

ON ADOPTION 7/16/91

ANNUAL REPORT 1989

International Irrigation Management Institute



BOARD OF GOVERNORS

Abdalla Ahmed Abdalla

Khartoum, SUDAN

Benjamin U. Bagadion

Consultant

Quezon City, Metro Manila
PHILIPPINES

David E. Bell (*Chairman*)

Commission on Health Research
for Development
Boston, Massachusetts
U.S.A.

Kamla Chowdhry*

New Delhi, INDIA

Carlos Grassi

Professor

Interamerican
Center for Land & Water
Resources Development
CIDIAT
Merida, VENEZUELA

Guy LeMoigne

Senior Advisor

Agricultural and Rural
Development Department
World Bank
Washington, D.C.
U.S.A.

Roberto L. Lenton

(Ex-officio)

Director General, IIMI
Colombo, SRI LANKA

Robert McNamara

Washington, D.C.
U.S.A.

Letitia E. Obeng

Accra, GHANA

G. R. Sandhu

Member, Natural Resources
Pakistan Agriculture Research
Council Islamabad, PAKISTAN

Kunio Takase

Director

International Development Center
of Japan
Tokyo, JAPAN

Jean-Pierre Troy

Director

École Nationale du Génie Rural
des Eaux et des Forêts (ENGREF)
Ministère de l'Agriculture
Paris, FRANCE

A.A. Wijetunga

Secretary

Ministry of Lands, Irrigation &
Mahaweli Development
Colombo, SRI LANKA

* Resigned 1989.

Support for the institute is provided by members of the IIMI Support Group. During 1989, IIMI's donors included the Aga Khan, Ford and Rockefeller Foundations; the African Development Bank and the Asian Development Bank; the International Bank for Reconstruction and Development (World Bank); the International Development Research Centre, the International Fund for Agricultural Development; the United Nations Development Programme; and the Governments of Canada, France, Federal Republic of Germany, Japan, the Netherlands, and the United States of America. The Government of Sri Lanka and Pakistan provided facilities and additional in-kind support for IIMI, and the Governments of Bangladesh, Burkina Faso, Indonesia, Morocco, Nepal, the Philippines and Sudan provided program support for IIMI-related activities in those countries.

DDC: 631.76

ISBN: 92-9090-127-6

Please direct inquiries and comments to:

International Irrigation Management Institute

P.O. Box 2075, Colombo, Sri Lanka.

Tel: (94-1)565601

Tlx: 22318 IIMIHQ CE, 22907 IIMIHQ CE

Fax: (94-1)562919

E-mail IIMI (10074: CGU022)

© IIMI, 1990

*The responsibility for this publication rests with the International Irrigation Management Institute, July 1990.
All rights reserved.*

Photo credits: John Colmey: Cover, iv, 2, 5, 10, 12, 13, 16, 21, 22.

Matthew Driskill: 1, 23, Victor Oro, (PCAARD): 8, UNEP: 17, 19.

Edited by John Colmey

ANNUAL REPORT 1989

International Irrigation Management Institute

CONTENTS

FOREWORD	iii
INTRODUCTION	iv
COUNTRY OPERATIONS	1
Sri Lanka	1
Nepal	3
The Philippines	5
Indonesia	6
Pakistan	8
India	11
Bangladesh	13
West Africa	14
Morocco	16
Sudan	17
GLOBAL PROGRAMS	18
Evaluating Performance	19
Simulating Canal Flows	20
Dry-Season Irrigation Management For Rice-Based Systems	22
Farmer-Managed Irrigation Systems	23
Management Training	24
Information	25
FINANCE AND ADMINISTRATION	26
ANNEXES	32

FOREWORD

There is a turning point in the history of any successful organization, when strategy evolves into action, when common goals are realized, when ideas translate into results — when hard work pays off. In every aspect of its endeavors — research, training, and information — 1989 marked that point for IIMI.

In its country operations IIMI completed the first generation of long-term projects, which should yield innovations with potential worldwide application. In Nepal, IIMI staff, together with local agencies, completed a four-year field project showing irrigation policy makers how to rapidly assess communal irrigation systems and what help farmers need to improve system management and output. In Indonesia, field staff completed another four-year project demonstrating through action research how new procedures for assessing and improving irrigation performance can be adopted cost effectively. In Pakistan, IIMI helped identify management options for managing ground and surface irrigation to improve overall performance. In Sri Lanka, staff identified the design, institutional and managerial constraints that inhibit irrigation performance in large settlement schemes, and proposed measures to overcome them.

In its global programs, the Institute's international network on farmer-managed irrigation continued to serve as a focal point for researchers in over forty countries, stretching from the Philippines to Argentina. IIMI also completed work on how to manage dry season irrigation for non-rice crops; the results were reported at regional and international workshops and are being disseminated through an IIMI-sponsored network of national researchers and policy makers. A simple computer model for examining alternative operational scenarios for main canals, developed in collaboration with a leading French research institute, neared the final stages of development in 1989.

IIMI also came into its own in management training and information exchange. The Institute expanded its contacts with national partners in the area of irrigation management training, and, with the participation of more than 300 professionals, successfully tested an experimental training needs assessment in collaboration with the Malaysian Irrigation Department. The quality and quantity of the Institute's publications significantly improved, with more than 40 publications in 1989 — an increase of more than 50

per cent over the previous year. Staff also increased their contributions to international workshops and seminars.

Many steps were taken toward implementing IIMI's long-term strategy. Memoranda of Agreement were signed with three governments, and national consultative committees to help formulate research projects and disseminate results were established in three other countries. A project development office was established at headquarters to assist the staff of all Divisions with proposal preparation and relations with donors.

The strength of the Institute was tested during the year by a tense period of unrest in the headquarters host country. The resilience of the IIMI staff and the support of the Government of Sri Lanka proved invaluable in making it possible to move IIMI's headquarters from Digana Village to Colombo in August without undue difficulties. The fact that our Sri Lanka field research continued as scheduled throughout the country during 1989 deserves special mention.

In 1989, IIMI celebrated its fifth birthday. In November the first five-yearly External Review of the Institute's program and management was begun. The Report of the Panel, concluded in early 1990, provided a very positive overall judgement of IIMI's performance to date. In particular, the Panel commended IIMI for having done "an effective job during its relatively brief period of existence, of initiating and carrying out various projects that should contribute significantly to the improved management and performance of irrigation systems in the developing world". The Panel also observed that "during the last three years, IIMI has engaged in what the Panel considers to have been an excellent planning process that has resulted in the preparation of strategic and operational plans to help guide its efforts over the next several years". We believe that the conclusions of the Panel, together with its many recommendations for improvement, provide an excellent basis for the further development and growth of the Institute in the years to come.

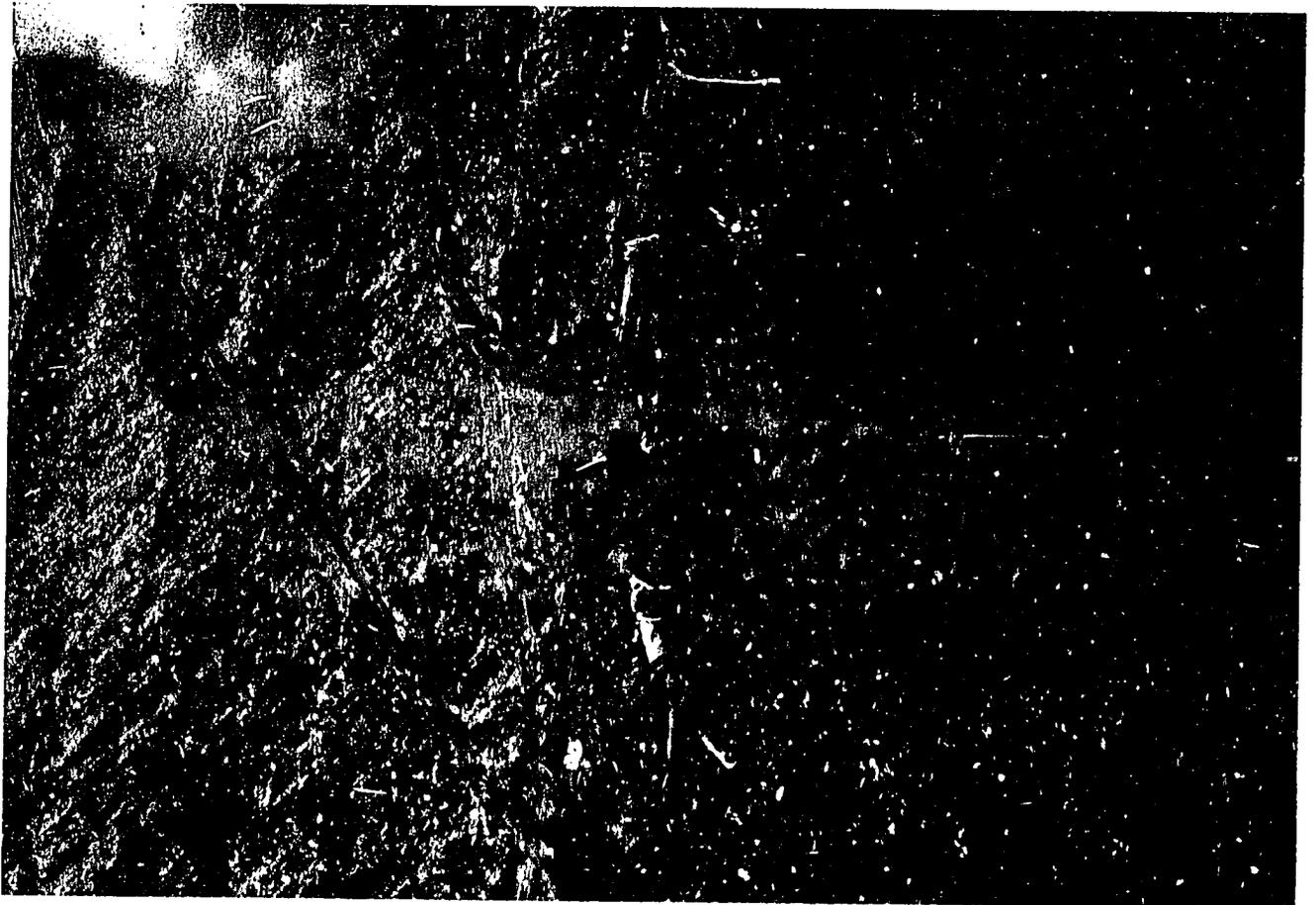


Roberto Lenton
Director General

INTRODUCTION

Details of IIMI's accomplishments during 1989 are presented in the four sections of this report. Parts one and two describe the work of IIMI's country operations (including Pakistan) and its global

research, training and information programs, respectively. Part three presents financial data for the year, and part four records additional information on the Institute's accomplishments, as annexes.



COUNTRY OPERATIONS

At the close of 1989, IIMI had resident field operations in eight countries and one geographic region. Operations continued in Sri Lanka, Nepal, the Philippines, Indonesia, Pakistan, Bangladesh, India, Morocco, Sudan and West Africa (with IIMI's office based in Burkina Faso). IIMI's first non-resident program commenced operations in early 1989 in India, and Heads of Field Operations for Sudan and Morocco took up residence in those countries at mid-year.

During the year, the Institute took several initial steps to implement its strategy, which was completed in late 1988. Many of these had direct bearing on field operations.

First, IIMI expanded the use of "Consultative Committees," national coordinating bodies composed of high-level officials from national agencies and institutions in the irrigated-agriculture sector. First implemented in Sri Lanka, and later in Pakistan, this innovation has proved to be an effective way of determining research priorities and ensuring the rapid dissemination of research results to policymakers. In 1989, consultative committees were established in Bangladesh, Morocco, India and Sudan.

Second, IIMI worked to implement an Institute policy to precede all field activities in a given country with a

formal Memorandum of Understanding. Such agreements outline the responsibilities, rights and obligations of all parties concerned. In January and February, IIMI finalized Memoranda of Understanding with the Governments of India, Sudan, and Nepal, enabling collaborative activities to get underway in those countries. Similar agreements were discussed with the Governments of the Philippines and Indonesia.

Third, the Finance and Administration Division implemented a new, project-based budgeting system. The system uses a "bottom-up" approach, and allows the Institute's management and field staff to more carefully plan and monitor project expenditures. By the end of the year the new system was firmly in place in all of IIMI's country operations.

Last, the Institute established the Project Development Office near the end of the year. This office will help develop all future project proposals and identify new sources of funding, with the objective of freeing up research staff to concentrate on more substantial issues.

Reports on each of IIMI's country operations follow, presented in the order of their establishment, first in Asia and then in Africa. A map showing IIMI's country operations can be found on the inside back cover.

SRI LANKA

For the Sri Lanka Field Operations, 1989 was a difficult, but productive transitional year; difficult because unrest in the country disrupted research activities and transitional because this was the first year in which the unit operated as a separate Field Operation within IIMI's headquarters.

However, the year was productive for three reasons. First, several projects were completed, and a large number of publications and reports were prepared and disseminated, reflecting several years of research on Sri Lankan irrigation systems; second, much progress was achieved in continuing projects; and third, IIMI made considerable progress in identifying new project activities.

In March, IIMI completed a project funded by the Asian Development Bank (ADB) on system operations, irrigation financing and crop diversification. Most of the work was carried out in three major irrigation projects, — as well as in one system in the Philippines for comparison. IIMI staff submitted a three-volume Final Report, with conclusions and recommendations, to the ADB and collaborative government agencies; several other significant publications on irrigation financing and crop diversification synthesizing earlier work by IIMI also resulted from the report.

Among the results, staff found the actual levels of Operations and Maintenance (O&M) expenditures per

hectare to be declining in recent years — in 1989 these expenditures were only 20 to 33 percent of the desired level. Additionally, research determined that farmers' benefits from irrigation were sufficient to enable them to pay O&M costs, but not the more expensive capital construction costs.

“ In March, IIMI completed a project funded by the Asian Development Bank (ADB) on system operations, irrigation financing, and crop diversification. ”

IIMI also completed a four-year project in north central Sri Lanka, conducted in two irrigation systems — one old, one new — on irrigation management for diversified crops during the dry season. As most of the findings emerged during 1988 (reported in the 1988 Annual Report and in other IIMI publications), the primary activity in 1989 focused on the documentation and dissemination of the results.

At mid-year, the Institute published the final report on research conducted on land settlement planning for improved irrigation system performance, carried out by a post-doctoral fellow in southern Sri Lanka. The findings clearly showed problems in the implementation of settlement policy, which impacts the farmers' potential to take responsibility for parts of the irrigation systems, and made several recommendations as to solutions.

Throughout the year, IIMI's Sri Lankan operations staff continued work on two major projects, and on two smaller ones, that will continue into 1990.

In April, staff submitted an interim report on the ADB-supported project on Irrigation Management and Crop Diversification, a multi-theme project in two major irrigation systems in southern Sri Lanka. This project addresses system performance issues in the newer Kirindi Oya settlement scheme and the older Uda Walawe scheme, which is undergoing rehabilitation. The report sparked indepth discussion among relevant irrigation and agricultural agencies, and between the agencies and the ADB. Among the recommendations adopted in the projects: (1) the establishment of a committee to plan a diversified cropping pattern in Kirindi Oya; (2) the reorganization of the Irrigation Department to form a separate O&M division in Kirindi Oya; and (3) the establishment of a committee for Uda Walawe to examine and adapt the draft O&M manual developed by IIMI-contracted consultants.

Under a second ongoing project, funded by the United States Agency for International Development (USAID), three private firms are implementing four research subcontracts, in collaboration with the Sri Lanka Irrigation Department and Irrigation Management Division. The project places heavy emphasis on involving agency officials in all stages of the research, and on frequent meetings and informal workshops to discuss the implications of findings.

“ The report sparked in-depth discussion among relevant irrigation and agricultural agencies, and between the agencies and the ADB . ”

The third project is “major” in visibility and likely impact, though small in budgetary terms. The project on farmer-managed irrigation systems in Sri Lanka is a component of a larger project (see section on Global Programs for more information) financed by the International Fund for Agricultural Development



(IFAD) and Bundesministerium für Wirtschaftliche (BMZ). The findings to date verified strengths, but severe weaknesses as well, in the programs of both non-governmental and government organizations in this sector. For example, during one workshop, it was discovered that none of the NGOs using "participatory" methods in rehabilitating small reservoir systems had a strategy for withdrawing support, nor could they point to any cases where they had withdrawn, leaving a self-sustaining farmers' organization.

A fourth project continued through 1989 analyzes the costs and benefits of various types of irrigation investments in Sri Lanka after 1948. Preliminary

findings released in 1989 suggest the benefit cost ratio of new irrigation construction has declined to less than one after 1980.

Last, an Associate Expert from The Netherlands Government continued to work with IIMI staff to refine an analytical framework for evaluating the decision-making process in irrigation management agencies, and to apply it to two major irrigation systems in the south.

By the end of the year, IIMI neared conclusion on development of a new project to assist the government in refining its policy towards farmer involvement in system management.

NEPAL

Between now and the year 2000, Nepal's Department of Irrigation plans to increase the role farmers play in irrigation. Farmers already manage 63 percent of the country's irrigated area and make a critical contribution to the nation's food production. But a new national irrigation policy calls for farmer participation at all levels of irrigated development — from project identification to management of completed systems.

Action plans developed by a high-level task force to implement the policy call for the phased turnover of small, government-managed systems to farmers, and for an increase in farmer participation in jointly managed systems. To facilitate the change, the Department of Irrigation has decentralized support services by establishing 75 new irrigation offices, one for each district.

IIMI's Nepal Field Operations, with over four years of research experience in farmer-managed irrigation, has played an active role in creating awareness for new directions. In 1989, Nepal's National Planning Commission appointed an IIMI scientist to serve on the Irrigation Sector Task Force. IIMI's staff contributed to the development of an Irrigation Master Plan. Perhaps more importantly, extensive field-based information and a number of field-tested innovations have become resources for the government to draw upon as it moves to develop a closer working relationship with farmers.

In 1989, IIMI's Nepal Field Operations staff completed a four-year action-research project to test alternative

assistance strategies for existing farmer-managed irrigation systems. The project was carried out in collaboration with the Water and Energy Commission Secretariat, with Ford Foundation funding.

The project's first phase led to the development of a simple, low-cost inventory process for identifying and ranking 119 farmer systems for assistance. The second phase provided assistance for physical and management improvements in 19 systems drawn from the original pool of 119. Local consultants engaged by the Water and Energy Commission Secretariat to supervise physical improvements completed the second phase of fieldwork in July 1989 and submitted final reports in November.

As this project ends, the Water and Energy Commission Secretariat and IIMI can point to several innovations developed along the way and conclusions that will considerably affect government efforts to assist farmer-managed systems in Nepal and elsewhere.

“ In 1989, IIMI's Nepal Field Operations staff completed a four-year action-research project to test alternative assistance strategies for existing farmer-managed irrigation systems. ”

Among the innovations: a cost-effective reconnaissance inventory procedure for ranking systems in terms of needs, and a rapid appraisal procedure to rank the necessary changes in terms of priority and impact; the use of farmers from well-managed systems to train farmers from poorly functioning systems; and the use of farmers from successful systems as consultants in designing system improvements.

“ Among the innovations: a cost-effective reconnaissance/inventory procedure for ranking systems in terms of needs, and a rapid appraisal procedure to rank the necessary changes in terms of priority and impact; . . . ”

Several conclusions also emerged from this research.

- In many farmer-built irrigation systems, three necessary conditions are in place for effective, low-cost investments to improve irrigated food production — farmers have identified land and water resources, have shown a willingness to invest their own resources, and have created some level of water users' organization.
- Farmers can quickly identify necessary physical improvements in their systems, but seldom understand the major constraint is organizational and not physical. At the same time, assistance for physical improvements can provide farmers with experience in managing many of the same activities they need to operate and maintain the system once the physical works are completed.
- Farmer-managed irrigation systems have evolved a range of institutions — organizations, rights, water allocation principles, water distribution practices, and procedures for conflict management — to fit the particular environment of each system. This evolution is never complete, and the first task in providing assistance is to gauge the strengths and needs of these institutions and then to tailor assistance to match those needs.

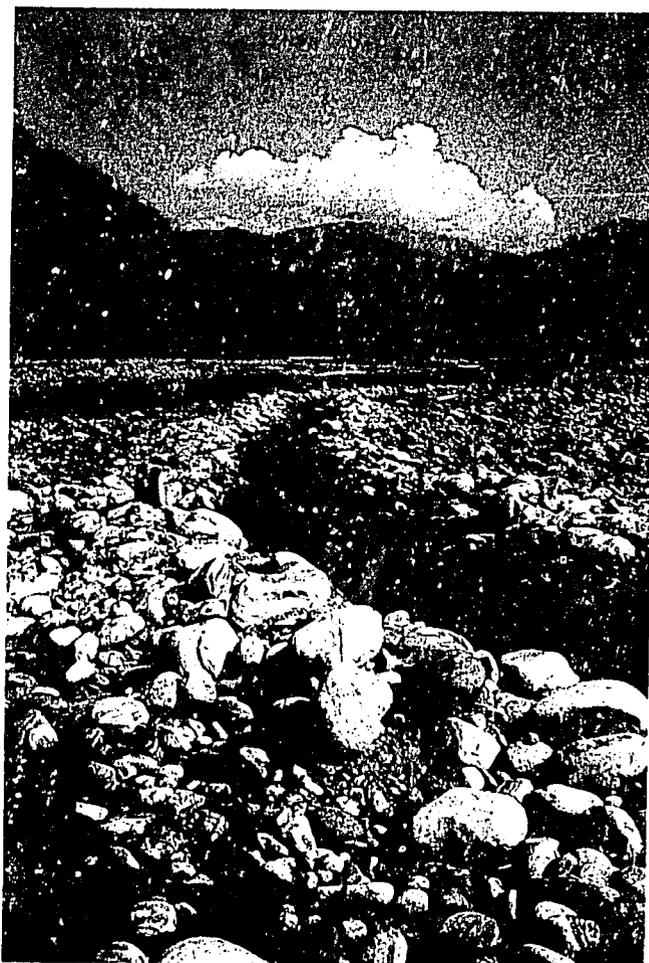
In 1990, IIMI will collaborate with the Department of Irrigation in adapting these innovations and

conclusions to farmer participation and turnover projects.

In August, staff completed fieldwork on another project started last year in the 3,500 ha Chhattis Mauja irrigation system. The study examined water distribution, organizational structure and its effectiveness, and resource mobilization for system O&M. IIMI found that while physical improvements were needed, there was little scope for expanding the irrigation coverage or cropping intensity by better water management.

In the area of training, Nepal staff carried out a 10-day training and observation program in February for a Bhutanese delegation of irrigation engineers, agriculturalists and farmers. Among other aspects of the program, Nepal staff exposed the group to rapid appraisal methodology and the collection and translation of irrigation information into field reports.

In September and October, IIMI provided an institution development specialist for three weeks to work with a USAID team in redesigning the AID



funded Irrigation Management Project. The goal is to institutionalize system management and training activities within the Nepal Department of Irrigation.

In the future, IIMI's research emphasis in Nepal will be changing, in response to a request by His Majesty's Government of Nepal to work directly with the Department of Irrigation in developing and implementing irrigation management innovations. At

the end of the year, the Department and IIMI operations staff developed a proposal identifying the Department's newly established district offices as the starting point for IIMI involvement. IIMI will also assist the Department at the central level to adjust procedures and policy on implementing assistance programs to farmer-managed systems and on participatory irrigation management in agency-managed systems.

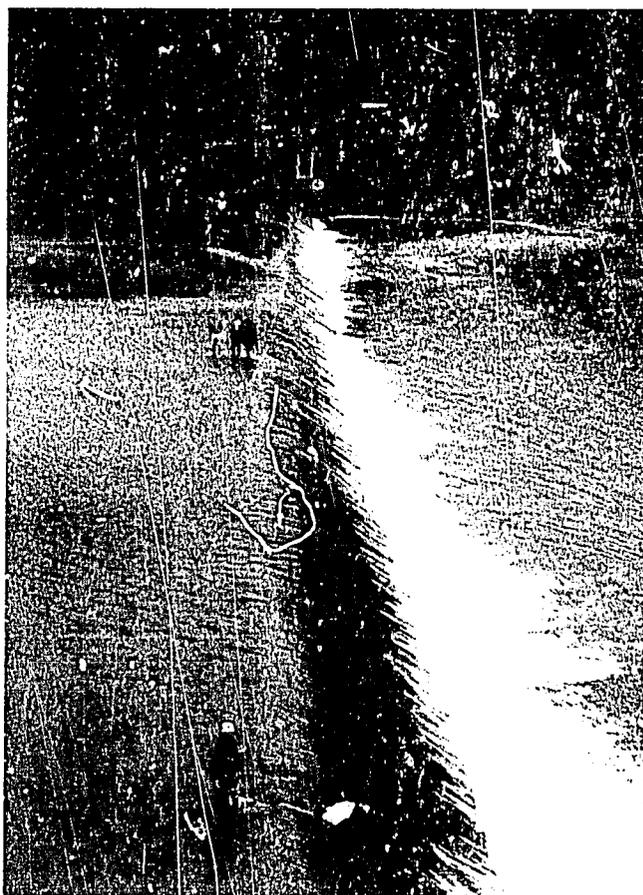
THE PHILIPPINES

Since the late 1960s, the Philippines has consistently searched for new ways to improve irrigation management. The National Irrigation Administration (NIA) pioneered the movement toward farmer-participation in irrigation, strengthening small, communal systems and transferring to farmers increasing responsibility to manage large parts of previously government-operated systems. When rice prices plunged in the mid-1980s, the Philippines was among the first Asian countries to search for new irrigated crops to grow. When many Asian countries began to move toward self-financing of their irrigation systems, the NIA was again one of the first to act, financing its own operating budget entirely from the revenues it generated beginning in 1982.

IIMI's Office in the Philippines, established in 1985, has worked closely with the NIA and several regional universities in these three efforts, with the multiple objectives of strengthening the country's research capacity, documenting innovations and disseminating the results to other countries where similar moves are underway.

In 1989, IIMI completed a major ADB-funded project started in 1987 to determine irrigation management practices most likely to enhance the cultivation of non-rice crops during the dry season and to field-test those practices under operating conditions. The final report was submitted to the ADB and the government in November. Findings presented at a national workshop in late 1988 were published and disseminated in August 1989.

In general, IIMI identified the crops most likely to be successful, and the conditions necessary to make the transition from rice to non-rice crops.



During 1989, IIMI continued to contribute to a three-country project with the International Rice Research Institute (IRRI), with funding from the Rockefeller Foundation, to research management problems in rice-based irrigation systems (see section on Global Programs). In the Philippines, 17 major studies were conducted; staff from both institutes and collaborating partners reviewed the results at two national workshops.

“ In 1989, IIMI completed a major ADB-funded project started in 1987 to determine irrigation management practices most likely to enhance the cultivation of non-rice crops during the dry season . . . ”

In another study, several important findings of the IIMI-IFPRI (International Food and Policy Research Institute) collaborative project on recovery of irrigation costs from farmers were presented and discussed at a 1989 workshop, attended by 20 senior NIA staff members and staff from both institutes. Discussions focused on irrigation investment in the Philippines and recurring costs. Participants noted the negative impact of general economic deterioration in the Philippines during the early 1980s on infrastructure investment in general and irrigation in particular. Participants agreed that efforts by the government to make the NIA responsible for full repayment of investment costs for new construction had a chilling effect on investment levels. With respect to recurrent costs, a variety of responses to the complete cutoff in operating subsidies in 1981 were noted. These included efforts to devolve increased O&M responsibility to farmers, significant cutbacks in staffing levels, an unsuccessful attempt to increase irrigation fees and a variety of efforts designed to increase irrigation fee collection levels. The program to reduce costs was found to be more effective than the effort to increase revenues, which remained almost constant on a per hectare basis.

INDONESIA

In the past decade, Indonesia moved from the world's largest importer of rice to self-sufficiency, combining a multi billion dollar, aid-dependent effort to expand and rebuild aging irrigation systems with the expanded use of high-yielding rice varieties. As self-sufficiency approached, the government shifted priorities toward a self-financing irrigation sector, more varied cropping patterns and greater farmer participation in system operations. The precipitous drop in oil prices in the 1980s, which led to deep

In addition to the above projects, IIMI initiated a new project in collaboration with the NIA to assist the agency's current effort to establish farmer organizations on communal irrigation systems (built and managed by farmers) and in parts of its 600,000 ha of national systems. IIMI's role is to coordinate the research component of USAID's Accelerated Agricultural Production Project, a multi year effort to strengthen farmer organizations and enhance NIA ability to support these groups.

The Project Agreement was signed in February, and shortly afterward an internationally recruited IIMI Research Coordinator arrived in-country to manage the project. During April and May, IIMI and the NIA's regional staff identified nine universities or research institutions that will propose and implement research on documenting the NIA program in partnership with NIA regional offices. During July, a 12-day workshop was held at the Institute of Philippine Culture to train research teams. In September, research advisory committees were established at the national and regional levels. By October, the committees had finalized four project proposals out of 40.

“ . . . IIMI initiated a new project in collaboration with the NIA to assist the agency's current effort to establish farmer organizations on communal irrigation systems (built and managed by farmers) and in parts of its 600,000 ha of national systems. ”

budget cuts in allocations to irrigation, reinforced those trends.

In 1989, IIMI completed a four-year, multiphase action program to assist in the implementation of government policy. Like steps of a ladder, the two-part program proceeded through a series of phases: investigation, analysis, diagnosis, pilot studies, recommendations and ultimately, assistance in adoption of management innovations.

The project operated in close collaboration with the Directorate General of Water Resources Development in the Ministry of Public Works. Funding was provided by the ADB and the Ford Foundation.

One part of the project focused on finding ways to improve system management of government systems.

Between March and September 1989, in collaboration with Provincial Irrigation staff, IIMI conducted a field-based training program and pilot study, covering four irrigation systems in West Java. The program involved sub-section staff and had as its goal the development of simple, low-cost methods for strengthening the management information base necessary to implement Indonesia's highly sophisticated irrigation systems.

“ Like steps of a ladder, the program proceeded through a series of phases: investigation, analysis, diagnosis, pilot studies, recommendations and ultimately, assistance in adoption of management innovations. ”

The program pilot-tested several IIMI recommended innovations: mapping tertiary blocks to determine the actual crop areas irrigated by offtakes versus additional water sources; calibrating measuring devices; measuring and comparing conveyance losses in main canals; and inventorying control structure conditions and measuring devices.

Overall, the training program proved cost-effective. The simple mapping technique cost approximately US\$ 3.00 per ha. The simplified calibration method for tertiary gates (using portable flumes) cost about 19 cents (US) per ha. The conveyance loss method for secondary canals cost about 25 cents (US) per ha. The information obtained was directly usable in calculating more accurate target discharges, leading to an immediate improvement in operations.

To improve the equity of water distribution and to increase cropping intensity, earlier work illustrated a need to improve the ways in which water is rotated to different tertiary blocks. In mid-1989, IIMI and agency staff tested a new procedure for establishing and implementing irrigation rotations in a large irrigation system in West Java. In the process, agency staff

improved uniformity in water deliveries while at the same time decreasing weekly management inputs of irrigation staff. Farmers' active participation in the planning and implementation of schedules considerably reduced tensions normally present during water-scarce periods.

In all of the systems where IIMI worked, monitoring of water allocation and delivery procedures improved through the use of IIMI innovations. Inspectors reported actual water delivery procedures, rather than targeted deliveries. Irrigation staff showed a readiness to use the Delivery Performance Ratio, an IIMI-designed performance indicator that compares actual against target discharges, which managers can use for evaluating and correcting actual water distribution.

The importance of these studies is that they demonstrate how new procedures to improve performance can be adopted, without extra cost and without changing basic rules and regulations.

The second part of IIMI's 1989 Indonesia work involved researching, monitoring and evaluating a major government program to turn over to farmers the responsibility for operating and maintaining all irrigation systems below 500 ha. This represents nearly 70 percent of the systems in the agency's inventory, or 19 percent of its design area. The program started in West Java and West Sumatra.

“ The importance of these studies is that they demonstrate how new procedures to improve performance can be adopted, without extra cost and without changing basic rules and regulations. ”

Throughout the year, IIMI participated in national and provincial — West Java and West Sumatra — working groups which reviewed findings and proposed improvements in the implementation process. In April, IIMI assisted the Institute for Socioeconomic Research, Education and Information and the Directorate of Irrigation in formulating draft supporting materials for the turnover program; these materials were used for high-level policy decisions on turnover and eventually culminated in ministerial

regulations of the Minister of Public Works on the turnover process.

In August, staff participated in a national workshop to develop a guide for turning over small irrigation systems to farmers and to discuss future government strategies for continued assistance to small-scale systems after turnover has been achieved.

HMI staff also conducted research in many of the systems about to be turned over on topics ranging from assessing how well sample systems were performing prior to and during turnover, to documenting the effectiveness of the turnover process in the field. Three resulting recommendations stand out among several which were later incorporated into the program.

First, HMI recommended the use of irrigation inspectors in the combined role of field-level turnover officers and institutional organizers. This proved cost-effective while at the same time providing a learning opportunity for the agency to plan and invest jointly with the users. Second, HMI suggested several ways to enhance and streamline the inventory and design stages so as to avoid the collection of unused data and to make the process more easily understood by farmers. Third, HMI demonstrated the need for, and suggested how to implement, a transition program in

which the responsibility for O&M changes hands from government to farmer groups.



PAKISTAN

Pakistan has the largest contiguous irrigation system in the world. It covers a gross area of about 15 million ha and includes nearly 75 percent of the country's total agricultural area. The canal system carries and distributes water to about 3.6 million farms between the mountain ranges of the Northern Frontier and the Arabian Sea. Over 250,000 tube wells supplement surface irrigations. At the same time, Pakistan's long history of irrigation has produced a vast administrative infrastructure. However, most of it developed at a time when water supply was adequate to deliver water in a relatively uncontrolled manner; as a consequence, an operational system evolved that was geared to administering the system rather than managing it.

Despite a rapidly changing social environment and an increasing demand for irrigation, the operational

methods and procedures remain much the same today. Adapting the operational system to meet the needs of the physical infrastructure is one of many priorities of Pakistan's irrigation authorities. Designing strategies to alleviate the twin menaces of waterlogging and salinity is another.

In 1989, HMI continued work on a wide range of management issues in close association with a national Consultative Committee and in collaboration with the Provincial Irrigation and Agriculture Departments, leading research institutes and international development agencies.

In collaboration with the Punjab Irrigation Department, HMI has carried out field observations and water measurement activities over several successive agricultural seasons on several

distributaries in two sub divisions of the perennial Lower Chenab Canal system. The 90-year-old canal system serves an irrigable command area between the Ravi and Chenab rivers in excess of 1.2 million ha through more than 200 secondary and subsidiary channels. Research analysis of data already collected confirms that the water delivery performance of distributaries persistently and severely departs from operational objectives. The distribution of water to outlets in the upper half of these channels is commonly four times greater than to outlets in the tail reaches. Among the causes identified by IIMI are the high rates of channel sedimentation and low levels of maintenance inputs.

In 1989, field operations staff began **to develop and test management interventions to improve performance of distributaries**. In one pilot project, IIMI and the Punjab Irrigation Department jointly planned and implemented targeted desiltation and maintenance of one distributary and as a result the inequity of water distribution between head and tail outlets was reduced from a ratio of more than 5:1 to less than 1.5:1.

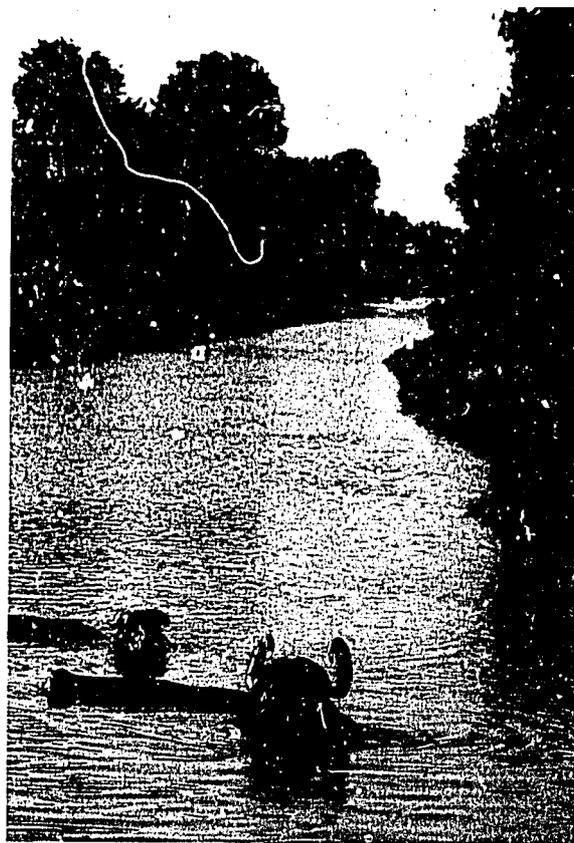
In a related study, staff used a computer-based hydraulic model to simulate irrigation rotations for comparison with existing practices in one canal sub-division. Results demonstrated that, if carefully planned and followed, a rotational program applied to the main canal during low flow periods could more than double water supplies to outlets in the lower section of distributary channels.

In a second area of research, IIMI continued work to develop management strategies for **conjunctive use of surface water and groundwater irrigation systems**. Over large areas of the Indus Basin, especially in Punjab Province, the surface irrigation system is supplemented by the extensive use of public and private tube wells. The number of shallow private tube wells has grown rapidly in the past decade and now provide three-quarters of the estimated 40 percent of irrigation water derived from groundwater. A primary objective of IIMI's research in this area, carried out in association with the Punjab Irrigation Department and the Water and Power Development Authority, is to determine how private and public tube well operations mesh with canal system operations.

In 1989, staff surveyed a large sample of private and public tube wells in several different watercourses. Many important findings emerged from this work. Overall, electric-powered pumps comprised less than

one-third of all private tube wells, but were operated much more intensively than diesel or tractor-powered pumps. Surprisingly, groundwater more than doubled surface water supplies throughout the distributary command, emphasizing its importance as an "on-demand" component of irrigated agriculture.

Private tube well utilization is also sensitive to groundwater quality. Farmers with access to good quality groundwater pump about one-third more intensively than those without such access. Still, many farmers are compelled to compensate for poor surface water deliveries by using large quantities of poor-



“ In one pilot project, IIMI and the Punjab Irrigation Department jointly planned and implemented targeted desiltation and maintenance of one distributary and as a result the inequity of water distribution between head and tail outlets was reduced from a ratio of more than 5:1 to less than 1.5:1. ”

quality groundwater. IIMI's research on groundwater quality has heightened concerns about the sustainability of present patterns of irrigated agriculture in areas where conjunctive use of both water sources is practiced.

Research continued in northern Pakistan **to improve management of small-scale systems.** This work followed a request from the Aga Khan Rural Support Programme (AKRSP), for IIMI to assist in determining performance parameters of newly established, farmer-managed irrigation systems. In collaboration with and funding from the AKRSP, IIMI in 1989 implemented a six-month, comparative study of six farmer-managed systems in Gilgit District, and the Northern Areas. In three villages staff compared newly developed systems with older, well-established systems.

Large variations in application efficiencies were found in both the new and old systems, indicating considerable potential for improvement. A more precise control of water at the field inlet, better leveling of the fields, and appropriate intervention by the irrigator would substantially improve field-level efficiencies.

In a fourth area of research, the Institute continued work **to determine irrigation constraints to wheat product.** In an earlier study, staff found a significant correlation between wheat yields and dry-season rainfall, especially during January, when canals are closed for repair, and March, when crop-water needs become acute. Several hypotheses relating to annual canal closure and the early termination of irrigation were tested in several districts of the central Punjab during the 1987-88 winter cropping season. At the request of the Punjab Agriculture Department, an additional district was added to the list in 1989.

During 1989, as part of this work, IIMI trained 25 field assistants (in addition to 15 agriculture officers and 33 field assistants trained in 1987-88) to collect detailed data on 25 watercourses selected in four districts. A systematic random sample of four farms in each of the 25 watercourses was selected, each representing head and tail portions. The 100 farms included in the study represented a range of good, average and poor operational conditions with different irrigation supply situations. Results reported at the end of 1989 confirmed previous findings and shed new light on ways to improve water management for wheat production.

Last, IIMI initiated a five-year research project early in 1989 to **develop management innovations to minimize waterlogging and salinity.** Together the

“ In a fourth area of research, the Institute continued work to determine irrigation constraints to wheat production.”



two affect over 2.2 million ha before the monsoon, and another 4.5 million ha afterwards. Equally important, these conditions can spread to parts of irrigation systems not yet affected. The first phase will identify and determine the links between irrigation management and persistent waterlogging and salinity problems. This is to be followed, in a second phase, by action research to field-test management strategies under operational conditions.

First phase activities focused on characterizing the ecological context within which waterlogging and salinity are found. Towards this end, staff made several field visits and collected data from a range of local agencies. A paper based on the results of this work, and a review of available literature, was later submitted to a Program Advisory Panel Meeting in May organized by the International Waterlogging & Salinity Research Institute of Pakistan.

Staff also studied salinity problems in Punjab where IIMI has already been working. In those sites, farmers' complete dependence on tube well water appeared to increase the incidence of salinity. To quantify the contributions of several sources of groundwater recharge, which impacts salinity, IIMI invited two civil engineers from the Institute of Irrigation Studies at the University of Southampton to conduct field research on two watercourses during the 1989 monsoon season.

Their research showed that water tables in the area do not rise during the monsoon season. Apparently, seepage from rice fields and recharge from the monsoon rains are balanced by withdrawals from the groundwater by tube wells. More importantly research found that profile and surface salinity reached hazardous levels, especially at the tail of watercourses and distributaries.

INDIA

By the year 2000, India's population will top 1 billion, with an increase roughly equal to the population of Indonesia, itself the fifth most populous country in the world. Most of those people will be poor and rural and will depend on agriculture for their livelihood. At issue now, says M.S. Swaminathan, a member of IIMI's Board of Governors, is "not a shortage of food, but a famine of work."

Having invested nearly 10 percent of its government outlays since independence in 1947 on expanding irrigated area, the government is now shifting its attention to crop intensification and diversification through small-scale rehabilitation and irrigation management training and research. The challenge lies in coordinating national efforts, while at the same time taking into account the physical, economic, and social diversity that makes India what it is today.

Rather than focus on issues specific to one state — be it waterlogging in Bihar or water scarcity in Rajasthan — IIMI has chosen a macro-approach aimed at strengthening the research and training capacity of selected institutions through a series of collaborative projects in Bihar, Gujarat, Tamil Nadu and Uttar Pradesh. Utilizing a network research and workshop approach, IIMI is providing a link among the national institutions and between them and the Institute's larger worldwide research network. The program is coordinated by Headquarters staff in Sri Lanka and funded by USAID and the Ford Foundation.

Operations began in early 1989 with the signing of a Memorandum of Agreement with the government's Water and Power Consultancy Services Ltd. (WAPCOS). Following the agreement, a Coordinating Committee was established with representatives from the Ministry of Water Resources, Central Water

Commission, WAPCOS, IIMI, the Ford Foundation and USAID. At its first meeting in February the Committee selected a number of institutions for exploratory missions and a broad range of research themes. At its second meeting in August 1989, the Committee finalized the lists.

In Tamil Nadu, IIMI will collaborate with Anna University in Madras and the Irrigation Management Training Institute in Trichy on main system management and performance of a World Bank-funded National Water Management Project.

In Gujarat, IIMI, the Institute of Rural Management in Anand and the Water and Land Management Institute (WALMI) in Gandhinagar will research management processes in the main system of one large irrigation system.

In Uttar Pradesh, IIMI will interact with Roorkee University and the Okhla WALMI in New Delhi to research issues related to conjunctive use and management of surface water and groundwater for irrigation.

“ Rather than focus on issues specific to one state — be it waterlogging in Bihar or water scarcity in Rajasthan — IIMI has chosen a macro-approach aimed at strengthening the research and training capacity of selected institutions ... ”

Finally, in Bihar, the collaborating research partners are the College of Engineering in Patna and the Bihar WALMI. Researchers there will analyze issues related to the management of a conjunctive irrigation system in one heavily waterlogged system in Northern Bihar.

By joining university researchers with WALMI staff, mainly government engineers, the overall intention is to achieve a mix of practical and theoretical experience.

In addition to the above work, IIMI staff contributed to several conferences and workshops held in India during the year. Early in 1989, IIMI staff presented a series of lectures on irrigation sociology at Anna University's two-month "Training of Trainers"

program, sponsored by the Indian Government and USAID. An IIMI Senior Systems Analyst contributed to a seminar on efficiency and equity in groundwater use and management, organized jointly by the Ford Foundation and IFPRI at Anand in January-February 1989. And IIMI's Documentalist participated in and led an information system workshop held at the Irrigation Management Training Institute in Trichy during October.

In a separate project, an IIMI predoctoral fellow completed her study of ancient irrigation tanks in Tamil Nadu, using "Expert System Techniques," in July 1989 and submitted her doctoral thesis to Anna University.



BANGLADESH

At first glance, Bangladesh seems in the throes of a downward spiral of rural poverty, natural disaster and famine. The country's increase in food production appears stalled below the level necessary to meet basic food needs, while its population continues to climb at a rate of 2.4 percent a year, three times the rate of many developed countries. Virtually all of the country's cultivatable land is already in use and each year farm sizes grow smaller and the number of landless laborers grows larger.

On closer inspection however, a more optimistic outlook for the future is possible. The country has fertile soils in the combined floodplain of the Ganges, Brahmaputra and Meghna rivers. There is more than enough water — if properly managed — to triple the amount of land currently irrigated and substantially increase food production. Additionally, there are several innovative attempts currently being undertaken by government and non-governmental organizations to improve access by the poor to potential and existing resources.



Two key factors set Bangladesh apart from other countries where IIMI operates. First is the country's potential and current groundwater supplies — roughly three-fourths of the country's irrigated land is served by tube wells and lift irrigation systems. Second is the need to increase rice yields to a scale found in other Asian countries where attention is shifting to irrigated crops other than rice.

IIMI established an office in Bangladesh in late 1988 under a Memorandum of Understanding with the Bangladesh Agricultural Research Council (BARC). In 1989 the Head of Bangladesh Field Operations established a national consultative committee and worked to develop a coherent research program. Initial research activities in 1989 centered on a joint project with IRRI entitled **“Problems of Irrigation Management in Rice-Based Irrigation Systems.”**

The Bangladesh Consultative Committee met for the first time in June 1989 and again in November to discuss research priorities. Committee members are drawn from related government ministries and agencies, BARC, universities and research institutions. The Committee identified several topics for research including privatization and turnover of public irrigation resources, command area utilization, irrigation fee payment systems and equitable use of irrigation. Of these, the Committee selected Privatization of Small-Scale Irrigation for initial study.

The IIMI-IRRI project began in 1988 in two research sites — the North Bengal Tubewell Project and the Ganges Kobadak Irrigation System. A third site, near Rajshahi, was added to the project in 1989. During the year, IIMI placed researchers in all three sites.

IIMI's contribution to this work — also carried out in collaboration with the Bangladesh Water Development Board — has several components. In

“ In Rajshahi, a project team is assessing an innovative attempt by the Rajshahi Krisbi Bank to provide financing and managerial inputs to farmer groups associated with three types of tube wells; . . . ”

North Bengal, researchers are monitoring the implementation of a minimum-acreage rule and are also examining preconditions for the turnover of public tube wells to farmers. In the Ganges-Kobadak Canal project, researchers are analyzing options and constraints associated with setting and maintaining a fixed and predictable water delivery schedule.

In Rajshahi, a project team is assessing an innovative attempt by the Rajshahi Krishi Bank to provide

financing and managerial inputs to farmer groups associated with three types of tubewells: the wells were installed and operated, rented or sold, by the Bangladesh Agricultural Development Corporation. The role of farmer organizations in irrigation and constraints to the collection of irrigation service fees are also under consideration. During the year, two workshops were held to discuss results.

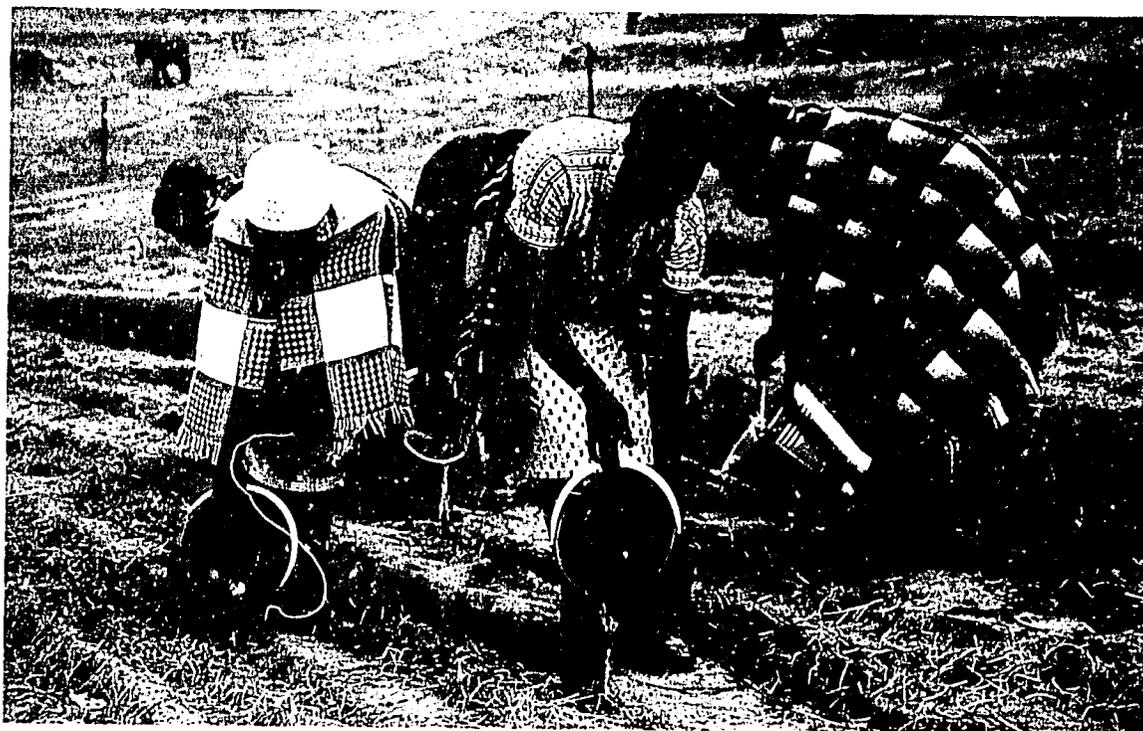
WEST AFRICA

Throughout the 1970s and 1980s, irrigation projects in Sub-Saharan Africa came under increasing attack from development experts. In spite of considerable investment, total cultivated area hardly increased at all. Many of the developed areas were not cultivated and not all the cultivated lands were harvested, partly because intensive agriculture, as normally associated with irrigation, did not mesh with rainfed, subsistence strategies traditionally practiced by farmers.

In short neither farmers nor government agencies were prepared for the ramifications of large-scale irrigation. Unlike Asia, Sub-Saharan Africa had little experience with irrigated agriculture before 1950; the

institutions necessary to support intensive cropping — credit and marketing bodies, extension services and farmer organizations — were largely undeveloped, or not organized to support irrigated farming practices.

“ . . . neither farmers nor government agencies were prepared for the ramifications of large-scale irrigation.”



Despite the early setbacks, even the harshest critics now agree irrigation is crucial to meeting the region's food needs and reducing the vulnerability to the harsh and unpredictable Sahelian climate. And not all irrigation has been unsuccessful. Rapid growth in small-scale irrigation efforts has been achieved — in swamps, flood plains and around community wells — in Nigeria and elsewhere. These systems, developed by farmers without government assistance, have made large contributions to food production and have demonstrated the potential of irrigated farming.

Learning from these successes, several West African governments are now seeking to rapidly increase farmer participation in the operation and maintenance of national irrigation schemes, to strengthen farmer organizations, and to develop assistance strategies for small, informal systems.

Established in mid-1988, IIMI's West Africa Field Operations exists to support these national and regional trends. The program, operated from its headquarters in Burkina Faso, has developed links with five irrigation sectors in five countries — Burkina Faso, Mali, Niger, Nigeria and Senegal. Taking into account the complexity of West Africa and the difficulty of travel and communications, the program is designed to be implemented over the next five years.

During 1989, staff moved forward to define projects in cooperation with the respective national institutions. The Head of Operations made field visits to potential research sites and developed a set of action research projects in collaboration with national and regional partners (identified during 1988). At the end of the year, several projects had been finalized, for implementation in 1990 and beyond (The African Development Bank appraised and evaluated the project in early 1990).

In **Mali**, the Ministry of Agriculture, the Office du Niger and the Direction Nationale du Génie Rural, collaborated with IIMI in preparing a project to help the Office du Niger implement a proposed rehabilitation project. The project will undertake applied research on existing operational water management procedures, analyze data from past and

current rehabilitation efforts and establish a training program on irrigation management techniques and methods.

In **Burkina Faso**, IIMI collaborated with the Comité Interafricain d'Etudes Hydrauliques, the Institut d'Etudes et de Recherches Agricoles and the Office National des Barrages et des Aménagements Hydro-Agricoles in developing a proposal to research small dams and irrigated perimeters in the north-central area of the country.

In **Senegal** three different groups worked with IIMI in the preparation of a proposal on irrigation management and system turnover in the Senegal River Valley. The project will involve a government line agency, a national research institute and an association of farmers in conducting action research and will seek to improve the returns to the new irrigation schemes made possible by the construction of the Diama and Manantali dams.

In **Niger**, the Institut National de la Recherche Agronomique and the Office National des Aménagements Hydro-Agricoles requested IIMI to prepare a proposal for an action research project on irrigation management in the farmer-managed systems of the Niger River valley. The government of Niger has already turned over management of substantial parts of the river irrigation system. The purpose of the project will be to analyze the existing system and make recommendations for improvements that will reduce operational costs, diversify crop production and strengthen the capability of the line agencies to support and advise farmer cooperatives.

In **Nigeria** IIMI continued work with the Institute for Agricultural Research at Ahmadu Bello University near Kano on action research to support the turnover of irrigation management to farmer associations in the Kano River and Bakolori project areas. During the year, IIMI staff carried out missions to that country to provide assistance in the diagnostic and recommendation phases, particularly on socioeconomic and institutional issues. At the end of the year, the Director, Field Operations held discussions aimed at setting up broader irrigation management collaborations in Nigeria.

MOROCCO

Unlike other countries where IIMI conducts operations, Morocco lacks an abundant water resource, or tropical rainfall. The climate is generally semi-arid to arid, except for a narrow strip along the Atlantic and Mediterranean coasts. As a result, water-saving irrigation techniques have developed over centuries, evolving into sophisticated and effective irrigation organizations and methods common to the Western Mediterranean.

Much of this expertise is unknown outside the Arab world and parts of Francophone Africa. But at the same time, Morocco lacks experience in farmer-managed irrigation systems or the turnover of government-managed systems to farmers. Therein lies IIMI's opportunity and rationale for initiating field operations in Morocco.

IIMI established the Morocco Field Operations unit in March 1989, following the 1988 signing of a Memorandum of Understanding with the government. At mid-year, and following a proposal from the Ministry of Agriculture and Agrarian Reform (Ministère de l'Agriculture et de la Réforme Agricole), IIMI established its office in the headquarters of the Irrigation and Drainage Experimentation Service



(Service des Expérimentations d'Hydraulique Agricole — SEHA) in Rabat. SEHA is a section of the government with a national mandate similar to IIMI's.

The Morocco Consultative Committee met for the first time in September and endorsed two ongoing projects: a 1990 workshop on farmer participation (in preparation during the year) and research of traditional systems in the Tessaout valley. The Committee also approved a future project on the implementation of management techniques within irrigation agencies, and suggested IIMI launch two new projects in collaboration with SEHA, to assess the performance of large irrigation systems and the dissemination of irrigation advice to farmers. Proposals for those projects were in preparation at the end of the year.

In late 1989, IIMI undertook a literature review and documentation of farmer behavior in the modernization of traditional irrigation systems in the upper Tessaout valley. This project operates in collaboration with ORMVAH (Office Régional de Mise en Valeur Agricole du Haouz — the Regional Agency for Agricultural Development of Haouz) and with the "Human Sciences" Department of Hassan II Agronomic and Veterinary Institute (Institut Agronomique et Vétérinaire Hassan II). The second stage of the project, the submission of recommendations and budget discussions for completion of a similar modernization on the lower part of the Tessaout valley, was initiated at the end of the year.

Also at the end of 1989, IIMI staff finalized plans for a 1990 workshop on African experiences in farmer-managed irrigation systems. The workshop, organized jointly with the Ministry of Agriculture and Agrarian Reform, will take place at the Rabat headquarters of IAV Hassan II.

“ In late 1989, IIMI undertook a literature review and documentation of farmer behavior in the modernization of traditional irrigation systems in the upper Tessaout valley. ”

SUDAN

Since Independence in 1956, Sudan has expanded its irrigated area to almost 1.7 million ha, more than any other country in Sub-Saharan Africa. While this amounts to only 25 percent of the total cultivated area within the country, nearly 50 percent of the food is produced on this land, including all wheat, most of the legumes, and 90 percent of the cotton. In addition to sustaining exports in years of low rainfall, irrigation can mean the difference between survival and mass starvation.

However, improving irrigation management will not be easy. Most systems are designed to irrigate extensive areas of land for short periods of time (as opposed to intensive irrigation of rice), which in arid lands leads to stiff competition for inputs — water and labor — among crops. Additionally, the rapid development of the irrigated sector has stretched available water resources to the limit.

A general realization in Sudan now exists that a mere restructuring of the physical system is not adequate to meet the new demands being placed on irrigation, i.e., achieving food self-sufficiency and maximizing agricultural exports. What is needed is better and more flexible irrigation management strategies.

IIMI began field operations in Sudan in 1989. IIMI signed a Memorandum of Understanding with the Government of Sudan to establish field operations in February and posted an internationally-recruited, resident staff member in July. Initial activities focused on outfitting the field offices, hiring staff, developing contacts with relevant government agencies, and devising a five-year "demand driven" workplan.

In October, IIMI hosted a national policy workshop and invited 75 high-level Sudanese officials to determine the most pressing irrigation management issues, and ultimately to develop a workplan for IIMI operations. Several issues emerged: farmers' roles in



irrigation management, inter-institutional cooperation and coordination, optimization of water-use, equity, and needs and objectives of systems modernization.

In December, the Sudan Consultative Committee was formally established with many members drawn from among those in attendance at the workshop. An early 1990 meeting was scheduled to finalize a long-term workplan.

At the end of the year, negotiations were underway to finalize plans for a second, internationally-recruited staff member to be posted at the Headquarters of the Sudan Gezira Board at Barakat. IIMI's irrigation specialist will serve the board as a senior water management adviser.

“ In October, IIMI hosted a national policy workshop and invited 75 high-level Sudanese officials to determine the most pressing irrigation management issues, and ultimately to develop a workplan for IIMI operations. ”

GLOBAL PROGRAMS

This section highlights global research related to IIMI's seven themes. Work in this area falls within the scope of the Programs Division, established in late 1988 as part of IIMI's new organizational restructuring. Activities of the Information Office are also presented here.

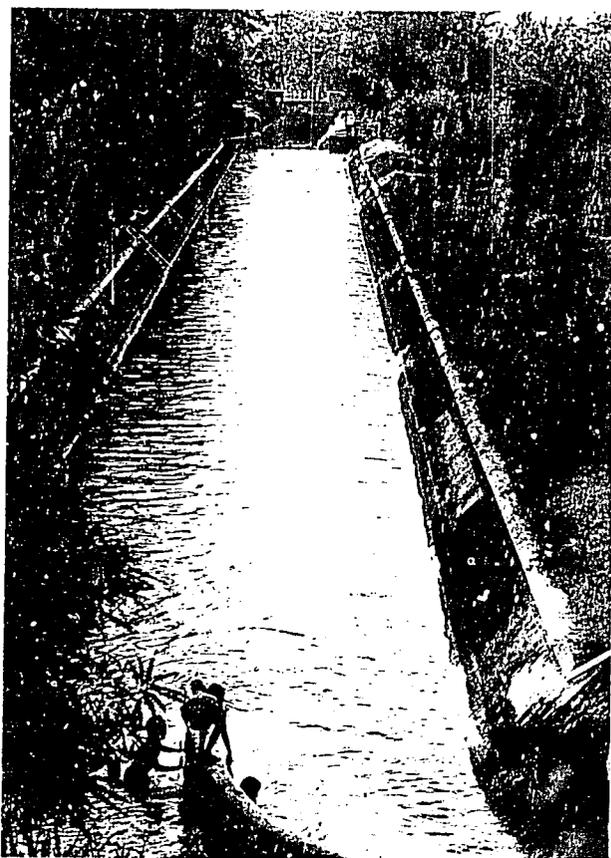
During 1989, the Institute concentrated efforts in this area on translating strategy into action. Often this meant reshaping existing activities to fit the thematic structure; in other cases it meant initiating new categories of activities. Throughout the year, staff continued three ongoing sets of activities concerned with *computer simulation of canal operations*, *irrigation management for rice-based systems*, and *assistance strategies for farmer-managed irrigation systems*. The Institute also initiated two new activities related to *the measurement of irrigation performance and management training*.

The Institute also drew on the Programs Division and Information Office to support other IIMI units, and to represent IIMI externally. Activities included: project missions to Sudan; project development in Nigeria; project development missions to Australia to identify potential areas of collaboration; and missions to the Philippines to assist in data analysis and report preparation.

Other activities included sending a project development team to India and a mission to Southeast Asian countries to investigate the potential of establishing a network on irrigation finance. Additionally, staff participated in a World Bank workshop on irrigation training for operation and maintenance and presented lectures at an international training course in France. A 1990 joint workshop of

IIMI and the International Congress on Irrigation and Drainage on Latin American irrigation management issues was also planned.

Division staff presented papers at international irrigation conferences in Manila, Berlin, Southampton and Tokyo. IIMI-sponsored regional advisory committee meetings were held in July and December to guide the farmer-managed irrigation systems and crop diversification networks.



EVALUATING PERFORMANCE

Evaluating performance of irrigation systems is one of the most perplexing questions in irrigation management research today. Performance touches on every aspect of irrigated agriculture — productivity, equity, sustainability and quality of life. While everyone agrees the performance of most irrigation systems in developing countries is less than it should be, few agree on the definition of performance, or how to measure it. The result is that performance generally comes down to the personal agenda of the evaluator, i.e., an engineer defines it one way while an agricultural specialist defines it as something entirely different.

In 1989, IIMI, in collaboration with IFPRI, initiated a multi-phase project with the ultimate goal of developing simple, low-cost methodologies for measuring the performance of irrigation systems. It is expected that various irrigation agencies will use these systems in planning, system improvement and evaluation tasks. The main thrust is directed towards providing system managers with benchmarks for evaluating and planning improvements to their systems.

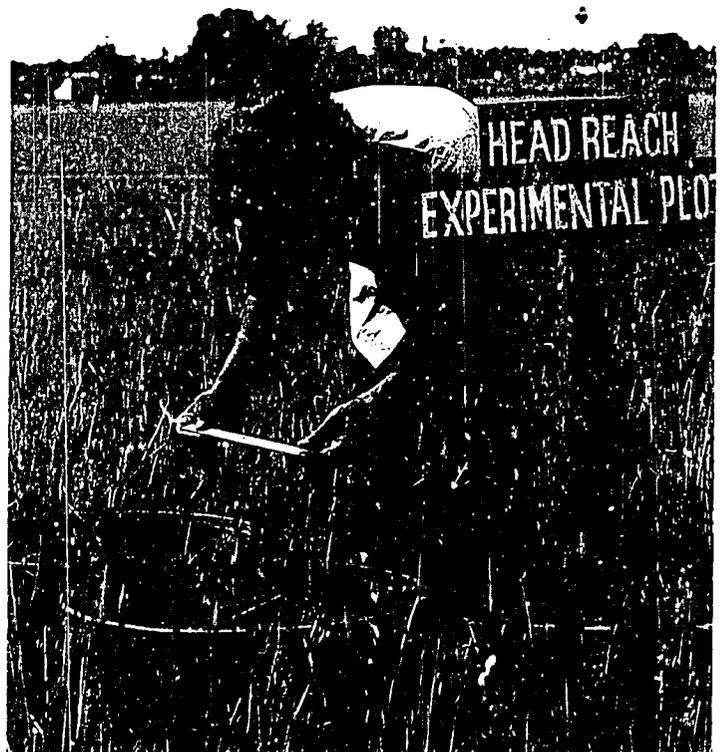
The purpose of this research is, first, to develop a conceptual foundation for measuring the performance of irrigation systems; second, to devise a set of performance measurements based on the conceptual foundation thus developed, utilizing accumulated experience with evaluation techniques and indicators; third, to test the suggested measures with existing data from system samples classified by category (arid, water-abundant, small) and fourth, to make available to potential users strengthened indicators and methods for their use, generated from the application of this approach to different classes of irrigation systems.

The project is proceeding as scheduled. The conceptual framework was completed in December 1989 with the preparation of two papers: one, an overview of the conceptual development of performance measures, and the other, a review of measurement techniques suggested by various professionals.

Additionally, three supporting activities neared or reached completion at year's end. The first is the development of a system classification model. The second is the design of a survey to test the availability of basic data from various

“ In 1989, IIMI, in collaboration with IFPRI, initiated a multi-phase project with the ultimate goal of developing simple, low-cost methodologies measuring the performance of irrigation systems. ”

agencies in the project sites. The survey, conducted in Sudan and India, was necessary because the project intends to introduce measures to be utilized with existing data and a minimum of field work. The third activity, completed in December, is a pilot study of the goal formulation process and the elaboration of system objectives in a selected number of organizations in Zimbabwe.



An important contribution made in this area was the holding of a one-day Symposium on the performance of irrigation systems in November 1989 as part of the Institute's annual Internal Program Review. In discussions and submitted papers, staff sought to assess developments and experiences gained in various projects relating to performance evaluation

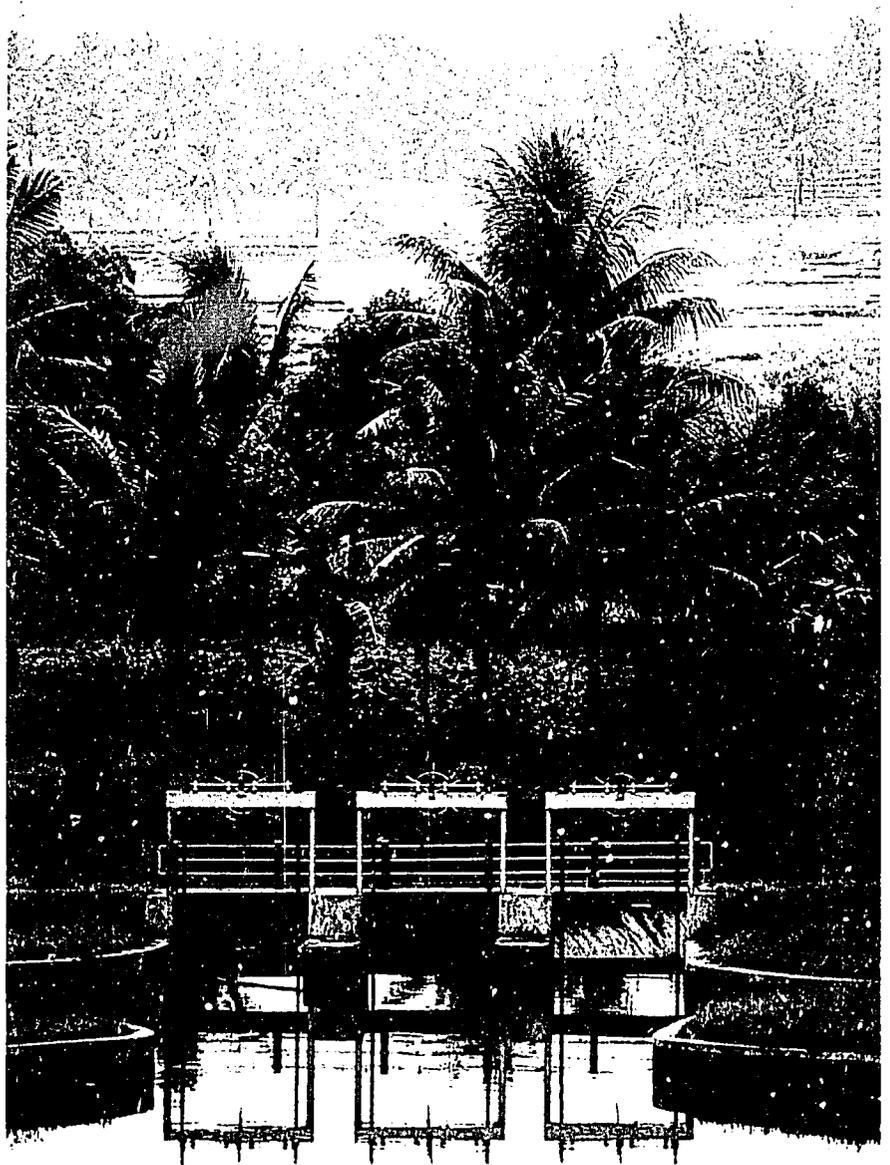
and to plan for the future direction of the research. Among the topics: a social science perspective on performance evaluation, systemic approaches and indicators in performance evaluation projects, and the need for control systems in organizations. Symposium papers will be published in 1990.

SIMULATING CANAL FLOWS

In almost five years of research, IIMI has rarely found an irrigation system that performed as intended by its designers. Few people appreciate the number of variables that affect the operation of large canals, many of which change during construction and after the system is completed. These factors can include the quality of construction in different sections, weed growth, siltation and debris buildup, rain, wind, and how well staff members synchronize the opening and closing of gates to smaller canals. Still, most irrigation engineers operate canals as though they were unchanging; any changes made over time tend to be rough estimates based on personal observations during occasional visits to the field; the longer the canal, the less accurate the estimation and the more deleterious the consequences.

An enterprising engineer, with a well-trained staff, could measure all these variables and run a series of field trials under different conditions to improve canal operation to its optimum performance level. However, IIMI has rarely found engineers willing to risk experiments that impact, in most cases, thousands of farmers and their families. There is an answer however. Develop a computer program that, after entering as many variables as necessary, simulates the

operations of a specific canal under varying conditions found in the field. The same engineer could then run



as many experiments as needed to learn how a particular canal works; if the engineer is transferred, the incoming engineer could use the same model to learn the system, a sort of institutional passing of knowledge.

Two years ago, IIMI set out to help adapt a "user-friendly" simulation model to be used by researchers and irrigation engineers with nothing more than a simple personal computer. At the end of 1989 the model neared completion.

The project has been carried out in collaboration with the Centre National du Machinisme Agricole, du Génie Rural, des Eaux et Forêts (CEMAGREF), a state-sponsored, applied research center in France with expertise in hydraulics and irrigation, and Sri Lanka's Irrigation Department. CEMAGREF is developing the model building upon sub-programs already in existence there. User-friendly interface factors are being added according to IIMI's specifications, based on field research of the 30 km Kirindi Oya canal in southern Sri Lanka. The interfaces are aimed at catering to the needs of researchers, as well as department staff in a position to simulate different operating rules for the main canal, before actually implementing the rule in the field.

“ Two years ago, IIMI set out to help adapt a “user-friendly” simulation model to be used by researchers and irrigation engineers with nothing more than a simple personal computer. ”

To review the progress and guide development of the model, a Study Advisory Committee (SAC) composed of several international experts in mathematical modeling, and representatives of the Sri Lanka Irrigation Department has been established. The

committee met twice in 1989, once in June and again in October. The participation of the Sri Lanka Irrigation Department has been critical in ensuring the practical use of the model.

CEMAGREF delivered the final calibrated version to IIMI in late August. During the year, IIMI used the model to simulate steady and unsteady flow conditions, to test the capacity of the canal it was originally based on and to identify canal sections that might require improvement. It was also used to yield information on various aspects of design and maintenance, e.g., demonstrate the effect of changes in canal roughness, or increased weed growth, and assess the impact of any contemplated design modification such as canal lining.

In October, IIMI began simulations with the unsteady flow model using the first interfaced version; this included the potential to calculate offtake discharges, or offtake gate openings, for a range of specified downstream conditions.

The current application of a mathematical model to simulate canal operations in Sri Lanka is only the first step in IIMI's long-term strategy aimed at upgrading the design and management of main canals. The overall goal is to achieve higher performance levels in the conveyance and distribution of water. Looking to the future, IIMI intends to test the model, once completed, in other physical and institutional environments.

“ The current application of a mathematical model to simulate canal operations in Sri Lanka is only the first step in IIMI's long-term strategy aimed at upgrading the design and management of main canals. ”

DRY-SEASON IRRIGATION MANAGEMENT FOR RICE-BASED SYSTEMS

At the time of IIMI's establishment in mid-1984, several Asian countries were on the threshold of becoming self-sufficient, or had already attained self-sufficiency, in rice production. This was possible through the spread of the new rice technologies introduced by the International Rice Research Institute (IRRI) and counterpart national research institutions, in combination with the rapid expansion of irrigated areas. Huge investments in irrigation systems provided the controlled, flooded-water environment necessary to take advantage of the new, high-yielding and early-maturing rice varieties. The success in increased rice production spawned, however, a second-generation problem of declining farmer income from rice production.

It is in this context that IIMI, shortly after its establishment, responded to a request from the ADB to explore the potential for, and constraints to, accommodating non-rice crops in irrigation systems designed, constructed, and operated solely for rice production.

IIMI began to address the issue in early 1985 in the Philippines, Sri Lanka and Indonesia. In 1988, the ADB provided funding to IIMI to make a comparative synthesis of the results of its research in the three countries. The synthesis was completed in 1989. (IIMI's collaborative project with IRRI, entitled "*Problems of Irrigation Management in Rice-Based Irrigation Systems*," carried out in the Philippines, Indonesia and Bangladesh with funding from the Rockefeller Foundation, embraces similar issues. Results from that project are discussed in this report under Country Operations.)

In undertaking the project, research results obtained from selected irrigation sites in the three countries from 1985 to 1988 were analyzed and compared. This was done by establishing common reference points, such as common constraints, potentials, and institutional arrangements, and explaining differences based on observed data for each system. Relevant secondary data from sources other than those collected at other research sites, such as reports prepared for the ADB, the World Bank and other organizations, shed further light on the synthesis.

Preliminary findings were presented in Bangkok in late 1988 at an organizational and planning workshop

for a research network on irrigation management for diversified cropping in rice-based systems. In early 1989, staff presented the implications of the findings on the rehabilitation and modernization of rice irrigation schemes at the Asian Regional Symposium on the Modernization and Rehabilitation of Irrigation and Drainage Schemes held in the Philippines.

At the end of 1989, several conclusions could be drawn and recommendations made to policymakers now considering ways to increase non-rice crop production in rice-based irrigation systems. (Country-specific information on constraints and potentials is reported under Country Operations.)

These conclusions and recommendations include:

- The systems that should be selected first are those with a limited water supply where conditions are not adequate to meet the requirements of rice for the whole command area during the dry season and which have substantial areas of well-drained, coarse or diversified land soils.
- The physical condition of the irrigation system should be at least such that a satisfactory level of water delivery and control at various levels can occur.
- There is an urgent need to improve interaction between irrigation staff and farmers involved in irrigation system management. Some form of joint management by encouraging increased organized farmers' participation in the management process is needed to meet the demanding requirements of non-rice crops in situations where the water supply is limited and often unreliable.

The synthesis of the research results strongly suggests the following research agenda to tackle the outstanding issues on the subject:

- Research should focus on suitable methodologies for the introduction of an effective process for improving communication between agency staff and farmers in the management of the more demanding intermittent water delivery.
- There is a need to develop improved assessment methods for matching water supply and demand, including water supply augmentation possibilities under diversified cropping conditions.

- To reduce, if not eliminate waterlogging, there is a need to find alternative irrigation and drainage system designs to enable the timely application and removal of water.

Some of these research issues are best addressed by national agricultural research systems or by international crop research institutes. On the other

hand, through the research network on irrigation management for diversified cropping in rice-based systems, organized by IIMI in 1989, the Institute will be able to collaborate with irrigation management agencies and research organizations in developing and disseminating management innovations to solve the outstanding problems.

FARMER-MANAGED IRRIGATION SYSTEMS

During 1989, the IIMI-sponsored network on Farmer-Managed Irrigation Systems (FMIS) continued to expand and evolve through workshops, dissemination of an international newsletter, and specific research projects designed to support national research efforts. The network and related research are funded by IFAD and BMZ.

During the year, considerable progress was made in six countries: Bhutan, Pakistan, Thailand, Sri Lanka, and Morocco.

In early 1989, IIMI staff conducted a training program for eight Bhutanese officials on rapid appraisal and water users' associations.

In **Pakistan**, IIMI continued its interaction with the Chitral Area Development Project which plans to rehabilitate 80 farmer-managed systems and construct 80 new ones. In total, 4,500 ha will receive irrigation facilities through the Chitral Area Development Project irrigation component. The project, generally, will follow a model developed by the Aga Khan Rural Support Programme, which organizes villages to implement construction work. During discussions with project managers, IIMI agreed to provide a range of support from analyzing the implementation process to developing a database on Chitral irrigation management systems currently practiced by farmers.

In **Thailand** work also began on the IFAD-financed Peoples Irrigation Project in the Chiang Mai Province.



During the year, IIMI reviewed the project's implementation and progress through field visits and discussions with relevant agencies in Bangkok. Discussions aimed at identifying project constraints

and developing appropriate approaches and operational strategies for project development.

In **Sri Lanka**, IIMI concluded several activities, including a rapid assessment survey of the Anuradhapura Dry Zone Agricultural Project, a literature review of research on small-scale irrigation in Sri Lanka, and a national workshop on the role of NGOs involved in farmer-managed irrigation system improvements.

In **Morocco**, IIMI-sponsored research documented government efforts to improve the infrastructure of farmer-managed systems, without endangering the indigenous management systems. The work is being carried out by a faculty member from IAV-Hassan II, in collaboration with a local parastatal organization.

At the end of the year, **the FMIS Network** had expanded its mailing list to include 429 members in 44 countries. The network advisory committee met once

to discuss the scope of the FMIS network. The group agreed to include groundwater use as a future study focus.

The network sponsored two workshops during the year jointly organized by IIMI and the Thailand Research and Irrigation Management Network.

In May, "the role of social organizers in farmer-managed irrigation systems" was held in Khon Kaen, Thailand, with 25 participants from 9 countries. The proceedings will be published in 1990. In December, a workshop on "Design issues in farmer-managed irrigation systems" was held in Chiang Mai, Thailand. Over 70 researchers from 19 countries participated. Thirty papers were presented for discussion. The purpose was to create an awareness of the importance of design in these systems, to present design innovations, and to exchange information of design ideas. The workshop proceedings will be published by IIMI in 1990.

MANAGEMENT TRAINING

A large number of training courses in irrigation are offered around the world. Most are centered on three disciplines — engineering and hydrology, agriculture, and economic social sciences. A few do offer courses on irrigation management, but most of these are in developed countries. Efforts are underway to introduce interdepartmental training programs, as with the Water and Land Management Institutes in India; but in most countries these programs are in the very early stages of development if they are being developed at all.

As part of IIMI's Strategy, the Institute is placing more emphasis on training activities; this included hiring a full-time training specialist and increasing the budget over earlier years. Activities will focus on irrigation management and will target irrigation managers, researchers, and trainers. Results will be achieved indirectly, through the provision of support to national training agencies, and directly, through the organization of seminars and workshops, the provision of opportunities for on-the-job research experience, and the continuation of IIMI's Fellowship and Special Awards Program.

In early 1989, and as a first step in developing the program, the Training Specialist visited several

national irrigation institutions and training agencies to learn more about existing training capabilities, facilities, and their "vision" of irrigation management training. These included institutions in Thailand, the Philippines, Malaysia, and India. The specialist also participated in several workshops, seminars and missions, including among others the Seminar on Policies and Strategies for Irrigation Training and Management at the Centre for International Irrigation Training and Research at the University of Melbourne, Australia.

In November, following months of preparation, a team of IIMI professionals joined counterparts in the Malaysian Department of Irrigation and Drainage (DID) for an experimental training needs assessment of irrigation staff. The 16-session month-long program, held in Kuala Lumpur and Kota Bharu in November 1989, was the first of many such assessments IIMI hopes to conduct in other countries. Over 338 irrigation professionals attended the sessions, including system managers, trainers, and senior officials from the DID, the Muda Agricultural Authority, and the Malaysian Agricultural Research and Development Institute. The purpose of the four-part exercise was to determine the knowledge, attitudes, and skills needed to develop an effective personnel

training program for the Malaysia irrigation department.

Following the workshop, staff conducted a post-evaluation using information culled from lists, questionnaires and forms used in the exercise. (Results of the final assessment were presented to top management officials in a February 1990 workshop.)

In the area of fellowships and special awards, during 1989 IIMI sponsored five Master's Degree candidates

and nine doctoral candidates (for a complete list see Annex III). One master's student completed his work in the Philippines, on the "corporate strategy of the Upper Pampanga River Integrated Irrigation System" in that country. A doctoral candidate from France completed her work to determine the feasibility of using the "Expert System Technique" for the diagnostic evaluation of tank irrigated systems in Tamil Nadu, and submitted her thesis to Anna University in Madras.

INFORMATION

1989 has been a year of consolidation and planning for the future. The year's biggest challenge was to find systems capable of meeting the Institute's needs in the dissemination of management information while reaching out to support national efforts to obtain information on irrigation management.

Various strategic steps were taken during the year to create the necessary base. These included designing the information component of the 1990-1994 Workplan and reshaping the program to fit the current Workplan in 1989 and 1990. Planning was facilitated by the completion of an evaluation of IIMI's information program to date with recommendations for the future carried out with funding from the International Development Research Centre of Canada. The Information Office, also helped prepare a publications policy which served to increase output, target audiences and markets and provide outlets for access to refereed journals and co-publishing opportunities.

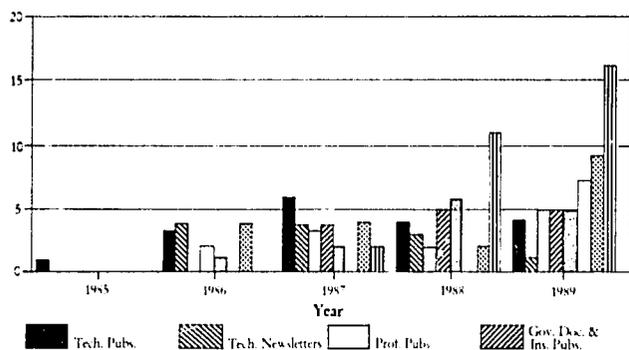
Along with strategic action, the Office completely overhauled the organizational structure to meet the

requirements of the program. This included the creation of line departments – Publications, Communications and Technical Information; recruitment of support staff to key positions; and implementation of a new strategy to move away from in-house production to outside contracting (mainly in Singapore). The shift to Singapore for printing improved the quality of publications and lowered costs. At the same time, the Office took advantage of improved distribution servicing facilities available there.

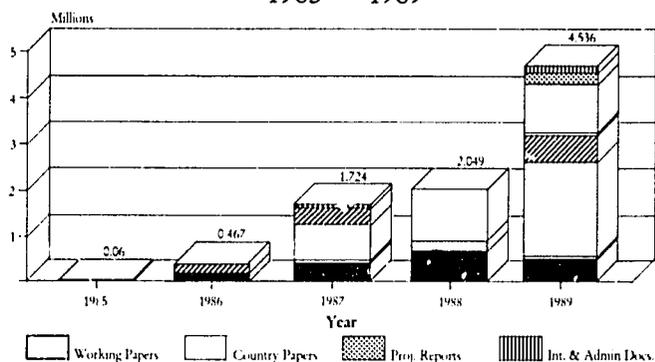
During 1989, the number of publications increased markedly over 1988. By the end of the year, the Office had edited 6,144 text pages and printed and published 52 volumes (an increase over the 1988 figures of 140.5 percent and 57.5 percent respectively.) The Institute initiated a new series, the Country Paper series. Near the end of the year, the Office assisted the World Bank in preparing a publication on *Groundwater and Poverty Alleviation*.

IIMI displayed its publications at the Frankfurt Book Fair and several other locations. IIMI representatives

PUBLICATIONS
1985 – 1989



PRINTED PAGES
1985 – 1989



also attended CGIAR information meetings in Hyderabad and Bonn. Visits were also made to IBSRAM, ICRAF and IRRI. The promotion and sales of selected IIMI publications were started toward the end of the year, and sales distribution agreements were made for North America and Europe.

The IIMI slide library base continued to increase in volume. A core slide show on IIMI and its activities was prepared.

The *Technical Information Department*, constituted by the Library and Documentation service made good progress despite a mid-year move of Headquarters operations. New acquisitions totalled 1,232, a 27.6

percent increase over 1988. The documentation data base continued, increasing its records from 3,712 to nearly 5,000.

Last, in October, an IIMI staff information specialist conducted a five-day workshop on the development of a microcomputer-based library information system for 18 participants from nine Irrigation Management Training Institutes and Water and Land Management Institutes in India at the Irrigation Management Training Institute at Tiruchirapalli.

The *ODI/IIMI Network*, continued its efforts in information outreach producing two issues of eight papers and considerably expanding its mailing lists.

FINANCE AND ADMINISTRATION

In 1989, IIMI employed US\$2.272 million in unrestricted resources, US\$0.288 million in indirect cost recoveries and US\$4.139 million in restricted support to meet gross expenditures of US\$6.636 million thus ending the year with a modest surplus of about US\$63,000. After allowing for indirect cost recoveries, IIMI's net resources for 1989 were US\$6.411 million and net expenditures were US\$6.348 million.

The US\$2.272 million in unrestricted resources employed in 1989 breaks down as shown in Table 1. Details of indirect cost recoveries are shown in Table 2.

Table 1. Unrestricted support for 1989.

DONORS	FUNDS RECEIVED FOR 1989 (US\$)
UNRESTRICTED GRANTS	
Canada	167,842
Ford Foundation	400,000
Japan	136,142
Staff Secondment - Netherlands	55,945
Japan	85,000
United States	300,000
World Bank	600,000
Subtotal	1,744,929
Interest Income	174,876
Other Income	102,441
Transfer from Operating Surplus	250,000
Total	2,272,246

Source: 1989 Report of the Auditors.

Table 2. Statement of Indirect Cost Recoveries - 1989 (US\$).

INDIRECT COST RECOVERIES	
ADB - Indonesia Phase II	25,510
ADB - Philippines Phase II	3,918
ADB - Regional TA	13,533
AFDB - IIMI Program in Africa	14,674
Aga Khan Foundation - Research on FMIS	9,598
Cornell-Nepal Assignment	1,892
Ford - Bangladesh	24,234
Ford - India	10,713
Ford - Indonesia Phase II	8,313
Ford - Sudan	42,924
France - Support for Morocco & West Africa	1,955
Netherlands - Waterlogging & Salinity Project	19,889
USAID - Accelerated Agricultural Production Project	38,322
USAID - India	7,803
USAID - ISM Sri Lanka	7,181
USAID - ISPAN	31,920
USAID - West Africa	25,125
World Bank - Editing of Groundwater Colloquium	800
Total	288,304

Source: 1989 Report of the Auditors.

Tables 3 and 4 show the breakdown of the total 1989 expenditures of US\$6.636 million by expense categories and by organizational units, respectively. In both cases, 1989 actual expenditures are compared with 1988 actual expenditures.

Table 3. Expenditures by Expense Categories, 1989 and 1988 (US\$000)

	ACTUAL EXPENDITURE 1989	ACTUAL EXPENDITURE 1988
International staff salaries & benefits	2,554,360	1,836,636
Consultants	317,998	156,834
National staff salaries & benefits	976,689	685,864
International Travel	460,761	380,572
National Travel	271,732	257,527
Office & research supplies	911,532	755,306
Workshops	100,439	43,590
Fellowships	89,853	25,836
Publication & Dissemination	153,944	92,347
Vehicle Equipment	379,392	680,904
Indirect Cost	288,304	170,214
Contract Research	131,418	81,529
Total	6,636,422	5,167,159

Sources of actual expenditures: 1989 and 1988 Reports of the Auditors.

Table 4. Expenditures by Organizational Units, 1989 and 1988 (US\$000)

	ACTUAL EXPENDITURE 1989	ACTUAL EXPENDITURE 1988
FIELD OPERATIONS DIVISION		
Direction	160,820	142,154
Sri Lanka	464,997	480,942
Indonesia	448,348	314,293
Philippines	368,613	172,192
Nepal	160,924	159,254
India	93,876	23,120
Bangladesh	181,140	34,415
West Africa	243,160	320,688
Morocco	40,906	8,506
Sudan	261,806	96,022
PAKISTAN DIVISION	1,114,086	953,893
PROGRAMS DIVISION --		
Direction	194,455	166,330
General	68,328	-
Training	166,038	157,107
Thematic Research	634,819	356,706
Regional Projects	3,672	285,127
Informational Exchange	17,745	-
INFORMATION OFFICE	346,466	349,170
GOVERNING BOARD	142,767	186,595
DIRECTOR GENERAL'S OFFICE	332,123	210,772
PROJECT DEVELOPMENT OFFICE	80,794	-
FINANCE & ADMINISTRATION DIVISION	649,150	749,873
SHIFT TO COLOMBO	461,389	-
Total	6,636,422	5,167,159

Sources of actual expenditures: 1989 and 1988 Reports of the Auditors.

As reflected in Table 5, 25 restricted projects with a value of over US\$2 million were approved during the year. Expenditures of US\$4,138 million on restricted projects in 1989 are shown in Table 6.

Table 5. Restricted Projects approved in 1989.

Donor	Project	US\$
ADB	Workshop on resource management for sustainable management of major irrigation schemes	50,000
AFDB	HMI program in Africa	125,000
AGA KHAN	Research on irrigation efficiencies on farmer-managed irrigation systems in Hunza-Gojal	
CIDA	Support for External Review of HMI	24,861
CORNELL	Nepal irrigation management project	9,592
FORD	Bridging support for Nepal	176,000
FORD	Workshop at Khen Kaen – The role of social organizers in farmer-managed irrigation systems	6,000
FORD	Workshop at Khen Kaen – The role of social organizers in farmer-managed irrigation systems	9,850
FORD	Support the efforts to strengthen international research on natural resource management	20,948
FORD	Support for External Review of HMI	29,052
FORD	Third Int'l conference on Water Law and Administration	12,000
FRANCE	Support for activities undertaken by HMI in Morocco and West Africa	139,820
FRANCE	Support for External Review of HMI	15,652
FRANCE	Trust Fund for Staff Secondment	121,916
IFPRI	Joint research project on "assessing irrigation system performance"	85,000
ISPAN	Provision of institutional development specialist on the IMP redesign project	6,972
JAPAN	Irrigation management for crop diversification	20,000
JICA	Irrigation Investment Trends	9,370
ODA	Support for External Review of HMI (Sterl. Pounds 10,000)	16,000
ROCKEFELLER	Support for External Review of HMI	25,000
USAID	Accelerated Agriculture Production Project	640,000
USAID	India: Collab. Res. & Training Activities in Irrig. Mgmt. with Indian Institutions	500,000
USAID	Support for External Review of HMI	20,000
UNDP	Workshop at Chiang Mai	39,000
WORLD BANK	Editing Paper of Poverty and Groundwater Colloquium	4,000
Total		2,159,278

Table 6. Restricted expenditures in 1989 (Expenditures include indirect costs charged to donors where applicable).

Donor	Project	US\$
ADB	Indonesia Phase II	288,392
ADB	Philippines Phase II	66,714
ADB	Regional TA	86,668
ADB	Sri Lanka TA	122,328
ADB	Workshop on Resource Mobilization for Sustainable Irrigation	3,014
AFDB	HMI Program in Africa	108,978
AGA KHAN	Research on FMIS	53,245
CIDA FRANCE/ ROCKEFELLER	HMI External Review	43,420
CORNELL	Nepal Assignment	9,592
FORD	Bangladesh	166,439
FORD	Nepal	148,060
FORD	India	53,565
FORD	Khon Kaen Workshop	15,850
FORD	Indonesia	76,520
FORD	Joint Paper on Associated Centres	20,948
FORD	Nigeria	20,000
FORD	Professional Development	6,661
FORD	Sudan	260,271
FORD	Third Int'l Conference on Water Law and Administration	5,890
FRANCE	Simulation Model	34,207
FRANCE	Support for Morocco and West Africa	42,351
FRANCE	Trust Fund for Staff Secondment	94,581
IDRC	Support for Review for HMI Information Program	21,659
IFAD/BMZ	Assistance to Farmer-Managed Irrigation	196,513
IFAD	Pakistan	109,105
IIPRI/FORD	Irrigation Performance Assessment	44,750
JAPAN	Crop Diversification	14,148
JICA	Irrigation Investment Trends	9,370
NETHERLANDS	Waterlogging and Salinity Project	215,852
ROCKEFELLER	HMI/IRRI Project	353,041
UNDP	Workshop at Chiang Mai	25,463
USAID	Philippines	274,927
USAID	India	40,310
USAID	Sri Lanka	61,380
USAID	ISPAN	159,223
USAID	Pakistan	735,884
USAID	West Africa	123,623
USAID	Nepal	6,972
WORLD BANK	Groundwater Colloquium	18,700
Total		4,138,614

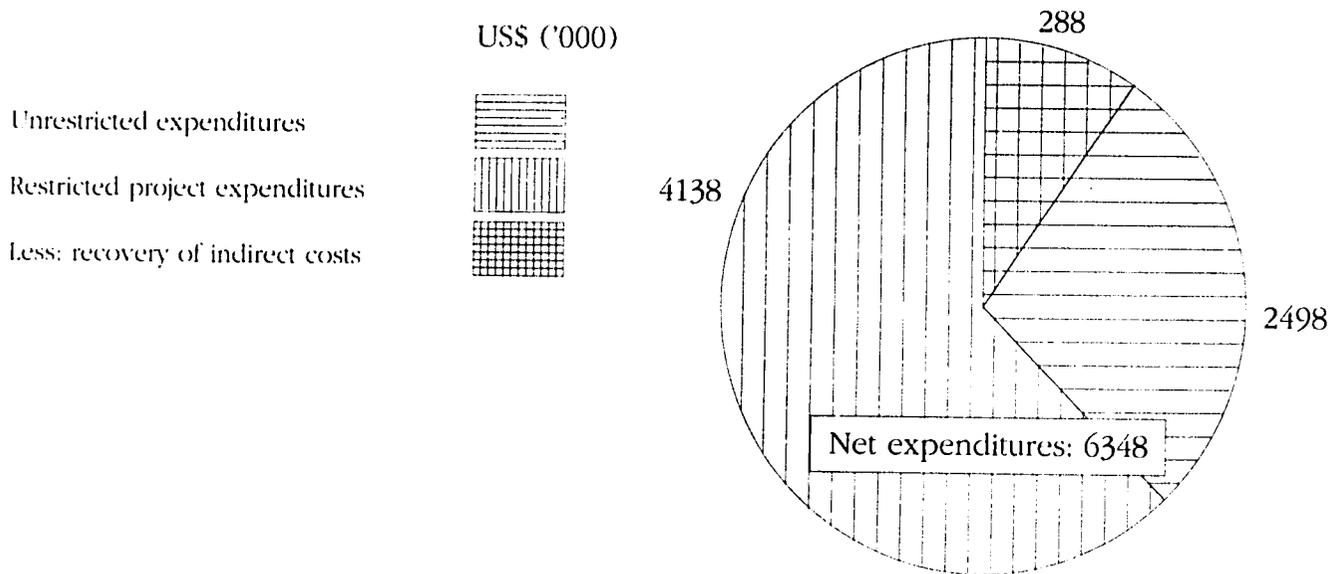
Source: 1989 Report of the Auditors.

Consolidated Statement of Financial Position (Balance Sheet)
as of 31 December 1989

IIMI's consolidated balance sheet as of 31 December 1989 reflects the fact that during the year 1989 the accounting policy relating to the recognition of restricted grants receivable was changed in order to bring the Institute's accounting policies in line with those recommended by the Consultative Group on International Agricultural Research (CGIAR) Guideline Series 2 issued in 1988. The comparative figures for 1988 have been accordingly restated.

	1989 US \$	1988 US \$
CURRENT ASSETS		
Cash and Short Term Deposits	1,000,789	2,683,386
Receivables	1,498,028	677,993
Deposits and Pre-payments	550,725	136,760
Total Current Assets	3,049,542	3,498,139
PROPERTY, PLANT AND EQUIPMENT	<u>2,037,413</u>	<u>1,962,631</u>
TOTAL ASSETS	<u><u>5,086,955</u></u>	<u><u>5,460,770</u></u>
 CURRENT LIABILITIES		
Funds Applicable to Succeeding Years	1,310,923	1,615,908
Other Payables and Accruals	458,094	414,448
Total Current Liabilities	1,769,017	2,030,356
 FUND BALANCES		
Funds representing investment in Property, Plant and Equipment	2,037,413	1,962,631
Reserves	448,095	448,095
Retained Operating Surplus	832,430	1,019,688
Total Fund Balance	3,317,938	3,430,414
TOTAL CURRENT LIABILITIES AND FUND BALANCES	<u><u>5,086,955</u></u>	<u><u>5,460,770</u></u>

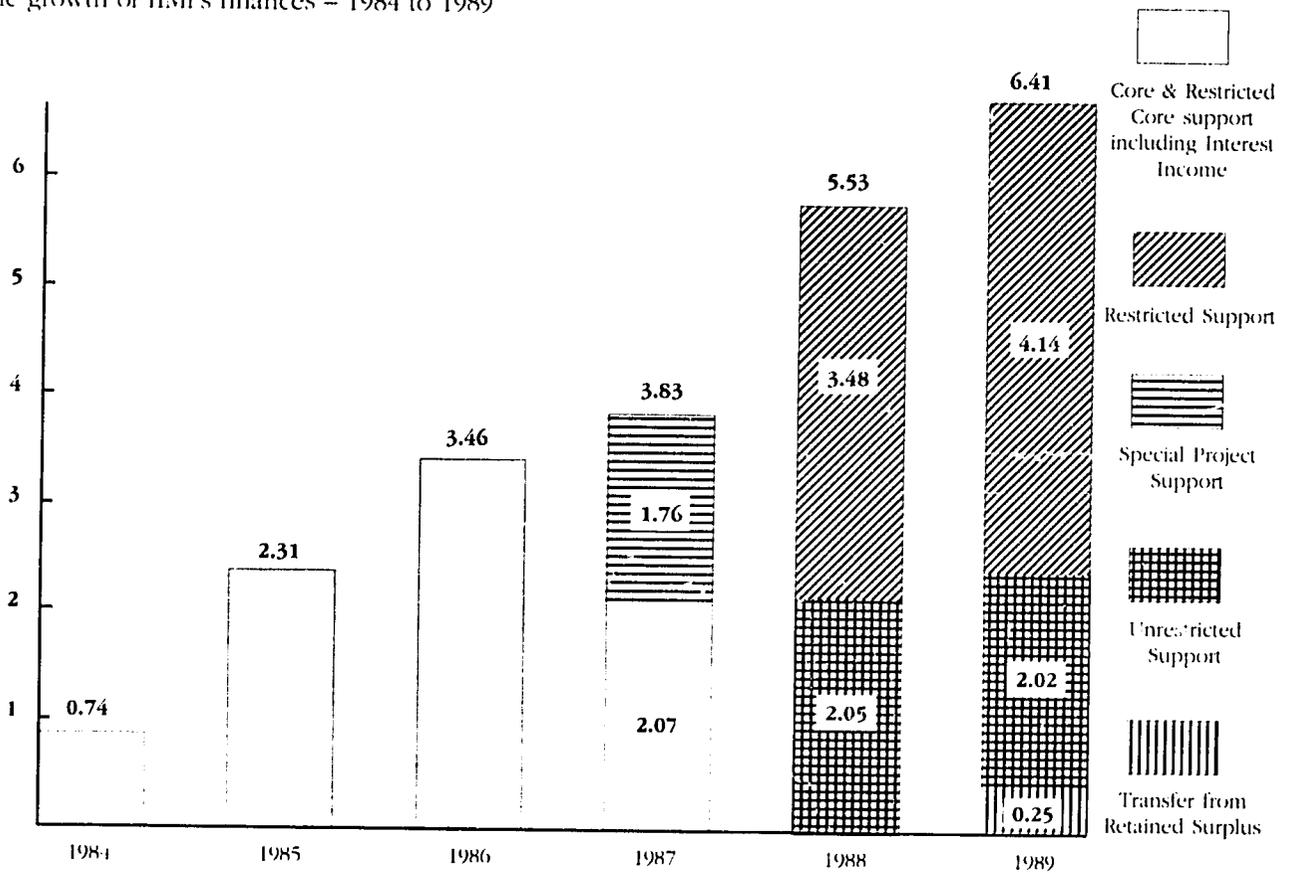
1989 Net Expenditures



1989 Net Income

The following figure shows IIMI's net income of \$6.41 million from unrestricted and restricted project sources for the year 1989 in comparison with net income for the years 1984, 1985, 1986, 1987 and 1988.

The growth of IIMI's finances - 1984 to 1989



ANNEX I

1989 RESTRICTED PROJECTS

PROJECT/PURPOSE	FUNDING SOURCE	AMOUNT*	DURATION
<p>STUDY ON IRRIGATION MANAGEMENT IN INDONESIA PHASE II</p> <p>To identify changes which would promote more efficient use of O&M resources, to pilot test suitable O&M practices for non-rice crops, and to analyze and document processes used in turnover to water users. This project builds on Phase I of the IIMI ADB study to identify constraints to irrigated non-rice cropping in the dry season.</p>	ASIAN DEVELOPMENT BANK	600,000	2 years
<p>STUDY ON IRRIGATION MANAGEMENT FOR DIVERSIFIED CROPS IN THE PHILIPPINES PHASE II</p> <p>To strengthen the long-term viability of Philippine irrigation systems by identifying management improvements which are sustainable throughout the process of system rehabilitation, design and management.</p>	ASIAN DEVELOPMENT BANK	350,000	30 months
<p>STUDY ON IRRIGATION SYSTEMS REHABILITATION AND IMPROVED OPERATIONS AND MANAGEMENT</p> <p>To strengthen the long-term viability of irrigation systems by identifying improvements that can be made in systems management and in operations and maintenance for systems that are mainly rice-based, and which also are suitable for some diversified cropping.</p>	ASIAN DEVELOPMENT BANK	350,000	14 months
<p>STUDY OF IRRIGATION MANAGEMENT AND CROP DIVERSIFICATION-KIRINDI OYA AND UDA WALAWE</p> <p>To identify means to increase use of existing land, water and infrastructure resources through improvements in the processes of rehabilitation, systems management, and operation and maintenance with particular attention to crop diversification.</p>	ASIAN DEVELOPMENT BANK	350,000	28 months
<p>WORKSHOP ON RESOURCE MANAGEMENT FOR SUSTAINABLE MANAGEMENT OF MAJOR IRRIGATION SCHEMES</p> <p>To support, at the request of the Government of Sri Lanka, a national workshop to assist in achieving a consensus on policies and implementation strategies for resource mobilization, to support the policy object of improving irrigation systems performance through participatory management with farmers.</p>	ASIAN DEVELOPMENT BANK	50,000	1 year
<p>SUPPORT FOR IIMI RESEARCH PROGRAMS</p> <p>Support for IIMI research programs in West Africa, Morocco and Sudan.</p>	AFRICAN DEVELOPMENT BANK	245,006	2 years
<p>RESEARCH ON IRRIGATION EFFICIENCIES ON FARMER-MANAGED IRRIGATION SYSTEMS IN HUNZA-GOJAL</p> <p>To determine current systems performance in several AKRSP associated as well as older, established farmer-managed irrigation systems in Hunza-Gojal and to identify improvements if any that can be met in the design, development and management of irrigation systems currently followed by farmers.</p>	AGA KHAN FOUNDATION/ CIDA	Pak Rupees 1,139,378	1 year
<p>ASSISTANCE TO FARMER-MANAGED IRRIGATION SYSTEMS</p> <p>To support a research program in farmer-managed irrigation systems.</p>	BMZ	520,000	3 years
<p>SUPPORT FOR EXTERNAL REVIEW OF IIMI</p> <p>Partial support to meet expenditure in connection with the External Review of IIMI.</p>	CIDA	24,861	6 months

ANNEX 1 (continued)

NEPAL IRRIGATION MANAGEMENT PROJECT Support for IIMI consultant to the Nepal Irrigation Management Project.	CORNELL UNIVERSITY	9,592	1 month
SUPPORT FOR EXTERNAL REVIEW OF IIMI Partial support to meet expenditure in connection with the External Review of IIMI.	FORD FOUNDATION New York	29,052	6 months
SUPPORT TO BANGLADESH FOR RESEARCH AND TRAINING IN IRRIGATION SYSTEMS To strengthen the capacity of relevant institutions and personnel in Bangladesh to manage irrigation systems and irrigation development.	FORD FOUNDATION Dhaka	450,000	3 years
COLLABORATIVE RESEARCH AND TRAINING ACTIVITIES IN IRRIGATION MANAGEMENT WITH INDIAN INSTITUTIONS To explore and initiate collaborative projects between IIMI and Indian institutions through research, professional development and information exchange. This work is designed to strengthen the capacity of Indian institutions to contribute to the improvement of irrigation systems.	FORD FOUNDATION Delhi	200,000	2 years
ANALYSIS OF IRRIGATION RESEARCH FINDINGS IN INDONESIA To support collaborative research with the Gadjah Mada University to recalibrate irrigation measurement devices in selected irrigation schemes in Java.	FORD FOUNDATION Jakarta	26,200	18 months
EFFICIENT IRRIGATION MANAGEMENT & SYSTEM TRANSFER PROJECT To identify changes which would promote more efficient use of O&M resources, to pilot-test suitable O&M practices for non-rice crops, and to analyse and document processes used in turnover to water users. This project builds on Phase I of the IIMI ADB study to identify constraints to irrigated non-rice cropping in the dry season.	FORD FOUNDATION Jakarta	300,000	30 months
ESTABLISHMENT OF RESEARCH PLANNING AND IMPLEMENTATION UNIT ON IRRIGATION MANAGEMENT IN NEPAL To support a program in Nepal to strengthen the capacity of that government's principal irrigation agency to plan, manage, and utilize irrigation management research, particularly research related to government assistance to small-scale and farmer-managed irrigation systems.	FORD FOUNDATION Delhi	200,000	3 years
STUDY ON FARMER-MANAGED IRRIGATION IN NORTHERN NIGERIA Research on farmer-managed irrigation in Northern Nigeria in collaboration with Ahmadu Bello University.	FORD FOUNDATION Dakar	20,000	2 years
FELLOWSHIP SUPPORT FOR IMPROVED IRRIGATION MANAGEMENT To support postdoctoral research on irrigation-related settlement planning, and predoctoral research to develop a model that would simulate the functioning of a small tank irrigation system.	FORD FOUNDATION New York	46,300	3 years
SUPPORT FOR ESTABLISHING A PROGRAM IN SUDAN Partial support to establish an irrigation management program in Sudan.	FORD FOUNDATION Cairo	495,000	2years

ANNEX I (continued)

THE THIRD WORLD CONFERENCE ON WATER LAW AND ADMINISTRATION Grant to support airfares, accommodation, registration and other costs of four participants presenting papers at the above conference.	FORD FOUNDATION Delhi	12,000	1 year
WORKSHOP AT KHON KAEN Support for South East Asian participants to participate in an irrigation workshop on social organizers assistance to farmer-managed irrigation systems.	FORD FOUNDATION Jakarta	9,850	1 year
WORKSHOP AT KHON KAEN Support for South Asian participants to participate in an irrigation workshop on social organizers' assistance to farmer-managed irrigation systems.	FORD FOUNDATION Delhi	6,000	1 year
SUPPORT FOR THE PREPARATION OF A JOINT PAPER ON THE WORK OF ASSOCIATED CENTERS To support IIMI's efforts to strengthen international research on natural resource management.	FORD FOUNDATION New York	20,948	1 year
BRIDGING SUPPORT FOR NEPAL To support a program in Nepal to strengthen the capacity of that government's principal irrigation agency to plan, manage and utilize irrigation management research, particularly research related to government assistance to small-scale and farmer-managed irrigation systems.	FORD FOUNDATION New York	176,000	1 year
TRUST FUND Government of France - trust fund for staff secondment.	FRANCE	121,916	1 year
APPLICATION OF MATHEMATICAL MODEL FOR SIMULATIONS OF MAIN CANAL OPERATIONS IN SRI LANKA To support research on main canal operations using a mathematical model produced on microcomputers.	FRANCE	114,000	3 years
SUPPORT FOR EXTERNAL REVIEW OF IIMI Partial support to meet expenditure in connection with the External Review of IIMI.	FRANCE	15,652	6 months
SUPPORT FOR IIMI PROGRAM IN MOROCCO AND WEST AFRICA Support for activities undertaken in Morocco and West Africa.	FRANCE	F.FRANCS 800,000	1 year
ESTABLISHMENT OF AN IIMI BRANCH IN PAKISTAN To establish a branch in Pakistan for research and training, in collaboration with agencies and on going projects in Pakistan and other countries with similar irrigation environments, on improved management techniques and operational methods for irrigation systems.	IFAD	Pak. Rupees 22,400,000	3 years
ASSISTANCE TO FARMER-MANAGED IRRIGATION SYSTEMS To support a research program in farmer-managed irrigation systems.	IFAD	120,000	3 years
SUPPORT FOR JOINT RESEARCH PROJECT ON "ASSESSING IRRIGATION SYSTEM PERFORMANCE" To undertake a joint research project on assessing irrigation system performance.	IFPRI/FORD	85,000	18 months
SUPPORT FOR REVIEW OF IIMI INFORMATION PROGRAM To assist IIMI in obtaining the services of a consultant to advise on a viable information program	IDRC	CAD 25,750	15 months

ANNEX I (continued)

PROVISION OF AN INSTITUTIONAL DEVELOPMENT SPECIALIST ON THE IMP REDESIGN PROJECT Services of an HMI staff member to serve on the Technical Assistance Team as an Institutional Development Specialist under ISPAN Activity No.664B.	ISPAN	6,972	21 days
IRRIGATION INVESTMENTS TRENDS Research in alternative investment opportunities in Sri Lanka	JICA	9,370	1 year
IRRIGATION MANAGEMENT FOR CROP DIVERSIFICATION Support for studies in irrigation management for crop diversification	JAPAN	20,000	1 year
STAFF SECONDMENT Support from the Government of the Netherlands for staff secondment.	NETHERLANDS	340,350	3 years
STUDY ON MANAGING IRRIGATION SYSTEMS TO MINIMIZE WATERLOGGING AND SALINITY PROBLEMS Support to HMI Pakistan to implement, in collaboration with national agencies, a program of applied research on waterlogging and salinity. Research will focus on irrigation strategies designed to prevent the occurrences of waterlogging and salinity.	NETHERLANDS	2,200,000	5 years
SUPPORT FOR EXTERNAL REVIEW OF HMI Partial support to meet expenditure in connection with the External Review of HMI	ODA	Stl.Pounds 10,000	6 months
HMI IRRI COLLABORATION ON IRRIGATION MANAGEMENT FOR RICE-BASED FARMING SYSTEMS To conduct collaborative research with IRRI on the problems of water management in irrigation systems devoted to rice based farming systems in the Philippines, Indonesia, and Bangladesh	ROCKEFELLER FOUNDATION	1,200,000	3 years
SUPPORT FOR EXTERNAL REVIEW OF HMI Partial support to meet expenditure in connection with the External Review of HMI.	ROCKEFELLER FOUNDATION	25,000	6 months
IRRIGATION SYSTEM MANAGEMENT IN SRI LANKA To assist USAID'S Irrigation System Management project through the development and implementation of research on key irrigation management questions and to strengthen Sri Lankan national capacity for irrigation management research. This work will build on HMI's collaborative relationships with Sri Lankan irrigation-related research institutions and agencies.	USAID Sri Lanka	395,150	35 months
IRRIGATION SUPPORT PROJECT FOR ASIA AND THE NEAR EAST (ISPAN) To increase HMI's capacity to develop more effective training and professional development programs.	USAID Asia and Near East Bureau	570,000	3 years
INSTITUTIONAL SUPPORT GRANT TO HMI PAKISTAN To support HMI Pakistan's efforts to strengthen Pakistan's national capacity to improve the performance of irrigation systems through management innovations.	USAID Pakistan	2,000,000	2 years
SUPPORT FOR EXTERNAL REVIEW OF HMI Partial support to meet expenditure in connection with the External Review of HMI.	USAID Science & Technology Bureau	20,000	6 months

ANNEX I (continued)

ACCELERATED AGRICULTURAL PRODUCTION PROJECT (AAPP) Program in support of the objectives of AID's irrigation component of the AAPP for the Government of the Philippines.	USAID Philippines	640,000	2 years
COLLABORATIVE RESEARCH AND TRAINING ACTIVITIES IN IRRIGATION MANAGEMENT WITH INDIAN INSTITUTIONS To explore and initiate collaborative projects between IIMI and Indian institutions through research, professional development and information exchange. This work is designed to strengthen the capacity of Indian institutions to contribute to the improvement of irrigation systems.	USAID India	500,000	18 months
WORKSHOP AT CHANG MAI To create awareness in the importance of irrigation, system design for farmer-managed irrigation systems. Identify shortcomings of present design methods and procedures of operations and maintenance to exchange information on design ideas and experience, and to recommend new design ideas and strategies.	UNDP	39,000	4 days
POVERTY AND GROUNDWATER COLLOQUIUM Support for colloquium on how to reach the poor through ground-water irrigation. Presentation of research papers and editing the papers presented at the colloquium.	WORLD BANK	14,730	18 months

• in US dollars unless otherwise stated

BMZ	=	Bundesministerium für Wirtschaftliche Zusammenarbeit
CIDA	=	Canadian International Development Agency
IFPRI	=	International Food Policy Research Institute
IDRC	=	International Development Research Centre
IFAD	=	International Fund for Agricultural Development
ISPAN	=	Irrigation Support Project for Asia and the Near East
JICA	=	Japan International Cooperation Agency
ODA	=	Overseas Development Administration
USAID	=	United States Agency for International Development

ANNEX II 1989 PUBLICATIONS

GENERAL PUBLICATIONS:

1. International Irrigation Management Institute. Managing irrigation in the 1990s. A brief guide to the strategy of the International Irrigation Management Institute. The Institute. 32p. (September).
2. International Irrigation Management Institute. Proposed program and budget for 1990. The Institute. 70p. (September).
3. International Irrigation Management Institute. IIMI Workplan 1990-1994. The Institute. (Draft). 48p. (September).
4. International Irrigation Management Institute. International Staff Terms and Conditions of Employment. The Institute. 36p. (November).
5. International Irrigation Management Institute. A selected bibliography on irrigation management (Documents entered in the Irrigation Management Information Network (IMIN) Database in 1988). Vol. 2, No. 1. The Institute. 64p. (June).
6. International Irrigation Management Institute. Annual Report 1988. The Institute. 64p. (September).

PERIODICALS:

7. International Irrigation Management Institute. IIMI Review Vol. 3, No. 1. The Institute. 24p. (September).

NEWSLETTERS:

8. International Irrigation Management Institute. Farmer-Managed Irrigation Systems Newsletter. No. 6. 28p. (September).

TECHNICAL PAPERS AND MONOGRAPHS:

9. Martin, E. D. and Yoder, R. Public intervention in farmer-managed irrigation systems. International Irrigation Management Institute. 316p. (July).

ANNEX II (continued)

10. Valera, A. Crop Diversification in Irrigated Agriculture in the Philippines: Proceedings of a National Workshop 5-7 October 1988. Puerto Azul Beach and Country Club Ternate, Cavite, the Philippines) Los Banos, Laguna, Philippines. 304p. (August).
11. Small, L. E.; Adriano, M. S.; Martin, E. D.; Bhatia, R.; Young, K. S. and Pradhan, P. Financing irrigation services: A literature review and selected case studies from Asia. International Irrigation Management Institute. 300p. (September).
12. Miranda, S. M. Irrigation management for crop diversification in Indonesia, the Philippines and Sri Lanka: A synthesis of IIMI's research. International Irrigation Management Institute. (Technical paper No. 1). 120p. (September).
13. Groenfeldt, D. and Mook, L. J. Social science perspectives on managing agricultural technology. International Irrigation Management Institute. 240p. (September).
14. Miranda, S. M. Research network on irrigation management for diversified cropping in rice-based systems. International Irrigation Management Institute. 160p. (December).

COUNTRY PAPERS:

Sri Lanka

15. Raby, N. and Merrey, D. J. Professional management in irrigation systems: A case study of performance control in Mahaweli System H, Sri Lanka. International Irrigation Management Institute. (Sri Lanka - Country paper No. 1). 110p. (September).
16. Merrey, D. J. and Somaratne, P. Institutions under stress and people in distress: Institutions-building and drought in a new settlement scheme in Sri Lanka. International Irrigation Management Institute. (Sri Lanka - Country paper No. 2). 104p. (December).
17. Panabokke, C. R. Irrigation management for crop diversification in Sri Lanka: A synthesis of current research. International Irrigation Management Institute. (Sri Lanka - Country paper No. 3). 72p. (September).
18. Stanbury, P. Land settlement planning issues for improved irrigation management: A case study of the Kirindi - Oya. International Irrigation Management Institute. (Sri Lanka - Country paper No. 4). 96p. (September).

Pakistan

19. Johnson, R. Private tube well development in Pakistan's Punjab: Review of past public programs policies and relevant research. International Irrigation Management Institute. (Pakistan - Country paper No. 1). 36p. (September).
20. Kijne, J. W. Irrigation management in relation to waterlogging and salinity: Precipis for a research agenda in Pakistan. International Irrigation Management Institute. (Pakistan - Country paper No. 2). 24p. (September).
21. Vander Velde, E. J. V. Irrigation management in Pakistan mountain environments. International Irrigation Management Institute. (Pakistan - Country paper No. 3). 48p. (September).

CASE STUDIES:

22. Gunadasa, A. M. S. S. The Kimbulwana Oya irrigation scheme: An approach to improved system management.

International Irrigation Management Institute. (Case study No.2). 56p. (September).

23. Weerakkody, P. Farmer-officer coordination to achieve flexible irrigation scheduling: A case study from System H, Sri Lanka. (Case Study No. 3). 80p. (November).

WORKING PAPERS:

24. Sally, H.; Berthery, D.; Certain, F. and Durbec, A. Calibration of the Kirindi Oya RBMC mathematical flow simulation model: Description of the field measurement campaign and preliminary results. International Irrigation Management Institute. (Working paper No. 10). 28p. (July).
25. Moragoda, R. and Groenfeldt, D. Organizational aspects of irrigation management in Kalankuttiya block, Mahaweli System H, Sri Lanka during the 1986 dry season. International Irrigation Management Institute. (Working paper No. 11). 36p. (July).
26. Pradhan, N. C. and Yoder, R. Improving irrigation system management through farmer-to-farmer training: Examples from Nepal. International Irrigation Management Institute. (Working paper No. 12). 20p. (August).
27. Pradhan, P. Irrigation development in Bhutan. International Irrigation Management Institute. (Working paper No. 13). 24p. (September).
28. Groenfeldt, D. Guidelines for rapid assessment of minor irrigation systems in Sri Lanka. International Irrigation Management Institute. (Working paper No. 14). 44p. (December).

PROJECT REPORTS:

29. International Irrigation Management Institute. Final Report for ADB Regional Technical Assistance 5273. Study on irrigation systems rehabilitation and improved operations and management. Volume 1. Activity A: Rehabilitation and improvement for management. The Institute. 388p. (March).
30. International Irrigation Management Institute. Final Report for ADB Regional Technical Assistance 5273. Study on irrigation systems rehabilitation and improved operations and management. Volume 2. Activity B: Dry-season irrigation management for rice-based systems. The Institute. 208p. (March).
31. International Irrigation Management Institute. Final Report for ADB Regional Technical Assistance 5273. Study on irrigation systems rehabilitation and improved operations and management. Volume 3. Activity C: Financing the costs of irrigation. The Institute. 256p. (March).
32. International Irrigation Management Institute. Interim Report on the Technical Assistance Study (TA 846 SR). Irrigation management and crop diversification (Sri Lanka). The Institute 135p. (April).
33. International Irrigation Management Institute. Seasonal summary report on the Technical Assistance Study (TA 846 SR). Irrigation management and crop diversification (Sri Lanka). 44p. (October).
34. International Irrigation Management Institute. Irrigation institutions report for Walawe - Yala 1989. (Draft report based on the field research in Yala 1989 season). 36p. (October).

ANNEX II (continued)

35. International Irrigation Management Institute. Irrigation institutions in Kirindi Oya - Yala 1989. (Draft report based on the field research in Yala 1989 season). 56p. (October).
 36. International Irrigation Management Institute. Final report for ADB Technical Assistance (859 PHD). Study on irrigation management for diversified crops. Volumes I and II. 350p. (October).
 37. International Irrigation Management Institute. Final report for ADB Ford Foundation Technical Assistance (937-INO) Indonesia. Efficient irrigation management and system turnover. Volume I, II, III. 484p. (December).
- ODI/IIMI PUBLICATIONS:**
38. ODI/IIMI. Irrigation Management Newsletter. 20p. (ODI/IIMI Irrigation Management Network paper 89 1a). (July).
 39. Zhi, M. Identification of causes of poor performance of a typical large-sized irrigation scheme in South China. 20p. (ODI/IIMI Irrigation Management Network paper 89 1b). (June)
 40. Ansari, N. Rehabilitation of communal irrigation schemes in Nepal. 10p. (ODI/IIMI Irrigation Management Network paper 89 1c). (June).
 41. Chaudhry, M. A. and Ali, M. Economic returns to operation and maintenance expenditure in different components of the irrigation system in Pakistan. 20p. (ODI/IIMI Irrigation Management Network paper 89 1d) (June).
 42. Bhuiyan, S. I. Irrigation and water management for diversified cropping in rice irrigation systems: Major issues and concerns. 20p. (ODI/IIMI Irrigation Management Network paper 89 1e). (June).
 43. ODI/IIMI Irrigation Management Network Newsletter. (ODI/IIMI Irrigation Management Network Paper 89 2a). (December).
 44. Levine, G. and Coward Jr. E. W. Equity considerations in the modernization of irrigation systems. (ODI/IIMI Irrigation Management Network Paper 89 2b). (December).
 45. Vermillion, D. L. Second approximations: Unplanned Farmer contributions to Irrigation Design. (ODI/IIMI Irrigation Management Network Paper 89 2c). (December).
 46. Morton, J. Tubewell irrigation in Bangladesh. (ODI/IIMI Irrigation Management Network Paper 89 2d). (December).
 47. Asaduzzaman, M. Irrigation charges in the Barind Integrated Area Development Project: A new approach. (ODI/IIMI Irrigation Management Network Paper 89 2e). (December).
- STAFF EXTERNAL PUBLICATIONS:**
48. Abernethy C. L.; Kikuchi, M. and Lenton, R. L. The research strategy of the International Irrigation Management Institute, with special reference to the differences between humid and water deficient environments. Paper presented at the 7th Afro-Asian Regional Conference ICID., Tokyo. (October)
 49. Abernethy C. L. Performance criteria for irrigation systems. Paper presented at the Conference on Irrigation Theory and Practice, Southampton, U.K. (September).
 50. Miranda, S. M. Crop diversification: Its implications on the modernization and rehabilitation of rice irrigation systems. Paper presented at the Asian Regional Symposium on the Modernization and Rehabilitation of Irrigation and Drainage Schemes held at the Development Academy of the Philippines, Tagaytay City, the Philippines, (February).
 51. Murray-Rust, D. Hammond. Selecting the appropriate management strategy. Special lecture to the Asian Regional Symposium on Rehabilitation and Modernization of Irrigation and Drainage Systems, Tagaytay, Philippines (February).
 52. Murray-Rust, D. Hammond. Interactions between irrigation management and crop production. DWK Bulletin No. 16 (April).
 53. Parker, D. Research needs regarding how to reach the poor through groundwater irrigation. Paper presented at the Colloquium on Groundwater Irrigation and Poverty Alleviation, the World Bank(April).
 54. Pradhan, P. and Yoder, R. Monitoring and evaluation of small irrigation systems. Paper presented at the GIRDP-supported workshop on Integrated Rural Development projects, Kathmandu, Nepal(April).
 55. Tiwari, D. N. and Yoder, R. Spatial distribution of irrigation water and equity issues in the Chhattis Mauja irrigation system. Paper presented at the International Conference on Irrigation Theory and Practice, Institute of Irrigation Studies, the University of Southampton, UK(September).
 56. Vander Velde, E. J. Irrigation Management in Pakistan Mountain Environments. Paper presented at the ICIMOD - NWFP Agriculture University Workshop on Mountain Agriculture in Pakistan, Swat, NWFP, Pakistan, 15-18 (February).
 57. Vermillion, D. Turnover of irrigation systems in Indonesia. Paper presented at the International Conference on Irrigation Theory and Practice, Institute of Irrigation Studies, the University of Southampton, UK(September).
 58. Abernethy C. L. New approaches in irrigation management: the strategy of the International Irrigation Management Institute. DWK Bulletin No. 16 (German Association for Water Resources and Land Improvement). (April).
 59. Valera, A. and Cablayan, D. Studies on diversified cropping in NIA irrigation systems. Paper presented at the NIA-JICA Seminar on Irrigation Engineering for Diversified Crops. 21 February. Quezon City, the Philippines.

ANNEX III

Ph. D. Research Fellowships

Name	Dates	Thesis Research Topic	Location
1. Muhammad Nawaz Bhutta	April 1987 December 1989	Effect of varying discharges on the equity of water distribution in irrigation systems.	Pakistan
2. Robert Johnson	September 1988 March 1990	Private tubewell development as an alternative to public management of groundwater levels in Pakistan.	Pakistan
3. Tolentino B. Moya	May 1988 April 1990	Diversifying rice-based irrigation systems.	Philippines
4. Rodolfa A. Natividad	June 1988 December 1989	Management and operation of an irrigation system for mixed cropping.	Philippines
5. Adriano Esouerra	October 1988	Physical facility requirements of diversified rice-based farming systems.	Philippines
6. Muchjidin Mawardi	March 1988 March 1990	Management improvement of government managed irrigation system.	Indonesia
7. Sukirno	March 1988 March 1990	Decision making analysis on the planning and updating of cropping calendar of diversified crop in Irrigated paddy field.	Indonesia
8. Sigit Supadmo Arif	November 1988 November 1990	Increasing production of ill-drained rice area through drainage system improvement and crop diversification.	Indonesia
9. Odile Oswald	August 1987 July 1989	An expert system for the diagnostic of tank irrigated systems: a feasibility study.	India

1989 Master's Degree Scholarships

Name	Dates	Thesis Research Topic	Location
1. Hermingildo Gutierrez	September 1988 June 1989	A corporate strategy for the Upper Pampanga River Integrated Irrigation system.	Philippines
2. Zenaida Esteban	July 1989 December 1989	Labor productivity and income performance analysis of major cropping patterns in the Laoag-Vintar River Irrigation System	Philippines
3. Harendra Srivastava	April 1989 December 1989	Selected social factors related to farmers' participation in irrigators associations.	Philippines

ANNEX IV
AGREEMENTS SIGNED IN 1989

Organization	Purpose
India: Water and Power Consultancy Services (India) Ltd. on behalf of Ministry of Water Resources, Government of India.	Collaboration with Indian institutions for research and training in irrigation management.
Nepal: Department of Irrigation, Ministry of Water Resources	Collaborative research with a view to enhancing national capacity in irrigation management.
Philippines: United States Agency for International Development (USAID) Mission to the Philippines.	Cooperative Agreement for supporting irrigation component of USAID's Accelerated Agricultural Production Project.
Sudan: Hydraulic Research Station, Wad Medani on behalf of the Government of Sudan.	Establishment of a unit of IIMI in Sudan for collaborative research.
Japan: Tropical Agricultural Research Centre, Japan (TARC)	Strengthening national efforts to improve and sustain performance of irrigation systems through research.
France: Ministry of Agriculture and Forestry	Secondment of Mr. Jean Verdier for appointment as Head, IIMI Morocco Field Operations.

ANNEX V

1989 WORKSHOPS AND CONFERENCES

1. Workshops and conferences organized by IIMI

Title	Date	Location
Social Organizer Workshop	15-19 May	Khon Kaen, Thailand
Design Issues in Farmer-Managed Irrigation Systems	12-15 December	Chiang Mai, Thailand
Irrigation Systems Management Workshop on research and preliminary results	December	Sri Lanka
National Policy Workshop	October	Sudan

2. Selected workshops and conferences at which IIMI was represented

Executive Council, International Congress on Irrigation and Drainage, Ottawa, Canada, 4-10 June.
 Seventh Meeting of UNEP's Advisory Group on Water, Nairobi, Kenya, 24-28 June.
 Irrigation Theory and Practice, Institute of Irrigation Studies, Southampton, U.K., 14-15 September.
 Seventh Afro-Asian Regional Conference, ICID, Tokyo, Japan, 15-20 October.
 Crop Diversification Network, Steering Committee Meeting, Kuala Lumpur, Malaysia, 1-2 December.
 Education & Training in Water Resources in Developing Countries, the Central Board of Irrigation and Power, Aurangabad, India, 12-16 December.
 Eighth Meeting of the Advisory Group on Water Resources, UNEP, Cairo, Egypt, 15-16 December.
 Sixth Annual Irrigation and Drainage Seminar, World Bank, Washington D.C., USA, 22 December.
 Asian Regional Symposium on the Modernization and Rehabilitation of Irrigation and Drainage Schemes held at the Development Academy of the Philippines, Tagaytay City, the Philippines, 13-15 February.
 DWK Conference on Site-Specific Irrigation Management, Berlin W. Germany, (April).
 World Bank Colloquium on How to Reach the Poor Through Groundwater Irrigation, Washington, D.C., USA, 12-14 April.
 Workshop on Efficiency and Equity in Groundwater Use and Management, Anand, Gujarat, 30 January -1 February.

ANNEX VI

IIMI's Professional/Management Staff (As of 31 December 1989)

OFFICE OF THE DIRECTOR GENERAL

Roberto L. Lenton (Argentina)
 Director General

PROJECT DEVELOPMENT OFFICE

Marian Fuchs-Carsh (USA)
 Project Development Officer

FIELD OPERATIONS DIVISION

Nanda Abeywickrema (Sri Lanka)
 Director, Field Operations

R.W.F. Ratnayake
 Assistant to the Director,
 Field Operations

Bangladesh (Dhaka)

Donald E. Parker (USA)
 Head, Bangladesh Field Operations

Abdur Rahman
 Administrative Officer

Indonesia (Jarkarta and Bandung)

Hammond Murray-Rust (USA)
 Head, Indonesia Field Operations

Douglas L. Vermillion (USA)
 Irrigation Specialist

Adriza
 Data Analyst

Busro, M.E.
 Senior Technical Adviser

Ganjar Kurnia
 Social Scientist

Helmi
 Field Assistant

K. Paulus
 Field Assistant

Supriadi
 Field Assistant

Morocco (Rabat)

Jean Verdier (France)
 Head, Morocco Field Operations

Nepal (Kathmandu)

Robert Yoder (USA)
 Head, Nepal Field Operations

Prachanda Pradhan (Nepal)
 Irrigation Specialist

Naresh Chand Pradhan
 Agricultural Social Scientist

Jitendra Rana
 Irrigation Engineer

Surendra Raj Shrestha
 Administrative Officer

R.B. Thapa
 Anthropologist

Juanita Thurston
 Editor

ANNEX VI (continued)

D.N. Tiwari Engineer Economist	H.M. Hemakumara Research Officer	Robert Johnson Research Fellow
Philippines (Manila) Alfredo Valera (The Philippines) Head, Philippine Field Operations	K. Jinapala Research Officer	H. Khan Field Research Engineer
C.M. Wijayarathna (Sri Lanka) Irrigation Specialist	L. R. Perera Research Officer	Abdul Majeed Personnel Administrative Supervisor
Damilo Cablayan Research Associate	P.G. Somaratne Research Officer	A.S. Qureshi Field Research Engineer
Jacinto Alexis Elegado Research Assistant	W.J.J. Upasena Research Officer	Saeed-Ur-Rehman Senior Field Research Economist
Arturo Francisco Research Assistant	West Africa (Ouagadougou, Burkina Faso) Jean-Claude Legoupil (France) Regional Representative	A. S. Safdar Field Research Engineer
Amado Maglino Researcher	Pakistan Division (Lahore) F.E. Schulze (The Netherlands) Director	Mohammad Saleem Field Research Social Scientist
Gregorio Simbahan Research Administrative Assistant	D. Jayatissa Bandaragoda (Sri Lanka) Senior Management Specialist	F. Hanif Sendhu Senior Field Research Hydrologist
Andrew Valdeavilla Research Assistant	Jacob Willem Kijne (The Netherlands) Senior Irrigation Specialist	Tariq Shahzad Field Research Engineer
Sudan M. Siddique Shafique (Pakistan) Head, Sudan Field Operations	Edward J. Vander Velde (USA) Irrigation Specialist	Waheed-uz-Zaman Field Research Engineer
Sri Lanka Douglas Merrey (USA) Head, Sri Lanka Field Operations	Rana A. Afaq Irrigation Engineer	PROGRAMS DIVISION Charles Abernethy (UK) Director, Programs
Masao Kikuchi (Japan) Irrigation Specialist	M. Anees Senior Field Research National Scientist	D. Berthery* (France) Irrigation Specialist
Edward Martin* (USA) Irrigation Specialist	Haroon Anwar General Manager, Administration	Zenete M.P. da S. Franca (Brazil) Training Specialist
R. Sakthivadivel (India) Senior Irrigation Specialist	Khurshed A. Babar Field Research Engineer	David Groenfeldt* (USA) Irrigation Specialist
C. Nijman Associate Expert	M. Badruddin Senior Principal Irrigation Engineer	Khin Muang Kyi (Burma) Senior Management Specialist
P.B. Aluwihare Research officer	M. Akhtar Bhatti Principal Irrigation Engineer	Shaul Manor (Israel) Senior Irrigation Specialist
B.R. Anyaratne Research Officer	M. Nawaz Bhutta Research Fellow	Senen Miranda (The Philippines) Senior Irrigation Specialist
M.H.S. Dayaratne Research Associate	G.R. Firdousi Senior Principal Irrigation Engineer	Hilmy Sally Irrigation Specialist
Ratnasiri Ekanayake Research Officer	Z. Habib Systems Analyst	Jayanthakumar D.G. Arumugam Research Associate
Nihal Fernando Research Associate	Noor Hassan Field Station Manager	M. A. Karunasena Research Associate
K.A. Hemakeerthi Research Officer	Hoshi Irani Accountant	T.A. Kuuppuarachchi Research Associate

ANNEX VI (continued)

Mark Svendsen (USA)
Research Fellow, IFPRI/IMI Irrigation
Specialist (Based at IFPRI, on joint
appointment by IMI and IFPRI)

INFORMATION OFFICE

Francis O'Kelly (Ireland)
Head, Information

S. Dissanayake*
Administrative Officer

K. Kurukulasuriya
Editor

Ramya de Silva
Documentalist

V. Somasundaram
Administrative Officer

A.C.M. Sufian
Printing & Distribution Officer

FINANCE AND ADMINISTRATION DIVISION

Daniel C. Goodman, Jr (USA)
Director, Finance and Administration

Mohan Abayasekera
Travel and Conference Coordinator

Laksiri Abeyssekera
Controller

T.K.O. Bahar
Personnel Officer

P. S. B. Ekanayake
Assistant Accountant

G. Halvitige
Senior Accountant

D. P. Samaraweera
Manager, Administrative Services

A. D. S. Weerasekera
Budget Officer

Shanti Weerasekera
Manager, Office Support Systems

K. S. C. Perera
Maintenance Engineer

* Departed IMI during 1989.

ANNEX VII 1989 CONSULTANTS

<u>NAME</u>	<u>MISSION</u>
Marietta S. Adriano	To assist in the assessment of the economic aspects of the crop diversification project in the Philippines.
Raj Bhatia	To develop accounting software.
Asit K. Biswas	To evaluate IMI's information program.
Corporate Consulting Group	To review Sri Lanka's national staff salaries and benefits related to the Colombo market.
Kamla Chowdhry	To review the Institute's headquarters operations.
John Colmey	To provide editorial support to IMI's Information Office.
Robert Cunningham	To review the Institute's headquarters operations.
Matthew Driskill	To assist in the preparation of various IMI reports, documents, and provide overall communications support to the Information Office.
Omer Elaward	To conduct a data availability survey on irrigation systems in Sudan.
Mira Fischer	To translate documents from French to English.
William Gormbley	To assist in the development of an administrative procedure manual.
David Groenfeldt	To prepare the full text for one issue of the FMIS Newsletter.
Gunaratna Associates	To advise on the acquisition of a headquarters building in the Colombo area.
Alex Gunasekera	To develop computer programs in costing telecommunication use.
Asma Khalid Henry	To assist in the preparation of proposals for various IMI projects.
A.A.Kampfraath	To collaborate in the development of a methodology to assess training needs in irrigation management.
Robert Lamb	To assist in the completion of the Annual Report 1988, to rewrite the Strategy and write the Brief Guide to the Strategy; to prepare the IMI Review and to provide general information support.
Gil Levine	To assist in project development, Pakistan operations and training.
Edward Martin	To help complete a detailed Impact Assessment Questionnaire on ADB Technical Assistance Grants provided to IMI.
A. Mohankrishnan and C.R. Shanmugham	To conduct a system-wide data availability survey of three irrigation systems in Tamil Nadu State, India.

ANNEX VII (continued)

<u>NAME</u>	<u>MISSION</u>
Ranjini Moragoda	To conduct and complete a field survey on a Sri Lankan rehabilitation program.
Stephen Parker	To write a preliminary evaluatory report on the IIMI library.
C.R. Panabokke	To provide overall guidance to the development and implementation of the Sri Lanka Field Operations program.
P.S. Rao	To participate in the Training Needs Assessment exercise in Malaysia at the Drainage and Irrigation Department.
G. Skogerboe	To review, modify and improve the course content of the water management training design relative to training needs.
Ahmed H Thabit	To assist in the preparation of IIMI's Accounting Policy Manual.
Uraivan T.K. Yong	To provide support and backstopping services to the agencies and consultants charged with implementing the IFAD-financed Peoples Irrigation Project in Thailand.
Thomas Wickham	To review IIMI's program in the Philippines.
C.M. Wijayaratna	To participate in seminars workshops conducted by the Philippines National Irrigation Administration.

**ANNEX VIII
IIMI ADDRESSES**

HEADQUARTERS

52 New Parliament Road
Rajagiriya via Colombo,
Sri Lanka
Telephone : (01, +94-1) 565601
Telex : 22518 or 22907 IIMI HQ CE
Fax : (01, +94-1) 562919
E-Mail : IIMI (10074:CGU022)
Address : P. O. Box 2075, Colombo,
Sri Lanka

NEPAL

P O Box 3975
Kathmandu, Nepal
Telephone : (977-01) 228775
Telex : 2321 BASS NP (Attn:
IIMI)
Alt & Saturdays: 2262
NARANI NP
(Attn: YODER 524859)
Fax : 977-1-524509
E-Mail : IIMI-Nepal (157:CGI106)

PAKISTAN

1-A B Danepur Road
GOR I, Lahore
Pakistan
Telephone : (042 within Pakistan: 92-42
from overseas) 305810,
869195
Telex : 44926 IIMIP PK
Fax : 92-42-869194
E-Mail : IIMI-PAK (157:CGI220)

BANGLADESH

56A Road 16 (New)
Dhanmandia R.A.
Dhaka-1209, Bangladesh
Telephone : (880-2) 324128
Telex : 642940 ADAB BJ
Attn:IIMI
c/o. Ford Foundation

MOROCCO

IIMI c/o SEHA
461 Avenue Hassan II
Al Akkari, Rabat
Morocco
Telephone : 212-791101
Telex : DERMARA 32705M
(Quote "IIMI")
Fax : 212-763566
(Attn: IIMI C/o Mrs.
Kabbaj, UNDP)

THE PHILIPPINES

IIMI OFFICE
ICC Bldg, NIA Compound
EDSA, Diliman
Quezon City, Metro Manila
Philippines
Telephone : (02 within the Philippines;
63-2 from overseas)
99-93-46
Telex : Mon-Fri 40860 PARRS PM
Attn: IIMI

Afternoon Fri-Sun 22456 IRI
PH, 40890 RICE PM
(c/o. Water Management
Dept)
Fax : (63-2) 817-8470
(c/o Water Management
Dept)
E-Mail : CGI401
(c/o Water Management
Dept)

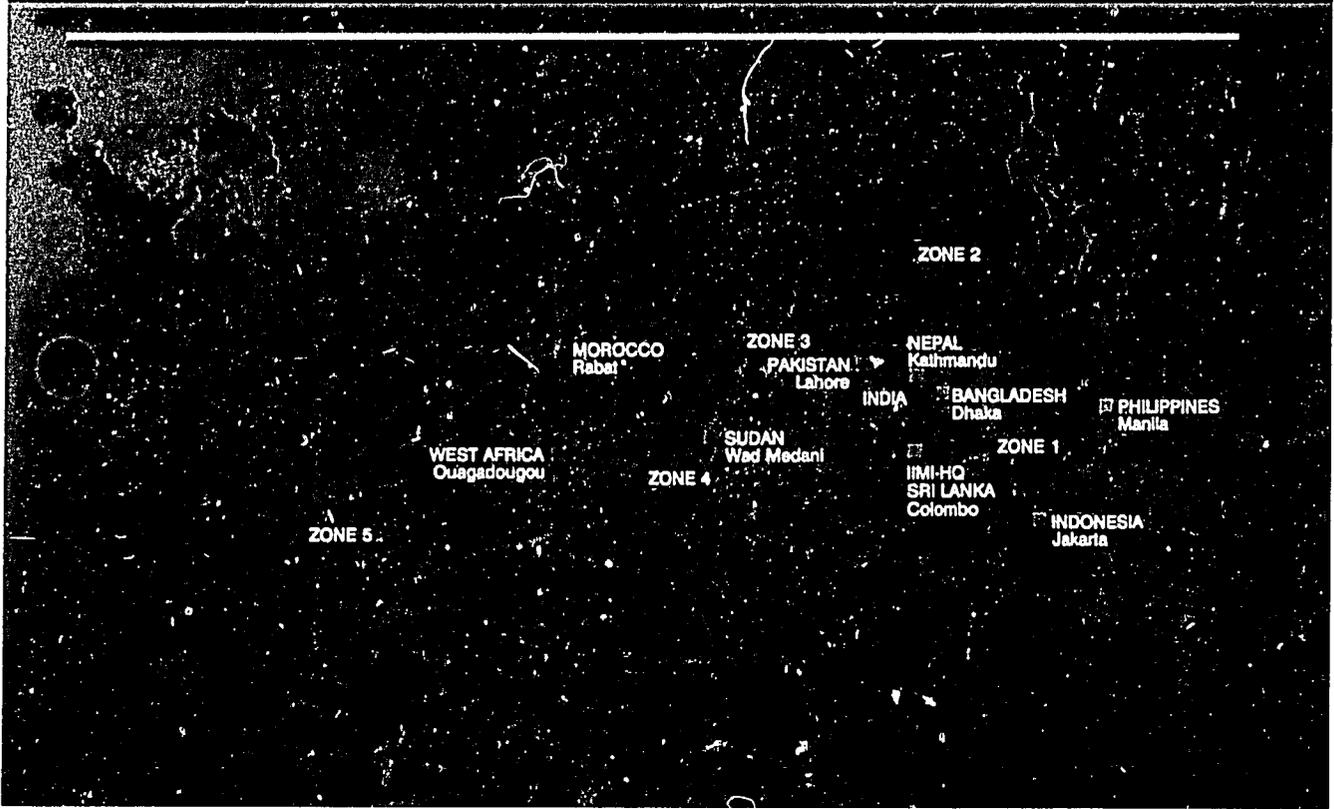
SUDAN

IIMI
P.O. Box 20
Khartoum Sudan
Telephone : Wad Medani 2448
Alt: c/o Ford Fnd.
249-11-43474
(08:30 to 14:30)
Telex : 24088 GUL SD
22255 ASIN SD
Alt. WAD Medani
50013 HRS SD

WEST AFRICA

IIMI BP 5373
Ouagadougou (BF)
Burkina Faso
Telephone : (226) 308489
Telex : 5381 SAFGRAD BF
Fax : 226-31-06-18
E-Mail : IIMI-BF.TEST74
(10074:CGU033)

THE WORLDWIDE



MOROCCO
Rabat

WEST AFRICA
Ouagadougou

ZONE 5

ZONE 3
PAKISTAN
Lahore

SUDAN
Wad Medani

ZONE 4

ZONE 2

NEPAL
Kathmandu

INDIA

BANGLADESH
Dhaka

PHILIPPINES
Manila

ZONE 1

SRI LANKA
Colombo

INDONESIA
Jakarta