



ANNUAL REPORT 1991

International Irrigation Management Institute

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FOREWORD

1991 was the Institute's first year as an active member of the Consultative Group for International Agricultural Research (CGIAR), and it brought with it new developments, partnerships and challenges that will have a significant bearing on IIMI's future.

The year saw the successful conclusion of several important projects. The first phase of a five country program in Farmer-Managed Irrigation Systems was completed and the results shared with IIMI's global FMIS network, which now links 1,300 professionals in 75 countries. Work was also completed on a study to enhance the understanding of design and management interactions by linking results from research at two Malaysian irrigation systems. In the area of privatization and turnover, IIMI published a major discussion paper on Turnover and Self-Management of Irrigation Institutions in Developing Countries. The first stage of the Institute's innovative program to assess training needs and plan, design and develop irrigation management training curricula and materials reached a successful conclusion in Malaysia.

During 1991, more and more countries turned to IIMI for insights into complex management questions or for research-based analysis and support. In Sri Lanka, several key policy papers written by IIMI staff on the basis of six years of field research are being used as the basis for policies that call for increased participation of farmers in the management of the country's irrigation systems. In Pakistan, senior staff of the Punjab irrigation sector met with IIMI staff during a two day "retreat" in October. Policymakers commented that they had gained valuable and unexpected insights from IIMI's research results. One immediate outcome of the retreat was the establishment of a committee to help IIMI to field test proposed management interventions in Punjab. In Sudan, IIMI was asked to sponsor a workshop on privatizing government irrigation schemes during which several far-reaching recommendations were made. During three weeks of mini-workshops in Bangladesh, senior management officials of the Bangladesh Agricultural Development Corporation brainstormed with IIMI colleagues on the Corporation's transition from a tubewell installing agency to one supporting the small-scale irrigation sector. And when a two-person IIMI team visited Latin America during 1991 to design the Institute's program for the region, many country representatives expressed strong interest in collaborating with IIMI.

Several new collaborative projects and agreements that offer exciting new opportunities were finalized during the year. In West Africa, IIMI joined the Burkina Faso office of the International Union for the Conservation of Nature in defining and implementing a program focused on irrigation and the environment. In Pakistan, the Institute has begun a major project to develop a crop-based irrigation management system in the country's North West Frontier Province. A project on performance assessment implemented in collaboration with Hydraulics Research Ltd., of Wallingford, UK got off the ground in 1991, and IIMI's collaboration with the German Foundation for International Development continued throughout the year, with activities that ranged from a course on training of trainers in Malaysia in October to a workshop on adding a management orientation to irrigation engineering curricula in Bangkok in November.

The transition into the CGIAR system has required rethinking our strategy and developing workplans to fully capitalise on the opportunities that arise from membership in a worldwide network of international agricultural research centers. In December, the first draft of IIMI's revised strategy document was submitted to the Institute's Board. At the same time, IIMI initiated discussions with the CGIAR's Technical Advisory Committee to plan the first TAC External Program and Management Review of the Institute, now scheduled for early 1994.

The closing days of 1991 saw the Institute move to its new headquarters building. A gift from the host country, Sri Lanka, the new building provides the Institute with 80,000 sq. ft. of office space in a beautiful suburb of Colombo approximately 20 minutes from the commercial capital.

Despite IIMI's major accomplishments during 1991, several challenges remain. One is to adequately prepare for IIMI's new future as a member of the CGIAR system, while maintaining the momentum of our current program and enhancing the quality and quantity of our research results. I look forward to reporting positively on this challenge in the 1992 Annual Report.

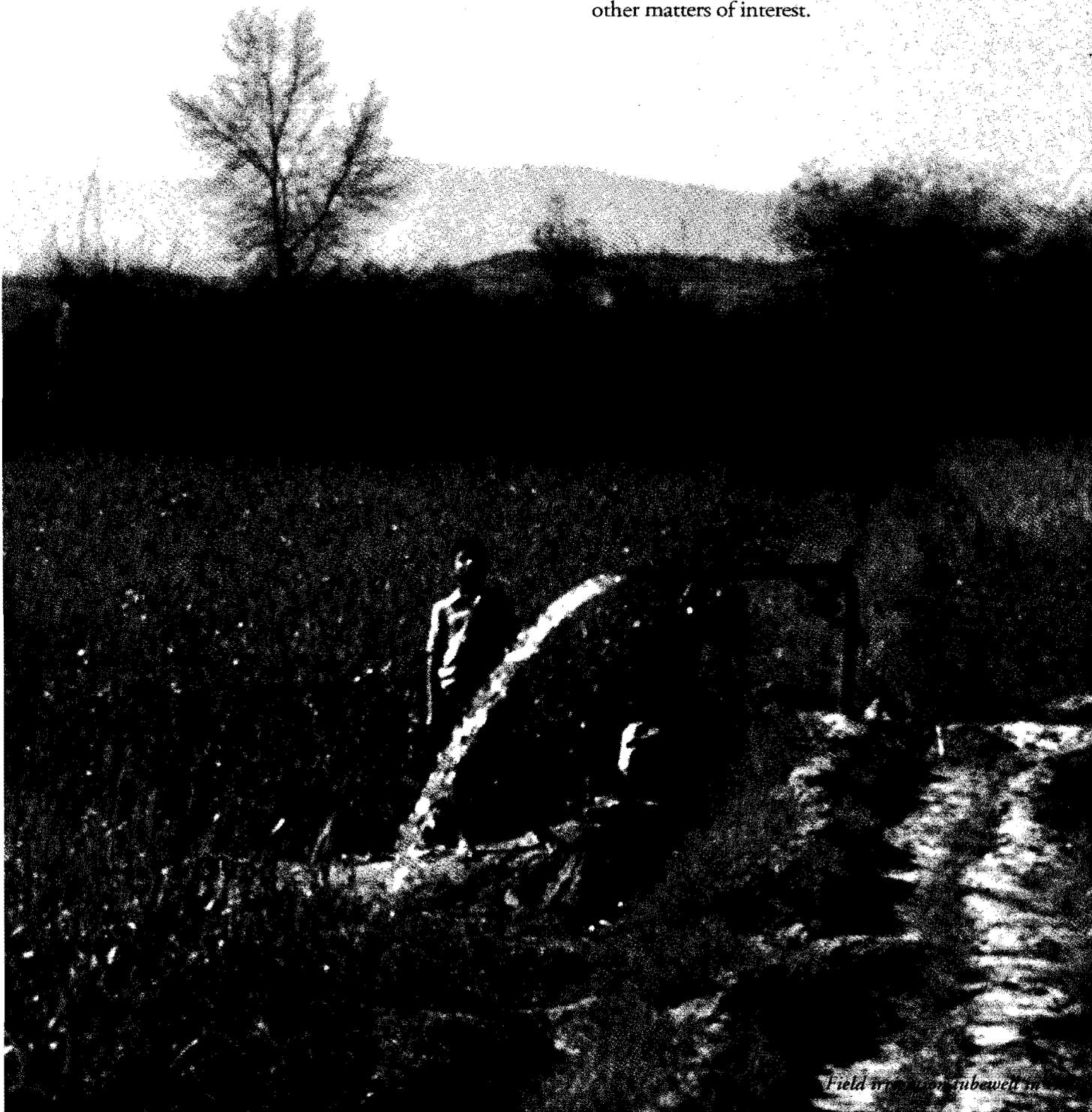


Roberto Lenton
Director General

Introduction

This report presents details of the achievements of the International Irrigation Management Institute (IIMI) during 1991. The first section focuses on programs of thematic research carried out by the Institute in several developing countries. The second section describes IIMI's country

operations and has been organized in order of broad geographical zones. There are separate sections on Training and Capacity Building, Information, and Finance and Administration. A concluding Annexes section provides additional information on projects, publications, awards and other matters of interest.



Thematic Research Programs

Since its founding in 1984, the International Irrigation Management Institute has worked to strengthen national efforts to improve and sustain the performance of irrigation systems in developing countries through the development and dissemination of management innovations. The key word is innovations: new ideas, operational methods, measurement tools, or management structures and arrangements that

apply it across a number of countries in a range of field conditions. The goal is new knowledge that is generic to irrigation systems from Indonesia to Nigeria.

For example, IIMI's scientists working in the farmer-managed hill irrigation systems of Nepal in 1986 – 87 noticed that some systems functioned better than others. So, they decided to bring a group of farmers from the superior systems to tour and visit farmers in the other systems. The result was farmer-to-farmer or peer training. Scientists then presented the idea at international workshops where it was discussed in a broader context. From there, IIMI fostered further discussion through the headquarters-based Farmer-Managed Irrigation Systems Newsletter. The notion of farmer-to-farmer training is now being successfully tested in IIMI field sites.

The results that follow represent advances made by IIMI scientists in generating innovations that can be generically applied in many countries.



Farmer exchange visits are an effective mechanism for transferring technologies and experience from one system to another.

bring about changes to improve the way an irrigation system performs. These changes may be completely novel. Or, they may represent the introduction of a practice which has been used successfully elsewhere, either in developed or developing countries.

IIMI looks for innovations in a variety of ways, through the Institute's own collaborative research in the specific locations, through the research of others, and through international networks of scientists who exchange information in workshops and conferences and newsletters. Once a potential innovation is developed, a multidisciplinary group of IIMI scientists based at headquarters discuss, review, evaluate, and systematically compare and

Performance Assessment

In the 1980s, IIMI gathered irrigation managers and planners to advise the Institute on priority issues for research. One word repeatedly surfaced in the discussions — performance. At the same time, in its early field work, IIMI scientists discovered they lacked certain critical information, like measurement of water deliveries, to compare and evaluate performance aspects of a given irrigation system.

For example, in 1987, in Indonesia, scientists and irrigation staff found why certain sections of a system were receiving too much water, while others were receiving too little — why planned deliveries did not match actual deliveries. As it

turned out, the problem was not a case of imprecise information, but the absence of a simple system to properly record water deliveries in the field and then to use this data to monitor performance. Staff designed a special field book for use by gatekeepers. Once this was done, and accurate information started coming in, staff developed the “management performance ratio,” a tool that allows managers to compare planned deliveries to actual deliveries on a regular basis.

In the broadest sense, assessing performance — the effectiveness of an agency in achieving a set of objectives and the efficiency with which it marshals its resources to meet those needs — is present in all of IIMI’s research. However, its importance both to the Institute’s scientists and to its client collaborators, led IIMI in 1990 to select Performance Assessment as a research theme worthy of in-depth study.

In 1991, the Institute formed a Performance Task Force to develop a ten-year comprehensive program of research to address four aspects of performance in irrigation: performance indicators, methodologies for assessing performance, evaluating the determinants of performance, and institutional change and adoption of performance-oriented management. The Task Force is charged with the implementation of the Program and members will devote all their energies toward performance issues. However, other IIMI staff will participate on an intermittent basis in connection with associated project activities. By October, staff had completed an in-depth work plan and had begun the initial four-year phase.

There were several early achievements related to the project. During the year staff completed a report on Performance Assessment Diagnosis, the first phase of a two-year collaborative project with the International Institute for Land Reclamation and Improvement and the International Institute for Hydraulic

and Environmental Engineering, both based in the Netherlands. The project compared 15 case studies in Asia, Africa and Latin America, drawing parallels with elements of business management. This was used to develop hypotheses about design conditions that affect irrigation performance.

For example, systems that showed higher levels of efficiency were those with relatively simple objectives. This was particularly true where objectives represented a consensus between agencies and farmers, backed up by a clearly defined process for implementation, monitoring of actual conditions, feedback to decision makers, and reevaluation of objectives in response to changes. However, most systems experienced significant shortfalls in performance.

In a related activity, the Institute completed a detailed study in two Malaysian irrigation systems to assess the extent to which their performance was directly affected by the design of physical infrastructure. The study is one of a series initiated by the World Bank; its objective is to collate comparable data for systems around the world and draw conclusions concerning the impact of design and management interactions on performance.

In the Malaysian study, the downstream control technology incorporated into one of the systems proved unsuccessful because of the failure



Canal flow measurements provide critical information on water distribution.

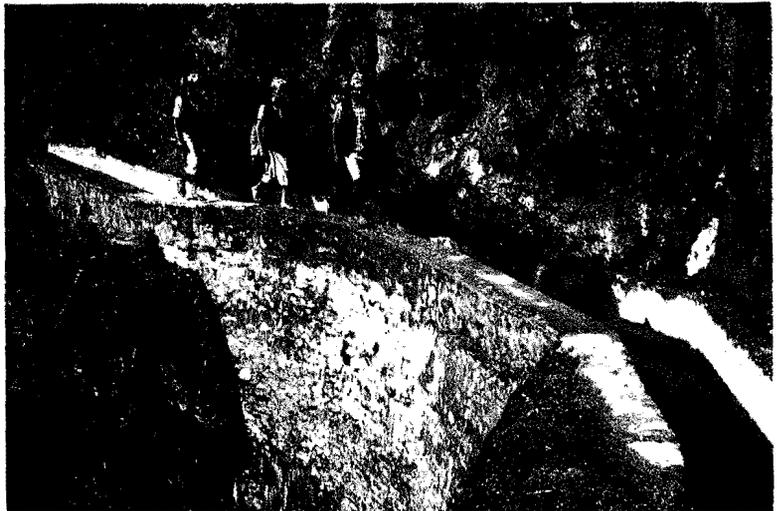
of upstream pumps to deliver adequate water supply. Management responded by utilizing the downstream technology in an upstream control mode. In the second system studied, design had less to do with the performance than with management issues. Decreasing income from rice cultivation, compared with available off-farm employment, also contributed significantly to lower the anticipated performance.

Simulating Canal Operations

Few irrigation systems operate as originally envisioned by designers — the larger and the more complex the system, more often than not, the greater is the diversion between its expected and real behavior. Rather than design failure, this simply reflects how hard it is to predict how a multitude of variables — weed growth, rainfall and, in manually operating systems, human behavior and response time — interact once the sluice gates of a reservoir are opened for the first time, and each time thereafter.

It is for this reason that scientists from IIMI and the French-based Centre National du Machinisme Agricole, du Génie Rural, des Eaux et des Forêts (CEMAGREF) began in 1987 to look for a way managers could experiment with and simulate the operation of a real life system. The Irrigation Department of Sri Lanka has been, from the inception of the project, an enthusiastic and critical collaborator.

The result: a mathematical flow simulation model of the 32-km long Kirindi Oya Right Bank Main Canal in southern Sri Lanka. The system was intended to irrigate about 5,000 hectares (ha), utilizing 33 distributary and field canals; in practice, the system has been able to deliver water to 3,650 ha. In the first phase, completed in 1990, scientists working with the system's managers developed the simulation model software, calibrated the model to field conditions, and



Irrigation systems managed by farmers play an increasingly larger role in irrigation development.

produced a set of operating manuals. The model is designed to run on a PC computer.

In 1991, scientists and irrigation staff began the second phase of the project — to field-test and evaluate the simulation model as a practical operational tool. This meant determining such factors as the amount and quality of information needed to run tests of a given scenario — say, rainfall in one part of the system — changes in attitude and additional training required of field staff, and organizational implications required for the model's implementation. The end result, expected in 1993, will be a decision-making support tool for the managers of manually operated canals.

Farmer-Managed Irrigation Systems and Support Services

Some of the world's oldest irrigation systems are those built and operated by farmers themselves. In some countries, like Nepal, they constitute more than half of the total irrigated area. These systems, referred to as Farmer-Managed Irrigation Systems (FMIS), range from small hill systems less than 100 ha, to large river diversion systems covering thousands of hectares, and can be found from Indonesia to Nigeria to Argentina. The arrangements for operating, maintaining and

sharing the benefits of FMIS can be sophisticated and cost-efficient. However, only recently have governments begun to recognize the potential of farmer-managed irrigation for alleviating poverty and contributing to a nation's food supply, with relatively little assistance.

To help achieve this potential, in 1987, the Institute initiated a global research network on FMIS. The response has been impressive. In 1991, the network linked 1,300 irrigation professionals in 76 countries on six continents. The network, through its Advisory Committee, organizes workshops and study tours and promotes information exchange and the sharing of research results among participants through a network newsletter.

In March 1991, the network Advisory Committee, whose membership rotates among participants, held its fifth meeting in Manila, the Philippines, to review its achievements. Members identified several generic innovations produced by participants and outlined ways for their dissemination and application. In November, the network expanded its growing links with professionals of Latin America at its third international workshop in Mendoza, Argentina. The workshop, titled, Performance Measurement in Farmer-Managed Irrigation Systems, brought together 95 scientists from 25 countries.

In a related effort, IIMI and the German Foundation for International Development sponsored a workshop for mid-career professionals in Chiang Mai, Thailand in September and October. The three-part workshop exposed 24 irrigation practitioners to FMIS management concepts, reviewed the extent of FMIS in participants' home countries, and introduced strategies for assistance to FMIS.

At the heart of the network is IIMI's own research on FMIS. In 1991, the Institute completed the first phase of a three-year project to help government agencies and nongovernment institutions in Pakistan, Bhutan and Thailand develop appropriate strategies to assist the farmer-

managed sector. The research also aims to develop assessment methods to enable managers and planners to reach informed decisions about options of intervention.

In Pakistan, Institute scientists documented the physical components and institutional features of three indigenous irrigation systems in Chitral District, North-West Frontier Province. In Thailand, scientists completed research on the People's Irrigation Project. Its unique feature is a "Mobile Campaign Unit," a multidisciplinary team of Thailand's Royal Irrigation Department and Forestry and Extension departments. In Bhutan, IIMI assisted local researchers in documenting organization and management practices of small-scale FMIS. Final results were presented at a national workshop in August, which was followed by the presentation of recommendations to the government.

At the same time, the Institute commissioned IIMI's former Head of the Nepal Country Program, to write three books based on 15 years of experience with FMIS. One book will document the author's research on FMIS in Nepal. Two other books examine locally managed irrigation systems and the design of irrigation structures in mountainous environments worldwide.

Privatization and Turnover

Privatization of government industries, agencies and landholdings and the turnover of their management have swept across the developing countries. Irrigation Departments are no exception. Squeezed by rising costs and funding cutbacks, irrigation agencies have begun to reevaluate their roles and the potential role of nongovernment groups and water users.

In some cases, privatization has led to the transfer of ownership of assets or services — the provision of pumps, agricultural inputs — to private groups. In other cases, agencies have retained state ownership, but have sought to increase the role of users in operating and maintaining sections of large irrigation systems, or,

where possible, entire systems. In both cases, changes can include decentralization of agencies, organization realignment, new financing arrangements and integrative arrangements for interagency planning and administration.

In the late 80s, the Institute studied and facilitated management turnover in Indonesia and Sri Lanka. Today, similar efforts are being assessed in five of the ten countries where IIMI is directly working.



Irrigated nonrice crops are often found to be more profitable than irrigated rice.

In 1991, the Institute initiated a thematic program to turn these research results into generic lessons for widespread dissemination. An IIMI scientist with experience in several countries, initiated the discussion with a paper entitled, "The Turnover and Self-Management of Irrigation Institutions in Developing Countries." The report describes irrigation privatization and management turnovers in Asia, Africa, and Latin America and provides a conceptual framework for identifying alternatives and working hypotheses about conditions shaping management transfer and its results.

In collaboration with the International Food Policy Research Institute and the Washington State University, the Institute completed a case

study of management turnover from the US Bureau of Reclamation to local irrigation districts for the 550,000-acre Columbia Basin Project in Washington State, USA. The project attracted scientists' interest due to the success and scale of transfer, the length of time since it was completed (1969) and the availability of extensive data. Scientists studied the conditions leading to turnover, the turnover process and irrigation performance before and after.

Also in 1991, the Institute collaborated with a Sri Lankan research firm to assess the early stages of a national program to turnover management for distributary canals of large government schemes to local farmers' groups. Initial findings suggest rapid improvements in performance where farmers' organizations have readily accepted the responsibility for management.

Crop Diversification Network

One of the most dramatic developments affecting farmers in the past decade has been the fall in rice prices. As a result, farmers in developing countries, have had to become more competitive and versatile in the crops they choose to grow each year. In Asia, the most successful have been those farmers who grew nonrice crops in irrigated areas with well-drained soils during the dry season. Similar success has been shown on higher or porous lands in irrigated areas during the wet season. Irrigation agencies have been quick to respond to the changing needs. But it is not easy. Nonrice crops — onion, garlic, or mung bean, for example — have much more specific water needs, both in amounts and timing, than rice.

Between 1985 and 1990, a large portion of IIMI's research in Asia — Sri Lanka, the Philippines, Indonesia and later Bangladesh — was dedicated to identifying the constraints,

potentials and solutions to growing nonrice crops in irrigation systems designed, constructed, and operated solely for rice production.

This work has been continued through the "Irrigation Management for Crop Diversification in Rice-Based Systems Network." The idea, first vetted at a regional workshop at the Institute's Sri Lankan headquarters in 1986, became a reality with the inauguration of the Network in late 1988. Today, it links researchers, irrigation and agricultural officials and policymakers from Bangladesh, India, Indonesia, Nepal, Malaysia, the Philippines, Thailand, Sri Lanka and Vietnam.

In September 1991, the Network held its second Annual Review and Coordination Workshop in Yogyakarta, Indonesia, co-organized by the Directorate General of Water Resources Development, the Gadjah Mada University and the Provincial Irrigation Service of Yogyakarta. Participants — senior officials from the nine countries, IIMI's Director General and four IIMI staff — reviewed national experience in promoting crop diversification. The proceedings are expected to be published in mid-1992.

The workshop was accompanied by the second issue of the Network newsletter. The newsletter is used as a forum for members to exchange experiences, ideas, news of emerging publications, results of other workshops and short abstracts of research reports. The Network also formed five national committees in the Philippines, Nepal, Bangladesh, Sri Lanka and Thailand, to oversee activities in those countries; similar committees in the remaining three countries are expected.

In a related effort, IIMI's field research with collaborating organizations in Bangladesh neared completion in 1991. This is part of a three-country collaborative project with the International Rice Research Institute; components in the Philippines and Indonesia were completed in 1990. The results in Bangladesh were presented at two national workshops in that country.

Health

Most irrigation systems are created for a primary public health objective — to improve human nutrition. Their success in attaining this objective may sometimes be reduced by negative impacts on health. These are of two main types. Diseases borne by water-related vectors, especially mosquitoes and snails, may increase because the irrigated environment may support much greater populations of these vectors. Secondly, water provided for irrigation is often used for many other purposes such as drinking, cooking and washing. Gastroenteric and other diseases may be easily transmitted among people through these uses.

In 1988, the Institute joined hands with the UN-sponsored Panel of Experts on Environmental Management for Vector Control (PEEM), as part of the Panel's eleven collaborating centers. IIMI's formal designation in this role was accomplished in 1991. At the same time, the Panel broadened its own scope to incorporate water-related diseases other than vector-borne ones.

In August, the Institute and PEEM commissioned two internationally recognized scientists to visit Sri Lanka, Nepal and Pakistan and report back with recommendations as to how the Institute might address the relationship between irrigation and public health.

Beginning in 1992, IIMI will undertake research on these and other environmental issues under a new thematic program focusing on the environment.

Women and Irrigation

In the past decade, there has been a vast expansion of knowledge about the roles women fulfill in developing countries in farm production, commerce and other economic spheres. However, the contributions of women to irrigated agriculture and water management have been largely neglected as a research area.



Future IIMI research will increasingly address gender issues.

In 1991, the Institute undertook to include gender issues in future research. As a first step,

IIMI commissioned a consultant to propose the future direction of the Institute's research on issues related to irrigation and gender.

An important task will be to find areas of congruence between the interests of women and those of irrigation managers and policymakers. For example, in areas where groundwater development has been undertaken, notably in India and Bangladesh, there is growing interest in women's roles as investors, pump irrigation managers and water users in home gardens. In Bangladesh, some nongovernmental groups are already training women in managing irrigation pumps.

Country Programs

IIMI's collaborative field research and action research at country level are conducted through specific projects in active collaboration with national agencies. This research is normally conducted in countries where IIMI has sustained resident programs. These country programs are designed to contribute to IIMI's overall research and research-related objectives and to the growth of national efforts in irrigation management research and development. In addition, they are implemented so as to maintain effective and productive relationships with national organizations concerned with the management of irrigated agriculture.

Four regions have been identified in IIMI's strategy as appropriate and distinctive units in which it will operate. They are South and

Southeast Asia, West Asia and Northeast Africa, Northwest and West Africa and Latin America and the Caribbean.

IIMI's early focal area was South and Southeast Asia, because of the importance of irrigation to its agriculture sector. In the late 1980s, IIMI's program spread to include countries in West Asia and Northeast Africa where agricultural production is almost wholly dependent on irrigation. The Institute has also expanded its research activities in Northwest and West Africa where irrigation is a feature of increasing significance to agricultural development. IIMI is currently taking steps to initiate programs in Latin America where there is a growing need to improve irrigation performance to increase food production.

The year 1991 saw considerable growth and achievement in IIMI's country programs. More importantly, the impact of the work programs implemented over several years was felt at the national level in several countries where IIMI has been operating. The programs expanded particularly in the West Africa Region where new activities designed to have a regional impact have been initiated. Several new projects have also been launched in Asia. Negotiations are currently

underway for commencing new programs in Bangladesh, the Philippines, Morocco and Mali.

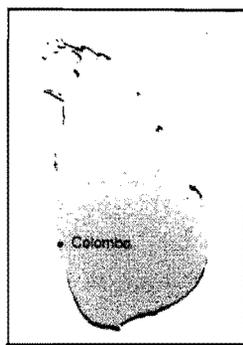
In several countries IIMI is operating in, the activities are getting diversified and have consequently assumed a programmatic nature. The phenomenon of national agencies and other groups coming to IIMI for assistance has been evident in practically all country operations, but principally in Sri Lanka, Nepal, the Philippines, Sudan and West Africa.

South and Southeast Asia

This region is characterized by predominantly rice-growing irrigation systems. Climates generally display at least one season of generous rain which supports large areas of rain-fed as well as irrigated nonrice crops. Although nonirrigated production is strong, dependence on irrigation for a staple food crop is significant due to very high population densities. But in recent years, the zone

has achieved notable success in increasing its rice production faster than its population growth, which has presented some new management issues such as marketing and diversification away from rice. The major countries of the zone are Bangladesh, Myanmar, India, Indonesia, Cambodia, Laos, Malaysia, Nepal, Sri Lanka, Thailand, the Philippines and Vietnam.

SRI LANKA



Sri Lanka, the home of IIMI's headquarters, has been experimenting for several decades with new ways to encourage people's participation in rural development. More recently, government and nongovernment institutions have implemented a

number of pilot activities for enhancing farmers' participation in irrigation management. In the last decade, the government actively encouraged these efforts and began incorporating their lessons into its policies. In 1988, the government formally adopted a "participatory management policy" for irrigation system management, which sought to devolve authority and responsibility for system management to farmers' organizations, with support from state agencies.

Since its founding in 1984, the Institute has worked closely with the government in implementing these and other initiatives through a combination of policy research and analysis and field studies. Research topics have ranged from irrigation management for diversified crops to the rehabilitation of ancient irrigation tanks to



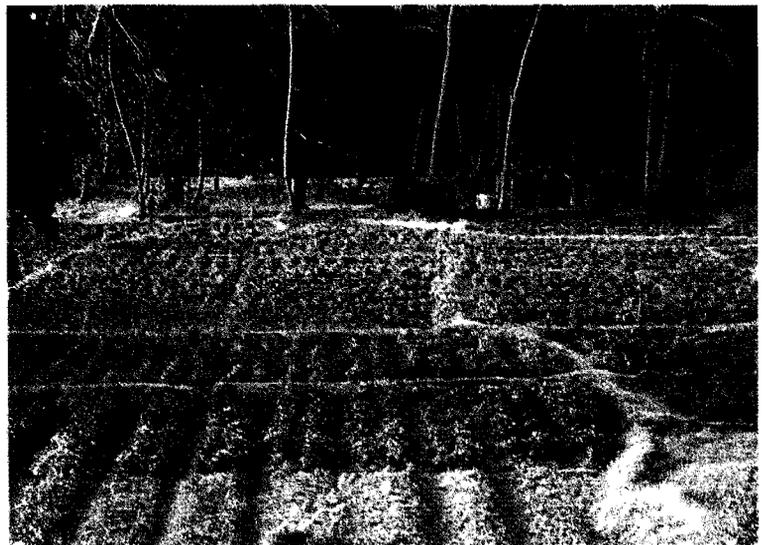
In Sri Lanka, the Institute has carried out research on rehabilitation and modernization of irrigation systems.

modernizing large-scale irrigation systems. In carrying out these projects, a common thread has been a strong emphasis on using a participatory approach as a mechanism for ensuring relevance to the user and the country, thereby developing a commitment to the results.

One of the Institute's most visible activities during 1991 was its involvement in the Irrigation Management Policy Support Activity (IMPSA). Funded by the United States Agency for International Development (USAID), IMPSA uses a unique process for elaborating and refining the government's participatory management policy and for developing a wide consensus on the institutional reforms and strategies.

IMPSA is being implemented by a Secretariat of Sri Lankan professionals, and is guided by a high-level Irrigation Management Policy Advisory Committee (IMPAC). The Institute provides office and technical support services to the Secretariat, while Secretariat members, consultants and Institute staff prepare draft working papers in consultation with panels of experts; for each paper, the Secretariat organizes a series of consultative workshops with a spectrum of people ranging from farmers to irrigation managers. From there, the papers are further refined by IMPAC, who after reaching a consensus, forwards recommendations to the government for formal induction into policy.

Six policy papers, which Institute staff helped draft, were completed and approved by IMPAC in 1991. These set out a broad vision of the future of irrigated agriculture and provided: 1) specific guidelines for developing system-level self-management and joint-management systems based on strong farmers' organizations; and 2) basic policies in regard to operation and maintenance, performance monitoring and financing. Other papers proposed specific and far-reaching changes in the mandate, staffing and organization of leading implementing agencies and provided an



IIMI's program in Sri Lanka includes field research relevant to irrigation management for crop diversification.

overview of a future water resources policy, the basis of a master planning activity scheduled to begin in 1992.

In a related effort, IIMI sponsored a national workshop early in the year to review proposals for future investment strategies. Participants agreed that the concepts of operation and maintenance of existing irrigation systems, institutional strengthening, and research and development should take priority in the government's future investment strategy.

In field research, Institute staff began field-testing and implementing innovations which emerged from IIMI research in two large irrigation systems in southern Sri Lanka. The Institute is using this project to refine a methodology for using action research as a mechanism for organization strengthening and professional development. Called "Participatory Action Research" the methodology establishes a subcommittee consisting of project and field officers, Institute staff, and where appropriate, farmer representatives. The subcommittee plans and implements the activity, collects, and analyzes and evaluates the data.

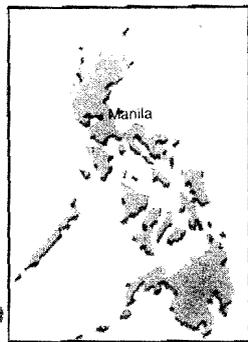
Also during 1991, staff continued to oversee several research projects carried out by national institutions as part of USAID's Irrigation Systems Management Project. An important aspect of the

Project is to evaluate alternative strategies for rehabilitating irrigation schemes in a cost-effective manner. In one study on the profitability of agriculture in four large schemes in the eastern Polonnaruwa District, researchers found rice yields had stagnated; but wide variations in yields suggested room for improvement. The study indicated that returns from rehabilitating the schemes may not match the costs.

In another study, researchers evaluated the process of turning over management responsibilities of six distributary canals to farmers' groups of irrigation systems in Polonnaruwa District. Results showed a wide variation in the management success of farmers' organizations; the best organization improved subsystem performance and diversified into other income-generating activities. But farmers need additional training in financial management skills and more support from field staff.

Also during the year, staff completed a number of activities related to farmer-managed irrigation systems. Two reports presented authors' evaluations of different strategies for government intervention in small-scale irrigation schemes. A third report compared the sustainability of two small systems previously rehabilitated, one by the government and the other by a nongovernment organization.

THE PHILIPPINES



In the past three decades, the Philippines has consistently searched for new ways to improve irrigation management. The National Irrigation Administration (NIA) pioneered the movement in developing countries toward farmer participation in irrigation.

The Philippines was among the first to respond to the fall in commodity prices by searching for new irrigated crops to grow. And,



In the past three decades, the Philippines has consistently searched for new ways to improve irrigation management.

long before the word “privatization” became fashionable, the National Irrigation Administration (NIA) was again among the first to act: NIA began financing its operating budget entirely from its own revenues as early as 1982.

Three years later, IIMI established its first field office in the Philippines. It has worked closely with NIA, regional universities and farmers’ organizations ever since to strengthen the national research capacity, document innovations and disseminate the results to other countries where similar moves are underway.

In 1991, Institute scientists in the Philippines completed the first phase in the research component of the Accelerated Agricultural Production Program. Financed by USAID, the Program’s research objective is to identify, develop, field-test and evaluate innovations to strengthen the capacity of Irrigators’ Associations, farmers’ organizations and NIA to improve irrigation

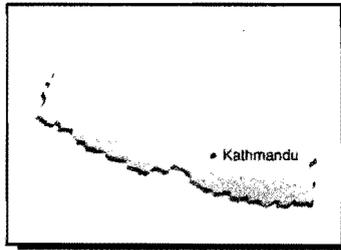
performance. The focus is on two types of irrigation systems: National Irrigation Systems which are owned and constructed by the government but jointly managed by NIA and Irrigators’ Associations through differing contractual agreements; and Communal Irrigation Systems, which are owned and managed solely by farmers with assistance from NIA.

In 1991, IIMI in collaboration with nine regional universities, and NIA regional offices, completed 14 research

projects. Final reports examined the performance of systems managed by Irrigators’ Associations, reviewed the strengths and weaknesses of interaction between the associations and NIA, evaluated the interaction between design and management of Communal Irrigation Systems and considered the effectiveness of NIA’s Farmers Irrigator’s Organization Program. In addition to the results, the program led to lasting ties between NIA and the nation’s regional network of universities.

Based on the findings of these projects, IIMI, NIA and the universities went on to conduct a one-year pilot test of proposed interventions in four more projects. The results of these and other projects were reported in final drafts of four major research publications, 14 project reports, three country reports, and seven research papers prepared for workshops and seminars outside the country. In addition, Institute scientists provided technical inputs into three Irrigation Training Manuals completed by NIA.

NEPAL



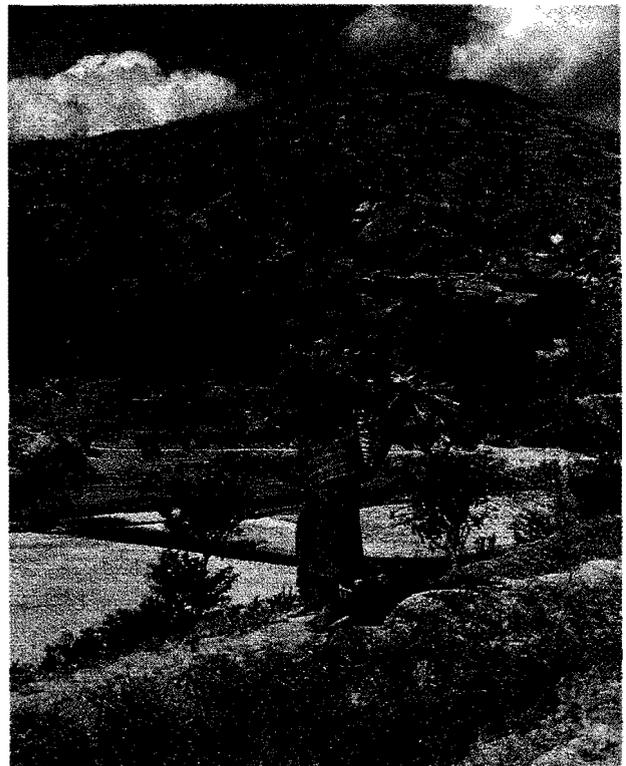
Even before democracy swept into Nepal last year, the country's irrigation agencies had seen the wisdom of increasing the participation of people in government — in this case, farmers. In 1989 and 1990, the Irrigation Master Plan gave new emphasis to participatory and joint management and system turnover as the linchpins in the government's program to make farmers partners in development. Farmers already manage more than 60 percent of Nepal's irrigated area.

IIMI has carried out five years of collaborative research in Nepal on these issues. Among the innovations that have emerged in that time are a cost-effective reconnaissance procedure for ranking farmer-managed systems in terms of need; a rapid appraisal procedure to rank the necessary assistance in terms of impact; the use of farmers from well-managed systems to train farmers from less-efficient systems (i.e., peer training); and the use of farmers as consultants in designing system improvements. Institute scientists are now adapting these and other innovations for use by the Department of Irrigation in its new program.

For example, in 1991, IIMI in collaboration with the District Irrigation Office in Kapilavastu used peer training to prepare farmers for participating in the management of the Banganga Irrigation System, a large, formerly government-

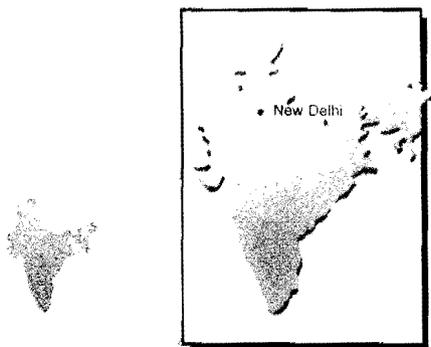
operated scheme. Once formed into an organization, farmers: i) cleaned about 30 km of canals and field channels; and ii) formulated rules and regulations for regular maintenance by the organized water user groups. Activities are also underway to organize farmers along the entire system. Moreover, Institute staff found that an active and dedicated government manager was critical to the task of organizing farmers.

Also in 1991, the Institute completed a study to document and evaluate a program of the Agricultural Development Bank of Nepal to assist the small-scale irrigation sector. The Bank provides irrigation packages that include irrigation technology and financial, technical and organizational hardware to farmer groups. Scientists found that the packages are cost-effective in increasing production and that the internal rate of return was substantially greater than the Bank's assumed costs of funds.



In Nepal, over 60% of the irrigated land is under farmer-managed irrigation systems.

INDIA



Few countries in the world have expended more effort with more success than India has done in developing its water resources. Irrigation has essentially eradicated the threat of famine in the subcontinent and in many states it has created the excess capital necessary to expand industry. However, much of the gains has come in sheer expansion rather than in improved management. And as India begins to liberalize its economy, as happened last year, improving the performance of irrigation to create farm income in rural areas becomes critical to sustaining the success of the new policy. Agriculture remains the engine of growth, and the majority of India's estimated 500 million people continue to toil in rural areas.

Given India's size and diversity and the number of qualified irrigation engineers and researchers, the Institute has pursued a nonresident collaborative approach to its work on the subcontinent. The program, begun in 1989, is aimed at strengthening the capacity of selected Indian institutions to carry out interdisciplinary management research and demonstrate the capability of improving irrigation performance through field research. It involves some 40 researchers, including visiting Institute staff from Colombo, who are carrying out projects in four states — Tamil Nadu, Gujarat, Uttar Pradesh and Bihar — chosen to reflect a range of conditions. Implementation of the projects began in earnest in 1991.

In Tamil Nadu, staff from Madras-based Anna University, Trichy-based Irrigation Management and Training Institute and the Irrigation Wing of the Public Works Department, began researching the performance and main system management of the Tamiravaruni Irrigation Scheme. Social scientists are evaluating existing farmers' organizations and their interaction with main system management. Engineers have installed flow measuring equipment, calibrated the structures and have begun collecting flow data. Other team members will be documenting the decision-making process and studying the interaction between different governmental agencies involved with the project.

In Gujarat, staff of the Water and Land Management Institute, the Institute for Rural



Improved irrigation management is a feature of increasing significance to agricultural development in Bihar.

Management, Anand and Gujarat's Water Resources Department are carrying out similar studies on the Mahi-Kadana Project. In addition, special emphasis will be given to developing an interactive methodology of water delivery schedules on minor canals and the formation of farmers' groups.

In Uttar Pradesh (UP), the University of Roorkee, UP Water and Land Management Institute and the Irrigation Department are working in three pilot areas on the conjunctive use and management of groundwater for irrigation in the as-yet-unfinished Madhya Ganga Project. Studies are underway to assess groundwater behavior and the extent of groundwater resources. A systematic soil survey study is also being conducted to identify diversified land uses and associated management practices. Socioeconomic studies are also underway.

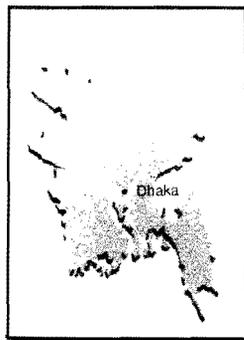
Last, in Bihar, the Patna-based Bihar College of Engineering, the Bihar Water and Land



Agriculture remains the most vital component of development in India.

Management Institute and the Irrigation Department are analyzing issues related to conjunctive use of surface water and groundwater resources in the Eastern Gandak Project. The surface irrigation infrastructure has not yet been completed due to severe waterlogging, a major obstacle to agricultural production throughout India's poorest state.

BANGLADESH



Last April, a massive cyclone sent a six-meter wall of water over the coast of Bangladesh killing more than 100,000 people and destroying millions of dollars of crops. Almost by itself, the cyclone cut

the 5.8 percent GNP growth rate of 1990 almost by half in 1991. It also led to another round of emergency food imports.

Despite being prone to such natural disasters, however, Bangladesh continues to have the potential for substantial agricultural growth. Although virtually all of the country's nine million hectares of cultivable land are already under use, Bangladesh's vast irrigation potential, unlike its Asian neighbors, has barely been tapped. Independent estimates suggest that there is enough water to triple the current area under irrigation. The application of controlled water supplies to the fertile soils of the floodplains of the Ganges, Brahmaputra and Meghna rivers could lead to a substantial increase in agricultural production and

rural incomes. The combination could provide the necessary margin of safety against future disasters and turn the tide against poverty.

Two key factors set Bangladesh apart from other countries where the Institute is currently working. First is the predominance of lift irrigation — tubewells as well as motorized pumps drawing from surface supplies — versus canals. Second is the need to increase rice yields to a scale comparable with other developing Asian countries. The national program of irrigation development is responding to both these needs by trying to rapidly expand the irrigated area and to better utilize existing resources. In particular, the government has placed heavy emphasis on privatizing the installation of pumps and the management of the pump irrigation sector.

To assist in this process IIMI, the International Rice Research Institute and several national cooperating institutions initiated research in 1988 as part of a three-country project entitled “Irrigation Management Options for Rice-Based Farming Systems.”

In 1991, as part of this effort, researchers continued and expanded field tests of an innovative water delivery plan in the Ganges-Kobadak Irrigation System, a large lift canal scheme operated by the Bangladesh Water Development Board. In earlier phases of this study, researchers and irrigation staff had implemented a ten-day rotation (five days on, five days off) of water delivery to farmers in one secondary canal and its system of tertiary canals.

The project staff’s commitment to ensure water delivery and the involvement of farmers in carrying out the new schedule resulted in a substantially larger irrigated area compared to previous dry seasons. Last year, the research team repeated and sustained the results along the canal studied in 1990 and also successfully expanded the program to three other secondary canals.

In the North Bangladesh Tubewell Project (NBTP), Institute staff evaluated the transfer of ownership of many of the project’s deep tubewells to the Grameen Bank under the national privatization program. Grameen has gained world renown for the development of innovative ways to provide credit to the poor. Its expansion into tubewell management is a fairly recent initiative. Under its program, the Bank purchases a deep tubewell and contracts with farmers to exchange one quarter (or more, if inputs are provided) of their harvest for a share of water. A bank employee lives and works at the site and runs all aspects of the operation including water management.

The Bank, however, has had mixed results in implementing the program in the NBTP area. Farmers, who had grown used to paying minimal charges (if any) to the Water Development Board, resisted the idea of contracting and later paying the Bank’s share of their harvests. Grameen also suffered losses due to low yields and high management costs.

In Rajshahi, researchers evaluated performance, fee collection and farmer participation in the management of three types of deep tubewells: private, rented and public. Among these, the privately managed wells appeared to irrigate larger areas with the same amount of water. All three, however, showed higher rates of farmer participation in management and costs than was evident in the Ganges Kobadak and NBTP study sites.

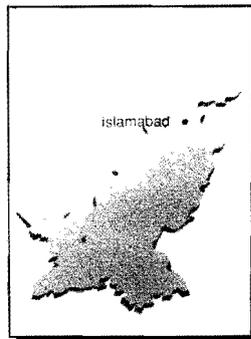
Results of research and recommendations for improving performance at all three sites were presented at an October workshop held at the Bangladesh Agricultural Research Council. Representatives of irrigation agencies, government ministries and research institutions participated in this workshop.

West Asia and Northeast Africa

Major rivers originating in mountain systems fringing the zone carry plentiful silt and have laid down deep, level and fertile soil systems. The average annual rainfall is generally very low and many of the countries in the region depend almost totally on irrigation for food and fiber crops. Human populations crowd the irrigated areas

because nonirrigated food production capacity is low. In many systems, virtually all surface water resources have been captured so that improved management to increase productivity per unit of water is the only way forward. The major irrigation countries of the zone are Pakistan, Iran, Iraq, Syria, Egypt and Sudan.

PAKISTAN



Placed end to end, Pakistan's major irrigation canals could stretch around the world more than four times. Add almost 300,000 tubewells and Pakistan ranks fifth in the world in gross irrigated area with 16 million hectares. At the same time, comprehensive studies have shown the Indus Basin to be one of the world's most favorable environments for intensive, highly productive irrigated agriculture. The International Food Policy Research Institute believes Pakistan and Thailand are the only two countries in Asia with the potential to export food on a sustainable basis in the 21st century.

However, with all that in its favor, the government still predicts shortfalls in national food and fiber requirements to the tune of 10 percent by the year 2000 and of 25 percent in 2013. And,

that assumes Pakistan can meet targets set by the national "Water Sector Investment Plan" of 1990. Not surprisingly, good quality surface water supplies are said to be the nation's scarcest, most valuable agricultural resource. With more than two-thirds of Pakistan's 110 million people engaged in agriculture, returns to investment in improved irrigation management strategies will yield tremendous social and economic benefits.

The Institute's program in Pakistan, begun in 1986, continues to develop and adopt management innovations consistent with the awareness shown by the country's policymakers of the need to improve irrigation management. Working closely with federal ministries of Water and Power, and Food and Agriculture, provincial irrigation staff and national research institutions, the Institute's staff have developed indices to monitor the equality of water delivery, developed assessment methods to target canal maintenance, and have shown the importance of the first irrigation of wheat, which frequently conflicts with the annual closure of canals.

In 1991, Institute staff continued research on waterlogging and salinity. Spreading salinity — caused when salt moves upward through the soil with rising water tables, or when irrigation water is pumped from groundwater of doubtful quality

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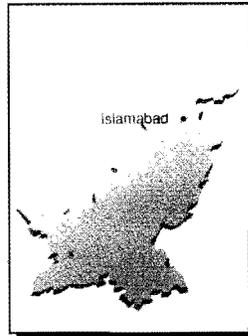
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In Pakistan, farmers use groundwater and canal water conjunctively to bolster crop yields.

which takes an increasing importance — takes thousands of hectares of farm land out of production, with nearly irreversible consequences. Earlier studies on the topic, begun in 1988, found a link between inequitable water delivery to the head, middle and tail portions of canals and increased incidence of salt accumulation in the soils in water-deficit locations. Farmers who did not receive their scheduled water delivery made up the difference with tubewell supplies; but the same tubewell water was found to have high salt contents.

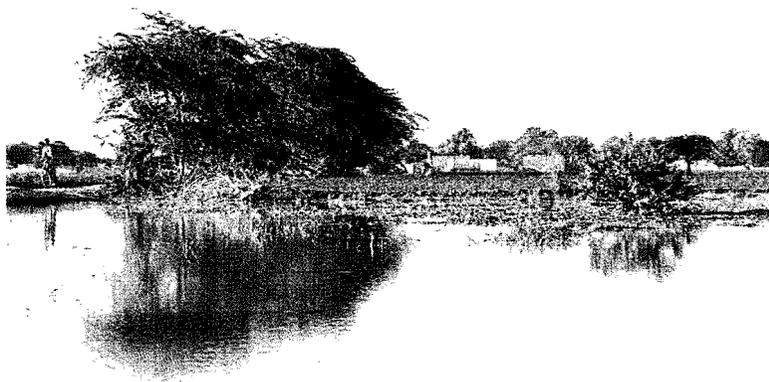
Last year, the Institute began testing ways to reverse the trend. Working on one canal with the Punjab Irrigation Department, IIMI demonstrated that, even with budgetary constraints, targeted maintenance can produce conditions that result in surface water deliveries much closer to the intended equity objective. Supplying increased amounts of better quality canal water to underserved areas, permits farmers to mix irrigation supplies, or to apply good quality and poor quality waters alternately. This improves the average quality of water used, slows the rate of secondary salinization and reduces its

impact on crop yields. In this regard, Institute staff began testing several components of a decision-support package to assist irrigation line officers in planning their annual canal maintenance.

At the request of federal and provincial authorities, IIMI scientists began work in 1991 in Pakistan's North-West Frontier Province. The Province has embarked upon two new projects; one is the remodeling of the physical infrastructure in the Lower Swat Canal; the second is the construction of the Chashma Right Bank Canal. IIMI has developed an applied research project to develop a

crop-based operational strategy to improve productivity of water resources in the two systems.

Pakistan's irrigation system continues to operate according to design objectives of British engineers who originally planned it. Many structures are fixed — as opposed to movable irrigation gates — so the system can run with a minimum of management personnel. As a consequence, the system delivers water on a fixed rotation; there is little room to deliver varying



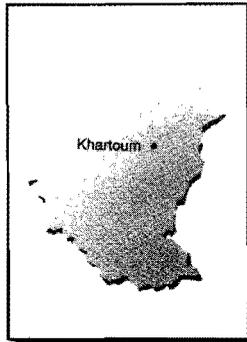
During 1991, research on waterlogging and salinity continued in Pakistan.

quantities of water to different crops in the same section of the system in accordance with the needs of the crops. So IIMI scientists, in this case, will be trying to determine the minimum amount of infrastructure and management changes necessary to adapt the systems to meet varying crop water requirements.

The Institute is also directly involved with a nationwide effort to upgrade large portions of

Pakistan's irrigation research network and to strengthen the research capacity of the institutions involved. IIMI's role is to provide technical assistance to participating national research institutions. In particular, the Institute is working closely with the International Waterlogging and Salinity Research Institute. The aim is to enhance the research management skills of the staff through "hands on" experience in planning, monitoring and evaluation of irrigation- and drainage-related research.

SUDAN



In a hot desert climate with errant rainfall like that of Sudan, and an impoverished population of 25 million people, the margin of error in irrigation performance is razor thin. A ten percent expansion of irrigated area or in the efficiency of delivery to existing areas can save the lives of thousands of people in a single year of drought.

But Sudan has more irrigation than any other country in the zone save Egypt — almost 1.9 million hectares. While this amounts to only a quarter of the country's total cultivated land, nearly half of Sudan's food is produced on it, including all of Sudan's wheat and 90 percent of its cotton. The most prominent systems are the 60-year-old Gezira System, which accounts for a third of the irrigated area, and the more recent New Halfa and Rahad schemes. However, small systems make a significant contribution to cultivation.

Having finalized a long-term work plan with the government in 1990, the Institute began field research in Sudan last year. In 1991, staff began working with the Ministry of Irrigation and the Rahad Agricultural Corporation to improve the operation and maintenance of the Rahad Irrigation Scheme. The first step was to find out just how well the system was working. To do that staff began by installing gauges, data loggers and other measurement devices along a major secondary canal. Data collection continued through the second half of the year, and will be complemented by surveys of water users and managers in early 1992.

In the first half of the year, an IIMI staff member assigned to the Sudan Gezira Board worked with top management staff and collaborating researchers to identify major obstacles to performance of the Gezira Scheme. Once completed, field research began at the scheme's pilot farm, in October, to quantify water and agronomic parameters and their impact on wheat production. Yields proved uncertain, and in some cases crops were lost altogether; sixteen major shortcomings were identified, ranging from the hardness of recently introduced wheat to a lack of flow measuring devices. Appropriate management strategies will be tested in 1992.



The 60-year old Gezira Scheme is about to undergo important changes in its agricultural and management systems.

In the area of training, staff organized two major workshops and conducted several short-term and long-term training courses. In May, staff collaborated with the Agricultural Ministry to sponsor a workshop on water charges. The participants reviewed present policies in regard to water charges, considered lessons from other countries, and identified a range of policy options for Sudan.

At the request of the ministers of Irrigation and Agriculture, the Institute assisted in organizing an October workshop on the subject of privatizing irrigation schemes. Lively discussions led to a series of far-reaching recommendations: these ranged from the establishment of water users' organizations to the turnover of various responsibilities for management of government

systems to farmers. In Sudan, where farmers have heretofore had little say in management, or even about the crops they grow, this represented a revolution in thinking.

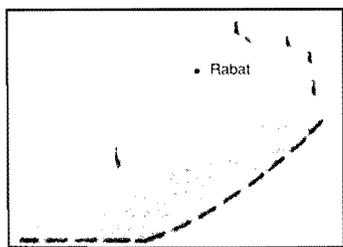
Also during the year, the Institute conducted a twelve-day training course on Rapid Rural Appraisal for nineteen participants from the Institute's collaborating government and nongovernment partners. Two IIMI staff from outside Sudan and the two resident IIMI staff joined a consultant in conducting the course. And throughout the year, staff conducted a series of short seminars on the Institute's experiences in other countries. And several senior officials from the Gezira Board were taken on a study tour of Bangladesh and Pakistan to see how officials in those countries deal with related problems.

Northwest and West Africa

In this zone, reliance on irrigation has hitherto been quite low. Population densities are usually low and over great parts of the continent rain-fed production has sufficed to feed the population with irrigation concentrated on cash crops or export crops. A trend toward more irrigation for staple food production is now emerging as

populations grow and pressure on food resources increases. However, unlike in other zones, irrigation traditions and infrastructure are lacking, so institutional formation is a management issue here. Nigeria, with the continent's highest population, is the most significant irrigator country in the zone.

MOROCCO



Morocco is renowned for its development of water-saving irrigation techniques in the absence of a major water source or extensive rainfall. Much of this expertise is unknown outside West Asia and North Africa. In contrast, Morocco lacks Asia's long experience in farmer-managed irrigation or, the more recent experience of the turnover of government systems to farmers. However, FMIS outside Morocco's command areas of ORMVAs (parastatal agencies in charge of agricultural development) command almost one third of the country's irrigated area. Including those systems within ORMVA's command, FMIS make up two-thirds of the irrigated surface of the country.

During 1991, the Institute, which operates a comparably smaller program here than in other countries, carried out the first phase of a project to provide irrigation advice to farmers in surface irrigation systems in Tadla. Researchers found that farmers who depend on the principal of "Robta" — small flooded basins — waste significant quantities of water, except when used in the advanced stages of cotton. Also, while farmers were able to determine their present crop water requirement, they proved unable to accurately anticipate the shift from a simpler, planned irrigation to a more flexible water delivery schedule.



Morocco has centuries old traditional irrigation systems.

Throughout the year, the Institute's staff in Morocco advised other IIMI country programs, in Pakistan and West Africa, and various institutions within Morocco. The staff also worked with the

Institute's research division in assessing the interaction of design and management of Morocco irrigation systems for a generic project of the same title.

WEST AFRICA

From Burkina Faso to Nigeria, West African governments are struggling to feed, clothe and care for a population that is growing far faster than the land can sustain. In the Sahel, people shift with the sands that each year spread the domain of the desert. In these countries, there is rarely any mention of a permanent balance of food, with imports racing ahead of production. In the humid tropics to the north, extremes of income further tip the balance toward volatility.

Irrigation won't solve the problem. But it will help. At present, irrigated lands make up less than 3 percent of the region's cultivated area, or about 1.7 million out of 61 million hectares. However, the extent of irrigated lands could be tripled, and if carefully managed, could provide a relatively large and steady source of food and income that planners can depend on and farmers can live by. Under crisis conditions, particularly in the Sahel, every additional crop grown on an additional hectare makes a difference.

Although more than two thirds of existing irrigation is already managed by farmers, it is generally accepted, however, that irrigation systems do not achieve their initial planned objectives. Performance of irrigation in Africa viewed in purely technical terms is comparable with irrigation in other parts of the world (rice

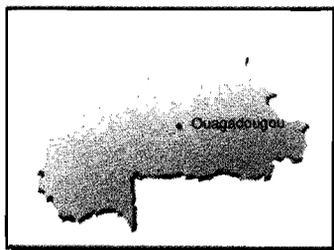
yields of 5–6 t/ha/cycle are quite common). The difficulties are largely related to the combined effect of different socioeconomic factors.

It is in that context, that the Institute initiated a regional network for West Africa in 1988. Given the similarities of irrigation development and potentials in West Africa, the network is designed to provide vital links between Asia and the region and within the region itself, through research, training and information exchange. It is based on the concept of triage, i.e., it is designed to produce results in the shortest possible period of time.

In 1991, research began in Burkina Faso, where IIMI's Regional Representation is based, and in Niger and Nigeria. In 1993, research will begin in Mali. The research in these four countries will form the basis of the network that will eventually link and provide valuable inputs to the other countries of the Sahel and the humid tropical zones.

In 1991, in addition to coordinating and planning the regional research and training network, IIMI's regional representative produced the first issues of the quarterly West Africa Irrigation Network Newsletter in English and French. The response to the Newsletter was overwhelmingly positive.

BURKINA FASO



The potential of irrigation in West Africa is well-exemplified by Burkina Faso. Its population of nearly 9 million is currently growing at an annual rate of about 3 percent. Irrigated agriculture is estimated to cover about 16,000 ha, but the potential is estimated to be ten times that. The irrigation sector is confronted with a set of problems typical of the early stages of its development — low cropping intensities, farmers with little or no tradition in irrigated agriculture, personnel involved in irrigation system management who lack the requisite training and skills, multiple institutions which intervene in the sector with different priorities and preoccupations.

1991 saw the commencement of IIMI's program in Burkina Faso, aimed at improving the performance of small-scale, reservoir-based village irrigation schemes, common to the country. Six such irrigation schemes have been selected as research sites. During the year, staff began field research in two systems: the 24-year-old Mogtedo and the three-year-old Itenga schemes.

By the end of the year, staff had completed a socioeconomic and organizational profile of both systems, and had updated the information relating to their physical characteristics. Staff had also assessed system management practices through monitoring of water deliveries along the main canals and in sample distributary canals and had carried out water balance surveys in selected fields, to determine such factors as percolation and

evapotranspiration rates. In the process, researchers had identified a number of shortcomings: weak farmers' organizations, a lack of management training among personnel, and the absence of reliable information related to the irrigation infrastructure (canal network, irrigated areas). In one case, an extensive topographical survey carried out by IIMI staff revealed that "unauthorized irrigation" in the head reaches alone amounts to 25 percent of the command area.

The research component of the program is complemented by training/professional development and information dissemination components. In November, as part of a new collaborative agreement with the Burkina Faso representation of the World Conservation Union (IUCN), the Institute produced a newsletter in

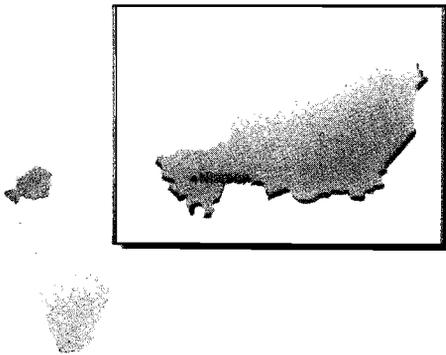


IIMI's program in Burkina Faso is aimed at improving the performance of small-scale irrigation systems.

Moor, the most widely spoken national language. The issue featured irrigation and reforestation as well as presented the views of farmers in the Institute's two field sites. IIMI also collaborated

with IUCN and the John-Paul II Foundation to coproduce a video film on water in the Sahel, part of which was filmed at IIMI field sites. The video highlights the benefits which can be obtained from proper water resources management.

NIGER



ONAHA (a parastatal, financially independent institution which plays a decisive role in irrigation development).

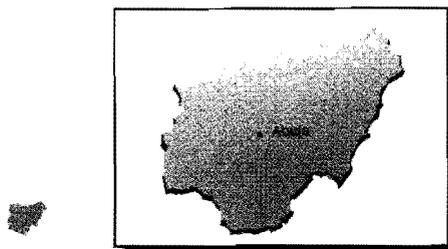
State disengagement and the success of the Cooperative Movement in Niger are largely due to a favorable institutional context and a gradual introduction of formal contractual links among the different actors who play a role in irrigation management. However, the initial success of self-management by the beneficiaries is threatened by difficult political and socioeconomic conditions. The legal status of the cooperatives is still awaiting finalization, the rural code is being reviewed, and low priced rice imports compete with local production.

In the case of Niger, irrigation may represent the last stand against the spreading desert. Landlocked, 600 km from the sea, Niger is one of the hottest regions on earth. Only 12.5 percent of the land is potentially cultivable and only 2.5 percent is actually cultivated. The population of 7.2 million is growing at some 3.5 percent a year. Still, there is a potential for irrigating 270,000 ha against the present total of 81,000 ha. Most of this lies along several major sources of water including the Niger and Komadougou rivers, where irrigation is carried out with small-scale hand-lifting to large-scale pumping stations.

In 1991, staff concluded a formal country agreement to work in Niger with diplomatic status, identified five experts and three technicians to be seconded from the government, hired three support staff and moved into IIMI offices. By the end of the year, preliminary work had been completed leading to the identification of three research sites along the Niger River, and the development of an accompanying research program. The work is scheduled to begin in early 1992.

There are some 30 modern irrigation schemes along the Niger River covering over 6,700 ha. To date, farmer-management of larger-scale schemes has functioned well with the technical support of

NIGERIA



In the late 1960s, Nigeria was one of Africa's major exporters of food and was able to meet its own needs on a sustainable basis. But during the oil boom, agriculture was delegated less priority. By the late 1970s when prices began to fall, Nigeria had become a major importer of food stuffs. Still, the severe drought of 1972-73 prompted the government to undertake water conservation and utilization projects. In 1976, the government formed 11 river basin development authorities to undertake irrigation-related infrastructure and agriculture development.

In 1987, the government announced plans to privatize and commercialize public sector enterprises, including the 11 River Basin Development Authorities. Today, with some 1 million hectares of irrigated area — 90 percent under traditional irrigation systems — and an estimated potential of 2 million hectares, the government is pursuing a two-pronged development approach. First, existing irrigation agencies are being asked to become self-financing; this will involve the imposition of water charges, new institutional arrangements and greater participation of farmers in irrigation management.

At the same time, the government has undertaken to develop the remaining irrigated potential.

The Institute, in 1991, assisted the government to make this difficult transition. In particular, staff are working in the Kano River Irrigation Project, in collaboration with the Hadejia Jama'ara River Basin Development Authority. Until 1987, the Kano River staff provided farmers with water, agricultural inputs, machinery for land preparation and marketing services. With the new policy, farmers must pay for all services, while the Authority is shifting to irrigation-related activities only.

During the year, staff collected information at three pilot sites on the socioeconomic status of farmers, crop coverage, water availability, the extent of existing farmers' organizations and the ability and willingness of farmers to pay water charges.

Utilizing techniques from Nepal and elsewhere, IIMI staff worked with the Authority to develop a procedure for the formation of the farmers' organizations, to create a legal basis for their existence, and to define the role they were



Better utilization of existing irrigation systems is necessary to meet Nigeria's future food needs.

expected to play in water management. Staff also rationalized the fee collection procedures and the amounts to be assessed. This and other

information will be documented for use in other systems in Nigeria, where agencies are struggling to adjust to their new role as commercial enterprises.

Latin America

The area under irrigated agriculture in Latin America is about 16 million hectares. The major irrigation countries of the region include Mexico, Brazil, Argentina, Chile, Peru, Cuba, Ecuador and Colombia. These countries account for almost 90 percent of the total irrigated area of the region. Although, in several countries, irrigation is concentrated on market crops rather than on staple cereal crops, there are substantial pockets like northeast Brazil, northwest Peru, and central Chile where irrigation plays an important role in food production.

The rationale for an IIMI program in the region lies mainly in the opportunities it offers in addressing generic irrigation management issues in an environment that is different from those usually encountered in Asia and Africa. These differences stem from levels of technology used as well as from a more prominent role of the nonpublic sector in the development and management of irrigation systems.

The first regional activity carried out by IIMI in Latin America was the organization of a symposium on irrigation management in 1990. During 1991, an international workshop on the performance of farmer-managed irrigation systems was held in Mendoza, Argentina. It was sponsored by the FMIS Network and organized jointly by IIMI and the Instituto Nacional de Ciencia y Técnica Hídricas (INCYTH), Argentina. This workshop provided an opportunity for strengthening understanding of the basic concepts and principles of performance evaluation and its

role in the management of irrigation systems. It also brought together irrigation management experiences of Asia, Africa and Latin America, thus promoting the possibility of continuing dialogues and exchanges of experiences between Latin America and the countries of Asia and Africa.

To establish its program in Latin America, IIMI (with financial support from the Ford Foundation), fielded a two-man consultative mission to develop a workplan for the region. In the latter part of 1991, the mission visited six Latin American countries (Argentina, Brazil, Chile, Colombia, Ecuador and Mexico) and had discussions with many members of national irrigation departments and other government departments, research institutions, water users' associations and regional organizations.

The mission has identified several areas of research: these include the operational management of water deliveries, the management of transfer of responsibilities, methodologies for performance assessment, and the role of policy instruments. These research areas have been selected not only because of their individual importance but also because of their mutual interdependencies. Collaborative research activities in the region will be complemented by professional development and information exchange programs.

The report of the mission will serve as a basis for developing an IIMI Program in Latin America.

Training and Capacity Building

In many developing countries, irrigation agencies administer rather than manage irrigation systems with an emphasis on following rules and procedures. What is most often needed is the strengthening of the organizations responsible for managing the systems, primarily through the development of the necessary human resources. The Institute's program of training and capacity-building has two principal components: strengthening national institutions and training of individual managers and policymakers.

The Institute's recently completed three-year training cycle in Malaysia, shows how IIMI endeavors to strengthen irrigation institutions.

At the end of 1989, the Institute training staff, in close collaboration with the Department of Irrigation and Drainage (DID) in Malaysia, initiated the cycle with a Training Needs Assessment. The assessment, conducted over 30 days, sought to identify factors affecting individual performance of 321 irrigation staff; and to provide a proposal for solutions, for example, fulfilling training needs or making organizational changes.

In February 1990, the resulting evaluation was presented to 28 senior managers and engineers, during a three-day workshop. This was then followed by a one-day workshop in October to discuss and decide on organizational needs for implementing two training activities with the Institute's assistance. The DID chose to focus on curricula for Engineers and Irrigation Overseers including definition of general objectives, participants' level, time frame, contents and evaluation strategies.

In February 1991, staff developed the curricula and prepared basic training materials to support the exercises. Materials included slide and video presentations, charts, handouts, exercise sheets, flip charts and audio cassettes, which were derived from eight Institute publications and papers on topics ranging from farmer-managed systems to

the role of engineers in irrigation systems; texts and videos from other organizations were also included.

From 22 April to 11 May 1991, the Institute used these training materials in the first exercise for Training-of-Trainers at the Continuing Education Center of the Universiti Pertanian Malaysia, in collaboration with the Irrigation Department and university staff. Fifteen university teachers and irrigation and agricultural trainers attended. From 15 to 25 October, the Department's Director General, Director of Projects and Deputy Director General and some 40 other senior officials met with the Institute's training staff to review organizational issues and the progress of the activities.

Last, from 26 October to November 6, the first two training activities were carried out by five Malaysian trainers from the university and the DID and were monitored by IIMI staff. Participants developed a series of action plans, which will be monitored by the DID training staff, who will later provide feedback to the Institute. One of many outcomes of the three-year exercise was the development of a Human Resources Development Plan by the DID; the plan includes a systematic training program and a performance evaluation system for personnel.

Based on its success in Malaysia, the staff also initiated the same cycle for the Bangladesh Agricultural Development Corporation. The exercise began with a May assessment of 179 personnel. Staff returned to present the results to the Corporation's senior managers in September. In 1992, efforts will get underway to begin the cycle in Sudan.

Related to this effort, an International Training-of-Trainers Program was held in Kuala Lumpur in early November with participants from Indonesia, Malaysia and Thailand.

Individual Training

In the area of Individual Training, IIMI hosted three fellowships and four scholarships during 1991. These included one doctoral candidate from Burkina Faso and four Master's Degree candidates — two each from Burkina Faso and Pakistan — and two research fellows from Burkina Faso (see Annex III).

Collaborative Research Activities

Research collaboration with national partners is an excellent vehicle toward IIMI's goal of strengthening national capacities. Participating staff learn about field research firsthand and gain a greater benefit from the results. Collaborative

studies are, therefore, a vital element in IIMI's training activities. In 1991, collaborative research activities were initiated in several countries including Pakistan, Burkina Faso, Niger and Sri Lanka, details of which are given in the boxes below.

In Pakistan, IIMI is participating in a nationwide effort to upgrade the country's irrigation research network and to strengthen the research capacity of the institutions concerned. IIMI's role in this project is to provide technical assistance to participating national research institutions. As part of this effort, IIMI is working closely with the International Waterlogging and Salinity Research Institute to enhance the research management skills of their staff.

Agreements

Organization

Purpose

Burkina Faso

International Union for Conservation of Nature and Natural Resources

For joint publication of a newsletter in the national language (Moor) which will address issues related to irrigation and the environment.

Niger

Government of Niger

Memorandum of Agreement for Research Development Program on Irrigation Management in the farmer-managed irrigation systems of the Niger River

Nigeria

International Crop Research Institute for the Semi-Arid Tropics

To collaborate in a research program with Hadejia Jama'ara River Basin Authority in Kano, Nigeria.

Research Contracts

<i>Contract Title</i>	<i>Research Institute</i>
Pakistan	
Rapid Socioeconomic Survey of Sample Areas in the North-West Frontier Province (NWFP), as Part of the Crop-Based Irrigation Operations Project in NWFP.	Economic Development Corporation, Pakistan.
Philippines	
Develop a Technical Training Manual for Use by the National Irrigation Administration.	Mandala Agricultural Development Corporation, Philippines.
Research/Intervention Project on People's Upliftment through Self-Help.	Central Mindanao University, Musuan, Bukidnon, Philippines.
Pilot Intervention in Bicol for Organizational Development for Strengthening of Irrigation Associations and IA/NIA Partnership.	Bicol University Development Foundation Inc., and Ateneo de Nagar University, Naga City, Philippines.
Research/Intervention Project Involving Information, Education and Communication Materials in Irrigation Management.	University of the Philippines in the Visayas, Iloilo City, Philippines.
Extension of Water Measurement and Farm Productivity Study in the National Irrigation Systems in the Bicol Region.	Bicol University Development Foundation Inc., Philippines.
Extension of Design Review of Communal Systems in Region VI.	Central Philippine University, Iloilo City, Philippines.
Research/Intervention Plan 2 for Region VI: A WVSU-NIA Social Action Research Project.	West Visayas State University, Iloilo City, Philippines.
Support Activities, Staff Training and Irrigation Associations' Intervention Training.	National Irrigation Administration, Philippines.
Sri Lanka	
Study of Turnover and O&M on Distributaries to Farmers' Organizations in Polonnaruwa District.	TEAMS (Pvt) Ltd., Sri Lanka.
Study on Maximizing Profitability of Irrigated Agriculture in the Polonnaruwa District.	Agriculture Industry Consultancy & Services (Pvt) Ltd., Sri Lanka.
Study on Cost-Effective Irrigation Modernization Strategies.	Engineering Consultants Ltd., Sri Lanka.
Provide Training in Methodologies to IIMI Regional Offices and Field Staff.	Sri Lanka Institute of Development Administration Staff, Sri Lanka.

Workshops and Conferences

Workshops and conferences and related institutional development activities are designed to contribute both to strengthening national irrigation research capacity and supporting the introduction of improved management and policymaking.

These workshops provide opportunities to exchange information between countries on new

thinking and current experiences in the field of irrigation management.

In 1991, IIMI organized or co-organized 25 workshops and conferences in several countries. IIMI also participated in 27 workshops and conferences organized by other institutions. The details of these events are as follows:

Workshops and Conferences Organized or Co-organized by IIMI

<i>Title</i>	<i>Dates</i>	<i>Location</i>
Future Directions for Irrigation Investments in Sri Lanka (co-organizer: IMPSA).	24–25 January	Colombo, Sri Lanka.
World Bank-IIMI Workshop.	4–5 February	Colombo, Sri Lanka.
Workshop on Financing Irrigation Services in the Philippines (co-organizers: IFPRI/NIA).	1 March	Manila, Philippines.
5th Annual Meeting of the Advisory Committee of the Network on Farmer-Managed Irrigation Systems.	12–14 March	Manila, Philippines.
Workshop on Training-of-Trainers in Collaboration with Universiti Pertanian Malaysia and Department of Irrigation and Drainage, Malaysia.	22 April – 11 May	Perdang, Malaysia.
Training Needs Assessment at Bangladesh Agricultural Development Corporation.	26 May – 15 June	Dhaka, Bangladesh.
Workshop on Irrigation Water Charges (co-sponsor: Advisory Unit for Agricultural Corporations).	29 May	Khartoum, Sudan.
Workshop to Review the Inception Report of the Phase II of the Technical Assistance Study, Irrigation Management and Crop Diversification.	10–11 June	Hambantota, Sri Lanka.
Training Seminar on Research Methods for Irrigation Management Research (co-organizer: Water and Land Management Institute, Bihar).	11–14 June	Bihar, India.

2nd Progress Review and Coordinating Workshop on Irrigation Management for Crop Diversification in Rice-Based Systems Research Network (co-sponsored by DGWRD and the Faculty of Agricultural Technology, Gadjah Mada University).	9–12 September	Yogyakarta, Indonesia.
DSE/IIMI Workshop on Farmer-Managed Irrigation Systems.	23 September – 11 October	Chiang Mai, Thailand.
Workshop to Deliver Training Needs Assessment Results to Top Management of Bangladesh Agricultural Development Corporation.	28–30 September	Dhaka, Bangladesh.
Regional Workshop on Research on Sustainable Agriculture (co-organizers: ICRISAT/IBSRAM)	30 September – 2 October	Bangkok, Thailand.
Privatization of Irrigation Schemes in Sudan (co-organizers: Ministry of Agriculture/Ministry of Irrigation, Sudan and Arab Organization for Agricultural Development).	6–7 October	Khartoum, Sudan.
Workshop on Improving Management of Irrigation Systems Maintenance.	8 October	Colombo, Sri Lanka.
Applied Research for Increasing Irrigation Effectiveness and Crop Production (co-organizers: IRRI/BRRI).	8–9 October	Dhaka, Bangladesh.
Training Course on Rapid Rural Appraisal for Irrigated Agriculture (co-organizer: Sudan Gezira Board).	8–20 October	Wad Medani, Sudan.
Round-Table Discussions and Workshops for Senior Managers of the Department of Irrigation and Drainage in Malaysia.	15–25 October	Kuala Lumpur, Malaysia.
Accelerated Agricultural Production Project - Project Development Workshop.	23–25 October	Legaspi City, Philippines.
Monitoring the Implementation of the Training Activities in Malaysia — Training of Irrigation Overseers.	26 October– 6 November	Kota Bharu, Malaysia.
DSE/IIMI Training and Dialogue Program — International Training-of-Trainers.	28 October– 6 November	Kuala Lumpur, Malaysia.
DSE/IIMI Workshop on New Trends and Policies in Irrigation Management.	4–7 November	Colombo, Sri Lanka.
Performance Measurement in Farmer-Managed Irrigation Systems (co-organizer: National Institute of Water and Technology).	12–15 November	Mendoza, Argentina.

Monitoring the Implementation of the Training Activities in Malaysia — Training of Irrigation Engineers.	13–26 November	Penang, Malaysia.
DSE/IIMI Workshop on Management Orientation in Irrigation Engineering Curricula.	25–29 November	Bangkok, Thailand.

Selected Workshops and Conferences at which IIMI was Represented

Irrigated Agriculture Sector Review (organizers: National Irrigation Administration/World Bank).	26–27 February	Manila, Philippines.
International Symposium on Indus, the Lifeline of Pakistan (organizer: Pakistan Council Research Water Resources).	2–7 March	Islamabad, Pakistan.
Irrigation Issues in Bangladesh (organizers: Rural Development Academy/Human Resources Development Program of Winrock International).	11 March	Bogra, Bangladesh.
54th Meeting of the Technical Advisory Committee (organizer: Consultative Group on International Agricultural Research).	12–17 March	The Hague, Netherlands.
42nd International Executive Council of the International Commission on Irrigation and Drainage (organizer: International Commission on Irrigation Drainage).	14–21 April	Beijing, China.
Training Workshop on Farmer Participation in Irrigation (organizer: Water and Land Management Institute, Gujarat, India).	28–30 April	Anand, India.
VIIth International Water Resources Association World Congress on Water for Sustainable Development “in the 21st Century” (organizer: International Water Resources Association).	13–18 May	Rabat, Morocco.
Second Irrigation Management Policy Advisory Committee Policy Workshop (organizer: Irrigation Management Policy Support Activity Secretariat, Colombo, Sri Lanka).	17–19 May	Ahungalle, Sri Lanka.
Regional Workshop on Salt Water Intrusion Problem (organizer: Pakistan Council Research Water Resources).	19–28 May	Lahore, Pakistan.
Irrigation Management in Asia (organizer: Agricultural Productivity Organization).	18–20 June	Tokyo, Japan.

Irrigation Development Policies in the Sahelian Countries (organizer: Inter-State Commission for Prevention of Drought in Sahel and the Organization for Cooperation and Economic Development).	18–21 June	Banjul, Gambia.
Comprehensive Water Resources Management Policy Workshop (organizer: World Bank).	21–28 June	Washington, USA.
55th Meeting of the Technical Advisory Committee (organizer: Consultative Group on International Agricultural Research).	24–30 June	Rome, Italy.
1991 Annual Convention of the Japanese Society of Irrigation, Drainage and Reclamation Engineering (organizer: Japanese Society of Irrigation, Drainage and Reclamation Engineering).	17–19 July	Kochi, Japan.
Third Irrigation Management Policy Advisory Committee Policy Workshop (organizer: Irrigation Management Policy Support Activity Secretariat, Colombo, Sri Lanka).	20–22 September	Habarana, Sri Lanka.
Common Property Conference (organizer: International Association for the Study of Common Property).	26–29 September	Winnipeg, Canada.
Use of Modern Irrigation Systems in Arab Countries (organizer: Arab Organization for Agricultural Development).	8–11 October	Kenitra, Morocco.
Finance and Rural Development in West Africa (organizer: International Center for Cooperation in Agronomic Research Applied to Development).	21–25 October	Ouagadougou, Burkina Faso.
11th Annual General Meeting of the Panel of Experts on Environmental Management and Vector Control (organizer: Panel of Experts on Environmental Management and Vector Control).	21–25 October	Kuala Lumpur, Malaysia.
56th Meeting of the Technical Advisory Committee (organizer: Consultative Group on International Agricultural Research).	21–27 October	Washington, USA.
CGIAR International Centers Week (organizer: Consultative Group on International Agricultural Research).	28 October– 1 November	Washington, USA.
Gender Awareness Workshop (organizer: Consultative Group on International Agricultural Research).	1–2 November	Washington, USA.

Consultative Workshop on Land and Water Resources Development Policy Issues (organizer: Irrigation Management Policy Support Activity Secretariat, Colombo, Sri Lanka).	15-16 November	Katunayake, Sri Lanka.
8th Afro-Asian Regional Conference on "Land and Water Management in Afro-Asian Countries" (organizer: International Commission on Irrigation and Drainage).	18-23 November	Bangkok, Thailand.
Regional Seminar on Water Management Practices (organizer: Federation of Engineering Institutions of South and Central Asia).	21-22 November	Dhaka, Bangladesh.
Geographic Information Systems Workshop (organizer: International Development Research Center, Canada).	28-29 November	New Delhi, India.
8th Annual Irrigation and Drainage Meeting (organizer: World Bank).	9-16 December	Washington, USA.

Information

IIMI's Information Program supports two main elements of the Institute's strategy. First, the program publishes and disseminates reports of management innovations and research outputs. Second, it assists in strengthening national capacities and enhancing national efforts by distributing information to developing countries. The latter is increasingly done through national irrigation information systems.

As an operational support mechanism, the Information Program relates to all areas of the Institute. As an educative process, the Program is closely connected to training activities of an operational nature. Through its public relations and functions, the Information Program further disseminates news about the research programs. The program has three components: publications, communications and technical information services.

During 1991, the Institute published 16 new titles: these included 4 governance publications, 3 research publications, and 4 working papers and

project reports. In addition, five newsletter issues were also produced and distributed: these included two issues of the FMIS Network Newsletter, one issue of the IMCD Research Network Newsletter, one issue of the West Africa Irrigation Network Newsletter and one issue of the IUCN/IIMI Newsletter (see Annex II). To lower costs and speed publication, the Institute has introduced desktop publishing.

Library and Documentation

In 1991, library holdings at headquarters increased to 8,504 items from the 6,504 in 1990. The number of physical items amounts to 57 percent of the holdings, i.e., 4,819 physical volumes, while the remainder includes unpublished material and reprints of journals. The Library and Documentation unit also published Vol 3, Number 2 of the Irrigation Management Information Network, a database of selected literature on irrigation management published semiannually.

Finance and Administration

During 1991, IIMI's income consisted of US\$1.960 million in unrestricted resources, US\$0.772 million in indirect cost recoveries and US\$6.147 in restricted support, to meet expenditures grossing US\$9.280 million. After allowing for indirect cost recoveries, the Institute's net resources for 1991 were US\$8.107 million, against net expenditures of US\$8.508 million (See Figures 1&2).

Even though the accounting policy adopted by IIMI in the previous years was not to recognize depreciation, consequent to IIMI's admission to the Consultative Group on International Agricultural Research (CGIAR) in 1991, the accounting policy adopted by IIMI was changed to fall in line with the guidelines issued by the CGIAR which required International Agricultural Research Centers to recognize depreciation as a charge against the operating income of the year. Accordingly, the total depreciation charge applicable to IIMI for 1991 amounted to

US\$407,150. Reduction of IIMI's retained operating surplus enabled the deficit of US\$401,050, which was the direct result of the depreciation charge of US\$407,150, to be adjusted. Had IIMI not provided for depreciation, IIMI would have ended the year with a modest operating surplus of US\$6,100. IIMI's cash assets at the end of 1991 were US\$2,270,125. Over US\$9,800,000 of new restricted grants to fund IIMI projects had been approved during the year.

Arrangements for a permanent headquarters building in Colombo were finalized with the Government of Sri Lanka and IIMI moved into its permanent headquarters in December 1991.

At the close of 1991, IIMI had 30 senior internationally recruited staff. Some 102 national and international professionals were engaged in IIMI's research, training, and information activities in headquarters and overseas units. IIMI's total staff numbered 297, more than half of them based outside Sri Lanka (See Figure 3 in Annex IV).

Unrestricted and Restricted Support — 1991

<i>Donor</i>	<i>1991 Grant US\$</i>
Unrestricted Support	
CIDA	262,824
Ford Foundation	450,000
Japan	232,261
Netherlands - Staff Secondment	154,310
USAID	300,000
World Bank	500,000
Bank Interest	46,422
Sundry Income	14,143
Subtotal	1,959,960

Unrestricted and Restricted Support — (continued)

<i>Donor</i>	<i>Project</i>	<i>1991 Grant US\$</i>
Restricted Support		
ADB	Proposed Management Improvements to Undertake Crop-Based Irrigation Operations in NWFP, Pakistan	268,102
ADB	Technical Assistance in Sri Lanka: Phase II	209,365
AFDB	Irrigation Management Development in Burkina Faso	129,455
AFDB	Irrigation Management Development in Niger	146,040
AFDB	Support for IIMI Research Programs in Africa (carry over 1990)	83,052
AFDB	Support for IIMI Research Programs in Africa	118,785
AUSTRALIA	AIDAB Assistance for Collaboration between IIMI and Australian Institutions	24,837
BMZ	Enhancement of Research on Irrigation and Drainage Technology (IPTRID)	158,860
DSE/ZEL	Workshop on New Trends and Policies in Irrigation Management — 1990	(1,020)
DSE/ZEL	Workshop on New Trends and Policies in Irrigation Management — 1991	35,000
FORD	Strengthening the Capacity of Institutions and Personnel in Bangladesh to Manage Irrigation Systems	127,430
FORD	BUET Workshop on Performance Evaluation of Flood Control, Irrigation and Drainage Projects in Bangladesh	7,118
FORD	Collaborative Research in India to Strengthen the Capacity of Indian Institutions to Improve Irrigation Systems	6,758
FORD	Support to Design and Initiate Irrigation Programs in Latin America	59,259
FORD	Support for an Irrigation Management Program in Nigeria	175,180
FORD	Publications on Farmer-Managed Irrigation Systems	24,910
FORD	Professional Development	1,096
FORD	Support for a Study of the Irrigation Program of the ADBN in Nepal	12,055
FORD	Support for an Irrigation Management Program in Sudan	338,225
FORD	Support for Collaborative Activity in Nepal to Develop Participatory Programs for Irrigation Development	61,175
FORD	Support for Training in Rapid Rural Appraisal (RRA) in Sudan	37,920
FORD	Support for a Regional Workshop on Design Issues in Small-Scale Irrigation in Mountain Environments	16,163
FRANCE	Model Applications at Kirindi Oya, Sri Lanka	68,887
FRANCE	Support for IIMI Activities in Morocco & West Africa	156,999
FRANCE	Trust Fund for Staff Secondment 1990	38,041
FRANCE	Trust Fund for Staff Secondment 1991	42,096

Unrestricted and Restricted Support — (continued)

<i>Donor</i>	<i>Project</i>	<i>1991 Grant US\$</i>
IDRC	Support for Workshop on FMIS Performance	17,500
IFAD/BMZ	Assistance to Farmer-Managed Irrigation Systems: Phase I	96,139
IFAD/BMZ	Assistance to Farmer Managed Irrigation Systems: Phase II	157,568
IFAD	IIMI Participation in an IFAD Mission on Non-Indus Basin Irrigation Systems in Pakistan	2,926
JAPAN	Support for Irrigation System Performance Assessment Program	199,074
JICA	Support for Staff Secondment	30,000
JICA	Research on Irrigation Investment Trends in Sri Lanka	1,526
NETHERLANDS	Performance Assessment Diagnosis	105,977
NETHERLANDS	Applied Research on Waterlogging and Salinity in Pakistan	527,532
ROCKEFELLER	IIMI/IRRI Collaborative Research on Rice-Based Farming Systems in the Philippines, Indonesia and Bangladesh	73,370
ROCKEFELLER	Grant for Performance and Research Direction in Bangladesh	449,450
TARC	Studies on Improvement of Water Management of Cascade Tank Systems	2,360
USAID	Program to Support the Irrigation Objectives of the USAID Supported AAPP in the Philippines	900,582
USAID	Collaborative Research in India to Strengthen the Capacity of Indian Institutions to Improve Irrigation Systems	165,866
USAID	Irrigation Management Policy Support Activity (IMPSA) in Sri Lanka: Phase I	147,721
USAID	Irrigation Management Policy Support Activity (IMPSA) in Sri Lanka: Phase II	49,210
USAID	Irrigation Systems Management Project in Sri Lanka (ISM)	145,744
USAID	Irrigation Support Project for Asia and the Near East (ISPAN)	40,548
USAID	Action Research Program in Banganga Irrigation System in Nepal	106,712
USAID	Strengthening National Capacity to Improve the Performance of Irrigation Systems in Pakistan	187,840
USAID	Improving the Capacity of Water Management Research in Pakistan	207,694
WORLD BANK	Appointment of a Senior Water Management Advisor to the Sudan Gezira Board	180,637
WORLD BANK	IIMI/World Bank Workshop	5,000
	Subtotal	6,146,764
	Total	8,106,724

See ANNEX I for an explanation of the projects listed above.

CONSOLIDATED STATEMENT OF FINANCIAL POSITION (BALANCE SHEET) AS OF 31 DECEMBER 1991

IIMI's consolidated balance sheet as of 31 December 1991 reflects the fact that during the year 1991, the accounting policy relating to the recognition of depreciation was changed. The policy adopted in the previous years was not to recognize depreciation. Based on the guidelines issued by the CGIAR, as from 1 January 1991 CGIAR Centers are to recognize depreciation on all nonexpendable assets as a charge against operating income of the year and to transfer an amount equivalent to the depreciation charged from the investment in nonexpendable assets account to a capital fund account. According to the CGIAR Guidelines, the accumulated depreciation on fixed assets for the period prior to 1 January 1991 was transferred from the investment in nonexpendable assets account to the accumulated depreciation account.

	1991 / US\$	1990 / US\$
CURRENT ASSETS		
Cash and Short-Term Deposits	2,270,125	1,165,692
Receivables	831,628	1,165,112
Deposits and Pre-Payments	313,615	281,626
Inventories	49,623	78,222
Total Current Assets	3,464,991	2,690,652
PROPERTY, PLANT AND EQUIPMENT (Net of Depreciation)		
Total Assets	1,837,134	1,103,466
	5,302,125	3,794,118
CURRENT LIABILITIES		
Funds Applicable to Succeeding Years	1,437,069	1,428,783
Other Payables and Accruals	963,151	388,946
Total Current Liabilities	2,400,220	1,817,729
PROVISION FOR LIABILITIES & CHARGES		
Severance & Gratuity Benefits	98,687	11,446
LONG-TERM LIABILITIES		
Program-Related Investment Loan — Ford Foundation, New York	1,014,121	NIL
FUND BALANCES		
Funds Representing Investment in Property, Plant and Equipment	917,494	1,103,466
Reserves	448,095	448,095
Accumulated Operating Surplus	12,332	413,382
Capital Fund	411,176	NIL
Total Fund Balances	1,789,097	1,964,943
TOTAL LIABILITIES AND FUND BALANCES	5,302,125	3,794,118

Source: Extracted from the 1991 Auditors' Report.

Figure 1
Net Income, 1984 – 91
 (US\$ millions)

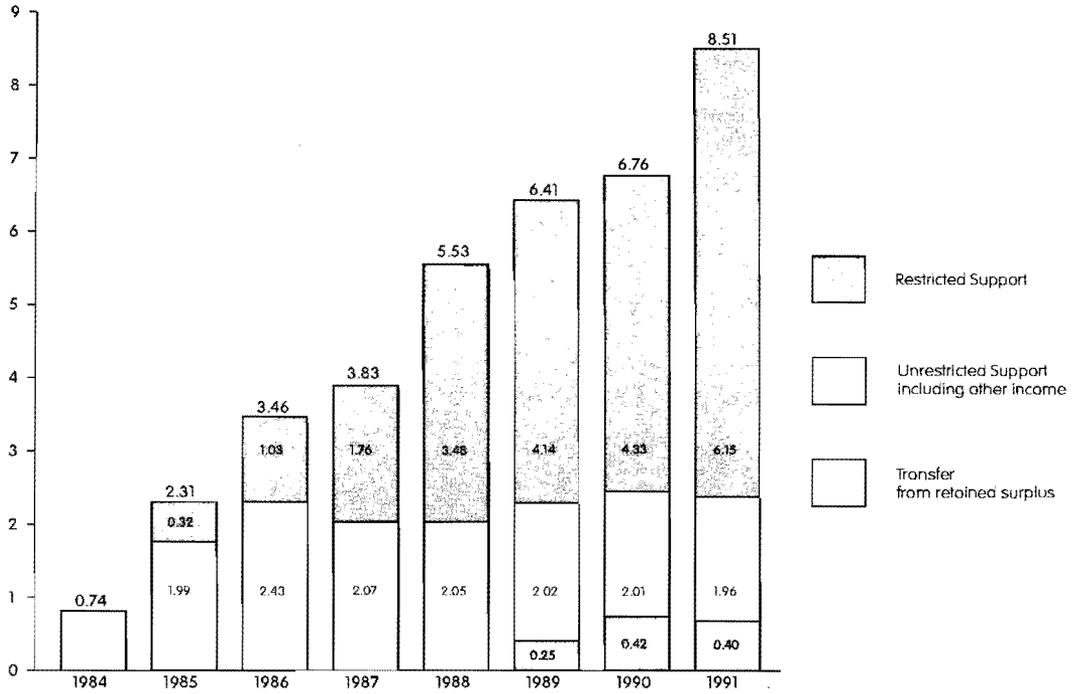
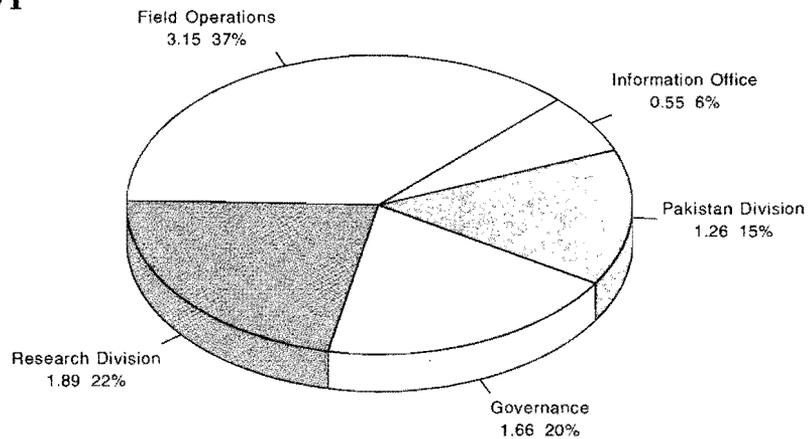


Figure 2
Net Expenditure, 1991
 (US\$ millions)



ANNEX I RESTRICTED PROJECTS 1991

Project	Donor	Pledged amount*	Duration	Cumulative expenditure to 31/12/1990 US\$	Expenditure 1991 US\$
<p>PAKISTAN</p> <p>To identify and assist in the implementation of proposed management improvements for undertaking crop-based irrigation operations in the North-West Frontier Province.</p>	ASIAN DEVELOPMENT BANK	1,000,000	36 months	—	268,102
<p>SRI LANKA TA PHASE II</p> <p>To strengthen the long-term viability of irrigation systems and to optimize the use of existing land, water and infrastructure resources through implementing, refining and evaluating management recommendations developed under Phase I in the processes of: system management, operation and maintenance; system rehabilitation and improvement; and institutional strengthening of irrigation agencies and farmers' organizations, with particular attention given to requirements for crop diversification.</p>	ASIAN DEVELOPMENT BANK	750,000	27 months	—	209,365
<p>BURKINA FASO</p> <p>To support a program of research, professional development and information exchange to improve the performance of small-scale reservoir-based village irrigation schemes.</p>	AFRICAN DEVELOPMENT BANK	877,117	48 months	—	129,455
<p>NIGER</p> <p>To support a program of research, professional development and information exchange to improve the performance of small-scale reservoir-based village irrigation schemes.</p>	AFRICAN DEVELOPMENT BANK	829,924	48 months	—	146,040
<p>IIMI PROGRAM IN AFRICA</p> <p>To support IIMI research programs in West Africa, Morocco and Sudan.</p>	AFRICAN DEVELOPMENT BANK	575,000	36 months	311,954	201,837
<p>COLLABORATION WITH AUSTRALIAN INSTITUTIONS</p> <p>Assistance of the Australian International Development Assistance Board (AIDAB) for collaboration between IIMI and Australian Institutions.</p>	AUSTRALIA	Australian \$ 40,000	12 months	—	24,837

*In US dollars unless otherwise stated.

ANNEX I (continued)

ENHANCEMENT OF RESEARCH ON IRRIGATION AND DRAINAGE TECHNOLOGY (IPTRID)	BMZ	900,000	36 months	—	158,860
<p>To provide a framework for collaborative action for assessment of technology Research and Development (R&D) needs; assist developing countries and external supporting agencies in identifying priorities in R&D related to irrigation and drainage technology; support the formulation of R&D policies and programs in line with sectoral plans; facilitate training and exchange of information and experience.</p>					
DSE COLLABORATION	DSE/ZEL	43,352	10 days	9,372	33,980
<p>DSE/IIMI Workshop on New Trends and Policies in Irrigation Management, 1990 and 1991.</p>					
BANGLADESH	FORD FOUNDATION Dhaka	450,000	56 months	325,069	127,430
<p>To strengthen the capacity of relevant institutions and personnel in Bangladesh to manage irrigation systems and irrigation development.</p>					
BANGLADESH UNIVERSITY OF ENGINEERING TECHNOLOGY (BUET) PERFORMANCE WORKSHOP, BANGLADESH	FORD FOUNDATION Dhaka	32,000	9 months	25,015	7,118
<p>Aimed at performance evaluation of flood control, irrigation, and drainage projects in Bangladesh as part of BUET and Bangladesh Water Development Board pilot program to improve management.</p>					
INDIA	FORD FOUNDATION Delhi	200,000	67 months	129,334	6,758
<p>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.</p>					
IIMI MISSION TO EGYPT	FORD FOUNDATION Cairo	30,000	12 months	17,689	0
<p>Exploratory mission to assess the possibility of establishing a collaborative research and development program in Egypt.</p>					
IRRIGATION MANAGEMENT FOR LATIN AMERICA	FORD FOUNDATION New York	300,000	24 months	—	59,259
<p>Support to design and initiate irrigation programs in Latin America</p>					

ANNEX I (continued)

NIGERIA	FORD FOUNDATION New York	425,000	24 months	—	175,180
Support for an irrigation management program in Nigeria.					
LOCALLY MANAGED IRRIGATION SYSTEMS	FORD FOUNDATION New York	35,000	14 months	10,090	24,910
To prepare publications based on a review of literature and experience related to Farmer-Managed Irrigation Systems					
PROFESSIONAL DEVELOPMENT	FORD FOUNDATION New York	46,300	49 months	45,204	1,096
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.					
STUDY OF THE IRRIGATION PROGRAM OF THE AGRICULTURAL DEVELOPMENT BANK OF NEPAL (ADB)	FORD FOUNDATION New York	75,000	19 months	50,870	12,055
Support for a study of the irrigation program of ADB.					
SUDAN	FORD FOUNDATION New York	478,000	24 months	—	338,225
Support for an irrigation management program in Sudan					
SUPPORT FOR COLLABORATIVE ACTIVITY IN NEPAL	FORD FOUNDATION New York	405,000	36 months	—	61,175
Support for IIMI to assist the Government of Nepal in developing participatory programs for irrigation development.					
SUPPORT FOR RESEARCH ON FARMER CONTRIBUTIONS TO IRRIGATION COSTS	FORD FOUNDATION Bangkok	3,925	24 months	—	0
IIMI consultancy expenses — grant to the Faculty of Economics and Business Administration of the Kesetsart University.					
TRAINING IN RAPID RURAL APPRAISAL (RRA) WORKSHOPS	FORD FOUNDATION Cairo	37,920	6 months	—	37,920
Support for training in Rapid Rural Appraisal.					

ANNEX I (continued)

MOUNTAIN WORKSHOP	FORD FOUNDATION New York	75,000	18 months	—	16,163
Support for a regional workshop on design issues in small-scale irrigation in mountain environments.					
SIMULATION MODEL APPLICATIONS AT KIRINDI OYA	FRANCE	French Francs 640,000	36 months	—	68,887
To support research on main canal operations using a mathematical simulation model produced on microcomputer.					
SUPPORT FOR MOROCCO AND WEST AFRICA	FRANCE	French Francs 800,000	12 months	—	156,999
Support for activities undertaken by IIMI in Morocco and West Africa.					
TRUST FUND FOR STAFF SECONDMENT	FRANCE	187,059	24 months	—	80,137
Government of France — trust fund for staff secondment.					
MENDOZA WORKSHOP	IDRC	17,500	10 days	—	17,500
To support the participation of one participant each from South Asia and the Middle East and two participants from Latin America.					
ASSISTANCE TO FARMER-MANAGED IRRIGATION SYSTEMS — PHASE I	IFAD BMZ	US\$120,000 DM 940,000	36 months	619,186	96,139
To support a research program on assistance to farmer-managed irrigation systems, including maintaining a research network and newsletter.					
ASSISTANCE TO FARMER-MANAGED IRRIGATION SYSTEMS — PHASE II	IFAD BMZ	US\$150,000 DM 970,000	36 months	—	157,568
For continuing a research program in farmer-managed irrigation systems.					
PAKISTAN	IFAD	10,000	3 weeks	—	2,926
To participate in an IFAD general identification mission on Non- Indus Basin Irrigation Systems Utilized by Small Farmers.					
PERFORMANCE ASSESSMENT PROGRAM	JAPAN	199,974	12 months	—	199,074
Support for irrigation systems performance assessment program.					

ANNEX I (continued)

IIMI/JICA STAFF SECONDMENT	JICA	30,000	12 months	—	30,000
Support for staff secondment.					
IRRIGATION INVESTMENT TRENDS	JICA	2,000	12 months	—	1,526
Research on alternative investment opportunities in Sri Lanka.					
ICID - PERFORMANCE ASSESSMENT DIAGNOSIS	NETHERLANDS	DFL 287,458	15 months	48,092	105,977
To undertake a joint project with the International Institute for Land Reclamation and Improvement and International Institute for Hydraulic and Environmental Engineering, on relationships between irrigation design and management and resulting effects on performance of irrigation systems.					
WATERLOGGING AND SALINITY PROJECT, PAKISTAN	NETHERLANDS	DFL 4,009,000	60 months	625,899	527,532
Support to IIMI 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 waterlogging and salinity.					
IIMI/IRRI COLLABORATION ON IRRIGATION MANAGEMENT FOR RICE-BASED FARMING SYSTEMS	ROCKEFELLER FOUNDATION	1,200,000	56 months	1,126,630	73,370
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.					
GRANT FOR PERFORMANCE AND RESEARCH DIRECTION, BANGLADESH	ROCKEFELLER FOUNDATION	500,000	24 months	—	449,450
To test irrigation management approaches that improve coordination between irrigation agencies and farmers in Bangladesh; to initiate a major effort to quantify measures of irrigation performance; and to expand IIMI's capacity for multidisciplinary research.					
TROPICAL AGRICULTURE RESEARCH CENTER (TARC)	JAPAN	3,000	5 months	—	2,360
Studies on Improvement of Water Management of Cascade Tank Systems.					

ANNEX I (continued)

ACCELERATED AGRICULTURAL PRODUCTION PROJECT (AAPP), PHILIPPINES	USAID Philippines	1,485,070	35 months	582,544	900,582
Program to support the irrigation objectives of the USAID supported AAPP in the Philippines.					
COLLABORATIVE RESEARCH IN INDIA	USAID India	500,000	42 months	138,263	165,866
To explore and initiate collaborative projects between IIMI and Indian institutions through research, professional development and exchange of information. This work is designed to strengthen the capacity of Indian institutions to contribute to the improvement of irrigation systems.					
IRRIGATION MANAGEMENT POLICY SUPPORT ACTIVITY (IMPSA) PHASE I, SRI LANKA	USAID Washington	283,253	15 months	155,731	147,721
Project aimed at supporting the policy initiatives of the Government of Sri Lanka in the irrigation sector.					
IRRIGATION MANAGEMENT POLICY SUPPORT ACTIVITY (IMPSA) PHASE II, SRI LANKA	USAID Washington	139,615	10 months	—	49,210
Project aimed at supporting the policy initiatives of the Government of Sri Lanka in the irrigation sector.					
IRRIGATION SYSTEMS MANAGEMENT PROJECT (ISMP), SRI LANKA	USAID Sri Lanka	579,950	58 months	317,114	145,744
To assist USAID's Irrigation Systems Management Project through the development and implementation of research on key irrigation management questions, and to strengthen Sri Lanka's national capacity for irrigation management research. This work will build on IIMI's collaborative relationships with Sri Lankan irrigation-related research institutions and agencies.					
IRRIGATION SUPPORT PROJECT FOR ASIA AND THE NEAR EAST (ISPAN)	USAID Asia and Near East Bureau	460,000	48 months	419,452	40,548
To increase IIMI's capacity to develop more effective training and professional development programs.					
IRRIGATION IN BANGANGA, NEPAL	USAID Nepal	218,474	12 months	—	106,712
To provide support for IIMI's action research program with the Department of Irrigation of the Government of Nepal in the Banganga Irrigation System.					

ANNEX I (continued)

INSTITUTIONAL DEVELOPMENT SUPPORT, IIMI PAKISTAN	USAID Pakistan	2,000,000	24 months	1,812,160	187,840
To support IIMI Pakistan's efforts to strengthen Pakistan's national capacity to improve the performance of irrigation systems through management innovations.					
IRRIGATION SYSTEMS MANAGEMENT PROJECT	USAID Pakistan	2,000,000	22 months	—	207,694
To improve the capacity and relevancy of water management research in Pakistan.					
SENIOR WATER MANAGEMENT ADVISOR, SUDAN GEZIRA BOARD	WORLD BANK	Sudanese Pounds 567,400 US\$ 395,500	24 months	85,653	180,637
Support for the appointment of a senior water management advisor to the Sudan Geriza Board under a World Bank-assisted rehabilitation project.					
IIMI/WORLD BANK WORKSHOP	WORLD BANK	5,000	2 days	—	5,000
To support direct costs of the participation of IIMI's field operations staff at a workshop for the World Bank to familiarize itself with the activities and programs of IIMI.					
Total	6,146,764

* In US dollars unless otherwise stated.

ANNEX II PUBLICATIONS 1991

GENERAL PUBLICATIONS

International Irrigation Management Institute. External program and management review of the International Irrigation Management Institute. A report by the external review panel. Colombo, Sri Lanka: International Irrigation Management Institute. 116p. (March). ISBN-92-9090-139-X

International Irrigation Management Institute. 1992 Program & Budget. Colombo, Sri Lanka: The Institute. 80p. (September).

SERIALS

International Irrigation Management Institute. A selected bibliography on irrigation management (Documents entered in the Irrigation Management Information Network database in 1989). Vol. 3. No. 2. Colombo, Sri Lanka: The Institute. 128p. (August). ISSN-1015-1680

PERIODICALS

International Irrigation Management Institute. Annual Report 1990. Colombo, Sri Lanka: The Institute. 60p. (September). ISSN-1017-5954

International Irrigation Management Institute. IIMI Review. Vol. 5. No. 1. Colombo, Sri Lanka: The Institute. 36p. (November). ISSN-1012-831X

NEWSLETTERS

International Irrigation Management Institute. FMIS. No. 8. Newsletter of the Farmer-Managed Irrigation Systems Network. Colombo, Sri Lanka: The Institute. 24p. (February). ISSN-1012-988X

International Irrigation Management Institute. FMIS. No. 9. Newsletter of the Farmer-Managed Irrigation Systems Network. Colombo, Sri Lanka: The Institute. 16p. (September). ISSN-1012-988X

Institut International du Management de l'Irrigation. Bulletin du Réseau Irrigation Afrique de l'Ouest. No. 001. Burkina Faso, West Africa. 48p. (July). ISSN-1017-110X

Institut International du Management de l'Irrigation. Union Mondiale pour la Nature, Bulletin NAMANECDZANGA. No. 001. Burkina Faso, West Africa. 8p. (November).

International Irrigation Management Institute. IMCD News. Vol. 2. No. 1. Newsletter of the Research Network for Irrigation Management for Crop Diversification in Rice-Based Systems. Colombo, Sri Lanka: The Institute. 16p. (October). ISSN-1016-7927

TECHNICAL PAPERS

Vermillion, D. L. The turnover and self-management of irrigation institutions in developing countries. A discussion paper for a new program of the International Irrigation Management Institute. Colombo, Sri Lanka: International Irrigation Management Institute. 52p. (June).

BOOKS

Small, Leslie; Carruthers, Ian. Farmer financed irrigation. The economics of reform. Cambridge, New York: Cambridge University Press and International Irrigation Management Institute. 248p. (October). ISBN-0-521-38073

ANNEX II (continued)

RESEARCH PAPERS

Aluwihare, P.B.; Kikuchi, Masao. Irrigation investment trends in Sri Lanka: New construction and beyond. Colombo, Sri Lanka: International Irrigation Management Institute. 108p. (October). ISBN-92-9090-137-3

COUNTRY PAPERS

Sri Lanka

Dayaratne, M.H.S. A review of alternative strategies for improving farmer-managed irrigation systems in Sri Lanka. Colombo, Sri Lanka: International Irrigation Management Institute. 104p. (IIMI Country Paper - Sri Lanka No. 7). (June). ISBN-92-9090-136-5

WORKING PAPERS

Dayaratne, M.H.S.; Moragoda, Ranjini. An assessment of the village tank rehabilitation program of the Freedom From Hunger Campaign Board in Anuradhapura District. Colombo, Sri Lanka: International Irrigation Management Institute. 48p. (Working paper No. 20). (July). ISBN-92-9090-138-1

PROJECT REPORTS

International Irrigation Management Institute. Inception report on the Phase II Study (TA 1480 SRI): Irrigation Management and Crop Diversification. Colombo, Sri Lanka: The Institute. 154p. (July).

PUBLICATIONS BY IIMI STAFF IN OUTSIDE JOURNALS, CONFERENCE PROCEEDINGS, ETC.

Abernethy, C.L. and C.M. Miranda. Crop diversification in rice-based irrigation systems. Paper presented at the 7th Afro-Asian Regional Conference of the International Commission for Irrigation and Drainage, Bangkok, Thailand, 18–23 November 1991. 7p.

Abernethy, C.L. Canal lining: Techniques and benefits. Paper presented at the 11th Annual Meeting of the Panel of Experts on Environmental Management for Vector Control, Kuala Lumpur, 21–25 October 1991. 14p.

Amarasekera, N. Environmental impact assessment of the Kirindi Oya Irrigation and Settlement Project, Sri Lanka. ESCAP Environment News, 9(2):12–14.

Ansari, N. and P. Pradhan (Eds.) Assistance to farmer-managed irrigation systems: Experiences from Nepal. Papers presented at the seminar on Improving Farmer-Managed Irrigation Systems: Experiences of Different Agencies and Organizations, 27 June 1990. Ministry of Water Resources, Department of Irrigation, Kathmandu, Nepal.

Bhatti, M.A.; F.E. Schulze and G. Levine. Yield measurement of irrigation performance in Pakistan. Irrigation and Drainage Systems, 5(2):183–190.

Bhutta, M.N.; M. Latif and J.W. Kijne. A study of water distribution from a branch to distributary canals: A case study of Gugera Branch, Punjab, Pakistan. Irrigation and Drainage Systems, 5(3):229–247.

Fernando, N. Technological options in irrigated agriculture for the future. Economic Review, Sri Lanka, (11&12):19–21;54.

ANNEX II (continued)

Lenton, Roberto L. Irrigation management strategies for the 21st century. Paper presented at the round table discussion on Water Strategies for the 21st Century: Guiding Ideas and Tendencies, 7th World Congress on Water Resources, International Water Resources Association, Rabat, Morocco, 13–18 May 1991. 10p.

Lenton, Roberto L. Problems and prospects in irrigation management in developing countries, with special emphasis on performance monitoring. Paper presented at the Annual Convention of the Japanese Society of Irrigation, Drainage and Reclamation Engineering, Kochi, Japan, 17–19 July 1991. 11p.

Merrey, D.J. Irrigation management institutions in Sri Lanka. *Economic Review* (special issue on “Irrigation in the Year 2000”), Sri Lanka, (11 & 12):13–15;64.

Merrey, D.J. Reform in irrigation management systems in Sri Lanka: Farmer burden or farmer opportunity? Paper presented at the Research Colloquium of the Institute of Fundamental Studies (Kandy School of Science), Kandy, Sri Lanka, 2 October 1991. 15p.

Merrey, D.J. Book review — “Transforming a bureaucracy: The experience of the Philippine National Irrigation Administration,” edited by Frances F. Korten and Robert Y. Siy Jr. *Public Administration and Development*, 11(1):89–90.

Svendsen, M. Sources of future growth in Indian irrigated agriculture. In Meinzen-Dick, R. and M. Svendsen, (Eds.) *Future directions for Indian irrigation research and policy issues*. Washington D.C., USA: International Food Policy Research Institute. pp. 42–68.

Valera, A. Farmer-managed irrigation systems: Its significance and effective government assistance. In *Proceeding of the National Irrigation Policy Exercise Workshop*, sponsored by the Department of Agriculture, Ministry of Agriculture, His Majesty's Royal Government of Bhutan, Thimpu, Bhutan, 25–31 October 1991.

Valera, A. and C.R. Panabokke. Irrigation management issues affecting clayey soil management for non-rice crop production in rice-based systems. In Pushparaha, E.; C.R. Elliot and R.N. Leslie (Eds.) *The management of lowland clayey soils after rice in Asia*. Bangkok, Thailand: International Board for Soil Research and Management (IBSRAM Proceedings no.11).

Vermillion, D.L. Farmer-level irrigation management in private and public systems in Indonesia: Distribution rules and exceptions. In *farm level irrigation water management: Report of a study meeting in Lahore, Pakistan*, 7–18 February 1989. Tokyo, Japan: Asian Productivity Organization. pp. 41–64.

Vermillion, D.L. The transition to self-managing irrigation institutions in developing countries. Paper presented at the Panel Session on Water Common Property Systems I, Common Property Conference, University of Manitoba, Winnipeg, Canada, 26–29 September 1991. 25p.

Wijayaratna, C.M. Irrigation management in Asia. In *Asian Productivity Organization, Management of irrigation facilities in Asia and the Pacific*. Report of APO Multi-Country Study Mission on Management of Irrigation Facilities, 18–28 June 1991. Tokyo, Japan: Asian Productivity Organization. pp. 23–76.

IIMI-RELATED PUBLICATIONS

Panabokke, C.R. Irrigated agriculture in the year 2000. *Economic Review*, Sri Lanka, (11&12):3–6;37.

Yoder, R. Assistance to farmer-managed irrigation systems: Experience from WECS/IIMI/FORD Action Research Project in Indrawathi Watershed Basin. In Ansari, N. and P. Pradhan (Eds.), *Assistance to farmer-managed irrigation systems: Experiences from Nepal*. Paper presented at the seminar on Improving Farmer-Managed Irrigation Systems: Experiences of different agencies and organizations, 27 June 1990: Ministry of Water Resources, Department of Irrigation. pp 51–70.

ANNEX III FELLOWSHIPS AND SCHOLARSHIPS 1991

Name	Dates	Case Study	Location
Ph.D. Research Fellowships			
Youssof Dembele	August 1991 – August 1994	Optimization of Hydraulic Management of a Water Reservoir	Burkina Faso
Master's Degree Scholarships			
Amadou Keita	December 1990 – November 1991	Hydraulic Functioning of Irrigated Areas: the Case of Mogtedo	Burkina Faso
Amadou Allahoury	November 1991 – June 1992	Motivating Low-Intensity Use of the Itenga Irrigated Area During the Off-Season	Burkina Faso
Anton van Essen and Casper van der Feltz	October 1990 – April 1991	Waterlogging and Salinity	Pakistan
Other Fellowships			
Andre Da	November 1990 – February 1992	Contribution to a Diagnostic- Analysis of Two Hydraulic Schemes for Agriculture in Burkina Faso	Burkina Faso
Kalilou Diakite	November 1990 – September 1991	Contribution to a Diagnostic- Analysis of Two Hydraulic Schemes for Agriculture in Burkina Faso	Burkina Faso

ANNEX IV IIMI SENIOR STAFF 1991

(The country, in the case of internationally recruited staff, is given in italics)

OFFICE OF THE DIRECTOR GENERAL

Lenton, Roberto — *Argentina*
Director General

Daudrumez, Wendy
Special Assistant to the Director General

Nugawela, Dewaki
Executive Secretary (from March)

RESEARCH DIVISION

Mohtadullah, Khalid — *Pakistan*
Director, Research (from May)

Abernethy, Charles — *United Kingdom*
Senior Technical Advisor

Amarasekera, Nalini
Research Associate

Franca, Zenete — *Brazil*
Training Specialist

Hemakumara, H.M.
Research Officer

Itakura, Jun — *Japan*
Junior Seconded International Staff
Member (seconded from Tropical
Agriculture Research Centre, Ibaraki,
Japan) (from August)

Karunasena, H.A.
Research Associate

Kurupparachchi, Tilak
Research Associate

Manor, Shaul — *Israel*
Senior Irrigation Specialist

Miranda, Senen — *The Philippines*
Senior Irrigation Specialist (transferred to
Pakistan in May)

Murray-Rust, Hammond —
United Kingdom
Senior Irrigation Specialist

Mutukumarana, P.
Asst. to the Training Specialist (from
October)

Nijman, Charles — *The Netherlands*
Associate Expert

Rey, Jacques — *France*
Associate Irrigation Specialist (from
February)

Sally, Hilmy — *Sri Lanka*
Irrigation Management and Engineering
Specialist (transferred to Burkina Faso in
April)

Samad, Madar
Assistant to the Director for Research
(from June)

Schulze, Ernst — *The Netherlands*
Senior Technical Adviser (from July to
September)

Svensen, Mark — *USA*
Research Fellow¹

Valera, Alfredo — *The Philippines*
Irrigation Specialist (transferred to Nepal in
August)

Vermillion, Douglas — *USA*
Irrigation Specialist

Wolter, Hans — *Germany*
Irrigation Specialist² (from April)

FIELD OPERATIONS DIVISION

Abeywickrema, Nanda — *Sri Lanka*
Director, Field Operations

Ratnayake, Ranjit
Assistant to the Director, Field Operations

Bangladesh

Parker, Donald — *USA*
Head, Bangladesh Field Operations

Hakim, M.A.
Associate Researcher (Seconded from Rural
Development Academy, Bogra,
Bangladesh)

Rahman, Abdur
Administrative Officer

Burkina Faso

Legoupil, Jean-Claude — *France*
Regional Representative, West Africa Field
Operations

Pouya, Andre-Marie
Information/Communication Specialist

Sally, Hilmy — *Sri Lanka*
Irrigation Specialist and Project Leader,
Burkina Faso (from April)

Morocco

Verdier, Jean — *France*
Head, Morocco Field Operations

Nepal

Pradhan, Prachanda — *Nepal*
Head, Nepal Field Operations (transferred
to Nigeria in August)

Valera, Alfredo — *The Philippines*
Head, Nepal Field Operations (from
August)

Dutga, K.C.
Research Officer

Rayamajhi, Udaya
Administrative Officer

Shrestha, S.R.
Office Manager

Niger

Lonsway, Kurt — *USA*
Irrigation Specialist and Project Leader,
Niger (from June)

Nigeria

Pradhan, Prachanda — *Nepal*
Irrigation Specialist and Project Leader,
Nigeria (from August)

Abubakar, A.R.
Research Officer

Olanrewaju, M.S.
Administrative Assistant

ANNEX IV (continued)

Oyedepo, F.D.
Research Assistant

Sondangi, A.I.
Research Assistant

Philippines

Wijayaratna, Chandrasekara, M. —
Sri Lanka
Head, Philippines Field Operations

Cabluyan, D.
Research Associate

Elegado, J.A.
Research Assistant

Maglinao, Amado
Associate Researcher, IIMI-IRRI Project
PCARRD, Los Baños, Laguna

Manangan, Celso
Accounts and Administrative Officer

Marino, Ma Delia
Research Assistant

Pintor, E.M.
Research Associate

Sri Lanka

Merrey, Douglas — *USA*
Head, Sri Lanka Field Operations

Aluwihare, Parakrama
Research Officer

Ariyaratne, B.R.
Research Officer

Brewer, Jeffrey — *USA*
Social Scientist (from December)

Ekanayake, Ratnasiri
Research Officer

Hemakeerthi, K.A.
Research Officer

Jinapala, K.
Research Officer

Karunasena, H.A.
Research Associate

Kikuchi, Masao — *Japan*
Irrigation Specialist (until April)

Perera, L.R.
Research Officer

Sakthivadivel, Ramaswamy — *India*
Senior Irrigation Specialist

Samarakoon, Darshana
Administrative Officer

Somararatne, P.G.
Research Officer

Upasena, W.J.J.
Research Officer

Vithana, Chulawansa
Research Officer (from January)

Sudan

Shafique, Muhammad S. — *Pakistan*
Head, Sudan Field Operations

Haq, Azharul — *Bangladesh*
Senior Water Management Advisor

PAKISTAN DIVISION

Schulze, Ernst — *The Netherlands*
Director (until June)

Kijne, Jacob W. — *The Netherlands*
Director (from June)

Afaq, Rana Mohammad
Irrigation Engineer

Anwar, Haroon
General Manager,
Finance and Administration

Babar, Khurshid
Field Research Engineer

Badruddin, Mohammad
IIMI Pakistan Associate

Bandaragoda, Jayatissa — *Sri Lanka*
Senior Management Specialist

Bhatti, M. Akhtar
Principal Irrigation Engineer

Garces-Restrepo, Carlos — *Colombia*
Irrigation Engineer (from April)

Habib, Zaigham
Systems Analyst

Haider, Sayed
Daniyal Accountant

Hussain, Irfan
Field Research Engineer

Khan, Hakeem
Field Research Engineer

Kuper, Marcel — *The Netherlands*
Associate Expert (from May)

Miranda, Senen — *The Philippines*
Senior Irrigation Specialist (from May)

Rehman, Saeed-ur
Senior Field Research Economist

Safdar, Ahmed Saleem
Field Research Engineer

Saleem, Mohammad
Field Research Social Scientist

Sendhu, Faiz Hanif
Senior Field Research Hydrologist

Shahid, Bagh Ali
Principal Irrigation Engineer

Strosse, Pierre — *France*
Agricultural Economist (from May)

Van Waijjen, Erik — *The Netherlands*
Associate Expert (from July)

Vander Velde, Edward J. — *USA*
Irrigation Specialist

Zaman, Waheed-uz
Senior Field Research Engineer

INFORMATION OFFICE

O'Kelly, Francis — *Ireland*
Head, Information (until July)

Lenahan, James — *United Kingdom*
Head, Information (from September)

De Silva, Ramya
Documentalist

Fernando, K. Nimal A.
Chief Production Editor

Karunaratne, D.C.
Artist/Cartographer (from January)

Kurukulasuriya, Kingsley
Editor

Rabindranath, Susila
Press Officer (from February)

Somasundaram, Vasumathy
Administrative Officer

ANNEX IV (continued)

Sri-Nammuni, Shanthi
Assistant Librarian

Sufian, A.C.M.
Production Manager

Van Eyck, David
Distribution Manager

Yapa, N.U.
Head Librarian

PROJECT DEVELOPMENT OFFICE

Fuchs-Carsch, Marian — USA
Project Development Officer

Blok, Sharmini
Asst. Project Development Officer
(from April)

FINANCE AND ADMINISTRATION DIVISION

Goodman, Daniel C. Jr. — USA
Director, Finance and Administration

Abayasekara, Mohan
Travel and Conference Coordinator

Abeysekera, Laksiri
Controller

Abeysekera, Fred
Personnel Manager

Bahar, Omar
Personnel Officer

Ekanayake, Somasiri
Assistant Accountant

Halvirige, Gamini
Senior Accountant

Nanayakkara, Charith
Computer Services Manager
(from September)

Perera, K.S.C.
Maintenance Engineer

Samaraweera, Daya
Manager, Administrative Services

Weerasekera, Shanthi
Manager, Office Support Systems

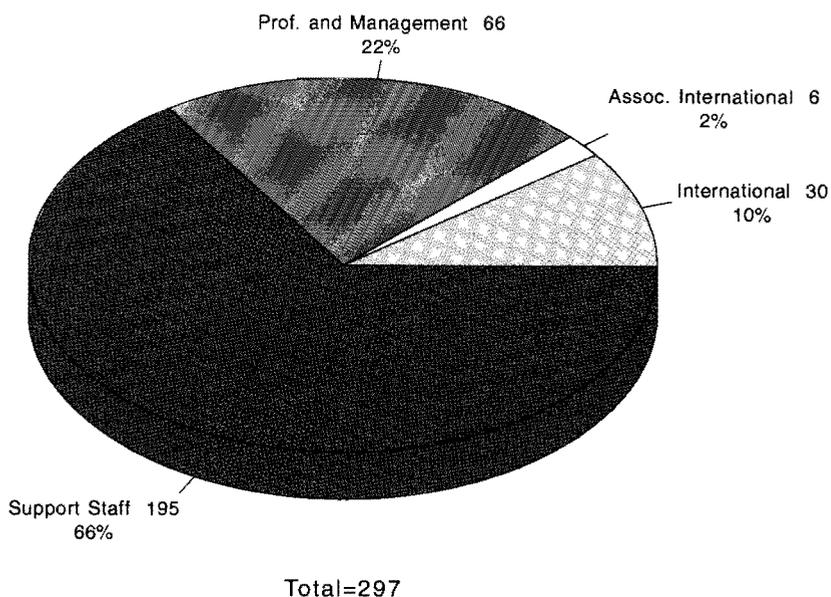
Wettasinghe, Udaya
Budget Officer

¹Based at IFPRI, under IIMI-IFPRI Collaborative Program

²Based at IPTRID (on secondment from IIMI)

Figure 3

Composition of IIMI Staff



**ANNEX V
CONSULTANTS 1991**

Name	Country in which the Consultancy was Conducted	Mission
Research Division		
Mr. Adriza	Sri Lanka	To analyze irrigation performance data collected by Prof. Kyi and his collaborators.
Dr. S. Amunugama	Sri Lanka	To translate documents from French to English for the Research Division.
Ing. A. Bertranou	Latin America	To develop an IIMI Strategy and Workplan for Latin America.
Prof. D. Constable	Sri Lanka and Malaysia	To review IIMI reports on management control and management training of irrigation institutions.
Prof. A.A. Kampfraath	Bangladesh and Sri Lanka	To provide editorial assistance to a research publication and to assist training staff in the Workshop for Senior Managers at BADC in Bangladesh (to be held from 28–30 September 1992).
Prof. K.M. Kyi	Philippines and Sri Lanka	To complete reports on organizational dynamics studies in the Philippines and Sri Lanka.
Prof. G. Levine	Sri Lanka	To prepare Performance Program material.
Mr. B. Maier	U.S.A.	To assist with data collection for a case study on the Management Transfer of the Columbia River Basin Project.
Mr. P. Mutukumarana	Sri Lanka	To develop training materials for the training of engineers, overseers and senior personnel in the Department of Irrigation and Drainage, Malaysia.
Mr. R. Pochat	Sri Lanka	To review achievements and proposals concerning the simulation modeling project.

ANNEX V (continued)

Dr. P.S. Rao	Malaysia	To assist the training staff in: (a) a 3-week program for Training-of-Trainers in Malaysia (April–May 1991); (b) a 3-week Training Needs Assessment Program for BADC staff in Bangladesh (May–June 1991); (c) a 3-day Workshop for senior managers of BADC to Deliver TNA Results (September 1991); and (d) Five training activities in Malaysia including three workshops for senior managers (October–November 1991); and the implementation of Management Training for Engineers and Irrigation Overseers. To assist the Training Specialist.
Mr. J.P. Sauvagere	Sri Lanka	To review achievements and make proposals concerning the simulation modeling project.
Ir. F.E. Schulze	Latin America	To develop an IIMI Strategy and Workplan for Latin America.
Dr. D. Seckler	Sri Lanka	To assist in planning the 1992 Performance Program Activity.
Mr. K.J. Shepherd	Sri Lanka and Australia	To review various IIMI proposals and reports related to irrigation privatization, to prepare a case study on Self-Management in South Australia, and to suggest ideas for collaboration with IIMI.
Ms. R. Sooriyaarachchi	Sri Lanka	To rewrite statistical programs to analyze research data sets.
Dr. R.D. Wanigaratne	Sri Lanka	To function as a resource person for the IIMI/DSE workshop on Trends and Policies in Irrigation Management for Senior Policymakers in South East Asia.

Field Operations Division

Dr. H.L. Angeles	Philippines	To coordinate and supervise research activities of the irrigation component of the Accelerated Agricultural Production Project.
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ANNEX V (continued)

Mr. B. Bagadion	Nigeria	To discuss with the relevant staff of the Kano River Project the process of farmer involvement in irrigation management and to observe present operation and maintenance aspects of the Project.
Mr. H.G. Farbrother	Sudan	To prepare a paper for the workshop on Privatization of Irrigation Schemes in Sudan.
Dr. E. Ndiaye	Sri Lanka	To assist with planning and data analysis activities under Phase II of the ADB-supported work in Kirindi Oya.
Ms. A. Oyedotun	Nigeria	To facilitate the finalization of the Memorandum of Agreement to be signed between the Federal Ministry of Water Resources in Nigeria and IIMI.
Dr. C.R. Panabokke	Sri Lanka	To plan and coordinate meetings for the Consultative Committee and to contribute to the Project on Irrigation Management and Crop Diversification.
Dr. S.P.F. Senaratne	India	To train field observers in collecting management-oriented data under the India-IIMI Program.
Dr. D. Taylor	Sri Lanka	To formulate a methodology for analyzing the benefits and costs of management innovations being tested in Kirindi Oya and Walawe.

Pakistan Division

Mr. Ch. N. Ahmad	Pakistan	To write a report on Mechanisms for Coping with Salinity and Waterlogging Problems.
Ms. N. Gijzen	Pakistan	To advise on the applications of geo-information systems for IIMI's research in Pakistan.
Prof. G. Levine	Pakistan	To advise on the implementation of three ongoing programs, and to conduct a "Retreat" with senior staff of the Punjab Irrigation Department.

ANNEX V (continued)

Information Office

Dr. A. K. Biswas	United Kingdom	To supply articles for the "IIMI Review."
Mr. J. Colmey	Sri Lanka	To design photograph albums.
Mr. B.H. Hemapriya	Sri Lanka	To provide editorial assistance to the "IIMI Review."
Mr. R. Lamb	Sri Lanka	To finalize all outstanding issues on the "Annual Report" and the "IIMI Review."
Mr. C.S. Ranasinghe	Sri Lanka	To copyedit and proofread "Irrigation Decision-Making Processes and Conditions."

Project Development Office

Dr. B. Lynch	Sri Lanka	To prepare a report that defines a research program on Women and Irrigation.
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Director General's Office/Finance and Administration

Mr. R. Bhatia	Sri Lanka	To install a computer network in the Accounts Department.
Dr. C. Francy	Sri Lanka	To design and prepare a prototype of an administrative procedures manual.
Mr. K. Fussing	Sri Lanka	To complete the design for the interior and furniture for the public areas of the IIMI headquarters building.
Dr. W. Gormbley	U.S.A.	To prepare a report on Post-Secondary Educational Benefits.
Ms. J. Joshi	Sri Lanka	To assist Finance and Administration write an administrative procedures manual.
Mr. S. Lee	Sri Lanka	To provide recommendations for the setting up of a local area network system for IIMI headquarters.

ACRONYMS AND SYMBOLS

ADB	Asian Development Bank
AFDB	African Development Bank
APO	Asian Productivity Organization
BADC	Bangladesh Agricultural Development Corporation
BMZ	Bundesministerium für Wirtschaftliche Zusammenarbeit (Germany)
BRRRI	Bangladesh Rice Research Institute
CIDA	Canadian International Development Agency
CGIAR	Consultative Group on International Agricultural Research
DGWRD	Directorate General of Water Resources Development (Indonesia)
DID	Department of Irrigation and Drainage (Malaysia)
DSE	Deutsche Stiftung für Internationale Entwicklung (Germany)
ESCAP	Economic and Social Commission for Asia and the Pacific (United Nations)
FMIS	Farmer-Managed Irrigation Systems
IA	Irrigators' Association (The Philippines)
IBSRAM	International Board for Soil Research and Management
ICRISAT	International Crops Research Institute for the Semiarid Tropics
ICRISAT-WASIP	ICRISAT — West African Sorghum Improvement Program (Nigeria)
IDRC	International Development Research Centre (Canada)
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute
IMCD	Irrigation Management for Crop Diversification
IMPSA	Irrigation Management Policy Support Activity (Sri Lanka)
IPTRID	International Programme for Technology Research in Irrigation and Drainage
IRRI	International Rice Research Institute
JICA	Japan International Cooperation Agency
NIA	National Irrigation Administration (The Philippines)
NWFP	North-West Frontier Province
O&M	Operations and Maintenance
ONAHA	Office National des Aménagements Hydro-Agricoles
ORMVA	Office Régional de Mise en Valeur Agricole
PCARRD	Philippines Council for Agriculture, Forestry and Natural Resources Research and Development
TARC	Tropical Agricultural Research Centre (Japan)
TEAMS	Technology Evaluation and Management Services (Pvt.) Ltd. (Sri Lanka)
TNA	Training Needs Assessment
USAID	United States Agency for International Development
WECS	Water and Energy Commission Secretariat (Nepal)
WVSU-NIA	West Visayas State University — National Irrigation Administration
ZEL	Food and Agricultural Centre (ZEL)
ha	hectare(s)
t	ton(s)

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