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# Irrigation Management Research—the role of IIMI

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The need to improve the management and performance of irrigation systems in developing countries is receiving much attention from various national governments and international agencies. This paper deals briefly with concepts in the management of irrigation systems and goes on to describe some of the research issues receiving priority in IIMI's programme.

## Irrigation system

An irrigation system comprises the physical system of reservoirs, canals, regulators and other structures required to store, convey, regulate and distribute water to farms. It may also include wells or tubewells, water lifting devices and/or pumping installations and drainage channels and structures. These are the **hardware** aspects of the irrigation infrastructure. There are also the **software** aspects: the planning philosophy, the operating rules and procedures for allocation and distribution of water, the legal rights and codes, the staff of the irrigation bureaucracy and the water users and their organisations. Water at the headworks of the canals constitutes the **input** into the system, water delivered to farmers for growing irrigated crops the **output**. The irrigation system is embedded in an environment containing physical, economic, social and political attributes with which it interacts.

Effective irrigation development should be perceived as part of the overall transformation of rural society and socio-economic development. In a hierarchy of systems, the output of an irrigation system, the irrigation water, becomes a critical input to the agricultural production system at the next level and its output, agricultural production, leads to socio-economic development at the next higher level.

The objective of an irrigation system is to deliver water to farms in a timely, equitable, predictable and reliable manner. Ideally, the water supply should match the crop water requirements.

The objective at the next level is to increase crop productivity. Water is a vital input to the agricultural production process, that when successful, enables farmers to invest in other inputs—high yielding variety of crops, quality seeds, fertilizers and pesticides—all of which interact to increase productivity. But, there is also need for knowledge of crop production technology, agricultural extension, timely supply of

credit, availability of labour or farm power, and more importantly, the price incentives to produce more and achieve higher margins of net benefits. The road and communication networks and facilities for storing, moving and marketing produce become part of the essential infrastructure of the production system. The other objectives at this level are related to equity in the distribution of production benefits, ability to sustain the increased production over the long term, and minimising adverse effects on the ecology and environment.

At the third level, the increased production should lead to greater rural employment and higher rural incomes resulting in higher standards of living.

## Conceptual framework for irrigation management

Irrigation management involves **six processes**:

- Planning and design
- Construction
- Operation and maintenance
- Irrigated farming (the activities that occur on individual farms)
- Performance evaluation
- Rehabilitation

Strong interactions between these processes exist. The activities that are carried out within them comprise five interrelated **management dimensions**:

- a physical dimension, (moving, storing, maintaining and using materials and structures);
- a biological dimension, (maintaining the biological environment);
- a human and institutional dimension, (influencing the behaviour of individuals and institutions);
- an information dimension, (acquiring, processing and disseminating information); and
- a financial dimension, (acquiring, managing and using financial resources).

The relationships between the six processes and the five dimensions over which they are carried out are tabulated in the matrix below. The matrix shows important irrigation management activities, and further, identifies which of them are being focused on in IIMI's research programme.

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Management dimensions	Irrigation processes					
	Planning and Design	Construction	Operation & Maintenance	Irrigated farming	Performance evaluation	Rehabilitation
Physical						
Biological						
Human & Institutional						
Information						
Financial						

■ Important irrigation management component

● Component of major importance to IIMI

## Research programmes

IIMI's research programmes focus on those irrigation management activities that will improve the performance of irrigation systems. They are aimed at deriving methods and conceptual understandings that result in better management of irrigation resources. Emphasis is placed on:

- analysis of whole systems;
- interdisciplinary research;
- field-oriented research in collaboration with national agencies; and
- formation of research networks addressing similar issues in various countries.

The research activities are grouped under three programme areas:

### 1. System management

This programme addresses issues of improved management of relatively large-scale systems where government agencies have primary responsibility for system management. The research includes:

**Performance evaluation:** Appropriate indices and methods to help irrigation managers assess system performance with reference to objectives are being developed.

**Irrigation management for diversified cropping:** As some countries in south and south-east Asia have become self-sufficient in rice, they find it necessary and desirable to diversify and grow non-rice crops especially in the dry season when water is scarce. There is thus a need to develop appropriate irrigation practices at the field and system levels for several upland crops grown in areas irrigated by irrigation systems designed for rice.

**Resource mobilisation:** Research focuses on the relationships between system performance, managerial responsiveness of irrigation agencies and appropriate methods of financing recurrent costs of irrigation.

**Irrigation institutions:** Research seeks to assess the role and influence of both irrigation agencies and farmers in alternative institutional

arrangements to manage irrigation water effectively.

### 2. Rehabilitation and design for management

Irrigation development is well established in many countries, particularly in Asian countries with large irrigated areas. New sources of irrigation water are often scarce and expensive. As a result, projects to rehabilitate or modernise existing systems are becoming increasingly important and attract funding from international agencies and donor countries. The research activities include:  
**Rehabilitation process:** The topic of study is the interaction between the national irrigation agencies, the donor (or lending) agencies and the consultants, and its influence on decision-making in the rehabilitation of irrigation systems.

**Design and management interactions:** The extent of improvement in the performance of the existing systems by management innovations is limited by the constraints inherent in the original system design. Rehabilitation can be used as an opportunity to design systems differently for better management and higher levels of performance.

### 3. Farmer-managed systems

In many countries, the area commanded by farmer-managed systems exceeds that of agency-operated systems, and the quality and management of the two systems are often quite different. Relatively little is known about the interplay of institutional, agricultural and physical factors that affect the performance of the community-based systems, which are often among the most and least successful of systems. IIMI research focuses on evaluating appropriate ways for government agencies to improve or expand the scope of farmer-managed systems without jeopardizing long-term management and performance capacity.



Land preparation