

**THE STRATEGY OF
THE INTERNATIONAL IRRIGATION
MANAGEMENT INSTITUTE**

INTERNATIONAL IRRIGATION MANAGEMENT INSTITUTE
1989

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Preface

This paper sets out a strategy for the International Irrigation Management Institute (IIMI). The strategy outlines the proposed directions for IIMI during the next 5-10 years. It follows lines proposed by Dr. Selcuk Ozgediz, Management Advisor to the Consultative Group on International Agricultural Research (CGIAR). In particular, it uses his definition of strategy as one that "describes the most desirable vision of an organization's future, outlines the essential elements of the course that it intends to follow to realize that vision, and provides justification for the identified course."

The paper has been prepared through an extensive process of consultation involving many people over many months. We would like to express our appreciation to all the members of the IIMI staff, management, and Board of Governors who played an active part in this process. We would also like to express our gratitude to the many representatives of IIMI's partners who participated in an IIMI Strategy Workshop held in April 1988; and to the United Nations Development Programme (UNDP), which provided financial support for that workshop. Finally, we would like to express our appreciation to the many irrigation researchers, consultants, policy makers, and others who have expressed interest in IIMI's strategy, and who have helped shape our views through various comments and suggestions.

IIMI owes a special debt of gratitude to three individuals. The first is Charles Abernethy, who as Special Advisor to the Director General in 1987 and 1988, undertook the responsibility for formulating the strategy and for preparing this document and the many drafts which preceded it. The second is Gerry Egan, Professor of Psychology at Loyola University in Chicago, who proved an invaluable resource early on by acting as key consultant at a staff strategy workshop in July 1987. And the third is Selcuk Ozgediz, who critically reviewed several early drafts of the Strategy Paper and who, along with Ben Bagadion of IIMI's Board of Governors, helped lay the framework of the paper through participation in a staff workshop on strategy and structure held in early 1988.

Last, it should be noted that this document first appeared as a draft in September 1988 and is now being published with a small number of changes which have emerged from subsequent reviews. For a more compact and quick reference to IIMI's Strategy please refer to *Managing Irrigation in the 1990's. A Brief Guide to the Strategy of the International Irrigation Management Institute*. Additional insight into how the Institute plans to implement the strategy can be found in the "IIMI Workplan 1990 - 1994." Copies of both of these documents can be obtained by writing to IIMI's Information Office in Colombo.

Roberto Lenton
Director General

Executive Summary

The strategy that will guide the evolution of the International Irrigation Management Institute (IIMI) over the 5 to 10 year period from the beginning of 1989 has been prepared through an extensive process of consultation involving IIMI's staff, management, and Board of Governors; representatives of IIMI's partners in countries where IIMI now operates or plans to operate in the future; representatives of those countries and organizations which are the sources of IIMI's financial support; and irrigation researchers, consultants, and others who have a stake in IIMI's activities.

The heavy investments in irrigation development in developing countries in the 1960s and 1970s have in many cases not yielded benefits on the scale anticipated. Deficient management is considered to be a major cause of these disappointments. This is the context in which IIMI was founded. The goals of research and development in irrigation management are identified as improvements in productivity, equity, sustainability, and quality of life.

The groups to whom IIMI should deliver benefits are, ultimately, the rural poor in developing countries whose livelihoods depend on irrigated agriculture. However, these are dispersed groups, and the benefits can reach them only through the medium of others who are the immediate users of IIMI's outputs. Six types of organizations are defined as immediate users: irrigation management organizations, policy forming organizations, water users' organizations, research institutes, universities and training establishments, and consultant organizations.

IIMI is a young organization, established in 1984 with its headquar-

ters in Sri Lanka and highly decentralized operations in more than 10 countries in Asia and Africa. Several basic values govern its strategic planning decisions: the promotion of multidisciplinary, collaborative, field-based research on real irrigation systems; an orientation towards solving real problems; the maintenance of high standards of excellence; the strengthening of national irrigation management agencies; and the reduction of poverty, the promotion of social justice and the improvement of the situation of disadvantaged groups.

IIMI's comparative advantage, in relation to other institutions already active in the field, has the following salient features: its international status and staff of wide international provenance and stature, its multicountry programs, its sustained presence in selected countries, and its emphasis on collaborative investigations and problem-solving. These features provide a flexible, multidisciplinary "program" approach, made possible by a combination of project-specific and unrestricted funding.

IIMI's mission is:

to strengthen national efforts to improve and sustain the performance of irrigation systems in developing countries, through the development and dissemination of management innovations.

In order to perform its mission, IIMI's five priority areas of work are: field research in specific environments; thematic research to synthesize findings from varied environments; adaptive, action research to determine how to implement innovations in particular circumstances; information exchange; and management training.

The principles which guide the

methodologies of IIMI's field work are the quantitative measurement of the components of irrigation performance, the formulation of objectively testable hypotheses about the various cause/effect linkages in irrigation management processes, the analysis of the interactions between irrigation design and management, the encouragement of institutional change, and the application of modern management principles and practices.

Irrigation management is defined by IIMI as:

the process in which institutions or individuals set objectives for irrigation systems; establish appropriate conditions; and identify, mobilize, and use resources, so as to attain these objectives; while ensuring that these activities are performed without causing adverse effects.

This definition goes far beyond the primary water-delivery function, and incorporates a variety of human, agricultural and economic aspects. The domain covered by this definition can be analyzed and broken down into thirteen major sectors. Of these, IIMI proposes to concentrate its principal initial efforts on exploring seven, chosen by criteria of users' needs, the potential of each sectors' impacts, and IIMI's comparative advantage. The seven initial program themes are consequently:

Institutions for irrigation management

Management of water resources for irrigation

Management of financial resources for system sustainability

Management of irrigation facilities

Management of irrigation organizations

Management of irrigation support services to farmers

Management of change in the institutions for irrigation

IIMI's field work and its action research, will be normally conducted in the context of specific projects in active collaboration with national irrigation agencies or other suitable organizations, and according to established criteria for project selection. The findings and results that emerge from this work will be evaluated and compared across countries and regions in the context of thematic research, the aim of which is to establish a body of overview knowledge. From this, further conclusions and problem solving expertise can be drawn of a more general, yet direct and practical relevance to irrigation managers.

Management training activities will be aimed at managers, trainers, and researchers. Indirect training systems, delivered through collaboration with national institutes, will be intended to predominate with emphasis on training needs assessments, curriculum development, the generation of widely usable training materials, and the professional development of national training staff.

The Institute will maintain a strong and diversified information program aimed at various audiences. Its major emphasis will be making available, through publications and other media, the findings of IIMI's thematic

research, action research, and site-specific projects to a wide range of people who are in positions where they can use or benefit from such results. The program will also aim to keep the wider public informed, both in developing countries and in donor countries, of the activities in IIMI and the problems it addresses.

IIMI's field operations will be built upon country units which execute collaborative field projects. The criteria for determining in which countries these should be established will include the receptivity and needs of the recipient country, the range and extent of irrigation already present in the country, and the technical interest of the project. Existing institutional strengths, tied to appropriate administrative arrangements and adequate donor support, will also be of relevance in project decision making.

Country units will have various levels of intensity. Currently, IIMI includes four levels of involvement: nonresident programs, resident programs, a strong "branch" program, and multicountry or regional resident programs. Each level requires a certain minimal institutional framework to ensure integration with broader country activities. These include a Memorandum of Understanding with the national government regulating the legal and fiscal status of the IIMI country unit, a Technical Agreement providing for joint activities with one or more relevant national organizations, and a Consultative Committee, bringing together senior national irrigation managers and others with IIMI staff.

IIMI envisages collaborative efforts with six types of organizations: national irrigation-managing agencies and associated research and training organizations; international agricultural research centers; other centers of excellence; international lender and donor organizations; non-governmental organizations; and national and international professional bodies.

Five major zones have been identified for IIMI's program activities, each possessing certain internal similarities in respect of irrigation: South East Asia, East Asia, West Asia and North East Africa, Africa except the Nile Valley, and Latin America and the Caribbean. Initially IIMI opened up operations in South East Asia, and the arid/semiarid zone of South West Asia and Africa. Within the next five years, it will initiate work in the other identified zones.

The internal organization of IIMI is based on four Divisions, each headed by a Director: Programs, Field Operations, Pakistan, and Finance and Administration. In addition to (and working in support of) these divisions, are the Offices of Information and Project Development.

The Strategy's infrastructural formulation takes into account the appropriate needs of an institute with highly decentralized operations, the additional parameters of strong country field operations working within this flexible structure, and the consequent requirement for a sound and balanced portfolio of restricted and unrestricted funding.

Introduction

This paper sets out a strategy for the International Irrigation Management Institute (IIMI), which is a relatively young organization, created in 1984. This strategy, prepared during 1987-88, is intended as having a perspective of the order of ten years.

The strategy is constructed in four parts. The first part describes the context (both external and internal) for which the strategy is devised. This part considers why such an institution as IIMI was deemed necessary; what are the problems and opportunities that caused its conception; what other activities already occur in these fields. It tries to identify certain categories of people who have interests in IIMI's existence and its activities. Especially important is the identification of those groups to whom IIMI should be delivering benefits. Finally, this part considers what IIMI itself is, at present: its values, its strengths and weaknesses, and aspects of the work pattern it has evolved since its establishment.

The first part concludes with the articulation of IIMI's mission in a statement of the broad goals that should guide and lead its management and staff in their choices of shorter-range objectives, priorities, and actions.

The second part considers the broad categories of activity IIMI should undertake in order to accomplish its mission. This part establishes the kinds of services IIMI will offer to its previously identified clientele. It reviews the domain encompassed in the phrase "irrigation management," and makes a selection of major themes on which IIMI will concentrate its efforts. It discusses the need for IIMI to work collaboratively with certain types of partner institutes. Training and information services are outlined.

The third part considers an appropriate structure for IIMI's programs: what relationships will it develop with the countries where irrigation is important; how will its work in those countries be organized; what are likely to be the most fruitful kinds of collaboration at the technical level. This part also considers in which countries IIMI should focus its operations and what criteria it should use to guide its selection of further countries in which to develop operations.

The final part of the paper considers the internal arrangements that IIMI itself should make in order to implement the strategy. These include its departmental components and its staffing and financing.

This strategy has, as has been remarked already, a relatively long-term perspective, of the order of a decade. It will be subjected to five yearly reviews. In order to convert it into short-and medium-term operational terms, a document with a different sort of focus is also needed. For this purpose IIMI will use a system of "rolling" five-year plans. The reader who is interested in IIMI's planning on this time scale is referred to these papers, starting with the "IIMI Workplan 1990-94."

In order to ensure that the strategy is, as far as possible, relevant and achievable, IIMI has engaged in a wide process of consultation in evolving it. The process of consultation has involved the circulation of early versions of the Strategy for comments by interested people in many categories: irrigation managers, researchers, and staff of donor organizations, representing many disciplines and viewpoints. IIMI's staff, management, and Board of Governors have all contributed at each stage. In April 1988, a workshop was held to which were invited senior representatives from all countries in which IIMI is developing active programs. This provided a major opportunity for refining the Strategy to conform to their perceptions of needs.

PART I
THE CONTEXT

The External Environment

The Importance of Irrigation in Developing Countries

There are now about 220 million hectares (ha) of irrigated land in the world, representing about 15 percent of the total cultivated area. Of the 220 million ha, 158 million ha, or 72 percent, are located in developing countries. The irrigated area in these countries makes up 20 percent of the total cultivated area.

In production terms the significance of irrigated agriculture is even greater. In South Asia, for example, yields per hectare obtained from irrigated cereals average between 1.5 and 2.25 times as much as from those on unirrigated lands. More than half of the region's total food production comes from irrigated lands. In the 1960s and 1970s, when the increase of cereal output in these countries was running at an impressive 3.4 percent per year, more than two-thirds of this growth was attributed to irrigation.

Not surprisingly, the developing world has made massive investments in the development of new irrigation schemes or in the rehabilitation of older schemes. Several developing countries with irrigation potential have devoted over three-fourths of their public spending for agriculture to irrigation projects. Worldwide investment on the scale of US\$10 billion per year is often cited by irrigation professionals. Overall, the payoff for these investments has been high. In its absence, it is doubtful whether the tremendous gains in food production achieved over the past two decades would have been possible.

Despite the importance of irrigation in sustaining food production,

most irrigation systems are performing far below their potential. This is true whether performance is measured in terms of achieving planned targets, or in terms of the production potential created by the physical works. In other words, most of the benefits of irrigation development have stemmed from the magnitude of the investment, not from efficient and productive systems.

In many systems, the area irrigated is much less than the area commanded and annual cropping intensities are lower than anticipated. More often than not, water is distributed inequitably between farmers near the head-end reaches of the system, where water is assured, and those less fortunate farmers located downstream. Water deliveries to farmers' fields rarely correspond in quantity and timing to the true requirements of the farmers' crops. Net incomes of farmers and landless laborers in irrigated areas remain below their potential.

The combination of reduction in operating budgets and the inability of managing agencies to recover operating costs, for social and other reasons, usually lead to deficient maintenance and declining performance. Often, irrigation systems must be totally rehabilitated before the original investments are recovered. In general, net returns on irrigation investments have been disappointing. And the cost of developing new irrigation systems is rising rapidly. The cost of new irrigation projects in many tropical countries is now as high as US\$12,000/ha.

Despite these setbacks the demand for irrigation continues to increase. The question that now arises is, where will the increase in supply come from? Clearly, the land available for new

irrigation development is limited. In the future there will be an increasing demand for water by urban users for such purposes as hydroelectricity. The answer lies in improving the management of existing irrigation resources.

The Wider Consequences of Irrigation

Irrigation is more than a water-distributing, crop-producing activity. The benefits of adequate, reliable water supplies to poor farming families are considerable. The contrast between high-risk, low-productivity, rain-fed agriculture and low-risk, high-productivity, irrigated agriculture is often dramatic. Well-managed irrigation produces sharp increases in food supplies and income. As cropping intensity increases to two, three, and even four crops per year, the farm family gains the security of food and income at shorter intervals. Risks of food shortage, indebtedness, and impoverishment are reduced. There is less need to migrate seasonally or to suffer the disruption, family separation, and humiliation which migration often entails. Reduced migration alleviates the pressure on the already overcrowded urban areas and marginal lands.

Successful irrigation boosts the wider rural economy. Household incomes and purchasing power increase; retail traders, transport operators, and many other suppliers of services have more business; new processing industries are established. The sum of these "secondary benefits" is often on the same order as the primary, crop-production benefits.

When well-managed, irrigated agriculture generates employment and higher wages for landless laborers.

New or rehabilitated irrigation schemes often entail land redistribution and settlement of landless families. The increased opportunities promote migration to irrigated areas, both seasonal and permanent settlements. The benefits extend beyond the rural poor to the urban poor, by reducing the pressure on urban employment and infrastructure and by increasing the real wages of urban laborers who spend the greatest proportion of their incomes on food.

At the level of the national economy, irrigated agriculture increases food security through higher and more stable crop production and the ease with which developing countries build and maintain buffer stocks of food. Increased and more diversified food supplies from irrigated areas generate earnings or savings of foreign exchange and buffer the economy against precarious world markets. Increased rural opportunities attract rural investment, both private and public, in rural infrastructure and thereby reverse the terms of trade between rural and urban areas.

Adverse effects also occur. There is a growing concern among environmentalists over the negative externalities which result from poorly managed irrigation. Each year thousands of hectares of agricultural land must be abandoned due to salinization of the soil. Whole regions can be impoverished by the effects of waterlogging. Water-borne diseases such as malaria, schistosomiasis, and filariasis detract from the positive health benefits of better nutrition that irrigation should bring. Overexploitation of groundwater resources threatens the livelihood of many rural communities. The additional work generated by irrigation may place excessive burdens on individuals; women may find themselves working harder in less healthy conditions. If unabated, it is likely that these problems will increase in the future.

Every one of these wider social and economic consequences is in

some way part of the business of irrigation management. The benefits or consequences that may flow from improvements in irrigation management, or from the continued degradation of systems and their environments in the absence of these improvements, are therefore potentially great and intensive.

Irrigation Management: Where Research is Needed

The potential benefits of irrigation are great; the actual achievements in many developing countries (though they are not negligible) are substantially less than the potential. The prospects for improvement lie in four aspects of irrigated agriculture. If management can lead the way, much else will follow.

Productivity. The average yield of food crops on irrigated land in India is about 2 tons/hectare (t/ha); in Japan it is about 6 t/ha. In tropical environments cereal productivity per unit of water can exceed 1 kilogram/cubic meter (kg/m^3) under good water controls; in practice, it is usually less than $0.4 \text{ kg}/\text{m}^3$, but relatively few managing agencies record it. The potential for gain is then as high as 300 percent.

Low productivity has many causes: seepage and other sorts of water wastage; inadequate, unpredictable, or untimely water deliveries; small areas irrigated; farmers' overcautious choices of crops and inputs, in turn a result of water unreliability. Each of these is susceptible to alleviation by management.

Equity. Sharp inequity between head- and tail-end farmers is common, and recent research shows that the gradients of deprivation are steep. In India's Mahanadi Project, cereal yields declined from 1,935 kg/ha at the head to 350 kg/ha at the tail end. Research in Sri Lanka and in Pakistan has revealed that tail-end farmers suffer multiple deprivations compared

with those in the head or middle of the system: they receive less water less reliably, in less timely fashion and have lower yields, lower returns to labor, lower incomes, less access to services and less influence. Inequity has some physical causes, but many of these effects could be mitigated by better management.

Sustainability. Irrigation systems, once constructed, should be sustainable in the long term, continuing to achieve and indeed to exceed their original objectives. That, however, rarely occurs. Loss of sustainability derives from several factors, or their interaction: physical factors, such as salinization of the soil (especially in the arid and semi-arid countries); financial factors, such as inadequate flows of resources into the system, depressing the motivation of its participants; and organizational factors, such as maintenance departments inadequate to deal with system deterioration. Each of these factors can be alleviated to some degree by good management skills.

Quality of life. The introduction of irrigation facilities brings many physical and social changes, affecting people's life style: their environments, their relationships, their work pattern. By increasing the capacity of land to produce food and support people, irrigation causes immigration and settlement of new populations, often causing cultural, social, and political changes. The different water regimes associated with irrigation are often favorable to disease-bearing organisms and vectors. Enhanced cropping intensity, a common goal of irrigation development, implies more time spent at work in the fields. The impacts on family life, especially on women and children, are considerable, but not yet well understood. All these considerations call for sensitive management, aimed at increasing benefits and reducing adverse impacts.

What are Others Doing?

There are already a range of

groups and institutes in many countries which have programs of work that are in one way or another aimed at the improvement of irrigation or of irrigation management. IIMI will maintain its awareness of, and as far as possible contact with, such activities in order to ensure that it is not undertaking activities that can be done equally or more effectively elsewhere; thus IIMI aims to identify the particular sectors and situations in which it operates with a comparative advantage.

It is important then to summarize the ongoing activities in research, training, and information related to irrigation management.

Much of the *research* is of a single-discipline kind, following conventional disciplinary lines, studying one or a few aspects of an irrigation system in relative isolation. Specialized institutions for such work exist in many countries. Research which analyzes irrigation systems from a holistic point of view, including the physical, agricultural, institutional, and operational dimensions, is far less common.

In countries with large irrigation systems, there have been numerous research projects of various kinds. Some include action research, as at the Mona Project in Pakistan, the joint work of the International Rice Research Institute (IRRI) and the National Irrigation Administration in the Philippines, the Egypt Water Use Project, and several projects in India.

A large number of *training* courses in irrigation are offered around the world. Most are specialized with continuing divisions between three major groups of disciplines: engineering and hydrology, agriculture, and the economic and social sciences. There are a particularly large number of courses available on the technical aspects of irrigation engineering but few on irrigation management, although some institutes in the industrialized countries offer such courses.

In recent years, several developing countries have initiated programs for in-service training in water management. In India, several new Water and Land Management Institutes (WALMIs) have been established for this purpose; other recent ventures include the course on management of irrigation projects at Mananga, Swaziland, the International Water Management Training Course for Asian & Pacific irrigation managers at the University of Melbourne and courses organized by Utah State University in collaboration with research institutions in Morocco and Thailand.

Information exchange systems and information databases in irrigation exist at the International Commission for Irrigation & Drainage (ICID) Headquarters in New Delhi; the Overseas Development Institute (ODI) London; and the Commonwealth Agricultural Bureaux International (CAB International), at Wallingford, England. These operate in different ways. ICID maintains a large library and publishes an annual bibliography; CAB International publishes regular periodicals of abstracts; ODI in collaboration with IIMI disseminates a newsletter and professional papers to a participating network.

Integrated programs with research, training and information components in irrigation management have begun to appear during the past decade. They include the Food and Agriculture Organization's (FAO's) International Support Program for Farm Water Management; the United States Agency for International Development's (USAID's) Water Management Synthesis Projects implemented by groups of US universities; and the more recent Irrigation Support Project for Asia and the Near East (ISPAN), also funded by USAID.

Current Trends In Irrigated Agriculture

However, the nature of irrigation and agriculture is changing, and with

it, the subjects or trends that need to be addressed. In some cases, the above organizations and research institutions are recognizing their staff and program to address these needs. In other cases new institutions and programs are emerging. In all cases, the complexity of emerging issues is leading to greater cooperation and collaboration between specialized institutions.

Foremost in the list of trends is the growing concern among development professionals over issues of agricultural and environmental sustainability. Due to continued population growth, and the lack of employment opportunities in rural areas, large populations are migrating to marginal or fragile lands. The research strategy of the past two decades emphasized maximizing productivity under high input, highly intensive farming conditions on the most productive lands. The emerging strategy is aimed at identifying crops, livestock, and systems of production that are adaptable to a wide range of physical and socio-economic environments. The strategy is multidisciplinary and holistic in nature and encompasses the management of whole resource systems rather than their individual components.

A number of international agriculture research centers both within and associated with the Consultative Group for International Agricultural Research (CGIAR) were established in the past decade to address this need. These include IIMI, the International Board for Soil Research and Management (IBSRAM), the International Council for Research in Agroforestry (ICRAF), the International Center for Living Aquatic Resources Management (ICLARM) and the International Center of Insect Physiology and Ecology (ICIPE), among others. Within the CGIAR the International Institute for Tropical Agriculture (IITA) and the International Crops Research Institute for the Semi-arid Tropics (ICRISAT) were established at least partly for

this reason; other centers within the CGIAR are now planning or are already undertaking research aimed at adapting crops to more complex environments and sustaining farming systems. Moreover, sustainability of food production systems is now at the forefront of discussions of the CGIAR's Technical Advisory Committee (TAC), and moves are underway to increase the linkages and cooperation among the CGIAR and the larger research community.

The role of irrigation management research in this context is to ensure that irrigation systems maximize employment opportunities and sustain farm incomes through diversified agriculture, and minimize the adverse environmental effects both within and outside irrigated areas. Further, it must seek to maximize returns to investments in irrigation to liberate financial resources for the development of other areas.

A number of trends are apparent within the discipline of irrigation management itself, which are now receiving the attention of donors, research institutions, and irrigation agencies.

First, due to reductions in the operating budgets of irrigation agencies, increased attention is being given to the turnover and devolution of management responsibility from agencies to farmers' groups, and to the mobilization of necessary resources to operate and maintain irrigation systems. Along these same lines, agreements between irrigation agencies and do-

nors often include covenants for participation of farmers in the design, construction, and rehabilitation of irrigation systems, and this offers considerable scope for research.

Second, increased attention is being given to improvements in irrigation and information technology and adapting these to existing conditions in developing countries. This includes research aimed at numerical modeling to improve main system operation, and its adaptation from mainframe computers to microcomputers, more appropriate to Third World conditions. Such work is currently underway, for example at the Centre National du Machmisme Agricole, du Genie Rural des Eaux et des Forets (CEMACREF) in France, at the Utah State and Colorado State Universities in the U.S. and as part of India's National Water Management Project. Information technology is coming into play in the improvement of communication linkages within irrigation schemes, and between managers in the field and those in the agency headquarters where much of the day-to-day and long-term operational plans are devised. This also includes the development of information technology that allows irrigation managers to store, retrieve, and analyze the abundance of data which they need to operate irrigation systems.

Third, as mentioned above, increased attention is being given to field research and the development of associated methodologies. As re-

searchers move from the experiment station to the field, as research becomes more multidisciplinary and holistic in nature, traditional research methodologies begin to break down due to the number of interacting variables and the lack of control of those variables. In the context of irrigation research, it is not practical to duplicate an operating irrigation system.

Fourth, there is an increasing need for research into managing the conjunctive use of different water sources for irrigation, and the shifting priorities which accompany the increasing demand for water for purposes other than irrigation. This includes the need for drinking water for families and livestock, and water for other household uses. This also includes the use of water for hydroelectricity and for industry in general.

Last, increased attention is being given to training appropriate to the above trends. Currently, only a few universities offer training in irrigation management, and those which do are located in developed countries. The basic training for irrigation specialists in developing countries is technical and engineering in nature. This means that irrigation engineers must frequently leave their host country for postgraduate education at considerable cost in terms of finances and career. This pattern is changing and innovative programs are emerging, such as those of India's Administrative Staff College, but there is a need for assistance in curriculum development in this area.

Beneficiaries And Users Of IIMI's Work

In this section we consider which groups of people, and organizations, should be the main users and beneficiaries of the results of IIMI's work. In order to maximize its impact, the Institute must identify these users and

their needs as sharply as it can, and ensure that it targets its work towards problems that are known to affect or constrain them significantly.

The ultimate beneficiaries of IIMI's

products and services are the rural poor (farmers, tenants, landless people, and hired and migrant laborers) in developing countries, whose livelihoods depend on irrigated agriculture. Farmers are ultimate benefi-

ciaries, rather than immediate clients, because their needs can be better met by national agencies than by an international organization such as IIMI. Those needs include better farm-level practices and technology; more appropriate extension services, including training in basic management skills; more reliable water delivery; more effective communication with agency staff; and better ways of working with canal-management agencies.

IIMI cannot, however, expect to develop (in general) a direct relationship with these beneficiary groups which are extremely large and dispersed. The direct users, or "clients" for IIMI's outputs are those organizations in the developing countries which are concerned in various ways with the management of irrigation. Their concerns may be at the levels of policy formation, operational management, research, or consultancy.

There are a number of such groups, and their exact nature differs in different administrative or political systems. IIMI recognizes the following groups are particularly significant for the orientation of its work programs.

1. Government irrigation management organizations which have

direct responsibility for planning, designing, operating and supporting irrigation systems. These may be ministries or parastatal bodies.

2. Policymaking organizations which are responsible for determining national policies in relation to water resources planning and to irrigated agriculture.
3. Organizations and associations of irrigation water users, which may own or exercise management functions on irrigation systems. Usually, but by no means always, the systems which these groups manage are relatively small; but such groups also often manage local distribution sectors of much larger schemes, and therefore have some management relationship and interface with a larger-scale agency.
4. National research institutes, especially those with established interests and activities in irrigation or in management studies.
5. Universities and national establishments for professional training, especially those aiming at higher levels of management.
6. National consulting organizations which exist to give advice on irri-

gation-related questions. The growth of the indigenous consultancy sector is a significant current trend of development in many countries.

There are as yet few research or training institutes with an explicit orientation towards the management of irrigation (as distinct from the technologies of irrigation). IIMI is therefore in a rather different situation from many other international agricultural research centers, in that it will rarely be interacting with directly comparable national institutes. These may come into existence later, or irrigation management may be added to the range of existing national institutes.

IIMI has tried to ensure that the views of affected client groups have influenced the evolution of its strategy. The main actions in this regard were the wide circulation of earlier drafts of the strategy, and the convening in April 1988 of a Strategy Workshop, to which senior representatives from all countries where IIMI is developing active programs, and also some from geographical areas where IIMI is not yet represented, were invited.

The Internal Environment

Origins

IIMI is the first international institute whose efforts are devoted solely to the subject of irrigation management. It was established in 1984 with headquarters in Sri Lanka, and finance was provided by an International Support Group (see box for its donor membership) constituted for this single purpose.

The process that led to IIMI's creation began in the early 1970s, and

DONOR MEMBERS OF THE IIMI SUPPORT GROUP

Aga Khan Foundation	International Fund for Agricultural Development
African Development Bank	Japan
Asian Development Bank	Rockefeller Brothers' Fund
Australia	Rockefeller Foundation
Canada	The Netherlands
Federal Republic of Germany	United Kingdom
Ford Foundation	United Nations Development Programme
France	United States of America
International Development Research Centre	World Bank

was conducted largely by or in close liaison with the CGIAR and its Technical Advisory Committee. The motivating factors which, throughout this period, sustained a general consensus that such an institute as IIMI should be created were that:

1. deficiencies in the management of irrigation, and related institutional problems, were becoming a major constraint to the realization of sustained increases in agricultural production;
2. the international center approach, characteristic of CGIAR, had had notable success in alleviating other constraints to agricultural production; and
3. because of the location-specific nature of irrigation and its associated problems, it was apparent that a major effort was needed to strengthen national institutions and programs.

Although IIMI is a young organization, it has nevertheless existed for five years and in that time has accumulated certain experiences and perceptions of its appropriate role.

Certain values are widely shared among IIMI's Board and staff. These values govern the conduct of its work, and guide the Institute in making choices among alternative courses of action, and in determining priorities that are consistent with its mission. They are as follows.

1. Promotion of multidisciplinary, collaborative, field-based research. This involves:
 - a) using real irrigation systems as field laboratories, rather than developing special experimental facilities; and
 - b) employing a systems approach.
2. Emphasis upon solving real problems, in keeping with IIMI's mission to help improve and sustain

irrigation performance. This in turn implies:

- a) ensuring that impacts reach clients and ultimate beneficiaries, not simply studying irrigation systems or developing better understanding of their behaviors;
 - b) not only developing innovations, but collaborating with client agencies for their adaptation and implementation; and
 - c) maintaining only a relatively small nucleus of headquarters staff, so that most of the professional staff are placed in direct contact with practical management problems.
3. Ensuring that IIMI's products and services achieve the highest standards of excellence. This implies:
 - a) international recruitment of the most qualified specialists in the field drawn from all parts of the world;
 - b) undertaking long-term programs when such effort is required; and
 - c) focusing efforts on those things that IIMI can do well.
 4. Fostering the increased autonomy of client agencies, in keeping with IIMI's mission to strengthen national efforts. The ultimate criterion of success will be the elimination of the need for IIMI to continue its assistance.
 5. Ensuring that IIMI's work ultimately contributes to the reduction of poverty, the promotion of social justice, and the improvement of the situation of disadvantaged groups. Irrigation has the potential to bring about such effects, but does not always do so, unless there is a positive orientation of management towards these goals.

All of these values are of high significance in the management of IIMI's programs, but the second one in particular may deserve some added explanatory remarks. IIMI must not become, nor be externally perceived as, an academic institution. Its orientation towards real problems and practical solutions must at all times be evident.

IIMI is by no means the only institution playing an active role in improving irrigation management. It has, however, certain features that are unique to it. These features define IIMI's comparative advantage, vis-a-vis other institutions in the field. IIMI will develop its activities in such ways as to use and develop these special features, which are:

- ★ An **international status** and open **international recruitment** policies enable IIMI to be a neutral objective observer, not identified with a particular country, particular discipline; or particular solution to irrigation management problems;
- ★ A **multicountry focus** enables the Institute to test potential irrigation management innovations in various contexts, and to promote intercountry exchanges of ideas and experiences;
- ★ A long-term presence and **resident staff in selected countries** enable IIMI to participate in sustained action research on important irrigation management problems, and to develop familiarity with the environments that influence them;
- ★ An emphasis on **collaborative investigations and problem-solving** helps IIMI to work effectively in this mode with a number of different national agencies simultaneously in a given country, rather than being tied to specific projects or agencies;

- * A combination of unrestricted and project funding facilitates a broad **multidisciplinary “program” approach** and provides IIMI with sufficient flexibility to address key long-range irrigation management problems.

There are other institutions char-

acterized by some (though not all) of these features. IIMI will aim to build up partnerships with these, and to take advantage of complementary strengths.

On the other hand, IIMI does not aim to develop its strengths or research facilities, in any one disci-

pline, in order to rival the existing single-discipline institutions in fields such as hydraulic engineering, irrigation agronomy, or computational modeling. It recognizes that its comparative advantage does not lie in that direction. IIMI's policy will be to develop cooperative, not competitive, relationships with established institutes in such fields.

IIMI's Mission

Purpose

In previous sections we have considered the nature of the problems and opportunities that arise in irrigation management; the identification of groups that can be assisted by an organization such as IIMI; and the character of IIMI itself, as it has evolved in its earliest years. These factors combine to lead to the following statement of IIMI's mission, which has been evolved by IIMI's staff and management and reflects the set of objectives formally given to the Institute in its founding charter.

IIMI exists for the following purpose:

- * **to strengthen national efforts to improve and sustain the performance of irrigation systems in developing countries, through the development and dissemination of management innovations.**

Definition of Terms

The above mission statement is brief. Some of the expressions in it deserve

amplification, because of their significance to IIMI's evolution.

- * **National efforts.** This refers to actions undertaken in developing countries by government agencies, parastatal bodies, non-government organizations, farmers' or tenants' groups or individuals, to improve the performance of their irrigation systems.
- * **Management innovations.** This means any physical or organizational change in the conditions or the processes of management that can cause improved performance of a system. It does not necessarily mean changes that are entirely novel (although that may sometimes be the case), but it will probably more frequently mean the introduction of some practice that is new to the particular system or institution, but has been successfully demonstrated in some different context.
- * These innovations will undergo **development and dissemination.** The first of these is the

process of identifying, field testing and evaluating the new approach, which includes determining the conditions required for its successful adaptation from one context to another. The second part, dissemination, involves extending the knowledge and experience so gained to IIMI's partners and clients.

- * **Performance of irrigation systems.** The improvement of performance is IIMI's major goal, so it is essential to know what it is. Performance is often taken to mean the degree to which a system achieves its objectives. But objectives differ for individual systems and may be reset from time to time by a management decision. IIMI's concern is with *absolute* standards of performance, so one of its early tasks is to develop consistent definitions and measurements of each component of performance: productivity (i.e., crop output per unit of each major input; land, water, labor), equity, reliability, sustainability, profitability, and quality of life.

The Benefits Of IIMI's Work

In the discussions that led to the Institute's establishment, and in the process of self-examination that led to the current strategy, two questions were often raised.

First, even in those situations where management defects are obvious, how can the Institute ensure that its activities will make a difference? The recent history of development is strewn with examples of projects whose anticipated benefits have failed to materialize, or have been realized only to a modest extent. IIMI must ensure that its activities do not follow the same path.

Second, if the anticipated benefits do materialize, to whom will they go? What sections of society seem most likely to gain from any successes by IIMI? Critics often accuse irrigation development of contributing to increases in social inequity; how can IIMI feel confident that the benefits of its activities will go to those who need them most?

IIMI cannot answer these questions fully, because both are affected by the broader consequences of national government policies. However, partial answers are possible.

In regard to the first issue, IIMI's situation is in many ways analogous to that of the older international agricultural research centers at the time of their establishment. In 1960, there was no guarantee that hybrid technologies and associated practices would be embraced in traditional farming communities, that a "Green Revolution" would in fact take place. What could be identified at that time was the existence of opportunities; and (less clearly), the receptiveness of individuals to new initiatives.

Both of these factors are present in regard to irrigation management. Opportunities are clear, because of the kinds and seriousness of problems noted earlier. A search for answers and willingness to change, by those responsible for managing agencies have become apparent during the past decade. New organizational structures are being contemplated in many countries: the move towards "turnover" of systems or parts of systems to some kind of newly created farmers' organization is one example. So are the efforts by many agencies to mobilize resources for operations through self-financing. Nevertheless, some agencies may hesitate to introduce changes because of the risk associated with change. In these cases, IIMI's activities will serve as a catalyst through its emphasis on action research, which seeks to determine the best ways of introducing new management practices. Once identified, IIMI's multicountry operations will provide a ready vehicle for disseminating agencies' experience in introducing change among other countries where similar conditions prevail.

As to the second issue (the identification of the beneficiary groups), there are several reasons for assuming that benefits from better irrigation management should diffuse widely through the economy and the population.

One function of irrigation management is to ensure that water is delivered equitably throughout the command area – that all farmers, regardless of their location in the system, receive their due share. When this occurs, poorer farmers, who are frequently located in the disadvantaged sections of the system, receive

immediate benefits; their families ultimately benefit from the increased quantity of food produced on the farm and the security that ensues.

In cases where water is conserved and managed to increase cropping intensity, farmers throughout the system have the opportunity to grow three crops a year instead of one or two, and the total food production and associated income of the system can increase considerably. This sets off a chain of events which reverberates throughout the local community including an increase in labor requirements within the system itself, an increase in demand for agricultural inputs and processing services, a downward pressure on informal interest rates, and a general reversal of the terms of trade which attracts public investment in rural infrastructure and private investment in rural business. All these increase the demand for labor throughout the rural community.

Irrigation is not undertaken just for farmers – if it was it would not attract the investment it does. Irrigation enables farmers to produce the surpluses that go to feed and clothe urban populations. When these surpluses are weak, there is importation of agricultural products. When the surpluses are strong (as good management should help to ensure) foreign exchange can be put to other uses that benefit the entire population.

Improved irrigation management can also lead to sustainable farming systems. When farmers feel assured that they will receive water deliveries that correspond in timing and quantity to field crops, they will be more willing to take the risk of diversifying

into new crops. This is particularly true for irrigating non-rice crops, which have highly specific water requirements, in irrigation systems designed for rice. The diversification

of cropping systems reduces economic and biological risks associated with growing a single crop.

Last, improved irrigation management can alleviate most of the nega-

tive environmental impacts mentioned thus far: salinization, siltation, and water-borne diseases. Such benefits often accrue to the disadvantaged rural families.

PART II
STRATEGIC ISSUES

Major Strategic Areas

In many spheres of activity, recent decades have seen some form of managerial revolution. IIMI's mission implies a sustained, international collaborative effort to bring the benefits of such a change to Third World irrigation.

IIMI should serve during this period of change as a center for innovation. It perceives itself as engaging in two principal businesses:

1. development of management innovations through research; and
2. assistance to national irrigation agencies in generating, implementing, and adapting such innovations in their own particular circumstances.

These major businesses can be further divided into several sectors which will be reflected in the principal units of IIMI's organizational structure in order to ensure that each receives adequate and sustained attention.

The development of management innovations requires:

1. field research on irrigation management systems in specific environments; and
2. thematic research to develop generic innovations that may be applicable in a variety of environments.

Assistance to strengthen the management capacities of national irrigation agencies requires:

1. adaptive research and action-research programs, whose purpose is to field-test management innovations in specific circumstances;
2. management training services; and

3. information services.

Each of these five work areas is reviewed in separate sections which follow. From the point of view of IIMI's own organization, areas 1 and 3 above are intimately related and will often be performed by the same staff group, possibly as consecutive phases of the same project, so they are reviewed together in the section on Collaborative Field Research. Before these work areas are reviewed, however, some general principles governing IIMI's activities, and the specific themes on which IIMI will concentrate its efforts, are outlined.

IIMI's role, in relation to the national organizations whose efforts it seeks to strengthen, improve, and promote, needs special attention. All of IIMI's work must be founded upon collaboration with such agencies. If there is not a complementary effort aimed towards management development on the part of a national agency, there would be little that IIMI can do, other than research alone, which we have already stressed IIMI does not wish to see as an end in itself.

Since collaboration is essential, questions will arise as to the extent and limits of IIMI's role. There can be no general answers to these, since the character and functions of the agencies with which IIMI relates are very diverse. However, it will not generally be sufficient for IIMI simply to prescribe solutions; that is necessary but IIMI's tasks must usually include some share in a phase of implementation and adaptation. Irrigation usually has numerous site-specific features that make localized adaptations essential. IIMI must also stay in contact with the practical implementation process for long enough

to ensure that it is capable of succeeding.

In pursuit of the general aim of practical relevance, IIMI will make arrangements for internal and external assessments of its own performance; for developing measurable criteria of its own productivity; and for making itself accountable to its client groups.

There are certain principles that must guide the methodologies of IIMI's studies and will animate all its work, regardless of the particular program theme. All of these principles are permanent characteristics of IIMI's work.

1. Measurement of irrigation performance, and the use of quantitative performance measurements as the objective criteria of the success or otherwise of management innovations and changes. This will require the determination of at least partially standardized sets of characteristic parameters to define aspects of performance. Only thus can valid intercountry comparisons be made.
2. Formulation of objectively testable hypotheses about the various cause/effect linkages in irrigation management processes. Only thus can we develop a capacity to predict the consequences of interventions.
3. Analysis of interactions between the design of the irrigation system and its management in a given environment. This implies distinguishing the constraints imposed by physical conditions from those imposed by management conditions.

4. Development of effective irrigation institutions and encouragement of institutional change and reform. Only by accepting change as a necessary principle and by motivating all participants to want change rather than resist it, will the institutions of irrigation adapt swiftly enough to accommodate the stresses of rising demands and the opportunities of improved technologies.
5. Application of the principles and practices of modern management to the management of irrigation systems. The principle needs little elaboration, but must underlie all IIMI's attitudes and activities.

Elements Of Irrigation Management

In this section we identify a set of major elements into which the subject area of irrigation management may be divided. This leads us to the subsequent section in which we make a selection of some of these, on which IIMI's work will initially concentrate.

What is Irrigation Management?

IIMI defines irrigation management as:

the process in which institutions or individuals set objectives for irrigation systems; establish appropriate conditions; and identify, mobilize, and use resources, so as to attain these objectives; while ensuring that all activities are performed without causing adverse effects.

It is also worthwhile to clarify the term "irrigation," and what it includes. This then leads to the analytic framework that seems appropriate for studying its management.

Definitions of irrigation are numerous. The word is used with two levels of meaning — a narrow, functional one, and a broad one that incorporates social, institutional, agricultural, and other connotations. In its restricted, functional sense (which is referred to here simply as "irrigation") a suitable definition is:

Irrigation is the totality of means employed by people to

augment and control the supply of water to the soil, for the purpose of enhancing the production of crops.

This "water-delivery" definition constitutes the original meaning of irrigation. However, when speaking of managing irrigation, it is not enough to consider whether water is manipulated correctly, although this is certainly vital. It is also necessary to ensure that a variety of human, agricultural, and economic aspects are taken into consideration before an assertion is made that an irrigation enterprise is adequately managed and sustainable.

It is precisely because of these two interpretations that the terminology "irrigation water management" has emerged, which is taken to mean the arrangements for delivering water to fields at prescribed places, amounts and times. "Irrigation management," on the other hand, is more often interpreted to mean management systems related to the broader scope of irrigation, which is IIMI's interpretation too.

Components of Irrigation Management

IIMI divides the components of irrigation management into five very broad categories:

1. setting *objectives*;
2. establishing adequate *conditions* and acquiring resources, for the achievement of those objectives;

3. controlling *processes* towards achievement of the objectives;
4. performing all these activities in ways that are appropriate to the external *context*; and
5. arranging *renewal* of the system, from time to time, so as to enhance its capacities.

Others may add a sixth component — monitoring, to see whether or not objectives are achieved. That is a vital task of managers. It is, however, an integral part of the third component, process control, which cannot be performed properly in the absence of monitoring and its associated follow-up activities — evaluation and feedback into corrective measures.

The five components above correspond to the following five questions.

1. What results do we want to achieve?
2. What resources and facilities do we need, in order to achieve these results?
3. How should we use these resources and facilities so as to achieve these results?
4. What external factors should be considered so that in achieving the results we do not harm the external environment, and so that external activities do not harm the internal operation?

5. How can we arrange to adapt and improve the system from time to time, so as to incorporate new ideas and technologies, and to deliver steadily improving results?

These five concerns apply to national irrigation plans and to individual projects. But they are also present in every subsector of irrigation management, and in each case the same five questions must be answered.

This leads to the identification of the major sectors of the field of irrigation management.

The following scheme of thirteen major sectors includes most of the issues that give rise to practical management problems. Each sector is linked to one of the five components listed above.

Component	Sector
Objectives	National irrigation policies
Conditions	Irrigation facilities

Processes	Institutions for irrigation management
	Management of water resources for irrigation
	Management of land resources for irrigation
	Management of crops in irrigated agriculture
	Management of financial resources for system sustainability
	Management of irrigation facilities
	Management of irrigation organizations
Context	Management of irrigation support services to farmers
	Contextual factors
Renewal	Improvement of irrigation facilities
	Management of change in the institutions for irrigation

There are many interactions among these sectors, but they are sufficiently distinct so that each can be treated as a separate topic of analysis.

An important feature is the relationship between the organizations that manage irrigation and the users (or farmers). They are joint participants in the business of crop production, and irrigation cannot succeed without the best efforts of these two groups. However, the farm community is not under the direct control of the management organizations. Some of the sectors in this analysis (such as the management of water) are usually subject to the direct control of a managing agency, and others (such as the management of land and crops) are usually not. Because the performance of the system is affected by those aspects that are outside its direct control, a managing agency cannot ignore what happens in these sectors. Instead, it must find ways of influencing them.

IIMI's Themes

From the set of irrigation management sectors identified above, IIMI has chosen initially a smaller group of seven major program themes upon which it intends to concentrate its efforts.

The selection of this subset of major themes is not to be regarded in a negative sense. It does not mean that IIMI will neglect other aspects of irrigation management; on the contrary, it must strive to maintain contact and awareness of developments in all of them. But the Institute is not a large one, and it must beware of the dangers of excessive disposal of its available resources across the very large field that is irrigation management. Its seven major themes will be the areas in

which IIMI seeks to make the strongest impact.

The themes will guide staff recruitment policies and ensure an appropriate balance of interests and disciplines. The application of a thematic structure to IIMI's programs will also optimize the use of a small nucleus of headquarters staff, whose function is to integrate or synthesize the results of country-specific studies, to perceive general trends, and to make inter-country comparisons (see section on Thematic Research).

In selecting its seven themes, IIMI has been guided by three considerations.

1. *Users' needs.* IIMI will address

problems that correspond to needs felt and expressed by its primary user group, the irrigation agencies, and will aim towards developing practical solutions.

2. *Impact potential.* IIMI will work on those problem areas in which solutions seem likely to have maximum impact.

3. *Comparative advantage.* IIMI will concentrate on themes where it possesses a comparative advantage relative to other institutes studying aspects of irrigation. This implies special attention to multidisciplinary questions and to integrated management, rather than single-discipline issues.

The seven themes on which IIMI proposes to build its programs are as follows:

- Institutions for irrigation management
- Management of water resources for irrigation
- Management of financial resources for system sustainability
- Management of irrigation facilities
- Management of irrigation organizations
- Management of irrigation support services to farmers
- Management of change in the institutions for irrigation.

Institutions for irrigation management

Under this heading, IIMI will concentrate on determining the most appropriate institutional conditions for managing irrigation systems.

This will involve research on such issues as the merits of schemes run by central management agencies versus those managed by farmers; or those that treat farmers as tenants as contrasted with those that give farmers transferable land titles. Of particular importance will be the examination of the impact of such fundamental institutional choices on irrigation performance under varying environmental and social conditions. For those systems managed by central management agencies, research issues will include determining the numbers, quality, knowledge, and skills of agency personnel; assessing alternative information gathering arrangements and communication systems; and analyzing the advantages and disadvantages of different institutional mechanisms for cost recovery.

Governance, also subsumed under this theme, is a significant part of the total set of management conditions, yet its relationship to system performance criteria such as productivity or cost-effectiveness has been

remarkably little studied. A wide variety of organizational models are in use, ranging from centralized ministries of government and single-system parastatal corporations to farmer-managed systems in which government agencies have no controlling voice. Within the farmer-managed sector itself, there are again a great many variants.

The institutions that affect irrigation are not only those that manage it directly. Other kinds of institutions condition the legal, social, political, and economic environment within which irrigations must function, and these can have significant impacts on system performance.

The justification for this theme comes from the second and third criteria quoted above: effective work in this field has high potential for impact, and lies well within IIMI's area of comparative advantage. There will be substantial interaction between this theme and all others, but especially with the next two.

Management of Water Resources for Irrigation

This theme concerns processes in the physical water supply, delivery, and disposal systems. In canal systems, it encompasses operations down to the delivery of water to farmers or farmer groups, so it implies awareness of crop needs for water, and of the constraints on water delivery that may be imposed by such aspects as soil type or land shaping. (However, IIMI does not expect to extend its research effort into these latter areas; it needs awareness of, but not research activity on them.)

The past decade has seen a number of field studies on tertiary water distribution, often going under the name "on-farm water management." There have been far fewer

studies of what are referred to as "main-system" operations, and on the second of our theme-selection criteria (impact potential) this is chosen as an area where the lack of past analyses suggests considerable possibilities of improvement.

Many of the present problems of canal operations are the result of changing objectives of canal systems (or changing external demands, not always explicitly recognized in restated objectives): such changes are happening through gradual evolution of the irrigated agricultural system, through unintended environmental impacts, or rapid changes in cropping patterns as farmers adjust to economic changes. In its work thus far IIMI has found that main canal operations, with their preponderance of hardware, are perceived by agencies as already operating efficiently, when the opposite is frequently the case. In these cases, IIMI must first prove that problems do exist and then seek solutions.

Other stresses on operational processes arise from deficient maintenance, so there will be significant interaction between this theme and that of maintenance and rehabilitation (below). A major focus of IIMI's work on this theme will relate to the operation of irrigation systems under changing conditions.

Canal operations are still the predominant area of irrigation water management in developing countries, but other features are steadily gaining importance. Groundwater development and conjunctive use of ground and surface water resources have helped many countries (notably in the Indian subcontinent and in northern China) to modify the seasonality of their irrigation supplies, and at the same time to combat waterlogging due to rising water tables. There are often special problems of heterogeneous management, since surface water is usually a public resource, whereas wells are often private.

Management of Financial Resources for System Sustainability

Having identified the management conditions that a system requires, there arises the associated question of mobilizing resources (usually financial) in order to secure and sustain these conditions. Budget cut-backs and the rising cost of rehabilitation have moved this problem to the forefront of agency considerations; thus, by our first criterion, clients' interest, it is a prominent issue. Expenditure may be defrayed in many ways: sometimes by recovery of irrigation services fees from beneficiaries; by beneficiaries' contributions in cash or in-kind, particularly labor; or, more commonly, by way of direct funding from national treasuries.

IIMI's comparative advantage lies not in the narrower financing questions of how much should be collected and from whom; but rather on the broader, interdisciplinary questions of the interactions among finance, agency performance, and overall system performance. Strategies have to be determined that will mobilize resources in ways that increase accountability and financial responsibility of agencies and hence the performance and sustainability of systems. This is a case for action research, in collaboration with irrigation management agencies willing to develop and field-test alternative methods for resource mobilization.

Despite its current importance to agencies, the theme of finance should not rest there. The problem of motivating two major groups of people – agency officials and farmers – to secure maximum performance from systems will always be closely associated with finance. There have recently been notable cases where system performance (measured by crop production) has collapsed as market rewards to cultivators dropped below motivating levels. Nor can farmers' service fees be pushed to

the level that it becomes a disincentive to farming, or crop selection, particularly when the underlying flow of resources into the system, from markets or central purchasing authorities, is deficient. The linkages of these factors to management and performance are intimately related.

Management of Irrigation Facilities

Irrigation systems deteriorate physically like any other physical structure. Structures may rust or be willfully damaged; weeds grow and sediment accumulates in canals; all sorts of obtrusions like animals, vehicles, garbage, may cause the banks and beds of canals to become deformed from their initial shape. Nearly all such deterioration detracts from the system's capacity to meet its objectives.

Management must develop an appropriate response to this fact, and the responses virtually always fall into one of two categories: maintenance or rehabilitation. These can be considered as, respectively, continuous or discrete methods of accomplishing the same basic objective of keeping the system approximately in the conditions for which it was intended. There is a substantial difference, however, in that rehabilitation, conducted after a significant number of years, is usually also taken as an opportunity to upgrade and update the system: to enhance the capacity of the system to meet new objectives. So the distinction between maintenance and rehabilitation goes well beyond the simple distinction between current cost and capital reinvestment.

The problems most widely perceived by managing agencies, in this theme area, are two. First, many countries with mature irrigation systems are currently making large investments in the rehabilitation of irrigation systems. Because systems include physical facilities, organizational struc-

tures, and management processes, appropriate mixes of hardware and software are required in order to upgrade the performance potential and then to sustain it at the new levels. Many alternative rehabilitation strategies are currently being implemented, and offer opportunities to compare costs, benefits, impact, and sustainability of systems rehabilitated.

Second, under current maintenance policies, systems must be maintained in a condition sufficient for the achievement of objectives. The organizing and financing of adequate maintenance is presenting difficulties to many agencies (and is indeed one of the motivations behind the search for better financing arrangements and for turnover schemes; so these themes have clear interlinkages).

Management of Irrigation Organizations

As described earlier, management of irrigation systems includes not only management of water but also management of people and management of information. In many developing countries, irrigation bureaucracies *administer* irrigation systems with emphasis on the supply of water as an input to agricultural production and on following rules and procedures. But the essence of *management* is to monitor not only the inputs but also the outputs, the process, and the feedback, and to make the necessary changes in real time operations in response to such feedback. Shifting from an administration mode to a management mode in operating systems by enhancing the management capacity of the decision-making and operating personnel of irrigation agencies is the key to achieving and sustaining high levels of irrigation system performance. In addition, if irrigation agencies are to adopt better canal operation practices and use them on a large-scale and sustained basis, profound changes in both their

internal structures and processes and the policy environment influencing them will be required.

IIMI thus proposes to devote special attention to the following policy decisions, institutional arrangements, and organizational and management changes that will make the implementation of improved canal operation practices possible. In conducting such work, IIMI will build on its experience to date on the subject, particularly in Sri Lanka and Indonesia.

- Change strategies (involving policy, organizational, and management innovations) to assist irrigation management agencies to shift from an administrative mode to a more dynamic innovative management mode.
- Methodologies for monitoring and evaluating the performance of the management process (i.e., of the agency itself) for operational use by irrigation agencies.
- Strategies to increase accountability of agencies, particularly to farmers, and to improve coordination among agencies.
- Organizational and management techniques to enhance the communication and information management processes of irrigation agencies.

Management of Irrigation Support Services to Farmers

Governmental institutions play a variety of roles to help develop and manage irrigation systems in developing countries. In some instances, governmental agencies are directly responsible for the management of irrigation. In other instances, governmental institutions play more indirect roles. These roles include promoting irrigation development through the provision

of credit and technical assistance services to farmer groups or individuals; assisting in the rehabilitation and reconstruction of systems owned and operated by farmers; and helping farmers improve operations, maintenance and management standards through water management advisory extension services and allied mechanisms. In addition, governments are generally responsible for coordinating the provision of seeds, fertilizers, credit, and other inputs required to increase the productivity of irrigated agriculture.

In a growing number of cases (see "Management or Change" below) government agencies originally established to play a direct role in the development, construction, and management of irrigation systems are now being asked to change their approach and play an indirect role geared towards providing support services to individuals or farmer groups responsible for farmer-managed systems. Such indirect roles, however, require management approaches as sophisticated as those required by irrigation agencies directly responsible for water supply and distribution. For example, they require the organization of credit and technical assistance services; the mobilization of labor and financial resources from farmers; and the coordinating of delivery of inputs and services provided by different agencies and private sources. They also require skills – in dealing with large numbers of small farmers, in working with farmer organizations and NGOs, and in recognizing the role of small farmer-managed systems in agricultural production – staff of traditional irrigation agencies and departments frequently do not possess. The need for management innovations and management training in the development of more effective irrigation support services to farmers is therefore great.

In addressing the management of

irrigation support services to farmers, IIMI intends to build on its work to date in Nepal, Sri Lanka, and other countries on improving the effectiveness of governmental assistance to traditional farmer-managed irrigation systems. Small irrigation systems built and managed by farmers exist in many of these countries, and in some (such as Nepal) they represent a majority of the irrigated areas.

Management of Change in the Institutions for Irrigation

The themes described above relate mainly to aspects of performance and management within an established institutional system. There are times when it becomes appropriate to make fundamental changes to an existing set of institutions: to introduce new ones, to abolish old ones, or to relocate the interfaces and redefine areas of responsibility between institutions.

The process is akin to modernization of the physical system. It involves (partially) returning to the system design stage, and establishing new management conditions. However, it is often much more difficult to achieve, because existing groups and institutions may resist the change.

The foremost example of this in the current decade is the trend to promote development of farmers' organizations, and to turn over to them certain functions, such as channel maintenance and perhaps fee collection, which were previously discharged by government agencies. Studies of this "turnover" process will form IIMI's main initial activity under this theme. A number of countries now have active policies in these directions, so IIMI's interest in it conforms to the criterion of clients' needs.

Physically, the turnover process

amounts to shifting the interface between agency and farmer group, say from the field channel head to a larger distributary channel head. Organizationally it is much more complex. It involves questions about the appropriate constitution, financial status, and extent of authority of these stronger farmer organizations; land tenure; relationship with agencies; transfer of employment of some

operation and maintenance staff to a new employer; and much more. The ways in which these matters are decided must have many implications in regard to the subsequent performance of the system, especially its output and equity.

The problem here is twofold: to determine the most desirable arrangements to achieve after the

transfer, and to manage the period of transition. All proposals for institutional change present these two problems, and the turnover question is the most prominent of them today.

Turnover is clearly a case where IIMI's multidisciplinary approach should display its comparative advantage; and its impact potential is also obvious.

Collaborative Field Research

Collaborative field research projects conducted on irrigation management systems in specific environments will be a key element of IIMI's work to develop management innovations. Frequently, such research will include components of adaptive or action research. The typical form of IIMI's field projects will continue to involve IIMI staff in collaborative activities with some national institute or management organization. The day-to-day control of such projects, and the compiling of reports when they end, will be primarily the business of the staff of IIMI's country units.

Projects will usually (although not always) be financed by external donors. The process of project formulation will generally, therefore, involve at least three parties: IIMI, a national agency, and a donor. For these reasons, project formulation will inevitably require significant amounts of time, and project planning must normally begin between one and two years before the desired inception date.

IIMI's basic sources for fresh information on irrigation management practices and problems will come from its field research programs. In general such research will be a part of some specific problem-solving exercise for which IIMI's participation

has been invited, so research and innovation development aspects will proceed together. In all cases there should be a national organization willing and able to collaborate effectively with IIMI.

National collaborators may be of several kinds: irrigation management agencies and research institutions; universities and professional training establishments; and irrigation users' organizations. Other international agricultural research centers may occasionally also be partners, but their presence would not usually be sufficient, since IIMI would also seek to establish a national-level interest in all its field work.

In its selection of projects to propose to its potential collaborators and funders for their support and participation, IIMI will apply the following criteria:

1. projects must address one or more of IIMI's set of seven strategic themes;
2. project objectives, workplans and budgets, including those of IIMI's collaborating partners, must be clearly defined in documents agreed to by IIMI, its partners, and the project's funders, before work begins;

3. projects offering the prospect of relatively quick results will (at least in IIMI's early years) be accorded priority;
4. projects which can be fully financed without recourse to IIMI's unrestricted funds will be preferred, since these funds are essential for sustaining much of the thematic work as well as central administrative services.

A recent World Bank mission said:

"Part of IIMI's research and innovative work lies in studying successful management practices and adapting those that are best suited to the given conditions of the country. Another part of IIMI's activities relates to implementing the selected project design with living irrigation systems operated by national agencies in the field to confirm the suitability of the design; to innovate improvements during implementation, as needed; to evaluate the results; and to decide on the suitability of the tested modes for system-wide application."

This statement describes well IIMI's own view of its role in field operations, and of the relationship between such operations and thematic research (see following section).

IIMI's field operations involve two types of work (between which there is not a sharp boundary). There is a

study phase, whose purpose is to understand a given system; and an implementation or innovation phase,

in which proposed changes are tested in practice and modified in order to optimize their effects in the given system.

Thematic Research

As noted earlier, the development of management innovations requires not only field research on irrigation management systems in specific environments, but also thematic research to develop generic innovations that may be applicable in a variety of environments. For this reason, research leading to generic descriptions and solutions of irrigation management questions, organized along the lines of the seven themes defined in the section on IIMI's Thematic Research Programs, will be a second key element of IIMI's work to develop management innovations. IIMI's field research activities, as described in the section on Collaborative Field Research, will be a significant source of field data and experience for input to IIMI's thematic research.

IIMI's proposed work on thematic research will build on the experience and data that the institute has already acquired through its field research work to date. However, special effort will be made to analyze this experience, comparing it with those published by other researchers, contrasting different country experiences, and developing conceptual frameworks that will connect and explain such findings and ultimately give them a predictive capacity. A significant element of the latter activity will be the formulation of objectively testable hypotheses about the various cause and effect linkages in the processes of irrigation management – one of the principles of IIMI's work outlined in the section on Major Strategic Areas.

An important aspect of IIMI's thematic research work will be the preparation and periodic review and updating of "state-of-the-art" analyses of the present state of knowledge on each of IIMI's seven themes. Such reviews will help integrate or synthesize the results of the work of IIMI and others, and perceive general trends; help inform irrigation managers, policy makers, and researchers about the major developments in the field of irrigation management in a systematic and regular manner; and serve as a secure foundation for the further work of IIMI in each of the seven themes through the identification of principal gaps in knowledge as well as areas requiring research.

Management Training

IIMI's clients, partners, and donors all show high interest in bringing about a "management revolution" in irrigation. If this is to occur (as IIMI believes it will) an essential ingredient will be training and professional development, especially oriented towards introducing fresh management ideas and opportunities at the middle and upper strata of managing agencies, where such ideas can most readily be adapted and implemented.

In this section we examine first,

the identification of target groups of people towards whom IIMI's management training activities should be aimed; second, the means by which training services can most effectively be delivered by an institute with IIMI's decentralized character, and third, the subject areas which IIMI's training should address.

In defining this management training strategy, the following principles and constraints have been observed.

1. The demand for training is

potentially vast – much greater than IIMI can hope to supply. IIMI must therefore concentrate in the areas where it possesses an advantage.

2. To conform to IIMI's mission statement, its training should emphasize management issues and should aim to help national agencies to develop innovation capacities.

3. National training needs are best

satisfied by national organizations. An international institute like IIMI is not oriented towards providing sustained training courses for individual countries.

4. IIMI will therefore assist and cooperate with existing national institutions which have the function of training for irrigation management at the national level; and in countries where appropriate institutions to deliver this kind of training do not yet exist, IIMI will help to stimulate the creation of such capacity.
5. IIMI has also a role in helping to develop national systems of innovation by training people to conduct research and analysis of management questions.

A corollary of points 1 and 2 above is that IIMI's training should not aim to develop general irrigation skills or understanding of irrigation technology. There are numerous institutions already supplying this field, and IIMI's management emphasis would be diluted if it allowed itself to become involved in these aspects.

Target Groups

The recipients of training towards whom IIMI will direct its activities are in three major groups.

1. Managers, especially those in (or likely soon to be in) positions where they can introduce or influence change and innovation in their organizations.
2. Trainers.
3. Researchers.

Activities

IIMI's management training activities will contain a mixture of direct and indirect approaches.

1. Direct training sessions conducted by IIMI personnel and collaborators will usually be of the seminar mode, and will

concentrate on the transmission of experiences in regard to implementation of innovations. These will be aimed principally at practicing irrigation managers.

2. Indirect training (meaning processes by which IIMI supports national training organizations) will form the larger part of the program. In this, IIMI's activities will concentrate upon:
 - a) advice on curriculum development,
 - b) the generation of widely usable training materials, and
 - c) the professional development of national training staff.

IIMI's management training efforts will also include a component directed towards developing national cadres of research staff with the capacity to conduct research leading to the development and dissemination of management innovations in their own countries. Such a component will require efforts on several fronts, not all of which will be strictly in the domain of IIMI's training staff. They will include (1) on-the-job training of staff of partner/client institutions seconded to IIMI for participation in collaborative action research projects; (2) fellowships for staff of national research institutions in developing countries; and (3) career internships for post-doctoral and other highly qualified staff of national research and training institutes. Of particular importance will be the development of cooperative action research programs in which national institutes take on primary responsibility for the conduct of research. Such programs could build on the experience that IIMI has achieved to-date through on-going cooperative activities in the Philippines, India, and Sri Lanka.

These roles on the boundary between research and training will be explicitly recognized in IIMI's system of Special Awards and Research Fellowships.

Partners

As noted above, most of IIMI's training efforts will be applied to indirect delivery of training services. This implies that IIMI will require national partners through whom to channel these services. There is no standard model for these partners, since national institutes explicitly concerned with the management of irrigation do not (in general) exist at present in most developing countries. Sometimes, the training agency will be the same irrigation agency with which IIMI forms its research collaboration; sometimes, it may be a university, an institute of management studies, or some other type of establishment.

It is to be hoped that national irrigation management institutes will, in due course, evolve, and in countries where this occurs IIMI's management training task is likely to be easier and more effective.

Identification of Training Needs

A task that IIMI is well equipped to perform is the assessment of training needs in irrigation management. These needs vary. Needs assessments are desirable both at a national level and at the level of individual agencies. IIMI will formulate general methodologies for making such assessments, and will thus be ready either to perform the assessments itself, or to help others to implement its methodologies.

Subject Matter

The topics of IIMI's proposed training activities can be divided into two groups. There are some subjects on which it is appropriate to develop regular or frequently repeated courses, which aim at establishing common bodies of understanding, attitudes, methods, etc., within an organization. Other subjects are more suited

to occasional, "nonrepetitive" presentations or seminars in relatively restricted groups.

The latter style borders very closely upon IIMI's information program. It is appropriate for the initial dissemination of new ideas and insights, especially among key people. It is to be expected that this will be a normal mode of imparting the results of IIMI's thematic studies and also for exposing the information gathered from a particular country program or project to wider audiences from other countries.

Regular training is appropriate in three major subject areas.

1. *Management of the irrigated agriculture sector.* To make the irrigation sector function effectively, many agencies and organizations must operate in a coordinated way. Each actor in this complex system has his own restricted objectives. To keep these in harmony with the objectives of the whole system there is a need for mechanisms that initiate and guide decision-making processes by these various participants.

The role of training in this respect is one of creating an awareness of the complexity of the irrigation system and its overall objectives and the role each actor is expected to play in this complex system so it will achieve these objectives.

The focus of such training should be on systems thinking, communication skills and methods, information sharing, and joint decision making.

2. *Management of an irrigation organization.* Management has been defined earlier as the process in which institutions and individuals set objectives for irrigation systems; establish appropriate conditions; and identify, mobilize, and use resources to attain these objectives.

Improving irrigation systems' performance through improved manage-

ment therefore means the improvement of the process by which institutions do these things. It is in this respect that distinctions can be made between administrative and management modes of operation.

In the administrative mode irrigation agencies visualize their responsibility in terms of the way they do their work. The emphasis is on being technically correct, efficient, and timely. To meet these responsibilities, most irrigation agencies in the administrative mode tend to be self oriented and input-focused.

In areas with severe water shortage and strong rules defining equitable sharing of the limited water supplies, this mode of operation may be justified, provided it is indeed technically correct, efficient, timely, and cost-effective.

In situations where there are less stringent water conditions and more potential and flexibility for matching system operation to changing agricultural opportunities, there is a need for organizations to operate in a more managerial mode, more oriented to clients and more concerned with agricultural outputs.

Presently the administrative mode of operation is a common phenomenon, even in situations where a more managerial mode could generate considerable benefits. Benefits could be realized through the introduction of improved management processes, appropriate and adapted to the local institutional, cultural, social, and technical environment.

The role of training in this context is one of assistance to irrigation institutions in the introduction of management innovations. At the same time however, there is an aspect of creating an awareness of the potential benefits that could be obtained from improved management processes and conditions. Such improvements do not always need to have far-reaching con-

sequences, as for instance the introduction of an improved management information system. A redefinition of tasks and responsibilities, as for instance in turning over the responsibility for parts of the system to its users, could on the other hand have considerable consequences for the agency. In both cases the role of training is to enhance the capacity of the agency to realize the required management changes.

3. *The roles of individuals within the management system.* There are many individuals involved in irrigation – not only individuals from irrigation institutions (government or non-government) and farmers, but also individuals from other government or non-government institutions like extension services, credit organizations, etc. Management training can help individual participants in irrigation management to understand, define, and implement their own roles within this organizational system.

A clear distinction has to be made between decision making on the one hand and the physical implementation of what has been decided on the other. As decision-making processes (or management in general) are usually not part of an irrigation technical training, there is indeed a need to fill this gap by management training focusing on the specific requirements in relation to managerial responsibilities for operation and maintenance of irrigation systems. Such a program will have to deal primarily with management principles and practices and their application to irrigation management. Enhancement of individual management capability skills is the major objective. This does not mean that irrigation skills can be ignored. On the contrary, proper irrigation management requires a basic knowledge of the physical possibilities of the system to be managed. If such knowledge is lacking, irrigation management training should also provide opportunities to fill this knowledge gap.

Information Service

The two principal operational objectives of IIMI's information work will be (1) to provide an adequate support format for the varied requirements of the Institute in terms of information output (during a period when the Institute's research activities will begin to generate significant information materials); and (2) to identify selected segments of IIMI's partners' and clients' information needs to which IIMI could have a comparative advantage in selectively catering.

IIMI has clearly identified three levels of target audiences for information exchange that must be reached for IIMI to fulfill its mission. At the first level are those people who are in positions where they can put into practice management innovations developed by IIMI and its collaborating agencies. Second are those people concerned with the study or analysis of irrigation management, and who are themselves engaged in developing management innovations. Third, are those people who maintain an interest in IIMI's activities and progress, including representatives of donor agencies and other stakeholders of IIMI.

The first of these groups involves people in middle to senior management positions and at policy-making and decision-taking levels, predominantly in ministries and irrigation management organizations. In some cases, these people will be in the countries where an innovation is developed and thus where the innovation may be readily applicable; in other cases they will be in other countries where conditions are similar, and where the innovation may be adapted.

The second group involves

managers and researchers in the management organizations and research and training establishments. Some of these individuals may reside in developed countries, within universities or specialized institutions.

The third is a more diffused group including most of IIMI's stakeholder and funder groups, as well as other international agricultural research centers whose work is directly or indirectly related to irrigation management.

For all of these groups, IIMI's information services are based, first, on the provision of materials that are developed within IIMI's own thematic research and field operations programs. Although other institutions can supply general information on irrigation management, IIMI is in an excellent position to do the conceptual and analytical work needed to identify problem areas, collect and analyze information, and disseminate the information to those people who need it most. Second, IIMI will provide more general information on its own activities as well as act in an information interface capacity to comment or advise on wider irrigation management issues and developments as it deems appropriate in the fulfillment of its mission. Third, it will assist other institutions and individuals involved in irrigation management information exchange. Fourth, the Institute's information services will provide product support for its training and professional development programs.

The Institute does not currently see a comparative advantage in maintaining widely accessible databases, or in collating abstracts of relevant publications by others. Activities of these kinds, based upon

assisting people to access aspects of irrigation management literature generated outside of IIMI, are already performed by others such as the International Commission on Irrigation and Drainage (ICID), and the Commonwealth Agricultural Bureaux International (CAB International). Nevertheless, IIMI will contact appropriate organizations in the field of multilateral, multidisciplinary network and referral systems in the field of irrigation management information exchange, where there is probably a comparative advantage in assisting in coordination of existing networks, and participating in defining, implementing, and substantively supporting such coordinatory mechanisms or bodies. The Institute will also assist the irrigation management community in enhanced access to selective information of use in innovation and decision making.

IIMI will also maintain and expand its internal library and information database for use by the Institute and its collaborators, although it does not aim to build up a general external service based on these. It will maintain close relationships with similar information gathering groups to ensure IIMI's access to those materials, and to ensure that those institutions have access to materials published by IIMI. And progressively, it will build on capacity to advise national research centres on relevant documentation and technical information technology.

Within the overall information thrust, publication is the activity which will generate, initially, the greater volume of output most readily available to target audiences. Specific-funded projects usually contain contractual requirements in terms of project reporting, be they initial,

interim, or final reports. Also, IIMI's work since its inception has accumulated a critical mass of ongoing research and results which can now form the genesis of a strong publications program. In addition, an information/publications component will be built into project design to ensure that the information gathered during the course of a project is converted into an information product which can be used by intended audiences.

IIMI's publications activities will concentrate on the following outputs:

1. *Project Reports*, which describe in full detail activities and results of specific field-work. These are often required as part of contractual project obligations and consequently respond to a project-specific format. They are often site-specific, and are written to comply with the requirements of the relevant national client department and collaborating institute, and the project funder. They may also have a relatively small external audience.
2. *Working Papers*, intended to stimulate discussion among people interested in different aspects of irrigation management. They make available the results of recent ongoing research, and the informed opinions of IIMI staff members and collaborators, as early as possible.
3. *Technical Publications*
 - 3.1 *Research Papers*. These are aimed at wider international audiences, broadly in the second audience category. They review, in a more condensed format, principal findings, especially those that seem to be of more general relevance. Such papers may be derived directly from IIMI's field-work; but they may also be commissioned, for example

under IIMI Special Awards, from non-IIMI people with relevant experience. These are usually short in length (20-80 pages) and will be sent to selected mailing targets and on demand.

- 3.2 *Monographs*. These are longer works (100-400 pages) destined for similar audiences. Publications will normally be written into project or research design. New formats for IIMI publications will be designed to promote both the research and practical aspects of the Institute's work. For example, IIMI's clients have shown a strong interest in receiving guidelines, manuals, and standards for irrigation management practices.

- 3.3 *Management Briefs*. These will be summaries of findings of major research. Primarily intended for middle-to senior-level irrigation officials, they are similar to fact sheets produced by extension organizations and disseminate quickly those pieces of information that IIMI thinks are of widest relevance. Management briefs generally describe the essence of some finding; readers with particularly high interest in that finding are told how to obtain the next, more detailed level of publication that amplifies it.

- 3.4 *Journal Articles*. Staff and project and program collaborators will be encouraged, with information services support, to publish their research in the foremost scientific journals in the field. Offprints will be made of these articles for distribution to IIMI's own audiences.

- 3.5 *Newsletters*. IIMI will publish network information and

theme-specific research results, such as the current FMIS and other newsletters, which are aimed at the second audience group, irrigation management professionals and researchers.

- 3.6 *Seminar Proceedings*. IIMI will organize research seminars given by senior staff and selected visitors. The proceedings of these seminars will be published as a "state of the art" series on relevant topics.

- 3.7 *Country Papers*. Similar to Research Papers, this series contains works of relevance mainly in their country of generation, and most of IIMI's country programs will produce works of this nature, as a result of their field activities.

In addition to its technical publications, IIMI will develop a communications and public affairs network with a view to providing more general news, information, and dissemination of results to enhance its overall interest, good will, and objectives. The quarterly *IIMI Review*, press releases, and other information materials will be issued on a regular basis, as well as reports and communications on the Institute's overall, "corporate" activities, such as *Annual Reports* and the *Program and Budget* documents.

Closely linked to this will be a progressively stronger effort in the area of audiovisual communication. Videos and other types of audiovisuals will be used to support the public affairs network as well as the research staff, and others who wish to make visual presentations of their work. It will be a particularly important component of training and professional development activities.

English will serve as the working language of the Institute. However, with the establishment of important

country and regional programs in West Africa and Morocco, French is increasingly needed as a second working language, initially in the region, but with wider connotations thereafter. It is to be noted that whereas in Asia many languages are used, in

Africa the three main languages of communication are Arabic, English, and French. IIMI also recognizes the importance of disseminating material in other languages that are widely used in its collaborator countries, such as Urdu, Tagalog, and Bahasa Indo-

nesia, and later, Spanish, Chinese, and Hindi. IIMI will endeavor to arrange with its national partners and consultative committees for translation into national languages those outputs with special significance to a particular country.

PART III
PROGRAM STRUCTURE

Modes of Operation

Country Operations

In keeping with its mission to strengthen national capacities in irrigation management, IIMI proposes to carry out its field-work through a set of country operations. The logic of this is clear; unlike many other kinds of agricultural research, nothing of significance in irrigation management can be studied in a laboratory, and because of location-specific influences relatively little can be studied theoretically. IIMI must therefore put its staff into direct contact with diverse irrigation management situations in the field, and country operations provide a vehicle for doing this.

Country operations can be organized at differing levels of involvement, according to circumstances and resources. The CGIAR Study Team on Water Management, whose 1982 report led to the establishment of IIMI, proposed six different levels of IIMI involvement, of which IIMI proposes to initially develop four.

1. *Non-resident operations*, in which IIMI undertakes those functions that can be done intermittently: seminars, workshops, information and staff exchanges, and encouraging national participation in network research.
2. *Resident operations*, in which IIMI fields one or two international staff and aims to provide them with supporting resources sufficient to pursue collaboration in action research and in training, and to extend research capacity by sponsoring nationals as research associates or fellows. This model can also accomplish all that the non-resident model does, but it

does not usually suffice to cover IIMI's complete thematic range.

3. *A strong "branch" operations*, in which IIMI places a fully multidisciplinary team, capable of operating across IIMI's range of themes and services. So far, this type has been implemented only in Pakistan, and because of its relatively high cost it will be appropriate only to countries with large amounts of irrigated land.
4. *Multicountry or regional resident operations*, in which a staff group is based in one country, but is intended to relate also to a number of neighbouring countries. This type of operation is being implemented in West Africa, and will be appropriate in regions where the extent of irrigation in individual countries is insufficient to justify the development of single-country IIMI operations.

Although IIMI has initially chosen the above framework, it will be necessary to maintain flexibility in its procedures. In some cases, IIMI may choose to play a more catalytic role, or a more advisory role in managing and supervising work by others. An example might be an IIMI research network, wherein staff assist in the development and management of research projects carried out by network members.

Management of Country Operations

Country operations, whether of the branch, resident, or non-resident types, require careful management arrangements. These must be designed to ensure that each operation will:

1. contribute to IIMI's strategic, and especially thematic, objectives;
2. contribute to the growth of national efforts, especially in irrigation management research and development; and
3. maintain effective and productive relationships with all significant national organizations concerned with the management of irrigation.

In addition, because most of the country operations' component activities must be funded through project grants, the activities will also be constrained by the need to satisfy objectives that are set by those donors.

To achieve these aims, IIMI's country operations will normally have three regulatory or control elements.

1. An Agreement, or Memorandum of Understanding, between IIMI and the national government, that regulates the legal and fiscal status of the IIMI country unit and its personnel.
2. A Technical Agreement, or series of such Agreements, between IIMI and key national irrigation organizations, which provides the framework for institutional collaboration in field-work and other technical activities.
3. A Consultative Committee, comprising senior national irrigation managers and other appropriate people, as well as IIMI staff. At present, IIMI's Consultative Committees meet about two or three times a year, to ensure that IIMI's activities are in concurrence with national objectives and IIMI's own strategic objectives. These will

also ensure that IIMI's activities remain "user-driven."

Following the adoption of IIMI's overall international strategy, component national workplans will be developed to guide program development in each of the countries where IIMI has active operations, in ways consistent with the overall strategy, but reflecting also the particular needs and priorities of each country.

IIMI does not intend to make country operations permanent installations. Operations must remain in place long enough to be economically and strategically viable. To remain in agreement with IIMI's mission to strengthen the capacity of national agencies and institutions, the goal of every country operation will be that over time IIMI's activities would be taken over by those institutions and agencies. For that reason, achievements will be evaluated on a regular basis by IIMI's Board, staff, and the host country Consultative Committees. This will also increase the accountability of each operation.

Criteria for Initiating Country Operations

In deciding where it should establish country operations, and the various levels of activity (above) which should take place, IIMI will be guided by the following criteria.

1. *Receptivity.* Because IIMI's work cannot be implemented without active national collaboration, it must feel assured that its presence and its inputs are strongly desired by significant national irrigation institutions.
2. *Need.* IIMI must locate its staff in places where there is evident need for the kind of work it can do, in order to ensure that the outputs have beneficial impacts.
3. *Range and extent of irrigation.* IIMI will presumably find more management problems and opportunities in countries with considerable numbers of irrigation projects, and considerable diversity of irrigation types. Resident IIMI staff in such countries will therefore generate a wider range of information to feed into IIMI's thematic studies.
4. *Technical interest.* Certain countries have developed special concentrations of effort, or have had notable success, with some aspect of management such as farmer-managed systems, turnover policies, or conjunctive use of groundwater. IIMI will have clear reasons to place staff where they can study such special experience.
5. *Institutional strengths.* The intensity of IIMI's own effort will be influenced by national capacity to contribute to these efforts. Where, for example, there are strong

national research institutes, the national role in a collaborative project can be greater, and IIMI's correspondingly less.

6. *Administrative arrangements.* IIMI must negotiate separate agreements, covering its legal and fiscal status, in each country where it proposes to place resident operation teams. The negotiations for these can be lengthy and costly, and IIMI will therefore prefer countries which offer acceptable arrangements most readily.
7. *Donor support.* IIMI does not expect to have unrestricted funds on an adequate scale to finance its country operations. Each new resident operation must therefore find donor support, sufficient in duration to justify the substantial effort of establishing a new office.

There are over 70 countries in the world that have more than 100,000 ha of irrigated land. Most of these are developing countries. IIMI will have offices and operations in a relatively small proportion of these. The appropriate total number of such country operations will have to be discovered through experience. IIMI must avoid the complementary dangers of excessive dispersion (which could lead to superficiality, and a heavy administrative and logistic burden) and of excessive concentration (which could reduce the range of IIMI's experience and relevance).

Modes of Collaboration

In implementing its country programs, IIMI makes partnerships and collaborative ventures a key element in its approach. Collaboration provides IIMI with access to operating irrigation systems, and allows resident staff the opportunity to access local knowledge and capitalize on the existing facilities and staff of collaborating agencies and partners. There are at least six types of institutions with which IIMI will collaborate:

1. national irrigation-managing agencies, and associated research and training organizations;
2. international agricultural research centers;
3. other centers of excellence;
4. international lender and donor organizations;
5. non-governmental organizations; and
6. national and international professional bodies.

National Agencies and Research Institutions

Collaboration with national agencies and research institutions is fundamental to carrying out IIMI's mission for several reasons.

1. *The scale of IIMI's mission.* IIMI's mission is an enormous one, relative to its staff and financial resources. To achieve sufficient impact, IIMI must involve others, act as a catalyst, and extend its efforts through collaboration with several national partners, rather than concentrate its efforts at single locations.
2. *A mechanism for implementing*

innovations. The development and testing of management innovations involve major problems of implementation, and cannot be done without the active collaboration of existing managing agencies. To be effective, IIMI's researchers must do more than prepare reports: they must be partners in a joint effort, with national agencies, to develop innovations, and to see whether and how they can be implemented.

3. *The need to understand national agencies.* The development of innovations requires first a thorough understanding of each existing agency, and its human, financial, and other constraints, before the most relevant modifications can be proposed. Such understanding can best be evolved through the close relationship with the agency, which a collaborative project entails.
4. *An opportunity for training and knowledge-transfer.* Research collaboration with national partners is an excellent vehicle towards IIMI's goal of strengthening national capacities. Participating staff learn about field research firsthand and gain a greater benefit from the results. Collaborative studies are therefore a vital (though somewhat informal) element in IIMI's management training.

International Agricultural Research Centers

Joint ventures between IIMI and other international agricultural research centers are also highly promising because of the critical role that such centers play in world agricul-

ture. There is strong complementarity among IIMI's field-oriented operational research approach, the experiment station approaches of such centers as IRRI, and the broad policy perspectives of such centers as the International Food Policy Research Institute (IFPRI). Collaboration between IIMI and other resource management centers such as the International Board for Soil Research and Management (IBSRAM) which focus on key factors of production could also be beneficial.

Other Centers of Excellence

Collaboration with scientific institutions and regional or international organizations located in (or supported by) industrialized countries is also of high importance, since it enables IIMI to increase operational flexibility and to benefit from (rather than duplicate) the highly specialized expertise available at such institutions. IIMI expects to collaborate with such institutions and to commission studies by them when these are required to further its own work. IIMI also proposes that it collaborate with reputed consulting firms, when such firms have specialized expertise of value to IIMI, or when they are engaged in activities that directly support IIMI's mission.

International Lending and Donor Organizations

IIMI proposes that it work in partnership with international lending agencies, particularly international or regional development banks such as the World Bank, the Asian Development Bank, and the African Develop-

ment Bank, other multilateral organizations such as the International Fund for Agricultural Development, and national agencies for development assistance, such as the US Agency for International Development. Such organizations play a key role in improving irrigation performance, not only because they directly finance numerous irrigation projects around the world, but also because of their large and increasing influence on irrigation policy, design, and management questions. Collaboration with the international lending organizations could in some cases take place through the technical assistance activities that such agencies provide to governments in connection with their loans in the irrigation sector.

Non-Governmental Organizations

Non-governmental organizations of many kinds conduct activities that are relevant to IIMI's mission. Some have a national focus, others operate internationally. The range of types is wide, and they offer IIMI numerous opportunities for interaction as well as more formalized collaboration.

National-level non-governmental organizations often play a significant role in promoting and developing the farmer-managed irrigation sector, and will therefore be relevant to IIMI's operations on the theme of management of support services to farmers. They are relevant for similar reasons

to the management of institutional change, especially in the matter of developing adequately strong farmer organizations in systems turnover schemes.

National and International Professional Bodies

National and international professional bodies are significant in promoting information exchanges. IIMI has a Memorandum of Understanding with the International Commission for Irrigation and Drainage, which organizes triennial congresses and operates various information services from its New Delhi headquarters.

Geographical Considerations

IIMI's efforts to help integrate multicountry experience will clearly be more useful and move faster, among countries that face broadly similar technical situations. For this reason, IIMI has distinguished five major zones, within each of which there is some broad similarity of irrigation problems, in relation to the major determinants cited in the two previous sections.

It should be stressed these are in no sense homogeneous zones: inevitably, in such broad division, much diversity must exist. But within each zone there is more sharing of common problems, and there will be more gain from information exchanges and general communication among professionals, than there is likely to be between different zones.

The five zones are shown in Figure 1. Certain significant statistics of each are contained in Table 1.

Table 1. Major statistics of the five zones.

	Population (M)	Cultivated area (M ha)	Irrigated area (M ha)	% Dependence on irrigation	Persons/cultivated ha
Southeast Asia	708	125	26.2	21.0	5.7
East Asia	1109	107	47.7	44.7	10.4
West Asia and North East Africa (Arid/Semiarid Zone)	748	182	56.8	31.2	4.1
Africa (except the Nile Valley)	439	155	5.1	3.3	2.8
Latin America	396	177	14.9	8.4	2.2

Southeast Asia

This zone was IIMI's early focal area and is characterized by predominantly rice-growing irrigation systems. Climates generally display at least one, and in many places two, seasons of generous rain; so rain-fed production of non-rice crops is quite strong. Recent tectonic and volcanic activity has raised steep mountain systems which give rise to very silty river

systems and great, fertile alluvial plains and deltas. These inherently productive conditions have led to very high population densities, so land holdings are typically quite small, and irrigation agencies have to deal with very large numbers of individual participants. Although nonirrigated production is significant, the population generally is well in excess of the capacity of nonirrigated agriculture to feed them; so irrigation for a staple

food crop is in general essential. The zone has in recent years achieved notable success in raising its rice production more rapidly than its population growth, which has presented some new management issues such as marketing and diversification away from rice.

The major countries of this zone are Bangladesh, Burma, the eastern seaboard states of India, Indonesia, Kampuchea, Laos, Malaysia, Nepal, Sri Lanka, Thailand, the Philippines, and Vietnam.

East Asia

The East Asia zone (China and Korea) is characterized, like Southeast Asia and the Arid/Semiarid Zone by immense irrigation systems based on great alluvial rivers. The enormous sediment content of the Yellow River, unique in the world, creates technical irrigation problems that condition management in specific ways. The zone has many affinities with Southeast Asia, notably its emphasis on rice; but it does not have a tropical climate, and in the temperate north there is much less rain and a greater diversity of crops. As in Southeast Asia and the Arid/Semiarid Zone, irrigation is an old established activity with strong social roots and established practices.

West Asia and North East Africa (Arid/Semiarid Zone)

From the Nile to the upper Ganga in North India and the Syr Darya in Soviet Central Asia, lies a zone of generally very low annual rainfall (usually less than 400 millimeters/year) traversed by major rivers that have their origins in mountain systems that fringe the zone. As in Southeast Asia, the rivers carry plentiful silt and have laid down deep, fertile, level, alluvial soil systems. This area supported several of the earliest irrigation societies. Its populations are very dense in the alluvial plains and sparse outside

them, because nonirrigated food production capacity is weak, or negligible. Many of these countries depend almost totally on irrigation for food and fiber.

Several of the systems have in modern times become stretched to the limits, notably on the Nile, where virtually all the surface water resources have been captured; improved management is then the only way forward, and the national goal must be to increase productivity per unit of water. The zone also displays some of the most severe environmental problems of irrigation; the flat gradients of the alluvial plains make drainage difficult; high evaporation rates into the hot dry air cause salt deposition in the topsoil; and the introduction of perennial irrigation into formerly seasonal water systems tends to create conditions favorable to disease vectors.

The major irrigation countries of the zone are India (except the eastern states), Pakistan, Iran, Iraq, Syria, Egypt, and Sudan.

Africa except the Nile Valley

Apart from the Nile Valley, Africa's reliance on irrigation has hitherto been quite low. Population densities are usually lower than in Southeast Asia, and over great parts of the continent rain-fed production has sufficed for these levels of population. In general, initial irrigation development was organized towards commodities other than staple foods: cotton, sugar, tobacco, and fruits, often aimed at foreign markets. These conditions are changing as populations grow and pressure on food resources increases. There is a wish by several countries to develop irrigation, especially motivated by climatic variability and the consequent wish for food security. There are not, however, the established irrigation bureaucracies typical of Southeast Asia, so institutional

formation is a management issue here. A recent history of significant decline in per capita food production implies certain wider agricultural problems, involving market mechanisms and the general motivation of the agricultural sector, which pose difficult management prospects related to financing and sustaining irrigation.

The countries of the Mediterranean littoral have been among the first to surpass their rain-fed resources, and have therefore moved rather further down the road of institutional development for irrigation; Nigeria, with the continent's highest population, is following suit; and a succession of other countries will be impelled along this course.

Latin America and the Caribbean

Latin America is (in an irrigation sense) less homogeneous than any of the zones so far described. South America has several of the features of the African situation; substantial rain-fed production capacity still remains, and irrigation has focused on commodities like sugar or high-value exports, rather than staple cereal crops. But there are substantial pockets (like northeast Brazil, northwest Peru, and central Chile) where this is not so, and a recent desire to expand irrigation (especially in Brazil) has resulted. In Central America and the Caribbean, the situation is more reminiscent of Southeast Asia, in that irrigation is necessary to feed the population. There are, however, few of the natural irrigation opportunities presented by great rivers and alluvial systems, so management units (except in Mexico) are usually of small- to medium-scale.

Deployment of IIMI Resources

Having identified these five great zones, within each of which there is some broad similarity of management

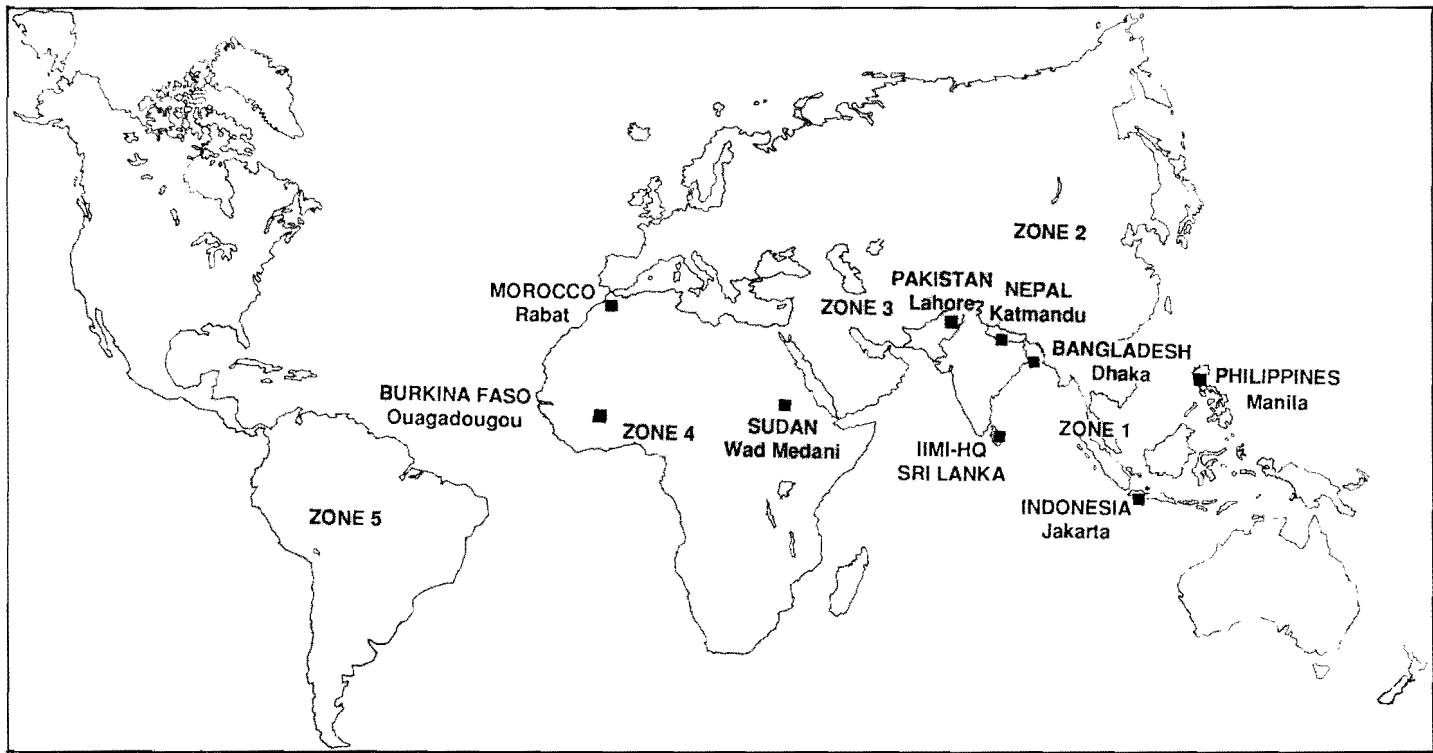


Figure 1: Major agro-climatic zones.

issues, and hence some prospects of promoting communication and cross-fertilization, how should IIMI deploy its efforts and limited staff resources among them?

IIMI's headquarters is itself located in zone 1, so it naturally began its operations in that zone. It extended at an early date also into West Asia and North East Africa. These seemed natural choices. Their dependence on irrigation is high, there are large managing agencies to study and interact with, and there are objective reasons for saying that the potential gains from improved management could be great.

In 1985, IIMI began to explore the possibility of entering other parts of Africa. This operation was undertaken in a deliberate fashion, beginning with missions to review the possibilities, leading to the development of a strategy document for the zone. On the basis of that strategy, country operations began in 1988. Initially IIMI will relate only to the western portion of the zone.

It is not likely in the immediate

future that IIMI's resources will grow to the point where it can safely undertake the substantial extra effort of embarking on resident programs in another zone, either East Asia or Latin America, even though these would hold great interest. A phase of consolidation and program development in the present zones must precede that, and any added resources that become available should probably be aimed at making more comprehensive efforts in the Arid/Semiarid Zone and in Africa. IIMI will however, aim to initiate programs, at least at the visiting level, in both East Asia and Latin America during the next five years(1990-94).

In the longer term, IIMI will aspire to have a fully international set of programs, with country units in all five zones. The possibility of achieving this is not in IIMI's hands alone, but depends on country interests and on the flow of donor funds. When it seems that the time is becoming ripe for such extension, the approach followed in Africa, with an initial exploratory team drafting a zone strategy paper, will serve as a model.

IIMI now has the experience that at least a three-year time lapse must be anticipated between the first exploratory visit and the first country program activity, so a degree of forward planning of this kind of initiative will be necessary.

Relationships with Industrialized Countries

IIMI's mission relates to assisting the developing countries. That does not mean that it neglects the experience already gained in industrialized countries. On the contrary, IIMI must seek to learn from successful irrigation systems in such countries, and must aim to become a channel for the selection and transfer of relevant parts of their methods to IIMI's own clientele. This means that IIMI should develop relationships with irrigation management and research organizations in those countries.

The relevant countries where reliance upon irrigation is substantial include the Mediterranean countries of Europe, the United States, the Soviet Union, Japan, and Australia.

Priorities

As described earlier, IIMI envisages its work being carried out in four major areas: thematic research, collaborative field research, training, and information. For the foreseeable future it expects that the majority of its operational expenditure and its staff allocations will go to the area of field research. The proportion of total resources used in this way should, nevertheless, be gradually reduced. Thematic research work should be increased proportionately, and as IIMI's stock of experience and knowledge increases, increased dissemina-

tion activities – training and information – will become necessary.

It is not appropriate to set quantitative targets for the distribution of effort among these work areas, as there are many unpredictable factors that will affect the balance. In its early years, IIMI focused upon establishing a set of viable country units, representing diverse environments, in order to put it into close contact with real problems and generate appropriate broad-based experience and learning opportunities.

IIMI's priority actions thereafter will be to:

1. consolidate its country operations to secure a strong database and information flow,
2. develop a strong thematic program concentrating on concept development,
3. promote the field-testing of innovative ideas, and
4. disseminate the benefits of accumulated experience through steadily growing programs of information and management training.

PART IV
OPERATIONAL IMPLICATIONS

Organizational Structure

Earlier parts of this paper have considered why IIMI exists and to whom it should try to deliver benefits; we have also considered the services it will offer, the themes it will address, and the ways in which it will operate in order to achieve these various aims. In this last part we consider how IIMI will organize itself, internally, for these purposes, and what arrangements it requires to make in regard to human resources, financial resources, and physical facilities.

First, we consider the organizational structure. Key considerations in the design of an appropriate structure include the following.

1. There must be organizational arrangements that ensure attention to the development of thematic understanding and of broader learning derived, initially, from field project experience.
2. There must be arrangements that ensure effective implementation of field projects to the satisfaction of both donors and collaborators.
3. There must be arrangements to organize and sustain a strong publications program of a more general nature than the location specific reports usually required as project outputs.
4. There must be careful attention to preparation of fresh projects for submission to potential donors and partners in a timely manner that will ensure a smooth flow of activity for project-oriented country units.
5. The structure should envisage effective delegation of project control to project leaders and heads of IIMI's country units, but should also provide effective arrangements so that such individuals can obtain the necessary professional support when they encounter difficulties in satisfying

all project commitments with the staff and disciplines available to them.

To satisfy these various requirements and constraints, IIMI will be organized in four principal Divisions:

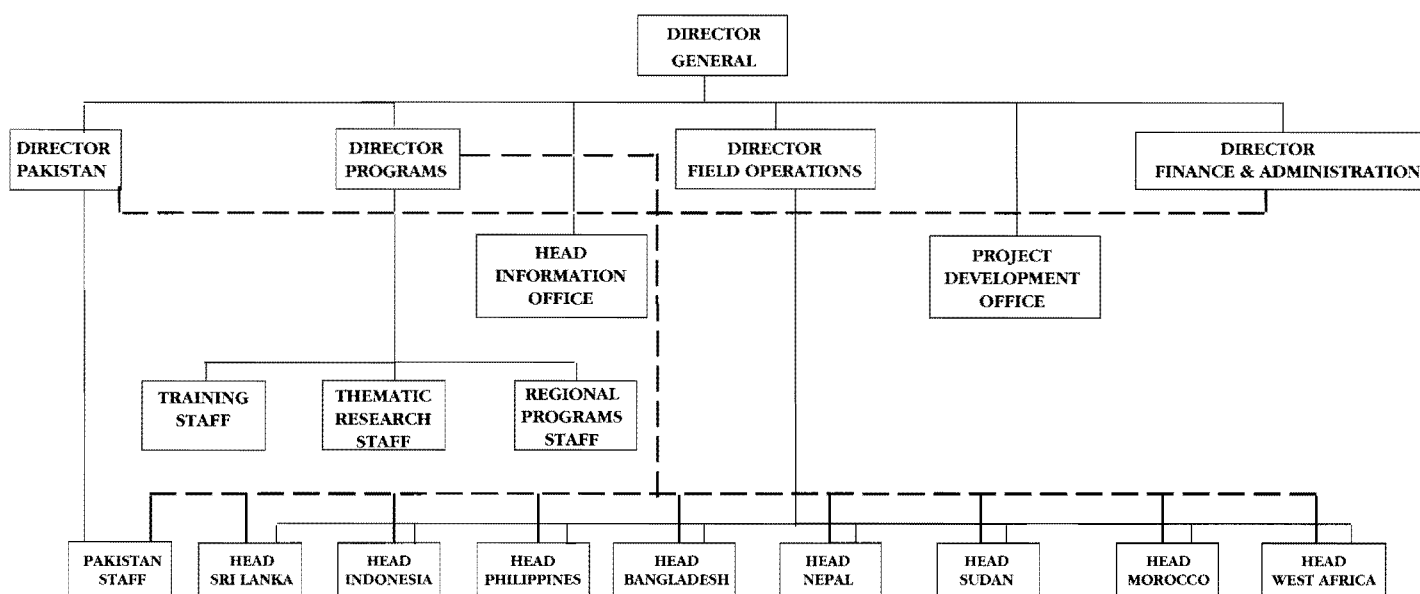
- * Programs,
- * Field Operations,
- * Pakistan, and
- * Finance and Administration.

Each will be headed by a Director. The Institute will have two additional sectors whose work necessitates close interaction with all four Divisions:

- * The Information Office
- * The Project Development Unit.

Reporting lines are indicated in the Organization Chart in Figure 2. The Directors of the four Divisions, the Head of Information, and the Project Development Officer will report directly to the Director General. As

Figure 2. Organization Chart.



provided for in IIMI's Charter, the Director General will be responsible to the Board for the administration of the Institute, the operation of its program, and the implementation of the decisions of the Board. The Board will formulate IIMI's policies, approve, review, and evaluate its major programs, approve the budget, review the financial condition of the Institute, and undertake all other such functions necessary for the fulfillment of the Institute's objectives.

Programs Division

This Division is responsible for IIMI's thematic program. It will be controlled by the Director, Programs (DP).

This Division will have three tasks:

1. thematic research;
2. regional or multicountry projects; and
3. management training.

Thematic research staff will not have day-to-day operational responsibilities for field projects. They will be responsible for developing conceptual analyses of irrigation management processes; integrating the project experiences (both of IIMI and of other institutions active in these fields) to provide general descriptions, analyses and explanations of irrigation management processes; and developing and implementing the thematic publications program. The DP will work closely with the Director, Field Operations (DFO) and the Director, Pakistan, in the design and development of field projects, to ensure that such projects support and are integrated with IIMI's thematic strategy. The DP will also be responsible for continuous review and evaluation of IIMI's programs and for organization of the Institute's annual Internal Program Review.

Thematic research staff need not

be permanently attached to the Programs Division; some will be seconded to it from the Field Operations Division for agreed terms (for instance, after successful completion of a field project). Further, not all such staff will be located at headquarters; it will be possible for staff at country units to be assigned frequently on a part-time basis.

Ultimately it is envisaged that the thematic staff will include several theme managers, who oversee all work conducted on each one of IIMI's seven strategic themes. While much of the thematic work can be done using restricted project funds, the coherence, quality, and continuity will depend on support by unrestricted funds. Ways will be sought to obtain funds to support specific pieces of thematic work. The degree of success in obtaining both restricted and unrestricted support will determine the number of thematic staff that can be supported.

IIMI headquarters staff undertaking regional or inter-regional projects will also be attached to the Programs Division, since (usually) the aim of such projects is to explore some chosen theme or topic in several different countries. These staff will also constitute a pool of resources from which Field Operations or Pakistan project resources can be temporarily augmented: for example, when a project requires certain inputs which the country operations cannot provide, such staff may fill this role.

IIMI's training staff will be, at least initially, attached to the Programs Division. Such staff will be responsible for developing all IIMI's management training activities, and giving advice to heads of country operations in regard to country projects which have a training content.

All staff for thematic analyses, regional or inter-regional projects, and management training, will work closely together as an integrated unit

under the overall supervision of the DP.

Field Operations Division

This Division will be responsible for all the Institute's country-specific collaborative field projects with the exception of those in Pakistan. It will be controlled by the Director, Field Operations (DFO), to whom all heads of country operations other than the Director, Pakistan, will report.

The DFO will be responsible for routine supervision of the implementation of country and regional programs, including allocation of resources, provision of necessary professional support to country program heads, monitoring of project budgets and performance, development of new country programs, and donor relations. The Director will also be responsible for working closely with the DP to ensure that IIMI's field projects are operated in such a way as to contribute to and support IIMI's broader thematic interests. The DFO will have a small staff to provide support in all these functions.

Heads of Country operations are responsible for the leadership of the Institute's field research and training projects in the concerned country. Such staff will:

1. provide leadership in conceiving, formulating, implementing, and coordinating the Unit's collaborative field research projects under the general direction of the DFO;
2. prepare annual budgets and internal review documents, submit periodic activity plans and progress reports, and undertake all other administrative activities required for the proper functioning of the Unit;
3. supervise the Unit's internationally and nationally recruited research and administrative staff;
4. help maintain effective relation-

ships with the host country principally through the medium of a Consultative Committee;

5. identify new research initiatives and assist the Institute in securing financial support for these initiatives; and
6. contribute to the broader intellectual and thematic programs of IIMI.

Pakistan Division

This Division will be responsible for all Institute activity in Pakistan. It will be headed by the Director, IIMI-Pakistan, who will function as the chief scientific and executive officer reporting to the Director General.

The Director, IIMI-Pakistan, will provide leadership in conceiving, formulating, and implementing all IIMI-Pakistan projects under the general direction of the Director General and in regular consultation with other Directors. He will also take principal responsibility, in consultation with the Director General, for continuing international recruitment of a first class multidisciplinary, professional staff; assist the Institute in attracting financial support from bilateral and multilateral sources; develop field programs in consultation with collaborating agencies; maintain diplomatic and policy relationships with the host country; operate and maintain IIMI-Pakistan's office in Lahore and its field facilities in Punjab and other provinces.

The internationally recruited staff of IIMI-Pakistan will, predominantly, be engaged in the implementation of agreed collaborative projects with agencies of the host country. In addition, they will be expected to contribute to the broader intellectual and thematic program of IIMI. One mechanism that will be employed to achieve this objective will be the temporary secondment of such staff to the Programs Division, as outlined

earlier. Three other functions are also envisaged:

1. participation in regional or multi-country projects contributing to the thematic analysis under the DP;
2. participation in preparation of further projects; and
3. preparation of material for the Information Office.

Finance and Administration Division

This Division will be responsible for planning and directing the financial, purchasing, personnel, housing and administrative support services of the Institute. It will be headed by the Director, Finance and Administration (DFA).

The DFA will develop, under the direction of the Board and Director General, the long- and short-range financial policies and budgets of the Institute; supervise the administration of its financial resources; direct the management and disbursement of IIMI's annual budget; and recommend adjustments when necessary. He will also assure adequate cash flow through financial management controls and planning within the available resources; supervise the maintenance of accounts and books consistent with accepted accounting practices; coordinate outside audits; manage all Institute accounts and signatory powers; direct all disbursements; supervise the management of IIMI's headquarters facilities and services; and assure compliance with international and local tax requirements.

Information Office

This Office will be responsible for IIMI's information activities and publication facilities and for the public relations and affairs of the Insti-

tute. It will be led by the Head of Information.

The Head of Information will be responsible for coordinating the Institute's publishing programs of reports, books, periodicals, and articles, and the library and information databases. The material for the thematic publications program will be provided through the DP; project reports will be provided through the DFO, the Director, Pakistan, or by the country operations. The Information Office will be responsible for the production of such publications, and for their design, presentation, and distribution, and will ensure that publications and other information materials reach the appropriate target audiences, by maintaining properly representative mailing lists. The Head of Information will also be responsible for the Institute's public relations and affairs, and for advising the Institute on information needs relative to irrigation management requirements.

Project Development Office

This office will be responsible for assisting the Institute's Management in identifying, formulating, funding, and monitoring of new projects. It will be headed by the Project Development Officer (PDO).

The PDO will participate in negotiations with donors and collaborators during the definition of the scope and schedules of new projects, or fresh phases of existing projects. (Such negotiations will, of course, generally be led or be initiated by IIMI Directors or the Director General.) The PDO will work closely with the DP, the DFO, the DFA, and the Director, IIMI-Pakistan, all of whom are closely interested in the successful execution of such work. The PDO will also have project monitoring functions, in support of the Institute's operations.

Physical Infrastructure

To fulfill its mission, IIMI does not need to possess extensive research facilities of its own. The management of irrigation systems has to be studied on real systems belonging to

national agencies, farmers' organizations, and so on. As we have seen in earlier sections, this leads to a decentralized structure.

The nucleus of this structure will

continue to be the Institute's headquarters in Sri Lanka. In its other country operations IIMI's staff will frequently be accommodated in offices provided by a collaborating organization.

Staffing

In order to implement its Strategy, IIMI will need a mixture of internationally recruited staff, and staff from each of its countries of operation.

International staff will be recruited on the widest possible basis, and the recruitment operations will be guided in particular by the values expressed in the section on the Internal Environment. These imply that IIMI will seek people of exceptionally high quality, with a broad perspective, and well suited to the collaborative modes of work to which IIMI is committed.

Staff selection will take account of the various disciplines involved in irrigation management, so that in each unit there are, as far as possible, people of complementary experience and knowledge. Several major groups or disciplines can be recognized within the general framework of irrigation management as it is described in the section on Elements of Irrigation Management.

These include, in alphabetical order:

- Agricultural science, including agronomy and soil science;
- Economics, including agricultural economics;
- Engineering, including civil and agricultural engineering;

Organization and management; and

Social science, including anthropology and rural sociology.

Ultimately, IIMI will aspire to develop staff members whose knowledge spans all or most of these disciplines as they affect irrigation, and who do not perceive themselves as belonging to any one particular discipline. However, that goal will take time to achieve.

To ensure availability of a variety of experience, IIMI will generally aim to develop each of its country programs to a level that can support at least two or three internationally recruited staff of complementary disciplines.

The need to ensure that ample attention is given to the staff search, evaluation, and selection process means that an international recruitment specialist will be a permanent feature of the organization structure.

IIMI will provide a working environment that will permit staff to achieve the highest level of individual and Institute performance. IIMI's policies will seek at all times to:

- * provide fair and equitable treatment for all staff;

- * encourage and provide self-development opportunities;
- * discourage in every form discrimination in employment because of such factors as ethnic origin, nationality, race, color, sex, age, marital status, religion, or political affiliation;
- * provide opportunities for promotion and advancement;
- * provide secure and well-equipped working environments; and
- * encourage and provide opportunity for staff communication and involvement in matters of their concern.

National staff policies will vary to some extent from country to country as the quantity and quality of relevant local resources are not the same everywhere. In keeping with IIMI's collaborative approach, some mixture of nationally recruited IIMI staff and seconded staff from national institutions will usually be expected, with a preference for seconded staff for research and field operations, and for nationally recruited staff for administrative and ancillary services. Criteria in regard to the choice and utilization of national research staff will include the following:

- * IIMI's mission involves strength-

ening national efforts, and also disseminating management innovations. Such processes will be accelerated if significant numbers of national staff can be associated with IIMI's programs, ideas, and methodologies.

- * As noted in the section on Management Training, participation in research projects contains an implicit training

component for staff of national institutions, and IIMI should arrange that this benefit is spread as widely as possible.

- * IIMI has, in many projects, a requirement to work along with other participating organizations, and to deliver its outputs according to some schedule. IIMI must have sufficient control over seconded

staff, to ensure that it can discharge such commitments.

- * Although IIMI's role is to innovate, it must not ignore relevant bodies of past experience or research results developed in national organizations. Seconded staff from national institutions are one useful route by which these factors can be fed into IIMI programs.

Finance

The funds which make IIMI's work possible come from a variety of donors and under a variety of arrangements. Among these IIMI will distinguish two major categories.

Unrestricted grants. These are grants provided without any conditions imposed as to the purposes for which they may be spent. Their utilization is therefore at the discretion of the Director General and the Board.

Restricted funds. These are funds provided for a specific purpose. Most commonly, they are given in order to enable IIMI to execute some defined project.

Unrestricted grants are currently provided to IIMI through its Support Group, which meets annually, and whose members pledge funds to IIMI on an annual basis.

Unlike other, more centralized international institutes, IIMI is able to secure substantial restricted funds through bilateral or special project funding, provided that the research undertaken in any country responds to the development needs of that country. This will enable IIMI to take advantage of financing opportunities

which would not be available through unrestricted sources alone.

Each of these types of funding has its own advantages and constraints. IIMI's approach will be to seek a balanced portfolio of unrestricted and restricted income. With an appropriate mix of both types, IIMI will be able to achieve more varied objectives and operate a more flexible workplan than could be arranged under either type alone. The following characteristics of the two types of funding are most pertinent.

- * Unrestricted grants provide opportunities for IIMI's Board and management to ensure stability of senior posts; to promote certain studies of their own choice; and to provide seed money for stimulating new avenues of research.
- * Restricted (project) funds are often provided in the context of some wider development project, and this helps to ensure that IIMI's inputs are relevant to national development objectives. For similar reasons restricted funding in a project context helps to ensure commitment on the part of

IIMI's national collaborators.

- * Restricted funds are available in significant quantity, and the rules and procedures observed by many donor or lender organizations mean that this is probably a larger source of funding than unrestricted grants.
- * Restricted funds support program activities and are not, in general, easily obtained for administrative and other ancillary and supportive activities.
- * Unrestricted grants help IIMI to stabilize its country programs. If these relied entirely on project funds there would be recurrent problems of maintaining a continuous and reasonably uniform financing level in each of these dispersed country operations which are also necessary for program development: for instance, to finance the early stages of contacts and program preparations with a new country or a new agency, before fully developed project submissions can be drawn up.

In order to implement its Strategy,

IIMI will therefore seek different funding arrangements for the different component activities. In broad outline, they are as follows:

Thematic research will be funded as far as possible from unrestricted grants. While ways will be sought to obtain restricted funds to support specific aspects of IIMI's thematic work, the overall integrity, coherence, quality, and continuity of IIMI's thematic research cannot be realized on a piecemeal basis. For this reason the

evolution, growth, and impact of IIMI's thematic research will depend substantially on basic support through unrestricted funds.

Field Operations and the regional-projects side of the Programs Division will be funded principally from specific project (restricted) funds.

The Pakistan Division will be funded, like Field Operations, principally from specific project funds.

The Finance and Administration

Division, Director General's Office, and Board of Governors, will be financed principally by applying an indirect-cost charge on all grants, which will be recalculated annually.

Information and management training will be financed by a combination of unrestricted and restricted grants. As far as possible, in both of these areas IIMI will aim to prepare and offer to donors appropriate projects, and minimize these units' need for unrestricted funds.