a new set of data and information for making decisions and undertaking action.

To be effective in managing activities at their own level, IA officers, TSA (or Sector) leaders, and members must have a good understanding of these management information systems.

Management Information System (MIS) in an Irrigation System

The management information system (MIS) in an irrigation as shown in Figure VI-1 has two complementing components:

i. *Irrigation Management Information System (IMIS)* - which is at the level of the NIA organization. This MIS has sub-levels that use similar information but for a different kind

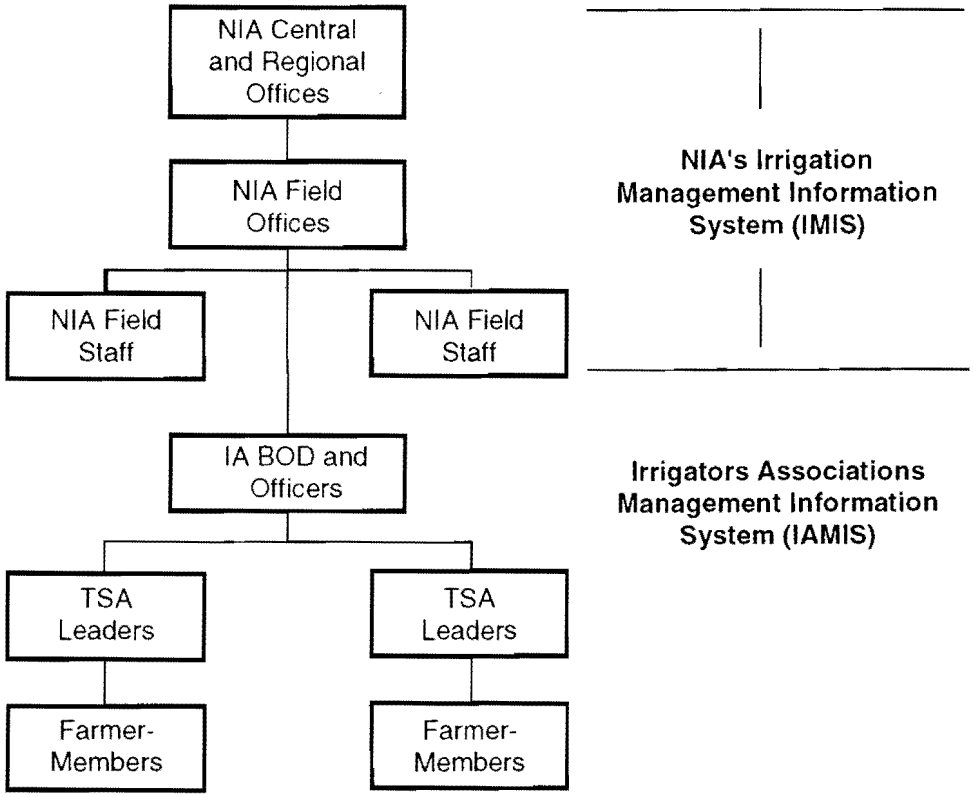


Figure VI-1. Illustration of Management Information System in an Irrigation System

of activity. These are:

a. Policy formulation, program development and policy implementation supervision - these activities are normally undertaken at levels above field offices such as central and regional offices;

b. Program implementation and work activity supervision - these activities are undertaken at the level of the head of field offices and their support staff. These offices are the Irrigation System Offices (ISO) and Provincial Irrigation Offices (PIO); and

c. Program and activity implementation - these activities are undertaken at the level of the field personnel of the ISO and PIO.

ii. *Irrigators Association's Management Information System (IAMIS)* - is at the level of the IA organization. Similar to the IMIS, IAMIS also has sub-levels using similar data and information but for different kinds of

activities. These activities are:

a. Policy formulation, program development and policy implementation supervision - activities are undertaken at the level of the IA's Board of Directors and Officers and to some degree at the level of the TSA (or Sector) leaders;

b. Program implementation and work activity supervision - activities are undertaken at the level of the TSA (or Sector) leaders; and

c. Program and activity implementation - activities are undertaken at the level of IA farmer-members.

These different levels of the NIA and IA make use of the same set of raw data and information monitored and collected at the system and farm levels. However, they process and analyze data and information in a slightly different manner to generate new sets of data and information needed at their own level. In most cases, each level uses data summaries generated by the level immediately below them. This is illustrated in Figure VI-2.

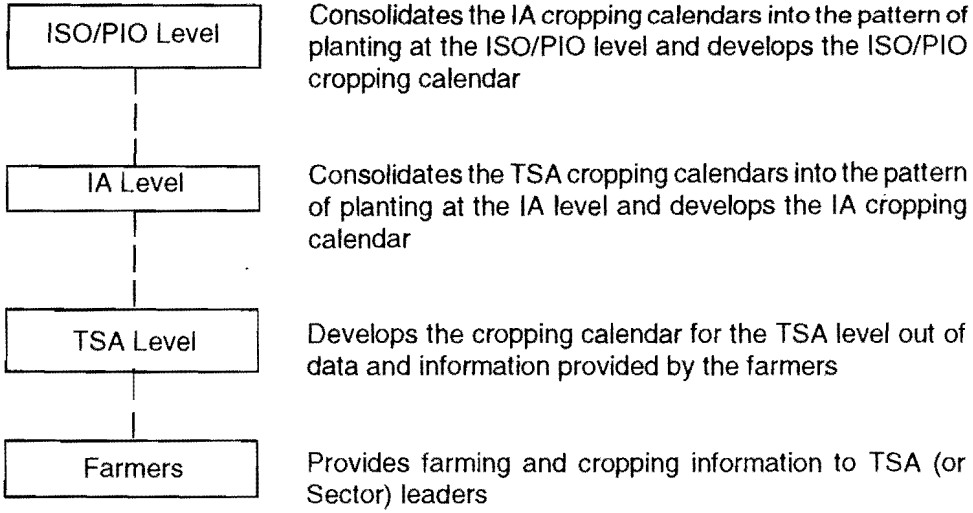


Figure VI-2. Generation of a Pattern of Planting at a Level through the Cropping Calendars at the Lower level

The above examples indicate that data and information needed both for planning and implementation at the different levels flow vertically and in both directions.

The same is followed for the data and information relative to:

i. delivery and distribution of irrigation water;

ii. maintenance and repair of irrigation facilities and structures; and

iii. collection and remittance of irrigation service fees and/or amortization.

At each level, the general set of activities relative to monitoring and evaluation are to:

i. monitor and collect relevant data and information;

ii. process and analyze data and information to generate a new set of data and information;

iii. make decisions based on new sets of data and information and initiate actions on decisions made; and

iv. prepare summaries of raw and new set of data and information and submit copies to the next higher level.

All these general set of activities are undertaken in all levels both at the:

i. planning period - normally starts with a program based on existing policies at the higher level and is filtered

down at the lower levels for preparing plans at their level of responsibility; and

ii. implementation period - normally the flow of data and information starts at the lower level where operational decisions are made. These are filtered up to the higher levels where policy decisions relative to implementation are made.

iii. post-irrigation period - These activities can start at all levels where each level summarizes all relevant information for the whole cropping season. Included in these are recommendations on changes in policies, rules and regulations to improve implementation of O & M in the succeeding seasons.

Facilitator's Guide

Session III
Management of Conflict on the Delivery and Distribution of Irrigation Water

Specific Objectives:

At the end of the session, the trainees shall be able to:

1. Define conflict and conflict management as used in irrigation systems management.

2. Enumerate examples of common conflict in the delivery and distribution of irrigation water and discuss measures to minimize them.

3. Discuss the steps or processes in settling conflicts in the delivery and distribution of irrigation water.

Contents

Introduction

As discussed earlier, operation and maintenance involve a large number of people. From the start of initial delivery and distribution of irrigation water to the end of terminal drainage in an irrigation area, people are in constant interaction.

Given this situation, the occurrence of

conflict is inevitable. Conflict may be between farmers in a TSA (or Sector), between TSA (or sector) leaders, or even between IA officers. It can also happen between a farmer and TSA (or Sector) leaders or even IA officers.

IA officers, TSA (or Sector) leaders and members benefit from basic knowledge on how to behave during conflict situations. Furthermore, it is even more important that they develop skills and positive attitudes to enable them to effectively manage conflict.

What is conflict?

Conflict is a state of fighting, disharmony or opposition between two persons, group of persons, or between a person and a group. These occur when they are in constant or periodic interaction.

Delivery and distribution of irrigation water is an activity in the operation and maintenance of an irrigation system. Conflict is inevitable from the start of irrigation to the end of terminal drainage.

The most common causes of conflict in the O and M of irrigation system are:

i. inequity in the delivery and distribution

of irrigation water;

ii. out of schedule irrigation of farms or irrigation units; and

iii. stealing of irrigation water.

Conflicts normally occur during periods of low water supply from the source. They are very common and prolonged during the middle to the later part of the dry season.

The general solutions to minimize conflict are the following:

i. strict implementation of the cropping calendar and pattern of planting;

ii. strict implementation of the schedules of water delivery and distribution;

iii. regular review of the supply and use of irrigation water at the different irrigation units; and

iv. immediate initiation of actions on inequity in the delivery and distribution of irrigation water.

These general solutions must be supported by IA policies and sanctions relative

to the transgression of IA plans and programs. They are not only useful in settling actual conflict but also deter unpopular decisions and actions of IA officers, TSA (or Sector) leaders. Therefore, it should be the priority of the IA management to:

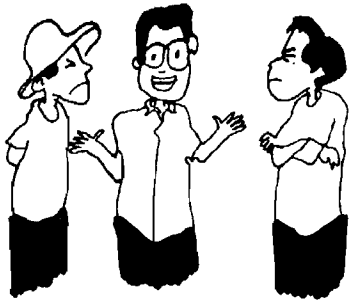
i. formulate such policies and sanctions;

ii. inform IA officers and members intensively about it; and

iii. strictly implement such policies and sanctions in a balance and non-discriminating manner.

Management of Conflict

Conflict must be managed properly in a staged manner such that:



i. *It must be anticipated.* A careful review of the data and information on the O and M of the irrigation on a regular schedule could point out discrepancies in implementation.

ii. *It must be minimized.* After identifying discrepancies, corrective measures must be undertaken to lessen its impact and, therefore, minimize

conflict; and

iii. *Settle conflicts as they arise.* Unsettled conflict tends to escalate. It is important that they be settled when they occur.

While conflict can be minimized, it definitely will occur in varying degrees of gravity. Should they occur, they must be handled carefully. The foremost action in any conflict situation is **never side with any of the conflicting parties from the start to the resolution of the conflict.**

The general processes in settling conflict are as follows:

i. gather information from both parties;

ii. evaluate the information;

iii. plan the approach and list down alternative actions and solutions;

iv. implement the plan; and

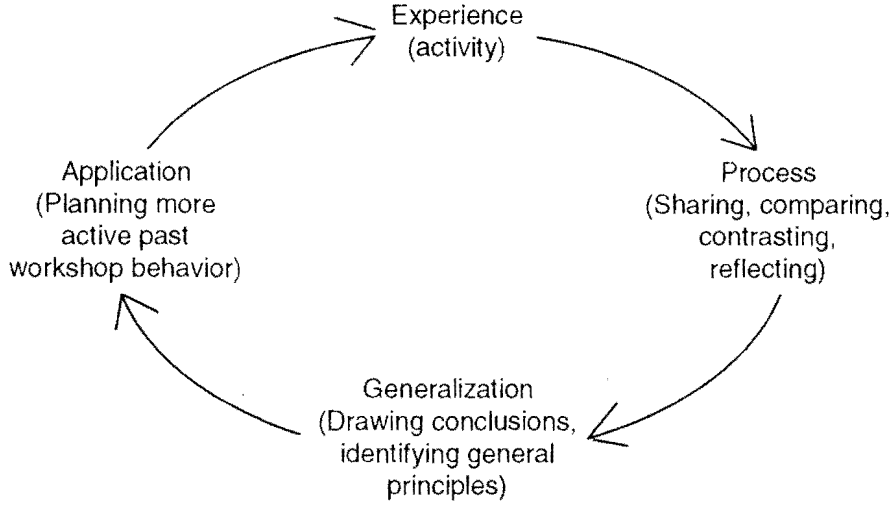
v. follow up agreed actions of both parties.

Annex 1

THE EXPERIENTIAL LEARNING CYCLE

Experiential learning concept is based on the modern study of training called andragogy ("andro" - adult, from the Greek root; "gogy", the root for learning). It recognizes that adult learners learn differently from child learners, thus they are treated differently. Such differences lie in self-concept, experience, readiness to learn, and application of learning.

Experiential learning approach focuses on the learner and his own discovery of the learning process. More importantly, experiential learning follows a logical sequence called the Experiential Learning Cycle. This ELC model can be graphically represented by the figure below which contains four major phases.



What are these phases?

1. The **Experience Phase** enhances the participants to be involved in "doing" something which is very much related to the real situation, e.g. case studies, role plays, simulations, lecturettes, skill practice, slide shows, completing an instrument, living with a family from another country. This activity is dependent of the session goal.

2. The **Process Phase** follows immediately after the experience phase is completed. This phase is concerned with participants' reactions/reflections towards the activity or experience. Participants with the trainers' assistance attempt to relate these thoughts and feelings (cognitive/affective) together to derive some meaning from the experience. Participants may speak individually, in small groups or as a whole training group.

3. Out of the first two phases of the cycle, participants form conclusions and generalizations which are applicable in real life. This phase is called the **generalization phase**. The trainer may be helpful to the participants at this stage by asking questions like:

   - What did you learn from all of this?
   - What general meaning does this have for you?
   - What general patterns do you see from the learnings?
   - What differences exist?

4. The **Application Phase** provides the participants the chance to give careful thought to develop plans to incorporate learnings for a more effective future behavior. The trainor may help facilitate this stage through questions like:

   - What will you do differently in your work when you go back home?
   - How will learnings be applied?

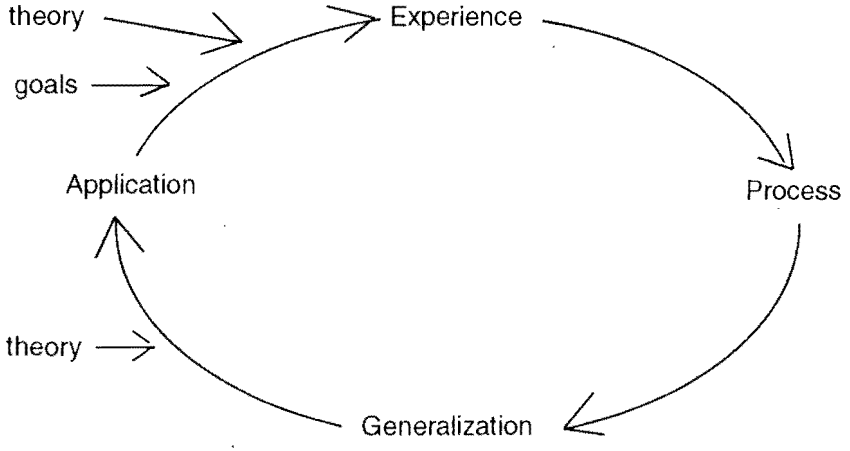
   The participants develop their individual action plans that may be shared with the group for enrichment.

Two points need to be stressed about the ELC model:

1. The exact nature of each phase of the model is determined by the goals of the training session or program. Once the training goals are defined, the session can be designed using the model as framework.

2. The theory can come in two different places, either before the experience (in which case, the experience can test the theory or try out the skills) or after the experience, when it is interwoven into the generalization phase as participants develop their own theory.

At this point the ELC model may be illustrated as:



The ELC model is especially useful for skills training because most of its techniques are active and are designed to involve the participants in skill practice. It helps people assume responsibility for their own learning because it asks them to reflect on their experience.

Lastly, for the model to be effective, it must be rigorously applied in both the

design and delivery stages.

The design components of an experiential session following the concept of ELC is presented below.

DESIGN COMPONENTS OF AN EXPERIENTIAL SESSION

1. Climate Setting/Introduction

   - Stimulates interest, curiosity, induces participants to begin thinking about the subject at hand.
   - Provides rational for why subject is important to participants and how it will be useful to them.
   - Links this training session to previous ones and places it into the overall framework of the workshop.

2. Goal Clarification/Session Objectives

   - Presents statements to the participants that describe the intent, aim or purpose of the training activity.
   - Provides opportunity for participants to seek clarity on goals, add additional issues or raise concerns.

3. Experience/Activity

   - Provides opportunity to "experience" a situation relevant to the goals of the training sessions.
   - Becomes the data-producing event from which participants can extract and analyze as they complete the training cycle.
   - Common "experiences" are role plays, case studies, paper and pencil instruments.

4. Processing/Reactions to Activity

- Participants share individual experiences and reactions to the experience.
- The experience is analyzed and reflected on thoughtfully by the group.
- Trainer guides and manages this process.

5. Generalization/Learnings
   - Participants determine how the patterns that evolved during the "experience" relate to the experiences of everyday life.
   - Participants seek to identify key generalizations that could be inferred from the experience.
6. Applying the Learnings
   - Using the insights and conclusions gained from the previous steps, participants identify and share how they plan to incorporate these new insights into their everyday life.
   - Answers the question, "Now what?" and "How can I use what I learned?"
7. Closure
   - Briefly summarizes the events of the training session.
   - Links back to goals and seeks to determine if goals have been met.
   - Wraps up training session and gives a sense of completion.
   - Links session to rest of program especially future sessions.

Record of Farming Activities, Projection of Cropped Area-Growth Stage, and Irrigation Service Fees (ISF)

_____ Irrigators Association

_____ Sector Wet/Dry Season, Crop Year 19___

Farm Lot Number	Landowner or Tiller	Farm Area in hectares	Planted Area in ha	Crop Variety Planted	Date or week of Sowing	Day or weeks to Mature	Expected Harvest Week	Cropped Area - Growth									
								1	2	3	4	5	6	7	8	9	10
			Area Under Veg Growth Stage, ha														
			Area Reprod. Growth Stage, ha														
			Area Under Terminal Drainage, ha														
			Area under Harvesting, ha														

Fig. V-2. List of Irrigated and Planted Areas.

with Stage Projection (Weeks)										Cumulative Planted Area, ha	Farmer's Concurrence (Signature)	Harvested Area in ha	Benefitted Area in ha	Gross Production in Cavans
11	12	13	14	15	16	17	18	19	20					
										Total				

Prepared by:

____

TSA/BSM Chairman/Sector Leader

Form B-4

_____ of _____

List of Lots with Total Crop Failure
Due to Water Shortage, Infestation, Flood, Etc.
(Per MC # 26, s. 1980)

	Lot No.	Name of Landowner	Area of Lot	Cause of Damage
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
etc.				

Prepared by:

Approved by:

Certified Correct:

BAEX or BPI Farm Management Technician

Fig. V-3. Report of Crop Damage.

Summary of Bills: (To be filled up by Billing Clerk at the bottom of the last page of the list)

	No. of Bills	Area in Hectares
Total Bills Prepared	_____	_____
Less: Bills to be Cancelled	_____	_____
Total Bills to be Issued	_____	_____

Fig. V-4a. Irrigation Service Fee Bills (Summary).

Republika ng Pilipinas
PAMBANSANG PANGASIWAAN NG PATUBIG
(National Irrigation Administration)
_____ Irrigation System

BILL AND STATEMENT OF ACCOUNT

BILL NO. _____

As of _____ Season Crop Ending _____, _____.

_____
(Name and Address of Landowner/Lessee/Beneficiary)

Lot No. _____ District/Division/Zone _____

PARTICULARS	AMOUNT IN KILOGRAM
Current Irrigation Fees this Cropping Season:	
Area Irrigated & Planted in Hectares _____ has.	Date per hectare in Kg. _____ kgs. net wt.: _____ kgs. net wt.

STATEMENT OF ACCOUNT

Current Irrigation Fees this Cropping Season			:	kgs. net wt.
Add: Current penalties on unpaid irrig. fees of past cropping seasons			:	
Unpaid Irrig. Fees Kgs.	No. of Months Delay Kgs	Penalty of 1% per month %	:	kgs. net wt.
Total (this bill)			:	kgs. net wt.
Add Unpaid irrig. fees in kind of past cropping seasons including past penalties			:	kgs. net wt.
Total Irrigation Fees in Kind Due as of this cropping season			:	kgs. net wt.
Total Unpaid Old Irrig. Fees (Old rate-prior to July 1, 1975)			:	_____

PREPARED BY:

_____
Billing Clerk

APPROVED BY:

_____
Irrig. Supt./Head of System

NOTE:

1. Please pay your current irrigation fees on or before _____ to avail of the 10% discount and to avoid the incurrence of 1% penalty a month after the deadline specified above. Please pay also your back accounts so as not to incur further penalties.
2. Your account may be paid in palay or in equivalent cash based on the current prevailing government support price at the time of payment. Now, the government support price of palay per kilogram is _____ so that, if you wish to pay in cash now, the cash equivalent of your current irrigation fees is _____ (_____kgs. x _____/kg.). Please take note that the specifiec cash equivalents change whenever the government support price changes at the time you pay. Aside from this you still have unpaid old account of _____.
3. Please specify bill and lot members when making payments.
4. If you have any problem with your account and our service, please feel free to see us in our office.

Fig. V-4. Sample ISF Bill and Statement of Account.

Example No. 1

Sample Irrigators Association
Wuthering Heights, Batanes

No. 0032
Date: _____

OFFICIAL RECEIPT
(for ISF Payment)

Name of Payor: _____ Lot No.: ____ Area: _____
Address: _____ Location of Lot: _____

NATURE OF COLLECTION

Particulars	ISF Due	Discount	Penalty	Total Amount Rec'd
Irrigation Service Fee a. Current Account b. New Back Account c. Old Back Account				
TOTAL				

Amount in words: One Thousand Five Hundred Pesos only

_____ Partial Payment
_____ Full Payment

Received the amount stated above:

_____
Treasurer/Collecting Office

Figure V-5. Sample of an Official Receipt for ISF Payment.