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AN ACTION PLAN FOR STRENGTHENING WATER RESOURCE MANAGEMENT IN EGYPT

Report Number 3



Prepared by the

**International Irrigation Management Institute
Sri Lanka**

For the Study

"Strengthening Irrigation Management in Egypt"

**Ministry of Public Works
and Water Resources**

**United States Agency for
International Development**

December 1995

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LIST OF ACRONYMS

ASME	Agricultural Sector Model for Egypt
EWUP	Egypt Water Use Project
IAS	Irrigation Advisory Service
IFPRI	International Food Policy and Research Institute
IIMI	International Irrigation Management Institute
IIP	Irrigation Improvement Project
LE	Egyptian Pounds
IMS	Irrigation Management Systems
ISPAN	Irrigation Support Project for Asia and the Near East
MALR	Ministry of Agriculture and Land Reclamation
MED	Mechanical and Electrical Department
MoU	Memorandum of Understanding
MPWWR	Ministry of Public Works and Water Resources
MSM	Main Systems Management
NGO	Non-Government Organization
NWRC	National Water Research Center
O&M	Operations and Maintenance
OM&R	Operation, Maintenance and Rehabilitation
PDM	Planning Distribution Model
PSM	Planning Studies and Models
SCAP	Steering Committee for the Action Plan
SCRB	Separable Cost-Remaining Benefits
SRP	Strategic Research Program
USAID	United States Agency for International Development
USU	Utah State University
VDCS	Voice - Data Communication System
WMP	Water Master Plan
WUA	Water User Associations

ACKNOWLEDGEMENTS

This Report is one of a series of reports produced over a period of about seven months, from January to July 1995, under the Study entitled "Strengthening Irrigation Management in Egypt." This Study has been implemented collaboratively by the International Irrigation Management Institute (IIMI) and the Ministry of Public Works and Water Resources (MPWWR), Government of Egypt. Its implementation has been supported by the United States Agency for International Development (USAID), under Cooperative Agreement Number 263-0132-A-00-5036-00, with IIMI.

IIMI wishes to express its appreciation to USAID for the invitation to submit a proposal for the activity, and for the strong support provided in its implementation. Special thanks go to Dr Wadie Fahim, USAID Project Officer, Mr Russ Backus, Acting Office Director for Irrigation and Land Development when most of the work was done, and Mr Donnie Harrington, who has been Activity Manager for this work during its last few months. There are others in USAID who have been very supportive as well.

IIMI would also like to thank the Ministry of Public Works and Water Resources, Government of Egypt, for giving us an opportunity to work together on the important issues facing the Ministry. Although rightly skeptical at the initial stages, and sometimes critical of the initial Study results, the Ministry has continued to provide strong support to the Study throughout the period. The senior officials who constitute the Steering Committee have given a great deal of time and effort, not only at meetings and workshops but also informally as the Study progressed, and in spite of their very busy schedules. The various professionals who participated in the task forces worked extraordinarily hard, and with great dedication and professionalism, sometimes putting in long hours on field trips and at meetings. They maintained their good humor and constructive approach throughout, and never complained about the grueling pace and heavy demands of the IIMI team.

Special thanks go to Eng. Gamil Mahmoud, Chairman of the IMS High Coordinating Committee and of the Study's Steering Committee, and Eng. Sarwat Fahmy, Chief of the IMS Monitoring Office (and, as Secretary of the Steering Committee, IIMI's main day-to-day contact) for their continuing advice and assistance; and to Dr Mahmoud Abu-Zeid, Chairman of the National Water Research Center, and Eng. Abdel Rahman Shalaby, Head of the Office of Central Management for the Minister, for their constructive comments and intellectual leadership.

IIMI is particularly grateful to the Minister of Public Works and Water Resources, His Excellency Dr Mohamed Abdel Hady Rady. He has been highly supportive of the Study throughout the process; the Study could not have been completed successfully without his strong support.

Finally, we would like to thank the IIMI team members, expatriate and Egyptian, IIMI staff members and consultants. Everyone worked very hard, putting in many extra hours on weekends and holidays, far beyond the call of duty. Their dedication, willingness to take on added responsibilities, and constant good humor made the work of the co-team leaders much easier.

The first draft of this Report was discussed at a workshop on 7-10 July 1995. The revised draft was circulated before the end of July. Formal comments were received from USAID at the end of September, and from the Ministry in mid-November. But there was a lot of informal feedback as well. This final version has been completed by the IIMI team leader based on the comments received.

The Report represents a joint effort of many people not named here, from the Ministry, USAID, and IIMI. It largely reflects the views of many people from all these organizations. Nevertheless, as the party responsible for the implementation of the Study and preparation of all reports including this one, IIMI remains responsible for any weaknesses or errors contained herein. The views expressed are not necessarily shared by USAID.

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December, 1995

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December, 1995

EXECUTIVE SUMMARY

INTRODUCTION

Demand for water in Egypt is increasing through population growth, agricultural expansion, and growth of municipal and industrial uses. But the supply of water is fixed, and is affected by increasing pollution. Therefore, Egypt must “do more with less water” in future. Other factors affecting water resource management are the impact of the liberalized agricultural economy on water demand; and budget shortfalls which affect maintenance and operations.

In recent years, the Ministry of Public Works and Water Resources (MPWWR) has made significant progress in improving its capacity for water resource management. The United States Agency for International Development (USAID) has assisted the Ministry in achieving this progress, especially through supporting the Irrigation Management Systems (IMS) Project. The IMS Project is a multi-component 16-year project which has significantly strengthened the Ministry in many areas, and tested innovative solutions to Egypt's water problems. The challenge now is to focus on how to make best use of this improved capacity, which is likely to require important policy and institutional changes.

To begin addressing this challenge, the International Irrigation Management Institute (IIMI) was invited to work with the Ministry in a Study which had two objectives:

1. To develop a long range plan that would enable the MPWWR to make effective use of IMS outputs; and
2. To make further progress towards clarifying and establishing Egypt's future policy toward cost recovery and cost sharing to ensure the sustainability and efficiency of water resource management.

The Study was carried out during 1995, with the active participation and close collaboration of the Ministry. The Minister appointed several task forces of middle-level professionals to work with the IIMI team. A Steering Committee of senior officials guided the overall Study. A large number of reports were prepared analyzing current institutional and water services cost sharing issues, and proposing strategies and opportunities for change. In addition to a great deal of informal consultations with Ministry officials, four workshops were held to discuss and improve the findings.

Basically, the Study confirmed the important achievements of the Ministry in water resource development and management. But the broad institutional analysis of the Ministry and the issues it faces in fully using and integrating IMS outputs concluded that effective use of these outputs to meet future challenges will be enhanced by improvements in the management processes, institutional framework, and human resource policies of the Ministry.

On cost sharing, the Study concluded that the Ministry should begin with recovery of costs from non-agricultural users, implement the current policy of recovering capital costs of *mesqa* improvements, and initiate cost sharing for O&M of the irrigation system above the *mesqa* with a flat area-based charge. In the long run, the Ministry should move to using cost sharing as an incentive to improve both delivery and use efficiency, but this will require substantial institutional and infrastructural changes.

The present report is the culmination of the IIMI-MPWWR Study. Based on the findings, it provides a detailed *Action Plan* for strengthening water resource management in Egypt.

GOALS AND OBJECTIVES OF THE ACTION PLAN

The broad goal of the Action Plan is to contribute to the Egyptian Government's goal of *using water productively and sustainably for multiple purposes, with special emphasis on agriculture*. The overall objective is to help the MPWWR to adapt its policies, organizational structure, and procedures so that the Ministry can "do more with less water" and thus address future water resource challenges effectively.

The specific objectives follow the three main components of the Action Plan:

1. *Irrigation Operations and Maintenance (O&M) Program*

The objective of this Program is to develop strategies, procedures and institutional arrangements for the Irrigation Sector to deliver water to farmers more adequately, equitably and flexibly. This will enable the Ministry to provide more satisfaction to farmers and strengthen its capacity to manage anticipated future water scarcities. It will do this by pilot testing and validating in the field a set of eight institutional and technical innovations which are largely based on IMS experience.

2. *Water Service Cost Sharing Program*

In anticipation of a political decision to legislate for water service cost sharing, the objective of this Program is to assist the Ministry to plan, carry out preparatory work for, and initiate a water service cost sharing program.

3. *Strengthening Ministry Management Program*

The aim of this Program is to strengthen senior officials' management skills, and assist them in a systematic program to re-examine water resource policies and goals, MPWWR mission, roles and responsibilities, and the subsequent implementation of new policies and programs including those contained in the previous two components.

The Action Plan is the first phase of a long term process of change and development. Successful implementation will enable the Ministry officials to evaluate its future

requirements and options objectively, formulate a long term strategy for policy and institutional reform, and begin implementing the agreed changes.

SUMMARY OF THE THREE PROGRAMS

Irrigation O&M Program

This Program is described in chapter 2. It is a field-based Program to be implemented in three or four pilot command areas and at Directorate and Central levels of the Irrigation Sector. The introduction of a decentralized, integrated scientific measurement-based water management system will enable the Ministry to improve performance, and respond to future water scarcity situations more effectively.

Eight technical and institutional innovations, some of them derived from existing IMS projects but not yet systematically integrated into a package, will be tested over a three-year period. These are:

- measurement-based flow control,
- continuous flow,
- information systems for decision-making,
- integrated water budgeting,
- improved demand forecasting,
- improved maintenance management,
- user involvement in decision-making, and
- localized planning and decision-making.

The Program will be implemented following a “participatory action process” in which the Irrigation Sector and IIP, NWRC staff, and an outside partner institution will work collaboratively in designing, implementing, and evaluating the results as a basis for recommendations to the Ministry. The pilot command areas have been selected by the Ministry with IIMI’s assistance based on a set of agreed criteria. A set of performance indicators has been proposed as a basis for evaluating the results to satisfy MPWWR and users’ needs. The results will be important inputs to the Management Strengthening Program.

A National Water Services Cost Sharing Program

This Program is described in chapter 3. The studies done by IIMI and MPWWR propose a three-phase implementation strategy based on achieving progressively more complex goals.

The Action Plan covers the first phase. The suggested first phase activities are:

1. Prepare a detailed implementation plan for cost sharing;
2. Implement the program of cost recovery for mesqa improvements and document the experience;
3. Introduce cost recovery for water services provided to non-agricultural users;
4. Carry out a public education campaign on the benefits and costs of water delivery services;
5. Test and validate a functional budgeting and accounting system so that actual costs can be identified clearly and transparently;
6. Carry out preparatory studies, for example social marketing studies on conditions affecting willingness to pay, and studies on what disadvantaged users actually pay at present;
7. Carry out a further study on the options for service fee collection as a basis for a firm recommendation; and
8. Adopt legislation for cost sharing.

This Program will be integrated with the Irrigation O&M Program and its results will be inputs to the Management Strengthening Program.

In the long run, the second and third phases will involve: a) implementation of the flat area-based fee, in subphases; b) implementation of a functional budgeting and accounting system in the Ministry; and pilot testing of other ideas on cost sharing.

Management Strengthening Program

At present there is no clear consensus within the Ministry regarding its future role and organization. A number of alternative scenarios exist and function well in other countries, and these experiences may offer useful guidance to Egypt. For example, decentralized user-responsive financially autonomous utilities or companies to manage water services would allow the Ministry to strengthen its role in setting overall policy, long range planning, and regulation of water use. In the current setup, it is difficult to achieve accountability for water services to the users, or Ministry's customers; and the attempt to fulfill all water service functions makes it difficult to focus enough attention on each one to do all of them well.

The Management Strengthening Program, described in Chapter 4, is designed to assist senior officials of the Ministry to address important policy and institutional issues systematically, and develop their own solutions. The Program includes:

- team building activities,
- management training and orientation,
- preparation of synthesized information for senior officials to use, and
- structured working sessions for senior officials to analyze water resources and management issues and develop long term solutions.

The steps and activities of the Program are as follows:

1. Assess the present water resource management and water service situation, and come to clear conclusions on the strengths, weaknesses and issues;
2. Look into the future (15 to 20 years) and define the possible, and most likely, water resource situations the Ministry may face;
3. Review existing water resource management and water service goals and policies;
4. Develop any necessary recommended changes in goals and policies; and
5. Examine institutional and management issues and recommend any required changes.

This final step may include reviewing and recommending changes in the role of the Ministry (and other agencies as well as users), the legal framework, the Ministry's management processes, and the Ministry's annual work program and budget; and developing a detailed implementation plan. The results of both the Irrigation O&M and Cost Sharing Programs will be integrated into this activity.

Special Studies

Four special studies to support the Action Plan are suggested in Annex 2. These are:

- Performance Assessment of the Irrigation Improvement Project
- Study of Feasibility of Continuous Flow on System-Wide Basis
- Assessment of the Future Role of Irrigation Advisory Service
- Assessment of the Institutional Framework for Water Quality Management.

The need for other studies may be identified as the Action Plan is being implemented.

EXPECTED OUTPUTS AND IMPACTS

Irrigation O&M Program

Outputs

- More effective functioning of the District Engineer's offices;
- Identification of ways to make better use of the telemetry system at all levels;
- Identification of feasibility and benefits of continuous flow, and requirements for wider implementation;
- Useful computerized data bases at District and Directorate levels;
- Better understanding of the system and its hydrology, and of water use by farmers;
- Development and use of a decision-support system for day-to-day operations at the central level;
- A better methodology for forecasting demand;
- Identification of ways to get effective user participation in system decision-making;
- Improved maintenance management at District level;
- Better integration of IMS Project outputs in regular MPWWR operations;
- Training and procedural manuals for wider implementation of the innovations;
- Identification of possible future institutional reforms.

Anticipated Impacts

On the ground:

- Measurable increase in equity and timeliness of water distribution in pilot command areas,
- Measurable increase in the value of crop production in selected commands,
- Measurable increase in satisfaction of farmers, and
- Measurable improvement in gross value of agricultural production per unit of water.

Within the MPWWR:

- Adoption of scientific measurement-based water management in selected commands,
- Measurable improvement in familiarity with user needs and willingness to satisfy those needs,
- Recognition of value of the innovations and desire to implement them more widely,
- Measurable increase in satisfaction of Irrigation General Directors with water distribution to the Directorates,
- Greater job satisfaction, and
- Strong interest in carrying institutional changes further in future.

National Water Service Cost Sharing Program

Outputs

- Cost-sharing by major non-agricultural users to MPWWR,
- Routinized and effective implementation of cost recovery for mesqa improvements,
- Functional budgeting and accounting system,
- Better understanding of conditions affecting willingness to pay for water services,
- An implementation plan for phasing in a water services cost sharing program, and
- Legislation enabling a phased program for water service cost sharing.

Anticipated Impacts

- More cost-effective water services by MPWWR,
- Enhanced capacity for setting and collecting water service fees,
- Better public awareness and political acceptance of the need for sharing costs of water services, and
- Improved financial sustainability of the Ministry and its units.

Management Strengthening Program

Outputs

- Realistic up-to-date policy and goal recommendations for water resource management and water services,
- Redefinition of the role of the Ministry in providing water services, managing water resources, and water quality management,
- Recommendations to the Government on changes in the legal framework needed to address current and future water resource issues,
- A plan to improve the management processes of the Ministry,
- A plan for enhanced private sector roles in water service activities,
- Enhanced inter-Ministerial coordination for water resource management, and
- A detailed plan for implementing the proposed changes institutional changes.

Anticipated Impacts

- Adoption of improved policies,
- Initiation of institutional changes in the Ministry, and clear plans to continue making changes and improvements,
- A set of high- and middle-level officials who have had significant training in management skills, and therefore improved ability of the Ministry to use modern management techniques,
- Adoption of a program for continued training in management skills, and
- Changes in the Ministry's activity program, investment program, and budget to match reformulated goals and policies.

IMPLEMENTATION

Chapter 5 discusses the proposed implementation arrangements. A basic premise underlying the Action Plan is that the concerned Ministry officials must be responsible for planning, pilot testing, drawing conclusions, making decisions, and implementing change programs. Therefore, the implementation of the Action Plan will be guided by a high-level *Steering Committee for the Action Plan (SCAP)*. This will be a committee consisting of senior officials (including some officials likely to be promoted in the near future to

very senior positions), to be appointed by the Minister. In addition to guiding the overall Action Plan implementation, the members of this committee will act as the oversight committee for the Irrigation O&M and Cost Sharing Programs, and will be the key participants in the Management Strengthening Program. Thus they will be in a unique position to integrate the results of all the various activities into a coherent future Ministry program. For both the Irrigation O&M and Cost Sharing Programs specific committees are proposed to plan, guide and evaluate the activities under those Programs.

The Action Plan is designed to make maximum use of existing capacities and resources of the Ministry. For example, the Planning Sector, National Water Research Center, and Training Center will play very important roles in various aspects of this Program. But a lesson learned from organizational change programs in both public and private sectors is that outside expertise can often play key roles in such programs. Therefore, the Action Plan calls for the use of both Egyptian and expatriate specialists as consultants, trainers, and researchers. It is suggested that an international research institution with experience and expertise in water resource and organizational change issues can play a useful role in implementing the Action Plan.

AN ACTION PLAN FOR STRENGTHENING WATER RESOURCE MANAGEMENT IN EGYPT

Chapter 1

INTRODUCTION TO THE ACTION PLAN

1.1 Background and Study Objectives

The completion of the High Aswan Dam in 1971 led to dramatic changes in the water and agricultural sectors of Egypt. Previously Egypt had to manage seasonal water crises, both droughts and floods during the main agricultural season, with insufficient water the remainder of the year to take full advantage of its fertile agricultural land. After the Dam came into operation, Egypt has had a surplus of water in most years, and has been able to use its water to dramatically raise agricultural intensity and production. However, as population and agricultural area as well as non-agricultural demand for water and water pollution have increased, Egypt is in transition to an era of increasing competition for water.

In this context, Egypt has continued to carry out research to solve technical problems and to find better ways to use its water resources; and it has continued to invest in modernizing its technology for water resources. The Ministry of Public Works and Water Resources (MPWWR) has the primary responsibility for developing, managing and conserving the water resources of Egypt. The United States Agency for International Development (USAID) has been assisting the Ministry since the late 1970s in its effort to increase its capacity for water resource management as well as in research and development to modernize the water resource system.

USAID supported the Egypt Water Use Project (EWUP), which was completed in 1984. This was a multi-disciplinary field-based research program that attempted to understand on-farm water management problems and develop solutions that would improve irrigation efficiency and agricultural production. This project complemented the Water Master Plan (WMP) effort of the Ministry in the 1970s and 1980s, which developed policies and recommendations for addressing global water resource issues of Egypt. Both of these projects provided important inputs to the current Irrigation Management Systems (IMS) Project, the main vehicle for USAID support to the MPWWR since 1981.

The IMS Project has evolved over time, and includes more than 10 components (see section 1.4). The total budget for IMS is some \$340 million from USAID and the equivalent of about \$125 million from the Government of Egypt. Some components have been successfully completed, while others are still on-going (the project has been extended to the end of September 1996 to complete work under selected components). During the past few years of implementation, both the Ministry and USAID have become concerned

that the IMS Project components should be fully integrated into the Ministry's operations in order to achieve their broader purpose of improving irrigation efficiency. While some components are undoubtedly already contributing to this broader purpose, both the Ministry and USAID recognize that more needs to be done to integrate and make best use of other components.

Under the IMS Project, several studies had also been carried out on the broad subject of cost recovery and cost sharing. At present there is no direct recovery from agricultural users of the costs of delivering water to the *mesqa*, the small private canals that take water from government canals and carry it to farmers' fields. Studies were carried out which showed that farmers could in principle afford to pay some of these costs. The studies also tried to identify operation and maintenance costs above the *mesqa*. More recently, to support the Irrigation Improvement Project (IIP), a component of IMS, the law was amended to legalize water users associations and their sharing of the costs of *mesqa* improvement.

The Ministry and USAID had also begun in late 1994 to discuss the shape of a new project, called the Water Resources Management Project, which would completely replace the IMS Project. Both parties had agreed that this Project should focus more than IMS had on policy and institutional issues¹.

At the same time, USAID approached the International Irrigation Management Institute (IIMI) to inquire about IIMI's interest in providing assistance in two areas: cost sharing, and an institutional analysis of the IMS experience. IIMI had a long standing interest in Egypt, and had already developed a modest relationship with the National Water Research Center. The invitation from USAID was seen by IIMI as an opportunity to expand and deepen its relationships in Egypt, as well as to both contribute to and learn from Egypt's experiences. Therefore, IIMI accepted the invitation and prepared a proposal for the consideration of USAID and the Ministry. After some discussion and further improvements, this proposal was accepted and became the basis for the Cooperative Agreement with USAID entitled "Strengthening Irrigation Management in Egypt." Relevant extracts from the Work Plan describing the terms of reference for this report are included as Annex 3.

The Study began in January 1995 and was scheduled for completion in July 1995. USAID subsequently granted a no-cost extension to the end of December 1995 to allow time to complete several draft reports, including this Action Plan. The Study has two broad objectives as laid out in the Agreement and the Work Plan (IIMI 1995a):

1. To develop a long range plan that would enable the MPWWR to make effective use of IMS outputs; and

¹ This project was later dropped by USAID for internal reasons; and this Action Plan has been finalized in a context in which the Ministry and USAID are discussing the shape of their future long-term relationship.

2. To make further progress towards clarifying and establishing Egypt's future policy toward cost recovery and cost sharing to ensure the sustainability and efficiency of water resource management.

1.2 Purpose of this Report

This Report provides a detailed *Action Plan* for strengthening water resource management in Egypt. Therefore, it fulfills the first objective of the Study, i.e., to develop a long range plan that would enable the Ministry to make effective use of IMS outputs. It is based on a recognition that there are no easy recipes for bringing about the changes needed to enable the Ministry to make better use of IMS components, and achieve a substantially higher level of performance in the management of water resources. Implementation of this Action Plan over the next few years will lead to a substantial improvement in Ministry performance, and put it into a position where it can continue to make necessary improvements as well as attract and make good use of necessary investments to achieve its long term objectives.

1.3 Methods Used to Prepare the Report

In the original proposal and the Work Plan (IIMI 1995a), it was agreed that the Study would be carried out jointly and collaboratively by IIMI and the Ministry. IIMI's previous experiences had shown that such a participatory approach greatly increases a sense of commitment to, and "ownership" of, the final product. Accordingly, the Study has been guided throughout by a high level Steering Committee established by a decree of the Minister. This Committee has been fully and actively involved throughout the Study, in spite of the busy schedule of its members.

IIMI had a large team working on the Study. It consisted of IIMI staff members, special international consultants engaged by IIMI, and Egyptian professionals (including a senior well-respected Egyptian Co-Team Leader)². This Team has worked closely with the Ministry in carrying out diagnostic studies on institutional and cost recovery issues. As part of the diagnostic study, the IIMI-MPWWR team formally interviewed about 130 officials in the Ministry as well as 80 farmers in two areas of the country, analyzed documents and data gathered from records and various other sources, and spent many hours in informal discussions with a wide range of Ministry officials and consultants. All of this provided the basis for identifying the key issues to be addressed in the Action Plan.

During the first, or diagnostic, phase of the Study, i.e., to May 1995, there were two *Task Forces* consisting of middle-level professionals from within the Ministry working closely with the IIMI team. Beginning in late May, new Task Forces were created to assist IIMI in the preparation of this Action Plan³. These Task Forces have played very

² Annex 1.B lists the IIMI team members.

³ Annex 1.A lists the members of the new Task Forces.

active roles, providing knowledge and advice to the IIMI team, assisting the team to carry out interviews and gather data, designing data collection protocols and carrying out data collection and analysis, contributing their ideas, recommendations, and proposed solutions to problems through brainstorming meetings, and reviewing draft reports to ensure their accuracy and usefulness to the Ministry.

Four formal Workshops have been held, of which three have been separately reported (IIMI 1995b, 1995c, 1995d); the fourth, held on 7-10 July 1995, was a discussion of the first draft of this Action Plan, and its results were used for preparing the revised draft. These workshops brought together members of the Steering Committee, Task Force members, other Ministry officials, USAID officials and IIMI team members to discuss a variety of issues, including the findings and recommendations emerging from the Study.

A draft outline of the Action Plan was developed and discussed with Steering Committee members in May, and became the basis for the shape of the draft Action Plan. IIMI's team was split into sub-teams to work with specially designated Task Forces on each of the major chapters of the Action Plan. For each chapter, the responsible IIMI team members developed drafts, which were then shared and discussed in detail with other team members and the appropriate Task Force members. Revised drafts were shared with a wider variety of people having a stake in the Plan, including Steering Committee members and others, to get their suggestions and ideas for further improvement.

The July Workshop was used as a vehicle for further improvement and refinement of the Action Plan. It focused on steps to implement the Plan in a coordinated manner, and getting the commitment of various Ministry units and officials to its implementation. After that Workshop, the IIMI team held intensive meetings with the task force members, and also met many of the senior officials of the Ministry to get their views and suggestions before revising the Action Plan.

At the end of July, a *revised draft* of the Action Plan was circulated to USAID and Ministry officials. For various reasons it took longer than expected for the Ministry and USAID to comment on the revised draft. However, in late September IIMI received written comments from USAID, and in mid-November, also received written comments from the Ministry. These comments were supplemented by considerable informal discussions with USAID and Ministry officials.

This final version of the *Action Plan* has been very substantially revised based on the comments received and IIMI's own observations since July. IIMI has attempted to reflect all the suggestions made. In the few instances where this was not possible, an explanation is given. Throughout this process, the IIMI team has tried to focus on achieving better integration and use of IMS outputs, with the long-term purpose of achieving improved water resource management.

1.4 Observations on the Experience of the IMS Project

1.4.1 The IMS Project Components

The Irrigation Management Systems (IMS) Project began in 1981 with a program aimed at replacing a large number of small and medium-sized irrigation structures. Over the years the Project has been amended several times, adding new components and additional funds. It is presently authorized at about \$460 million counting both USAID and Government of Egypt commitments. USAID has recently agreed to extend the Project for one more year, to the end of September 1996, for selected components. The objectives and current status of the ten components of IMS are briefly summarized in IIMI (1995f).

For some components the objectives have been largely met and the work essentially completed. This includes the Structural Replacement, Professional Development, Project Preparation Department, Survey and Mapping, and National Water Research Center (NWRC) components. Other components are at various stages of completion. For example, the Main Systems Management (MSM) component, which aims to improve the management and operation of the water delivery system through installation of a telemetric data gathering system, a voice/data communications system, flow measurement equipment and a pilot automation program is still under construction, though installation is close to being complete.

The Irrigation Improvement Project (IIP) is an important component that emerged from the EWUP studies mentioned above. It is introducing improved raised mesqas or pipelines, single-point pumping into the improved mesqas, water users associations to manage the improved mesqa and pump, continuous flow in distributaries, and improved water management practices, assisted by a Ministry Irrigation Advisory Service (IAS). The original goal was too ambitious -- 395,000 feddans⁴ although it was considered a "pilot" project. The current objective is 70,000 feddans (1,050 mesqas) of which about 45,000 have been completed. Many unresolved issues remain, including the feasibility of continuous flow on a system-wide basis, the long-term role of WUAs, the most cost-effective mesqa technology, and the future implementation arrangements including the future of the IAS. Because of the planned expansion of IIP (for example, the World Bank-financed National Irrigation Improvement Project, just getting underway), it is important to address these issues soon.

The Preventive Maintenance/Channel Maintenance component has been implemented in six of the country's 26 Governorates. The Planning Systems and Models (PSM) component has now developed about 20 mathematical models for a variety of purposes. Some of them are currently being used, for example to predict inflows into Lake Nasser, and for water delivery operations planning. In recent years, various new activities have been initiated under the category "miscellaneous." These include the Strategic Planning Program in NWRC, the water quality unit also in NWRC, establishment of a Ministry Communications Unit, and the present IIMI-MPWWR Study.

⁴

One feddan equals 0.42 ha.

1.4.2 Concerns Regarding the IMS Project

A number of concerns have been expressed by both the Ministry and USAID regarding:

- a. the delays in implementation of some project components;
- b. the likely impact, usefulness and cost-effectiveness of some components; and
- c. the extent to which the Ministry has integrated, or will be able to integrate, these components into its overall management processes.

The delays that have occurred are the result of many factors, and are not unusual in innovative development programs. By and large, most IMS components are potentially important and useful to the Ministry. Therefore, the issue addressed by the IIMI-MPWWR Study is the integration of IMS technologies and innovations into the Ministry's overall management processes. This is discussed in the next section.

1.5 Findings of the Study

1.5.1 Results of the Institutional Analysis

The first stage of the Study aimed at gaining a broad understanding of the experiences and lessons of the IMS Project, and the underlying institutional factors affecting both IMS implementation, and more generally, the operations of the Ministry. The methodology used is summarized above (section 1.3), in the Work Plan (IIMI 1995a), and in the report on the institutional analysis (IIMI 1995f). Many of the Study's conclusions are based on the views expressed by Ministry officials themselves.

The Study confirmed the achievements of Egypt in water resource management and irrigated agriculture. Egypt's agricultural yields are among the highest in the world for developed as well as developing countries -- yet considerable opportunity still exists for further improvements (John Mellor Associates Inc 1995). The Ministry of Public Works and Water Resources has played a key role in these achievements, through construction of impressive and important water control structures, and through its operation of the system over the years under changing conditions.

The IMS Project is an important attempt by the Ministry to make use of modern hardware and software to further strengthen and improve its ability to respond to increasingly serious water resource management challenges. The Study confirmed the broad agreement that to date IMS outputs have not been fully integrated into the Ministry's management processes. But this is not because of a lack of effort by IMS Project staff. Rather, the reasons lie within the Ministry's management processes and organizational structure.

The Study examined policy, technical and management issues related to water resource management, and specific organizational and institutional issues facing the Ministry. A large number of issues and potential opportunities for change were identified. These can only be briefly summarized here.

Under *policy-making* and *planning*, the report discusses seven issues affecting the effectiveness of these management processes and suggests a number of possible opportunities for change. The topics of *water allocation, delivery and disposal* as well as *water pollution* and *maintenance* generated a very large number of issues affecting the Ministry's effectiveness in these areas. The report identifies three issues facing the *Irrigation Improvement Project*, and also discusses some concerns regarding how the Ministry can make best use of both the *research* and *training centers* which have been greatly strengthened in recent years.

The observations on the basic organizational issues facing the Ministry proved to be the most controversial within the Ministry. The report analyzes the strengths and weaknesses of the *decision-making processes* and *organizational structure* of the Ministry, and identifies a number of issues that may have a serious impact on its management effectiveness. The Study found that there is both fragmentation of programs and functions and considerable overlap among Ministry units. Relatively few officials make most of the decisions, reflecting a highly-centralized organizational structure with little delegation of authority. While some officials did not agree with IIMI's observations on these structural issues, there was widespread agreement that *communication of data and information sharing* is a serious problem. The report makes a specific recommendation to change the *financial and budget management system* to convert it into an effective management tool and to make cost allocations more transparent (see Lewis and Hilal 1995). The relationship of *special projects* (including some IMS components) to regular Ministry units was analyzed and the drawbacks of creating special implementation units or placing projects in the wrong units (even if the short-term reasons are good) are highlighted. It is suggested that creation of special units retards institutionalizing innovations as part of the normal Ministry routine.

Another area under which many important issues emerged is *human resource and personnel management*. This includes such issues as the low levels of, and sometimes inequitable compensation, imbalances of staff availability and needs, concerns about the current personnel performance evaluation system, and the lack of linkages between performance and incentives. This is a complex problem that is generally applicable to the Egyptian civil services (Palmer et al. 1988). The Ministry is dominated by one discipline, and tends to encourage civil engineering *generalists* although increasingly it needs highly trained *specialists* in a wide variety of engineering and other technical, policy and managerial disciplines.

1.5.2 Results of the Work on Cost Recovery and Cost Sharing

The IIMI-MPWWR team reviewed previous cost recovery studies, updating the findings of the ISPAN (1993) study in particular; carried out an assessment of the appropriate allocation of costs for water services among sectors; carried out a detailed desk study on cost recovery from non-agricultural water users (Cestti 1995); and with assistance from the International Food Policy and Research Institute (IFPRI) and its Agricultural Sector Model for Egypt (ASME), analyzed the sectoral impact of alternative mechanisms for cost recovery and water supply cuts (Lofgren 1995). The findings are summarized in IIMI

(1995e). A workshop was also held in May 1995 to discuss the findings and try to formulate recommendations (IIMI 1995d). A more recently-completed paper outlines cost sharing mechanisms and a plan for phasing in cost sharing (IIMI 1995j).

In 1994, Law 213 amended the Irrigation and Drainage Law 12/1984 to legalize private Water Users Associations at the mesqa level, and to provide for recovering the capital costs for improved irrigation facilities at that level over a ten to twenty-year period. The implementation of this law is at its early stages under the IIP; a parallel legal provision enables the Ministry to recover part of the cost of field drainage systems installed through the Drainage Authority.

Using the Separable Costs Remaining Benefits (SCRB) method also used by ISPAN, the cost of operation and maintenance for providing agricultural water for old and new lands comes to about LE 74 per feddan⁵, or about LE 11.50 per thousand cubic meters. This cost is stable -- it does not change significantly when various sensitivity analyses are carried out. However, this average masks considerable variation among regions, with Upper Egypt being LE 128 per feddan, Middle Egypt LE 81, and the Delta LE 60 per feddan.

The Study made use of the IFPRI version of the Egypt Agroeconomic model to analyze the impact of full recovery of water service charges on agricultural incomes. This analysis showed that full recovery would be equivalent to about 4.5% of net farm incomes, which is not substantial. The impact on agricultural production and incomes of alternative charging systems was also analyzed. The conclusion is that for the level of charges implied by full recovery for water services, the impact of a relatively simple charge based on crop-area basis has the same efficiency benefits as would a volumetric approach. Further, if cost recovery is to be used as a means to achieve reduced water use by agriculture, the service charge would have to be very high -- equivalent to 30-50% of farm income to achieve a 15% reduction in water use. **Volumetric water charging would not be economically or politically feasible.**

Implementing water service charges is difficult economically, politically and socially. Nevertheless, the long term benefits to the water users as well as the nation are likely to be far greater than the costs. Several countries, most notably Indonesia, which previously had no cost recovery policy, are now successfully implementing such a policy. (IIMI commissioned a presentation on Indonesia's experience for the Workshop, and this was very well-received; see Gerards 1995.) **A key lesson learned from Indonesia and other countries is the crucial importance of linking cost recovery to accountability for the service provided.**

The following scenarios or recommendations are therefore presented:

⁵ In 1995, 3.4 Egyptian pounds (LE) was equivalent to US \$ 1.00. A feddan is roughly an acre, or 0.42 hectare. Therefore, LE 74 per feddan is about \$52 per ha; LE 11.50 per thousand cubic meters is \$3.38 per thousand cubic meters.

1. Non-agricultural users should pay the full cost of water service delivery based on metered charges or estimated consumption (including water treatment if needed).
2. The simplest way to recover costs of water delivery services to farmers is to charge a flat area charge, following a clear and transparent timetable.
3. To reflect water consumption in water service charges, agricultural water service charges should in future be crop-based and reflect water consumption by that crop, either individually or by group (based on high, medium and low consumption).
4. The Ministry should introduce the proposed budgeting and accounting system to better capture costs of different services and activities, and introduce transparency in cost allocations, as recommended in the report by Lewis and Hilal (1995).
5. Water service charges can in principle be collected by the Finance Ministry on advice of the MPWWR. However, the land tax collection department may need strengthening if this is to be done effectively (Mohieddin 1995). **These funds should come directly into a special fund with the MPWWR, and be used for providing water delivery services.**
6. Based on the lesson from other countries on the importance of linking accountability for service and cost recovery, IIMI recommends that the Ministry initiate a long term program, building on the experience of IIP, to:
 - a. federate water users associations at higher levels;
 - b. use these WUA federations to develop a new relationship between the service providers and users;
 - c. define the water services to be provided based on water allocations; and
 - d. enable the federations to take responsibility for paying the Ministry or a larger scale water service utility (see Section 1.8.2) directly for its services, and set and collect the federation's own charges internally for services provided to its members.

This last recommendation would require a long term program for implementation, which could be based on, and integrated with, both the comprehensive program on strengthening Ministry management processes and the irrigation operations and maintenance action plan. It could also be considered as a later stage of a phased approach beginning with introducing flat area- and crop area-based charges.

Successful implementation of a cost sharing policy will require mobilizing sufficient support at the highest political levels, combined with a public information program to explain the importance and benefits to the country and its citizens.

1.5.3 Overall Conclusion of the Study

The Study came to the following basic conclusion:

Effective use of past and future technological investments (including but not limited to IMS outputs) will require improving the overall management processes and institutional framework for water resource management within the MPWWR, as well as continued improvement in the human resources of the Ministry.

The implication of this conclusion is that there are no quick and easy solutions to such problems, no "recipes" or "manuals" for making the necessary changes. The institutional, management process, and human resource issues affecting the Ministry's performance, as well as the question of future cost sharing policies and mechanisms are complex and highly integrated, and therefore require long term approaches to address them. The issues facing Egypt are faced by others as well, but the solutions appropriate for Egypt must be developed by Egyptians, based on lessons and principles learned elsewhere.

Another important conclusion, therefore, is that identifying, reaching agreement on, and implementing changes in management processes and the institutional framework cannot be done by outsiders, no matter how well-intentioned or how skilled they are. Therefore, the process for identifying, agreeing on, and implementing change must be one that is carried out by Ministry officials themselves. But even the most modern and profitable private firms in the world use outside expertise to facilitate and assist such change processes.

It would have been possible for IIMI to make a large number of specific recommendations on how the Ministry should solve its problems; indeed we have made some recommendations in this report, the institutional analysis (IIMI 1995f) and in the cost sharing reports. But a key lesson from IIMI's and others' experiences is that the process of developing and implementing solutions is the key to success.

Therefore, a basic premise underlying the Action Plan is that the concerned Ministry officials must be responsible for planning, pilot testing, drawing conclusions, making decisions, and implementing change programs. However, the Ministry can do this most effectively if it makes good use of outside specialists and expertise. Outsiders can help the Ministry officials reach new understandings about the problems and issues; introduce them to other relevant experiences; facilitate workshops, change processes and pilot programs; carry out specific technical studies as required; and provide training in skills needed by the Ministry officials to solve their problems.

1.6 Objectives and Components of the Action Plan

1.6.1 Goal and Objectives of the Action Plan

The broad goal of the Action Plan is to contribute to the Egyptian Government's goal of *using water productively and sustainably for multiple purposes, with special emphasis on agriculture.* The overall objective is to help the MPWWR to adapt its policies,

organizational structure, and procedures so that the Ministry can "do more with less water" and thus address future water resource challenges effectively. This subsumes both of the specific objectives of the Study, namely a) developing a long range plan to make effective use of IMS outputs, and b) making further progress toward establishing Egypt's policy on cost recovery.

The specific objectives follow the three main components of the Action Plan:

a. *Irrigation Operations and Maintenance (O&M)*

The objective of this Program is to develop strategies, procedures and institutional arrangements for the Irrigation Sector to deliver water to farmers more adequately, equitably and flexibly. This will enable the Ministry to provide more satisfaction to farmers and strengthen its capacity to manage anticipated future water scarcities. It will do this by pilot testing and validating in the field a set of eight institutional and technical innovations which are largely based on IMS experience.

b. *Water Service Cost Sharing*

In anticipation of a political decision to legislate for water service cost sharing, the objective of this Program is to assist the Ministry to plan, carry out preparatory work for, and initiate a water service cost sharing program.

c. *Strengthening Ministry Management*

The aim of this Program is to strengthen senior officials' management skills, and assist them in a systematic program to re-examine water resource policies and goals, MPWWR mission, roles and responsibilities, and the subsequent implementation of new policies and programs including those contained in the previous two components.

1.6.2 Strategy and Components of the Action Plan

The strategy of the Action Plan is based on four ideas:

- The Action Plan directly addresses the key issues that were identified during the IIMI/MPWWR institutional analysis (IIMI 1995f) and discussed at the April 1995 Workshop (IIMI 1995c). These fall into four areas: policy and planning, management processes, water delivery operations, and system maintenance.
- The Action Plan incorporates activities directed toward establishing a water delivery service cost sharing system in Egypt. The activities take into account the conclusions reached by the IIMI/MPWWR studies and at the Cost Recovery Workshop on cost allocation and cost recovery mechanisms (IIMI 1995e; 1995j; 1995d).
- The Action Plan is based on the idea that institutional change is best planned and implemented by the persons responsible for the functions to be changed, assisted by

experts as needed. That is, the basic approach is a participatory one in which the responsible MPWWR personnel are involved in all aspects of planning and carrying out changes.

- The Action Plan proposes incremental change of the existing situation. The idea is to take a step-by-step approach to change, building on the existing strengths in the Ministry and the tools and strengths created through the Irrigation Management Systems Project.

The Action Plan has three basic components:

1. The *Irrigation Operations and Maintenance (O&M) Program*, described in Chapter 2, works with system managers at all levels of the system to upgrade the performance of the MPWWR in delivering water to users efficiently and effectively. Three major aspects of this component are a) upgrading the ability of system managers to control water flows, b) involving users in operational decisions, and c) upgrading maintenance management.
2. The *Water Services Cost Sharing Program*, described in Chapter 3, will assist the MPWWR to develop its ability to control its own resources and thus to respond more effectively to needs in the future.
3. Through strategic planning and management improvement exercises supported by training, team building activities, and special studies, the *Management Strengthening Program* (described in Chapter 4) helps the top managers to: a) resolve key issues about the future of water resources in Egypt and about the future role of the MPWWR; b) develop the policies and strategies that will lead to the desired goals; c) adjust the structure and procedures of the MPWWR, as necessary; and d) adapt the MPWWR's program and budget to best reach those goals.

These three components are essential parts of a single strategy to strengthen Egypt's ability to face the challenge of increasing demand for a fixed supply of water. Improvements in water delivery at the field level to be brought about by the Irrigation O&M Program will require supporting policy and organizational changes throughout the MPWWR to be brought about by the Management Strengthening Program. Similarly, the Water Services Cost Sharing Program will assist both of the other programs by giving the assurance of adequate resources for MPWWR activities.

Figure 1.1 diagrams the interdependence among the components of the strategy. The details of each component are spelled out in the following chapters.

1.7 Making Effective Use of IMS Project Outputs

The Action Plan will make use of the following IMS outputs and integrate them into regular Ministry operations.

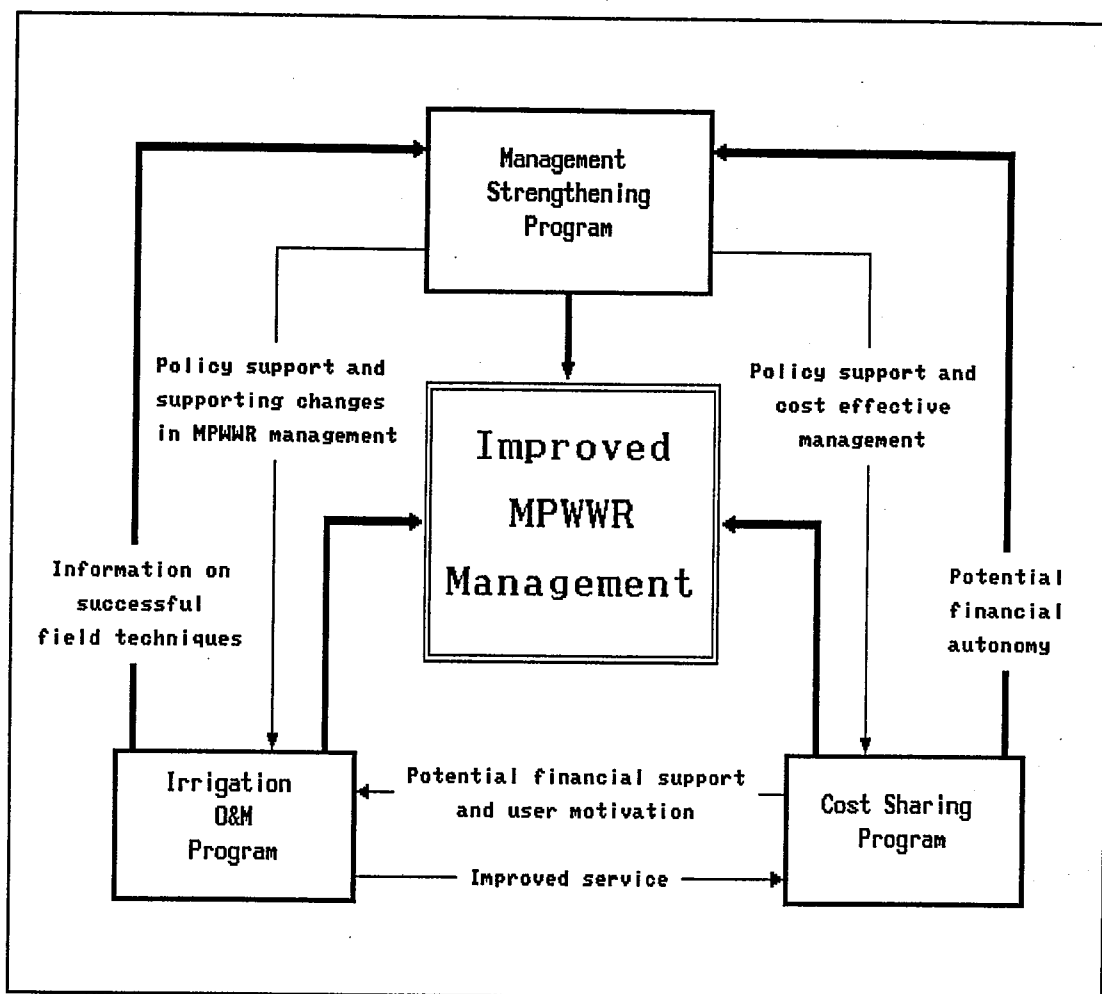


Figure 1.1 Interrelationships of the Action Plan Components

1. ***Structural Replacement*** The Structural Replacement effort upgraded and constructed nearly 20,000 structures in the system. This effort was an essential prerequisite for implementing a comprehensive flow measurement program and making the system more controllable. Thus it underlies the proposed improvements to irrigation operations.
2. ***Irrigation Improvement Project*** The Irrigation Improvement Project (IIP) is improving water delivery to farmers by a) improving mesqas, b) putting a continuous flow system in place, and c) organizing farmers into water user associations (WUAs). All three of these are key innovations for the improvement of irrigation operations and both continuous flow and WUAs are explicit parts of the Program for Irrigation O&M.
3. ***Preventive Maintenance*** The maintenance management techniques tested and refined in the Preventive Maintenance project will be used as part of the Irrigation O&M Program while the results will form a major input to the planning and policy effort of the Management Strengthening Program.

4. **Main Systems Management** Use of the telemetry system installed by the Main Systems Management (MSM) Project is a key element of the Irrigation O&M Program. In addition, the discharge measurement facilities put in place in the Irrigation Directorates will be directly used as part of the Irrigation O&M Program.
5. **Planning Studies and Models** The Planning Studies and Models (PSM) Project has undertaken two types of efforts. One effort, including the development of the Nile Forecasting Center and some computer models as well as undertaking various studies, has been directed at providing information and analytic tools for high level planning. These tools and outputs will be used in the strategic planning effort of the Management Strengthening Program. The other effort, carried out with the help of Utah State University, has been to develop a computerized model for managing canal operations along with an operations manual for the same canals. The manual and the evaluated computer model will be used as input for testing and adapting similar tools in the Irrigation O&M Program.
6. **Professional Development** This component has developed strong training capabilities in the Training Center. The Irrigation O&M Program will make extensive use of the Training Center's capabilities to carry out most of the training required by the Program.
7. **National Water Research Center** This component has greatly strengthened the capabilities of the Center. The Irrigation O&M Program makes direct use of the research results of several of the Center's institutes and also proposes to make use of the developed capabilities by involving at least three institutes directly in carrying out the field work.
8. **Survey and Mapping** An activity proposed under the Irrigation O&M Program is to explore the possibility of using the products of the Egyptian Survey Authority, strengthened by the IMS Project, to improve demand forecasting as part of seasonal operations planning.
9. **Miscellaneous**
 - **Strategic Research Program** The research findings of the Strategic Research Program will be important as inputs to both the Management Strengthening and Irrigation O&M Programs.
 - **Water Quality Program** Information produced by the Water Quality Program will be important inputs to the Management Strengthening Program and, possibly, to the Irrigation O&M Program.

1.8 The Action Plan as a Long Range Program

1.8.1 Strengthening Capacity to Plan and Implement Change

The activities described in this report cover a three year time span only. However, the Action Plan should be viewed not as a three year project, but as the initial phase of a long range plan to transform the MPWWR and its role. Overall, the Action Plan should result in improved ability of the MPWWR to serve Egypt by wisely and efficiently distributing water to its people.

- A key outcome of the Action Plan will be to develop closer links and better communication between system managers at all levels and users. The top managers understand the total supply of water and set the policies that affect demand for water; the users, particularly farmers, determine the actual demand by their choices of activities; field level managers have to match demand with supply. Improving this linkage will enable users and managers to work together to solve the problems caused by increased demand and fixed supply.
- The Management Strengthening Program will provide the means and techniques to make key policy decisions more effectively, including not only decisions on water use but also decisions on how the Ministry will operate. The abilities developed by the Management Strengthening Program should make it possible to adapt policies, procedures, and organizational structure to changing needs over time.
- The changes to be introduced under the Irrigation O&M Program and the Water Services Cost Sharing Program can serve as a basis for further development in the direction of local autonomy. One possibility would be to make the Districts or Directorates into financially autonomous management units that pay for services provided by higher level agencies in the system.
- The Irrigation O&M Program will give system managers greater capability to control water flows. This change is essential for the introduction of additional modern technologies of planning and control. Thus the changes set the stage for future technical improvements in water distribution.
- The Water Services Cost Sharing Program should put the Ministry on a firm financial basis and give the Ministry the means to know and demonstrate that it is using its resources efficiently.

1.8.2 Future Scenarios: "Strengthening" for What?

At the present moment, there is no clear consensus in the Ministry as to the future role and organization of the Ministry and its units. But many officials hold interesting private views on the broad direction future changes should take. For example, many people favor decentralizing control of water distribution, and enhancing the role of the users in local level system management. The Action Plan is designed to set the stage for major changes in management organization and procedures that will help Egypt "do more with less water." Some possible changes include:

- Water distribution might be organized into financially autonomous water utility companies on major canal commands. These utilities could pay for water services from a semi-autonomous "Central Nile Authority" responsible for managing the river and Lake Nasser.
- User-based groups, organized into public entities such as municipal water companies and farm water user associations on smaller canal commands, would pay for specified water services provided by the utilities that distribute water to individual users.
- With a shift to financial autonomy of water service agencies and acceptance of the principle of payment for service, and service for payment, Egypt will be able to move to more sophisticated cost sharing mechanisms linking water consumption with service fees. This shift, however, will require considerable investment in new infrastructure.
- As the Ministry reduces its direct management role, it would strengthen its role in setting overall policy, long range planning, and regulation roles. The latter role would include enforcing rules for allocating water, and controlling pollution.

These scenarios exist and function well in one or more countries in the world. But it is premature to recommend radical reform, and such recommendations from outsiders will be resisted. The Action Plan will assist and enable Egypt's policy makers themselves to come to firm decisions on the future direction of changes, plan for these changes, and initiate implementation.

IRRIGATION OPERATIONS AND MAINTENANCE PROGRAM

2.1 Objective of the Program: Improving Water Distribution

2.1.1 The Need for Improved Water Distribution

In the statement adopted by the Vision Workshop, a major goal for the future is that "Egypt will do more with less water" (IIMI 1995b). Doing more with less water will become a necessity as population growth and other factors increase demand for Egypt's fixed supply of water while increasing pollution decreases the opportunities for reuse.

Doing more with less water requires increased water delivery efficiency. Also, if there are improvements in the efficiency and effectiveness of on-farm water use, a more efficient water delivery system is needed to capture and use the benefits of those improvements. Improved maintenance will sustain the increased water delivery efficiency.

The overall efficiency of the Nile system is very high because of the large amount of reuse (Keller et al 1995); that is, water lost at one point of the system becomes available for use further down the system. However, a major finding of a wide variety of studies is that there is substantial inequity and untimeliness of water distribution throughout the system. Poor local water distribution and untimely supply may mean that crop production is not as high as it could be even though water lost from poor distribution is used elsewhere. Also, improved water distribution will lower the costs of pumping groundwater and drainage water to supplement canal supplies.

In future, Egypt is likely to be faced with an increasing gap between water demand and supply. It will be difficult to manage shortages and maintain reasonably reliable and equitable water deliveries with the present water management arrangements. The basic hypothesis underlying this chapter is that a modern water management system, based on measured discharges with substantial decentralization and user involvement in decision-making, will enable Egypt to respond more effectively to future changes in water conditions.

The objective of the Irrigation O&M Program is:

to develop strategies, procedures and institutional arrangements for the Irrigation Sector to deliver water to farmers more adequately, equitably and flexibly.

It will do this by pilot testing and validating in the field a set of eight institutional and technical innovations (largely based on IMS experience). This will enable the Ministry to provide more satisfaction to farmers and strengthen its capacity to manage anticipated future water scarcities.

2.1.2 Opportunities for Improved Water Distribution: Integration of IMS Components

The Ministry of Public Works and Water Resources (MPWWR) is responsible for water distribution throughout the country. Over the last decade, the Irrigation Management Systems (IMS) Project has developed various tools and knowledge to help the MPWWR improve water distribution. IMS contributions to this goal include:

- Improved ability to control water through the Structural Replacement Project.
- Establishment of the telemetry system under the Main Systems Management (MSM) Project.
- Development of three key innovations under the Irrigation Improvement Project (IIP): a) improved mesqas with single point pumping b) continuous flow; and c) water user associations (WUAs). The IIP also developed the Irrigation Advisory Service (IAS) to work with the WUAs and to improve on-farm water management.
- Development and testing of computer models for operational purposes under the Planning Studies and Models (PSM) Project.
- Improvements in maintenance procedures in selected Governorates through the Preventive Maintenance Project.
- Improvements in knowledge of the system and its hydrology through studies carried out by and in collaboration with the National Water Research Center institutes, supported by the Water Research Center Project and the Strategic Research Program.
- Improvements in the government's ability to survey and map crops, cropped areas and other key items brought about by the Survey and Mapping Project.
- An increase in the number of trained MPWWR personnel resulting from the Professional Development Project.

This chapter proposes a field-based action program to devise, field-test and validate changes in MPWWR's systems for allocating and distributing water and for maintenance. The Program will make use of IMS tools and knowledge to give system managers better information on water flows within the system, better knowledge of users' water needs, and sustained control over how much water is delivered to users.

2.2 Summary of Current Operation and Maintenance of the System

This section is based primarily on the institutional analysis of irrigation operations (IIMI 1995f). Water distribution in Egypt has the following characteristics:

2.2.1 Water Allocation

- Water is initially allocated to agricultural areas on the basis of the predicted cropping pattern, based on information provided by the Ministry of Agriculture and Land Reclamation (MALR). Water is initially allocated to other uses on the basis of estimates derived from population figures and industrial and navigation needs.
- Adjustments to allocations are made in response to requests from users. The allocation system is best described as a system in which an initial estimate is made and then adjusted in response to requests. Allocation is a part of the day-to-day operation of the delivery system.
- Virtually all water allocation and planning of water distribution is carried out at two levels. The Central Directorate of Water Distribution allocates water to Irrigation Directorates and plans delivery schedules. Each Irrigation Directorate plans distribution of water to every canal within the Directorate.

2.2.2 Water Delivery

- In most areas, water is delivered to canals in rotations with each rotation lasting several days. The most common method of ensuring that water is delivered equitably is by adjusting the rotations.
- The main canals are operated by delivering measured discharges and volumes of water. The rest of the system is operated by maintaining water levels at key points throughout the system. The proper levels are known from experience rather than from calculation; the discharges associated with the levels are not known accurately because of changed canal parameters.
- Responsibility for operation of the system is divided among various MPWWR units and others:
 - Operation of the High Aswan Dam is the responsibility of the Aswan Dam Authority.
 - Operation of the major barrages and canals below the major barrages and above the mesqas is the responsibility of the Irrigation Sector in the Irrigation Department.
 - Operation of the mesqa is the responsibility of the farmers with assistance from the Ministry of Agriculture and Land Reclamation (MALR) except in IIP areas where the assistance comes from the IAS.
 - Below turnover points, water distribution to domestic consumers and industry is the responsibility of local and other government agencies.
 - Operation of the drains is the responsibility of the Drainage Authority.

- Operation of all government pumps is the responsibility of the Mechanical and Electrical Department (MED). Pumps are generally operated by MED on instructions from Irrigation Sector or Drainage Authority personnel.
 - Operation of specific services being provided under special projects (e.g., the telemetry system) is the temporary responsibility of special project units.
 - Water allocation is the responsibility of the Irrigation Sector which consequently gives orders to the Aswan High Dam Authority and to the MED for pump operation.
- There is no official user involvement in management of the system above the mesqas.

2.2.3 Drainage and Groundwater Use

- Pumping water from drains without prior permission by MPWWR is prohibited; however private non-sanctioned pumping occurs in large amounts. In some cases, drainage water is of poor quality and use of drainage water for irrigation may affect crop yields.
- Private use of groundwater must be licensed by the Irrigation Sector. The licenses specify the amount of water that may be pumped; however, there is no practical way to enforce the pumping limits.

2.2.4 Maintenance¹

- Responsibilities for maintenance of the water delivery and disposal system are divided among a number of MPWWR units, including:
 - Irrigation Sector for the Nile main stem, canals and associated structures.
 - Mechanical and Electrical Department for pumps.
 - Drainage Authority for both surface and subsurface drains.
 - Planning Sector for the telemetry system.
 - Aswan High Dam Authority for both Aswan Dams.
- Each unit maintains its own facilities; there is little sharing of facilities or coordination of work among the units.
- Irrigation Directorates and Irrigation Districts are responsible for the maintenance of canals and associated structures within their areas. Much of the work is carried out by contract with public or private companies. All contracts are handled by the

¹ This section is based on the special report on maintenance management (Vissia 1995).

Irrigation Directorates and maintenance budgets are controlled by the Directorates. Some work is carried out by laborers hired by the Directorates and Districts.

- The IMS Preventive Maintenance Project has been implemented in six Governorates and has improved the maintenance of those items to which it has been applied -- roads, structures, and some weed control (Vissia 1995).
- Drainage Directorates and Districts are responsible for the maintenance of both surface and tile drains in their areas. Similarly, the MED Directorates are responsible for maintenance of pumps in their areas. These Directorates and Districts do not, in general, have the same boundaries as the Irrigation and Drainage Directorates.

2.3 Proposed Technical and Institutional Innovations

The IIMI-MPWWR team has identified eight innovations in Irrigation Sector procedures and practices that address the issues outlined in Box 2.1. The contributions of the IMS components to these innovations are also specified. These innovations are not new ideas; all have been suggested before and some have been implemented in special programs. **The new feature in this action program is that these innovations will be implemented and evaluated in an integrated and systematic way by the Irrigation Sector personnel who are responsible for water distribution.**

2.3.1 Operational Innovations

These proposed innovations are intended to give system managers better information about, and control over, water flows.

a. *Measurement-Based Flow Control*

Water flow control below the main canals is now based on levels rather than on discharge. This system of flow control makes it impossible to know how much water is supplied to a particular canal command. Giving system managers knowledge of discharges at key points and using that information to manage flows should enable them to better adjust flows to meet actual needs. As argued persuasively by Walker et al (1995), knowledge of quantities and discharges allows system managers to analyze actual use and to modify deliveries to closely match demand².

Measurement-based flow control is already in use in part of the system; the Central Directorate for Water Distribution has established a measurement-based flow control system for the major canals. The proposed innovation will extend this to the canals managed by the Irrigation Directorates and Districts.

² Draft reports by Utah State University on its work in Sharkiya Directorate under the IMS Planning Studies and Models (PSM) Project became available after the revised draft of this Action Plan was completed. Many of their recommendations are consistent with the recommendations emerging from the IIMI study, and their final reports will be very useful in the next stage of planning the implementation of the Irrigation O&M Program. See USU (1995a; 1995b).

Box 2.1: Irrigation Management Issues

Improving water delivery means that demand and supply are more closely matched and that shortages, if any, are distributed equitably. In turn this means that system managers need better knowledge of both demand and supply. There is a need therefore to address the following issues concerning water distribution practices and procedures in Egypt:

- Because of the recent policy changes giving farmers freedom of crop choice, the MALR's crop forecasts are not as accurate as desired. Also, farmers are changing their crop calendars to accommodate higher cropping intensities in ways not planned by the MALR. Improved crop forecasting or other means to estimate demand for better planning is needed.
- Inequities in water deliveries need to be addressed by getting better knowledge of and control over water flows. This means that operations to meet the needs of the crops should be based on discharges rather than on levels alone. Also, IIP work as well as work done under the PSM Project by Utah State University (USU 1995a) suggest that continuous flow may have some advantages over the prevailing rotational system. Continuous flow should be tested under various operational conditions.
- Problems caused by the division of system management among many units of the MPWWR should be identified and addressed; clear linkages and good communications need to be established.
- System managers lack needed knowledge of the availability, quality, and private use of drainage water and groundwater. Without this information, canal deliveries cannot be effectively integrated with use from other sources.
- There is a need to link users and system managers. Users can provide managers with better information on demand and on delivery problems; and users can help solve problems by changing their activities to reduce peak demand. User involvement means that decision-making in the agencies, particularly the Irrigation Sector, should be moved as close to the users as is possible (see also USU 1995a).
- There is a need to upgrade maintenance management; scattering responsibilities and resources among the Districts, Directorates, and special units has led to inefficiencies in use of facilities (Vissia 1995). Properly managed maintenance of the water distribution system will become increasingly important as demand increases to prevent losses and inequities of deliveries. Also, high quality maintenance is extremely important for improved technologies, such as those introduced by the IMS Project; such technologies require properly functioning canals and structures.

These six issues are addressed by the proposed Irrigation O&M Program.

Some tools for this purpose already exist; the telemetry system and other items from the Main Systems Management (MSM) Project are designed to help put a measurement-based flow control system in place; and the Operational Manual for Sharkiya Directorate prepared by Utah State University will also be a useful guide (USU 1995b).

b. *Continuous Flow*

The IIP has initiated continuous flow deliveries to some improved mesqas. Preliminary results indicate that continuous flow has important advantages over rotational deliveries from the point of view of the farmers, even without the existence of improved mesqas with single point pumping. However, implementing continuous flow requires modifications of both the canals and of operational procedures.

It is proposed to attempt to implement continuous flow under different conditions in selected canal commands after making the necessary canal modifications. Many of these modifications have already been made by the IIP. This attempt will test the feasibility and usefulness of continuous flow as a means of improving water distribution under different conditions³.

c. *Information Systems for Decision-Making*

Experience in other countries suggests that a well-designed computerized information system can be a useful tool to help system managers make seasonal plans and make day-to-day operating decisions (Rey & Hemakumara 1994). The PSM Project has already developed and evaluated some such tools and is testing for operations control at the Directorate level in Sharkiya Directorate (see USU 1995a; 1995b).

Appropriate computerized information systems for decision support will be provided to system managers; they will be assisted to integrate these tools into their decision-making processes. The tools to be supplied will not include highly sophisticated data collection devices nor use sophisticated modelling techniques; rather they will consist of a computer and selected programs to manage data in useful ways, such as calculating discharges from levels and vice versa. This attempt will test the usefulness of such tools in conjunction with the other innovations being tested in this action program. It will draw on the work and expertise of the PSM Project.

d. *Integrated Water Budgeting*

System managers generally do not have adequate knowledge of how much drainage and groundwater is available for use nor how much is used by private pumping. Consequently, managers cannot plan canal deliveries to make maximum use of these alternative water sources. Where water quality is a problem, overuse of drainage water may cause reductions in yield, a problem that might be mitigated by different patterns of

³ Special Study Number 2, described in Annex 2 of this report, complements this study by testing the feasibility of maintaining continuous flow on a system-wide basis; that study will be based on mathematical modeling using the capacities created under the PSM Project.

canal delivery. Providing system managers with good information about the availability and use of all their water resources may help them manage canal deliveries to better serve users' needs.

The Drainage Research and Groundwater Research Institutes, strengthened by the IMS Project, now have relevant information. This information can be more fully used to reduce the gaps in information at the field level, and the services of these Institutes can be used to fill any remaining gaps. This innovation proposes to provide system managers at all levels with relevant data and with tools to estimate the availability and usage of all sources of water to improve their ability to make the best use of the canal flows. One possible way to do this is through water user associations (WUAs) as proposed below under User Involvement in Decision Making.

e. *Improved Demand Forecasting*

Water allocations for agriculture must take the crop needs and schedules into account. Since the government has removed crop restrictions, it is now difficult to accurately predict cropping patterns. In this situation, there is a need to improve the means by which agricultural water demands are forecast. One means to be used is to discuss the matter with farmers through WUAs (see below under User Involvement in Decision Making). Also, following up on a suggestion from Walker et al (1995), the Program will explore the possible uses of historical analysis and remote sensing for improving demand forecasting. For remote sensing, the products of the Egyptian Survey Authority, strengthened by the Survey and Mapping Project, will be used. In addition, other techniques can be explored, such as commodity market analyses and analysis of other factors that affect farmers' crop choices. A major goal will be to better understand farmers' decisions about crops and schedules⁴.

2.3.2 **Maintenance Innovation**

Adequate maintenance is essential for sustaining the benefits of Measurement-Based Flow Control, Continuous Flow, and other innovations. The work on maintenance management is intended to improve system managers' ability to manage maintenance in response to needs.

f. *Improved Maintenance Management*

Currently, most maintenance is done on schedules fixed by the Irrigation Directorates. Some, of course, is done in response to emergency situations. As shown by Vissia (1995), there are several opportunities for improvements, which will be considered for adoption. Specifically, the Irrigation O&M Program will adapt the improved techniques introduced under the Preventive Maintenance Project, including the handbook, software, and others, as appropriate, to improving the planning of regularly scheduled maintenance.

⁴ USU (1995a) points out that the key piece of information required by system managers is the area planted to rice; during other times of the year estimates are reasonably accurate with existing information.

In addition, the Program will introduce techniques, such as walk-through surveys, designed to improve system manager's information on maintenance needs so that maintenance schedules can be revised to best fit needs. Finally, maintenance planning will be linked with User Involvement in Decision-Making as discussed below; improvement of communication with farmers will enable more efficient identification of maintenance needs.

2.3.3 Institutional Innovations for Improved Distribution

The following institutional changes are intended to support the use of the technical innovations listed above. These changes will also help system managers acquire better information on water demand. More important, these innovations will lay the basis for considering future re-organization of water management functions by demonstrating whether decentralized management combined with user involvement is feasible in the Egyptian context; and if it is feasible, these activities will provide a basis for designing future organizational changes. Therefore, these innovations are in many ways the most important of the eight proposed.

g. User Involvement in Decision-Making

Users presently have no official role in system management except for management of mesqas and below. As suggested by Mankarious (1995), USU (1995a; 1995b), and others, providing for user involvement in seasonal planning and operational decision-making through water user associations (WUAs) or other means will have two major advantages:

- User involvement in decision-making gives the system managers better knowledge of demand and the condition of various parts of the system.
- User involvement in decision-making makes the users partly responsible for matching supply and demand and thus makes them responsible for adjusting activities to match the available water supply when water is short. Also, in an emergency, users may be willing to help with needed system repairs.

The Program will work to define and create organizational mechanisms for user involvement in decision-making at appropriate levels in the system. The WUAs created by the IIP may be able to serve as a basis for the needed mechanisms; the IIP's Irrigation Advisory Service also (IAS) has been shown to be an effective tool for organizing users. The Program will work closely with IAS and other IIP staff. However, alternatives to the WUAs and to the use of the IAS to organize farmers may also be considered. But the expectation is that the Irrigation O&M Program will use the lessons of IIP as a foundation, but move beyond mesqa-level WUAs.

h. Localized Planning and Decision-Making

Currently, lower level system managers -- Inspectors and District Engineers -- are expected to carry out plans made by the Irrigation Directorate. If some of the decisions now made at the Directorate level were made by the District Engineer, the District

Engineer might be able to deliver water to farmers more effectively and solve farmer problems more easily. More localized planning and decision-making potentially offers three advantages over the present practice:

- District Engineers have good opportunities to know the farmers and field conditions. They are thus in a good position to judge water needs accurately and can generally make better planning and operational decisions about water deliveries than can higher level managers.
- Having District Engineers make decisions directly saves considerable time; they can respond faster to farmers' needs and field conditions than if the decision has to be made at a higher level. This applies to both operations and maintenance.
- Better information on farmers' needs and the ability to make their own decisions means that District Engineers can be more flexible in response to changing conditions.

Because of the integrated nature of the system, there are limitations to the degrees of freedom that can be given to the District Engineer. There must be guidelines to ensure that the District Engineer's decisions and actions do not adversely affect the water distribution in other sectors⁵.

The Irrigation O&M Program will explore the kinds and extent of decisions that can be localized to make the overall operations more responsive to farmer needs. The technical innovations listed above, together with the mechanisms for user involvement in decision making, will provide most of the data and information needed by District Engineers to make good decisions.

2.3.4 Relationships among the Proposed Innovations

With the partial exception of Continuous Flow, the eight proposed innovations work together to enhance the ability of the system managers, particularly at the District level, to serve the needs of the farmers. Figure 2.1 shows how the different innovations interact to strengthen each other.

Leaving Continuous Flow aside for the moment, the interrelations can be described as follows:

- *Localized Planning and Decision-Making and User Involvement in Decision-Making* work together to put the seasonal and operations planning closest to those the system is meant to serve, the farmers and other users. This means that plans and operational activities can be best fitted to users' needs and desires. Also, users' activities can be modified to fit water shortages since they will have adequate warning and will have developed institutional mechanisms to share shortages.

⁵ USU (1995a) has made several suggestions on how decision-making can be decentralized effectively.

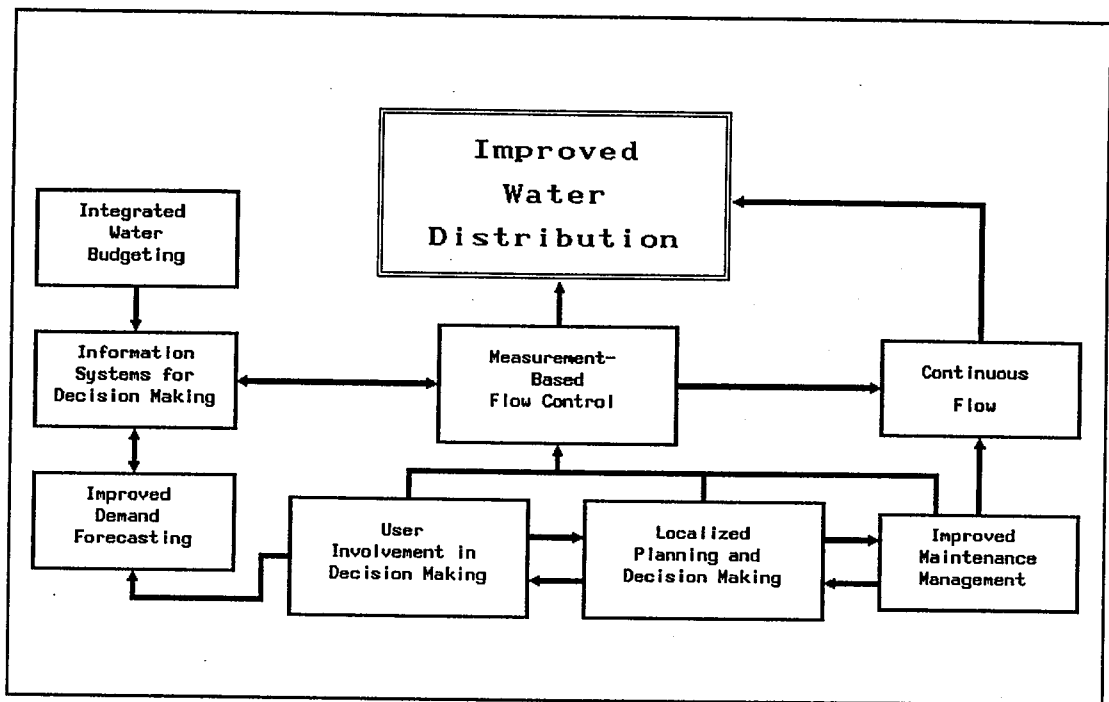


Figure 2.1 Interrelationships of the Innovations

- *Measurement-Based Flow Control, Integrated Water Budgeting, Information Systems for Decision-Making, and Improved Demand Forecasting* give the District Engineer tools to better handle the technical aspects of water distribution planning and operations.
- *User Involvement in Decision-Making* means that the users can make a key contribution to *Improved Demand Forecasting*.
- *Improved Maintenance Management* means that the physical structures for controlling water flow will be kept operating in a sustainable way.

As shown in Figure 2.1, Continuous Flow is different since it neither contributes to nor is dependent on the other innovations, except that it requires Measurement-Based Flow Control and Improved Maintenance Management to work properly. However, Continuous Flow simplifies planning and decision-making for both the District Engineer and farmers. In an indirect sense it potentially strengthens all of the other innovations.

2.3.5 Linkages among Levels of Management

Water distribution decisions are made by system managers at different levels, including the Central Directorate for Water Distribution in Cairo, the Irrigation Directorate and Inspectorate, and Irrigation District. Currently, information of different kinds passes among these management levels as shown in Figure 2.2. These management levels are interlinked and interdependent.

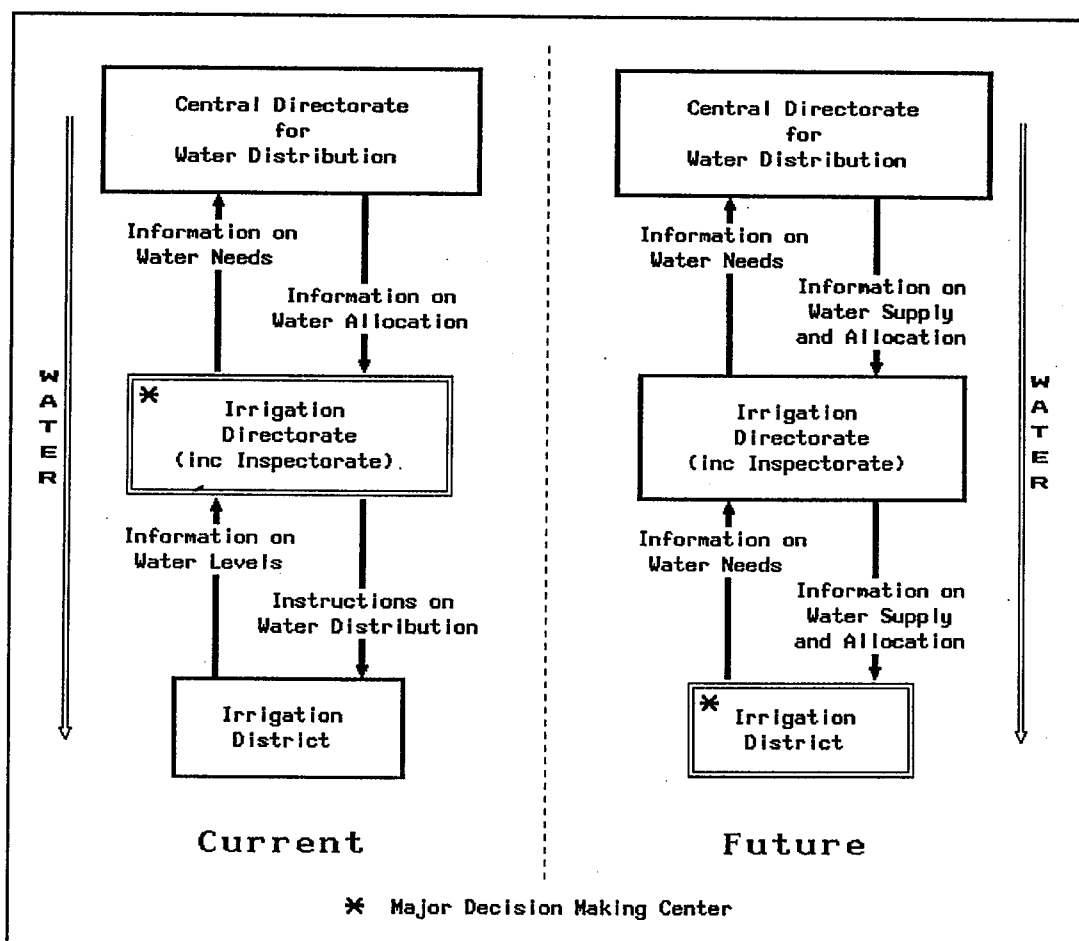


Figure 2.2 Information Flows among Management Levels

To improve service to farmers and other users, it is proposed to strengthen the abilities at the lowest level, namely the Irrigation District. Activities at the Directorate level, including the Inspectorate office, are also needed to support the proposed District level activities. Similarly, activities at the Central level are needed to support the activities at other levels. Thus, all eight innovations will be implemented and tested at three levels: the Irrigation District, the Irrigation Directorate, and the Center. However, the eight innovations take different forms depending upon the management level where they are implemented.

These innovations are expected to lead to significant changes in the relations among the management levels, particularly between the Directorate and District levels, and in their functions. Figure 2.2 shows the changes in information flows expected.

As operational decision-making is decentralized, the roles of higher levels change to those of monitoring, evaluating, planning, and pragmatic investigation to solve problems (USU 1995a). Higher levels will take on higher level management responsibilities in support of the new system. Districts will be strengthened to take greater operational responsibility and to be accountable for their performance to both users and higher levels.

2.4 The Participatory Action Approach

2.4.1 The Blueprint Approach to Institutional Change

Traditionally, development projects have been designed with a "blueprint" approach. In a "blueprint" approach a consultant or internal expert designs an activity (or structure) which is then implemented by an appropriate agency. Some adjustments are generally made during implementation but the adjustments are viewed as problems and aberrations. A "blueprint" makes good sense in designing a physical structure or an activity whose every step and final outcome can be clearly specified.

When the blueprint approach is applied to an institutional change project, experts design a new set of procedures and organizational forms, employees are trained in the new procedures, and the agency orders that the new procedures be followed. This approach often fails to achieve the desired results. Instead it may result in confusion and problems, particularly when the proposed changes are radical, because: a) the employees do not accept the need for the new procedures and organization; b) the employees are reluctant to change ways they know for ones that they have to learn; and c) consultants and experts rarely have full knowledge of local needs so the innovations often need to be modified in the field.

2.4.2 The Participatory Action Approach to Institutional Change

IIMI's experience and the experience of others suggests that implementing institutional innovations and changes in behavior is best done through a "participatory action" approach (Sakthivadivel et al 1992, IIMI 1995g). The key characteristics of the participatory action approach are:

- Although a plan is made at the beginning of the program, the activities are constantly monitored so that adjustments to the plan can be made during implementation of the plan. That is, it is an "action" process. This feature is sometimes called the "learning process" approach to change⁶.
- The innovations are planned and evaluated jointly by the system managers, and the farmers if relevant, who are expected to implement the innovations, and by the outside partner personnel. That is, decisions about what to do explicitly include the participation of the persons whose procedures are to be changed. The monitoring reports are provided to the joint bodies that include the system managers.
- An outside agency working as a full partner is required for two functions:
 - First, the outside agency provides ideas on how to make the innovations work, provides program administrative services, and sometimes provides other facilities. The outside agency helps push the action program along, and works closely with

⁶ The approach advocated here is also called a "structured flexibility approach;" see Brinkerhoff and Ingle (1989).

the other participants to facilitate and guide the process, while ensuring the managers feel full "ownership" and responsibility for the success of the program.

- Second, the external partner systematically monitors and records the activities and their impacts. The outside agency does this for two reasons: a) monitoring of the innovations and their impact and reporting the findings involves efforts beyond those of normal management feedback; and b) system managers generally respond well to the fact that they are being monitored by an outside agency. Monitoring should include process documentation, detailed assessment of impacts, and assessment of costs and benefits. Monitoring is a source of direct feedback on how the program is going.

Because monitoring is a key part of the effort, the outside partner generally is a research organization with the skills needed for monitoring and reporting the results; for this reason, this approach is also called "participatory action research."

The participatory action approach ensures that the innovations are modified to fit local needs through the planning, implementation, evaluation, and modification action process. Also, since the system managers participate in the planning and evaluation of the innovations, a) they can make use of their knowledge of local conditions to adjust the outside agency's ideas to local needs, b) they have a stake in making the innovations work, and c) at the end of the program, they thoroughly understand and appreciate the innovations. The last feature means that the involved system managers can help in the wider dissemination of the successful innovations.

2.4.3 Features of the Proposed Participatory Action Program

As applied to the Irrigation O&M Program, the participatory action approach will have the following features:

- The basic units for innovations will be the lowest level management unit within the Irrigation Sector, namely the Irrigation District; and within the District, selected command areas comprising bounded hydrological units. Selected commands within Districts is the appropriate level to begin innovations since it is the District that must work most closely with farmers and other users. However, it will be necessary to make changes at the Central and Irrigation Directorate levels to support the District and command level changes. Selected commands within Districts are the places to begin localization of planning and decision-making. Proposed commands and Irrigation Districts are discussed in Section 2.6.1.
- Outside institutions will be appointed to serve as the partner and monitoring agency. Proposed institutions to play these roles are discussed in Section 2.6.2.
- Participation in planning and evaluation of the innovations will be achieved through the appointment of committees to plan, guide and evaluate the Program. The committees will consist of local officers from relevant agencies within and outside of the MPWWR, including officers from the MALR, and consultants and staff from the outside institutions. Each specific component of the Program will be overseen by an

informal subcommittee consisting of the directly involved personnel. In addition, workshops will be used to involve larger numbers of persons affected by the proposed changes in planning and evaluating the activities. The proposed committees are discussed in Section 2.6.3.

- Additional staff will be needed at the District and Central levels and must be provided by the MPWWR. A preliminary identification of additional staff needed is discussed in Section 2.6.4.
- Training for MPWWR personnel implementing the innovations will be a key means of changing their practices. Training programs will take place at various levels and some participating personnel will be trained in several such programs. Many of the programs will be highly participatory; others will be unique since they will be needed for a particular purpose only. The proposed institutions to carry out the training are discussed in Section 2.6.2.
- Research services, particularly into the hydrology of the selected commands, will be provided as needed by expert research institutions. The proposed research institutions are discussed in Section 2.6.2.
- Selected equipment and facilities will be provided as needed to complement those already provided through the existing IMS Project components.

2.5 Implementation Plans

The following activities are tentatively proposed for each of the eight innovations. The final decisions about which activities will be undertaken and how they will be undertaken will be made through the committees established to manage the project.

2.5.1 Proposed Measurement-Based Flow Control Activities

Measurement-Based Flow Control on Selected Commands

This activity includes several subactivities:

- Identification and calibration of selected measurement points. This involves preparing a map showing the hydrological boundaries and all structures, identifying the critical control structures where decisions about water flow are needed, repairing those structures if needed, and calibrating those structures.
- Development of a set of equations to represent the stage discharge relationship for each discharge measurement site.
- Providing for systematic collection and communication of flow measurements to the District Engineer. Now the gatekeepers report the downstream water level below each gate. In order to compute discharges, gatekeepers must measure and communicate both upstream and downstream water levels and the gate openings. Also, there will

probably be a need to develop a trained team of technicians equipped with current meters and motorcycles to carry out water measurements.

- Providing better means for the District Engineer to issue instructions to the gatekeepers. At present, when a District Engineer wants to give instructions to gatekeepers, he either has to wait for the gatekeepers to make their reports of water levels or he must travel to the gatekeepers. Overall, provision for better two-way communication between the District Engineer and the gatekeepers is needed. In a few places, the VDCS telemetry system may solve the problem; in others, other means will be investigated.
- Integrating use of the telemetry system into District operations. At the moment, the telemetry readings are routinely distributed only to the General Director in each Directorate. The readings for inflow into each District should be routinely distributed to the District Engineer. There is a need to develop formats and communication procedures for this purpose with the help of the Directorate level telemetry staff. The Program will cooperate closely with the Main Systems Management (MSM) Project in this activity.
- Establishing benchmark demands for the pilot commands (and eventually the District) as proposed by USU (1995a:8). The idea is to establish an annual water duty or target, and allow more flexible scheduling to match demands, keeping in mind the total annual demand. This would be a first step to introduce accountability for water delivery performance.

Measurement-Based Flow Control at the Directorate Level

The District Engineer will not be able to operate his canals in terms of discharges and quantities unless he knows the quantities being provided to him. Therefore, it will be necessary for the Irrigation Directorate to adopt a measurement-based flow control system, at least for the canals supplying the selected pilot commands. The steps are the same as outlined for this activity at the District level.

In addition, the Irrigation Directorate will be asked to provide technical support to the District Engineer, including the following:

- The MSM Project has supplied each Irrigation Directorate with flow measurement equipment, a vehicle for flow measurement, and trained personnel. This equipment and personnel will be needed to work with the District Engineer to calibrate the key structures. Additional help with calibration, if needed, could be provided by the Hydraulics and Sediment Research Institute; however, one goal is to develop the capabilities of the Irrigation Sector staff to handle this function.
- The telemetry system is based in the Irrigation Directorate; all data is processed at the Irrigation Directorate office. It will be necessary for the Irrigation Directorate staff to prepare and send reports to provide the District Engineer with the information he needs.

- Establishing annual benchmark demands (see USU 1995a:8). Utah State University's proposal on this was intended to apply to the Directorate in the first instance and then to be extended to the District; the proposal here is to move from command to district to directorate levels.

When the District has taken on more decision-making responsibilities, the Program will explore how the Directorate can be assisted to take on higher level management functions, such as long-range planning, monitoring and evaluation, and investigation of problems arising in the field.

Measurement-Based Flow Control at the Central Level

The Central Directorate has already adopted a system for measuring discharges and delivering water by quantity. The necessary measurement work is carried out through the Regional Directorates. This effort will be strengthened under the action program in several ways:

- Flow measurement work has been done with limited personnel and equipment and additional work is needed, including measurement of drainage inflow into the Nile and direct pumpage from the Nile. This Program will provide increased facilities, additional staff needed, and train staff for this purpose. One possibility proposed by the Central Directorate is to create seven additional branch offices from which water measurement teams can operate.
- When fully completed, the master station of the telemetry facility should be transferred to the Central Directorate. This will provide the Central Directorate with excellent data about flows throughout the country. Investigation of ways to fully integrate the use of the telemetry data into day-to-day operations will be carried out and necessary training provided to the staff.
- The Central Directorate for Water Distribution clearly needs reliable communication with the Irrigation Directorates, the Aswan High Dam, and the Regional Directorates. Also the Regional Directorates need good communication with their widespread gatekeepers to make necessary operational changes. These communication needs will be investigated and facilities provided as necessary. In most places the VDCS telemetry system can help.

In addition, as agreed at the May 1995 MSM Workshop, the Central Directorate will support the Directorate and District level initiatives by distributing a computer program, called CALIBRAT, it has developed to derive an equation of the stage discharge relationship based on gauging data and gate opening.

2.5.2 Proposed Continuous Flow Activities

Continuous Flow on Pilot Commands

An effort will be made to establish continuous flow in selected canal commands within Districts to test its feasibility and usefulness. To minimize design and construction

requirements, every effort will be made to use canals on which the IIP has already made most of the required improvements. Establishment of continuous flow will require, among others, the following actions:

- Identification of the constraints (design, construction, operation, institutional),
- Canal improvements, including the installation of modular discharge regulators, downstream controls and modification of unimproved mesqas,
- Development of mechanisms for the IIP and district personnel to work together in jointly planning and implementing the switch over from rotational deliveries,
- Development of contingency plans in the event of inadequate water supply to the pilot command,
- Determination of the drainage and groundwater pumping patterns to be adopted,
- Analysis of the likely behavior of the farmers under continuous flow, including their pumping patterns and use of drainage water and groundwater.

Establishing continuous flow will clearly face different requirements depending upon whether mesqas have been improved or not. The Program will be initiated on selected canal commands. There will be a need to plan for operation of a canal with both improved and modified unimproved mesqas. This will provide the opportunity to test the usefulness of continuous flow even without improved mesqas.

Continuous Flow at the Directorate and Central Levels

Establishment of continuous flow in selected canals will require changes in operations at the Irrigation Directorate level. These changes must be identified and worked out. In addition, canal improvements needed to establish continuous flow at the District level are likely to require assistance in contracting and construction management that should be provided by the Irrigation Directorate or Inspectorate.

All canals controlled by the Central Directorate for Water Distribution are already under continuous flow.

2.5.3 Proposed Activities on Information Systems for Decision-Making

Information Systems for Decision-Making at the District Level

A computerized data base is the basic requirement of any information system and can be of great help to the District Engineer in making decisions. This activity will include provision of a computer and software to the District Engineer's office, identification of the information that should go into the data base (crops, cropping pattern, flows, water usage, land holdings, etc), determining the staff and budget needed to maintain and use the data base, and training the District staff in the use of computers. A key element is the development of a monitoring program for the District Engineer's office to collect the

needed data. The monitoring program should also include means to gather meteorological data. The monitoring program will not require complex or sophisticated measuring equipment and will rely on existing sources of data to the extent possible.

Establishment of a data base is a first step toward use of a distribution model such as the Planning Distribution Model tested by the PSM Project in Sharkiya Irrigation Directorate (USU 1995a; 1995b). This program will consider the installation and testing of such a model. However, it may not be possible to put a PDM-type model in place at district level during the period of this program since it takes at least a year to gather the necessary data. Simpler spreadsheet software can be used at the initial stages (USU 1995b). Establishing a data base will help prepare the district office for using such a model by: a) starting the data collection process; and b) familiarizing the District staff with the use of a computer as a decision support tool. Technical assistance for this work can be provided by the PSM Project staff in the Planning Sector or by consultants.

Information Systems at the Directorate and Central Levels

The Irrigation O&M Program will establish a data base and monitoring program for the Irrigation Directorate like that proposed for the selected District. As with the District data base, this will be a first step toward establishing an operations model for the Irrigation Directorate.

The Central Directorate for Water Distribution has been using a number of mathematical models, including NILE, DIRECT, CALIBRAT, and SIWARE, in their planning and operational activities. However, these models have not been integrated to provide a computerized decision-support system with a good user interface that makes them easy to use for day-to-day operations. The Program will work with the Central Directorate to create and put into use a fully functional decision support system and to train the staff in its use.

2.5.4 Proposed Integrated Water Budgeting Activities

Integrated Water Budgeting on Command Areas at the District Level

The goal of this activity is to provide the District Engineer with adequate knowledge of the availability and use of all sources of irrigation water on the pilot commands. Measurement-based flow control will provide him with adequate information on canal water; however, most District Engineers now lack information on the availability, quality and use of drainage and ground water. Overall, the District Engineer needs very good knowledge of the hydrology of his district.

The Irrigation O&M Program will study the hydrology of the pilot command areas in detail, including studying the relationships of drainage flows, canal flows, seepage flows, and the availability of ground water. Another activity will be measurement of and development of tools for estimation of private use of drainage and groundwater. One possible way to measure use of drainage and ground water will be to get the help of WUAs as discussed in Section 2.5.7.

In addition, investigation into *water quality* will be needed to determine what limitations there are on the use of drainage and ground water. The data base will be a useful way to make this information available for decision-making.

There will need to be considerable discussion on the limits of the District Engineer's authority to make decisions about use of these sources of water since overuse, particularly overextraction of ground water, might affect other Districts. One possibility with regard to groundwater is to limit extraction to the safe yield. Considerations of water quality and flow in drains may also define limits to the authority of the District Engineer.

Integrated Water Budgeting at the Directorate and Central Levels

There is a need to develop within the Irrigation Directorates the ability to support the Districts by providing water quality information and tests. Support will be provided to the Irrigation Directorates for training and, perhaps, some equipment so that they can provide this support.

The data on national level drainage and ground water availability and use available to the Central Directorate is not considered by the Central Directorate to be fully adequate for planning and operational decision-making. The Program will work with the Central Directorate to further define its needs for information on availability and use of all sources of irrigation water, particularly of drainage and ground water. Then possible sources of this information will be sought with the help of the appropriate research institutes, particularly the Drainage Research Institute and the Groundwater Research Institute. One possibility to be investigated is developing a link with the Nile Forecasting Center to get rainfall forecasts for the Delta area and flash flood forecasts to be used in planning water deliveries. Also, a linkage with the Mechanical and Electrical Department may be established to allow better monitoring of pumpage from the Nile.

2.5.5 Proposed Improved Demand Forecasting Activities

Improved Demand Forecasting at the District Level

Irrigation demand forecasting is a complex subject requiring good understanding of farmers' decision-making in response to seasonal, market and other conditions. Improving the current system requires moving away from simple crop forecasts as produced by the MALR. A key element is to understand the factors affecting farmers' crop choices, including the markets, soils, and other factors. The information needed includes not only the areas of crops to be planted but also the timing of planting since the evidence is that Egyptian farmers are modifying their crop rotations to get more profit from crops each year⁷.

⁷ USU (1995a) reports a finding that the particular mix of summer and winter crops has little impact on seasonal water requirements or demand hydrographs -- with the single exception of rice. USU suggests focusing the annual irrigation plan "almost exclusively" on the area expected or allowed for rice.

WUAs will provide a means to get demand information directly from farmers, particularly prior to each season. Unfortunately, this information may not be available when needed or, since it can be gotten only from a sample of farmers, may not be as accurate as needed. At later stages it may be possible to use WUAs to limit rice areas based on the likely water supply to the command area.

The Irrigation O&M Program will also explore the potential of historical analysis, remote sensing, market analysis, and other means of supplementing farmer reports to improve demand forecasting at the Irrigation District level.

Improved Demand Forecasting at Directorate and Central Levels

The Program will explore the potentials of the same technologies at the Irrigation Directorate level to supplement improvements expected through user involvement. If demand forecasting is well done at the District level, there is no need to develop strong capabilities at the Directorate level except as a check on District level forecasts.

To improve demand forecasting at the central level, the Program will explore the potential of remote sensing, incorporating work done under the Survey and Mapping Project, historical analysis, market analysis, and other means. The primary need at the Central level is to be able to check the demands presented by the Irrigation Directorates.

2.5.6 Proposed Improved Maintenance Management Activities

Improved Maintenance Management at the District Level

The Irrigation O&M Program will improve the ability of the District Engineer's Office to plan and oversee maintenance work. Specifically, four activities will be undertaken:

- The techniques and tools developed by the Preventive Maintenance Project will be adapted to the needs of maintenance scheduling and performance on the pilot commands. Lessons from the Weed Control Institute studies will also be used as appropriate.
- Proven techniques for assessing the condition of canals and structures, such as canal walk-throughs with the farmers, will be used for providing periodic identification of maintenance needs.
- Farmers will be consulted during maintenance planning to get their input into needs (see Section 2.5.7).
- District level maintenance planning will identify the resources needed, including funds, equipment, etc. The most effective means of supplying the needed resources will be discussed and determined. One possibility is having the required resources provided by the Directorate upon approval of the District plan. An alternative would be to allocate funds directly to the District.

Improved Maintenance Management at the Directorate and Central Levels

The District level changes will need support from the Irrigation Directorate. Resources for maintenance are currently held by the Directorate; it will be necessary to make some available to the District to meet the District's defined needs. Also, all contracting is carried out by Directorates; it will be necessary to find some way to have the District supervise contract work, or, better yet, let the District contract for the work to be done. Where Preventive Maintenance units exist, ways for the Preventive Maintenance units to support the District Engineer's office will be sought.

The Central Directorate for Water Distribution currently has no direct maintenance responsibilities. However, the Central Directorate for Maintenance has been responsible for implementing the Preventive Maintenance Project. The services of this Directorate will be enlisted to strengthen implementation of better maintenance procedures at all levels.

2.5.7 Proposed Activities on User Involvement in Decision-Making

User Involvement in Decision-Making at the District Level

The goal of this activity is to get effective user participation in allocation, operational, and maintenance decision-making at the pilot command (and later District) level, as a means to improve water management. Doing so requires the following actions:

- As in the IIP, IAS staff will be asked to establish mesqa-based WUAs throughout each selected pilot command using their expertise and other techniques such as public awareness programs. Since it will not be possible to wait for improvement of all the mesqas, it may be necessary to modify the IIP's seven step process, specifically by defining new benefits for the farmers to organize around. A major motivation will be having a voice in operation of the canals. Other possible motivations include a) facilitating marketing, and b) having the District Engineer and other Irrigation Sector personnel consider only those irrigation problems brought through the WUA. This problem of farmer motivation has arisen and been solved in various countries in different ways (e.g., IIMI 1995h, Mankarious 1995).
- To get effective farmer involvement in decision-making, a mesqa-based WUA is too small. A larger organization at the command (branch or distributary canal) level is needed. The distributary canal WUA federations proposed by IIP is a possibility. An alternative is to establish joint management committees made up of Irrigation Sector employees and WUA representatives. In either case, the federation or committee would take responsibility for making decisions about distribution questions along the canal and, perhaps, about maintenance priorities.
- A *joint water management board* will be established at the command area level. This committee would be made up of the District Engineer, MALR representatives, relevant representatives from other MPWWR units and other government agencies, and representatives from the distributary canal based farmer organizations. This body will have the following functions:

- help plan allocations by defining the cropping pattern before each season;
- help plan operations by anticipating where the greatest needs will be;
- help in maintenance planning by identifying and prioritizing maintenance needs; and
- help in operations by discussing problems that arise during the season.

The joint water management board will be a major mechanism for official communication between Irrigation Sector personnel and the users. If successful, this board could form the nucleus of future local level water service groups or utilities.

- Although the IIP has had good results with WUAs, the Program will also consider alternatives to WUAs and WUA federations as the base organizations for user participation. Villages, agricultural cooperatives and others are possible base organizations whose advantages and disadvantages will be considered. If any of these alternatives are selected for testing, there will still be a need to train and work with the leaders and members so that they can play the expected role in irrigation management effectively.

Joint management committees and water boards have proven very successful in a wide variety of countries and circumstances, including in developed countries like the Netherlands where water boards are very old, and in developing countries like Sri Lanka where joint management committees are new (IIMI 1995h).

These activities will require a substantial increase in the IAS staff in the pilot commands. Also, since some IAS staff will be working outside IIP areas, they should be made part of the District Engineer's staff as is discussed in Section 2.6.4.

User Involvement in Decision-Making at Directorate and Central Levels

It is proposed that a *joint water management board* be established for the Directorate level. The membership should include representatives from all of the important user groups and from all of the involved government agencies. The Governorate Undersecretary could be the chairman. The main functions would be to help determine the demands at the beginning of each season and to solve problems during the season. To strengthen the command (or District) level board, its representatives should be explicitly included.

The Central Directorate of Water Distribution has established user involvement in decision-making in the form of quarterly meetings with the General Directors about water allocations and distribution schedules. The Program will explore whether this forum can be improved, perhaps by more frequent meetings or in some other way.

2.5.8 Proposed Activities on Localized Planning and Decision-Making

Localized Planning and Decision-Making at the District Level

The District Engineer is currently expected to follow the distribution schedule worked out at the Irrigation Directorate office. Therefore, giving the District Engineer better information and decision-making tools alone will not change operations. The District Engineer must be given greater responsibility for planning and implementing water distribution within his District, and be encouraged to use this responsibility. Insofar as physically possible, the Irrigation Directorate should allocate a specific amount of water to the pilot commands and give each District Engineer the responsibility of deciding how it should be distributed. As suggested by USU (1995a) such "benchmark demands" should be established at various levels of the system. This will enable the District Engineer to make joint decisions with the users to establish plans that best fit the needs of the District.

Maintenance planning, like planning of water distribution, is partly done at the Directorate, with the added complication that most of the resources for maintenance are controlled from the Directorate and contracts are made by the Directorate. To improve the effectiveness of maintenance management, it is necessary to give the District Engineer greater responsibility for maintenance planning. This also means that resources will have to be made available at the District level.

It will be important to thoroughly discuss the authority to be devolved from the Directorate to the District and the guidelines within which the District Engineer must operate. There may be a need to set limits to some decisions by the District Engineer because of effects on other Districts. In addition, it will be useful to establish criteria by which the District Engineer's performance can be judged and good performance rewarded: increasing accountability is essential for long-term success.

The increased responsibilities of the District Engineer mean that his office will require additional staff. The organization and staffing of the District Engineer's office are taken up in Section 2.6.4 below.

Localized Planning and Decision-Making at Directorate and Central Levels

Devolving decision-making to the District requires making corresponding changes at the Inspectorate and Directorate levels. Distribution planning within the selected district must be left to the District Engineer. The changes must be discussed and worked out in detail so that all understand them and their implications. Similarly there will be a need for changes regarding maintenance management. This will be done at a workshop held early in the project. There may be a need to consider how to link delegation of authority to performance evaluations.

At present, the Regional Directorates have no decision-making functions. The advisability of decentralizing some decisions to the Regional Directorates will be explored. Any decentralization will require consideration of the capabilities of these offices and may require strengthening of the offices through additional staff, training, and equipment.

2.6 Implementation Plans

Chapter 5 provides information on the suggested implementation arrangements for the Action Plan. This section discusses implementation issues specific to this component.

2.6.1 Site Selection

Basic Unit: District versus Command

Site selection is a difficult problem because the boundaries of the lowest management unit -- the Irrigation District -- do not coincide with hydrological boundaries. A major objective of the Irrigation O&M Program is to field test a decentralized water management system, thus strengthening the lowest level management unit of the Irrigation Sector. This unit is the Irrigation District. But actual implementation of the package of innovations will necessarily be on canal commands. Further, computation of water balances and assessment of impacts on the productivity of water can only be done on a hydrological basis.

Because of its emphasis on the *management unit*, IIMI had advocated implementation of this Program on an Irrigation District basis. However, in its comments on the earlier draft of the Action Plan, the Ministry emphasized its wish to implement the Program on a *command area* basis. Therefore, the basic unit for testing the decentralized management system will be *pilot command areas that fall within a single district* (or the district boundaries constitute points where water flows can be measured to compute a water balance). These commands will generally be second to fourth order branch canals or distributaries.

IIMI had also proposed a maximum of three pilot sites, to be implemented in phases. The IIMI team felt that more than three sites would be difficult to manage, and would require more than three years to arrive at reasonable conclusions. But to capture the full range of variation in factors that would affect success, four sites have been suggested by the Irrigation Department⁸.

Criteria for Selecting Pilot Command Areas

The key criteria for selection of the pilot command areas are:

1. **Operational Problems** It was proposed to work in three different crop demand situations: a site where rice is the dominant crop during summer; a site where sugar is a major crop; and a site having mixed crops where neither rice nor sugar is found. Other factors such as security concerns have made it difficult to choose a sugar area. Further, the Irrigation Department suggested that other operational problem areas, such as areas with poor quality drainage, high water tables, water shortages, or areas with the potential for "real" water savings, need to be represented.

⁸ The Task Force members have produced detailed draft reports on five sites, which will be useful for planning the implementation of this work.

2. ***Presence of an IIP Site*** All three IIP innovations -- mesqa improvement, continuous flow, and WUAs -- are important for this Program. Thus it is necessary to choose commands that include IIP areas where most of the work has been finished. This will ensure that the Program can be implemented with these areas.
3. ***Presence of Other IMS Components*** It is important that all of the sites have functioning telemetry sites. At least one selected Directorate should have a Preventive Maintenance Unit, although it is not essential that the Unit be in place to make use of the products of the Preventive Maintenance Project. More recently it was suggested that one site should be in the same Directorate where the Strategic Research Program will be carrying out field reconnaissance work in 1996 to identify the potential for saving water.
4. ***Canal commands within District*** Ideally, the pilot commands should be located within specific Districts, or at least have a clearly demarcated boundary where water measurements are feasible. Further, the District ideally should have commands with continuous flow (with both IIP and non-IIP improvements at mesqa level), and commands that can be used as controls.
5. ***Irrigation Staff Interest*** It is important that the District Engineer and General Director for the proposed sites be willing and interested in participating since they will have to carry much of the load of making the program work.

Other criteria are important if it is impossible to select sites on these criteria alone. For example it will be good if there is a diversity of farm level irrigation technologies to see how well the innovations serve all farmers.

Together, these criteria severely reduce the number of candidate districts. After considerable discussion with Ministry officials, and numerous field visits, the following four sites are suggested:

- Wasta Irrigation District, Beni Suef Directorate (Middle Egypt)
- Abu Hammad District, Salhiya Directorate (East Delta)
- West Sidi Salem District, Kafr El Sheikh Directorate (Middle Delta)
- Kafr Eldwar District, Beheira Directorate (West Delta)⁹.

Table 2.1 provides some basic data on the selected sites. Wasta Irrigation District includes largely completed IIP sites, continuous flow, and eight functioning MSM telemetry sites. Abu Hammad Irrigation District includes a largely completed IIP site and six functioning telemetry sites. Further, its location is convenient to draw upon MSM experience with computer modeling in Sharkiya Directorate. West Sidi Salem and Kafr

⁹ West Abu Korkas District in West Minya Directorate (Upper Egypt) is the fifth site considered.

Table 2.1 Characteristics of the Proposed Field Sites

Item	Site 1	Site 2	Site 3	Site 4
Region	Middle Egypt	East Delta	Middle Delta	West Delta
Directorate	Beni Sueif	Salhiya	Kafr El Sheikh	Beheira
District	El Wasta	Abu Hammad	West Sidi Salem	Kafr Eldwar
Area (feddans)	36,330	48,387	45,000	70,370
Rural Population*	c. 144,000	c. 180,000	not available	not avail.
Number of Farms*	c. 15,900	c. 19,800	not available	not avail.
Main Canals	Ibrahimiya, Giza Canals	Saidiya Canal	Bahr El Saidi,	Mahmoudia Canal
Land Holdings	53 % under 3 feddans, no large holdings	44 % under 3 feddans, some large holdings	<3 fed. & some large holdings	<2 fed. & some large holdings
Main Summer Crops	cotton, corn, vegetables	rice, cotton, corn	rice, corn, cotton	rice, cotton
Main Winter Crops	berseem, wheat	berseem, wheat	berseem, wheat, sugar beet	wheat, berseem
Other Crops	fruit	fruit, vegetables	vegetables	vegetables, fruit
Irrigation Methods	lift from canals, 10% gravity fed	lift from canals	lift from canals, some gravity	lift from canals, some gravity
Supplementary Water Sources	ground water, drainage	drainage, ground water, storage tanks	drainage, rainfall	drainage, rainfall
Soils	54 % clay	mostly sandy	>60% clay	clay & silty clay
Depth to Water Table	0.5-1.2 meter	< 0.8 meter	est. 0.4-0.6 meter if tile drains, 1 m	est. 0.4-0.6 meter, if tile drains, 1 m

* Figures estimated from the 1981-82 Agricultural Census from the MALR

Eldwar Districts represent areas with poor quality groundwater subject to sea intrusion; potential increases in the use of drainage water are one means to achieve "real" water savings. Both have current IIP sites and are likely to see further improvements under the World Bank-funded IIP.

The General Directors and District Engineers at the proposed sites have stated their willingness and interest in participating. All the sites also have adequate diversity of farmer technologies for irrigation.

2.6.2 Participating Institutions

There are four main categories of participants in this Program, including:

■ *Implementors*

Irrigation Sector staff in the selected Irrigation Districts and Directorates, in the Central Directorate for Water Distribution, and in the Regional Directorates for Water Distribution; and staff of the Irrigation Improvement Project (IIP) will be the primary implementors of the action program. Other implementing agencies such as the Drainage and Mechanical and Electrical Authorities, and units of the MALR will also play important roles.

■ *External Partner*

In participatory action programs for testing and institutionalizing changes, an external agency is essential. The role of this outside partner includes the following:

- provide ideas about how the innovations can be implemented;
- provide day-to-day multi-disciplinary technical support and guidance to the action process;
- provide overall administrative and management services, for example organizing activities like committee meetings and training programs, preparing workshop and training materials, etc.;
- station personnel in the field to monitor the process and report back directly to the project implementors;
- train the staff of the implementing agency in the skills needed for successful implementation;
- document and guide evaluation of the results including preparation of required reports and briefing papers;
- provide advice on how to replicate and institutionalize the results on a larger scale.

The National Water Research Center (NWRC) of the Ministry, in collaboration with an international research institution having the appropriate experience and expertise, could play this role.

■ *Trainers*

Training will be required for virtually all participating irrigation staff. It is expected that there will be three kinds of training:

- on-the-job training, i.e., learning by doing in association with the outside partners;
- formal targeted training courses to provide staff with specific necessary skills (such as water measurement, computer skills, methods to organize farmers, etc); and
- workshops for exchanging ideas, planning next steps, and reviewing and consolidating lessons learned.

The training be designed and coordinated by the outside partners, but the formal courses should be organized through and by the Ministry's Training Center. This will facilitate future replication.

■ *Specialized Research and Technical Assistance*

Some specialized research will be needed on hydrological issues, particularly drainage flows and ground water. This research can be done through contracts with the relevant institutes within NWRC, particularly the Drainage Research Institute and the Groundwater Research Institute.

Some research and technical assistance will also be needed in: a) the use of remote sensing for crop forecasting; b) the applicability of data on crop markets and marketing to crop forecasting; and c) computer program design and testing. These services can be provided by appropriate Egyptian institutions such as the Egyptian Survey Authority and others.

2.6.3 Irrigation O&M Program Implementation Committees

The Irrigation O&M Program is complex, involving many different people at different levels within the Ministry, as well as others from outside the Ministry. In addition, this Program is one of three components of the overall Action Plan. As discussed in chapter 5, a *Steering Committee for the Action Plan* (SCAP) is proposed to guide the overall Program.

SCAP can also play the role of Steering Committee for the Irrigation O&M Program; it would need to meet two to three times a year for this purpose. Coordinating Committees will be established at the Central, Directorate, and District levels, to meet quarterly. Box 2.2 lists the suggested participants in the Irrigation O&M Steering Committees.

Box 2.2 Suggested Irrigation O&M Program Committees

District Coordinating Committee (meets quarterly)

- General Director of Irrigation Directorate (Chair)
- IIP General Director
- Directorate Water Distribution Engineer
- IAS Director
- Inspector of Irrigation responsible for the selected District
- Irrigation District Engineer
- Appropriate representative from MALR
- Relevant External Partner Team Members
- NWRC Representative
- Donor Representative
- WUA or other farmer representative(s)

Directorate Coordinating Committee (meets quarterly)

- MPWWR Undersecretary for the Governorate (Chair)
- General Director of Irrigation Directorate
- Inspector of Irrigation responsible for the selected District
- Irrigation District Engineer
- General Director of Drainage Directorate
- General Director of Mechanical and Electrical Department
- Undersecretary of Agriculture for the Governorate
- Directorate Water Distribution Engineer
- General Director of Irrigation Improvement Directorate
- External Partner Team Leaders
- NWRC Representative
- Donor Representative

Central Directorate Coordinating Committee (meets quarterly)

- Head, Irrigation Sector (Chair)
- General Director of Water Distribution
- Undersecretaries from selected Governorates
- Regional Directors of Water Distribution
- General Directors of the Selected Irrigation Directorates
- Representative from MALR
- MSM Project Director
- PSM Project Director
- External Partner Team Leader
- Relevant NWRC Representative
- Donor Representative

Some have commented on earlier drafts of the Action Plan that too much time is to be spent in committee meetings. While it is recognized that a complex committee structure can lead to paralysis and waste of time, IIMI's experience has shown that it is very important to maintain regular communication and joint discussion in a participatory action program. The committee structure is the primary means for all parties to participate in planning and evaluating the innovations. Therefore, a high level of support is needed from the Ministry for the functioning of these committees; and incentives based on Ministry guidelines may be necessary to achieve full participation.

As the Program progresses, linkages among the subcommittees from the separate field sites for interchanges of experiences and lessons learned will be useful. In addition to these committees, temporary task forces may occasionally be created to deal with some of the specific innovations. These will be constituted as needed for each site.

Note that the committees discussed here are *temporary committees* established to oversee and manage the Irrigation O&M Program. They should not be confused with the joint management boards consisting of users and government officers proposed for canal commands and Directorates. The latter are expected to evolve into permanent entities for managing water resources within their areas.

2.6.4 Additional MPWWR Staffing Needs

The Irrigation O&M Program involves making changes in the responsibilities at all three levels. These changes have staffing and organizational implications.

Organization and Staffing of the Irrigation District Office

Most Irrigation District offices are currently staffed by a single engineer, a few technicians, 30 or more gatekeepers, and 20 or more maintenance laborers. While there are enough low level staff (gatekeepers and laborers), the management and technical staff are not sufficient to take on the increased responsibilities proposed by this Program. This difficulty has been recognized within the MPWWR. The Irrigation Improvement Project has prepared two versions (IIP 1994; IIP 1995) of a proposal to implement all of the IMS components in pilot "ideal districts." The proposals are essentially identical except that they identify different sites for the pilot experiment. The 1994 proposal includes a proposed district office organization with a much augmented staff including seven engineers and many more technicians than now exist. The proposal also incorporates both IAS staff and staff for the maintenance of drains into the District Engineer's office. Both IAS and drain maintenance functions are now assigned to other organizations.

The district level organization proposed in the 1994 "ideal area" proposal is logical but ambitious. The present Program does not propose taking over maintenance of drains, hence it does not require such an ambitious change. However, the basic principles underlying the proposed "ideal area" organization have been adopted for the suggested organization shown in Figure 2.3.

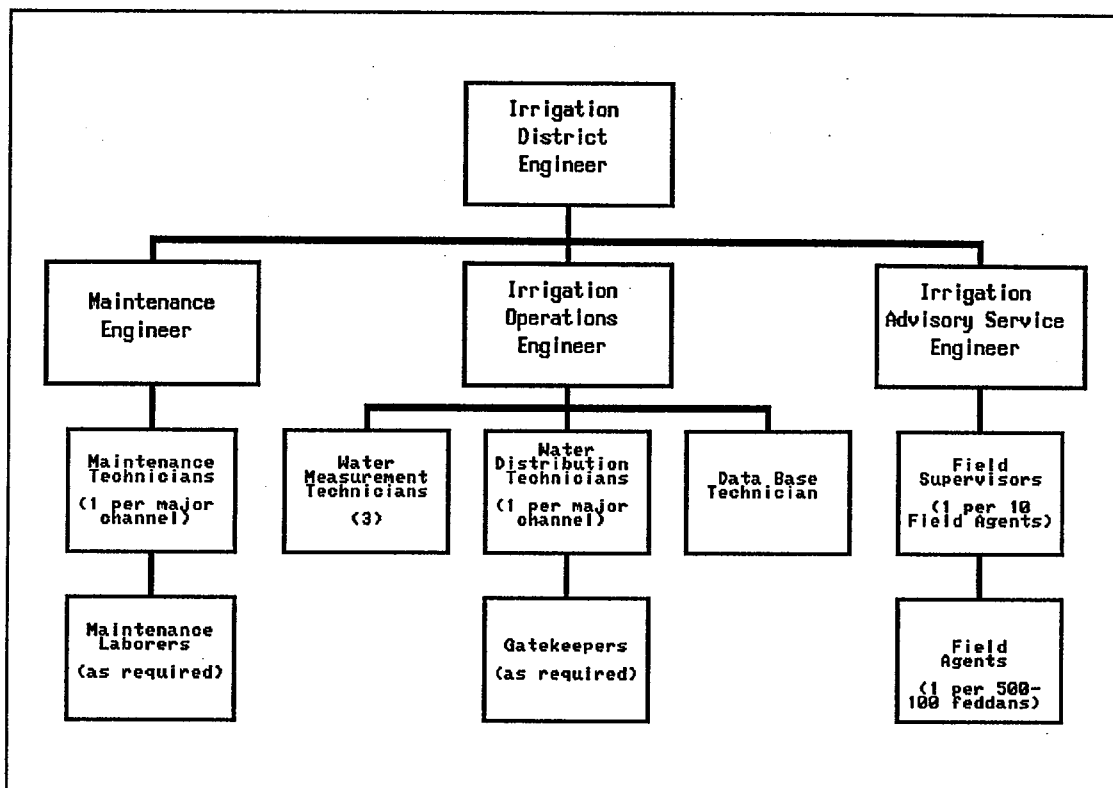


Figure 2.3 Proposed Irrigation District Organization

Explicit provisions for an increase in IAS staff needs to be made. Consideration should be given to recruiting persons with social science and agricultural education and training for the IAS staff. If an increase in IAS staff is not possible, consideration should be given to making use of the services of non-governmental organizations or MALR personnel. Providing the additional staff in time will be a major contribution of the MPWWR to the Irrigation O&M Program.

Organization and Staffing at the Irrigation Directorate Office

Because most of the planned activities are at the District (command) level, there will not be large changes in responsibilities at the higher level offices. If the proposed changes are spread to all or most Districts, however, there may be implications for staffing levels of the Irrigation Directorate and Inspectorate offices, particularly as they shift to higher level management functions. For the most part the Irrigation Directorate offices are adequately staffed for current responsibilities.

The only new responsibility to be added will be the development and use of the computerized data base. It is expected that no additional staff will be needed for this responsibility. However, some members of the existing staff will have to be assigned to the data base and trained in its development and use.

Organization and Staffing at the Central Level

There will be a need for an increase in staff at the Central Directorate for Water Distribution, particularly engineers. Takeover of responsibility for the operation of the telemetry master station will increase the Central Directorate staff. Additional staff may be needed for the water measurement program and for further computerization of the Central Directorate's activities.

The organization and staffing of the enlarged Central Directorate will be investigated and discussed early in the action program. The organization and staffing of the Regional Directorates will also be investigated and discussed in the light of the potential changes in their responsibilities.

2.6.5 Work Plan

Chapter 5 provides an overview of the proposed Schedule of Activities and implementation arrangements for the entire Action Plan. This section briefly summarizes key steps specific to the Irrigation O&M Program.

Schedule of Work for Each Field Site

The steps to be taken at each field site to complete the action program are outlined below:

a. *Establishment of the Oversight Committees*

The first step is to organize the coordinating committees.

b. *Essential Procurement/Upgrading Activities*

Some procurement and structural upgrading will be necessary, for example, procurement of computer for the District Engineer, and structural repairs and upgrading for continuous flow and water measurement. Since these activities will take some time, they should begin immediately after establishing the relevant committees.

c. *Staffing and Permissions Needed*

Additional staff will be needed at the District level, including additional IAS staff. Also, special permission may be required for some of the proposed procedural changes. Both of these will require some time and should also be initiated as soon as the relevant committees have been established.

d. *Prepare Detailed Implementation Plans*

The External Partners' staff must work with the subcommittees, and as necessary, with individual District and Directorate officers to develop detailed work plans for carrying out each component. These proposals will be finalized at a workshop of all concerned

officers. The proposals will include initial training and research plans, procurement plans, and other activity plans.

e. Detailed Impact Monitoring Plan

The External Partners will also work out a detailed plan for impact monitoring in consultation with District and Directorate officers.

f. Carry Out Initial Training Activities

Some training of Irrigation Sector staff will be needed right at the beginning of the action program. This will be started immediately after finalization of the work plans.

g. Implement Seasonal Work Plans

Work plan implementation will be carried out seasonally. At the end of the first season of implementation, progress will be reviewed and plans revised for the second season. At the end of each subsequent season, progress will be reviewed and plans revised for the following season. At the end of the third season, an overall evaluation of the results at the site will also be carried out, and lessons learned and further steps needed will be identified.

The first five steps will be carried out during the initial three month period. Step 6 will be carried out during the second three month period. A minimum of three seasons of plan implementation will be required to give the program implementors adequate time to adjust the innovations to local needs. The first season is a trial period to learn to make the innovations work and to complete the necessary preparations. This first season must be followed by a full year of testing and adjustment of the innovations to cover all of the essential needs.

Overall, then, the Program at each field site will require at least two years, including a season for preparatory activities, and three seasons of working with the innovations.

Schedule of Work for the Central Directorate

The work plan for the Central Directorate for Water Distribution will include the following steps:

a. Establishment of the Coordinating Committee

The first step is to organize the coordinating committee.

b. Prepare Detailed Implementation Plans

The External Partner will work with the committee, and, as necessary, with individual Directorate officers to develop detailed work plans for carrying out each component.

These proposals will be finalized at a workshop of all concerned officers. The proposals will include initial training and research, procurement, and other activity plans.

c. Implement Quarterly Work Plans

Work plan implementation will be carried out quarterly. At the end of each quarter, progress will be reviewed and plans revised for the next quarter. At the end of the eighth quarter, progress will be reviewed, an overall evaluation of the Program carried out, and lessons learned and further steps needed will be identified.

It is expected that the first two steps can be completed during the first three months. For the most part, the proposed innovations for the Central Directorate are not tied closely to the cropping seasons; hence it is proposed to review progress and modify plans quarterly. It is expected that work with the Central Directorate will require two years, primarily because integration of the telemetry system into regular operations will begin in earnest only after the telemetry system is completed and turned over.

Phasing

The Irrigation O&M Program is ambitious. Implementing all of the innovations at three or four field sites as well as the Central Water Distribution Directorate will stretch the capabilities of both the Irrigation Sector staff and the participating institutions.

Therefore, it is suggested that the work be implemented in phases. It is proposed that work be started with the Central Directorate and one of the field sites initially, then work should begin at the second field site six months later, and work should begin at the third field site six months after the beginning of work at the second site. With this schedule, the complete Program will require a minimum of three years to complete for three sites.

Milestones

The detailed implementation plans will only be drawn up after the beginning of the action program. Therefore it is not possible to define all of the milestones here. The detailed work plans and monitoring plans are milestones for the first part of the implementation. Because the Program will operate in periods, the reports to be produced at the end of each quarter for the Central Directorate activities and at the end of each season for the field activities can be considered milestones.

2.6.6 Plan for Monitoring Field-Level Impacts

The recent USU (1995a) study, using computer simulations, suggests that improved management at the Directorate level could have substantial real benefits. Section 2.7 lists the expected outputs and impacts of the Program at both field level and within the MPWWR. The expected impacts in the field include:

- a measurable increase in equity and timeliness of water distribution to farmers within the pilot commands;

- a measurable increase in the gross value of crop production;
- a measurable increase in the satisfaction of farmers with water distribution and the performance of the MPWWR as shown by a reduction of complaints.

The most important indicator of field-level impacts will be changes in the gross value of agricultural production per unit of water delivered at different levels.

A key activity of the Program will be to monitor and assess these expected impacts. Such a monitoring program is essential for a proper evaluation of the cost-effectiveness of the innovations. However, it is likely that during the initial three-year period, impacts will be modest and difficult to measure. It may be necessary to continue a monitoring program for two to three more years to document impacts clearly.

Data to be Collected

For the monitoring of these expected impacts, data be will collected on the following subjects:

■ ***Water Use and Water Distribution***

The program will collect data on:

- planned and actual amounts of canal water delivered to farms,
- planned and actual amounts of drainage water delivered to farms,
- planned and actual amounts of ground water delivered to farms,
- the quality of the water from each source.

Equity and timeliness of distribution will be assessed from this data by comparing deliveries with plans and by comparing deliveries at different farms located in different places.

■ ***Farm Economy***

The innovations can induce changes in the value of crop production and in farmer income through several possible means:

- Increasing cropping intensity or cropped area,
- Inducing shifts to higher value crops,
- Increasing overall yields of crops,
- Increasing yields of crops in the tails of channels,
- Reducing the farmers' investments in time and other costs of crop production.

The value of the crop output depends primarily upon the size of the crop and the market price for that crop. Therefore, the following data will be collected:

- Cropping pattern and cropping sequence on selected farms,
- Yields and crop production,
- Local and international crop prices as they change over time.

In addition, data will be collected on the costs of production to understand the farmers' crop choices.

From these data, the following will be calculated:

- Total crop value for each crop and each sample farm,
- Net return for each crop and each farm,
- Incremental differences in these figures.

■ *Farmer Satisfaction with Irrigation Service*

Farmer satisfaction with irrigation service will be measured in two ways:

- By sampling the opinions of the farmers about the service,
- By keeping track of complaints and requests for special services received by the District Engineer and by selected gatekeepers.

From the first two sets of data it will be possible to compute the gross value of agricultural production per unit of water delivered. This will serve as an effective indicator of performance.

Other Relevant Data

Some additional data will be needed to understand the social and management processes and relationships. Of particular relevance will be data on the functioning of water user associations and on their role in water distribution and crop selection.

Methodology

To assess the impact of the innovations, it is necessary to know the situation before and after the innovation. The Program will draw upon existing data collected by the IIP monitoring unit or others to establish a baseline. Further, samples of mesqas and farms on those mesqas will be monitored from the beginning to the end of the Program. Since actual field implementation of the innovations will not begin until six months or so after the beginning of the Program, there will be time to document the situation prior to implementation of the innovations¹⁰.

Selection of the sample mesqas will be based on the following:

¹⁰ Study Number 1 in Annex 2 is a detailed program for assessing the impact of IIP; this study can also serve the purpose of establishing a baseline on pre-Program performance.

- continuous or rotational flow in the canal,
- location of the mesqa on the canal (head or tail),
- improved or non-improved mesqa,
- presence and activity of a WUA (active WUA or not).

Together these four factors distinguish sixteen conditions. For each pilot command area (field site) it is proposed that two mesqas be selected for each condition, making a total sample of 32 mesqas. Additional factors that will be used to distinguish among mesqas include:

- length of the distributary canal,
- existence and ownership of pumps,
- crops.

Selection of farms along the sample mesqas will be based on:

- holding size and land tenure arrangement,
- crops,
- location along the mesqa,
- farmer's relation to the WUA (member, officer, none).

It is proposed to select six farms for each mesqa, two at the head, two in the middle, and two in the tail. This will give a total of 192 farms for each sample area.

The following techniques will be used for data collection:

- flow measurement in canals (and mesqas if needed) using appropriate techniques such as current metering or flumes,
- measurement of water pumped to farms by assessing pump discharge and keeping records of pumping hours,
- farm record-keeping,
- seasonal farmer questionnaire surveys,
- crop cuts,
- informal interviews and participant observation,
- WUA records,
- data collected by government agencies and agricultural cooperatives.

Staff Needed

This monitoring program will require full-time, well trained data collectors who will need support while in the field. For each field site, at least six data collectors will be needed.

2.6.7 Plan for Monitoring the Impact on the Ministry

Measuring field-level impacts is essential to discover whether the package of technical and management innovations leads to positive outcomes. But these innovations will be sustainable only if they are institutionalized. The IIMI-MPWWR Study concluded that

improving the management processes and institutional framework is necessary for sustained use of performance-enhancing innovations.

The impact of the Irrigation O&M Program is closely linked to the progress and impact of the other two components of the Action Plan, especially the Management Strengthening Program. Impact can be assessed by continuing to answer three questions throughout the period of the Program:

- What are the impediments to, and progress in, implementing the technical and management innovations, and how are problems overcome?
- Is the Ministry providing support and incentives and making necessary adjustments to facilitate the Irrigation O&M Program's experiments?
- Is the Ministry taking the necessary steps to replicate and institutionalize changes that are shown to be useful as part of the Program?

The first question will be answered through systematic documentation of the process of implementation. This involves assigning specific staff to act as neutral and objective observers, who will:

- continuously interact with the staff and farmers involved in implementation,
- carry out formal and informal interviews and surveys,
- observe meetings and Program activities,
- prepare brief and timely reports on their observations.

These reports will be used by the concerned coordinating committees to make any necessary adjustments in the implementation of the Program and learn lessons on what works and does not work. These reports will also form the basis for answering the second question, whether sufficient support and flexibility in making needed adjustments actually happens or not. The coordinating and steering committees will play key roles in evaluating progress and ensuring the answer to this question is positive.

The third question can only be answered after there has been demonstrable progress. The necessary steps for institutionalizing changes in the Ministry will be the business of senior officials participating in the Management Strengthening Program.

Staff Needed

The External Partner will be responsible for providing the process documenting staff. At least three professional social scientists will need to be recruited and trained for this purpose.

2.6.8 Plan for Documenting Impacts

The impacts will be assessed through the regular monitoring and feedback activities described in sections 2.6.6 and 2.6.7. The outputs and impact will be reported in detail. These reports will cover:

- The process adopted to implement the innovations, including training, personnel, equipment, etc required;
- The success of each innovation and steps taken to remedy problems;
- The impacts of these innovations on water distribution and crop production;
- Suggestions and recommendations to solve problems and improve the implementation of the innovations;
- Suggestions for implementing the innovations in other areas; and
- Suggestions for additional improvements which could further enhance water management.

Progress Reports will be prepared on a quarterly basis with every second report being a seasonal report on field-level activities. These will include an executive summary and key issues to be addressed by the Coordinating and Steering Committees.

There will be an *Annual Report* at the end of each year of the project, which will summarize the progress and problems of the Program. This will be integrated into the Annual Report for the entire Action Plan.

The *Final Report* will also:

- evaluate the success of the action process as a means of implementing these innovations;
- identify the changes in laws and regulations needed to implement the successful innovations more widely.

In addition, training modules, special briefing papers, and journal articles reporting the results to the national and international scientific community will be prepared.

2.7 Outputs and Impacts

2.7.1 Expected Outputs

The expected outputs of the Irrigation O&M Program include:

- More effective functioning of the District Engineer's offices;

- Identification of ways to make better use of the telemetry system at District, Directorate and Central levels;
- Identification of feasibility and benefits of continuous flow, and requirements for wider implementation;
- Useful computerized data bases at District and Directorate levels;
- Better understanding of the system and its hydrology, and of water use by farmers;
- Development and use of a decision-support system for day-to-day operations at the Central Directorate for Water Distribution;
- A better methodology for forecasting demand;
- Identification of ways and processes for getting effective user participation in system planning and decision-making at all levels;
- Improved maintenance management processes at District level;
- Better integration of IMS Project outputs in regular MPWWR operations;
- Training and procedural manuals for wider implementation of the innovations;
- Identification of possible future institutional reforms to further enhance system performance.

2.7.2 Expected Impacts

There are two kinds of impacts expected:

- *On the ground,*
 - Measurable increase in equity and timeliness of water distribution in pilot command areas,
 - Measurable increase in the value of crop production in the selected commands,
 - Measurable increase in the satisfaction of farmers.

As noted above, a key index of impact is the gross value of agricultural production per unit of water delivered at different levels.

- *Within the MPWWR,*
 - Adoption of scientific measurement-based water management in selected commands;

- Measurable improvement in familiarity with user needs and willingness to satisfy those needs;
- Recognition of the value of the innovations and a desire to implement the more successful ones elsewhere;
- Measurable increase in the satisfaction of Irrigation General Directors with water distribution to their Directorates;
- Greater job satisfaction;
- Strong interest in carrying institutional changes further in future.

2.8 Replication and Institutionalization of Successful Innovations

This Program is a pilot effort. It will test and validate the useful innovations and will adapt them to specific local circumstances. If the Program is successful, replication in other districts and directorates will be the next step.

Replication will be facilitated by several features of the Program:

- There will be good documentation of the processes, outputs, and impacts so that lessons learned will be made available, both in English and Arabic.
- The participating Irrigation Sector officials will thoroughly understand the innovations and the process of adapting them to local circumstances. These officials will be available to assist others.
- Participation by the Training Center will assure that training materials and courses needed for replication of the successful innovations are available.
- Participation of NWRC will result in a good understanding of the processes involved in adapting the innovations to local circumstances. NWRC should be able to serve as a lead institution for future programs based on participatory action if needed.

The results of the Irrigation O&M Program will be important inputs to the Management Strengthening Program (see chapter 4). This will be facilitated by the Steering Committee for the Action Plan whose members will be active participants in the Management Strengthening Program. Chapter 3 suggests that the new management-oriented budgeting and accounting system be implemented on a pilot basis in the sample Directorates and Districts involved in this program.

Finally, to ensure good understanding of the Program at higher levels and make future replication easier, it is suggested that the Irrigation Sector identifying a senior official close to the Chief of the Sector who can closely monitor progress and take responsibility at a later time for planning future replication.

A NATIONAL WATER SERVICES COST SHARING PROGRAM

3.1 Introduction

3.1.1 Conclusions and Recommendations from IIMI Studies

This chapter describes the first phase of an approach, and associated actions, for the introduction of cost sharing for water services in Egypt. It draws on a number of studies carried out under the IIMI-MPWWR study in 1995¹.

The results and conclusions of the MPWWR/IIMI Workshop on Irrigation Service Cost Recovery in Egypt, which involved senior Ministry officials as well as IIMI and USAID representatives, are summarized in IIMI (1995d). The deliberations of that workshop provide the basis for many of the proposals set out below, although some ideas have evolved further since May 1995.

Section 1.5.2, above, summarizes the major conclusions and recommendations coming out of IIMI's studies. These conclusions include:

- Full recovery of water service charges to agriculture would amount to about LE 75 per feddan per year², or some 4.5 to 5% of farm income.
 - This figure is relatively insensitive to allocation of costs among sectors, since agriculture is by far the largest consumer.
 - There are large regional variations in costs of agricultural water service charges because of differences in pumping, with regional costs estimated at LE 130, 80, and 60 per feddan for Upper, Middle and Lower Egypt respectively.
 - More precise estimates of the cost are prevented by the highly aggregated accounting system used in the MPWWR.
- Service charges that relate either indirectly (crop-based) or directly (volumetric measurement) to water use will have a rather limited effect on farmers' choice of crops. The physical measuring infrastructure and complex accounting principles for volumetric charging is unlikely to be feasible or cost-effective in the near future.

¹ These studies are listed in the references, and include: Cestti (1995); Hutchens (1995); Lofgren (1995); Lewis and Hilal (1995); IIMI (1995d; 1995e; 1995i;); Harvey and Zimbelman (1995); Gerards (1995); Svendsen (1995); and Perry (1995). Much of material in the first few sections of this chapter is drawn directly and adapted from the report on phasing of and mechanisms for the introduction of cost sharing (IIMI 1995i).

² In 1995, US\$ 1.00 was equivalent to LE 3.40. One feddan equals 0.42 ha. Therefore, this charge is equivalent to about \$52 per ha.

The major scenarios or recommendations are:

- Non-agricultural users should pay the full cost of water service delivery based on metered charges or estimated consumption (including water treatment if needed).
- The simplest way to recover costs of water delivery services to farmers is to charge a flat area charge, following a clear and transparent timetable.
- To reflect water consumption in water service charges, agricultural water service charges should in future be crop-based and reflect water consumption by that crop, either individually or by group (based on high, medium and low consumption).
- The Ministry should introduce the proposed budgeting and accounting system to better capture costs of different services and activities, and introduce transparency in cost allocations, as recommended in the report by Lewis and Hilal (1995).
- Water service charges can in principle be collected by the Finance Ministry on advice of the MPWWR. However, the land tax collection department may need strengthening if this is to be done effectively. **These funds should come directly into a special fund with the MPWWR, and be used for providing water delivery services.**
- Based on the lesson from other countries regarding the importance of linking accountability for service and cost recovery, IIMI recommends that the Ministry initiate a long term program, building on the experience of IIP, to:
 - federate water users associations (WUAs) at higher levels;
 - use these WUA federations to develop a new relationship between the service providers and users;
 - define the water services to be provided based on water allocations; and
 - enable the federations to take responsibility for paying the Ministry or a larger scale water delivery utility directly for its services, and set and collect the federation's own charges internally for services provided to its members.

The last recommendation will require a long term program for implementation, which could be based on, and integrated with, both the Strengthening Ministry Management and Irrigation O&M Programs (chapters 2 and 4). It could also be considered as a later stage of a phased approach beginning with introducing flat area- and crop area-based charges.

3.1.2 Objective of the Program on Cost Sharing

The objective of this Program is:

to assist the Ministry to plan, carry out preparatory work for, and initiate a water service cost sharing program in anticipation of a political decision to legislate for water service cost sharing.

3.1.3 Present Cost Sharing Policy

The present situation regarding recovery or sharing of water service costs is as follows: non-agricultural users (municipalities, industries, navigation for example) pay no fees to the Ministry, which is the bulk provider or wholesaler of water in the Nile system. Within agriculture, in the old lands there are no procedures for directly recovering any portion of the capital or operating costs for water services above the mesqa. Farmers are responsible for O&M of their "private" mesqas, but if these are not adequately maintained, the Ministry can (and sometimes does) undertake the work and charge the farmers. In the New Lands, farmers are responsible for capital costs for infrastructure downstream of the booster pumps drawing water from distributary canals, serving areas of about 100 to 200 feddans. If the investments are made by government, they are recovered over twenty years at no interest (IIMI 1995e).

Under Law Number 12 of 1984, the Government has a policy of collecting the costs of installing tile drainage from beneficiary farmers. The costs are to be recovered over twenty years, beginning after a five-year grace period; included in the costs is an administrative fee of ten percent. However, no interest is charged, so that even with perfect collections, the government collects less than 25% of the real costs (IIMI 1995e; Mohieddin 1995). Mohieddin (1995:15) found collections are far from perfect: up to mid-1995, less than 6% of the total cost of the tile drainage program had been recovered.

Under Law Number 213 of 1994 and Decree Number 1490 (1995) of the Minister of Public Works and Water Resources, the Irrigation and Drainage Law was amended to enable recovery of capital costs of mesqa improvements (including pumps) such as those being done under the Irrigation Improvement Project (IIP). These costs are to be recovered over a period not to exceed 20 years, at no interest. Implementation of this cost recovery program has not actually begun, though this is expected soon. Experience over the next several years will be an important source of lessons regarding future cost sharing or recovery mechanisms.

In September 1995, MPWWR co-signed with the Ministry of Agriculture and Land Reclamation a Memorandum of Understanding (MoU) with USAID which indicates the government's commitment to move forward on cost sharing. The MoU calls for completion of the IIMI studies, development of an implementation plan for cost sharing based on the outputs of the IIMI studies, and initiating capital cost recovery for improved mesqas as called for in Law 213 of 1994. Under the heading "farmer cost sharing" the commitment is re-stated to "develop an implementation plan for allocating and recovering O&M costs."

Although water service cost sharing is a very sensitive issue in Egypt, the Minister has made public statements about the need to develop and implement a phased cost sharing program. In its comments on the earlier draft of the Action Plan, the Ministry suggested the "cost sharing program should be based on the philosophy of the cost recovery of mesqa improvement."

This section summarizes the consensus reached at the Cost Recovery Workshop. The five-element framework used in that workshop (goal, definition of service, rate base, collection, use of funds) provides the basis for this discussion. More details of the wide discussion that resulted in these conclusions can be found in the Workshop Report (IIMI 1995d). To summarize the five inter-linked elements of a charging mechanism:

- "goals" are the purposes and objectives;
- "service" refers to the entitlement of the user -- where and when it is provided and its essential characteristics;
- "rate base" refers to the amount charged users per unit of service;
- "collection" is the process and implementing agencies that secure payments from users; and
- "use of revenue" refers to the destination of the funds collected and how they are used, including deductions for collection costs and rules specifying sharing of costs.

Participants in the Cost Recovery Workshop agreed that the **goals** of service charges, in order of priority should be:

1. Recovery of operation and maintenance expenditures;
2. Conservation of water; and
3. Improved efficiency of service (better service for the same cost, or equal service at lower cost).

It was agreed that the **definition of the service** should move from the present partially demand-based allocations, to a clearer definition (in terms of volumes, flow rates, and schedules) of the seasonal irrigation program. At present, system operation is initiated using projected demands based on experience, and then frequently modified in response to information from the field. Liberalization of cropping controls has complicated this process substantially, as historical information now provides only limited guidance to farmer intentions, and the areas under water-consuming crops (rice and sugar cane) have increased rapidly. The progression of service definition from the present to the future will require closely linked infrastructural and management changes. Until more information is available about actual deliveries at the distributary level (for example through the Irrigation O&M Program; see chapter 2), little can be done towards defining operational schedules; and without infrastructure similar to that proposed in the IIP in place, there is no possibility of defining and measuring service to the individual farmer.

The **rate base** should be simple, and based initially on a flat rate per unit area (undifferentiated by crop or cropping intensity). To encourage awareness of water scarcity, it was further proposed that service charges should eventually reflect consumption of water, and be differentiated by crop, or crop category, with more water-consuming crops subjected to higher charges.

The **collection of funds** should be entrusted to the existing Ministry of Finance's field collection staff, who currently collect both land taxes and charges associated with the recovery of investments in drainage. A question not addressed by the workshop was whether the existing land tax commissions could collect irrigation service fees effectively, and whether service charges based on more than the area of the farm, i.e., a more complex charging system, could be undertaken through this agency. Seasonal accounting for area irrigated and crop type is clearly a far more complicated and potentially contentious issue than assessing an annual charge based on the cultivable area.

Since that Workshop, IIMI has commissioned a study of the present functioning and capacity of the land tax commissions in three selected districts, to test the assumption the Ministry of Finance could collect irrigation service fees effectively through its existing organization (Mohieddin 1995). The study raises great doubts on this point. The study found low motivation of staff as a result of poor compensation and facilities, and as a consequence, low levels of performance, inadequate record keeping, and overall, low levels of recovery of tile drainage costs. Mohieddin concludes that irrigation service fees should not be collected through the land tax commissions. He recommends the MPWWR itself should take on this function.

The **use of funds** should be for the purpose of system operation and maintenance, and thus funds should come directly to a fund within the MPWWR established for this purpose. A number of additional complexities were foreseen within this simple objective: if charges are linked to expenditures, should charges vary regionally, or locally? How would revenues be distributed among local, regional, and national levels?

The average annual cost of O&M services at LE 75 per feddan masks huge differences in regional costs because of differential dependence on pumping: costs by region are estimated at LE 130, 80, and 60 per feddan for Upper, Middle, and Lower Egypt respectively (IIMI 1995e:8). Uniform rates may be more "equitable" and politically attractive but would involve substantial subsidies and/or transfer payments from one region to another. This is an important political decision to be made. Related to this issue is the distribution of revenues. In other countries, revenues usually remain within the system except for an agreed payment to higher levels for higher level services; in Indonesia for example, 90% of the fees collected remain in the system while 10% goes to offset higher level administrative costs. This is another important decision, and is related to the regional differences in costs.

Finally, and intrinsic to the whole service charge exercise, a system of **accounting** for expenditures by purpose and location as proposed by Lewis and Hilal (1995) would need to be in place if anything beyond simple flat-rate charges are proposed -- and indeed improved accounting may be required to justify the selected level of flat rate charges. At the moment, the cost of irrigation services can be estimated in the aggregate; but it is not possible to identify local and functional costs. What does it cost to maintain X canal, and how are these costs allocated among cost categories? This is a legitimate question for a farmer to ask, and it cannot be answered precisely and transparently. It will be essential information if cost recovery becomes a mechanism for inducing better water delivery efficiency by the Ministry.

Table 3.1 provides a matrix showing how choosing increasingly complex goals can have important implications for the other components of a water service charging mechanism.

Table 3.1 Relationship between Goal and Other Components of Service Charging Mechanisms

<i><u>Component</u></i>	<i><u>One goal</u></i> <i><u>[Stage 1]</u></i>	<i><u>Two goals</u></i> <i><u>[Stage 2]</u></i>	<i><u>Three goals</u></i> <i><u>[Stage 3]</u></i>
<i>Goal</i>	Recover costs (partial or full)	* Recover costs * Conserve water	* Recover costs * Conserve water * Improve service efficiency
<i>Service</i>	Responsive to Demand	Predefined schedules, or responsive to demand	measured delivery at defined point
<i>Rate base</i>	Flat rate per feddan	Crop based	Volumetric
<i>Collection</i>	Ministry of Finance? or MPWWR	MPWWR assisted by WUAs?	Delivery agency assisted by WUAs?
<i>Use of Funds</i>	Central MPWWR	Regional and Central MPWWR	WUAs, Regional and Central MPWWR
<i>Accounting requirements</i>	Total National Cost of O&M	Cost of O&M by Function and Region	Cost of O&M by Function, Region, and Distributary

Pursuing only the goal of recovering some or all of the costs could be implemented through a flat area-based rate; in principle this would require the fewest institutional changes, although Mohieddin's study of the land tax system shows some changes would be required. Pursuing other goals through a water service charging program has more important implications for the institutional framework for delivering the services (and vice versa). If achieving these higher order goals is important, and most would agree they are, then the Table can be read as suggesting three *stages* of cost sharing. Egypt could begin with the simple approach, while experimenting with how more complex goals could be achieved, and implement these approaches based on lessons learned over time.

The stages are based on the priorities agreed at the Cost Recovery Workshop (IIMI 1995d). There is no *a priori* reason why achieving the goal of efficient use of water by users ("conserve water") should come before the goal of achieving improved efficiency of the service provider.

Successive stages involve a degree of sequential dependence within some (not all) specific components of the charging mechanism: for example, defined allocation and management of water at the regional level is a pre-requisite to defining allocations at the mesqa or farm levels. In addition, there are dependencies across components -- most particularly between the service and the rate base, and dependencies beyond the components of the charging mechanism -- for example to the infrastructure, since the present facilities cannot provide measured volumetric services. There are intermediate options within the third stage: volumetric charging can be done at the mesqa or distributary level if they are under the control of an autonomous unit; that unit can find other means to charge its members instead of measurement at the farm level. Not all the component characteristics are dependent on the goals -- some are "desirable" rather than strictly necessary.

3.3. Non-Agricultural Water Service Cost Sharing

The IIMI-MPWWR Study used the Separable Cost-Remaining Benefits (SCRB) method to allocate operation, maintenance and replacement costs among beneficiaries (Cestti 1995; IIMI 1995e). Following this method, about 85% of the OM&R costs are allocated to agriculture, and the remainder is allocated among a variety of other users (see Cestti 1995: 26, Table 14). The largest non-agricultural category is municipal and industrial intakes from canals (9.4%); "tourism and recreation" is next with 2% and all other categories each represent less than 1%. Nevertheless, some of these users could possibly be charged at higher rates, thus in effect subsidizing other users.

For municipal and industrial sectors taking water directly from canals, it seems feasible to introduce volumetric water charges for raw water at the intake point; similar systems are found in other countries (Cestti 1995:28). The MPWWR keeps records of the volume of water delivered to each water treatment and each major industrial unit; charging for these volumes, aside from recovering some costs, may introduce incentives for improving efficiency. For example, Cestti (1995:28) suggests that if the General Authority for Greater Cairo Water Utility were charged for each cubic meter of water withdrawn from the Nile, it would have more incentive to reduce its current (very high) level of losses. If industries were similarly charged, they too may increase their efficiency.

Charging volumetric rates from self-supplied firms for direct intakes either from the Nile or from groundwater may be more difficult as there is presently no system in place for monitoring. A possible solution is selectively taxing pumping costs by increasing the electric rates for pumps by about 10%, but implementation would be difficult.

Other non-agricultural sectors receive very small portions of the benefits and generally do not consume water. Fixed charges could be levied based on their proportion of OM&R costs; for example, a tax on boats; a higher tax on tourist cruise boats; and a payment by the Electricity Authority to the MPWWR for the construction and operation of Aswan Dam and the barrages for hydropower.

An additional option is to strengthen the Ministry's regulatory function as laid out in Law 48 of 1982, and use this function as a mechanism for cost recovery as well. Thus, the Ministry should charge reasonable fees for all water intake as well as discharge permits and floating vessel permits; monitor the quality of discharges and charge high fees for water that does not meet a defined quality; and levy stiff fines for non-compliance with regulations. This strengthened regulatory role would require considerable political commitment, but would have many benefits beyond cost recovery.

Initiating cost sharing with non-agricultural users may be politically more feasible as a first step, and may make a future program of cost sharing with agricultural users more palatable. Most of the major non-agricultural users are other government institutions (municipalities, many industries, hydropower); therefore what is required is political agreement at the highest levels. Once other users are paying their share of the cost of water services, this information can be used in a public education campaign aimed at agricultural users.

3.4. Phasing of Water Service Cost Sharing

A decision to proceed with asking users to share directly the costs of providing water delivery services can be implemented in phases. IIMI (1995i) describes a long term three-phase approach to implementing a cost sharing program (with an emphasis on agricultural users) as part of a larger institutional reform package. This section briefly outlines that approach. Phase I can be implemented during the period of this Action Plan (about three years); Phases II and III would be integral parts of a longer term program. A separate report (IIMI 1995i) provides more details on the proposed Phases II and III.

Phase I: Implementation of Cost Sharing for Non-Agricultural Water Services, and Preparation for Implementation in the Agricultural Sector

1. Prepare a detailed implementation plan for cost sharing.
2. Implement the program of cost recovery for mesqa improvements and document the experience.
3. Introduce cost recovery for water services provided to non-agricultural users.
4. Carry out a public education campaign on the benefits and costs of water delivery services.
5. Test and validate a functional budgeting and accounting system so that actual costs can be identified clearly and transparently.
6. Carry out preparatory studies, for example social marketing studies on conditions affecting willingness to pay, and studies on what disadvantaged users actually pay at present.

7. Carry out a further study on the options for service fee collection as a basis for a firm recommendation.
8. Implement the proposed Irrigation O&M Program (chapter 2) to test ways of consolidating and improving service with users' involvement.
9. Adopt legislation for cost sharing.

Phase II: Implementation of Cost Sharing for Agricultural Users and Pilot-Testing of Alternatives for Improving Efficiency

This will involve implementing the area-based fee in phases, implementing the functional budgeting and accounting system, pilot testing further innovations, and strengthening the Ministry's regulatory function, as described in IIMI (1995i).

Phase III: Implementation of Cost Sharing Linked to Service, and Institutional Consolidation

This will involve implementing fees linked to water use and water delivery services, and consolidating the institutional framework for long term sustainability, as discussed in IIMI (1995i).

3.5. Implementation of Service Charges: Phase I

This section proposes actions required to develop and implement a water service charge policy that could be done during the next three years³. It is difficult to anticipate much of the detail even for the next few years. The political decision to proceed with service charges will determine many of the subsequent preparatory and implementing activities by defining the targeting, phasing, and detailed objectives of the proposed cost sharing program. At one extreme, it may be decided to recover all costs from non-agricultural users, which would mean that no further consideration needs to be given to mechanisms for agricultural cost recovery. At the other extreme it may be decided to charge fully, and immediately, under which circumstances there is no alternative to a flat rate, as this is the only mechanism which can be fully defined and implemented with available information and infrastructure. More likely, it may be decided to introduce service charges gradually, over a period of time.

The political decision should address three specific points within the context of charges for irrigation:

- whether the differential costs of pumping in Upper, Middle, and Lower Egypt will be charged (resulting in estimated rates of LE 130, 80, and 60 per feddan per year, respectively), or whether an average rate will be charged;

³ IIMI (1995i) proposes actions over a longer term, covering Phases II and III.

- the extent to which cross subsidization across sectors should be provided (possibly including direct subsidy from government); and
- the time scale over which cost sharing should be achieved.

It is **suggested** that the rationale for service charges should be based primarily on the cost of providing the service, and the possibility that service quality would decline in the absence of additional resources from the beneficiaries. Promising that services will improve as a result of the charges should be avoided; this may indeed happen but should not be promised, because demonstrating improvements will be difficult, and would provide a possible reason for beneficiaries to refuse to pay in the absence of demonstrated incremental benefits.

The major actions **to be taken primarily by MPWWR** (and in some cases other entities of the Government of Egypt) during Phase I are outlined below. While the Ministry will be responsible for taking the key actions, the assistance of outside consultants and research organizations will be very useful for many of them. Therefore the possible roles of outside partners are also discussed.

3.5.1. Prepare Multi-Year Implementation Plan for Cost Sharing Emphasizing the Agricultural Sector

The Ministry of Public Works and Water Resources has agreed with USAID to prepare this plan, according to the Memorandum of Understanding between the MALR and USAID. This plan should be quite detailed in terms of what will be done, by whom, in what sequence, etc. It should list what legal and administrative changes are required, what the training requirements will be, and what issues need further investigation before decisions can be made. There should be a time frame for implementation, but with the understanding that it will be a "rolling plan," subject to revision as lessons are learned.

Implementation

This has to be the Ministry's plan. Therefore, the Ministry should appoint a task force responsible for preparing this plan. This task force should be a subcommittee of the Steering Committee for the Action Plan (SCAP) discussed in chapters 2, 4 and 5. The Ministry could benefit greatly from an international consultant who is fully familiar with the options and issues in assessing charges on various sectors, billing procedures, and other issues. The terms of reference should be for the consultant to work with the task force to provide ideas and suggestions, and prepare draft materials, which could be used by the task force to write its report. Approximately two person months of effort from the international consultant would be required.

3.5.2. Document the Results of Cost Recovery for Mesqa Improvement under the IIP

Rules are presently in place, though not yet applied, for the collection of investment costs associated with IIP. Implementation should begin soon. There are still a number of implementation details to be sorted out, and farmers need to be fully informed up front

on their financial obligations. The implementation process and results should be studied carefully to learn lessons. This will provide valuable field experience in defining procedures for use in non-IIP areas.

Implementation

IIP staff have primary responsibility for implementing this program. These officials should also carefully document the procedures and strategies used, the response of farmers and others, and solutions they have tried or would propose. Further, it is suggested that an Egyptian social scientist be engaged to document the process and lessons learned over a two-year period. This person will be responsible for periodically visiting a selected sample of sites and observing meetings and progress in collections, carrying out informal surveys of officials' and farmers' experiences and perspectives, analyzing documents, and preparing periodic reports to the Ministry on progress, problems encountered, and possible solutions.

3.5.3. Formulate and Initiate Implementation of Detailed Plans for Introducing Charges to Non-Agricultural Water Users

The Government may find it attractive to begin charging non-agricultural users (especially municipalities and industry) before moving to a program of cost sharing with agricultural users. To do this, the Ministry needs to develop a detailed plan of action, discuss it in detail with other affected Ministries and representatives of industries, tourism, and municipal water supply agencies, and get political approval. In the case of government-owned water using entities, it is likely no new legislation would be required. The plan should identify whether this is the case, and if legislation is required, this should be proposed. The plan should also address the question of how to deal with the relationship between charges and the quality/quantity of effluent.

Implementation

The same task force charged with development of a multi-year implementation plan for agricultural water users can be responsible for formulating this plan as well. Again, a consultant may be useful in assisting the Ministry. The same consultant as proposed in section 3.5.1 could assist the task force with this work (this may require an additional person month of effort). Once the task force has developed a plan that is satisfactory to MPWWR it must devote some effort to discussing it with other interested parties as noted above; and the Minister will have to play a key role in this process.

If the Ministry develops a good plan and takes a firm stand, implementation of charges for non-agricultural water uses could begin by year two.

3.5.4. Design and Implement Public Awareness Campaigns

The public awareness campaigns should be targeted at beneficiary groups as well as the public in general. Irrigation-related campaigns should highlight the recent improvements in agricultural income which have resulted from liberalization of crop prices, parallel changes in pricing policy in many other areas of the economy, the cost of providing the

service, and the tradeoffs -- what is lost in other sectors because of the use of public funds to subsidize irrigation. Further, such campaigns should educate the public on Egypt's real situation with regard to water -- increasing demand affected by rising pollution while the supply is fixed. Continuing to making adequate water available for all Egypt's needs is going to become increasingly expensive. It is this rationale, and not promises of improvement, that should be the basis for explaining the program to the public, as suggested above.

An internal awareness campaign for the officials of MPWWR, and also senior representatives of government agencies outside the Ministry which consume water, or rely on water services (power, navigation, urban, industries, tourism, etc.) should also be arranged to ensure that they are aware of the rationale for charges, and have a forum to express their preferences in finalizing charging structures. Obviously this campaign will be closely linked to the other activities discussed in this section.

Implementation

The newly-established Communications Unit in the Minister's office can take the lead in designing and implementing this awareness campaign. This assumes that the Unit will receive continuing donor support to build its capacity. For the proposed awareness campaign, it will be useful to establish a small task force of officials from various units of the Ministry, and to engage a public awareness consultant to assist in designing the campaign. In the first year, the campaign should pilot test a variety of media and messages, and evaluate their effectiveness. By years two and three it should be possible to carry out national campaigns targeted at specific audiences (urban residents, rural people, industrialists, government officials, etc).

3.5.5. Develop and Pilot Test Improved Budgeting and Accounting Procedures

The purpose of these new procedures is to make it possible to identify service costs by function and location, as proposed by Lewis and Hilal (1995). This information will be very useful for management purposes in the Ministry; and to strengthen the case and establishing the rates for cost sharing. It is proposed to initiate this exercise on a pilot basis at the field level as part of the Irrigation O&M Program (chapter 2), and with parallel, top-down introduction more generally.

Implementation

The first step is to prepare terms of reference for an Egyptian management accounting firm which will in turn develop a detailed budgeting and accounting system and design and implement the pilot test. The consultant who prepared the original recommendation could prepare these terms of reference. The Ministry could then seek proposals from Egyptian firms, and choose an appropriate firm. This firm will do a detailed analysis of the current system, and design a system that builds to the extent possible on existing practices, fully meets Egyptian government administrative and legal requirements, but which will be an effective tool for budgeting and tracking functional costs by location. Once a draft system is agreed to, it should be implemented on a pilot basis. The pilot testing could be a second phase of the contract with the management accounting firm.

3.5.6. Carry out Field Studies on Farmer Attitudes to Service Charges

When the subject of cost sharing is raised with farmers, they resist the idea of paying for irrigation services (e.g., Mohieddin 1995). This is not surprising -- no one would like to begin paying for something he had received free of charge previously. Nevertheless, many farmers are presently paying extra costs to overcome water supply problems. For example, farmers at deprived tail ends of mesqas pay for pumping low-quality drainage water (the low quality's impact on production itself being a cost). Similarly, in urban areas with poor water supply, people with low incomes pay substantial amounts for access to water, an indicator of demand⁴. On average, according to a small survey carried out by IIMI, farmers presently pay about LE 17 per feddan (\$12 per ha) for mesqa maintenance.

Typical surveys on this issue simply ask farmers broad questions like, "Are you willing to pay for irrigation?" or, "How much are you willing to pay?" It is no surprise that negative responses are given by people who presently perceive the service as free. But responses to questions depend to a large degree on how the questions are asked. There are sophisticated methodologies, such as the "contingent valuation method," for carrying out this type of study, and getting reasonably accurate responses to hypothetical questions⁵.

Several types of field studies will be useful. First, a sample survey of what farmers actually pay for water in various circumstances in both old and new lands will give a better picture of the real value of water, and real costs to disadvantaged farmers. Second, a sophisticated social marketing-type survey using methods like "contingent valuation" will provide valuable leads on what farmers value most (for example reliability, quality of water, convenient timing) and what might constitute a rationale for asking people to pay for these costs.

Implementation

International consultants will be useful in designing the studies, and providing training and technical support in their implementation. An Egyptian research institute or university department specialized in market and economic research could carry out the studies.

3.5.7. Systematically Study Service Fee Collection Options

Mohieddin's (1995) study raises important questions about the effectiveness of the land tax collection system. However, it was not intended to be conclusive; the questions it raises require further study. If the land tax collection system is as ineffective as his report

⁴ Cestti (1995: Annex II) reports an informal survey in the outskirts of Cairo, where people pay from two to forty times the normal metered rate per cubic meter of water.

⁵ See Griffin et al. (1995) for an example of the successful application of this method, including a discussion of what is required for such a study to make accurate predictions. Although this method has been applied more to domestic water supply than irrigation, it is equally applicable.

suggests, it will be necessary either to reform and strengthen it, or develop an alternative capacity within the MPWWR itself for fee collection. The latter will be a considerable investment and its cost effectiveness needs to be examined carefully.

Implementation

First, the Ministry should hold detailed discussions with the Ministry of Finance regarding the options for service fee collection, and the appropriateness of the land tax commissions or other units to collect such fees. For example, the land tax commissions may not be the appropriate body to collect fees from non-agricultural users. All the options, including the costs and benefits of the MPWWR having its own collection unit, should be considered.

Second, once several options are identified, a more detailed study of the capability of the units being considered is needed, to assess current capacity, gaps, and requirements to improve their capacity. A separate study is needed to identify what is involved in the MPWWR establishing its own unit.

The Ministry should establish a task force to be responsible for managing this work, including holding discussions with the Ministry of Finance. Egyptian consultants specialized in financial management can design and carry out the necessary studies. An international consultant (perhaps the service fee specialist suggested in section 3.5.1) can assist in designing the studies.

3.5.8. Implement the Irrigation O&M Program

This Program provides a context for pilot-testing new technical and institutional arrangements that will have implications for future modes and levels of cost sharing. It also provides a context for pilot-testing the functional budgeting and accounting system.

3.5.9. Prepare and Obtain Confirmation of Legislation

Legislation passed by the Peoples' Assembly will be required, reflecting the agreed political decision, including definition of phasing, basis for charges, assignment of responsibilities for implementation among departments, the use of funds recovered from users, and arrangements for financing O&M during the period of partial cost recovery. This legislation can be based on the detailed implementation plan and findings of the studies suggested above.

Two basic options can be considered. One is to amend the existing laws on irrigation and drainage and water pollution to enable collection of fees and levying of high pollution fines, and depositing these funds with the MPWWR. The other option is a more comprehensive legal reform that would change the status and organization of the MPWWR itself.

In the first option, two laws would be amended. Law 12 of 1984 on Irrigation and Drainage would be amended to legalize charging irrigation service fees and their use. This amendment would go beyond, but be consistent with Law 213 of 1994 which

amended Law 12 to legalize private water users associations and recovery of capital costs of mesqa improvement. Second, Law 48 of 1982 on the Protection of the River Nile and Waterways from Pollution, would be amended to enable the Ministry to use its regulatory function as a mechanism for cost recovery. Specifically, the Ministry could be authorized to charge reasonable fees for water intake and discharge permits, monitor the quality of discharges and charge high fees for discharging water that does not meet defined quality standards, and impose stiff fines for non-compliance.

The second option will be based on the results of implementing the Action Plan. It will emerge out of the activities proposed in this chapter, the results of the Irrigation O&M Program (chapter 2), and the conclusions reached through the Management Strengthening Program (chapter 4). These activities may lead to a decision to make more far-reaching changes in the function and organization of the Ministry. If so, a new Law on Water Resources may be prepared to replace the existing legislation entirely.

Implementation

This activity cannot go far until the activities discussed above are completed, and basic political decisions are made on the future irrigation service fee policy, and on whether this reform will be part of a larger package of institutional reform as suggested in the previous chapter. The Steering Committee for the Action Plan (SCAP) will be primarily responsible for taking the necessary steps.

3.6 Anticipated Outputs and Impacts

The expected *outputs* of this Program are as follows:

- Cost-sharing by major non-agricultural users to MPWWR,
- Routinized and effective implementation of cost recovery for mesqa improvements,
- Functional budgeting and accounting system,
- Better understanding of conditions affecting willingness to pay for water services,
- An implementation plan for phasing in a water services cost sharing program, and
- Legislation enabling a phased program for water service cost sharing.

The anticipated *impacts* of this Program are:

- More cost-effective water services by MPWWR,
- Enhanced capacity for setting and collecting water service fees,
- Better public awareness and political acceptance of the need for sharing water service costs, and
- Improved financial sustainability of the Ministry and its units.

3.7 Conclusion

This chapter proposes a set of actions that constitute the first phase of a long-term program having three phases. Completing this phase will require about three years. The next two phases will each require about five more years, depending on how quickly the Ministry is able to proceed with the actions proposed this Action Plan.

As noted several times in this chapter and in the report on phasing and mechanisms for cost sharing (IIMI 1995i), deciding to proceed with a program for cost sharing by asking users to contribute to the costs of the service will itself be difficult. Whenever people are accustomed to receiving a "free" service, they naturally resist being asked to pay. But the service is **not** free. This fact must be clearly communicated. The cost of delivering water to the millions of water customers in Egypt is being paid now. The lack of a transparent relationship between the service and the costs complicates the problem of improving the service. But in the long run, once this relationship is established, there will be strong incentives for the users both to demand a good service and to use the resource more wisely; and for the delivery services to provide a good service to keep the customers happy. This is a challenge faced by many countries in many sectors. But the precarious balance of Egypt's water supplies and demand make it imperative to move ahead with a program for cost sharing to achieve financial sustainability and as a motivator for improving the services.

Chapter 4

A PROGRAM TO STRENGTHEN THE MANAGEMENT OF THE MINISTRY OF PUBLIC WORKS AND WATER RESOURCES

4.1 Introduction

4.1.1 Objective

The objective of this program is

to strengthen senior officials' management skills; and assist them in a systematic program to re-examine water resource policies and goals, MPWWR's mission, roles and responsibilities, and the subsequent implementation of new policies and programs, including those contained in the other components of the Action Plan.

This will enable the Ministry to continue playing an effective role in the management of Egypt's water resources, and strengthen its ability to serve its customers, the water users.

Meeting this objective will require addressing the issues described in the diagnostic study conducted by IIMI in cooperation with Ministry personnel (IIMI 1995f), maximizing the use of the technologies developed under the IMS Project, and developing stronger leadership and management skills to supplement technical knowledge. The IIMI-MPWWR Study not only identified a number of important issues facing the Ministry, but also suggested quite a few "opportunities for change." The Management Strengthening Program will enable Ministry officials to evaluate these suggestions systematically and either adopt them in some form or develop other solutions. Further, this Program will play the key role in guiding, evaluating, integrating, and implementing the results of the Irrigation O&M and Cost Sharing Programs.

This Program is to be carried out *by the Ministry's top management officials and supporting staff*. To be successful, it will require the strong support of the Minister and commitment and intensive involvement of the Ministry's top managers. Expertise in management and administration from outside the Ministry will assist the Ministry managers to participate in, lead, and complete the steps and processes of the Program. A very important component will be team building activities and short term intensive leadership and management training and orientation programs, especially for the top officials of the Ministry.

4.1.2 Background

This Ministry was one of the first ministries established in Egypt. It was established with a certain mission. All organizations which are established with specific missions and have existed for a long time need to periodically re-examine their mission, role, program, and management processes in light of what the organization has accomplished over its history and current events that impact the organization.

During its history, the Ministry has completed several major water storage, delivery and disposal facilities. It faces increasing challenges to operate and maintain an aging water service system to satisfy increasing demands from a limited water supply. Changes in national policy also impact the Ministry such as the policy to liberalize cropping patterns and to encourage more private development of new lands and industries. Industrial expansion, according to the Ministry of Industry, is occurring at a much greater rate than estimated only ten years ago. Pollution of fresh water supplies is increasing due to this industrial expansion and a growing population. According to the Ministry of Housing and Public Utilities, old lands are being lost to urban expansion at twice the rate estimated in the Water Master Plan. Furthermore, technological programs introduced to the Ministry by donor organizations are not being implemented as rapidly as planned, and are not being used to their full potential. For these reasons a program of this nature will be beneficial to the Ministry.

Sometimes programs such as this one are undertaken because the top management of the organization recognizes the need to re-examine the policies, goals, mission and role of the organization. In other cases, donor organizations require such a program, because they want to be assured that the money they invest in the agency will accomplish the objectives of the program for which the money is furnished.

A water resource organization which used a similar process to re-examine its mission, policies and goals is the U. S. Bureau of Reclamation. In 1987 the Bureau initiated a program similar to the one proposed here. In its assessment of its mission it found that it had essentially accomplished the mission for which it was established: the development of the western United States. The critical finding of its assessment was that it must change its primary orientation from one based on federally supported construction to one based on resource management. It changed its objectives to improving management and utilization of resources. These changes are already largely in place. It also made agreements with its customers to take over the operation and maintenance of many of the project facilities it had operated and maintained. It also changed its program to provide engineering services to other agencies such as the Fish and Wildlife Service and the Environmental Protection Agency in protection of fish and wildlife habitat and cleaning up pollution of rivers.

In India, three States, Haryana, Orissa and Tamil Nadu, have initiated programs similar to this one with assistance from the World Bank¹. The Irrigation Departments in the States had requested large loans for rehabilitation of their water delivery systems. The Bank wanted to assure itself that the loans would accomplish their objectives, so they made it a condition of the loan that the Departments undergo an institutional analysis. Consultants were hired to assist each Department to assess its mission, institutional factors and management processes. In Haryana State, as a result of these programs, changes were initiated and are continuing. Changes are being made in some of its management practices and systems, relationships with other agencies and water users, and its organization. Modernization of its operation and maintenance practices and development

¹ The water resources consultant on the IIMI team, Mr Rod Vissia, was a consultant on the design of the Haryana program.

of a State Water Plan are also underway. In Tamil Nadu and Orissa, similar changes have just been initiated, because other issues concerning the World Bank loan delayed its approval until recently.

Similar processes are used regularly by private firms concerned about their competitors, market niche, profit margins, or seeking new areas of growth. They too draw upon both their own resources (including staff) and outside expertise to assist the process; and they too emphasize training in the leadership and management skills required for success. The proposed program is built around activities often called "strategic planning," but is more comprehensive than the usual strategic planning exercises.

There is a growing literature on the application of strategic management and participatory change approaches to large organizations in developing countries (e.g., Brinkerhoff & Goldsmith 1992; Brinkerhoff and Ingle 1989; Thompson 1995). Basic principles underlying changes being introduced in the public sectors in rich countries (e.g., Osborne & Gaebler 1992; Senge 1990) are also applicable to countries like Egypt, with appropriate modification. Franca (1994) provides a detailed description of a multi-year training-cum-strategic change program of the Department of Irrigation and Drainage of Malaysia, assisted by IIMI. The Program described here attempts to adapt the lessons from these experiences to enable the MPWWR to benefit from and use them in a practical manner.

Much of the preparatory work for this activity will be carried out by Ministry staff themselves, with assistance as necessary. The first four steps of the program, for example, involve using the expertise available in the Planning Sector and National Water Research Center to carry out analyses of present and future water resource situations, scenarios, and policies. There already exists a solid foundation in the Ministry upon which to build.

Implementing this activity will enable the Ministry to make better use of the results of the other activities proposed in this Action Plan. Results from those activities will provide important information to be used during this activity, and will also enable the Ministry to guide and direct those activities effectively as a learning process. The main participants in the Management Strengthening Program will be the members of the Steering Committee for the Action Plan (SCAP). They will be using their new knowledge and skills to guide other components of the Action Plan, as well as using the results from those activities. As discussed further below, the Management Strengthening Program will use the technologies and capacities developed under the IMS Project, and will also result in better integration and use of these capacities.

4.1.3 Summary of Results of the Institutional Analysis

The results of the institutional analysis are reported in detail in IIMI (1995f) and summarized very briefly in Section 1.5.1, above. The analysis confirmed the achievements of the Ministry in developing and managing Egypt's water resources and its continuing role in maintaining a high level of agricultural performance. But the Study concluded that the Ministry's management processes and organizational structure, while achieving a lot in the past, need to be re-examined and changed to make best use of IMS

Project outputs and meet future water resource challenges. The Study identified many issues affecting policy-making and planning, water management, and other functions of the Ministry. Some of these issues include:

- Fragmentation of programs and functions and some overlap among Ministry units;
- Centralized organizational structure with little delegation of authority and concentration of decision-making in a few hands;
- Drawbacks of creating special units to implement donor-funded projects which prevent full integration of the innovations;
- Low and inequitable compensation, and no linkage of rewards and performance; and
- Mismatch of staff availability and needs, including shortage of specialists and skills other than general civil engineering.

The Study concluded that important changes are needed, but that these could be best designed and implemented if Ministry officials themselves develop and implement solutions to their own problems. This idea underlies the entire Action Plan, and especially this chapter.

4.1.4 How the Program will Help Make Better Use of Tools Introduced Under IMS and Other Programs

In the institutional study (IIMI 1995f), several issues concerning the integration of IMS components into Ministry operations were identified. These include:

- Lack of information exchange and coordination between organizational units impede full integration of the new technology into normal Ministry operations;
- In some cases, the IMS project is located in an organizational unit other than the one which will utilize the technology;
- On some IMS projects, project managers and staff are on the project for only limited tours, even though some receive special training in the project's technology (high staff turn over);
- In the past, benefits to staff on IMS projects were greater than benefits to non-project staff. Although this disparity has been eliminated for pay incentives, there still exists greater benefits in training opportunities and in per diem payments for employees on IMS projects. This has led to transfer of high caliber staff to the project, leaving other activities short handed, and creating an environment of envy on the part of non-project staff. One result has been reduced cooperation between project and non-project units; and
- In some cases there is insufficient dissemination of information about the project to others who would be affected by it.

Several elements of this program for strengthening the management of the Ministry should lead to better integration of IMS technology into the operating practices of the Ministry and lead to improved water resource management. Activities which should assist in this integration of some IMS tools include:

- Some of the IMS tools and outputs will be used to provide information to top management for their working sessions. This not only facilitates their work, but also familiarizes them with what the technology can do. Examples include several models developed under the PSM Project in the Planning Sector, the telemetry and communication system developed under the MSM Project, and the results of the Strategic Research Program in NWRC.
- Top managers will also discover how important some of the IMS tools are in defining water resource goals and policy. An example is the models developed under PSM.
- Team building and changes in management processes in the Ministry designed through top management working sessions should help eliminate many of the institutional barriers to full integration of the IMS projects into Ministry operations.
- The results of the short term studies to be undertaken for this Program will provide direction on how some of the technology can be most successfully used in the Ministry's program. Examples include the proposed studies on continuous flow, on the future role of the Irrigation Advisory Service, and the IIP assessment (Annex 2).

4.2 Outline of the Proposed Program

This Management Strengthening Program includes: a) team building activities, b) management training and orientation, c) preparation of synthesized information for senior officials to use, and d) structured working sessions for senior officials analyze water resources and management issues and develop long term solutions. The team building and management training will be largely completed in the first year to enable the officials to evaluate management and institutional options critically and effectively. It is estimated to require two to three years for completion of the cycle, depending on how much time officials can devote to the Program.

The steps and activities of this program are summarized as follows:

- a. Assess the present water resource management and water service situation, and come to clear conclusions on the strengths, weaknesses and issues.
- b. Look into the future (15 to 20 years) and define the possible, and most likely, water resource situations the Ministry may face.
- c. Review existing water resource management and water service goals and policies.
- d. Develop any necessary recommended changes in goals and policies.
- e. Examine institutional and management issues and recommend any required changes.

This final step may include reviewing and recommending changes in: the role of the Ministry (and other agencies as well as users), the legal framework, the Ministry's management processes, and the Ministry's annual work program and budget; and developing a detailed implementation plan.

4.3 Methods to be Used in the Program

The members of the proposed Steering Committee for the Action Plan (SCAP) will be the key participants in this Program. The key methods to be used include:

- Management team building activities.
- Special high-level management orientation and training.
- Preparation of information for use by the top managers in structured working sessions.
- Structured working sessions for the top managers of the Ministry.

4.3.1 Team Building

Team building using proven methodologies will be an integral part of all the working sessions. Team building is a process for strengthening the leadership of the top management team, strengthening its decision-making process, and strengthening the way in which officials conduct the affairs of the Ministry. Team building activities can also be organized outside of working sessions. The exact mix of working sessions and team building activities will be developed by the consultants prior to the start of the Program, and will be further developed with the top managers as the Program proceeds.

4.3.2 Training

After the first "introductory" working session, all top managers will attend a management training program of three to four weeks in length. This program will include managerial topics such as leadership skills, creative problem solving and decision-making processes, working in teams, group dynamics, organizational behavior, managing conflict, management of change, recent management theory, and communication skills. These courses also typically provide managers feedback on their own communication and management skills and theories. Its location may be in Egypt or outside (see below).

Additionally, two more offshore training programs of about three months in length would be planned for at least four of the younger managers on the top management team. These programs would be intensive management training courses at world-class institutions. These two courses would also be scheduled between the "introductory" working session and the second working session concerning review of the present water resource and water service situation. All the elements of management would be addressed in this program.

Between the second and last working sessions, top managers will also be provided the opportunity to take two different management training courses at the American University in Cairo. One course is titled "Top Management", a four day course. The other is a regularly scheduled general management course, two weeks in length.

USAID has expressed a preference that all training be done in Egypt rather than overseas, arguing that "this would be more effective in that it would allow the number of trainees to be doubled and facilitate the use of national case studies²" USAID has also informally suggested that the services of its new "Development Training II Project" be used in organizing the training, whether overseas or local. The Ministry has not formally expressed its views on the issue of the location of training.

IIMI agrees with USAID that local capacities should be used to the extent possible. This is why the Program proposes having the top managers take specific courses at the American University in Cairo. In addition, some of the workshop facilitation, team building exercises, and specific management consultancies may be done using local expertise.

However, IIMI also suggests that sending selected top officials to intensive executive development course taught by the world's best management training institutions will be an excellent long-term investment. The officials to be sent should be carefully selected; they should be people who are likely to play leadership roles in the Ministry over the next five to ten years, and have the potential to respond to the challenge of an intensive top-notch course. Such intensive courses will expose officials to other top managers from the public and private sectors around the world; expose them to some of the world leaders in management; and challenge them to work hard to achieve the very high expectations of the courses. They are likely to return to Egypt with fresh new ideas and enthusiasm, new skills and insights, and an enhanced capacity to lead the Ministry's management strengthening and organizational change programs for the future. Annex 5 contains an indicative list of the kinds of management training institutions proposed.

IIMI suggests that the possibility be explored of arranging a "package" with a management training institute to provide a mixture of overseas training, short training courses in Egypt, and management consultancy services (see Section 4.5). Arranging training through USAID's Development Training II Project can be further explored; it may reduce administrative costs but risks fragmentation of responsibility of the program.

The training courses will be scheduled so that no more than three managers are in training at one time.

If the Program is successful, high-quality management training for Ministry officials will become an established policy of the Ministry.

² Letter from Donnie Harrington, USAID Action Plan Activity Manager, to Douglas Merrey, IIMI Team Leader, dated September 27, 1995.

4.3.3 Information Preparation and Studies

The first two steps in the process require some preparation of information and some analysis, the results of which would be used by the top managers in the following steps.

Defining the present situation and developing scenarios for future situations will require some work by the long range planning unit in the Planning Sector, the NWRC, and other units in the Ministry. These units, or task forces made up of members from appropriate Ministry units, can also develop the information summaries to be used by top management in their working sessions. The Planning Sector's PSM models would be used for doing some analyses. Scenarios of future situations could be done by the Planning Sector with input and help from NWRC and other units as necessary. Outputs from the Strategic Research Program can be summarized by NWRC personnel for use by the top managers.

The Ministry's lawyer can prepare the summaries of the legal framework to be considered by the managers involved in this program. Task forces such as those which assisted IIMI, the budget manager in the Planning Sector, and the administrative unit of the Ministry can assemble and summarize information concerning management processes, organizational information, personnel policies, budget and financial accounting procedures, and administrative procedures. Management issues identified for further study can be addressed by a management consultant.

Annex 2 describes four supporting studies whose outputs will be useful to this Program. They are referred to in the appropriate sections below. Section 4.5 describes the suggested outside assistance and implementation arrangements.

4.3.4 Structured Working Sessions

The key activities outlined in this chapter involve the top officials of the Ministry. Special structured working sessions or workshops covering several days at a time will be organized as follows:

- Introduction of the program and its process and initial team building activities.
- Review and consideration of information on the present situation and future scenarios for water resources and provision of water services.
- Review and change of goals and policies.
- Review and change of the Ministry's role.
- Review and change of the legal framework.
- Review of management processes.
- Plan changes in management processes.

- Review and change of programs and budgets.
- Implementation plan development.

Management and water resource policy consultants and facilitators will organize the working sessions and work with the Ministry's top management during the sessions. Ministry personnel will be used to support the top managers in their working sessions by providing additional information or studies as required. Although this chapter shows nine working sessions, the number of working sessions can be changed according to the subject matter and the progress of the process.

The management consultants will also assist in additional institutional diagnostic review as needed by the top managers for this program.

4.4 Detailed Description of Proposed Program

4.4.1 Assess the Existing Situation

The purpose of this activity is to establish a firm basis for the remaining activities. This base is formed by describing the present water resources and water service situation. This description must be in a summary form which can be easily understood and used by top managers during their involvement in the remaining activities of the program.

This definition of the present situation should include the following:

- A brief description of the legal framework under which the Ministry operates.
- A brief description of the key water resource goals and policies presently being followed by the Ministry and the government (horizontal expansion, crop liberalization, IIP, etc.).
- A summary of the present water use and water supply situation.
- A summary of the present water quality situation.
- A list of the ministries involved in water resources and a brief description of their responsibilities, relationships and present coordinating mechanisms.
- A description of the present role of the private sector (including users) in activities of the Ministry.
- A summary of IMS components and their status.
- A summary of gaps in or limitations of existing data and knowledge.
- The approximate opportunity costs/cubic meter of allocating scarce water using the present system.

4.4.2 A Look into the Future

The purpose of this activity is to envision what the water resource situation will be in the future under present water resource management policies and what water service requirements the Ministry may face.

This activity involves the development of alternative scenarios of future water supply, water allocation among sectors, water distribution among users, water use, and water quality conditions. These scenarios will describe alternative future water supply situations in Egypt as well as in the upper Nile basin. They are developed on the assumption that existing water resource management policies will continue during the time frame between the existing water resource situation and the future (15 to 20 years)³ The scenarios are developed using the most recent existing projections for population growth, per capita water use, industrial expansion, water quality programs, new land expansion etc. Alternative scenarios are developed by increasing or decreasing the projections.

The purpose of developing alternative scenarios is to create a range of possible water resource situations that might occur. This range of possible future water resource situations will give some indication of the types of water resource management issues the Ministry may face. From these scenarios a most likely future scenario is selected. The description of the future water resource situation must be prepared in a form easily useable by the top managers involved in the program.

Through the Planning Studies and Models Project, the Planning Sector has developed a lot of capacity for generating future scenarios. Therefore, the Planning Sector staff, assisted by NWRC and others, will play a leading role in this activity.

4.4.3 Review Policies and Goals

This activity involves reviewing existing policies and goals as defined in the policy and goal statements developed for the base condition (the present situation). This review will begin by assessing their applicability for managing water resources and providing water services under the defined present situation. The review will go on to assess their applicability in the future, for the most likely future scenario developed in the previous step.

For example, the future water requirement and water supply situation may require an alteration in the liberalized crop policy, in which farmers are free to grow any crop they wish, except for a maximum area planted to rice. Because of a fixed water supply, one policy option might be to limit or eliminate some high water use crops. Another important policy issue is the financial sustainability of operating and maintaining the water service system and linking cost sharing to providing water service.

³ Fifteen years is the period projected at the first workshop of the Study, entitled "Nile Water Resources Management in Egypt, 2010: Achieving a Common Vision" (IIMI 1995b).

Although this evaluation can largely be done with existing information, some additional information from special studies or evaluations will be useful in this step. These studies will provide the information needed by top management to assess the costs and benefits of alternative water resources allocation mechanisms to cope with water scarcity. Information from other short term evaluations may also be required to review the goals of some existing programs.

Suggested special supporting studies for this activity are discussed in Annex 2. They include:

a. An assessment of the impact of IIP on the productivity of water, and more generally its performance, and the relative contributions of its components.

This study will provide a basis for decisions about future investment and water quality policies, and will also have implications for understanding the future role of the Ministry. Based on the findings, the Ministry will get a clearer picture of the magnitude and nature of the benefits of IIP, and be able to decide whether to continue investing in the IIP, and if so, in what locations, and which components.

b. A study on the feasibility at macro level of continuous flow.

While the feasibility and benefits of introducing continuous flow on local commands will be examined by the Irrigation O&M Program, this study will examine its feasibility on a system-wide basis through mathematical modeling. It will use a simulation model such as the Planning Distribution Model (PDM) developed under the PSM Project in the Planning Sector.

c. A study of the Irrigation Advisory Service (IAS), its future and alternatives.

The results of the study on IIP impact will be complemented by this study, which is aimed at developing recommendations on the Ministry's future role in providing advisory services, and if it has a role, how these should be provided. It will include specific recommendations on the long term future of IAS.

Results from the Irrigation O&M Program (chapter 2) and the Water Services Cost Sharing Program (chapter 3) will also be inputs to this examination of policies and goals.

4.4.4 Develop Recommended Changes of Policies and Goals

After reviewing water resource management and water service policies and goals, using information provided from short term studies, the experiences of the Irrigation O&M and Cost Sharing Programs, and other information, the top managers will develop recommended changes in these policies and goals to strengthen the Ministry in providing water service and managing water resources. New goal and policy statements will be developed. Implementation of the proposed changes is the subject of the final working session of this program in which top management will develop a plan to achieve the changes recommended.

a. Review the Role of the Ministry and Recommend Changes as Needed

Presently, the Ministry's efforts are largely focused on irrigation water delivery and drainage services. The Ministry controls all operation and maintenance activities of the water system down to the head of the mesqa. In this step the Ministry's top managers will review this role in light of the information collected, the projections made and the recommended reformulated goals and policies developed in the previous steps. As water uses other than agriculture increase, the Ministry may wish to change its role concerning bulk water supply to these users. Various alternatives can be explored, such as creating a specialized water utility as a water wholesaler, which would leave the Ministry free to focus on policy, planning and regulation functions.

Similarly, the results of the special studies on the performance of IIP and the IAS may lead the Ministry to reconsider its role in relation to irrigation water users, and the future role of the water users themselves. This examination will also be facilitated by the Ministry's experience with the results of the Irrigation O&M and Water Service Cost Sharing Programs.

Another water resource issue that is becoming critical is *water quality*. Future water quality estimates and projected water quality conditions may lead the Ministry's top managers to change its role concerning the pollution of water, since pollution reduces an already short water supply. Chapter 3 and IIMI (1995i) suggest strengthening the role of the Ministry in regulating pollution and using such regulation as a means of generating operating funds.

Annex 2 proposes a study of the institutional framework for water quality management. The objective is to describe and analyze the institutions involved in monitoring water quality and setting and enforcing standards; identify the types of organizations contributing most to water pollution and those with a strong interest in controlling pollution; and suggest opportunities for solving these institutional problems.

In this step, the managers formulate a statement on the role and functions the Ministry should play in the future management of water resources and the provision of water services.

b. Review the Legal Framework under which the Ministry Operates and Recommend Changes as Needed

The laws and regulations under which the Ministry operates are summarized in the institutional study (IIMI 1995f). The most important are Law 12 of 1984 on Irrigation and Drainage and its amendment through Law 213 of 1994, and Law 48 of 1982 on Protection of the River Nile and Waterways from Pollution. These laws should be reviewed in light of the changes in water resource policies and goals and the role of the Ministry emerging in the previous activities. Some changes may be required to meet the future challenges of water resource management and the provision of water service. Likewise, the revised role of the Ministry may need new or changed decrees and legislation. Section 3.5.9 also proposes development of legislation related to cost sharing, and suggests this should be integrated with this work on the future role of the Ministry.

In this step the top managers will therefore review the summaries of the laws and develop recommended changes as needed.

c. Examine the Management Process of the Ministry

In this step the top managers review information about the Ministry's management processes, such as the institutional study (IIMI 1995f), the report on the Ministry's budget and financial accounting process (Lewis and Hilal 1995), organizational charts, and the experience with the Irrigation O&M Program (chapter 2). Information about water resource management organizations in other countries will also be used as a resource in this step. IIMI has proposed organizing a carefully-planned study tour to countries which have or are presently carrying out reforms which will be of interest to Egypt⁴. Participants in the study tour would be carefully selected by the Minister, develop a framework for describing the Ministry as it is presently organized (which needs to be done for this activity in any case; see Section 4.4.1), and use that framework for evaluating the relevance to Egypt of the experiences of three to four other countries.

In this working session, senior officials will review how the Ministry presently carries out the functions of operation and maintenance of facilities, construction, design, planning, research and regulation. Issues concerning these functions, the extent of programs related to these functions and the manner in which they are managed will be addressed.

The way in which administrative activities are managed will also be examined. These activities include human resources development, budget and financial accounting procedures, management of supplies, property and equipment and personnel management. The report on the Ministry's budgeting and accounting process (Lewis and Hilal 1995) and results of the Water Service Cost Sharing Program (chapter 3), which will include pilot testing of a new budgeting and accounting system, should provide helpful input to this activity.

Additional analysis may be needed to explore in more depth some of the issues that have arisen and to develop in more detail some of the "opportunities for change" identified (IIMI 1995f). Issues to be analyzed further should be identified early in this step, so that the results can be made available prior to the next working session.

d. Recommend, as Needed, Changes in the Ministry's Management Processes

This is shown as an activity separated from the previous one, examination of the Ministry's management processes, because these activities are likely to be complex and take considerable time. But this work emerges directly from the previous activity. Following from that work, the top managers will review others' recommendations, and develop their own recommendations regarding any necessary changes in management

⁴ See "Proposal for Extension of the Work Program for *Strengthening Irrigation Management in Egypt*, December 1995. The Economic Development Unit of the World Bank is also organizing a workshop on the turnover experiences in Mexico and Turkey, which can be integrated with this Program.

processes for carrying out its new functions and supporting administrative activity. The results of the Irrigation O&M Program will be a key input to this activity. Examples of possible areas of change include: the functions and organization of the Ministry; information flow and exchange processes; personnel policies; human resource development and training; budget and financial accounting systems and processes; delegation of authority; committee makeup and roles; and relationships to other ministries, donors and water users. The institutional study (IIMI 1995f) provides a more detailed set of opportunities for change.

e. Review and Recommend Changes, as Necessary, in the Ministry's Program Including the Investment Program

The Ministry's budget is formulated each year according to its program and activities such as operation and maintenance of the water supply and drainage system, major rehabilitation, IIP, field drain construction, research, etc. These program activities and their related costs may need to be changed to fit with the recommended changes in goals, policies and the role of the Ministry. The top managers will review the program in this step with the planning and budget manager, and make recommendations for change as needed to match the program with new goals and policies.

4.4.6 Develop an Implementation Plan

This step involves development of a detailed plan to implement the recommended changes in goals, policies, the Ministry's role, management processes, the legal framework, and the program and associated budget. The top managers will define the recommended changes and place priorities on them. They will develop the strategy for implementing the recommendations, and assign responsibility for the necessary activities for plan development. A time schedule will also be developed. Once the plan is developed, assignments to specific managers can be made to carry out the plan. This plan should also outline the process for change in the Ministry through involvement of Ministry staff.

Although shown as the last step in the sequence, this activity could be initiated at an earlier stage. Implementation of all proposed changes do not have to be delayed to the end of the period; those that seem clearly necessary and agreed upon can be initiated earlier.

4.5 Implementation Arrangements and Expertise Required

This Program, and indeed the entire Action Plan, will be guided by a Steering Committee for the Action Plan (SCAP), appointed by the Minister. These senior officials will be the main participants in the Management Strengthening Program described here. Their role in guiding the overall Action Plan, and evaluating the results emerging from the other activities, will enable integration of those results with the results of this activity. It is through this Committee that the Action Plan will be implemented as an integrated package.

The Program will make use of expertise existing in the Ministry wherever this is possible; for example the Planning Sector, NWRC, and the Irrigation Department have expertise that will be very important. But it also requires local and foreign consultants from outside the Ministry in various disciplines for several activities.

A management consultant is required to organize the Program, conduct team building activities and working sessions, organize and manage the training programs and conduct institutional diagnostic studies. Trained facilitators and specialists in team building will be required to assist in conducting the working sessions. Other specialists will be needed for implementing the special studies described in Annex 2 and other studies that may be required. As suggested in Section 4.3.2, it may be possible to identify a management training institution which could offer an integrated package of training (local and overseas) and management consulting services.

A senior water resources policy specialist will be required to assist in the review of the present and future water resource and water service situations, policy and goal review, redefinition of the Ministry's role and alteration of the program and budget to match new policies and goals.

Estimates of the required expertise, and also an overall schedule showing how this Program is integrated with the other two in this Action Plan are given in Chapter 5.

4.6 Anticipated Outputs and Impacts

With full commitment and support by the Minister and the active involvement of the Ministry's top management staff, this program will result in the following *outputs* and *impacts*:

- Realistic policy and goal recommendations to the Government for water resource management and water service based upon the most recent information about the current situation and the most likely future water resource situation. These recommendations will identify or propose:
 - A realistic position on development of upper Nile basin projects.
 - A realistic position on water supplies (quality and quantity) inside Egypt.
 - Effect of new land development on water supplies to the old lands and the production and economic consequences.
 - Water service required for industrial expansion and increasing domestic use.
 - The integrated management of surface and groundwater.
 - The proper role of IIP in water service.

- A redefined role of the Ministry for providing water service, and managing water resources and water quality management. This role definition will address:
 - The Ministry's role in developing and deciding national policy concerning water resources.
 - The key functions of the Ministry related to water service.
 - The key functions of the Ministry in managing water resources (supply, quality and uses).
 - The Ministry's role in obtaining additional water from the upper Nile basin.
 - The Ministry's role in relationship to activities and responsibilities of water users (customers) and other Ministries involved in water resources.
 - The Ministry's role in water resources research.
 - The Ministry's role in regulating water use and water quality.
- Recommendations to the Government for changes in the legal framework to address current and future water service and water resource management situations. These will address:
 - Sharing of water service costs.
 - Water quality control and management.
 - Priorities of water use and service.
 - Equipment and supply procurement.
 - Illegal activities by water users.
 - Regulation of water supply use and water rights or water commitments to water users of different categories.
 - Private sector involvement in water service activities.
- A plan to improve the management processes of the Ministry. The plan will include specific proposals related to:
 - Organization of the Ministry to carry out its redefined role and responsibilities.
 - Decision-making processes including delegation of authority.
 - Budget and financial accounting processes that are useful for making management decisions.

- Human resource development.
 - Personnel policies and procedures.
 - Equipment and supply procurement, management and disposal procedures.
 - Coordination among Ministry units.
 - Management style and environment.
- A plan for private sector involvement in the water service activities of the Ministry, which may include proposals regarding:
- The role and responsibilities of agricultural water users in both old and new lands.
 - The involvement of non-agricultural water users in the Ministry's water service activities.
 - The role of the private sector in providing services to the Ministry and assuming some of the water service activities of the Ministry.
 - The establishment of regional water service companies.
- A recommended program for enhanced coordination of the various Ministries involved with water resource management and water service, which could include:
- Mechanisms to address national water policy.
 - Mechanisms for exchange of information.
 - Approaches for long range water resource planning.
 - Programs for exchanging personnel for training purposes and to serve on task forces on issues concerning more than one Ministry.
- Changes in the institutional barriers impeding using IMS components to their full potential. Based upon IIMI's Study, some barriers which can be overcome are:
- Exchange of information between units.
 - Organizational location of management of special projects.
 - Coordination among IMS component units and units which would implement and benefit from the technology.
 - Spreading of donor project benefits (incentives, training, per diem) beyond the implementing unit.

- Sustaining the program after donor disengagement.
- Information concerning the benefits of the technology and how the technology helps staff in doing a better job.
- Effective training in use of the technology.
- Improvement of the ability of Ministry managers to use modern management techniques for better performance. This output should result in many changes and improvements in the following areas:
 - Process for assessing policy, goals and the role of the Ministry.
 - Decision-making and delegation of authority.
 - Staff performance evaluations.
 - Time management.
 - Communication skills.
 - Budgeting and accounting procedures.
 - Human resource and equipment planning, scheduling and utilization.
 - Coordination and communication between units.
 - Operation of top management as a team.
 - Openness and trust between managers (equal in rank and supervisor and subordinate).
 - Use of temporary task forces to address specific issues, fewer permanent committees and reduction in unproductive bureaucratic processes.

■ Identification of research issues.

This output should result in identification of research activities that address the policies and goals developed during this program and fit within the redefined role of the Ministry.

■ Changes in the Ministry's activity program and budget to match reformulated goals and policies.

This output should result in programs closely fitted to the Ministry's goals and policies in terms of priority and financial resources and the ability of Ministry managers to support their program budget request to the Planning and Finance Ministries.

- A detailed plan for implementing the proposed changes in Ministry goals, policies, role, management processes, legal framework, program and budget.

This plan will include implementation strategy, written proposals, time frame for implementation, and assignments for implementation. It is very likely that implementation of some of the proposed changes could begin prior to completion of this program.

The ultimate impact of implementation of the outputs should be improved water resource management and water services to users accomplished by an effective and efficiently run organization with appropriate involvement of the end users in decisions regarding the services they receive.

IMPLEMENTATION ARRANGEMENTS

5.1 Introduction

Chapters 2 to 4, which describe the three main Programs included in the Action Plan, present information on the proposed implementation arrangements as well. This is not fully repeated here. Rather, this chapter provides an integrated presentation of how the Action Plan could be implemented. Specifically, it discusses arrangements for managing the implementation of the Action Plan including the roles of the various partners; provides a tentative schedule of activities; presents a rough estimate of the inputs required for both the Ministry and the external partner; and gives suggestions on the reporting requirements.

This chapter does not contain a budget for two reasons. First, in the time available, IIMI was unable to obtain budgets from the Ministry; and IIMI did not have accurate information on costs to make its own estimate of Ministry costs. Second, in its formal comments on the earlier draft of the Action Plan, the Ministry requested it to be "presented in a more general way for any . . . consultant for the MPWWR to implement it." IIMI was not in a position to cost the inputs of other consultants as there are too many unknown factors.

5.2 Managing Implementation of the Action Plan

5.2.1 Committees and Task Forces of the Ministry

The Action Plan will address fundamental policy and institutional issues with a potentially profound impact on Egypt's future. Therefore, successful implementation requires the full support of the Minister of Public Works and Water Resources and the senior officials of the Ministry. It is therefore expected that the Minister will take an active interest in the implementation of the Action Plan and the results emerging from the work; and will continue to provide overall guidance and support. It is also very important that the Ministry officials themselves, and not outsiders, make the key decisions and in many cases carry out the necessary work. External partners can provide a great deal of support and active assistance, but *ownership of and commitment to* the results by the Ministry will occur only if the Ministry itself takes active responsibility.

It is proposed that the Minister appoint a *Steering Committee for the Action Plan (SCAP)*. The SCAP members would include a set of the most senior officials in the Ministry, but should also include some less senior officials who are likely to be promoted to senior positions in the next few years. The reason for this is that these less senior officials can benefit from the additional management training proposed in chapter 4, and

will ensure continuity of the Action Plan and future implementation of its results. In addition to the Ministry officials, the Ministry may wish to include representatives of the donor and external partner institution assisting the implementation of the Action Plan.

The role of SCAP has been discussed in chapters 2 to 4 with reference to each of the Programs. In the first place, it will be responsible for the overall guidance and evaluation of, and internalizing the results from, the implementation of the Action Plan. It will therefore serve similar functions to the various "High Coordinating Committees" now found in the Ministry. Second, the members of SCAP will be the key participants in the management training, team building and structured working sessions of the Management Strengthening Program. Thus, they will be the officials doing strategic planning and thinking regarding the future policies, roles, and institutional framework of the Ministry.

Third, the members of SCAP will guide both the Irrigation O&M and Cost Sharing Programs. This will allow the Ministry to ensure these Programs are implemented successfully, and their results are integrated into the work on Management Strengthening. It is the members of SCAP who will develop the key recommendations and plans emerging from the Action Plan, present them to the Minister for his suggestions and concurrence, and begin their implementation. Therefore, this committee will play a key role in seeing that the results are used to improve water resource management in future.

Section 2.6.3 discusses the role of SCAP and of several *temporary coordinating committees* in the implementation of the Irrigation O&M Project. Box 2.2 suggests the composition of these coordinating committees. IIMI has simplified the proposed committee structure after comments on the earlier draft that it seemed too complex. It may still seem complex to some, and of course committees are not always effective mechanisms for decision-making; but IIMI's experience in other countries with participatory action programs has shown the importance of regular and open communication and joint discussion. These proposed committees seem to be the best way to achieve this, but as the Program is implemented, adjustments can be made.

For the Cost Sharing Program, in addition to the overall guidance from SCAP, several *temporary task forces* are suggested for carrying out specific tasks. They will be assisted by consultants as needed (see Section 3.5).

5.2.2 Roles of the Partners in Implementation

This section lists the roles envisioned for the major participating organizations.

a. *Ministry of Public Works and Water Resources and its Departments/Units*

The Ministry of Public Works and Water Resources

- Provide overall guidance and support;
- Ensure availability of necessary staff and other resources within its budget;
- Ensure the active participation of officials assigned to the Program;

- Provide necessary permissions, clearances, decrees, etc;
- Ensure those trained remain in a position to make use of their training to contribute to the Program;
- Implement positive outputs of the work done under the Action Plan.

Irrigation Department (especially Irrigation Sector)

- Ensure availability of necessary staff and other resources within its budget;
- Actively participate in all aspects of Irrigation O&M activity;
- Complete necessary physical work in commands;
- Implement proposed O&M innovations to give them a fair test;
- Adopt and institutionalize proven innovations.

Irrigation Improvement Project

- Actively participate in the Irrigation O&M Program especially in IIP areas;
- Provide necessary staff (especially IAS);
- Strengthen WUAs in pilot command areas under IIP;
- Establish WUAs in non-IIP pilot command areas based on improved services;
- Establish WUA federations in command areas as planned;
- Assist to improve communication and interactions between District Engineer and farmers;

National Water Research Center

- Be responsible for monitoring and impact evaluation of Irrigation O&M Program;
- Participate in all aspects of planning, implementation and evaluation of Irrigation O&M Program;
- Provide necessary staff and supporting resources to carry out Irrigation O&M Program in the pilot command areas;
- Provide technical support and assistance, including research services, as needed (e.g., drainage, groundwater investigations);
- Maintain a data base on, and analyze and present data, on Program impacts;

- Facilitate and manage the process, in close partnership with the external partner;
- Prepare briefing papers, training modules, etc, including Arabic language translations;
- Train participating staff, including trainers from Training Center;
- Prepare scientific publications for wider scientific community.

Planning Sector

Water Planning Group

- Prepare briefing papers on water resource issues for the Management Strengthening Program according to MPWWR priorities;
- Provide data, and data analysis services, using models at its disposal;
- Provide technical support for computer modeling and data analysis to Irrigation O&M Program;
- Actively participate in workshops and other activities under all three components.

Main System Management Project¹

- Actively participate in the Irrigation O&M Program at all levels (command, district, directorate, central);
- Provide training and technical support as per normal activities;
- Provide any additional data and training required in the Program, as possible.

Communications Unit

- Plan, implement and evaluate public education and awareness campaigns on cost sharing issues.

Training Center

- Provide training services for the Irrigation O&M Program;
- Develop and implement new training programs based on outputs of all three components, in collaboration with NWRC and the external partner;

¹ This assumes the MSM implementation unit will continue after September 1996, which is not clear.

- Strengthen management training programs based on results of Action Plan;
- Provide a venue for training and workshop activities.

Other Ministry Units

Other Ministry units will be requested to participate as and when appropriate. For example, the Preventive Maintenance Project will participate actively in the improvement of maintenance in the pilot command areas.

b. External Partner

An international research institution with experience in both water resource issues (including institutional and management as well as technical aspects) and participatory action programs will be useful as a full partner working closely with the Ministry in implementing the Action Plan. It will have many functions, including:

- Provide multi-disciplinary technical support to all aspects of the Action Plan implementation through:
 - internationally recruited staff and consultants;
 - a small core of Egyptian professional staff.
- Provide overall administration and management services for Action Plan implementation, including:
 - coordination among all the various parties;
 - arranging and managing workshops and other meetings;
 - preparation of work plans, workshop materials, training materials, briefing papers, and necessary reporting to the Ministry and the donor;
 - subcontracting with other entities for special studies, research, and training services;
 - arranging for specialized management training both in-country and abroad;
 - providing direct training, through formal courses and on-the-job training, to participants in the Action Plan;
 - Working with the NWRC and other professionals in preparation of reports, conference papers, journal articles and other publications for the international scientific community;
- Prepare the required Quarterly Progress Reports, Annual Reports, Final Report, and other necessary materials, in English.

c. *The Donor*

Implementation of the Action Plan requires assistance from a major donor. The donor's role will include the following:

- Provide flexible and sufficient financial and other support to enable the implementation of the Action Plan;
- Participate actively in committee meetings, workshops, etc to assist and guide the implementation of the work;
- Provide consistent long-term support to ensure that the Ministry is able to take full advantage of the outputs for long-term improvement of its management capacities and performance.

d. *The Water Users*

The Irrigation O&M Program will create mechanisms for enhancing the role of water users. Obviously they have not been consulted in the preparation of this Action Plan. It will be very important to seek their assistance as they are the "customers" of the Ministry. They will:

- Participate actively in the planning, implementation and evaluation of the Irrigation O&M work on pilot command areas through WUAs or other organizations;
- Provide feedback on how management innovations affect farm productivity and incomes;
- Non-agricultural users will begin sharing costs of water services.

e. *Others*

Other parties will participate in selected activities. For example, the local units of the Ministry of Agriculture and Land Reclamation will be asked to participate in the work on pilot command areas. A number of Egyptian research and training institutes and universities will be asked to provide management training and research services. The technical assistance teams for IIP and the Strategic Research Program will be asked to collaborate as appropriate.

5.3 Tentative Schedule of Activities

5.3.1 Introduction

The Action Plan is a complex set of many different activities. There are many unpredictable factors which may affect its implementation. Further, the nature of institutional change is such that it must be carried out in a flexible manner, building step-

by-step on lessons learned in previous steps, including the field study. Therefore, as discussed in other chapters, no *blueprint* is possible for the three year period.

It is also very important that all the key participants in implementation play an active role in all of the planning, as well as implementation and evaluation of results. This is the essence of a participatory approach. It is the only way to ensure a real sense of ownership and commitment to the program and its results.

Therefore, at this stage, we can only provide an outline of the expected major activities and estimated schedule. The Inception Period will be used to develop and elaborate more detailed plans, including assignment of implementation responsibilities, agreed milestones, performance criteria, etc. *This period is not just for "planning" but is an implementation process itself for building ownership and commitment, and developing working relationships to ensure good teamwork, which are prerequisites to success.*

5.3.2 Inception Period: Planning, Mobilization, Commitment -- Months 1-4

a. Overall Program

- Establish the proposed *Steering Committee for the Action Plan (SCAP)*;
- Recruit and assign staff;
- Procure necessary equipment;
- Initiation Workshop to brief key participants on the overall Action Plan (one day);
- Plenary Workshop to finalize the Work Plan (two days);
- Approval of Work Plan by SCAP.

b. Irrigation O&M Program

- Confirm selection of command areas;
- Establish *O&M Program Steering Committee* (SCAP will play this role, so it is not a new committee);
- Establish *Central Directorate Coordinating Committee* (meets quarterly);
- Establish *Directorate Coordinating Committee* in first site (meets quarterly);
- Establish *District Coordinating Committee* in first site (meets quarterly);
- Prepare detailed implementation plans in first site at command, district, directorate, and central levels (a rolling three year plan, more detailed first year plan subdivided by quarters);

- Prepare detailed impact monitoring and process documenting plans;
- Finalize walk-through surveys of command;
- Obtain necessary special permissions;
- Initiate essential rehabilitation on the command area;
- Carry out necessary training of all involved staff;
- Install necessary equipment;
- Prepare a draft Work Plan;
- Workshop to finalize plans for presentation at Plenary Workshop (2 days);
- Approval of plans by appropriate committees including SCAP;
- Begin implementation in first site.

c. Cost Sharing Program

- SCAP to guide the program (to meet quarterly);
- Develop strategy for introducing cost sharing of water services provided to non-agricultural users;
- Develop a strategy for a public education program and awareness (in collaboration with the Communications Unit);
- Prepare terms of reference for and recruit a consultant, to prepare a detailed terms of reference and request for proposals from Egyptian consulting firms; the selected firm will assist in designing and testing a functional budgeting and accounting system;
- Prepare an outline of the detailed cost sharing implementation plan which is to be prepared;
- Prepare terms of reference for special supporting studies and identify local research organizations to carry out the work;
- Based on the above, prepare a Work Plan;
- Workshop to discuss and finalize plans for presentation at the Plenary Workshop (2 days);
- Final approval of Work Plan by SCAP;
- Initiate work based on approved Work Plan.

d. *Management Strengthening Program*

- Steering Committee for the Action Plan (SCAP) to constitute core group participating in this Program;
- Finalize selection of appropriate training programs and management expertise both inside and outside Egypt;
- Develop criteria for selection of officials to be trained;
- Finalize names of officials to be trained;
- Arrange for training programs (in Egypt and abroad; this may involve contracts with institutions which can offer package of short term specialist assistance, and training to be done in-country as well as abroad);
- Finalize terms of reference for preparatory studies identified in Annex 2;
- Identify specialists in Ministry, in Egypt, and/or outside to carry out preparatory studies;
- Prepare a detailed Work Plan;
- Preparatory Working Session to finalize Work Plan and initiate team-building training;
- Approval of Work Plan by SCAP;
- Begin implementing preparatory studies;
- Begin implementing training programs.

5.3.3 Implementation -- First Phase -- Months 5-16 [1 Year]

a. *Overall Program*

- Continuously monitor, coordinate and evaluate activities and results;
- Continue good communications among all parties;
- Communicate progress to all parties (Ministry, donor, etc);
- Biannual meetings of SCAP (2 meetings, months 10 and 16);
- Prepare Quarterly Action Plan Progress Reports for Ministry and donor.

b. Irrigation O&M Program

At Central Directorate Level:

- Complete staffing plans and initiate work.

At first site:

- Complete necessary rehabilitation of first command area;
- Implement Program on first command area;
- Continue training of participating officials and researchers as necessary;
- Quarterly reviews of progress, and adjustment of plans as necessary (on-going throughout period);
- Prepare Seasonal Progress Reports² (on-going throughout the period).

Based on lessons from first 6 months at first site:

- Establish Directorate Coordinating Committee at second command area;
- Establish District Coordinating Committee at second command area;
- Prepare detailed implementation plans for second site at command, district, directorate, and central levels (rolling 2.5 year plan, with more detailed first year plan, by quarters);
- Prepare detailed impact monitoring and process documenting plans for second command;
- Finalize walk-through surveys of second command;
- Obtain necessary special permissions on second command;
- Carry out essential rehabilitation on second command;
- Carry out necessary training of all involved staff in second site;
- Install necessary equipment in second site;
- Implement program on second site;

² It seems most sensible to limit reporting by the Irrigation O&M Program to seasonal rather than quarterly reports; each seasonal reports would be integrated into every second Quarterly Report.

- Reviews of progress and adjustment of plans as necessary [on-going throughout the period];
- Prepare Seasonal Progress Reports.

Months 14-16:

- Critically compare and evaluate progress at both sites;
- Prepare briefing papers on results and recommendations to date;
- Hold workshop to evaluate results and recommend next steps (3 days)
- Develop detailed plans for next steps in sites 1 and 2;
- Complete committee-formation, planning, training, rehabilitation etc processes (as above) for site 3 based on lessons learned from other sites;
- Begin implementation at third site.

c. Cost Sharing Program

- Implement plan for introducing cost sharing of water services provided to non-agricultural users.

(This will include a combination of surveys and studies to identify major users; assessment of how much water is used and its value; a political decision to proceed with sharing water service costs with non-agricultural users; establishment of procedures for collection, use and accounting for funds; interactions with various kinds with municipalities, large industrial users, other Ministries, etc.)

- Implement a public education and awareness campaign (through the Communications Unit);
- Implement the study to document impact, results, responses, and lessons learned from mesqa improvement cost recovery program in collaboration with IIP;
- Design and begin implementing the new functional budgeting and accounting system in selected areas and assess the results and impact;
- Implement the special supporting studies;
- Design and implement the study on options for service fee collection;
- Finalize the implementation plan for cost sharing by agricultural users;

- Prepare Quarterly Progress Reports;
- SCAP to meet quarterly to discuss progress.

Months 15-16:

- Hold workshop to critically evaluate progress and recommend adjustments;
- Prepare a revised Work Plan for next steps;
- Approval of revised Work Plan by SCAP.

d. Management Strengthening Program

- Complete the preparatory studies identified in Annex 2;
- Complete the formal training of senior participants;
- Hold Working Sessions (all include some team-building or other training exercises):
 - Assess present water resource situation;
 - Assess future water resource scenarios;
 - Review existing water resource management, goals, policies;
 - Develop recommended changes in water resource management, goals, policies;
 - Begin examining institutional and management issues to recommend necessary changes (e.g., role of Ministry, legal framework, Ministry program and budget);
- Evaluate program and make necessary adjustments;
- Identify management training needs not addressed so far;
- Prepare Quarterly Progress Reports;
- Approval by SCAP of updated Work Plan.

5.3.4 Implementation -- Second Phase -- Months 17-30 (1+ Year)

a. Overall Program

- Continuously monitor, coordinate and evaluate activities and results;
- Continue good communications among all parties;
- Communicate progress to all parties (Ministry, donor, etc);

- Meetings of SCAP (2 meetings, months 22 and 30);
- Prepare Quarterly Action Plan Progress Reports for Ministry and donor.

b. Irrigation O&M Program

- Continue implementation of activities at all three sites (and initiate fourth site if necessary);
- Regular reporting on impacts and processes (Quarterly Progress Reports);
- Regular evaluation by committees;
- Develop draft training modules and briefing papers, and continue training as necessary in all three sites;
- Make adjustments in package of innovations, implementation methodology, etc as needed based on lessons from experience.

Months 28-30:

- Workshops at all three sites to identify lessons learned and recommendations for future implementation;
- Workshop on lessons learned at Directorate and Central Directorate levels;
- Joint workshop of key participants from all sites to consolidate lessons and recommendations on how to institutionalize improved water management;
- Revise Work Plan for final phase;
- Approval by SCAP of Work Plan for remaining period.

c. Cost Sharing Program

- Continue work on implementing cost sharing by non-agricultural users;
- Continue public education and awareness campaign;
- Continue implementation and expansion of functional budgeting and account system;
- Continue work to improve mesqa improvement cost recovery program;
- Develop draft legislation for cost sharing (by all users; this may be part of other legislation emerging from Management Strengthening Program);
- Hold workshops to disseminate results and develop future activities;

- Prepare Quarterly Progress Reports;
- SCAP to meet quarterly.

Months 29-30:

- Critically review progress and identify necessary steps to consolidate and institutionalize results to date;
- Identify critical activities for remaining period of Action Plan;
- Prepare revised Work Plan for final phase;
- Workshop to review and finalize results;
- Approval by SCAP of Work Plan for remaining period.

d. Management Strengthening Program

- Complete Working Sessions on Ministry management processes;
- Recommend any necessary changes in management processes;
- Review and recommend necessary changes in Ministry's work program;
- Develop a long-term plan for implementing recommended changes in goals, policies, management processes, etc.;
- Evaluate results of Management Strengthening Program;
- Identify future management training needs;
- Begin implementing changes not already initiated.

5.3.5 Consolidation and Institutionalization -- Third Phase -- Months 31-36 (6 Months)

a. Overall Program

- Integrate lessons learned from all components;
- Adjust Management Strengthening Implementation Plan as necessary to incorporate results of Irrigation O&M and Cost Sharing Programs, leading to a long term program for implementing and institutionalizing specific changes;
- Commission external evaluation of results of the Action Plan;

- Workshop to discuss results and lessons learned (4 days);
- Prepare the Final Report, and any other training modules, briefing materials, etc required.

b. Irrigation O&M Program

- Complete implementation work at all sites and Central Directorate;
- Finalize development of training materials for future implementation by Ministry;
- Prepare the Final Report on lessons learned and recommendations for implementing and institutionalizing changes in water management policies and practices, and future research needs;
- Wrap-up Workshop with participants;
- SCAP to review Final Report.

c. Cost Sharing Program

- Continue implementing cost sharing by non-agricultural users;
- Continue public education and awareness campaigns;
- Implement functional budgeting and account system throughout Ministry;
- Continue work to improve mesqa improvement cost recovery program;
- Finalize recommended legislation for cost sharing and submit for legislative approval;
- Develop a plan for future implementation steps;
- Prepare Final Report on what was accomplished, and what needs to be done in future;
- Workshop to discuss plan for future steps, and Final Report;
- SCAP to approve Final Report, which will include proposals for future steps.

5.4 Estimate of Inputs Required

5.4.1 Suggested MPWWR Inputs

This section gives a **tentative** list of Ministry inputs needed for implementation of the Action Plan. Estimated inputs to the Cost Sharing and Management Strengthening Programs are relatively small and consist primarily of persons carrying out their regular activities focussed on selected subjects and time spent in training programs. On the other

hand, the list of inputs for the Irrigation O&M Program is quite extensive. It is likely to require considerable revision when detailed planning for implementation starts. An important kind of support the Ministry will need to provide is appropriate incentives for participants in the Action Plan work.

a. *Ministry Support for the External Partner*

In order to ensure close cooperation between the Ministry and the external partner, the Ministry should be prepared to assign office space equipped with airconditioning and telephone lines, and some logistical support.

b. *Ministry Inputs to the Irrigation O&M Program*

The inputs required from the Ministry have been divided into four categories:

- Inputs for the activities to be carried out by the pilot Irrigation Districts and their parent Irrigation Directorates;
- Inputs for the activities to be carried out by the Central Directorate for Water Distribution;
- Inputs from the National Water Research Center for activities to be carried out in collaboration with the external partner;
- Other NWRC research activities.

Many of the staff and facilities listed below are already available and in place. That is, not all of the items in this list represent additional costs to the Ministry. The Ministry will want to determine which items represent additional costs.

Inputs for Activities at the Pilot Districts and Directorates

- **Staff** No additional staff will be needed at the Directorate offices. The following lists the staff needed at *each District Office*. Section 2.6.4 provides an explanation of these requirements. It is assumed that the number of administrative staff, maintenance laborers, gatekeepers, and minor staff are now adequate; these persons are not mentioned here. Some of the needed engineers and technicians are already in place.
 - District Engineer (already in place)
 - Maintenance Engineer (civil)
 - Irrigation Operations Engineer
 - District IAS Engineer
 - About 20 Maintenance Technicians

- 3 Water Measurement Technicians
 - About 20 Water Distribution Technicians
 - 1 Database Technician
 - About 5 IAS Field Supervisors
 - About 50 IAS Field Agents (this assumes all WUAs will be organized at the same time; if work is phased a smaller number can be used).
- ***District Level Equipment*** The following is a list of equipment needed in *each District* to upgrade flow measuring, communications, data handling, and other items needed for the innovations to be implemented. Again, some or all of this equipment may already be in place or available elsewhere. It is assumed that the present office furniture and other office equipment is adequate.

For Measurement-Based Flow Control:

- 2 telephone lines and sets
- 1 fax machine
- 2 current meters
- 2 motorcycles (for the District flow measurement team).

For Information Systems for Decision-Making:

- 2 computers with printers and software
- 1 meteorological data station (may not be necessary).

For Integrated Water Budgeting:

- 1 pH meter for water quality assessment
- 1 salinity meter for water quality assessment.

For Improved Demand Assessment:

- maps, aerial photos, satellite photos as found useful for crop forecasting.

For Improved Maintenance Management:

- Preventive Maintenance manuals and computer software.

For User Involvement in Decision Making:

- IAS field support, including provision of transport and other special costs.

For General Support:

- 4 cars for the four engineers.
- **Directorate Level Equipment** The following is equipment needed for *each Irrigation Directorate* office to support the district level changes. It is assumed that water measuring equipment has already been supplied through the MSM Project.
 - 1 fax machine to communicate with the District office
 - 2 computers with printers and software for database development
 - 1 set water quality measuring equipment to support water budgeting activities
 - Maps, aerial photos, and satellite photos as found useful for crop forecasting
 - Preventive Maintenance manuals and computer software.
- **Construction Expenses** Some repairs to control structures will be needed to use them as flow measurement points. The number of structures listed here is a rough guess for *one district* only; surveys will be needed for more exact figures and for cost estimation. Also, to properly test continuous flow, it will be necessary to upgrade one canal in each District.
 - Repairs for about 100 control structures
 - Redesign/construction for continuous flow in one distributary canal.
- **Operating Expenses at District Level** There will be a need to provide funds to cover the operating expenses for the items listed above, including the 2 motorcycles and 4 cars per District. It is estimated that each motorcycle will be run about 1500 km per month and that each car will be run about 2000 km per month.
- **Other Inputs** This is an additional anticipated input.
 - Six to twelve person months assistance from the PSM unit for implementing operational models.
- **Authorizations Needed** The following items are areas in which the Ministry will need to authorize changes in operating rules and procedures on an experimental basis. The exact details will be worked out as part of the detailed planning for each pilot site.
 - Involving farmers in District and Directorate decision-making

- Giving District Engineers greater responsibility for operations
- Giving District Engineers greater control over maintenance resources.

Inputs for Central Directorate Activities

- **Additional Staff** In order to strengthen its ability to measure flows and control the main canals, the Central Directorate has proposed to establish four field offices for the Upper Egypt Regional Directorate and three field offices for the Lower Egypt Regional Directorate. If established, all of these will need to be staffed and equipped. In addition, more staff is needed in Cairo to support the proposed computerization. IIMI estimates that the following additional staff will be needed if all this is done:

- 2 additional engineers for the Cairo office (bringing the total to 4)
- 7 field engineers, one engineer at each field office
- 21 water measurement technicians, 3 for each field office
- Some additional office and other staff for the field offices.

- **Equipment**

For the Central and the three Regional Offices The following equipment is needed, in addition to the existing equipment, to support the computerization of the offices and to provide better communication with the field:

- 5 computers with printers and software (2 for Cairo, 1 for each Regional office)
- 1 additional telephone line and instrument in Cairo
- 4 radio communication stations.

For the Proposed Field Offices The following equipment will be needed to support the field offices described above:

- 7 pickup trucks
- 7 cars
- 14 current meters
- 7 computers with printers and software
- 7 telephone lines and instruments
- 7 radio communication stations.

- ***Operating Expenses for the Central Directorate*** Provision must be made for the operating expenses of the equipment listed above. Vehicle operating expenses are estimated at 2000 km per month per vehicle.

Inputs for NWRC Activities in Collaboration with the External Partner

- ***Staff*** NWRC will supply the field teams needed to support the Irrigation Sector personnel and monitor the activities and impacts in the three pilot sites. Following is an estimate of the staff needed:
 - 36 person months of one or two senior scientist(s) to work with the external partner's staff to oversee the activity;
 - 36 person months of a middle level scientist for supervision of the field work;
 - 3 junior irrigation engineers for 24-36 months each
 - 3 junior social scientists for 24-36 months each
 - 3 junior economists for 24-36 months each
 - 18 data collectors for 24-36 months each
 - 3 data entry operators for 24-36 months each
 - Field housing or allowances for all junior scientists; it is recommended that the data collectors and data entry operators be recruited locally so that no housing will be needed.
- ***Office Operating Expenses*** Each field team will need an office. Provision must be made for rental of 3 field offices for 24-36 months each. In addition, provision is needed for normal office operating expenses, including telephone bills.
- ***Office Equipment*** The following is suggested for furnishing *each field office*:
 - 1 telephone line and telephone
 - 1 fax machine
 - 4 computers with printers and software
 - 1 photocopier
 - 1 overhead projector
 - 2 easels for flip charts

- 1 whiteboard
 - 5 desks with chairs
 - 1 conference table with 10 chairs each
 - 3 filing cabinets
 - 3 bookcases.
- **Field Equipment** The following is a list of equipment for *each field team* to meet the anticipated needs for monitoring impacts, particularly impacts on water distribution:
- 3 current meters
 - 4 data loggers
 - 12 cutthroat flumes of assorted sizes
 - 1 pH meter
 - 1 salinity meter
 - 6 piezometers
 - 12 staff gauges
 - 1 Dumpy level.
- **Vehicles** The field team will need mobility. The following vehicles will be needed for *each field site*:
- 6 motorcycles (1 for each data collector)
 - 1 jeep or car for transporting scientists
 - 1 pickup truck for transporting equipment.
- **Vehicle Operating Costs** There will be a need to provide for vehicle operating expenses. It is estimated that each will cover 2000 km per month.

Other NWRC Research Activities It is anticipated that NWRC institutes, specifically the Groundwater Research and Drainage Research Institutes, will be asked to undertake specific hydrological studies in the pilot districts. At this time it is not possible to fully define these studies.

c. Ministry Inputs to the Cost Sharing Program

The primary Ministry input for this Program will be the time and expertise of officials through SCAP and through the suggested task forces. In addition, the Ministry needs to budget for the costs of public awareness campaigns; and for the cost of a local firm to assist in designing and implementing a functional budgeting and accounting system.

d. Ministry Inputs to the Management Strengthening Program

For this activity, most of the inputs consist of time by officials and staff of various Ministry units. Some of these activities, other than training activities, can and should be viewed as normal parts of the job. Others will be additional to their normal tasks. An indicative list of inputs follows:

- Preparation of background policy papers and carrying out preliminary studies by the Planning Sector with support from NWRC, the external partner, and others; this will require an estimated 24 person months of Ministry staff time plus small data collection and analysis costs;
- Involvement of top managers in working sessions -- about 24 days for each of 12 top managers over two years;
- Involvement of managers in training -- about 72 person weeks of training offshore and about 20 person weeks of training in Egypt over two years.

5.4.2 Suggested External Inputs

This section provides a tentative list of the inputs needed from an external partner. The suggested full-time staff will work on more than one of the Action Plan Programs, and the equipment and other resources will be dedicated to all of the Programs. Therefore, this list is not divided by Program.

- **Staff** Suggested long and short term expatriate and Egyptian specialists are as follows:

Full time expatriate Staff:	<u>Person Months</u>		
	<u>Year 1</u>	<u>Year 2</u>	<u>Year 3</u>
Institutional Specialist	12	12	12
Irrigation Engineer	12	12	12
Policy Analyst	12	12	12

One of the above staff will be appointed as Team Leader.

Brief terms of reference for expatriate staff:

The *team leader* will be responsible for the overall management of the external partner's program in Egypt, including maintaining relations and good communications with the Ministry and the donor, coordinating and leading the overall program. This person will

be one of the three internationally recruited specialists and will fulfill the leadership role in addition to her or his specialist role.

The *institutional or management specialist* will be responsible for guiding the Management Strengthening Program and the institutional aspects of the Cost Sharing and Irrigation O&M Programs, and designing and implementing research on institutional issues.

The primary responsibility of the *irrigation engineer* will be to provide the technical leadership and guidance for the Irrigation O&M Program. She or he will be expected to spend a substantial period in the field, guiding the planning, implementation and evaluation of the innovations. She or he will provide substantial informal and formal training of both water managers and researchers. The irrigation engineer will also provide guidance on the water resource aspects of the management strengthening program, and design and implement research on important water resource management issues.

The *policy analyst* will be responsible for designing and in some cases carrying out special studies and analyses required to implement the planned cost sharing and management strengthening programs, and assist in designing and implementing irrigation performance and impact research. More broadly, this person may be asked to design, supervise and implement studies on other major policy issues facing Egypt and the Nile Valley.

Full time Egyptian Professional Staff

Because much of the work on planning, monitoring, impact analysis, etc will be done by NWRC and others, the external partner will require only a small team of Egyptian professionals, as follows:

	<u>Person Months</u>		
	<u>Year 1</u>	<u>Year 2</u>	<u>Year 3</u>
Co-Team Leader	12	12	12
Irrigation Engineer	12	12	12
Social Scientist	12	12	12
Programmer/Statistician	12	12	12
Management Specialist	12	12	6

Brief Terms of Reference

In implementing the present Study, IIMI found that having a senior well-respected Egyptian professional as *co-team leader* is useful. Therefore, IIMI suggests maintaining this position for implementation of the Action Plan. The person will be responsible for working closely with the Team Leader and other team members to guide the program and ensure it is "on track" with the Ministry; advise the team to ensure the Program is consistent with Ministry needs; act as an additional liaison with senior Ministry officials to ensure good communications in both directions; and provide technical advice on water resource and other issues to the team, especially with respect to the irrigation O&M and water resource activities. This person should be accepted by the Ministry.

The *irrigation engineer* and the *social scientist* will be primarily responsible for working on the Irrigation O&M Program, and will be expected to spend considerable time in the field. The *management specialist* will carry out specialized studies and analyses primarily in support of the Management Strengthening Program, but will also assist as needed in the other two components. The *programmer/statistician* will be responsible for designing and maintaining data bases, designing and implementing data analysis procedures, assisting in sampling design, and producing reports. All of these specialists will be expected to provide training to their NWRC and Ministry counterparts.

Short term Technical Assistance

A preliminary estimate of the requirements for short term consultants is given in Box 5.1. It will need to be adjusted on an annual basis depending on actual needs.

■ Vehicles and Equipment

It is assumed that the computers and other office equipment purchased under the Cooperative Agreement for the present Study will continue to be available for the external partner's use. Box 5.2 provides an estimate of additional equipment needs.

5.4.3 Training Programs

Training is an important input, both within and outside Egypt. Workshops and on-the-job training will also be important for specific purposes.

This section gives a tentative list of training activities for each of the Programs. As with the equipment list, the final decisions will only be made during the implementation of the Action Plan.

Training for the Irrigation O&M Program

Training, including workshops and awareness sessions, is a major means of preparing personnel for changes in their work. However, it is not possible to specify exactly what training is needed until detailed plans are drawn up each season. Illustrative areas are shown below.

All training for this component will be in Egypt. For the most part, training activities will be carried out in cooperation with the Training Center. Much of the training will be in the field and will be carried out in short sessions of a few days only. Workshops and other forms of activities similar to training may be carried out by the Irrigation Sector assisted by NWRC and the external partner.

Training of District and Directorate staff may include:

- Training in calibration of structures for District level and Directorate level staff

Box 5.1 Estimated Short Term Technical Assistance Required

	<u>Person Months</u>		
	<u>Year 1</u>	<u>Year 2</u>	<u>Year 3</u>
<i>Expatriate Consultants</i>			
Senior Economist	2	2	2
Senior Irrigation Engineer	3	2	1
Senior Social Scientist	3	2	2
Process Documentation	2	0	0
Management Specialist	4	6	2
Workshop Facilitator	2	3	2
Water Policy Specialist	2	1	1
Financial Management Specialist	3	2	2
Cost Sharing Specialist	2	2	2
<i>Egyptian Short Term Specialists</i>			
Senior Technical Advisors	3	3	3
Economists	3	3	3
Financial Management Specialist	4	4	4
Water Policy Specialist	2	1	1
<i>Administrative Support Staff</i>			
Administrative Officer	12	12	12
Secretaries (2)	24	24	24
Drivers	60	60	60
Office Messengers	24	24	24
Training/Procurement	8	6	0

Box 5.2 Estimated Additional Equipment Needs for External Partner

- | | |
|---------------------------------|--|
| ■ 3 Office cars | ■ 1 Fax machine |
| ■ 2 Field vehicles | ■ 2 Camera 35 mm |
| ■ 4 Notebook computers | ■ 2 Automatic paper feeders for photocopiers |
| ■ 1 Desk top computer | ■ 2 Telephone equipment (2 lines) |
| ■ 1 Desk top computer | ■ Misc. office equipment |
| ■ 1 Color laser printer | ■ 4 each: Book cases, file cabinets |
| ■ 1 High-quality laser printer | ■ Field office furniture (as needed). |
| ■ Computer software (as needed) | |
| ■ 2 Overhead projectors | |

- Training for District field staff in management of continuous flow
- Training in computers and in special programs for relevant staff
- Training in computing water budgets
- Training in simple water quality assessment
- Training in improved demand forecasting techniques
- Training in maintenance management techniques
- Awareness programs on user involvement in decision making

Training of Central Directorate staff may include:

- Basic and other training for IAS staff.
- Training in calibration of structures and flow measurement
- Training in computers and specific software
- Training in demand forecasting.

Planned workshops include:

- A planning workshop for each field site
- A planning workshop for Central Directorate personnel
- One or more workshops on localization of management responsibilities and user involvement for each field site
- A workshop on water budgeting for each field site
- A workshop on maintenance management for each field site
- A final wrap-up workshop.

These lists do not exhaust the training to be provided under this component; training is a major part of the participatory action process.

Training in the Cost Sharing Program

The most important training requirement will be on the use of new collection procedures for collecting services fees from non-agricultural and, eventually, agricultural water users; and on the use of the new functional budgeting and accounting system. It is likely there will also be several workshops to address various issues, but these cannot be specified at this point.

Training in the Management Strengthening Program

Management training and team building as part of the working sessions form two of the major activities of this Program. Again, decisions are needed on the mixture of overseas and Egypt-based training (see Section 4.3.2). Planned training sessions include:

- Overseas management training course for top managers of 2-3 weeks or 3 months for some other managers (some may be done in Egypt);
- Shorter management training courses for the managers in Egyptian management training institutions.

In addition, there will be at least nine "working sessions" at which the top managers, with the help of a facilitator, thoroughly discuss and come to agreement on key policy and management issues.

5.5 Outputs, Impacts, and Reporting

At the end of each chapter, anticipated outputs and impacts of each program are listed in detail. These are not repeated here. The Action Plan is a very ambitious and far-reaching set of activities. If it is successfully implemented, it is to be expected that the impact will be very important in setting the future direction of water resource management in Egypt. It is therefore important to ensure that there is regular reporting of the results and lessons learned from this work. On the other hand, overwhelming the participants with huge reports will not be productive. Therefore, all reports should be short and specific (or contain an executive summary); and much of the reporting should be in Arabic as well as in English to maximize communication of results.

Reports specific to each Program are discussed in chapters 2 to 4. These are not repeated here. Following is the suggested reporting for the Action Plan itself:

- Quarterly Progress Reports, due one month after the end of each quarter. These will be the basis for discussions by SCAP.
- The fourth quarterly report each year will be the Annual Report, summarizing results for the previous year (these can be on an anniversary, fiscal or calendar year basis). In addition to being discussed in SCAP meetings, these may be discussed at annual workshops of key participants.
- A Report on the External Evaluation of the implementation of the Action Plan.
- A Final Report will be prepared at the end of the three year period. This report will review what was done, what changes had to be made during the implementation period and why, what lessons were learned, what were the outputs and impacts, and what is the likely future impact. It should also recommend the next steps for the Ministry, as the Action Plan is really the first phase of a long-term change program. The draft report will be the basis for a final workshop reviewing the results of the Action Plan.

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ANNEXES

ANNEX 1.A

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Irrigation Operations Action Plan:

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Eng. Khaled Bekheit	Irrigation Improvement Project
Eng. Mohamed Hamed Abdul Latief	Planning, Studies and Models
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ANNEX 1.B

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Dr. Mohamed Mahmoud Hilal	Financial Management Specialist (Consultant)
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ANNEX 2

SPECIAL STUDIES TO SUPPORT THE ACTION PLAN

INTRODUCTION

This Annex provides brief descriptions of four special studies whose results would be important to the success of the Action Plan. They all support the Management Strengthening Program. For each study, arrangements for their implementation are suggested.

SPECIAL STUDY NUMBER 1: PERFORMANCE ASSESSMENT OF THE IRRIGATION IMPROVEMENT PROJECT (IIP)

Objectives

The IIP is an important mesqa- and farm-level intervention supported under the IMS Project. It provides the basis for new ways of delivering water to farmers and new farmer responsibilities in system operation. IIP is now fully operational in about 70,000 feddans and thus can be evaluated on a significant scale.

More efficient on-farm water use, increased production, more equitable delivery of water, and higher cropping intensities have been recorded in pilot areas, and it has been suggested that water can be saved through IIP activities. But a number of important issues remain unresolved.

It is widely agreed that Egypt's water supply is, or is likely to become, a constraint to agricultural production. With this factor in view, a major objective of the IMS activities was to increase the productivity of water, through the package of innovations included in IIP, the telemetry system, improved main system management, etc.

The evidence for the impact of IIP is fragmentary, anecdotal, and largely based on the wrong "unit of account", namely water *diverted*, rather than water *consumed*.

The impact of IIP interventions on the productivity of water can be one of three possibilities:

- None -- the relationship between water consumed and production is unchanged;
- Reduced productivity of water -- the amount of water consumed has increased in relation to production; or

- Increased productivity of water -- production has increased in relation to water consumption, through: a) a reduction in water consumption while production remains constant; b) increased production with constant water consumption; or c) increased water consumption and a *more than proportional* increase in production.

Although the proposed study will focus on the impact of IIP, it is suggested that other donor-funded projects with similar objectives should also be examined, including the Egypt Water Use Project (EWUP), funded by USAID; ESAWIP, funded by Canada; and the Dutch-funded work in the Fayoum.

The results of this study will be especially useful for the Management Strengthening Program when it addresses future policies and roles of the Ministry. It can also be used to achieve and establish a performance baseline for the pilot command areas of the Irrigation O&M Program.

Policy Implications

Understanding which of the above impacts is being achieved has important implications for future investment and water allocation policies. If IIP interventions are productivity-neutral or negative, justification for expansion of IIP investments will depend on: local circumstances (the extent to which return flows can or cannot be recaptured); non-production impacts (equity, improved scope for conflict resolution); or other benefits, such as the possibility, in situations of severe shortage, of transparent allocation of water among mesqas.

If, as seems more likely on the basis of the available evidence, IIP has led to improved productivity of water, understanding and measuring the cause of this change -- reduced water consumption, increased agricultural production, or increased production and consumption -- is fundamentally important.

If water can be saved without cost to production in the old lands, then expansion into new lands can be continued in balance with investments to save water in the old lands.

If production can be increased with the same amount of water use in the old lands, the implications for releasing water to new uses is more complex: it is not necessarily the case that water can be withdrawn from existing areas without production losses, because operating under a degree of shortage has poorly understood implications for system operation and water allocation policies.

If increased water supply to the old lands leads to more than proportional increases in production, then it can be concluded that production is already water-constrained in the old lands, and meeting growth targets for agriculture will be far easier to achieve by intensifying in the old lands than "extensifying" into new lands.

Further, understanding *which* of the IIP components contributes to impacts, and quantifying these impacts, will provide a basis for refining the composition and phasing of IIP interventions to maximize the benefits in relation to costs.

Institutional Implications

The MPWWR, like all water resource agencies, oversees or carries out six functions:

- data collection;
- planning;
- design;
- construction;
- O&M; and
- regulatory activities (that is, dam safety, pollution control).

The balance among these activities is determined by the stage of water resource development. If there are major gains to be made by IIP system improvements, then MPWWR's future will include substantial construction work. This will have important implications for any future institutional reform program.

Activities, Time Schedule and Outputs

Phase 1

The first part of this study will involve a review of all data collected so far regarding productivity and water delivery and consumption in IIP areas and other areas. A considerable effort will be required to collect, collate, and analyze existing data on the performance of IIP, as well as EWUP, ESAWIP, and the Fayoum project. The usefulness and feasibility of using data bases held by the Egyptian Survey Authority, and the data from the 1992 crop inventory, will also be explored. Data quality is an important consideration: using poor quality data or overly simplistic analytical methods will compromise the usefulness of the study.

IIMI has used interpretation of satellite imagery data in other projects as a basis for tracking changes in cropping intensity, equity, and production and has found this useful and cost-effective. The same approach can be used to analyze IIP (and possibly other projects') impacts. The analysis would use a sequence of historical data for IIP and non-IIP areas to assess "before" and "after" as well as "with" and "without" conditions for areas with no interventions, areas with IIP interventions, and areas with other management interventions.

Based on the findings from these data analysis exercises, it will be possible to identify the additional data requirements to test hypotheses about performance impacts, select the field sites for data collection, and design and field-test the data collection program. At this

point a report can be prepared on the initial findings and the next phase of data collection over several seasons. The sites for data collection will include the pilot command areas of the Irrigation O&M Program.

This first phase will therefore provide interim conclusions on the issues identified above based on information already collected, and will formulate necessary further field investigations to provide further information as required as well as to establish a performance base line in the Irrigation O&M Program pilot areas.

In a longer term study, it would be necessary to introduce a number of these innovations individually, but time and resources are unlikely to allow this in this case, unless areas where partial implementation of IIP can be identified and analyzed separately on this basis.

The program will therefore produce three specific items by the end of the first phase (about nine months):

- A report which analyzes data collected to date on the IIP and similar programs, drawing conclusions to the extent possible on the impact in terms of water consumption, agricultural production, and the productivity of water;
- A report assessing impact based on interpretation of satellite data.
- A report providing a field-tested design for further investigations of the impact of IIP (and the future impact of the Irrigation O&M Program) on production and water use, and the perceptions of those involved (farmers, WUAs, MPWWR staff) on the impact of IIP.

It is likely the these reports will themselves be useful in the Ministry's planning of future activities, even before the longer term research is completed.

Phase 2

The second part of this program will involve data collection in selected areas where IIP has been introduced, and areas of similar soils classification, in both cases where full water accounting is possible (12 to 18 months). In designing this effort, indicators of the separate impact of WUAs, the IAS, continuous flow deliveries, and the single delivery point will be identified, and data collection designed accordingly.

A draft *Final Report* will be prepared for discussion at a workshop, before it is finalized; and a synopsis of this Report with specific policy recommendations will be prepared for use by SCAP. The monitoring may continue under the Irrigation O&M Program if necessary.

Staffing

The entire study will require about twelve person months of input from an experienced irrigation performance analyst to design and on a periodic basis supervise the study; two

person months each from an agricultural economist and sociologist for designing the data collection and analysis protocols and assisting in the interpretation; three months from a statistician to design and validate the data collection and analysis; fourteen months for an Egyptian professional engineer to supervise the overall study; three person months each of an Egyptian agricultural economist and sociologist; and 36 man-months of field staff for data collection and analysis.

SPECIAL STUDY NUMBER 2: STUDY ON FEASIBILITY OF CONTINUOUS FLOW ON SYSTEM-WIDE BASIS

Context

The existing rotational delivery policy does not meet the daily changes in farmers' demand patterns. The majority of the farmers' demand occurs during the daylight hours. The operational constraints of the canals do not allow increasing the capacity to meet this demand. Analysis of the system indicates that the supply to meet the demand can be greatly improved by providing a continuous supply and local storage within the canals. Water will be stored at night for release during the day. This storage in conjunction with a continuous supply of water is expected to alleviate many problems presently experienced in the irrigation system.

The Government of Egypt under the IMS Project has introduced IIP to improve the operational efficiency of mesqas and below. The fundamental structural change introduced by IIP is to replace low level mesqas by improved raised or buried pipe mesqas, replace individual farmers pumping at multiple points along the mesqas by collective single point pumping, and introducing continuous supply of water at distributary level. The introduction of continuous flow improvements at distributary level requires significant changes in canal operating practices. The main operating changes will be the introduction of continuous flow and regulation of supplies by discharge rather than level. Under this change, new or revised procedures will have to be introduced with regard to:

- prediction of water requirements as a basis for setting gate openings;
- monitoring and recording water levels and discharges; and
- making minor adjustments to gate openings in response to actual demand.

Also, adequate supervision is necessary to:

- supervise gate operators and gate operation;
- liaise with farmers through WUAs;
- keep operating records; and
- make regular inspections of the canal system.

Another characteristic of present upstream control operational practices is the top to bottom management of the operation, which means that once the water supply has been released, it has to be used or it will flow unused to the nearest drain through tail escapes. This problem is quite common especially in periods of low water requirements and reduced irrigation at night. This situation will be overcome under the continuous supply to be established under the IIP through introduction of a downstream control system. Under this system, the water which is not used will be stored in the canal reach upstream of the gate, as the downstream control gates will automatically close. Therefore, introducing continuous flow into the system warrants a complete transformation of the operational practices of the system operators as well as physical structural system changes to accommodate and utilize the night storage in the system.

One important question raised among system managers and policy makers is what difference will continuous flow make in the physical requirements and operational strategy of main and branch canals, and the main stem of the Nile River. During peak months of water requirement, there may be a mismatch between peak water duty of the branch canal against the main canal water duty; and main stem allocations may result at times of peak water use in shortage of water or under-allocation of water.

This may lead to: rationing and changing the timing of supplies to principal canals from the main stem; adjustment of cropping pattern and crop calendar to reduce peak requirements; development of additional water resources such as drainage and ground water within the directorates; and/or system alterations to accommodate the increased requirement from the main stem. The question that lingers in the minds of many managers and policy-makers is, "Would it be possible to put the system to continuous flow operation on a system-wide basis?".

Objective

The main objective of this study is to test through mathematical modelling the feasibility of maintaining continuous flow on a system-wide basis. Initially, the study will concentrate on testing through modelling whether the main stem of the River Nile can cater to the needs of the different directorates for likely changes in demand patterns under continuous flow operation. The study will also investigate the operational procedure to be adopted to satisfy the differing demand pattern accruing out of emerging scenarios of cropping pattern and crop calendar, and assess constraints, if any, on meeting the resulting demand pattern.

- Subsequently, the study can be extended to the directorate and district levels to identify operational constraints, if any. The results will be useful to the Management Strengthening Program when the top management considers future water allocation policies.

Methodology

A simulation model such as PDM will be used to test the feasibility of adopting continuous flow on system-wide basis.

Basically, the model will be used to test the feasibility of meeting the emerging demand pattern at the off-take points of the main stem. Two or three demand patterns will be arrived at based on projected crop patterns and crop calendars in the next 10 to 15 years. Also, the study will demarcate the water surface profiles of the main stem of the Nile River through steady and unsteady flow hydraulic modelling to examine whether the existing canal structures and facilities need any modification to satisfy the projected demand pattern. The study will also examine possible alterations in demand patterns among different directorates so that the physical alteration of existing canal facilities can be minimized.

Estimation of the projected water demand will take into consideration not only the changing dynamics of the cropping pattern due to crop liberalization, but also will account for increasing competition from drinking and industrial water requirements. The estimation of these requirements will lead to different projected water demands based on the assumptions made. Based on the available information, two or three different scenarios of water demand patterns at the different off-take points of the Nile main stem will be arrived at through a participatory approach involving all stakeholders. These demand patterns will become the input to the simulation modelling of the main stem of the Nile River.

The model will be run for the different scenarios of water demand and the results would then be analyzed to identify:

- What constraints or limitations would be encountered in operating the main stem of the Nile River for continuous supply under different projected scenarios of water demand;
- What physical and operational changes are required to meet a particular pattern of demand along the main stem of the Nile River; and
- What should be the demand pattern among different off-takes to operate the main stem of the Nile River with minimum physical modifications.

Collaborating Agencies

The Planning Sector can work closely with the Central Water Distribution Directorate to develop, test and implement the model simulation. A consultant can be hired for six months. The developed model will be installed in the central water distribution directorate to test the continuous flow operation and when the system put into continuous flow as well as to use it as an operational tool.

In estimating the water demand at off-take points of the main stem of the Nile River, crop water requirements will be computed in collaboration with MALR, and water demand will be estimated in close association with the concerned general directorates.

Time Schedule and Output

It is estimated that this study will require at least 12 months from the date of sanctioning. A tentative time schedule is as follows:

- | | |
|---|-------------|
| ■ Estimation of projected demand pattern: | months 1-3 |
| ■ Model development and model alteration: | months 1-4 |
| ■ Model testing and model runs: | months 5-8 |
| ■ Analysis of model results: | months 9-11 |
| ■ Workshop training and model installation: | month 12 |

The outputs will include calibration of a model for carrying out further analyses of similar questions, and a *Final Report* giving the results and recommendations. These results will be particularly useful for deliberations regarding future policy under the Management Strengthening Program.

SPECIAL STUDY NUMBER 3: ASSESSMENT OF THE FUTURE ROLE OF THE IRRIGATION ADVISORY SERVICE (IAS)

Issues

The Irrigation Advisory Service (IAS) currently plays a key role in the Irrigation Improvement Project (IIP). Specifically, IAS personnel talk with farmers to convince and assist them to create mesqa-level organizations for the design and management of improved mesqas. IAS personnel also attempt to teach the farmers how to use irrigation water more effectively on their farms. In carrying out these tasks, IAS personnel provide some services to the farmers as they become organized to take on the responsibilities assigned to the WUAs. These IAS functions are essential to the IIP; the IIP would not proceed very far or very fast without the IAS.

As some of the IIP areas are being completed, a discussion is going on within the IIP over whether IAS services need to be continued in areas where the IIP construction phases have been finished. The current IIP position is that some IAS services will be needed over a long period but with a lower density of personnel than are needed during the organizing and construction phases.

At the moment, the IAS is a sub-organization within the IIP Directorate which falls into the Projects Sector of the Irrigation Department. Like all other branches of the Ministry, the IAS is managed by engineers. However, the roles of the IAS personnel are more akin to agricultural extension roles than to traditional Irrigation Department roles. This has been recognized by the recruitment of lower level staff from the Ministry of Agricultural and Land Reclamation and by the recruitment of lower level staff who are not technically trained.

The Government has established a policy of expanding the IIP innovations into new areas. Under the current arrangements, the IAS staff will have to grow to accommodate this

expansion. Not only will new staff be needed for the IIP work in new areas, but also some IAS staff will remain behind in the completed areas. New administrative arrangements will have to be made for the IAS staff in completed IIP areas since the IIP organization itself will no longer be there.

In addition, there are proposals, like the present Action Plan, to organize farmers independently outside of the IIP. If the IAS is used for this activity, it would not only require new administrative arrangements, but also the IAS would need to develop new techniques for motivating farmers to organize themselves.

Assuming that the IAS continues in its role and expands to these new roles, there are some major issues to be resolved regarding administration and management of the IAS and regarding the resources available to support the IAS.

On the other hand, some have suggested that alternative ways to provide these services now provided by the IAS should be sought. One point is that as the IIP program or other organization programs expand, IAS costs will increase dramatically and may be unsustainable. Another point is that, because the IAS role and function is new to the MPWWR, it may be that other organizations, either government or non-government organizations (NGOs), may be more cost-effective because of their greater experience in this area or for other reasons.

These considerations suggest that the Ministry is facing the following questions concerning the IAS:

- What will be the needs for IAS services for expansion of the IIP? Are there alternative ways to provide the services now provided by the IAS? If so, what are the costs and benefits -- managerial, social, and economic -- of the alternatives when compared with the IAS?
- What will be the need for continuing support for WUAs following the completion of IIP in any given area? What are the alternatives for providing this support? What are the costs and benefits -- managerial, social, and economic -- of each of the alternatives?
- What will be the need for services to help farmers organize themselves apart from IIP? What are the alternatives for providing these services? What are the costs and benefits -- managerial, social, and economic -- of each of the alternatives?
- If the IAS is to serve in one or more of the above roles, what should be:
 - Its administrative location and relation to other units in the MPWWR?
 - The makeup of the staff in terms of background and education?
 - Its recruitment and promotion policies?
 - Its training policies?
- What will IAS continuation or expansion cost?

Objective of the Study

The objective is to develop a decision-making document that:

- Identifies the need for services of the IAS or an alternative organization now and over the next 5-10 years in both qualitative and quantitative terms;
- Identifies alternative means for providing those services, including, as at least one of the alternatives, continuation and expansion of the IAS;
- Evaluates the likely benefits and costs of the identified alternatives;
- Recommends one or more for consideration by the MPWWR top management; and
- If continuation of the IAS is recommended, suggests suitable location, recruitment policy, and other organizational items for the IAS.

The results of this study will be particularly useful to the Management Strengthening Program when it considers the future role and organization of the Ministry.

Study Methodology and Output

The basic data collection methodology will be interviews of persons involved with the IAS and IIP and with other farmer organization programs in Egypt, including farmers. IAS staff and consultants have carried out various studies and evaluations of the IAS. Also, they are currently involved in planning the future of the IAS. These studies and plans will be drawn upon to the maximum extent possible and will obviate the need for large-scale surveys of WUAs or of farmers' opinions.

The basic activities are as follows:

- Evaluate the IAS:
 - Describe the current activities of the IAS, including numbers of personnel and costs;
 - Evaluate the productivity of the IAS in different circumstances;
 - Project growth of IAS staff and costs after five years and after 10 years based on projected spread of the World Bank IIP, other IIP programs, and other needs for IAS services;
 - Examine the possibility of privatizing the IAS or of having farmers from functioning WUAs take on IAS roles either as a supplement to or replacement of IAS activities;

- Identify and quantify, where possible, the benefits -- managerial, social, and economic -- of IAS work; and
- Determine the cost effectiveness of IAS activities after five years and 10 years.
- Define and evaluate alternative ways of organizing farmers:
 - Examine the functioning of the agricultural extension services to determine the feasibility of their taking on IAS functions;
 - Evaluate how farmer organizational activities are implemented now in other programs;
 - Identify and examine the functioning of NGO programs that create rural organizations similar to the IAS-created WUAs;
 - From the literature on farmer organizations in irrigation management, identify other possible ways of creating the organizations and assess their suitability in Egyptian conditions;
 - From this information, identify technically and organizationally feasible alternatives to the IAS for providing the services needed over the next 5-10 years; and
 - Evaluate the costs and benefits -- managerial, social, and economic -- of each of the identified alternatives.
- Prepare a decision document that:
 - Identifies the tasks to be performed over the next 5-10 years;
 - Identifies the feasible alternatives for getting those tasks performed;
 - Evaluates the cost-effectiveness and ancillary advantages and disadvantages of each identified alternative; and
 - Recommends one of the alternatives.
- If continuation of the IAS is recommended, make relevant recommendations on IAS location, organization, staffing, and training programs to improve its effectiveness.

Personnel and Time Requirements

The study will be carried out by a team of an expatriate social scientist familiar with farmer organization efforts in Egypt and elsewhere and an Egyptian economist. Both the social scientist and the economist will work for four person months each.

The study will require a period of four months including three months to gather data and a month to write a draft *Final Report*, discuss it at a workshop with senior Ministry officials, and prepare the final version.

SPECIAL STUDY NUMBER 4: ASSESSMENT OF THE INSTITUTIONAL FRAMEWORK FOR WATER QUALITY MANAGEMENT

Background

Water quality is an area of primary concern amongst Egypt's water resource managers. Industrial and sewage pollution is a severe and worsening problem.

Several agencies are responsible for monitoring pollution of various water sources -- the Nile, groundwater, drainage water -- as well as the quality of water supplied to various uses -- domestic, industrial, and so on. In total some 12 different agencies are involved in monitoring, and a large number of standards are in place, many derived from international standards.

The primary responsibility for enforcing standards rests with MPWWR, but present indications are that little enforcement takes place. Reasons for this include the over-stringency of some of the adopted standards (cases where the quality of water delivered to users does not meet the effluent standard the user is supposed to meet have been quoted), and difficulties in enforcement where the polluting companies are government owned or otherwise influential.

Such problems are not unique, and have been addressed in many countries. A successful approach requires a combination of incentives and threats, carefully targeted to industries which are most critical and which can provide examples for others to learn from, and public awareness campaigns aimed at the public at large, industrial/commercial groups, and policy makers and politicians. Experience is perhaps the most critical initial input into designing a successful program.

Objective

The objective is to describe and analyze the institutional framework for monitoring water quality and setting and enforcing standards for maintaining and improving water quality; identify the type of organizations contributing most to pollution of water and identify organizations with an interest in controlling water pollution; and based on this analysis, identify issues and problems that require attention, and possible opportunities for solving institutional problems. The study will include attention to sources of pollution (both government and non-government), experiences to date in monitoring, information sharing, experiences and interests of donors involved in water quality work, and attempts to enforce standards or otherwise solve pollution problems¹.

¹ A starting point for the analysis is the report by Kelly and Welsh (1992) under the PRIDE Project.

The resulting report would provide the basis for discussion by the MPWWR and others regarding actions required for implementation, coordination with other government agencies, and supporting actions such as information campaigns and the design of assistance strategies to assist polluters to meet standards.

This study will be a very useful input to the Management Strengthening Program as it will form a basis for considering the Ministry's future role and policies in this arena.

Activities, Time schedule and Output

This study will involve interviews with a wide variety of government officials; examination of previous studies and other documentation; analysis of the data; and preparation of a report. The study can be completed in a period of six months. A small workshop will be held with senior policy makers to discuss the draft *Final Report* before it is finalized.

Staffing

Three person-months of a senior consultant with experience in other countries in designing the institutional framework and policies required for monitoring water quality, setting standards, and enforcing these standards; two person months of a senior water quality engineer with experience in designing, introducing and implementing water quality regulations; and six person months of a senior Egyptian consultant knowledgeable about water quality issues in Egypt to collect data, assist in interviews and data analysis, and collaborate in preparation of the *Final Report*.

ANNEX 3

EXTRACTS FROM THE WORK PLAN FOR THE STUDY

The original scope of work attached to the Cooperative Agreement is not specific about the reports to be produced. The Work Plan, which is the operative document giving the final terms of reference for the Study, contains clearer information on what was to be produced. Therefore, extracts from chapters five and six of the Work Plan (IIMI 1995a) are reproduced below.

It can be seen that the *Action Plan for Strengthening Water Resource Management in Egypt* has developed into a more comprehensive document that was envisioned. It is now far more than a "plan for improved irrigation operations," though it includes this as a key component.

Last Section of Chapter 5 of the Work Plan (page 28):

E. Process and Methodology: Developing a Plan for Improved Irrigation Operations

The Plan for Improved Irrigation Operations will be based largely on the conclusions and recommendations of the diagnostic phase of the Study. It will provide a set of recommended actions and implementation strategies and attempt to identify who should do what, and in what sequence and time frame. As the Program Description notes, ideally this Plan should be developed by those who will implement it. Therefore, the Task Force on Irrigation Operations, guided by the Steering Committee, will play a key role in developing this Plan, assisted by the IIMI team.

The overall sequence of activities in this diagnostic phase will be:

- * Preparation of detailed outline of Plan with assistance of Task Force (April)
- * Review of outline by Steering Committee
- * Assignment of chapters to IIMI team members and task force members
- * Identification of additional Egyptian expertise required if necessary
- * Interviews, discussions with officials and other possible contributors
- * Preparation of draft chapters
- * Discussion with Steering Committee
- * Elaboration and revision into an integrated draft plan
- * Workshop with senior and middle-level irrigation managers (June)
- * Further revision of draft plan
- * Workshop with Steering Committee and other officials and invited experts (July)
- * Discuss with Steering Committee to get guidance on final plan, if necessary
- * Preparation of final *Plan for Improved Irrigation Operations in Egypt* (July)

Early drafts and recommendations will be made available to the Ministry and USAID as necessary and possible, to expedite the design of the proposed Water Resources Management Project. The IIMI team will provide as much assistance as possible in preparation of the Project Paper.

6. EXPECTED OUTPUTS AND IMPACTS

As shown in the Schedule of Activities in Appendices III and IV, the Study expects to hold five major workshops and produce six major reports. With one exception noted below, the participants in all of the workshops will include senior Ministry officials and other Egyptian experts, senior officials from other Ministries as decided by the Steering Committee, USAID officials, and IIMI team members. Appendix V contains the proposed dates of these workshops.

A. Planned Written Outputs

The planned major written outputs are as follows:

1. *Work Plan for Study on Strengthening Irrigation Management in Egypt: A Program for the Future*

This consists of the final version of the present document.

2. *Report on Objectives for Improved Irrigation Operations in Egypt*

This report will analyze IMS experiences from an institutional perspective, identify objectives for a future program, and provide recommendations on areas requiring further attention through the proposed Water Resources Management Project.

3. *Report on Plan for Improved Irrigation Operations in Egypt*

This report will describe a set of detailed plans to implement the recommendations identified in the previous report. These plans are expected to be central to the design of the Water Resources Management Project. Some elements from the reports on cost recovery issues may also be incorporated into this plan. IIMI proposes to have this report translated into Arabic for wider dissemination.

4. *Report on Analysis of Cost Recovery for Egypt*

This report will describe the results of analytical and updating work, including results from modeling, on such issues as costs of OM&R, allocation of costs among sectors, and estimates shares of OM&R costs above the mesqa that must be recovered directly or indirectly from beneficiaries, or provided by government subsidies.

5. *Report on Cost Sharing Mechanisms and Phasing: A Proposal for Egypt*

This report will propose practical and feasible institutional mechanisms for cost sharing and phasing, including criteria for allocating irrigation water, rights and responsibilities of water users associations, and the relationship between these entitlements and a cost recovery program, for consideration by Egyptian policy makers.

6. Report on *Cost Recovery from Non-Agricultural Users: Findings and Recommendations Based on a Comprehensive Desk Study*.

This report will develop a framework for assessing the policy implications of water resource cost recovery programs from all users, review existing and likely future demands, suggest alternative phasing options and sharing mechanisms and their feasibility, and identify further data and analytical requirements.

7. Report on *Synthesis of Lessons Learned and Recommendations from Implementation of the Study*.

About two months after the end of the Study, IIMI will write a brief final report identifying the lessons learned from the Study and recommendations for future activities. The time spent on this report will not be charged to USAID.

ANNEX 4

LIST OF MAJOR REPORTS AND WORKSHOPS PRODUCED UNDER THIS STUDY AS OF DECEMBER 1995

List of Reports Produced

1. *Work Plan -- Strengthening Irrigation Management in Egypt: A Program for the Future.* March 1995. [Report No. 1 in the Work Plan]
2. *Nile Water Resources Management in Egypt in 2010: Achieving a Common Vision.* Report on a Workshop, 9-11 March, 1995.
3. *Water Resources, Irrigation Operations and Institutional Issues: An Analysis of the Ministry of Public Works and Water Resources, Government of Egypt.* December 1995. [Report No. 2 in the Work Plan]
4. *Water Resources, Irrigation Operations and Institutional Issues: An Analysis of the Ministry of Public Works and Water Resources.* Report on a Workshop, 19-22 April, 1995. June 1995.
5. *Non-Agricultural Cost Recovery*, by Rita Cestti. May 1995. [Report No. 6 in the Work Plan]
6. *Agricultural Cost Recovery*, by Adrian Hutchens. Draft. March 1995.
7. *Water Policy in Egypt -- An Analysis with IFPRI's Agricultural Sector Model*, by Hans Lofgren. June 1995.
8. *Financial Management Systems in the MPWWR -- An Analysis and Recommendations for Meeting Current and Future Needs*, by Charles Lewis and Mohammed Mahmoud Hilal. June, 1995.
9. *Cost Recovery for Water Services to Agriculture*, by IIMI Team. May, 1995. [Report No. 4 in the Work Plan]
10. *Irrigation Service Cost Recovery in Egypt.* Report on a Workshop, 24-27 May, 1995. July 15, 1995.
11. *An Action Plan for Strengthening Water Resource Management in Egypt.* December, 1995. [Report No. 3 in the Work Plan]
12. *Farmers' Views of the Old Irrigation System and the Irrigation Improvement Project in Two Governorates: Menya and Kafr El Shiekh.* by Mohamed M Mohieddin. July 1995.

13. *Study of Maintenance Management in the Ministry of Public Works and Water Resources, Egypt.* by Rodney Vissia. July 26, 1995.
14. *The Training Center and Human Resource Development in the Ministry of Public Works and Water Resources.* by P S Rao. July 26, 1995.
15. *A National Water Services Cost Sharing Program: Proposed Mechanisms and Phasing for Implementation.* December, 1995. [Report No. 5 in the Work Plan]
16. *The Land Tax System in Egypt: A Descriptive Report of its Historical, Legal and Organizational Aspects.* by Mohamed M Mohieddin. September 1995.
17. *Egypt: Water Service Charges to Agriculture.* by C. J. Perry. Draft IIMI International Research Report. December, 1995.
18. *Governance and Institutional Arrangements for Managing Water Resources in Egypt.* by Douglas J. Merrey. Revised version of a paper prepared for public lecture at Wageningen University, November 1995.. Draft IIMI International Research Report. December, 1995

Note: Reports numbered 17 and 18 will constitute the "Report on *Synthesis of Lessons Learned and Recommendations from Implementation of the Study*," listed in the Work Plan.

List of Workshops Held

Workshop on: Nile Water Resources Management in Egypt in 2010: Achieving a Common Vision. 9-11 March, 1995. Alexandria.

Workshop on: Water Resources, Irrigation Operations and Institutional Issues: An Analysis of the Ministry of Public Works and Water Resources. 19-22 April, 1995. Port Said.

Workshop on: Irrigation Service Cost Recovery. 24-27 May, 1995. Alexandria.

Workshop on: Draft Action Plan for Strengthening Irrigation Management in Egypt. 7-10 July 1995. Alexandria.

ANNEX 5

INDICATIVE LIST OF MANAGEMENT TRAINING INSTITUTIONS

The following list is indicative of the kinds of management training institutions that can be considered for the management training to be provided under the Management Strengthening Program. All these institutions offer courses that are potentially useful for the Ministry of Public Works and Water Resources; some will tailor courses to the needs of the client. All are recognized internationally as first class (but this is not a comprehensive list).

Being listed here in no way constitutes a specific recommendation by IIMI or a commitment by the management institutions listed.

- Institute for Development Policy and Management, University of Manchester
Manchester, United Kingdom
- John F. Kennedy School of Government, Harvard University
Boston, MA, USA
- Pennsylvania State University, Mary Jean and Frank P Smeal College of Business
Administration
University Park, PA, USA
- University Associates - International Consultants and Trainers
San Diego, CA, USA
- University of Connecticut, Institute of Public Service International
West Hartford, CT, USA
- University of Pittsburgh, Graduate School of Public and International Affairs,
International Management Development Institute*
Pittsburgh, PA, USA

*Offers the "Arabic Management Development Program" in Arabic.

وبالتالى فإن وضعهم سيسمح لهم بتجميع وتنسيق نتائج الأنشطة المختلفة فى برنامج واحد متكامل تابع للوزارة فى المستقبل القريب . وفى حالة برنامج تشغيل وصيانة شبكات الرى وبرنامج مشاركة التكاليف فإنه من المقترح أن يكون هناك لجان خاصة للتخطيط والإرشاد وتقييم الأنشطة تحت هذه البرامج .

وتهدف خطة العمل الى تعظيم الاستفادة من الكفاءات الحالية والموارد المتوفرة بالوزارة . فقطاع التخطيط والمركز القومى لبحوث المياه ومركز التدريب مثلا لهم دورا هاما فى الجوانب المختلفة لهذا البرنامج . ولكن هناك درسا واضحا مأخوذا من برامج التغيير التنظيمى فى كل من القطاعين العام والخاص وهو ان الخبرة الخارجية يمكنها ان تلعب دورا رئيسيا فى مثل هذه البرامج . وبالتالى فإن خطة العمل تنادى باستخدام كلا من الخبراء المصريين والأجانب كمستشارين ومدربين وباحثين . ومن المقترح انه يمكن لأى هيئة بحثية دولية ذات خبرة كبيرة فى مجال الموارد المائية والتغييرات التنظيمية المؤسسية ان تقوم بدور فعال فى تنفيذ خطة العمل هذه .

الآثار المتوقعة

- تبني سياسات محسنة .
- المبادرة فى التغييرات المؤسسية بالوزارة وخطط واضحة للاستمرار فى عمل التغييرات والتحسينات .
- مجموعة من الموظفين ذوى المؤهلات العليا والمتوسطة ممن حصلوا على التدريب الكافى فى المهارات الإدارية وبذلك تكون للوزارة القدرة على ادخال واستخدام طرق ادارية حديثة .
- تبنى برنامج التدريب المستمر لتحسين المهارات الإدارية .
- التغييرات فى برنامج نشاط الوزارة وبرنامج الاستثمارات والميزانيات لكيما يتناسب مع السياسات والأهداف المعدلة .

خطة التنفيذ

يتناول الفصل الخامس الترتيبات التنفيذية المقترحة والكفاءة الأساسية وراء خطة العمل تتمثل فى أن موظفى الوزارة المعنيين يجب ان يكونوا مسئولين عن التخطيط والاختبارات الرائدة واستخلاص النتائج واتخاذ القرارات وتنفيذ برامج التغييرات وغيرها . وبالتالي فإن تنفيذ خطة العمل ستكون تحت اشراف اللجنة القيادية لخطة العمل (SCAP) والمؤهلة تأهيلا رفيعا . وستكون هذه اللجنة مكونة من كبار الموظفين (بعضهم من المتوقع ان يحتل مناصب اعلى فى المستقبل القريب) يتم تعيينهم بواسطة السيد وزير الأشغال العامة والموارد المائية . وبالإضافة الى الارشاد والتوجيه أثناء تنفيذ خطة العمل ، فإن اعضاء هذه اللجنة سيقوموا بالاشراف على برنامج مشاركة التكاليف وبرنامج تشغيل وصيانة شبكات الرى وايضا برنامج تدعيم الادارة المائية .

- الفهم الأعمق لدى المزارعين للنظام وهيدرولوجيته لاستخدامات المياه .
- إنشاء نظام تدعيم صناعة القرار للعمليات اليومية على المستوى المركزي .
- وضع منهج أفضل للتنبؤ بالاحتياجات المائية .
- تحديد طرق مشاركة المستخدمين بطريقة فعالة في صناعة القرار الخاص بالنظام .
- تحسين إدارة الصيانة على مستوى الحى .
- تحقيق تكامل أفضل بين نتائج مشروع تطوير الرى (IMS) والعمليات الدورية التابعة للوزارة .
- توفير التدريب اللازم واصدار الدلائل الإرشادية لتنفيذ الأفكار الجديدة على نطاق اوسع .
- تحديد الإصلاحات المؤسسية المستقبلية الممكنة .

الآثار المتوقعة

على الأراضى

- الزيادة الملموسة فى تحقيق المساواة فى توزيع المياه ودقة المواعيد فى المناطق التجريبية الرائدة .
- الزيادة الملموسة فى قيمة انتاجية المحاصيل فى المناطق المختارة .
- الزيادة الملموسة فى ارضاء المزارعين .
- الزيادة الملموسة فى القيمة الكلية للإنتاج الزراعى للوحدة الواحدة من المياه.

دراسات خاصة

يشمل الملحق رقم (٢) اقتراح بأربعة دراسات خاصة لمساعدة خطة العمل هذه

تتلخص فيما يلي :

- ١- تقييم اداء مشروع تحسين الري .
 - ٢- دراسة جدوى نظام التدفق المائي المستمر على نطاق واسع .
 - ٣- تقييم الدور المستقبلي لخدمات الري الإستشارية .
- ويمكن ان تظهر الحاجة الى دراسات اخرى اثناء تنفيذ خطة العمل .

النتائج والآثار المتوقعة

اولا : برنامج تشغيل وصيانة شبكات الري

النتائج

- رفع كفاءة التشغيل لمكاتب مهندسى الري .
- تعريف طرق الإستخدام الأمثل لنظام التليمتري على جميع المستويات .
- تحديد جدوى ومزايا نظام التدفق المائي المستمر ومتطلبات التنفيذ على نطاق واسع.
- انشاء قواعد بيانات على الحاسب الآلى على مستوى الحى والادارة .

أما الخطوات والانشطة فهي كالآتى :

- ١- تقييم ادارة الموارد المائية الحالية وموقف الخدمات المائية لمحاولة الوصول الى خلاصة واضحة عن نقاط القوة والضعف والموضوعات الهامة .
- ٢- النظر الى المستقبل (١٥ الى ٢٠ سنة القادمة) وتعريف اوضاع الموارد المائية التى من المحتمل ان تواجهها الوزارة .
- ٣- مراجعة اهداف وسياسات ادارة الموارد المائية الحالية والخدمات المائية المتوفرة .
- ٤- ادخال اية تعديلات مطلوبة فى الاهداف والسياسات .
- ٥- اختبار الموضوعات الادارية والمؤسسية واقتراح التغييرات المطلوبة .

ويمكن ان تتضمن الخطوة الاخيرة مراجعة وتزكية بعض التغييرات فى دور الوزارة (وغيرها من الهيئات والمستخدمين) والإطار القانونى والعمليات الإدارية بالوزارة وبرنامج العمل السنوى والميزانية السنوية للوزارة وايضا وضع خطة تنفيذية مفصلة . وسيتم تضمين نتائج برنامج تشغيل وصيانة شبكات الرى وايضا برنامج مشاركة التكاليف ضمن هذا النشاط الأخير .

ثالثا: برنامج تدعيم الادارة المائية

فى الوقت الحاضر لا يوجد رأى جماعى واضح بالوزارة بشأن دورها المستقبلى وتنظيمها . هذا ويوجد فى بلاد أخرى عدة سيناريوهات (مخططات) بديلة تعمل بنجاح ويمكن أن تكون هذه الخبرات دليلا مفيدا لمصر . فمثلا فإن المنافع أو شركات الخدمات المائية الغير مركزية والمستقلة ماليا والسريعة الإستجابة للمستخدم يمكن ان تساعد الوزارة على تعضيد دورها فى وضع السياسة الكلية والتخطيط الطويل المدى وتنظيم استخدامات المياه . وفى المرحلة الحالية يصعب توفية مسئولية الخدمات المائية للمستخدمين أو للأشخاص المتعاملين مع الوزارة وقد وجد أن محاولة تحقيق كل الخدمات المائية مجتمعة تتسبب فى صعوبة التركيز على كل منها بمفرده لمحاولة الوصول الى تأدية جميعها بكفاءة .

لذلك فقد تم تخطيط برنامج تدعيم الادارية المائية - الموصوف فى الفصل الرابع - لمساعدة كبار الموظفين بالوزارة فى تناول الموضوعات السياسية والمؤسسية الهامة بطريقة منتظمة وفى ايجاد الحلول الذاتية التى تناسبهم . ويشمل البرنامج المكونات الآتية :

- أنشطة تكوين مجموعات العمل
- التدريب الادارى والتوجيه
- اعداد المعلومات المحللة لاستخدام كبار الموظفين
- جلسات عمل لكبار الموظفين لتحليل موضوعات الموارد المائية والادارة المائية ولوضع حلول طويلة المدى

٥- اختبار نظام فعال للمحاسبة والميزانية يمكنه حساب التكاليف الفعلية بوضوح

٦- اجراء الدراسات - مثل دراسات التسويق الاجتماعى - عن العوامل التى تؤثر فى الاستعداد لتحمل التكاليف وايضا دراسات عن ما يتحمله المستخدمين المتضررين حاليا .

٧- اجراء دراسة اضافية عن بدائل جمع ضريبة الخدمات كأساس لاصدار توصية جادة.

٨- الالتزام بتشريعات المشاركة فى التكاليف .

وسيتم تكامل هذا البرنامج مع برنامج التشغيل والصيانة على ان تعتبر نتائجه مدخلات لبرنامج التدعيم الادارى .

وعلى المدى الطويل ستتضمن المرحلتين الثانية والثالثة الآتى :

أ- تنفيذ فرض ضريبة المسطحات المساحية ، وذلك فى المراحل الفرعية .

ب- تنفيذ نظاما فعالا للمحاسبات والميزانيات بالوزارة ، مع اختبار أفكار اخرى رائدة فى مجال مشاركة التكاليف .

سيتم تنفيذ البرنامج تبعا " لخطة عمل مشتركة " بالتنسيق مع قطاع الري وبرنامج تحسين الري واعضاء المركز القومى لبحوث المياه ومؤسسات اخرى خارجية وذلك فى تصميم وتنفيذ وتقييم النتائج كأساس للتوصيات التى ستقدم للوزارة . وقد تم اختيار المناطق التجريبية الرائدة بواسطة الوزارة بالتعاون مع IIMI على اساس مجموعة من المعايير المتفق عليها . وتم اقتراح مؤشرات للاداء كأساس لتقييم النتائج لسد احتياجات الوزارة وايضا المستخدمين . وستكون النتائج مدخلات هامة فى برنامج تدعيم الادارة المائية .

ثانيا: البرنامج القومى لمشاركة التكاليف الخاصة بالخدمات المائية

يشمل الفصل الثالث وصفا لهذا البرنامج . وتقتصر الدراسات التى اجراها معهد IIMI مع الوزارة استراتيجية للتنفيذ على ثلاثة مراحل مبنية على تحقيق الاهداف الاكثر تعقيدا بطريقة تدريجية . وتشمل خطة العمل المرحلة الاولى التى تتم فيها الأنشطة التالية :

- ١- اعداد خطة تنفيذية مفصلة لمشاركة التكاليف .
- ٢- تنفيذ برنامج استعاضة التكاليف لتحسين المساقى وتوثيق هذه الخبرات .
- ٣- ادخال نظام استعاضة تكاليف الخدمات المائية الممنوحة لمستخدمى المياه فى الاغراض الغير زراعية .
- ٤- تنظيم حملة للتوعية العامة عن فوائد وتكاليف خدمات توصيل المياه .

ملخص البرامج الثلاثة

اولا : برنامج تشغيل وصيانة شبكات الري

يشمل الفصل الثانى وصفا لهذا البرنامج . وهو برنامج حقلى يتم تنفيذه فى ثلاثة او اربعة مناطق تجريبية تحت اشراف وادارة مركزية من قطاع الري . ان ادخال نظام ادارة مائية علمى متكامل قياسى وغير مركزى سيساعد الوزارة على تحسين ادائها وعلى الاستجابة بأكثر فاعلية لأوضاع ندرة المياه المستقبلية .

وعلى مدار ثلاثة سنوات سيتم اختبار ثمانية اتجاهات جديدة فنية ومؤسسية بعضهم مأخوذ من مشروعات تطوير الري الحالية ولكنها غير متكاملة فى وحدة واحدة بطريقة منتظمة . هذه الاتجاهات هى :

- ١- الضبط القياسى للتيار .
- ٢- التدفق المائى المستمر .
- ٣- نظم المعلومات واتخاذ القرارات .
- ٤- الميزانية المائية المتكاملة .
- ٥- تحسين التنبؤ بالاحتياجات المائية .
- ٦- تحسين ادارة عمليات الصيانة .
- ٧- مشاركة مستخدمى المياه فى صناعة القرار .
- ٨- التخطيط المحلى وصناعة القرار .

١- برنامج تشغيل وصيانة شبكات الري

ان الغرض من هذا البرنامج هو وضع استراتيجيات وقوانين واجراءات مؤسسية لقطاع الري لكيما يقوم بتوزيع المياه للمزارعين بكفاءة ومساواة ومرونة . وبهذا تكون الوزارة قد عملت على ارضاء المزارعين ورفعت كفاءتها الادارية لمواجهة تحديات ندرة المياه المستقبلية المتوقعة . ويمكن تحقيق هذا الغرض بواسطة اختبارات حقلية جديدة بنيت اساسا على خبرة مشروع IMS .

٢- برنامج مشاركة التكاليف فى الخدمات المائية

وبتوقع انه سيكون هناك قرارا سياسيا لتشريع مشاركة التكاليف فى الخدمات المائية ، كان هدف البرنامج مساعدة الوزارة فى التخطيط والأعمال المبدئية لانشاء برنامج مشاركة التكاليف للخدمات المائية .

٣- تدعيم برامج الادارة بوزارة الاشغال العامة والموارد المائية

ان هدف هذا البرنامج هو تدعيم المهارات الادارية لدى كبار الموظفين ومساعدتهم بواسطة برنامج منتظم فى اعادة النظر فى اهداف وسياسات الموارد المائية ورسالة الوزارة ودورها ومسئولياتها وما يتبع ذلك من تنفيذ سياسات وبرامج جديدة متضمنة تلك البرامج المذكورة فى البندين السابقين .

وبخصوص موضوع " مشاركة التكاليف " فقد اثبتت الدراسة ان الوزارة يجب ان تبدأ باستعاضة التكاليف من مستخدمى المياه فى الاغراض الغير زراعية ، وبتنفيذ السياسة الحالية لاستعاضة التكاليف الكلية التى تم اضافها على تحسين المساقى ، وبتنفيذ سياسة مشاركة التكاليف فى تشغيل وصيانة نظم الري على مستوى أعلى من مستوى المساقى على أن يكون متوسط التكاليف منسوب الى وحدة المساحة الأرضية وهى الفدان . وعلى المدى الطويل فإن الوزارة يجب ان تتحول الى استخدام سياسة "مشاركة التكاليف" كحافز لتحسين كلا من كفاءة الامداد والاستخدام ، ولكن هذا سيتطلب تغييرات مؤسسية وايضا تغييرات فى البنية الأساسية واسعة المدى .

ويعتبر التقرير الحالى هو ذروة الدراسة التى قام به معهد IIMI بالاشتراك مع وزارة الأشغال العامة والموارد المائية . وهو يعطى بناء على النتائج خطة عمل تفصيلية لتدعيم برامج ادارة الموارد المائية بمصر .

اهداف خطة العمل

ان الهدف العام لخطة العمل هو مشاركة هدف الحكومة المصرية فى استخدام المياه بانتاجية واستمرارية اكثر للاستخدامات المتعددة مع التركيز الأكبر على قطاع الزراعة . اما الغرض الكلى فهو مساعدة الوزارة فى ارساء سياستها وهيكلها التنظيمى والاجراءات والتشريعات المائية لكيما تستطيع ان " تفعل الكثير بالقليل من المياه" وبذلك تواجه بفاعلية التحديات المستقبلية فى مجال الموارد المائية .

وتتبع هذه الأغراض ثلاثة مكونات اساسية لخطة العمل :

١- وضع خطة طويلة المدى تمكن الوزارة من تعظيم الاستفادة من نتائج مشروع (IMS) .

٢- تحقيق تقدما اكبر فى ارساء وبلورة سياسة مصر المستقبلية والخاصة باستعادة ومشاركة التكاليف وذلك لتأكيد استمرارية وكفاءة ادارة الموارد المائية .

وقد تمت هذه الدراسة على مدار عام ١٩٩٥ بالاشتراك الفعال والتنسيق الدقيق مع اجهزة الوزارة ، حيث قام السيد الوزير بتعيين عدة مجموعات عمل بمؤهلات متوسطة للعمل مع مجموعة IIMI .

وتمت الدراسة ككل تحت ارشاد لجنة قيادية مكونة من كبار الموظفين . وتم اعداد عددا كبيرا من التقارير التى تقوم بتحليل الموضوعات الحالية المتعلقة "بمشاركة التكاليف" الخاصة بالمؤسسات او الخدمات المائية المختلفة مع اقتراح استراتيجيات وبدائل للتغيير . وبالإضافة الى الكثير من الاستشارات الغير رسمية مع اعضاء الوزارة فقد عقدت اربعة ورش عمل لمناقشة النتائج وتنقيحها .

وقد ركزت الدراسة اساسا على الانجازات الهامة للوزارة فى مجال ادارة وتطوير الموارد المائية . ولكن التحليلات المؤسسية للوزارة بصفة عامة والموضوعات التى تواجهها فى الاستغلال الأمثل لنتائج مشروع IMS وتكاملها اثبتت انه لمواجهة تحديات المستقبل يجب العمل على تحسين الادارة والهيكل المؤسسية والموارد البشرية بالوزارة .

الخلاصة

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مقدمة

تزداد الإحتياجات المائية بمصر بزيادة معدلات النمو السكاني والتوسع الزراعى وزيادة الاستخدامات المائية المدنية والصناعية . أما الموارد المائية فهي محدودة وتتأثر بازدياد التلوث البيئى . لذا فقد أصبح من الضرورى لجمهورية مصر العربية أن "تفعل الكثير بالقليل المتوفر من المياه" فى المستقبل . ومن العوامل الأخرى التى تؤثر فى إدارة المياه هى تأثير الاقتصاد الزراعى الحر على الإحتياجات المائية والعجز فى الميزانيات الذى يؤثر على عمليات الصيانة والتشغيل .

وفى السنوات الأخيرة أحرزت وزارة الأشغال العامة والموارد المائية تقدما كبيرا فى تحسين امكانياتها لإدارة الموارد المائية ، وذلك بمساعدة وكالة التنمية الفنية الامريكية (USAID) بالأخص من خلال مشروع تطوير الرى (IMS) . ومشروع تطوير الرى هو مشروع متعدد المكونات قام على مدار ستة عشر عاما بتعزيد أنشطة الوزارة فى مجالات مختلفة وباختبار الحلول الجديدة والمبتكرة للمشاكل المائية التى تواجه جمهورية مصر العربية . أما التحدى الآن فهو يتمثل فى التركيز على كيفية الوصول للإستفادة العظمى من هذه الامكانيات المحسنة والتى ربما تحتاج الى تغييرات سياسية ومؤسسية هامة .

وعند بداية مجابهة هذا التحدى ، دعى المعهد الدولى لإدارة المياه (IIMI) للعمل مع وزارة الأشغال العامة والموارد المائية فى القيام بدراسة ذات هدفين :

اخيرا نود ان نتقدم بجزيل الشكر لفريق العمل التابع لمعهد IIMI ، اجانب ومصريين ، وهيئة المستشارين والأعضاء العاملين . فالجميع عملوا يدا واحدة واعطوا بسخاء اكثر مما طلب منهم . ومما لاشك فيه ان هذه الروح من الولاء والاستعداد لتحمل مسئوليات اضافية بروح عالية قد سهلت مهمة رؤساء فريق العمل ومساعدتهم .

تم مناقشة المسودة الأولى لهذا التقرير فى ورشة عمل بتاريخ ٧ - ١٠ يوليو ١٩٩٥ وتم توزيع المسودة المراجعة قبل نهاية شهر يوليو ١٩٩٥ وتم ايضا استلام التعليقات الرسمية عليها من وكالة التنمية الفنية الأمريكية فى نهاية شهر سبتمبر ومن وزارة الاشغال العامة والموارد المائية فى منتصف شهر نوفمبر ١٩٩٥ بالاضافة الى ذلك كان هناك ردود فعل كثيرة بصفة غير رسمية . وقد اصدر رئيس فريق العمل الطبعة النهائية آخذا فى الاعتبار جميع هذه التعليقات .

هذا ويمثل التقرير مجهودا مشتركا لكثير من الناس ممن لم يذكر اسمائهم هنا سواء من الوزارة أو من هيئة المعونة الأمريكية او من معهد IIMI ، وهو يعبر عن وجهة نظر هؤلاء الناس جميعا ، ولكن باعتبار ان معهد IIMI هو المسئول عن اجراء الدراسة واعداد جميع التقارير الخاصة بها بما فى ذلك التقرير الحالى ، فإن معهد IIMI يعتبر المسئول عن أى نقص أو اخطاء يمكن أن يشملها التقرير . وليس بالضرورة أن جميع الاراء المشتملة فى التقرير وضعت بمشاركة من وكالة التنمية الفنية الأمريكية .

فؤاد الشبيني
مساعد رئيس فريق العمل
ديسمبر ١٩٩٥

دوجلاس ميرى
رئيس فريق العمل
ديسمبر ١٩٩٥

وفيما عدا بعض الشكوك في المراحل الاولى واحيانا بعض الاعتراضات على النتائج الأولية للدراسة ، فإن الوزارة استمرت في منح المساندة الفعالة طوال مدة الدراسة ولا نستطيع ان نتجاهل دور كبار الموظفين اعضاء اللجنة القيادية والذين بذلوا كثيرا من الجهد والوقت ليس فقط اثناء الاجتماعات وجلسات العمل ولكن ايضا بصفة غير رسمية اثناء تقدم سير الدراسة بالرغم من جداول عملهم المزدحمة . وقد قام العديد من المتخصصين اعضاء مجموعات العمل بعمل متميز اظهروا فيه خبراتهم المتميزة وولائهم ماضحين احيانا بساعات طويلة من وقتهم في الاجتماعات او الزيارات الميدانية بسعة صدر غير متذمرين للسرعة الفائقة المطلوبة منهم والاعباء الكثيرة التي فرضها عليهم العمل مع مجموعة IIMI .

ويحق الشكر ايضا للسيد المهندس / جميل محمود رئيس لجنة التنسيق العليا لمشروع تطوير الري (IMS) ورئيس اللجنة القيادية للدراسة والسيد المهندس / ثروت فهمي رئيس مكتب المراقبة لمشروع IMS وسكرتير اللجنة القيادية (الذي تمت بواسطته الإتصالات اليومية) لمعاونتهم وارشاداتهم المستمرة ، كما نخص بالشكر الاستاذ الدكتور / محمود أبو زيد رئيس المركز القومي لبحوث المياه والسيد المهندس/ عبد الرحمن شلبي مدير مكتب الإدارة المركزية لمكتب السيد الوزير لاستشاراتهم البناءة وقيادتهم الفكرية .

شكر وتقدير

هذا التقرير هو واحد من سلسلة تقارير صدرت تحت اسم " تدعيم برامج ادارة مياه الري بمصر " وقد اشترك فى هذه الدراسة كلا من المعهد الدولى لإدارة المياه (IIMI) ووزارة الأشغال العامة والموارد المائية (MPWWR) بجمهورية مصر العربية . وتم تنفيذ الدراسة بمساعدة وكالة التنمية الفنية الامريكية (USAID) بموجب اتفاقية التعاون المشترك رقم 263-0132-A-00-5036-00 مع معهد IIMI .

ويود المعهد الدولى لإدارة المياه IIMI ان يقدم الشكر الى وكالة التنمية الفنية الامريكية على دعوته للتقدم بمقترح لهذا النشاط ولمساندته الفعالة اثناء مراحل التنفيذ .

ونخص بالشكر الأستاذ الدكتور / وديع فهم مدير المشروعات بوكالة التنمية الفنية الامريكية والسيد / راس بيكوس المدير بالإدارة لقسم الري وتطوير الاراضى (اثناء تنفيذ معظم الأنشطة) والسيد / دونى هارينجتون الذى كان مديرا لبرنامج العمل اثناء الشهور الاخيرة للدراسة . بالاضافة الى العديد من اعضاء هيئة USAID ممن قدموا مساعدة كبيرة للعمل أيضا .

كما يود معهد IIMI ايضا ان يتقدم بالشكر لوزارة الأشغال العامة والموارد المائية بمصر لمنحه فرصة العمل المشترك فى المجالات الهامة التى تواجه الوزارة .

خطة عمل لتدعيم برامج
إدارة الموارد المائية بمصر

تقرير رقم (٣)

اعداد

المعهد الدولي لإدارة المياه
سريلانكا

لدراسة

" تدعيم برامج إدارة مياه الري بمصر "

وكالة التنمية الفنية
الأمريكية

وزارة الأشغال العامة
والموارد المائية

ديسمبر ١٩٩٥