WATER RESOURCES, IRRIGATION OPERATIONS AND INSTITUTIONAL ISSUES: AN ANALYSIS OF THE MINISTRY OF PUBLIC WORKS AND WATER RESOURCES, GOVERNMENT OF EGYPT

Report Number 2

Prepared by the

International Irrigation Management Institute
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for the Study

"Strengthening Irrigation Management in Egypt"

Ministry of Public Works
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TABLES

BOX

LIST OF ACRONYMS

ARC	Agricultural Research Center
ASME	Agricultural Sector Model for Egypt
BCM	Billion Cubic Meters
CIDA	Canadian International Development Agency
DHI	Delft Hydraulics Institute
EALIP	Executive Agency for Land Improvement
EEAA	Egyptian Environmental Affairs Agency
EGSA	Egyptian General Survey Authority
EWUP	Egypt Water Use Project
GIS	Geographical Information System
GOFI	General Organization for Industry
HAD	High Aswan Dam
IAS	Irrigation Advisory Service
IFPRI	International Food Policy and Research Institute
IIMI	International Irrigation Management Institute
IIP	Irrigation Improvement Project
IMS	Irrigation Management Systems
LE	Egyptian Pounds
MALR	Ministry of Agriculture and Land Reclamation
MED	Mechanical and Electrical Department
MIS	Management Information System
MOH	Ministry of Health
MOU	Memorandum of Understanding
MPWWR	Ministry of Public Works and Water Resources
MSM	Main Systems Management
NGO	Non-Government Organization
NIIP	National Irrigation Improvement Project
NOPWASD	National Organization for Potable Water and Sanitary Drainage
NWRC	National Water Research Center
O&M	Operations and Maintenance
PALR	Public Authority for Land Reclamation in the New Valley
PD	Professional Development
PDM	Planning Distribution Model
PEC	Public Excavation Companies
PM	Preventive Maintenance/Channel Maintenance
PPD	Project Preparation Department
PSM	Planning Studies and Models
S&M	Survey and Mapping
SR	Structural Replacement
SRP	Strategic Research Program
TMD	Training and Management Department
USAID	United States Agency for International Development
USU	Utah State University
WMP	Water Master Plan
WRC	Water Research Center
WUA	Water User Association

PREFACE

This analysis of the Ministry of Public Works and Water Resources (MPWWR), Egypt, has been produced by the IIMI-MPWWR Study, "Strengthening Irrigation Management in Egypt." The Study is funded by the United States Agency for International Development (USAID) under Cooperative Agreement Number 263-A-00-5036-00. The Report is the result of the combined efforts of the IIMI team of staff and consultants and the Ministry Task Force and Steering Committee members, who have done a large job in a small amount of time. In IIMI's Program Description, this report is referred to as the "Objectives Report." However, this title is too narrow (hence the change), as the report has grown into a broad institutional analysis of the Ministry of Public Works and Water Resources (MPWWR) of Egypt.

The report takes a broad perspective, sacrificing depth. It therefore has the merits and weaknesses inherent in such an approach -- it touches on many issues but does not analyze many of them in depth. The sources of data were published reports and interviews of Ministry staff conducted by the team and task force members. Because IIMI has used interviews as a basic source of data, the report reflects to a considerable degree the diverse *perceptions* of Ministry staff. Perceptions often differ and some in the Ministry would argue that some of the perceptions identified in this report are "wrong." But these differences in perceptions themselves reflect underlying institutional and communication issues, and are therefore valuable even if they reflect, from other perspectives, misunderstandings.

An important aspect of the IIMI-MPWWR Study is that reports produced should be agreed to by all parties to the Study -- IIMI, the Ministry, and USAID. But to produce a "consensus" document on such a complex topic would lead to a report that would be so full of meaningless generalities that its value would be minimal. Therefore, for those areas where IIMI believes there is broad agreement, the report reflects this; and for those areas where there are different views, it tries to reflect these differences.

The first draft of this report was discussed at a workshop held on 19-22 April 1995. In July 1995 IIMI circulated a revised draft, based on the outcome of that workshop, the completion of the analysis of the data gathered by IIMI and the Ministry Task Force, and additional comments received from several people and from USAID. No formal comments were received on this revised draft from either the Ministry or USAID. USAID informally stated that its comments on the previous draft constituted its final comments. The present final version has been further edited, corrected and revised by the Team Leader based on additional experience and understandings.

This report forms the basis or starting point of the *Action Plan for Strengthening Water Resource Management in Egypt*, the major product of the Study. IIMI believes that this first attempt to carry out a comprehensive institutional analysis of the Ministry will be useful for the Ministry itself and for others interested in water resource management in Egypt.

IIMI would like to express its appreciation to USAID for its generous support and guidance in carrying out the Study; special thanks are due to the Project Officer, Dr Wadie Fahim, who has been very supportive and has provided guidance from the beginning. Russ Backus and Donnie Harrington of USAID have also been very supportive and offered useful observations. IIMI is also grateful to the Ministry of Public Works and Water Resources, especially the Steering Committee of senior officials, for their patience and support. Eng Sarwat Fahmy has been IIMI's main point of contact in its relations to the Ministry while Eng Gamil Mahmoud is the Chairman of the Steering Committee. Both have been very patient and supportive and contributed much to the IIMI team's understanding.

The work could not have been completed without the hard work, dedication and enthusiasm of the Task Force on Irrigation Objectives, chaired by Eng. Hessain Elwan, General Director for Water Distribution. IIMI is very grateful to this group for its assistance. IIMI also wishes to acknowledge the assistance of the more than one hundred Ministry officials at various levels who gave their time, ideas, suggestions, and shared information with the IIMI team.

Finally, all the assistance acknowledged above notwithstanding, the IIMI team leaders retain the ultimate responsibility for the contents of this Report. The views expressed are not necessarily those of USAID or of any other institution.

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EXECUTIVE SUMMARY

Introduction

This report is part of an overall Study carried out by the International Irrigation Management Institute in collaboration with the Ministry of Public Works and Water Resources (MPWWR), Government of Egypt, and the United States Agency for International Development (USAID). One major objective of the Study is to develop a long range plan that would enable the Ministry to make more effective use of the outputs from the Irrigation Management Systems (IMS) Project supported by USAID over the past fifteen years. As a step in achieving this objective, the purpose of this report is to identify and define a broad set of issues affecting the Ministry's performance, and suggest opportunities for addressing these issues. Special attention has been paid to the integration of IMS components into the Ministry's management processes.

The methodology of the Study included analysis of published documents on the Ministry's programs; a large number of formal interviews with officials at all levels of the Ministry as well as some consultants and a small sample of farmers; informal discussions with many officials; and analyses that make use of the national and international professional experience of the IIMI team itself. The first draft of this report was discussed at length, and critically, at a Workshop held in April 1995. A substantially revised version reflecting the results of the Workshop as well as incorporating analyses of additional data was circulated in July 1995. The present final version reflects further thinking and lessons learned since July. This executive summary attempts to point out the major issues that have emerged without fully discussing their rationale and possible solutions, or opportunities for change. Dedicated readers are advised to read the report itself.

Chapter 1 discusses the Study's objectives and methodology in some detail. Chapter 2 reviews the present and future trends with regard to water resources supply, demand and quality; the role of the MPWWR, including its overall organization and functions; the roles of other agencies affecting water resources; the legal framework; and the status of the IMS Project components. After the completion of the High Aswan Dam, Egypt moved into a water-surplus condition. However, with increasing population and industrialization as well as rapid horizontal expansion of agriculture, Egypt is moving to a situation where demands for fresh water will exceed the supply. The MPWWR has a history of about 200 years, in which it has played the leading role in developing and managing Egypt's water resources. Today it is organized in terms of a variety of departments, authorities and sectors. Major investments in modern technology and human resource development, including the IMS Project components, have continued to increase the Ministry's potential capacity.

However, a basic conclusion of this Report is:

> *effective use of past and future technological investments will require improving the overall management processes and institutional framework for water resource management, especially within the MPWWR, as well as continued improvement in the human resources of the Ministry.*

An important context for the report and its findings is the output of a Workshop held earlier in the Study, entitled *Nile Water Resources Management in Egypt in 2010: Achieving a Common Vision*. This vision, developed by the Ministry participants at the Workshop, specifies that Egypt will need to do more with less water, and that an important requirement for achieving the vision is institutional change. The Report identifies specific institutional issues that need to be addressed, and possible opportunities for change that emerged from the interviews, workshop, and discussions.

Technical and Organizational Issues in Water Resource Management

Chapter 3 discusses issues under the following headings: water resources policy-making and planning; water allocation, delivery and disposal; water quality; maintenance; Irrigation Improvement Project; and research. Under *policy-making*, the report discusses three issues (which really synthesize a large number of other issues and problems), given in the order of priority they received at the April Workshop:

1. Need to improve the policy-development process;

2. Need to strengthen the policy concerning coordination of donor projects; and

3. Need to develop a common policy among Nile Basin countries.

A number of specific suggestions for improving the policy-making process and making it more systematic and up-to-date are given.

Three types of *planning* activities are identified: long range national water resources planning, water resource project planning, and program planning. Four summary issues were identified and are given in the priority they received at the April Workshop:

1. Need for clearer definition and improvement of the long range planning function and process;

2. Need to reduce the fragmentation of planning among several Ministry units;

3. Need to further improve the economic and financial analysis done by the Project Preparation Department; and

4. A question whether long range planning and project planning are receiving adequate supervision and direction given the large set of responsibilities of senior managers.

Again, about 22 possible opportunities for change are briefly described.

The above issues emerged primarily from interviews with senior headquarters-based staff. Interviews with field staff are the primary source of information on *water allocation, delivery and disposal*. This topic generated a very large number of issues. Some of the major issues identified include the following:

1. Demand assessment is not adequate;

2. Unaccounted-for use of ground and drainage water;

3. Unclear definition of responsibilities and accountability;

4. Lack of integration of the decision-support tools developed under IMS; and

5. The future sustainability of the new telemetry system.

Interviews with field staff generated information on a lot of problems that affect their ability to manage the water system adequately. Nineteen suggested opportunities for change are reported.

The top management of MPWWR in their interviews clearly identified *water pollution* as the most serious water supply problem facing Egypt. Three basic issues emerged:

1. Too many agencies monitoring water quality with no effective cooperation;

2. Ineffective enforcement of water quality laws; and

3. Lack of public awareness.

The five opportunities for change in essence suggest the MPWWR is the agency that should play a strong leading role in solving water quality problem.

Maintenance is clearly a very important responsibility of the Ministry, given its large and varied infrastructure. Responsibility for maintenance is scattered among a variety of Ministry units, and there are a number of programs, including the Preventive Maintenance Program under IMS, for improving maintenance. Both headquarters and field staff were interviewed about maintenance issues. From these interviews and the Workshop, five major issues were identified and prioritized as follows:

1. Need for an integrated Ministry-wide policy for upgrading maintenance performance;

2. Need for better technical standards and specifications;

3. Over-excavation by draglines;

4. Need to enforce laws and rules prohibiting activities that harm canals and drains; and

5. The need to involve water users in monitoring and managing maintenance.

Other issues that came out included insufficient attention to maintenance of the drainage system, inappropriate equipment, and the importance of expanding the Preventive Maintenance Program to other directorates. Ten opportunities for change are identified. A key opportunity is to reduce the overlap and redundancy in maintenance activities among different overlapping management units.

The *Irrigation Improvement Project (IIP)* is an extremely important component of the ISM Project. This is a package of innovations including raised *mesqas* (field channels) with single-point pumping managed by water users associations, and continuous flow deliveries to the heads of the mesqas. The IIMI team interviewed about 80 farmers in two areas, as well as a large number of Ministry staff. Three issues were distilled out of IIMI's initial observations at the Workshop, in the following priority:

1. Need to develop a long-range national irrigation plan, after overcoming remaining questions about the benefits and their sources;

2. The future role and sustainability of the Irrigation Advisory Service; and

3. The feasibility and implications of continuous flow.

In addition to further well-designed monitoring as a basis for planning future steps, it will be important to find ways to make the program more demand-driven as well as cost-effective. Again, several opportunities for change are identified.

Research is an important supporting activity, and in recognition of this, the Ministry has invested a lot in developing its research capacity under IMS and other projects. While recognizing this importance, and the real research capacity now available in NWRC, the non-research Ministry officials expressed some concerns about whether the Ministry is making optimum use of this capacity. This emerged both in interviews and at the Workshop, where the following issues were identified (according to priority):

1. Relationship of the National Water Research Center (NWRC) and the Ministry;

2. Coordination among NWRC institutes;

3. NWRC's input into policy-making; and

4. NWRC's relationship with other research organizations outside the Ministry.

There is a strong perception among Ministry officials that the NWRC could make a far greater contribution than it does to solving the Ministry's problems; this seems to be both an institutional and communication problem. Nine opportunities for change are suggested in the report.

Organizational Issues Facing the Ministry

Chapter 4 focuses on Ministry management processes and organizational issues, with special attention to the following four topics: decision-making processes; organizational structure; personnel management; and financial and budget management systems.

Two primary forms of *decision-making* are used in the Ministry: **hierarchical**, in which a single person makes decisions for his subordinates; and by **committee**, in which a group makes joint decisions (or, often, recommendations). Interviews with senior managers and examination of documents identified many problems inherent in the current processes of decision-making. This topic proved controversial at the Workshop, an indicator that strong opinions -- but also possibly real problems -- are involved.

Under the topic, "*decentralization of decision making*," four issues were identified at the Workshop, building on the earlier draft of this Report. These are:

1. Insufficient delegation of authority;

2. Subordinates tend to refer to their superiors decisions they could make;

3. Limited number of decision-makers at all levels; and

4. Insufficient involvement of subordinates in decision-making.

Four opportunities for change are identified.

The topic called "*modifying committee membership*" is summarized as a single but complex issue. It proved most controversial. A relatively small group of officials sit on nearly all of the many committees (so that different committees are often exactly the same people). Related to this is the observation that many of these same people are overloaded -- they spend a lot of time in committee meetings, and making decisions that possibly could be made by subordinates. This leaves them little time for more strategic thinking and actions. Further, insufficient opportunity to gain experience is offered to subordinates; the Ministry is therefore losing an opportunity to prepare younger officials as decision-makers. In addition, decisions by committee pose the risk of "lowest common denominator" or "safe" but not necessarily optimum decisions as members seek consensus among themselves.

While some Ministry officials do not agree with these observations on decision-making by committees, the IIMI team members (as well as many in the Ministry) are convinced further attention to this issue is important, and that it is having an impact on the implementation of the IMS Project as well as other Ministry functions. Three possible opportunities for change are therefore identified.

The many issues related to *organizational structure* that emerged from the interviews and observations by the IIMI team have been synthesized into four topics, given here in the priority order proposed at the Workshop:

1. Overall organization of the MPWWR;

2. Communications between MPWWR units;

3. Span of duties of senior officials; and

4. The relationship of special projects to regular Ministry units.

Presently, the Ministry includes a variety of types of units having different levels of autonomy, and a mixture of program and functional responsibilities. A key concern is the diffusion of functions among various Ministry units; this may lead to inefficiencies in use of personnel and equipment and problems in scheduling and coordination. Three opportunities for change are suggested.

Communication of data and information among Ministry units emerged as a serious issue, identified by most of the senior and many junior officials interviewed. Ministry officials mostly agree that too often data are hoarded, not shared, there is a lack of availability of routine data (and no standardized formats for data management), and coordination and exchange of information tends to depend more on personal relations than on need. This issue is closely related to the organizational structure issue. Four opportunities for change are suggested.

Research from many countries on organizational management shows clearly that a manager can supervise up to five to seven subordinates effectively. Some senior officials in the Ministry exceed this norm, and this may be affecting the quality of decision-making. The conclusion that this is a serious issue was controversial at the Workshop -- although the IIMI team believes it is a problem needing attention, many senior officials did not agree. Five opportunities for change are proposed.

Finally, the relationship of *special projects* to regular Ministry units was identified as a continuing problem. Separate units are often established when a donor-funded project is initiated, often at the donor's request. However, whatever the short term advantages of such an arrangement, this has affected the integration of the new innovations into the Ministry's management processes, complicated coordination and communication, and because of the special benefits for employees working on special projects, created problems in gaining inter-unit cooperation. A high turnover rate of key managers in donor-funded projects has also been noted. Five suggestions are made for addressing this issue.

Under *personnel management*, the IIMI team investigated a variety of issues, including compensation, promotions, job descriptions, training and career development, staffing levels and disciplines, and performance evaluations. The Ministry has about 88,000 employees of whom about 8,000 are top managers or professionals (largely civil engineers). Not surprisingly a large number of issues emerged from the interviews, and officials are keenly interested in seeing improvements that affect them personally, but also have a large impact on the implementation of the IMS Project, as well as the Ministry's performance generally.

In analyzing the many personnel issues initially raised, the Workshop participants identified three key issues in the following order of priority:

1. Compensation;

2. Staffing numbers, distribution and composition; and

3. Training and careers.

Base *salaries* are very low -- below what is required for even a modest life style unless supplemented from other sources, and very low compared to salaries for similar water resource professionals in other developing countries. Further, there are important inequities in compensation, which are only partially overcome by special Ministry efforts to reduce these inequities. Concern about low compensation affects the performance and motivation of Ministry staff. It is recognized this issue is one that pervades government and therefore goes beyond the Ministry; but it is clearly having a damaging impact in overall performance. Seven suggestions are made to address this issue.

There is reported to be an imbalance between *staff availability* and staffing needs. There is also a need to recruit and offer attractive careers to more specialized non-civil engineering staff as the Ministry uses more and more new technologies. Four opportunities for change are suggested.

Promotions are based primarily on seniority (with some consideration for performance and experience). There are mismatches of job assignments and training. There are weaknesses in the written job descriptions; and the current *performance evaluation* system is subjective and not used as an incentive for encouraging better performance. Staff tend to be generalists -- the Ministry does not specifically encourage specialization in peoples' careers. There is not sufficient linkage among job transfers, career advancement, and training. Finally, the *Training Center*, which started operating from its new campus in 1995, is yet to realize its full potential. Again, four opportunities for change are proposed.

The *financial and budget management systems* were examined to learn how well they support management in achieving targets. While the existing system is basically sound for reporting total expenditures, it is slow and cumbersome; more important, it makes it difficult to identify costs of specific activities and functions; and despite the advantages of the current decentralized system, the lack of standard criteria makes collection of comparative data difficult. Seven opportunities for change are suggested. A specific recommendation is made to adopt a more functional budgeting and accounting system which will be useful as a management tool.

Conclusion

Chapter 5 re-affirms that the Ministry is managing Egypt's water resources and is implementing improvements with considerable success. However, the chapter also emphasizes the overall conclusion that the Ministry's management processes and institutional framework need to be improved to enable the Ministry to make best use of

past and future innovations. Organizations are human *systems*, and the Ministry is a particularly large and highly integrated system. Therefore, a systematic planned approach to analyzing constraints to performance and designing solutions is required.

Further, the *process* by which changes are designed and implemented determine the success of institutional change programs. Such programs should ideally be internally led and directed. Therefore, a strong recommendation is made that the Ministry itself should follow a systematic comprehensive management and organizational review process to identify and address issues at the macro level; and should follow an action-based process for testing, adapting and implementing changes in its operations, which would also involve integrating IMS outputs where appropriate. Outside specialists can assist such a process but its leadership should be from within the Ministry itself.

Overall, then, the report identifies a wide range of institutional issues that the Ministry needs to address, and suggests (but does not evaluate) many different solutions or opportunities for change. These issues and opportunities provide the basis for the *Action Plan for Strengthening Water Resource Management in Egypt*, which is described in a separate report.

Chapter 1

INTRODUCTION

1.1 Project Objectives

The Government of Egypt is making great efforts to improve the efficiency and productivity of water use, especially in agriculture. This goal is extremely important as demand continues to increase for the limited supply of water. The Irrigation Management Systems (IMS) Project financed by the United States Agency for International Development (USAID) represents a 16-year program of investments whose objective has been to improve water use efficiency and productivity. As the implementation of these components neared completion in early 1995, the Ministry of Public Works and Water Resources (MPWWR) and USAID were discussing the shape and thrust of the next stage of investments. This next stage is likely to focus on further strengthening and refining policies, and institutions to enable Egypt to use its water supply in a productive and sustainable manner[1].

In 1994, USAID invited the International Irrigation Management Institute (IIMI) to submit a proposal to assist with the planning for cost recovery, building on previous studies, and for carrying out an institutional analysis of the IMS Project implementation. IIMI responded with a proposal that suggested an intensive and highly collaborative program in which IIMI would assist the Ministry to carry out the studies. This approach was accepted and IIMI began work in January 1995.

As defined in the Work Plan (IIMI 1995a), IIMI's effort has two broad 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.

Activities to achieve the first objective are referred to as the *Irrigation Operations* component; activities to achieve the second objective are referred to as the *Cost Recovery* component.

[1] In mid-July 1995 USAID informed the Ministry it could not proceed with the planned Water Resources Management Project; later in 1995 USAID and the Ministry were discussing the shape of their future relationship, which is still not clear as this report is being finalized.

1.2 Purpose of this Report

This report falls within the Irrigation Operations component of the IIMI/MPWWR study. In pursuit of the objective of developing a plan to enable the Ministry to make effective use of IMS outputs, the IIMI team has taken a broad view of the issues involved because improving the integration of IMS outputs may require changes in policy, organization and procedures within the MPWWR.

The first draft of this report defined a series of issues identified by the IIMI/MPWWR team in its diagnostic study of the operations of the MPWWR. These issues included problems to be overcome or situations where there are opportunities for improvement in the management of Egypt's water resources. For each issue, possible ways to make improvements were identified. Special attention was given to the integration of the IMS components into regular MPWWR operations.

On April 19-22, 1995, a workshop was held to review the draft report. The primary objective of the workshop was to identify the key issues in water resource management structure and procedures. A secondary objective was to generate opportunities for change that could be investigated during the remaining period of the study. The outputs of the workshop (IIMI 1995b) were used extensively in the preparation of a revised version of this report which was circulated in July 1995. The present version has been finalized based on further reflection by IIMI[2].

This report is meant to be used as the basis for further consideration and discussion of the issues and possible solutions. It is therefore important to emphasize this report is not an audit, or evaluation, or critique of the Ministry and its constituent agencies. Rather, it is intended as a joint collaborative analysis by IIMI and the MPWWR to identify areas requiring improvement, and opportunities for improvement. It is also important to note that most of the observations contained in this report reflect the views of MPWWR staff who were interviewed or otherwise consulted during the Study.

The observations and conclusions contained in this report were the primary basis for the content and strategy of the *Action Plan for Strengthening Water Resource Management in Egypt* (IIMI 1995d).

1.3 Study Methodology

This report is the product of a diagnostic institutional analysis carried out by the IIMI team with the help of a Task Force composed of MPWWR personnel. Annex A lists the responsible IIMI personnel and the Task Force members who assisted them.

The major means of data collection were review of relevant documents and interviews supplemented by informal group and individual discussions with involved persons. The

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[2] USAID informed IIMI informally that its comments on the first draft constituted its final comments; the Ministry did not provide comments on the July draft.

interviews were critical as they identify clearly the problems faced by MPWWR personnel in carrying out their responsibilities and activities. Interviewed persons came from the following categories:

- Approximately 35 top level managers in the MPWWR in Cairo, including the heads of most of the units.

- Approximately 85 top and middle level managers and lower level staff from all of the MPWWR units in field offices in El Minya and Khafr el Sheikh governorates. A few were interviewed from other governorates.

- More than 80 farmers in selected sites in El Minya and Khafr el Sheikh governorates.

- Approximately 5 USAID project management personnel and consultants on IMS projects.

- A few additional persons with relevant information.

Several persons, particularly those in the Imbaba and Shoubra offices in Cairo were interviewed twice or more to get their views on different topics. A list of persons interviewed is given in Annex B.

Most of the interviews were conducted using prepared questionnaires to provide comparability of answers. The questionnaires were tailored to personnel of specific units and to specific issues. Sample questionnaires are included in Annex C.

El Minya and Khafr el Sheikh governorates were chosen for intensive field studies because:

- they represent the two main areas of irrigated agriculture in Egypt (Upper Egypt and the Delta);

- El Minya has had the longest and most intensive experience with IMS projects while Khafr el Sheikh has had much less involvement; and

- Khafr el Sheikh is at the extreme tail of the Nile Valley system and thus is likely to show some tail-end problems.

In each governorate, officers and employees at all levels in all of the MPWWR units were interviewed to get a broad cross-section of views. Also, farmers both within and outside of the Irrigation Improvement Project (IIP) were interviewed for their views on irrigation services. Some shorter visits were also made to other governorates, including Gharbeia and Sharqiya.

There is a large body of published and unpublished reports on Egyptian water resources in general, and IMS project components in particular. The IIMI team has consulted many of these reports, which are available at the Ministry.

Finally, complementing the heavy reliance on the views of Ministry officials, the analysis and interpretation of these views largely reflect the professional views of the IIMI team members. They have used their own professional training (in several disciplines) and experience in a large number of countries as a basis for their interpretations. Integrating views that come from such a wide variety of backgrounds and experiences has not always been easy, but the IIMI team believes it does add value and credibility to the results.

Clearly, there are limitations to data collected in a short period, and so dependant on interviews (perceptions) rather than direct observation. Further, the interview sample is not necessarily representative in a statistical sense. Nevertheless, IIMI believes that the issues and opportunities that emerge are real, and useful, and are important to the Ministry.

1.4 Organization of this Report

The report is organized as follows:

- Chapter 2 succinctly describes the current state of water resource management in Egypt and the role of the MPWWR in managing the water resources. It also briefly describes the status of the Irrigation Management Systems (IMS) Project. This provides the context for the issues discussed in Chapters 3 and 4.

- Chapter 3 discusses the findings of the study and the results of the workshop with regard to water resources management issues. These include both technical and organizational issues in water resource policy-making and planning, controlling water distribution, water quality, maintenance, IIP, and research.

- Chapter 4 discusses the findings of the study and the results of the workshop with regard to broader organizational and management process issues. These include issues in decision-making processes, organizational structure, personnel management, and financial and budget management.

- Finally, Chapter 5 discusses the relationships among the large number of issues identified and recommends the Ministry should follow a comprehensive systematic action-based process for identifying and implementing needed changes.

Chapter 2

THE ROLE OF THE MINISTRY OF PUBLIC WORKS AND WATER RESOURCES, EGYPT

2.1 Water Resources in Egypt

Agriculture accounts for some 18% of GDP in Egypt, and nearly 40% of employment. With annual dependable rainfall close to zero, Egypt is unique among developing countries in having a substantial agricultural sector that is totally dependent on irrigation. Productive land resources are also constrained, although only 4% of Egypt's area is cultivated. The vast majority of the country is desert, with no potential for agricultural development. Nevertheless, the government has a strong commitment to reclaiming further land by transferring water out of the Nile valley to newly irrigated areas. Between 1960 and 1990, the cultivable area increased from 5.9 million feddans to 7.2 million feddans (1 feddan = 1.038 acres or 0.42 hectares). However, population growth has more than offset this increase, with per capita land availability falling by more than 40% over the same period (from 0.23 to 0.13 feddans per capita). The total area estimated to be available for reclamation is in excess of 3 million feddans, subject to the availability of water. A national "Horizontal Expansion" program has been initiated. Its goal is to bring into production an additional 1.6 million feddans by the year 2000. Loss of cultivable land within the Nile Valley has also been significant, though there is no agreement on the current rate of loss.

Construction of the High Aswan Dam significantly increased the usable water, and resulted in dramatic increases in cropping intensity and much improved scope for growing water-sensitive, high value crops. As a result of an ample, year round water supply from Lake Nasser, drainage of agricultural lands became necessary. In the 1970s, a field drainage program was started with a loan from the World Bank. To date, about half of the "old lands" have had field drains installed.

The policy of land reclamation as a basic national objective was also encouraged by the improved water availability. However, during the 1980s Government policy changed, primarily because the results of state-dominated farming in the new areas fell short of expectations. Three fifths of newly developed areas are now allocated to investors with adequate capital to develop commercially-oriented farms.

Although there are ten riparian nations on the Nile, only two, Egypt and Sudan, make significant withdrawals. The mean annual flow of the river, estimated at 84 billion cubic meters (BCM) at Aswan is divided in accordance with a 1959 agreement between the two nations. Egypt receives 55.5 BCM, and Sudan 18.5 BCM. Evaporation losses from Lake Nasser are estimated at 10 BCM.

The future balance between water supply and demand poses problems. Increases in demand, aside from vertical and horizontal expansion of agriculture, will be significant. Industry and commerce will underpin Egypt's future economic development and demand for water for these sectors will increase significantly over time. Depending on the assumption for per capita water use and the rate of population growth used, domestic water use is expected to increase to 2.0 to 4.5 billion cubic meters per year by the year 2010. The gross annual demand for industrial water is expected to grow to 6.2 to 11.5 billion cubic meters by the year 2010, again depending on the assumptions used (Cestti 1995).

On the supply side, additional sources are limited; groundwater reserves are largely non-renewable and the proposed project to canalize the Nile at Jonglei in southern Sudan has been stalled for some years due to the situation in Sudan. Under the compact with Sudan, Egypt's share of the average annual Nile flow at Aswan is 55.5 billion cubic meters. The safe annual yield of the Nile aquifer is estimated to be 7.6 billion cubic meters. The current rate of abstraction from the Nile aquifer is estimated at 4.4 billion cubic meters. Some groundwater also exists in the western desert and in the Sinai. These groundwater supplies are generally considered to be non-renewable. Official use of drainage water is estimated to be 4.2 billion cubic meters. Unofficial use of drainage water is not accurately known, but is estimated to be an additional 1.5 to 2 billion cubic meters per year. About 7.1 billion cubic meters per year of drainage water must be released to the sea to allow sufficient leaching of the soils and counteract sea water intrusion[3].

A potential future source of water supply in addition to the Jonglei Canal is the upper Nile projects which would increase water flow by reducing evaporation in the Sudd area, and the Bahr El Ghayal and Machar marshes. Even if concerns are overcome about possible environmental damages from draining these marshes, it may be some time before a water supply from this source materializes.

The dumping of municipal and industrial waste effluent into the Nile River and the delivery and drainage systems also adversely affects the quality and quantity of fresh water supplies. Policy concerning this issue has recently gained momentum through the new law, Law 4/1994 on Environmental Protection, and the Environmental Action Plan. The Environmental Action Plan proposes that the first priority will be to protect the Nile River and its branches, and the second priority will be to improve the water quality in secondary waterways and drains. A number of short and medium term targets have been defined with respect to legal and institutional improvements, improvement of waste water treatment and water supply and cost recovery. Realization will, however, depend upon the availability of funding for the execution of the program, as well as political will.

The prospects for saving water within the Nile basin are controversial. One view based on the data from the Egypt Water Use Project (EWUP) is that low irrigation efficiencies at field and farm level offer prospects of substantial water savings for use elsewhere

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[3]. The information concerning groundwater and drainage water are based on the *Inception Report* titled "Strengthening the Planning Sector", 1995, developed by the Delft Hydraulics Institute (DHI 1995).

(EWUP 1984). Others have argued that since the Nile is a closed basin, such savings are largely illusory as the losses observed at the field level are re-captured and used elsewhere in the system (WMP 1984; Keller et al. 1995; Mazen and El-Shibini 1995). Questions about water quality trends and solutions further complicate the issue of water "savings".

This debate on the prospects for saving and re-allocating Nile water resources within Egypt underlines the need to specify very carefully the objectives of improvements.

Over the last 10-15 years, the policy environment for the agricultural sector has changed dramatically. Up to the mid-1980s, the Government of Egypt set prices for major crops, specified the areas to be planted, and controlled the supply and price of many inputs. Wheat and cotton markets were particularly distorted, with wheat sold to consumers at extremely low prices, and cotton purchased from farmers at low prices for sale by government agencies on the world market.

Price liberalization and the removal of most quantitative restrictions have had substantial effects on the mix of agricultural production. For example the area under wheat increased by 75%, and production increased by 150% between 1985 and 1992. The area under fruits and vegetables has also increased sharply, especially on larger farms, while the area under berseem has declined. Another effect of liberalized prices has been an increase in the area under water-intensive crops, particularly rice. These changes in the policy environment will affect future approaches to managing water resources.

Overall, then, Egypt faces growing demand for water both from agriculture, including expansion of the irrigated area and intensification of cropping, and from industry and municipalities. At the same time, prospects for increasing water availability are small. Increasing pollution problems from agriculture, industry, and municipalities also put pressure on Egypt's water supplies.

2.2 The Ministry of Public Works and Water Resources

Under Law 12 of 1984, the Ministry of Public Works and Water Resources (MPWWR) has the overall responsibility for appropriating and distributing water and for managing drainage, groundwater, and the Mediterranean coastline. In addition, under Law 48 of 1982, the Ministry has the responsibility for controlling the inflow of pollutants into public waterways.

To undertake these responsibilities, the MPWWR has established a set of units and agencies. In addition to the Minister's Office and the administrative support staff, the primary units and agencies include:

1. Planning Sector - responsible for providing technical advice to policy-makers, for preparing water resources development plans, and for planning investments in water resources development.

2. Nile River Sector - responsible for keeping track of the water resources of the Upper Nile, for overseeing the execution of the treaty with Sudan over the Nile waters, and for planning works on the Upper Nile.

3. Public Works and Water Resources Sector (Upper Egypt) - responsible for coordination among the various units of the MPWWR at regional and governorate levels in upper Egypt.

4. Public Works and Water Resources Sector (Lower Egypt) - responsible for coordination among the various units of the MPWWR at regional and governorate levels in lower Egypt.

5. Irrigation Department - responsible for construction, operation, and maintenance of the system for the distribution of water; also responsible for regulation of the use of groundwater and for construction, operation, and maintenance of the barrages and reservoirs that control the Nile River below Aswan High Dam.

6. Mechanical and Electrical Department - responsible for installing and operating pumping stations for irrigation and drainage purposes.

7. Drainage Authority - responsible for establishing, operating, and maintaining tile and surface drainage systems.

8. Aswan High Dam Authority - responsible for operating and maintaining the Aswan High Dam and Lake Nasser.

9. Shore Protection Authority - responsible for protecting the sea coasts.

10. Survey Authority - responsible for surveying and mapping the lands of Egypt.

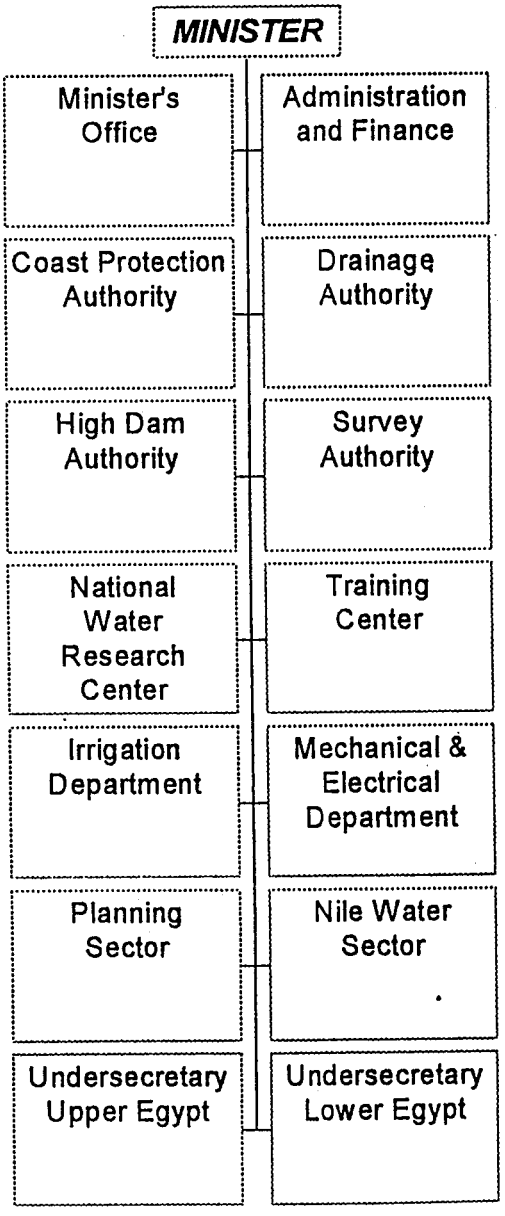
11. National Water Research Center - responsible for finding solutions to the key problems of water resource management in Egypt.

12. Training Center - responsible for human resources development.

Figure 2.1 shows the relationships among these units of the Ministry.

Reflecting the fundamental importance of operating the water distribution system, the Irrigation Department is by far the largest of these units. Of the approximately 88,000 employees of the Ministry, almost 39,000 are employees of the Irrigation Department. The next largest unit, the Mechanical and Electrical Department, has less than half the number in the Irrigation Department.

Figure 2.1 MPWWR
ORGANIZATION CHART



2.3 Other Agencies Involved in Water Resource Management

A number of agencies other than MPWWR, are involved in water resources management. Their roles are briefly reviewed below.

- *Egyptian Environmental Affairs Agency (EEAA)*:
  The role of EEAA is specified in the law on Environmental Protection. EEAA has a coordinating role in all aspects of environmental protection, such as legislation, environmental impact assessment, monitoring and dissemination of information.

- *Ministry of Agriculture and Land Reclamation (MALR)*:

  MALR formulates the policies with respect to cropping patterns and farm production. For new land development, MALR is also in charge of the implementation of irrigation works at farm level. MPWWR is responsible for designing and constructing the major water delivery facilities down through the branch canal and distributary level. Within the Ministry there are two semi-autonomous agencies involved in water conservation: EALIP (Executive Agency for Land Improvement) and PALR (Public Authority for Land Reclamation in the New Valley and other desert areas).

- *Ministry of Health (MOH)*:

  This ministry is responsible for setting standards for potable water sources, drain water that is mixed with other water for drinking purposes, and discharges from municipal and industrial treatment plants and from river vessels. MOH is also responsible for the monitoring (sampling and analysis) of municipal and industrial effluent. It also has a special concern with water-borne diseases, including schistosomiasis and gastro-intestinal diseases.

- *Ministry of Housing, New Communities Construction and Public Utilities; National Organization for Potable Water and Sanitary Drainage (NOPWASD)*:

  NOPWASD is responsible for planning, design and construction of sewage collection systems, municipal waste water and water treatment plants. For Greater Cairo, Alexandria and the Canal Cities, special organizations for waste water treatment and water supply have been formed. Once training of staff has been completed by NOPWASD, operation and maintenance of the facilities is left to the governorate. NOPWASD regularly inspects each treatment plant, assessing the quality of the staff and the efficiency of the operations. In cooperation with the governorates, measures to improve the performance are taken. In several governorates, poor cooperation has resulted in essentially non-operating treatment plants (DHI 1995).

- *Ministry of Industry; General Organization for Industry (GOFI)*:

  The Government of Egypt has owned the majority of industry for the last few decades. A program for privatization has been set in motion, but GOFI still manages about 330 industrial facilities (Kelly and Welsh, 1992). Decree No 380/1982 of the Ministry of Industry requires new industries to include equipment for pollution control as required

by Law 48/1982. This decree is not being enforced however. Enforcement of Law 48/1982 is also hampered, because the Government owns the majority of the discharging facilities and can choose not to penalize itself when it violates its own laws (Kelly and Welsh, 1992).

- *Ministry of the Interior, Surface Water Police Department*:

  The water police are obligated to enforce Law 48/1982, but are hampered in their task by lack of adequate equipment and overall support.

- *Other ministries and agencies*:

  Other ministries with an interest or role in water resources management are the Ministry of Transport (navigation requirement, disposal of oil and waste from river vessels), the General Authority for Fish Resources Development (under MALR), the Ministry of Electricity and Power Production (discharge of cooling water, hydro-electric generation), and the Ministry of Tourism (floating hotels and tourist vessels).

The large number of stakeholders with diverse and sometimes conflicting interests makes water resource planning and management very difficult.

2.4 Water Law in Egypt

The legal framework for water resources management is established in a number of laws and decrees of which the most important are:

- Law 12/1984 on Irrigation and Drainage regulates the use of water, including groundwater. It also regulates the operation of mesqas and drains and devices. It controls water rights, setting priorities between users, beneficial and harmful use of water, financial aspects and penalties.

- Law 93/1962, concerning drainage of liquid waste, implemented by Ministerial Decrees 649/1962 and 9/1989 (Ministry of Housing and Utilities). These decrees regulate the discharge of waste water into sewer systems. The part of decree 649/1962 that regulated drainage to water courses, was replaced by Law 48/1982. The Ministerial Decrees specify standards for liquid waste disposal to sewers and for use in irrigation.

- Law 48/1982 regarding the Protection of the River Nile and Waterways from Pollution, implemented by Decree 8/1982 of MPWWR. This law defines various types of waterways and regulates the discharge of liquid wastes in waterways. MPWWR is made responsible for the licensing of waste water discharge, whereas the Ministry of Health is responsible for monitoring. The decree specifies standards for the disposal of waste water under different conditions and for receiving water.

- Law 4/1994 on Environmental Protection describes the tasks of EEAA, provides general rules for the protection of the environment, and regulates air pollution and the use and protection of the marine environment.

- Law 213/1994 amends the Irrigation and Drainage Law 12/1984 legalizes private Water Users Associations at the *mesqa* level and provides for recovery of capital costs for improved irrigation facilities at mesqa level over a period up to twenty years.

Other laws and decrees are more specific; for example, Law 27/1982 regulating public water resources used for drinking and domestic use and Ministerial Decree 2703/1966 of the Ministry of Health, establishing the Supreme Committee for Water. This Committee has to set standards for drinking water, swimming, etc. and has to approve water treatment projects. Ministerial Decree No 380/1982 of the Ministry of Industry requires new industries to include equipment to prevent pollution in the technical specifications of the project.

2.5 Recent Shifts in Water Resource Issues in Egypt

Before the construction of the High Aswan Dam (HAD), the then Ministry of Irrigation had to manage water crises. That is, there were periodic floods, and periodic droughts, and dealing with these issues required strong control by the Ministry's engineers. The power and prestige of the District Engineer is said to have been so substantial that he was referred to as the "Minister" of his district.

After the construction of HAD there was a period in which the Ministry was basically managing a water surplus. That is, the HAD made water available on a year-round basis, and except for the drought period in the late 1980s, there was generally sufficient water to meet all demands. This is one of several factors that led to significant changes in the values, roles, and authority of irrigation engineers. Construction of new facilities and modernization of old ones remained a constant from the past.

The 1990s are a transitional period, in which Egypt is moving from a water surplus situation to what is likely to be a water scarcity situation. Adjusting successfully to managing Egypt's water resources in a deficit situation will make new demands on the MPWWR, and increase its importance to the nation. In recognition of this impending shift, Egypt has been investing heavily in new technologies to increase its capacity for water resource management, and has also invested a lot to improve the human resources available. But the conclusion of this report is that effective use of past and future technological investments will require improving the overall management processes and institutional framework for water resource management, especially within the MPWWR, as well as continued improvement in the human resources of the Ministry.

2.6 Overview of Objectives and Status of the Irrigation Systems Management (IMS) Project

The IMS Project is a major element of a long term strategy to improve water resources management in Egypt. The composition of the IMS Project was largely shaped by the UNDP/World Bank Master Water Plan Project which began in 1977, and the Egypt Water Use and Management Project (EWUP), also started in 1977 and assisted by Colorado State University with funding from USAID.

The IMS Project began in 1981. During the first six years of the project the three major components were Structural Replacement, the Water Research Center, and the Project Preparation Department. In 1987, IMS expanded to ten components with large funding levels for six of them (Irrigation Improvement, Preventive Maintenance, Main Systems Management, Planning Studies and Models, Professional Development, and Surveying and Mapping). After the recent agreement on a one-year extension, USAID assistance under IMS will continue for some components until September 1996.

The IMS components and their objectives and status are as follows:

Irrigation Improvement Project (IIP):

- Strengthen MPWWR's institutional capacity to continue the National Irrigation Improvement Project (NIIP), which emerged from the findings of EWUP, with limited expatriate assistance.

- Develop a rational interdisciplinary approach for planning, designing, and implementing the renovation of specific canal commands identified in the Ministry's five year plan.

- Organize operational Water User Associations in the IIP canal commands to provide farmer input during the renovation process, communicate local concerns to government officials, coordinate scheduling of water on mesqas, perform maintenance, and resolve local conflicts.

- Establish policies and procedures for recovering an appropriate portion of the O&M costs of the irrigation system and one hundred per cent of the costs of mesqa and on-farm improvements.

The original goal for IIP was the improvement of mesqas in 395,000 feddans. That goal was changed during project implementation. About 70,000 feddans will have improved mesqas by September 1995.

Structural Replacement (SR):

- Replace, rehabilitate, or construct about 19,500 small and medium structures.

This IMS component has been completed.

Preventive Maintenance/Channel Maintenance (PM):

- Increase agriculture production by improving water delivery and drainage.

- Reduce maintenance costs through improved management of the O&M function.

- Eliminate current maintenance practices that lead to channel deterioration.

The PM program has been implemented in six Directorates. The Ministry plans to extend the program to all Directorates in the future.

Main Systems Management (MSM):

- Improve the management and operation of the water delivery system through the installation of a telemetric data gathering system, a voice/data communications system, flow measurement equipment and a pilot automation program.

Installation of the data collection stations and radio systems is almost complete. Software has been developed. The system has not yet been fully integrated into the Ministry's operation of the water supply system, but efforts continue to achieve this.

Planning Studies and Models (PSM):

- Promote more efficient water use in the agriculture sector through development and implementation of computer models and programs to:
  - Develop annual and short-range operating plans and national agro-economic and water resource development plans;
  - Allocate water to competing uses and regions of Egypt; and
  - Define the water resource constraints and opportunities to increase agriculture production through desert and land reclamation projects.

About twenty mathematical models have been developed. Some of them are used to some extent for forecasting inflow to Lake Nasser, development of water resource scenarios, and water delivery system operations planning. Complete integration of this component into Ministry program activities has not yet taken place.

Professional Development (PD):

- Develop professional capabilities within MPWWR to improve the management and operating efficiency of the irrigation delivery drainage system by:
  - Improving quality, efficiency and relevance of the service, training and activities of the Training and Management Development Department (TMD);
  - Assisting in designing, planning and implementing a Training Center facility that can expand training assistance to MPWWR units; and
  - Exploring ways to help the Training Center become self sustaining and less dependent on donor funding.

The Training Center is complete and training courses have been established. They are being given to Ministry staff as well as students from other countries.

National Water Research Center (NWRC):

- Develop the long term capabilities of the NWRC and its research institutes to provide the Ministry and the Government of Egypt solutions to irrigation and water resources problems. This is achieved by such activities as:
  - Supporting training and professional development of NWRC staff;
  - Providing necessary equipment and capital items;
  - Strengthening the administration of NWRC; and
  - Supporting research programs, including the Strategic Research Program (SRP) and a program on water quality (PRIDE).

Most of the objectives of this support have been achieved.

Project Preparation Department (PPD):

- Provide quality technical and economic feasibility studies that analyze investment options open to MPWWR and prepare reports in English for submission to international donors. This component is complete and PPD is doing feasibility studies for Ministry projects.

Survey and Mapping (S&M):

- Produce mapping-related products through the Egyptian General Survey Authority (EGSA) and the Ministry's Planning Sector by expanding EGSA capabilities through training, the improvement of existing systems and procedures, and the installation of modern systems.

This component is essentially complete.

Miscellaneous:

- Provide funding for technical assistance, training and commodities to cope with problems not addressed by the other components.
- Finance the establishment and support of a Monitoring Office for IMS which is responsible for following the progress of IMS components and providing liaison among them.
- Support for the "Strategic Research Program" (SRP) under which the NWRC is carrying out policy-oriented work on the potential for real water savings.
- Support for establishing a "Communications Unit" for improving public awareness of water resource issues.

2.7 Desired Changes in Water Resources Management

As a part of the effort to define needed changes in MPWWR operations, IIMI and the Ministry organized a workshop on 9 to 11 March 1995 entitled "Nile Water Resources Management in Egypt in 2010: Achieving a Common Vision" (IIMI 1995c). This Workshop examined the broad situation that is desired within 15 to 20 years. Participants included a wide range of high level officials within the MPWWR.

Participants in the workshop created and adopted the following statement:

Egypt will do more with less water. Increased consumption in Sudan and other countries, increased demands from urban and industrial growth, and increased irrigation development in Egypt will offset expanded supplies. Competing interests over Nile water will be positively managed and cooperation strengthened. Hydropower production will increase and system reliability will be enhanced.

Egypt will become more conscious of its precious environment as evidenced by:

- *Protection of water quality even with limited non-agricultural development around Lake Nasser.*
- *Urban and industrial growth in Egypt will be directed to desert areas outside the valley, and conversion of agricultural land to non-agricultural uses in the Nile Delta will be strictly controlled.*
- *Curtailment of Nile inflows polluted by urban and industrial use.*
- *Stretched Nile water supplies by reducing evaporation in Lake Nasser and reusing agricultural drainage water and treated municipal and industrial effluent for irrigation.*
- *Efficiency of consumptive water use will increase. Efficient and effective management of water use and disposal will occur at the district level. Water user associations and federations will improve water management at the tertiary and secondary levels. Broadly constituted groups representing interests such as water resources, agriculture, industry, business, and farmers will participate in making decisions about water allocation and management among sectors. A portion of development and operating costs of water resource facilities will be recovered from all users.*
- *Waterlogging will be prevented and salinization controlled. Saline water intrusion into coastal aquifers will also be controlled and coasts protected.*

This statement presents a widely held view of the desired changes, including identifying some of the means (water user associations, etc.) by which those changes can be brought about. Given the MPWWR's responsibility for managing Egypt's water supplies, it will have the primary responsibility for achieving these desired changes. To do so, the MPWWR must consider carefully how to make its operations more efficient and more responsive to the needs of water users, while conserving Egypt's limited water resources for future generations. This report is intended as a contribution to the Ministry's consideration of how to meet these future objectives.

Chapter 3

TECHNICAL AND ORGANIZATIONAL ISSUES IN WATER RESOURCES MANAGEMENT

This chapter focuses on the technical and related organizational issues and problems faced by the MPWWR in carrying out its key tasks. The discussion is divided into three broad areas:

- Water resources policy-making and planning
- Water delivery and disposal (including water quality, maintenance, and the Irrigation Improvement Project)
- Research.

The issues and possible opportunities for change identified by the IIMI/MPWWR team are presented below for each of these areas.

3.1 Water Resources Policy-Making and Planning

The vision of the future developed at the Workshop on Achieving a Common Vision concerns doing more with less water through better management of Egypt's water resources. It is an ambitious but important vision. Its achievement will require effective water resource plans, policies and use of analytical tools. Water resource policy-making and planning are closely linked. Planning not only provides the basis for policies, but more detailed planning is often required as a result of policy-making.

3.1.1 Policy-Making

A. Background

Water resources policy relates to management of water resources. Water resource policy is usually stated as a series of goals and objectives for managing water resources. From these policy objectives, programs are developed for developing and managing water resources. This section of the report discusses water resource policy in Egypt and how policy is made in the MPWWR.

Policy is made in the Ministry by upper level management, by committees and by Boards of Directors of Authorities within the Ministry. The High Coordinating Committee is the primary Committee for development of major policies. It is chaired by the Minister and its membership includes the Senior Undersecretary of the Ministry, Heads of Authorities and Heads of Departments. The Committee strives to achieve unanimity in its decision- and policy-making. Some national water resource policies are made by interministerial committees, on which the Minister serves and sometimes chairs.

Water Resource Policies

During the last 20 years, the MPWWR has developed several water resource policies. The first was in 1975, followed by several new or changed policies (Mazen and El-Shibini 1995). In 1975, the Ministry adopted the policy to develop 2.8 million feddans of new agriculture lands and proceeding with the necessary steps to achieve this goal. Because questions were raised about the realism of this land expansion policy, a program to develop a national water plan was initiated. From 1977 to 1980 long range planning tools and schedules were developed. In 1980 the policy was changed to make long range planning a continuous process and to upgrade planning tools and develop alternative scenarios for the future management of water resources. In 1986 the Water Master Plan was completed. Also in the 1980s, the government changed its emphasis on state-dominated farming in new areas to encouraging private investment in agriculture. In 1990, the "Horizontal Expansion Policy" was developed. This policy concerns developing additional lands for irrigation in the northern Sinai and other areas.

A review of the achievements relative to past policy objectives would suggest that there have been significant gaps (Mazen and Shibini 1995). Past water resource policies have generally emphasized the expansion of irrigated agriculture. Water resource policies have assumed increasing water supplies from upper Nile Basin developments, increased water use efficiencies, increased use of drainage water, and increased use of groundwater.

Consequently, drainage water reuse schemes have been implemented; the IIP is being implemented with one of its objectives being to increase water use efficiencies; and groundwater use is increasing. However, development of the upper Nile Basin projects has been delayed by the situation in Sudan.

Horizontal expansion programs have been initiated and are proceeding in various parts of the country. The present goal is a total future irrigated area of nine million feddans (7.4 million feddans are presently irrigated). These expansion programs are clearly based on a belief that the water resource will be adequate to provide the necessary irrigation and industrial and domestic water.

The present policy for operating the water delivery system is to meet all crop water demands on an equitable basis. This may prove very difficult if water becomes short in the future. More details concerning this policy are discussed in Section 3.2.

Water Quality

In response to a questionnaire prepared by IIMI, various water resource issues facing Egypt were ranked by about 35 senior MPWWR managers. The issues and their ranking by the managers are given in Box 3.1.

The high score received by concern for pollution is an important observation (see Cestti 1995). Currently, the MPWWR is unable to enforce the regulations dealing with water quality. Government-owned enterprises are considered the main polluters, and they get special treatment. Some conflict exists between two laws which address monitoring of water quality. Law 4/1994 assigns supervision of a national monitoring network to the

Box 3.1 Ranking of Water Resource Issues by Senior Ministry Officials

Average Ranking	Water Resource Issue
8.9	Pollution of water from municipal and industrial effluents.
7.8	Expansion of the amounts of high water use crops.
7.1	Increasing water use by upper Nile Basin countries.
6.6	Population increase.
6.4	Expansion of new land irrigation.
5.9	Increasing energy costs.
5.6	Water logging of agricultural lands.
5.5	Increasing salinity of irrigation return flows.
5.2	Deterioration of the canal and drainage system.
4.7	Increasing municipal and industrial water use.
4.1	Sea water intrusion in the north delta coastal area.
3.2	Maintaining navigation flows in the Nile River.

(Rating scale is 1 to 10; 10 being most serious and 1 being least serious)

Egyptian Environmental Affairs Agency, while Law 48/1984 assigns the same responsibility to MPWWR. The government has also established the High Committee for the Nile, chaired by the Minister of MPWWR and comprised of representatives of the Ministries of Industry, Agriculture and Land Reclamation, Housing and Public Utilities, and Electricity and Energy. This Committee is responsible for the protection of the Nile River's quality and quantity.

Cost Recovery

The present national policy governing the recovery of costs from beneficiaries of water services may be summarized as follows (for a fuller treatment see IIMI 1995e and 1995f):

- The Government bears the costs of operation and maintenance for:
  - providing water to specified delivery points (head of mesqas in old lands, local pump point for new lands, offtake point for municipal and industrial services); and
  - major drainage works.

- Beneficiaries bear the costs of operation and maintenance for local facilities below the specified delivery points.

- The Government bears the capital costs of general system improvements.

- Beneficiaries pay a share of the cost of local improvements (subsurface drainage, improved mesqas).

B. Issues

In the first draft of this report, 13 issues related to policy-making were listed. Five of these were presented at the "Objectives" Workshop in April 1995 for consideration by Ministry representatives (IIMI 1995c). The Ministry representatives developed additional issues, so that the total water resources policy-making issues emerging from the workshop were 12. Many of these issues concerned a common overall water resources policy-making topic. Consequently, workshop participants developed and prioritized five summary issues. These five summary issues are presented below in the priority assigned by workshop participants.

1. Improving the process for development of water resources policy.

2. Strengthen the policy concerning coordination of donor programs and projects.

3. Development of a common policy among Nile Basin countries.

4. Water quality policy.

5. Cost recovery policy.

Issue Number One - Water Resources Policy Development
Improving the process for development of water resources policy.

Issues raised during interviews of Ministry staff are listed below:

- Water resource policy development has not always been based on the results of water resource planning activities and research results. For example, the "Horizontal Expansion" policy assumes additional water supplies from ground water, drainage reuse, and improving the efficiency of the water delivery system. However, results of the Water Master Plan (WMP) and Strategic Research Program (SRP) show the Nile Basin below Aswan to be a closed basin in which the only water that can be saved is that which escapes to the sea. Consequently, the policy goals may not be achievable, because water supplies may not be adequate.

- Pollution of the water supply is reducing fresh water availability. Control of polluting effluents is difficult and is virtually ineffective even though laws exist for such control. Some of the major polluters are said to be government-operated industries.

- Except for the WMP, alternative water resource policy scenarios have not been developed.

- There seems to be no effective mechanism for involving all the Ministries which have some activity related to water resources in the development of national water policies.

- Upper Nile Basin projects for developing additional water supply will not be completed in the near future, if ever, but new lands are still being developed for irrigated agriculture while non-agricultural water uses are growing.

Under the Planning Systems and Models (PSM) component of the IMS Project, the Planning Sector capacity for water resources policy development has been enhanced; and the SRP has produced findings with important policy implications. The question is whether the Ministry is as yet making best use of these tools.

Participants at the workshop developed other issues in addition to those listed above:

- Agreement between Ministries concerning water resources policy is possible and has occurred. However, for various reasons implementation of the policy by all Ministries does not always happen.

- Within the Ministry there is some confusion of the relationship of long range planning and policy-making. Some also wanted a clear definition of water resources long range planning and policy-making.

- There appears to be a lack of a routine periodic review of water resources policies.

- The involvement of beneficiaries or input from beneficiaries when making water resources policy needs strengthening.

Possible Opportunities for Change

- Review the existing process for making water resources policy. Examine how information is obtained, from what sources information is obtained, who is involved and what review processes are in place. Clearly define the process and the relationship between long range water resources planning and policy-making. Establish policy review processes.

- Consider implementing a participatory management approach to policy-making in which managers use specific participatory management processes to obtain input and ideas from their staff for problem solving, development of management procedures, program development, policy development and conflict resolution. This process involves team building activities, conflict resolution processes, program workshops, task forces, and participatory decision-making processes.

- For water resource policy development, the Ministry should design a process which will systematically utilize long range water planning outputs. Furthermore, policy-makers should provide direction to planners concerning issues that need to be addressed in long range planning activities.

- Organize workshops and "think tanks" to address major water resource policy issues such as, "does IIP save water and where should IIP be implemented?"; "strategy for approaching upper Nile Basin countries for negotiating water compacts"; "strategies and programs for addressing the pollution of fresh water supplies"; "how to best control groundwater extractions and what are the best ways to use surface water and groundwater conjunctively?".

- Develop better procedures to obtain input and participation from other Ministries in the development of water resource policy.

- Obtain outside expertise to assist in developing new management procedures and policy-making processes.

- Establish task forces with technically competent people to address specific issues which affect policy, while also making best use of existing Ministry units' expertise.

- Use existing Ministry staff, available Egyptian water resources specialists, and when necessary outside expertise to address specific water resource policy issues and to make recommendations to the Ministry for consideration. Make good use of other countries' experiences and lessons learned.

- Make better use of available tools provided by the IMS and other projects.

Issue Number Two - Donor Programs
Strengthen the process of coordination of donor programs and projects.

During interviews with Ministry personnel some managers commented that coordination of donor programs needs strengthening, and a specific policy for this coordination should be stated. Participants at the workshop had similar concerns.

The policy of creating separate organizational units within the Ministry for donor projects has impeded successful implementation of the projects and institutionalizing of lessons learned. One reason is that employees in donor projects get some special benefits not available to other Ministry employees, thus creating lack of cooperation between these units and other Ministry units. There is evidence that because of the extra benefits, much of the talented staff is drawn to these projects, leaving the less qualified staff to carry out the regular functions of the Ministry. In some instances, these donor project units are not located in the appropriate Ministry Department, Authority or Sector, creating problems in coordination and integration.

There are many donor programs in the Ministry: USAID (through IMS), CIDA, World Bank, European Union, Dutch government and other bilateral programs. There appears

to be no stated policy for coordinating these projects. Committees for project management are formed for each program. According to information collected from interviews of Ministry staff, there is insufficient coordination of the donor programs, duplication of technical assistance exists, and differing standards for similar activities often exists. Furthermore, there appears to be no clear Ministry program which the Ministry can get donors to support. Donors often take the initiative, through their consultants, to make proposals and offer financial assistance. The Ministry accepts them, leading to different projects which are not necessarily supportive of a consistent policy.

Possible Opportunities for change

- Review the present process for coordinating donor programs. Identify the shortcomings, and establish mechanisms for improved routine coordination of donor programs to reduce duplication, get the most benefit from them, and attract additional funds in areas not already financed.

- Examine the implementation process and policy within the Ministry for donor projects and the requirements of donors for implementation of projects. Develop procedures that reduce or eliminate the problems that organizational location, incentive programs and per diem policies create. Section 4.3.2 on decision-making also addresses this issue.

Issue Number Three - Upper Nile Basin Water Policy
Development of a common water resources policy among Nile Basin Countries.

Upper Nile Basin countries are slowly increasing their use of water in the basin. However, Egypt has a water agreement with only one country, Sudan. Under IMS and other projects, the Planning Sector has developed and is using several models to simulate upper basin supply scenarios. However, Ministry personnel interviewed and participating in the workshop felt that policy development for negotiating with upper Nile basin countries was not the Ministry's role. They stated that this policy would be developed by politicians and perhaps the Ministry of Foreign Affairs. The role of the MPWWR, as expressed by Ministry personnel, is to provide data and information to policy-makers concerning the status of water use and water management, and technical input concerning new projects to assist-policy makers in developing policy and negotiating positions.

Possible Opportunity for Change

- Review the process of providing information to policy makers outside the Ministry concerning the status of water resource use, development and management, so that they are aware of the water resource issues facing the country. Strengthen this process, and also strengthen the process for providing ideas and information to policy makers which will assist them in policy development and development of negotiating positions.

3.1.2 Planning

A. Background

The MPWWR conducts three types of water resource planning activities: long range national water resource planning; water resource project planning; and program planning. The primary unit for water resources planning in the Ministry is the Planning Sector. The Chief of this Sector is also the Deputy Minister and First Undersecretary of the Ministry. The Sector has units for program planning, project planning, computer modeling, water forecasting and development and operation of a management information system. The Sector also includes a unit for installation and development of a telemetry network for near real and real time hydraulic data acquisition (see Figure 3.1). This Main System Management (MSM) activity is discussed in more detail in Section 3.2, below.

Although the Ministry certainly developed water resources policy in its early years, no specific *long range water resources planning* was done until the Water Master Plan (WMP) was developed between 1977 and 1986. This long range planning effort resulted in a main report and several technical appendices. The planning effort developed three scenarios for future water use and supply based on various rates of agricultural development and water use increases. The WMP made recommendations for future studies and activities; and also developed an original set of mathematical models to be used for planning, setting water resource policy, and operating the water storage and supply system. These models have either been updated since the WMP or replaced by other models. Twenty models now exist and address the following activities: study and management of the upper Nile catchment, operation of the High Aswan Dam, and management of the irrigated area. MPWWR has qualified staff, excellent computer equipment and several planning tools to carry out its planning activities.

In addition to the assistance provided through USAID in long range and project planning activities, the Planning Sector is presently receiving help from the Dutch government (DHI 1995). This assistance is being provided via a three year program in two areas:

- Water resources planning, for which a methodology will be introduced to handle issues in a fully integrated way.

- Water quality management, including the introduction of a generally applicable decision-support system.

Project planning activities include making engineering and economic feasibility studies for new developments or major rehabilitation of existing water delivery system structures. The Project Preparation Department (PPD) within the Planning Sector is responsible for doing these studies. Its workload is dependent on feasibility study requests from other units within the Ministry. The IIP organization within the Irrigation Department normally does its own feasibility studies for its improvement projects, except for the current IIP planning activity funded by the World Bank. In this case, PPD did the initial study for the World Bank program, but is collaborating with the IIP unit in conducting the detailed project planning studies. The quality of the feasibility studies completed for IIP is good, and the feasibility studies completed by PPD are improving.

Development and monitoring of the Ministry's program is accomplished through another unit in the Planning Sector. The program is developed through a process of obtaining program proposals from the units in the Ministry, and consolidating these into a total Ministry program. This program is then forwarded to the Ministries of Planning and Finance for approval and funding.

B. Issues

In the first draft of this report, 17 issues were listed, of which 6 were presented at the April 1995 workshop for consideration. There, the Ministry representatives developed other issues, so that the total water resources planning issues emerging from the workshop were 16. Many of these issues concerned a common overall planning topic. Consequently, workshop participants developed and prioritized four summary issues. These four summary issues are shown below in the priority given by workshop participants.

1. Improvement of the water resources long range planning function and process to provide effective inputs to water resources policy-making, other Ministry activities and development of the Ministry's total program.

2. Water resources planning is sometimes done in other units of the Ministry. For example, some activities of the Strategic Research Program (SRP) in NWRC, such as the water balance studies, can be considered planning activities, not research.

3. Improvement of PPD's capacity to do economic and financial analysis as part of the project feasibility study process.

4. Water resource long range planning and water resource project planning activities may not be getting an adequate level and quality of supervision and direction, because of the heavy workload demands on the head of the Planning Sector.

Issue Number 1 - Long Range Planning

A clear definition and improvement of the water resources long range planning function and process to provide effective inputs to water resources policy making, other Ministry activities and development of the Ministry's total program.

The items related to this issue are as follows:

- Long range water resources planning as a continuous process
- The role of the Planning Sector in decision-support and water resources policy-making
- Influence of long range planning outputs on water resources policy-making
- Involvement of other MPWWR units in development of long range plans

- Involvement of other Ministries in long range water resources planning
- Information and data for long range planning
- Awareness within the Ministry about the function and activities of long range planning
- Use of planning tools.

The Water Master Plan (WMP) was completed in 1986. It was a very good long range planning activity, but has not been kept fully updated in its present form. In some countries a long range plan is updated periodically to incorporate new data and information on situations subsequent to the development of the plan, so that assumptions and water policy can be reviewed for current applicability.

Although the Ministry has not updated the WMP in its present form, it has updated some data, upgraded or replaced planning tools, and accomplished some additional long range planning activities. However, according to the Delft Inception Report (DHI 1995: 2-16), assessment of development scenarios is generally lacking; there is no indication which measures must be taken to realize the intended developments in various scenarios, and what the effect of these measures would be on, for example, national income, distribution of costs and benefits over various sectors of society, the development of various socio-economic sectors, and the environment, and what investments are required to implement the measures. From information gathered by IIMI, it appears that continuous long range water resources planning needs strengthening.

Related to the strengthening of long range planning is definition of the role which long range planning plays in decision-making and water resources policy-making. The Delft Inception Report (DHI 1995: 2-15) states, "The role of the Planning Sector in decision support for water resources planning is not clear. Reports are being produced and advice given, but interaction and back-coupling with decision makers (the Irrigation Department) is less satisfactory and should be improved."

It appears that the long range water resources planning outputs and the existing capability of the planners are not being fully utilized by those in the Ministry who formulate water resources policy. For example, the national "Horizontal Expansion Program" now under way is based upon certain assumptions for water supply (upper Nile basin projects, drain water reuse, groundwater development and water savings from IIP). The WMP and subsequent long range planning activities have indicated that IIP may not save the amount of water expected, drain flow availability may be less than expected, and groundwater resources may be more limited than expected. Furthermore, the upper Nile basin projects will not be completed according to the original schedules. As indicated in the Delft report (DHI 1995: S-3), "The reconnaissance of the Egyptian water resources system has shown that there is a need to assess present management policies for Egypt's scarce and endangered water resources and to develop and assess strategies to reach these policy objectives".

Although MPWWR is the primary Ministry in the water resources area, there are several other Ministries involved in water resources. In the development of the WMP, other

agencies were involved in providing data, projections of water use, strategy development and review of the WMP. These agencies were involved through the Inter-Ministerial Water Planning Committee. Although this committee may still exist, it has not been active since the WMP was completed. Coordination between agencies in the management of water resources is generally considered to be insufficient. This is also noted in the Delft Inception Report (DHI 1995: 2-14).

Based on interviews with key Ministry officials, coordination among Ministry units for long range plan development is also not as effective as it should be. This is especially apparent in data and information sharing. This issue was raised by many of the people interviewed, and it relates to all Ministry technical activities, not just long range planning. Five of eight mid-level managers interviewed raised this concern under three different questions contained in our standard interview format. Two of three engineers working in the headquarters office also addressed this issue. Even in the field, two of fourteen District Engineers volunteered a comment about poor coordination and poor data sharing, even though their questionnaire did not include this issue. Three of four donor project consultant team leaders also complained of the difficulty in getting data and the length of time to obtain it. At the Objectives Workshop, there was near unanimous agreement among workshop participants that this is an important problem in the Ministry.

The process to obtain data is bureaucratic. It is often based on personal relationships, and in some cases, units having the data want to be paid for it. There also appears to be little input from other units of the Ministry in development of strategy for long range planning scenarios and objectives.

Under the WMP program and the IMS Project various planning tools have been developed. However, they are not being fully utilized in long range planning activities. Based upon interviews and review of reports, some of the reasons for this situation appear to be: lack of coordination between other Ministry units and the Planning Sector; inability to get data from some Ministry units for model calibration and testing; and problems in coordination with other Ministries.

The Planning Sector has also developed models which can be used by other units of the Ministry, such as the IIP and the Irrigation Sector. Although IIP is said to have obtained access to these models, there remains widespread agreement that these models are not being effectively used in these units. The reasons for this situation are not clear, but seem to relate to the weakness in relations among Ministry units, and the lack of real demand or felt need for these models in the receiving unit.

Finally, awareness among Ministry officials about the role and importance of long range planning in the Planning Sector is weak. Almost all field staff interviewed had little or no knowledge about the long range planning activities, the role of long range planning and the tools developed. This lack of awareness was also detected among some headquarters staff that were interviewed.

The workshop participants generally agreed that long range water resources planning needs strengthening.

Possible Opportunities for Change

The following ideas for addressing the long range planning issue were developed by participants of the Objectives Workshop and IIMI team members. All of them would need some investigation and further evaluation and development to determine whether they are workable and acceptable.

- It was suggested that IIMI could collaborate with the Dutch team in reviewing the long range planning issue and improving the long range planning activity and its effect on policies and decisions. This collaboration would be through the head of the MPWWR long range planning unit in the Planning Sector.

- Develop a process for using technical task forces to assist in long range plan development and input to decision making committees.

- Examine the process for establishing long range planning activities and studies.

- Investigate means to create demand for long range planning outputs.

- Place activities and models that are not planning activities under the functional organization of the Ministry responsible for that activity; this unit can further develop the modeling tools for its own purposes. For example, the Forecast Center has data important to the Irrigation Department, but these data go to the Planning Sector. Perhaps the Center should be placed in the Irrigation Department, since this Department operates and controls Aswan Dam and Lake Nasser Reservoir. Models for predicting inflow to Lake Nasser and for assisting in operating the water delivery system (for example the Utah State University modeling activity) could be placed under the control of the Irrigation Department. Appropriate equipment and training would need to be provided.

- Institute a program of periodic updating of the WMP (every five years for example).

- Establish a process for getting input from other units in the Ministry for the long range planning activities, so that all concerns are addressed.

- Develop a process to get all Ministries involved in water resource activities to participate in the national long range planning activities. Perhaps the Inter-Ministerial Water Planning Committee can be reactivated.

- Develop a culture and process within the Ministry which recognizes that information sharing benefits each unit's program and leads to better overall accomplishment of water resource programs. Use outside assistance to examine MPWWR management processes and culture and provide both recommendations for change and assistance in achieving these changes.

- Develop a routine procedure for providing long range planning outputs to the water resource policy-making process.

- Develop a routine process for making tools developed in the Planning Sector available to other units which can use the tools.

- Establish a technical information data base available to all units of the Ministry.

Issue Number 2 - Planning Activities
Water resources planning is sometimes done in other units of the Ministry, sometimes leading to overlap, duplication of effort, difficulty in setting program priorities, and coordination problems.

In the first draft of this report, this issue was noted under the section on long range planning. Participants at the Workshop believed it was important enough to be treated separately as the number two issue under water resources planning.

Both long range water resources planning and project planning are done in more than one unit of the Ministry. Some long range planning work is done in the NWRC in addition to the Planning Sector. For example, some aspects of the SRP activity in the NWRC can be considered long range planning activities. Project feasibility studies for the IIP funded by USAID were done in the IIP unit in the Irrigation Department. All other feasibility studies for new projects or rehabilitation projects were done in PPD. Feasibility studies for IIP funded by the World Bank are done jointly by the IIP unit in the Irrigation Department and PPD. Some of the planning activity within different units is complementary, but other planning studies are overlapping.

There seems to be no clear definition of the roles and functions of the various units in planning. Some staff members in NWRC indicated that since the Planning Sector was not doing long range planning on certain issues, they decided to do it. Some participants in the Workshop and some managers that were interviewed indicated that there is unclear direction from upper level management concerning the overall responsibility for water resources planning activities. Some participants at the Workshop also indicated that some research is done in the Planning Sector - - the same issue in reverse.

Possible Opportunities for Change

- Review the way in which roles, responsibilities and program assignments are made for water resource planning activities. Develop clear definitions of the roles of each unit concerning water resources planning activities. In MPWWR program planning, ensure that program assignments are made to the correct unit based on their defined roles.

- Review existing water resources planning activities and consider placing them in the correct unit of the Ministry.

- Review the feasibility study process for IIP. Perhaps staff trained in doing feasibility studies can be concentrated in PPD, and PPD can serve the IIP unit in producing feasibility studies just as it serves other units in the Ministry (see D, below).

Issue Number 3 - PPD's Capability
Improvement of PPD's capacity to do economic and financial analysis as part of the project feasibility study process.

Some feasibility studies completed by PPD were reviewed. Some of these studies are only engineering plans, and do not include economic or financial analysis. Some of the studies seem to consider only one solution or plan, rather than considering various alternatives. Although the quality of PPD's feasibility studies are considered good in engineering terms, workshop participants agreed that PPD's capacity to do economic and financial evaluations as part of the feasibility study process needs strengthening.

Possible Opportunities for Change

- Implement a policy requiring that all studies consider alternative solutions and include economic analysis.

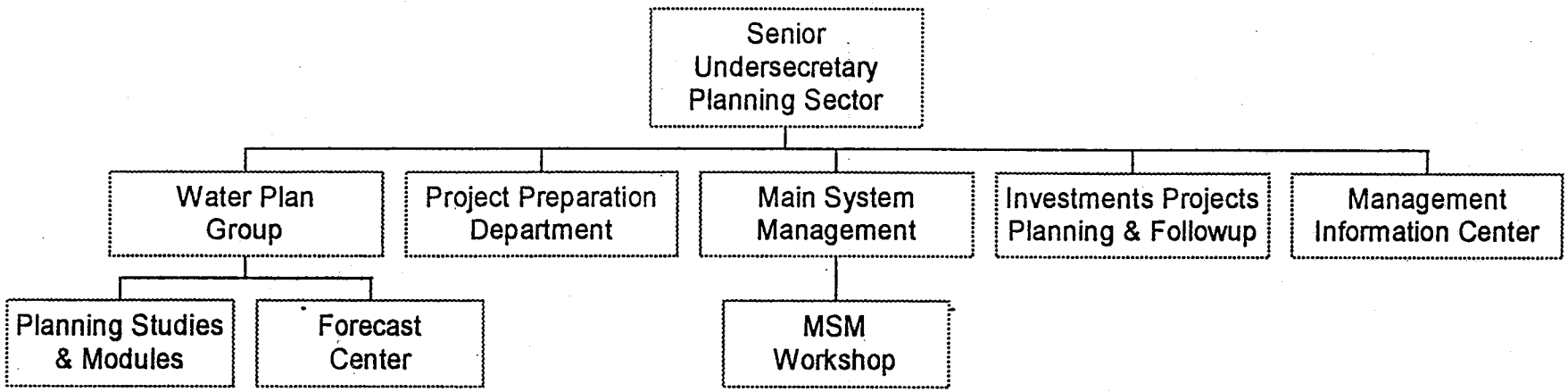
- Provide additional training in making economic and financial analyses.

Issue Number 4 - Program Planning
Water resource long range planning and water resource project planning activities may not be getting an adequate level and quality of supervision and direction, because of the heavy workload demands on the head of the Planning Sector.

During interviews of some Ministry staff, a concern was expressed that because of the heavy workload of the Senior Undersecretary of the Planning Sector in managing the Ministry's program, acting as Deputy Minister and participating on many committees, the water resource planning activities may not be getting the level and quality of direction and supervision it needs. Some participants at the workshop agreed that this is an issue, but others did not; the Head of the Planning Sector did not agree; he stated that his span of control and work load are not excessive.

The Senior Undersecretary of the Planning Sector supervises PPD, MSM, the Water Planning Group (which includes PSM and the Forecast Center) and the Management Information Center (see Figure 3.1). As Deputy Minister, he in effect also assists the Minister to supervise 10 major Authorities and Departments and several staff offices. Additionally, he is a member of 12 committees and chairman of seven of the twelve. Literature on management and experience in other countries indicate that a manager can effectively supervise up to five to seven subordinate managers. In many water resource agencies in other countries, the Deputy Minister has no other responsibilities except to assist the Minister. Also, water resource agencies in other countries usually separate program planning from other units, because of its importance and the heavy workload involved. Sometimes financial management activities are also combined with the program function in one unit.

Figure 3.1 . Planning Sector Organization Chart



Based upon management literature and experience in other countries, it appears that at the Minister's level there also may be a span of control problem (ten subordinate managers of major functions or programs and managers of several staff offices); but IIMI did not investigate this question fully. Section 4.2.2 also considers this span of control issue as part of a broader discussion of the Ministry's organizational structure.

Issues concerning the financial aspects of program and budget development are addressed in a separate report (Lewis and Hilal 1995) and also summarized in section 4.5.

Possible Opportunities for Change

- The Deputy Minister and program planning activities could be separated from the other water resource planning activities and placed in a special unit reporting directly to the Minister. Water resource planning activities could remain in the Planning Sector with a Sector Chief who would not be encumbered with program planning and Deputy Minister responsibilities.

- The Deputy Minister could be attached directly to the Minister's Office, and only have the responsibility of Deputy Minister activities. The program function could be combined with the financial management function in a central program and financial unit. The technical planning function would be placed in a separate sector.

Other Water Resource Planning Issues

Several issues and opportunities identified by the Study were not addressed at the Workshop. They are listed below.

- After project feasibility studies are completed, they are not always followed. The actions taken which deviate from the plan are not documented and often done without prior justification. Sometimes structures are eliminated or added in violation of the plan.

- The Ministry is developing a computerized Management Information System (MIS). The Planning Sector is responsible for its implementation and operation. Information systems exist in other Ministry units: a Geographical Information Systems (GIS) data base in the Survey and Mapping Authority; computerized payroll, personnel and accounting systems in the Mechanical and Electrical Department and the Survey Authority; a data base on pumps and pumping stations in the Mechanical and Electrical Department; and the telemetry system in the Planning Sector. Computerized MIS efforts are scattered and uncoordinated in the Ministry. There are numerous redundancies in the data collected and no standards for software or hardware. There appears to be no basic objective or strategy for the computerized information system.

Possible Opportunities for Change

- When making changes in the feasibility study plan during project implementation, consult the planning unit and involve the unit's staff in the decision making. Prepare

formal documents justifying the change, and also prepare as-built drawings for completed work that differs from the original plan or design drawings.

- Strengthen and officially recognize the Management Information Center as a unit providing services within the framework of a clear and agreed strategy.

- Prepare a new strategy for the development of the MIS within the Ministry; perhaps concentrate on the development of a few systems for key functional areas such as water management, planning, budgeting and finance and human resources (personnel functions). Establish task forces with members from the functional unit and the MIS organization to develop the systems.

- The role of the Information Center could be changed to keeping track of developments in the information field, promoting use of standards for software and hardware within the Ministry, providing technical backup for certain information development activities and software maintenance activities, and assessing the performance of outside contractors.

3.2 Operation and Maintenance of the Water Delivery and Disposal System

This section discusses four major topics: 1) Water allocation, delivery and disposal; 2) Water quality; 3) Maintenance; and 4) the Irrigation Improvement Project (IIP). A number of IMS components are discussed within each of these topics.

3.2.1 Water Allocation, Delivery and Disposal

A. Background

Egyptian irrigated agriculture is considered to be one of the most productive systems in the world. Irrigated agriculture is expanding. In addition to this increasing agricultural water use, there is increasing demand for water by the municipal and industrial sectors (Cestti 1995). Prospects for increasing water supplies in Egypt are limited.

The Ministry of Public Works and Water Resources has overall responsibility for allocating and distributing water, managing drainage and groundwater, and controlling the inflow of pollutants into public waterways. Objectives for management of the irrigation system have been: 1) to secure water resources for all its users; 2) to make water available to users at the proper time and in the quantity required; and 3) to minimize conflicts among users and between users and managers of the system.

Construction of the High Aswan Dam (HAD) was the most significant change in the water supply system, because it changed many of the old irrigation management practices. The previous unstable flow pattern became a stable flow pattern with an abundant water supply.

Presently, the water users usually do not experience large fluctuations in water supplies due to hydrological cycles as was the case before the construction of HAD. However,

the present Horizontal Expansion program to develop new lands, and the continuing increase in municipal and industrial water requirements is expected to stretch the water supply. The system will, in the future, need to be operated as a water short system. This situation will require increased management efforts for satisfying all the water demands of the different users.

Following are some of the factors and assumptions underlying operation of the water supply system:

- The Ministry of Agriculture provides information about the anticipated cropping pattern to assist MPWWR in determining water requirements for irrigation. However, with the freeing up of crop pattern restrictions, this activity has become very difficult.

- Water is delivered to agriculture in on-off patterns, with each rotation lasting several days.

- The system is operated by maintaining certain water levels at key points throughout the system.

- Operation and maintenance of the drainage system is the responsibility of the Drainage Authority of the MPWWR, while the delivery system above the mesqa is operated by the Irrigation Department.

- There is no direct user involvement in management of the system above the mesqa.

- Pumping water from drains without prior permission by MPWWR is prohibited; however unofficial pumping does occur.

- Technical assistance programs under the IMS Project such as Planning Studies and Models (PSM) and Main System Management (MSM) have been or are being implemented with the goal of improving water distribution to meet demands.

Over the past several years, there have been many changes in the hardware and software of the system. For example, the Structural Replacement program replaced about 19,500 structures, improving the system water control capacity. Not all of the changes have been as beneficial as planned. For example, the ban on using weedicides has make control of aquatic weeds in canals and drains very difficult. Some of the new technology is still in the implementation stage, and has not yet been fully integrated into the daily operation of the system. An example is the telemetry system.

In this context, the water delivery and disposal component of this study was designed to evaluate the following aspects:

- Basic assumptions being used in the operation and maintenance of the system.

- Issues in the present operating situation pertaining to system performance.

- Opportunities for change to improve present system operation, make better use of tools introduced through the IMS and other projects, and prepare for operation of the system under future water-short conditions.

In the first draft of this report, 22 issues were listed concerning this topic. Some of these issues were presented at the Objectives Workshop. The Workshop participants summarized all these into 5 issues.

B. Issues

The issues developed by workshop participants are as follows (they were not prioritized by the workshop participants):

- Demand assessment is not very accurate.
- There is unaccounted-for use of drainage water and groundwater.
- A clear definition of responsibilities for system operation is needed to add accountability and to counteract interference in operating decisions by outsiders (politicians, influential farmers etc.).
- Non-integration of decision support tools such as telemetry and models.
- Sustainability of the operation and maintenance of the telemetry system.

Based on interviews with both field and headquarters operating staff, the following additional issues were identified:

- Presently the deliveries of water to different parts of the service area are based upon the experience of the operating personnel and satisfaction of complaints from water users concerning water supply and deliveries.
- There is insufficient storage in the delivery system to provide flexibility in managing planned water allocations to meet real time change in water demand.
- Unofficial use of drainage water and groundwater complicates the delivery of water throughout the system.
- The telemetry system is not yet fully integrated into the daily operating routine and is not being used to its full potential.
- Some PSM models developed in the Planning Sector for planning annual operation of the system are not being used, because they are believed to require an unrealistic amount of data to use, and some operations staff are not familiar with the tools.
- There is inequity of access to water at the distributary and mesqa levels of the system.

- Freeing up crop patterns has created severe problems in meeting water demands in some parts of the service area.

- Some drains are being used for trash, sewage and industrial effluent disposal.

Results of field staff interviews

Field staff interviews included specific questions for different levels of staff. Annex D provides the detailed results of these interviews; only the most significant results are presented here.

Ten district engineers, two assistant directors, one inspector, two under secretaries, ten technicians and eighteen gatekeepers were asked the following questions:

- *What are your major responsibilities?*

- *What tasks take up the major part of your time?*

Except for technicians, virtually 100% of the personnel interviewed stated that water distribution and maintenance are their major responsibilities. Eighty percent of the Technicians reported that maintenance is their major responsibility. Up to seven responsibilities were cited. No one mentioned administrative functions as one of these.

Again, except for technicians, 55% to 75% of the staff interviewed cited water control and maintenance as the tasks that took up most of their time. Sixty percent of the Technicians indicated that maintenance took up the major part of their time.

Additional questions asked of the same staff except the assistant directors are:

- *Are funds and facilities provided adequate or inadequate?*

- *What are the major problems you have in carrying out your tasks?*

Seventy-eight percent of those interviewed stated that funds and facilities are inadequate. Lack of transportation facilities was the most frequently-mentioned problem in carrying out their responsibilities (fifty percent of those interviewed). Gatekeepers also identified lack of communication facilities in addition to transportation facilities as problems.

Questions concerning water allocation and distribution were asked of 10 district engineers, one assistant director and one inspector. The questions are:

- *What information is required for seasonal water allocations?*

- *What is the accuracy of this information under the present policy of liberalized cropping patterns?*

- *How do you assure that farmers get the water they need if the water allocation cannot be accurately assessed?*

- *What solutions do you propose for water allocation problems?*
- *During operations, what information is collected concerning water flow in different parts of the system?*
- *Is the water flow information adequate?*
- *What problems do you face in achieving effective water distribution?*
- *What changes in departmental procedures and resources are needed to make water delivery more effective and efficient?*

In response to the question concerning information needed for seasonal water allocation, 75% of those interviewed stated that crop pattern data are required; 40% said it is difficult to get accurate data. To the question on assuring that farmers get the water they want, all indicated that ensuring equitable water distribution and internal rotation adjustments are the most used procedures.

When asked for suggested solutions to water allocation problems the responses were varied, but equitable water distribution, the IIP, better maintenance, and administrative control of gatekeepers at the interface of Directorates to the Central Water Distribution Directorate were the most common proposed solutions.

When asked what information is collected concerning water flow in the system, 90% stated "water levels." Thirty-three percent of those naming water level data as the main data collected stated that the information is inadequate.

The problems faced most often in achieving effective water distribution according to the interviews are:

- Maintenance (58%)
- Inequitable water distribution (33%)
- Locational (head - tail) disadvantages in the system (25%)
- Water shortages at the tails (17%).

From these responses, it can be inferred that maintenance and equity of water distribution are perceived as the most serious problems.

Those interviewed suggested the following changes in departmental procedures and resources to improve system operations:

- More emphasis on maintenance (33%)
- More water (25%)
- More emphasis on trained and well equipped staff for flow measurements (17%).

Possible Opportunities for Change

Following are suggestions for addressing the issues concerning water allocation, distribution and disposal. Some may be inconsistent with others and there are certainly other possibilities not listed here. This is a starting point for thinking about future directions.

At the April Workshop the following five suggestions were developed by the small working groups:

- Improve the basis of, and conditions for, gathering and using information for water distribution and disposal.

- Improve staff skills and physical facilities for efficient water distribution according to set targets at different levels.

- Explore coordination mechanisms between water distribution units of the Ministry and relevant units within NWRC such as the Drainage, Groundwater, and Water Management Research Institutes.

- Consider developing the capacity in the private sector for maintenance and possibly even operation of the telemetry system.

- Explore mechanisms for estimating seasonal shares for each directorate.

The following suggestions are from interviews with MPWWR staff and some IIMI team members:

- Re-examine the validity, applicability and utility of the assumptions used for assessing water demand.

- For planning seasonal water deliveries, consider using the demand hydrograph of the previous year, or an average of several past years, if the planners feel that the preceding year was unusual (Walker et al. 1995)[4].

- The Ministry could involve water users ("users" may change from one level to another) in allocating water supplies. Such an involvement should help in managing conflicts over water supply during drought and scarcity situations which may arise in the near future.

- The process identified in the previous paragraph could be used either to negotiate allocations in specific situations, or to develop clear transparent allocation rules to be used during shortage periods, which will then be legitimate and socially acceptable.

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[4] A more recent report from Utah Sate University notes that it is only during the rice production season that assessing water demand is problematic (USU 1995a; 1995b).

- One option might be to fix the seasonal water share for each directorate based upon criteria to be developed and then holding irrigation directorates and their subordinate organizational units responsible and accountable for managing their respective shares (see USU 1995a for just this proposal).

- Another option might be to delegate authority for water distribution to the local districts and inspectorates with provisions for accountability.

- Involve the water users at the district level in issues related to water distribution. Criteria could be developed for implementation of such involvement.

- For more realistic water allocation and distribution, water boards at central, directorate and district levels could be considered.

- An enhancement in the existing performance of water distribution may be achieved if tools such as GIS and Decision Support Systems are used for monitoring, operation and maintenance of the system.

- Components of the PSM Project which relate to real time irrigation operations may be better utilized if located in, and further developed by, the Irrigation Department or Sector.

- For sustainable maintenance and perhaps operation of the telemetry system, creation of dependable capacity in the private sector could be given serious consideration.

- Use a "participatory action research" mode to develop, test and implement improved water allocation, distribution and performance assessment methods along with improved institutional arrangements. This would involve an active partnership of managers, researchers, trainers, and users.

- Suitable irrigation structural improvements can be considered for addressing the inequity of access to water at the distributary and mesqa levels.

- Consider provision of separate systems for disposal of irrigation drainage water, sewage water, and industrial waste.

3.2.2 Water Quality

A. Background

More and more untreated or under-treated effluents from industries and domestic uses are being discharged into the river system, canals and drains. Polluting the water decreases the real usable water supply. Recognizing this, the top managers of the Ministry, when asked about the most serious water resource problems in Egypt, rated pollution of the water supply as the most serious issue (section 3.1.1 A).

Chapter 2 of this report, Cestti's (1995) report and the Inception Report for "Strengthening the Planning Sector" (DHI 1995) all list and explain the various water

quality laws, and the government agencies involved with water quality and their responsibilities. Therefore, that information is not repeated here.

B. Issues

The first draft of this report listed four issues under this topic, which were presented at the Workshop. Participants summarized their discussion into three issues:

- Too many agencies monitoring water quality with no effective cooperation.
- No effective enforcement of water quality laws.
- Lack of public awareness.

There are a variety of agencies monitoring water quality or setting up monitoring programs without much coordination among them. USAID was, until September 1995, supporting one of these efforts in NWRC, under PRIDE; the objective was to collect and organize water quality data collected by others and make it more readily available. There also seems to be some disagreement between agencies as to what their specific responsibilities for water quality management and water quality law enforcement are. MPWWR has the major responsibility for enforcing water quality law, but it is thwarted in its effort, largely because many of the largest polluters are said to be government industries and MPWWR must depend on the Interior Ministry (police) for making arrests.

Much of the public is unaware of the seriousness of the problem. The general public does not understand the effects polluted water can have on health, the environment and crop yields. There seems to be no specific agency charged with making the public aware of water quality problems, though recently the Ministry has initiated the establishment of a water resources communications unit supported by USAID to develop its capacity in this area.

The water quality issues are multi-agency in nature, not just MPWWR issues.

Possible Opportunities for Change

- The water quality management decision-support system being developed in the Planning Sector with the help of DHI is a tool that should be useful.
- Review of experiences in other countries concerning their approach to water quality management may be useful in tackling the problem in Egypt.
- Outside expert assistance to evaluate the problem in Egypt and develop alternative scenarios for resolving the problem could be obtained.
- The Supreme Committee for Water Quality needs to become more active and aggressive in addressing the water quality problems in the country. The MPWWR could play a leading role in that committee since it is the manager of the water resources storage and delivery system.

- Since the MPWWR is the key manager of water resources, it could take responsibility for coordinating monitoring of water quality. It should also develop an extensive public awareness and educational program concerning water quality issues. The Ministry could seek outside assistance (building up the recently initiated communications unit), and could also seek the government's approval for being the primary agency responsible for public awareness of this topic.

3.2.3 Maintenance

A. Background

The MPWWR is responsible for construction, operation, maintenance and rehabilitation of the entire irrigation and drainage system down to the mesqa level. Maintenance activities are conducted by various units of MPWWR:

- Irrigation Department - canals and canal structures
- Drainage Authority - drains and drain structures
- Mechanical and Electrical Department - pumping plants
- Coastal Protection Authority - coast protection works
- High Dam Authority - Aswan Dam.

The on-going maintenance activities include a number of related components implemented by different units. Some of the important programs for maintenance are:

- The Preventive and Channel Maintenance program started under the IMS project, and now covering 6 Directorates.
- A biological, mechanical and manual weed control program.
- Maintenance of drainage pumping plants, structures and equipment.
- Maintenance of telemetry and other high-tech equipment installed under the IMS project.
- A training program for maintenance personnel.

The Irrigation Department is in charge of the Preventive Maintenance (PM) program, a component of the IMS Project. For regular canal maintenance, the Department primarily uses Public Excavation Companies (PECs). These companies use heavy equipment for canal dredging, and some damage has been sustained from their activities in canal cross sections. Force account staff for manual maintenance, as well as private sector companies, are also used for maintenance of the irrigation system. Private sector firms are not used as much as the PECs.

USAID and other donors have funded programs to assist the Ministry to improve maintenance of the water delivery and drainage systems. This assistance has been primarily in programs of preventive maintenance, maintenance manuals, equipment purchase and procedural changes. Most donor programs are implemented through special organizational units set up specifically for the programs. Little has been done in strengthening the institutional aspects of the maintenance program.

Two Authorities are responsible for the maintenance of the drainage system; the Drainage Authority, and the Mechanical and Electrical Department (MED). The former is responsible for channel and structure maintenance and the latter is responsible for pumping plants. The Drainage Authority depends on the MED for adequate inlet stage levels at the pumping stations for proper operation of surface and sub-surface drainage systems. Presently, many of the drainage channels are silted, poorly shaped and have excessive aquatic weed growth.

The Drainage Authority uses PECs as does the Irrigation Department. The rates are negotiated annually, and are based upon quantities of earth excavated. The work is accomplished primarily with draglines. The process strips soil from the banks and often creates unstable bank slopes causing erosion during water level changes. Consequently, the channels are wider with higher bed levels than they should be. In some locations, although drainage pumps have adequate installed capacity to handle most flow capacities, the pump operators are not running the pumps as required to maintain the drain water levels within channel design requirements.

Aquatic weeds are a significant maintenance problem. They reduce channel hydraulic performance, increase evapotranspiration losses and contribute to lower operating efficiencies. Weeds have been controlled by herbicides, manual and mechanical means. However, in 1991, in response to concerns about the affects of herbicides on the environment and human health, MPWWR stopped using chemicals for weed maintenance.

Results of Field Staff Interviews

The IIMI-MPWWR team interviewed both headquarters and field personnel concerning maintenance activities. Field personnel interviewed about maintenance included 18 engineers from the Mechanical and Electrical Department, 15 engineers from the Irrigation Department, 12 engineers from the Drainage Authority and 5 engineers from the Preventive Maintenance Program[5].

Engineers from the Drainage Authority were asked the following questions:

- *What are your major responsibilities?*
- *What tasks take up the major part of your time?*

[5] Vissia (1995) provides more details from a study of maintenance management carried out after this report was completed. Its findings confirm the results reported here.

- *Are funds, equipment and supplies provided adequate or inadequate?*
- *What are the major problems you have in carrying out your tasks?*
- *Is there a need to coordinate your activities with the activities of other MPWWR units?*

Sixty percent of these engineers responded that their major responsibilities are:

- Regular maintenance of open and tile drains;
- Solving problems reported by farmers concerning drains and water logging;
- Review of work on drainage projects.

Concerning what activities took the largest percentage of their time, forty percent reported that implementing irrigation and drainage laws and supervision of drain construction took the most time. Thirty percent listed survey activities and solving farmer problems as the most time consuming.

Seventy percent of the drainage engineers reported that fuel supplies, furniture, communication equipment, survey equipment, and other field equipment are inadequate. Thirty per cent cited inadequately qualified staff as a major problem along with inadequate training.

When asked about coordination of their activities with the maintenance activities of the MED and Irrigation Department personnel, 100% indicated that coordination is important, especially during winter closure and during the change of irrigation rotations.

Mechanical engineers from MED were asked the following questions:

- *What are your major responsibilities?*
- *What tasks take up the major part of your time?*
- *Are funds, equipment and supplies adequate or inadequate?*
- *What are the major problems you face in carrying out your tasks?*
- *What changes in Departmental procedures, facilities etc. are needed to make your performance more effective?*

Fifty percent of the MED engineers reported that their major tasks are operation and maintenance of pumping plants and replacement of pump units. Half of the engineers also reported that fuel, transportation facilities, potable water supplies and sewerage facilities are inadequate, and that housing provided at pump sites is dilapidated.

Changes they suggested to improve performance are as follows:

- Provide staff and communication facilities to match the volume of work (30%);
- Change the organizational structure by dividing the directorates into inspectorates and reducing sizes of districts (25%).

Other questions asked of 15 field personnel of the Irrigation Department, 12 from the Drainage Authority and 5 from the Preventive Maintenance Program are:

- *How do you select areas and plan for canal and structure maintenance?*
- *What are the major problems in carrying out canal maintenance?*
- *In your opinion, are current maintenance practices adequate to sustain the system indefinitely? If not, how fast are the canals and structures deteriorating? What additional efforts are needed?*
- *What changes in departmental procedures, facilities etc. are needed to make maintenance work more effective?*
- *Is there a need to coordinate your activities with other units or departments? If so, in what way?*

Thirty percent of the irrigation engineers interviewed cited the following as criteria or activities for selection of areas and planning maintenance:

- Field surveys of canals and structures
- According to the degree of weed infestation
- According to operational activities during the course of the year.

Major problems most often cited in carrying out canal maintenance are:

- Inadequate funds and equipment
- Weed growth
- Delays in execution of work by contractors.

Sixty percent of the engineers stated that the current maintenance practices are not adequate; more equipment and staff are necessary and better coordination with the other Ministry units performing maintenance is needed.

Seventy percent of the Drainage Authority engineers said they follow a predetermined schedule in carrying out their maintenance program. The three most often cited problems in drainage system maintenance are:

- Lack of public awareness about the importance of drainage system maintenance;
- Drains passing through communities are the most difficult to maintain; and
- Delays in work by contractors.

Forty percent of the drainage engineers felt that present drainage system maintenance is adequate. However, 50% stated that more modern equipment and staff are needed for effective maintenance.

The five engineers in the Preventive Maintenance (PM) Program responded to the questions as follows:

- Four engineers stated that following up maintenance work in the workshop takes the major part of their time. Three said they have no defined job description.
- These same engineers stated that transportation, equipment and supplies are adequate.
- Four engineers stated that coordination with other Ministry units involved in maintenance activities is carried out by their Project Director.

At the informal brainstorming meetings with field personnel, particularly in El Miniya, it emerged that most Irrigation Department engineers felt the PM Program is important and useful, and has also improved the Department's reputation.

More information from interviews of field staff on maintenance appears in Annex E.

B. Issues

In the first draft of this report, five issues were discussed, three of which were presented at the April Workshop. Participants summarized their discussion into five issues, which in order of priority are:

1. Need for a global integrated policy for upgrading maintenance performance; i.e., addressing the role of the private sector, extension of the PM Program and improving and controlling funding for maintenance activities.
2. Need for technical standards and specifications for:
   - how maintenance is to be done; and
   - when maintenance is to be done (tied to irrigation performance).
3. Over-excavation by draglines.
4. Enforcement of laws and decrees prohibiting activities that harm canals, drains and structures.

5. Involvement of water users in monitoring and managing maintenance.

Based on interviews with Ministry staff, the following additional issues were identified:

- Maintenance of the drainage system is not getting equal attention with maintenance of the water delivery system.
- Some directorates have inadequate equipment and some of the equipment is of the incorrect type.
- Elimination of the use of herbicides has made weed maintenance more difficult.
- The PM Program has been implemented in only six directorates, and some staff are concerned about the expansion of the program when IMS funds are terminated.
- A new maintenance activity for the Ministry is the maintenance of electronic equipment required by the telemetry system.

Possible Opportunities for Change

Participants at the April Workshop suggested the following ideas:

- Evaluate and prepare an inventory of the facilities and supplies for maintenance activities.
- Identify, categorize and evaluate current approaches to maintenance (public, private, PM and beneficiaries).
- Investigate the private sector as a source of maintenance service for high-tech maintenance such as that needed for the telemetry system.
- Develop an integrated policy for human resource development and funding for maintenance activities.
- Develop technical specifications for how and when to do maintenance.

Other possible opportunities for change developed from interviews with MPWWR staff are:

- In order to monitor and evaluate the quality of maintenance, investigate the possibility of involving a third technically qualified party, as well as water users.
- Re-examine the issue of using herbicides for weed control. Prepare a decision document using experience from other countries and information from manufacturing companies and other countries' regulatory agencies to review the safety and use of chemicals for weed control. Present this document to the decision makers to assist them in their review of this issue.

- Review equipment needs and selection criteria for equipment, and base future procurement of equipment on the results of this review.

- Assess the impact of the PM program on the cost-effectiveness of maintenance. If the effect has been beneficial, consider changing the priority of funding of maintenance to expand the PM program more rapidly throughout the service area.

- Conduct an institutional study of the maintenance activities of MPWWR, examining the units involved, resources (staff, supplies and equipment) used, location of resources, coordination of maintenance activities, budget allocations, procurement procedures etc. Develop recommendations for improving the management of maintenance based upon the results of the study[6].

3.2.4 Irrigation Improvement Project (IIP)

A. Background

The IIP was designed based upon research results of the Egyptian Water Use Project (EWUP 1984). Under IMS, the IIP originally had a goal of improving 395,000 feddans by 1995. As experience was gained during the early years of project implementation, these goals were revised downward. About 70,000 feddans will be completed in 1995. The World Bank has, in 1994, agreed to fund the improvement of an additional 248,000 feddans (World Bank 1994). The original objectives of IIP were to use water more efficiently, decrease O&M costs and increase crop yields.

The elements of the program are as follows:

- The improvement of mesqas by raising and lining them, or putting them underground in low head pressure pipeline systems or improving them without raising them, and providing a single point pump lift at the head of the mesqa.

- Providing continuous flow in the distributaries by installing downstream level control gates, and making other structural modifications as needed in the distributary canal.

- The establishment of legally recognized private water users associations (WUAs) on mesqas to participate in its modernization, operate and maintain the pump and improved mesqa (including rotation of water among users), and ensure the financing of O&M at the mesqa level.

- Establishing an Irrigation Advisory Service (IAS) to organize farmers. The IAS also assists farmers with advice regarding on-farm irrigation practices, and assists farmers in settling disputes concerning operation of the improved mesqa.

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[6] Vissia (1995) presents a detailed design and formats for this study, along with the results of a pilot-test of the design.

The IIP has a detailed monitoring program whose reports are available; and there is an increasing number of published reports on the IIP experience (for example, the IIP Monitoring and Evaluation Findings] and the Economic Analysis [IIP 1994]).

Field Staff and Farmer Interviews

The IIMI-MPWWR team interviewed IIP staff at headquarters and in the field. Field staff (nine IAS engineers) were interviewed in the El Minya and Kafr El Sheikh areas. Forty farmers in each area were also interviewed; the results are reported in Mohieddin (1995). Additionally, the technical assistance staff for both the IMS and the World Bank IIP programs were interviewed.

Basic information gathered from the 80 farmers in the two areas appears in Table 3.1. The farmers in each area were asked seven standard questions. Some of the responses are given in Table 3.2. Other information on responses to these questions is in Annex F.

Table 3.1

Data on Land Holdings and Pumps

	Minya %	Kafr El Sheikh %
LAND HOLDINGS		
Owned	70	53
Rented	5	5
Mixed	25	42
SIZE OF HOLDING		
< 3 feddans	63	38
3-10 feddans	20	45
10 or more feddans	17	17
HOLDINGS PER MESQA		
On only one mesqa	28	23
On more than one mesqa	72	77
MECHANICAL PUMP ACCESS		
Owned	65	93
Rented	35	7

Source: Mohieddin (1995).

Table 3.2

Farmers' Perceptions of Irrigation Problems and IIP

	Minya %	Kafr El Sheikh %
WHAT ARE THE PROBLEMS OF THE OLD IRRIGATION SYSTEM		
Water Shortage	35	50
Inequity of Access to Water	10	25
Poor Mesqa Maintenance	25	5
MODES OF RESOLVING IRRIGATION DISPUTES		
Direct Negotiation	28	30
Customary Law	23	15
IAS Engineers	25	0
MODES OF MANAGING WATER SHORTAGE		
Use of Well Water	55	0
Use of Drainage Water	3	60
Complain to the MPWWR	13	23
SUGGESTED IDEAS FOR IMPROVEMENT OF THE PRESENT SYSTEM		
Raise Water Level in the Canal	38	48
Line the Main Canal	13	5
No Ideas	25	25
READINESS TO JOIN THE IIP		
Yes	83	28
No	17	72
BENEFITS OF IIP		
Permanent Availability of Water	67	43
Increased Crop Yields	20	47
Clean Mesqas (Multiple Responses	13	36
PROBLEMS WITH IIP		
Fear of Financial Burdens	13	54
Long Construction Period	17	11
Over Supply of Pumps	7	46
Water Short/Competition for Water	20	4
No Problem	37	0

NOTE: Percentages do not add to 100% because of multiple responses in some cases.

A higher percentage of Miniya farmers are owners than in Kafr El Sheikh; Miniya farmers are more likely to have holdings of less than three feddan (63% versus 38%) while 45% of Kafr El Sheikh farmers fall into the 3 to 10 feddan range. Over 90% of Kafr El Sheikh farmers own mechanical pumps while 65% are pump owners in Miniya. Overall, the Kafr El Sheikh sample farmers appear to be better off as a group than the sample farmers in Miniya. In both locations, more than 70 percent of the respondents have land on more than mesqa, which means that farmers would join more than one WUA as their mesqas are improved.

There are important differences between the two groups of farmers in their responses to our questions on water problems and IIP (Table 3.2). More Kafr El Sheikh farmers report water shortages and inequitable access to water than do Miniya farmers. Kafr El Sheikh farmers tend to manage water shortages by using drainage water (60%) while Miniya farmers use well water (55%). On the other hand, 83% of Miniya farmers say they are ready to join the IIP while 72% of Khafr El Sheikh farmers say they are not ready for this; the latter group emphasized fear of financial burdens and oversupply of private pumps as the main reasons for their reluctance. Apparently they fear the loss of their existing pump investments -- recall that 93% own pumps. A quarter of the Miniya farmers said they would resolve disputes through the IAS engineers, while no farmers from Khafr El Sheikh mentioned this. This may be an indication of better Ministry-farmer relations in Miniya which itself may be a function of having less serious reported water problems.

Nine IIP field staff were asked five standard questions:

- *What are your major responsibilities?*
- *What tasks take up the major part of your time?*
- *What supplies and equipment are provided and is it adequate?*
- *What are the major problems you face in carrying out your tasks?*
- *What changes in departmental procedures, facilities etc. are needed to make your performance more effective?*

The detailed responses to these questions are reported in detail in Annex F. The majority responses are given below.

In response to the question about responsibilities, 67% said that supervising and training technicians and field staff, and planning and supervising construction activities were their major responsibilities. One third indicated that meeting farmers to solve problems and administrative work took the majority of their time.

Responses on equipment and supplies indicated that a government car, fuel and bikes are furnished; however two thirds of the respondents said these items were inadequate. One third stated that the major problems faced in carrying out their tasks were problems with

farmers because of their lack of awareness and their attitudes, and lack of facilities needed to do their job. Concerning changes in departmental procedures, facilities etc., 56% suggested increasing salaries and incentives.

B. Issues

In the first draft of this report, seven issues concerning IIP were listed, of which three were presented at the Objectives Workshop. Workshop participants identified three issues in the priority shown below:

1. Development of a long range national irrigation improvement plan.

2. The future role and sustainability of the IAS.

3. The implications of continuous flow.

Issue Number 1 - National Irrigation Improvement Program

A major issue to be addressed regarding IIP is whether the program results in water savings locally or system-wide. Monitoring of IIP benefits is incomplete and no data exist concerning water savings. Furthermore, Water Master Plan and SRP studies indicate that since the area from Aswan Dam to the sea is a closed basin, water losses (return flows) are available for reuse until they reach the sea, where they are lost (WMP 1984; Keller et al. 1995). Consequently, based on these studies, installing IIP in areas outside the lower Delta would not save water. Construction of IIP in these areas must therefore be justified on the basis of other benefits, for example reduced pumping costs, better equity and higher yields.

Based on information from interviews, other concerns related to IIP are:

- Farmer's reluctance to accept the program. Responses by farmers in the Kafr El Sheikh area provide some indication of this reluctance.

- The location and level of the implementing organization is of some concern to IIP employees.

  The total cost of the program will be considerable -- an estimated $3.2 billion (World Bank 1994). This relates to priority setting for best use of limited funds available to MPWWR.

- Implementation of the program has been slow and is far behind the original schedules.

- Improved low-level mesqas have been eliminated as one of the alternative improved mesqas available under the World Bank-funded program, in spite of this mesqa design being superior to the others in several aspects.

Possible Opportunities for Change

- A detailed well-designed monitoring program is necessary to monitor the costs and benefits of IIP in the areas where it has been implemented. Data from this program should be gathered and analyzed for two or three years to assist in planning the proposed national program. The *Action Plan* (IIMI 1995d) provides a terms of reference for this study.

- The results of WMP and SRP studies should be considered in planning the extent of a national program.

- Examine ways to make the program demand driven and to get more farmer involvement. Outside assistance and review of farmer involvement programs in other countries may help in this study.

- In Chapter 4 of this report, various management and organizational issues and possible opportunities for change are discussed. During the Ministry's examination of the way in which it manages its functions, organizational issues concerning IIP could also be considered, and the issue of where and at what level it should be located would be resolved.

- Re-evaluate the low-level improved mesqa alternative that could be made available to farmers.

Issue Number 2 - Future Role and Sustainability of the Irrigation Advisory Service (IAS) and Water Users Associations (WUAs)

IIP field staff, both IAS and non-IAS, were asked the following standard questions related to IAS and its role:

- *Are there major difficulties in getting farmers to form WUAs, and, if so, what are they?*

- *Are farmers willing to pay the cost of mesqa improvements? Why or why not?*

- *If there are WUAs in your area, do you interact with them directly? If so, with whom and over what questions do you interact?*

- *In your opinion, do WUAs make interactions with farmers more effective? If so, how?*

- *Is there a need to coordinate your activities with irrigation, drainage and/or pump operation personnel? If so, in what way? What are the problems of coordination?*

- *Is there a need to continue IAS activities with farmers after improved mesqas have been turned over to the WUAs? If so, what are the activities needed?*

- *Once the IIP construction activities in an area are finished, how can IAS activities be continued? What organizational or other changes are needed?*

- *Would WUAs federations be useful? If so, for what? Why should farmers want to support them?*

Some of the key information gathered from these interviews is presented below; more complete information is given in Annex F.

According to the IIP field staff, the main difficulties in getting farmers to form WUAs are inter-village social problems, lack of farmers' awareness, availability of privately owned pumps, fear of cost recovery, and the new technology of the system.

Concerning farmers' willingness to pay for mesqa improvements, 56% of the respondents said farmers are not willing to pay, 22% said they are, and 22% said some would be willing to pay. Those that said "yes" said the farmers believe the project is useful to them; a third of those saying "no" said the farmers are too poor to pay. They know the project is funded by USAID and the farmers have already paid for field drainage systems.

Almost 100% of those interviewed in areas where WUAs exist said they interact with WUAs, usually with the WUA leader. The main items addressed with WUAs were reported to be water distribution problems (53%), maintenance of mesqas (42%), irrigation issues (37%), and lining of canals (21%). (Some respondents gave multiple responses to this question.) Fifty-three percent of those interviewed said the existence of WUAs makes interactions with farmers more effective; three per cent said existence of WUAs did not help; the remaining 44% said they did not know or did not respond.

Seventy-eight percent of the IAS staff said there is a need to coordinate their activities with the personnel in irrigation, drainage and pump operation activities. The main reasons given for the coordination were stabilizing the water level for continuous flow, and assisting in dealing with farmers who were not abiding by the rules of irrigation deliveries. Fifty-six percent said there are no coordination problems, 33% did not respond, and 11% said coordination creates an additional work load for the engineers.

One hundred percent of the respondents said there is a need to continue the IAS program after the improved mesqas have been turned over to the WUAs. The main reasons given were monitoring of the operation of the system, maintenance of the system, training of farmers, providing farmers with irrigation advice, organization of irrigation, and solving technical problems. On continuation of the IAS after construction is complete, 56% said the IAS should be a separate authority and 33% said the IAS engineers should be responsible for operation of the mesqas.

On federations of WUAs, 57% of the IIP field staff said WUA federations would be useful, six percent said they would not be useful, and the rest either did not know or did not answer. The two main reasons given for the usefulness of federations were, "easier to organize irrigation operations," and "reduction of the number of farmers with whom the operations staff must deal". Fifty-six percent of the respondents were not sure if the farmers would accept organization of WUA federations, but the others said farmers would accept such a program. The only reason given for why farmers would support a federation program was to be able to participate with MPWWR officials in determining water distribution.

The key issue resulting from the interviews and the Workshop was concern for the future role and sustainability of the IAS. Related to this issue is whether this task should be done within the MPWWR, as part of the extension service of the Ministry of Agriculture, or by the private sector. If it is to be continued within MPWWR, should it be done by District Engineers or as a separate entity, and if so, where should it be located organizationally within the Ministry? The *Action Plan* (IIMI 1995d) provides a terms of reference for a study to address these issues.

Possible Opportunities for Change

- One opportunity to evaluate and decide this question is to examine the IAS as part of a detailed IIP monitoring program (see above).
- Re-examine with the Ministry of Agriculture, the appropriateness of the present interagency agreement concerning IAS and agricultural extension services, and determine the most suitable means to provide the necessary services based on the IIP experience to date.
- Conduct a program to obtain farmers' input to this question as part of the decision making process.

Issue Number 3 - Implications of Continuous Flow

This issue is related to the first issue concerning a national plan for IIP. In formulating a national plan, the capability of the system to deliver continuous flow must be examined.

Thirty field staff were asked four standard questions about continuous flow:

- *What changes will be needed to implement continuous flow throughout the area?*
- *If continuous flow is implemented, what problems will there be?*
- *Will continuous flow require any changes in drainage maintenance practices? If so, what changes will be needed?*
- *Would you say that the improved mesqa is as important to the farmers as is continuous flow? Why or why not?*

Some of the key information from the interviews is summarized below, and more complete information is in Annex F.

The changes needed to implement continuous flow that were mentioned most often were lining of canals, lowering the mesqa level, re-enforcement of canal banks, providing enough discharge, training the farmers in irrigating with continuous flow, and remodeling of canal and mesqa openings.

The most frequently mentioned problems resulting from implementing continuous flow were increased water loss, water shortage, increased need for maintenance, and drainage problems. Thirty-three percent of those interviewed stated that there would be no problems in introducing continuous flow. Responses to the question about continuous flow requiring changes in drainage maintenance indicated that 67% of the respondents expected that changes would be required.

Fifty-six percent of the respondents felt that farmers consider continuous flow more important than improved mesqas; one third felt that farmers consider them equally important, and 11% felt that farmers consider the improved mesqa more important than continuous flow.

No studies have been done to determine if continuous flow delivery is possible in the entire irrigation system. Workshop participants were concerned about whether peak demands could be met. On the other hand, in areas where only part of the area has been improved under IIP, the present rotational system of water control has in some cases had problems in providing continuous flow to the improved areas.

Possible Opportunities for Change

- Use the mathematical models developed in the Planning Sector to examine whether the system can deliver continuous flow to all of the service area without problems[7].
- Incorporate parameters in the IIP monitoring program to examine the impacts and operational issues of continuous flow.

3.3 Research

A. Background

Applied field and laboratory research on water resource and civil engineering issues have been practiced in Egypt for more than 100 years. The results are contained in the technical papers and reports still available in the "The Nile Basin" volumes. Although research tools and facilities were inferior to those available today, the research findings and results were rich. Many principles developed in those early years are still used, such as the Hurst equation for long-term storage, flood forecast analysis, and losses and gains methodologies and techniques. The names associated with this work are Hurst, Simaika, Phillips, Black, Amin, and others. Salinity problems and drainage, flow routing and time lag, hydraulic structures and navigation were among the research topics of the past. Obviously, research is not new to the MPWWR; its foundation was laid in the past long before the Water Research Center was established.

The need to further strengthen and expand Egypt's research capacities became urgent after the construction of the HAD. Sedimentation and degradation problems appeared,

[7] The *Action Plan* (IIMI 1995d) presents a terms of reference for this study.

operation under a stochastic inflow pattern, changes of river morphology, rising water tables as a result of the shift from basin to perennial irrigation system, pollution and environmental impacts were all side effects which required research. Indeed the great benefits of the HAD to Egypt, mainly flood protection, water security, hydropower, and irrigation also led to new issues requiring research.

Accordingly, MPWWR integrated all research units into one unit with a separate identity, the "Water Research Center" (WRC). A presidential decree was issued in 1975 to form the WRC to serve the needs of the country and specifically the MPWWR, as well as to be the bridge between the outside world and Egypt for technology transfer and adaptation.

More recently, the WRC was elevated to University status and renamed the National Water Research Center (NWRC); the Chairman of NWRC has ministerial rank and the Board of Directors has considerable autonomy. There are presently 12 research institutes in NWRC.

The NWRC is responsible for doing applied research on issues important to the MPWWR. But it also carries out research requested by other government and non-government organizations. During the past decade there has been a tremendous investment to build the research capacity of the NWRC. Much of this investment has come through the IMS Project. This has involved acquisition of modern research equipment and facilities, and training hundreds of staff. These heavy investments in human and capital resources were necessary to equip the NWRC to address the increasingly complex water resource issues facing Egypt. During this period NWRC received funds from the Government of Egypt, foreign donors, and a variety of collaborators and clients paying for research services. Limitations on government funds remains an issue that leads to competition in some cases, and an inability to meet all of the needs of the MPWWR and other Ministries. Now that a significant research capacity has been established especially in the engineering sciences, attention is shifting to consider how Egypt can get the best return possible on this investment, while continuing to broaden and deepen NWRC's strengths.

The status, role, and relationships to the rest of the Ministry of NWRC proved to be a controversial issue. Some people in NWRC may feel this section does not fully reflect its views. It however does reflect the views of many of NWRC's most important clients, the policy and operational staff in the Ministry. IIMI has received quite a few observations from Ministry staff at various levels, and information from discussions at the April Workshop has also been used. Participants at the Workshop included present and former NWRC staff.

B. Issues

The first draft of this report had nine issues concerning research. These issues were presented at the Workshop for consideration. Workshop participants generated a total of 11 issues relating to research. They combined them under three topics. This section also includes a fourth topic which was addressed in the first draft of this report. The topics generated in the Workshop appear below in the priority set at the Workshop, followed by a topic identified by IIMI in the first draft of this report.

1. Relationship of NWRC and the remaining units of the Ministry.

2. Coordination among NWRC institutes.

3. NWRC's input to policy making.

4. NWRC's relationship to other research organizations.

Issue Number 1 - Relationship of NWRC and MPWWR

The issues generated at the Workshop on this topic are listed below as they appeared on the flip charts:

- Insufficient knowledge by researchers in NWRC about the Ministry and its needs, and a similar lack of knowledge in the Ministry about NWRC.

- Sharing data among institutes and with the Ministry is not adequate.

- NWRC, as part of the Ministry, should comply with requirements of the Ministry.

- NWRC does not have adequate funds to do "basic work" for the Ministry for free.

- Boundaries are not respected between the Planning Sector and the NWRC.

- How is the program for NWRC developed? Who is involved?

- What is the accepted research agenda? What are the various research agendas?

- NWRC and the Training Center need better coordination.

- Need to publicize the work of NWRC.

These issues are discussed in the following paragraphs.

- IIMI team member discussions and interviews with staff of the MPWWR at all levels indicate some criticism and misunderstanding of NWRC and its present and potential contribution. There is a perception in the Ministry that NWRC is not doing research that is useful and practical, or that addresses real problems and issues. IIMI does not endorse this perception -- it is certainly not correct; but the perception itself is important and suggests that there is an issue to be addressed. This issue may be partly a communication problem and partly a deeper institutional problem.

  In terms of communication, perhaps policy-makers and operations managers are not able to communicate their needs clearly to the researchers (for example they may not be very good at expressing problems as research issues); and perhaps researchers are not effective in communicating what they can do that would be useful, and at

communicating their results and findings in a user-friendly manner to non-researchers. Sometimes researchers and decision-makers do not seem to share a common technical language.

Institutionally, there may not be sufficient incentive to ensure active interaction and collaboration between policy-makers and managers, and researchers. Researchers do not seem to perceive Ministry officials as their "customers" -- the consumers of their "products". And many Ministry officials seem not to perceive NWRC as the place to go for assistance in problem solving. There may not be sufficient incentive built into the relationship to ensure accountability and responsiveness of researchers and Ministry officials. For example, the lack of clear guidelines on this issue delayed an agreement between a NWRC Institute and IIP for an important monitoring program for some time.

- Related to the issue discussed above is the question of how the annual and five year programs for research are formulated and funded.

  NWRC's research is largely carried out using public funds. One would therefore expect that the data collected and the analyses carried out would be in the public domain, available to other interested users. At present, there is no *systematic* way for parties outside the NWRC to obtain research data and results from NWRC or its Institutes. Rather, data are often controlled by institute directors or researchers themselves, and access then is based on negotiation.[8] This lack of data sharing emerged frequently in interviews with MPWWR officials -- suggesting it is hampering relations between NWRC and other units of the Ministry. It should however be recorded that under the Strategic Research Program, progress is being made to address this issue.

  NWRC staff at the Workshop indicated that there is no clearly defined process to include MPWWR in research program development, and its funding. They indicated that if funds in the Ministry's budget were attached to specific research activities requested by the Ministry, the NWRC would put priority on these programs and provide the resulting information to the Ministry.

  Information gathered from interviews indicates that, with a few exceptions, coordination of the research institutes and their counterpart staff in the Ministry is often dependent on the personality of the institute head and his working relationship with Ministry personnel. In some cases, input to the research program is obtained from Ministry personnel, but in other cases, institute heads develop their own program without seeking sufficient input from Ministry personnel.

  NWRC's relationships with other potential "customers," for example other ministries, also seems to complicate its responsiveness to the needs of the MPWWR. For

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[8] An exception that has been pointed out by many people is the Annual Report of the Drainage Research Institute on its data.

example, there are apparently certain financial incentives for NWRC institutes to work for non-Ministry clients that do not apply to normal Ministry-requested work. It is not clear to what extent this has affected the responsiveness of NWRC institutes to the MPWWR, but it could be related to the extent and process of the Ministry's involvement in development and budgeting of the research program.

- The relationship between work done by the NWRC and the Planning Sector is not very clear. In principle, one would expect a very close working relationship between the Planning Sector and NWRC, with NWRC doing research on questions and issues faced by the Planning Sector and providing its data to the Sector as needed, and the Planning Sector in turn perhaps providing data to the researchers, as well as commissioning research. There is indeed cooperation. However, it appears that there is also considerable overlap in their activities, with the Planning Sector sometimes doing work that is perceived as "research" and the NWRC doing work that could be considered "planning." Further, there is a perception of competition rather than collaboration between these two units.

- A similar question arises in the relationship between the Training Center and NWRC. Strong dynamic training programs need to be closely integrated with field research. The Training Center's strongest training programs at present are those that are based on the previous field research carried out under EWUP (Rao 1995). On the other side, research results can often best be communicated to users through effective training programs. NWRC does carry out training, and does contribute to Training Center courses. But there used to be a closer institutional linkage between research and training in the past than there is now. Both the Training Center and NWRC could benefit from a closer and more formal relationship; and the research institutes could be asked to play a stronger role in designing and carrying out training programs.

- Some participants at the Workshop suggested that there is a lack of information about NWRC's program and the results of its research. They contended that if more information were available to Ministry staff, there would be more coordination and exchange of information.

Issue Number 2 - Coordination Among NWRC Institutes

- Coordination among the NWRC institutes is an essential building block for an integrated interdisciplinary research program. Most of the major issues facing Egypt in the water resources area cut across the specialized expertise of the different institutes. Thus, the institutes are complementary and NWRC can achieve its full potential only if there is sufficient inter-institute collaboration and communication. Our observations suggest that there is room for improvement in this area.

- An important issue related to the coordination issue is the sharing of data among the institutes. At present, data collected by an institute remains under that institute's control, and sharing is at the discretion of the institute directors or researchers. Further, formats for data collection and storage are often no compatible among the Institutes. The Strategic Research Program (SRP) is attempting to address this issue.

- The various NWRC institutes represent different disciplinary skills to a considerable extent. However, these disciplinary skills largely still fall into a narrow technical range. Many of the serious issues facing Egypt require a much broader multidisciplinary approach than is presently possible within the NWRC, even if all the institutes cooperate closely. NWRC presently has minimal capacity in social and management sciences and economics, for example. This issue is closely related to the question of NWRC's relations with other research institutes in Egypt and beyond, discussed below.

Issue Number 3 - NWRC's Input to Policy-Making

Participants at the Workshop were concerned that results from research activities should influence policy-making in the Ministry. They suggested that the process whereby research output is considered in policy-making needs improvement. For example some of the results concerning Egypt's water balance from the SRP study could affect the "Horizontal Expansion" policy presently being pursued by MPWWR and the Ministry of Agriculture. Likewise, a USAID official knowledgeable about NWRC expressed his concern about improving the process for using research output in policy-making.

Issue Number 4 - NWRC's Relationship to Other Research Organizations

There is a special issue in regard to the relationships between the NWRC and the Agricultural Research Center (ARC) and its constituent institutes. The Chairman of each sits on the other's Board, which is certainly an important step. But there is clearly a lot of overlap in terms of research carried out in some institutes of the two centers (for example, ARC's Soil and Water Research Institute, and NWRC's Water Management Research Institute). Is there sufficient cooperation and sharing of results? In addition, ARC and NWRC have complementary strengths. For example, ARC has strengths in agricultural economics, social sciences, and agronomic and soils sciences; NWRC has strengths in water-related sciences.

This issue can be broadened to include the relationships of NWRC to other academic and research organizations in Egypt and internationally. It will not be necessary or cost-effective for NWRC to try to include all the possible disciplines within the Center; collaborative relationships with other research organizations can strengthen its work considerably. IIMI is aware that NWRC does have close ties to universities in Egypt, as well as with various international organizations, and does draw on expertise from these institutions as necessary. NWRC should continue and further expand this process.

Possible Opportunities for Change

The following are ideas that have been suggested by various people; the list is not complete, and some suggestions are not consistent with others. It is simply a starting point for thinking about future directions.

- Supplement the Management Board and Board of Directors (the two high committees managing and directing NWRC now) with two assisting committees, each headed by one of the two Assistant Chairpersons of NWRC. One would be an Advisory Committee made up of professors and ex-directors to review all institutes' research plans, comment on the mutual involvement among the institutes, and make recommendations for improving the technical quality of the work. The second would be a Follow-Up (or Monitoring) Committee with 6-8 members including financial and administration representatives. Its role would be to overcome obstacles, write periodic reports based on what is received from the institutes, review and comment on annual reports of the institutes, and advise on budget allocations among and use of funds by the institutes.

- Joint training programs, joint field visits, shared use of facilities, and joint research with a variety of partners should be explicitly encouraged and rewarded with incentives.

- In case it is concluded that small adjustments in the organizational structure and procedures of NWRC would not be adequate to achieve the full potential of NWRC, more far-reaching changes, such as a more integrated structure built around specific long term research issues should be considered.

- If the primary responsibility of NWRC is indeed to support the objectives of the MPWWR, then the relationships between NWRC and the other components of the Ministry need to be strengthened. A partial solution, and first step, suggested at the last session of the April Workshop, could be joint planning of research[9]. The five-year and annual plans of the Ministry components as well as NWRC could be brought into harmony and better integrated; final approval of the research plans could lie with high policy committees having both policy makers and researchers represented. The funded plans would have very specific agreed outputs.

  Another approach to this problem might be to provide research budgets to the departments, sectors and authorities of the Ministry who will then negotiate with NWRC to get research done, and provide the funding for this. This would create a relationship that would include incentives for the researchers to treat the Ministry units as their "customers." A basic principle underlying the research budget is that it should be based on outputs that the customers (users) really need and want.

- Periodic workshops, seminars and technical meetings with Ministry staff and other interested parties would be a useful and inexpensive way to exchange experience and ideas. An important need is a mechanism for identifying research issues which the NWRC could be asked to address; such meetings may be one such mechanism, especially if Ministry officials also make presentations on their problems.

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[9] IIMI understands this does occur between some research institutes and their Ministry counterparts, notably the Drainage Research Institute and the Drainage Authority.

- Establishment of a comprehensive "Information Center" as proposed by the SRP. This Center could have three components: a data base, a library with national and international publications and reports (already existing), and a computer center (which also exists). The Iinformation Center would provide services both to the institutes within NWRC and to others needing the information. There should be clear rules and transparency about access; the Information Center could even charge fees for its services.

- Encourage more joint research by NWRC (or selected NWRC institutes) and other institutions, including ARC institutes, universities, other research organizations, and -- very important -- with units of the Ministry itself. Collaborative field research with researchers and managers participating together is a powerful mode of research. Joint collaborative agreements could be the basis; and the Ministry could work with donors to set aside funds to encourage such joint work.

- Establish a formal linkage between the Training Center and NWRC, charging NWRC researchers to participate actively in developing and delivering training, and involving Training Center staff actively in joint research activities. A close linkage between training and research would contribute greatly to enhancing the dynamism of both.

- Clearly define the functions, responsibilities and relationship of the NWRC and the Planning Sector, and assign future activities to these two units according to the defined functional statement. Also, evaluate means to improve coordination between the two units, so that their work is complementary.

Finally, perhaps it would be useful to make a distinction between two types of research, as suggested by a reader of an earlier draft of this report. NWRC does two types of "research": a) research for solving specific problems faced by the Ministry, for which Ministry officials believe NWRC researchers should be "on call;" and b) research to add to the body of knowledge to enhance water resources management or apply new technologies. The first type of research is almost a consulting function -- but is a perfectly legitimate application of the researcher's expertise. The second type of research may involve work that is independent of the immediate interests of the Ministry. But both are useful and important.

Chapter 4

MANAGEMENT PROCESSES WITHIN THE MINISTRY OF PUBLIC WORKS AND WATER RESOURCES

4.1 Introduction

Around the world, national water resource agencies are responsible for the key functions in managing a nation's water resources. Normally these functions include planning (long range, new project planning and program planning); design of facilities; construction activities; operation and maintenance of water storage, delivery and drainage facilities; and regulation of the use of surface and ground water. How a water resource agency is organized and managed determines how efficiently and effectively it carries out its functions.

MPWWR was one of the first Ministries founded in Egypt, with a 200-year history. It has been effective in adapting to changing circumstances. When it was founded, water supply varied according to the floods on the Nile River, because there was inadequate storage in the system to provide year-to-year consistent water supplies. Management of water resources at that time was considerably different than it is now. After construction of the High Aswan Dam, a dependable year-round water supply was created. New management procedures were adopted by MPWWR. Now, as municipal and industrial water use is increasing and irrigation use is expanding because of the Horizontal Expansion program, MPWWR again needs to re-assess and perhaps change its water resource management policies and procedures.

The question addressed in this chapter is whether management practices and organizational structures developed to deal with past conditions are adequate to meet future challenges in the management of the country's water resources.

This section of the report examines four organization and management issues that greatly affect the ability of the Ministry to carry out its mission:

- Organizational structure;
- Decision-making processes within the MPWWR;
- Personnel management; and
- Financial and budget management systems.

4.2 Organizational Structure

4.2.1 Background

Organizational structures can be based on managing either *programs* or *functions*. If an organization is based on managing *functions* it will have units responsible for each major function such as construction, operation and maintenance of facilities, administration, etc. Other organizations might be based on managing *programs* such as a drainage program which would include functions like the construction of, operation and maintenance of, and other activities related to drainage facilities.

The organization of MPWWR has some units responsible for programs and some units responsible for functions. The Ministry has four Authorities, two Departments, three Sectors, a Research Center, a Training Center and various staff offices reporting directly to the Minister (see Figure 2.1). Authorities have more autonomy for managing their programs than do Departments. The National Water Research Center with twelve internal research institutes, and the Planning Sector handling long range project and program planning, are responsible for specific functions. The other organizational units are responsible for programs which include such functions as operation and maintenance of facilities, design and construction of facilities and some regulatory activities.

Most Authorities, Departments, Sectors and NWRC have their own administrative offices. There is no single central administrative office which oversees all administrative activities in the Ministry. Three staff offices attached to the Minister's office include the Training Center, the Financial and Managerial Development Affairs Office and the Minister's Affairs Office.

The Ministry's organization outside the headquarters is by directorate. Most of the Authorities and Departments have field offices in some or all of the directorates. But the boundaries of the directorates of different units, for example Irrigation Department and Drainage Authority, do not overlap either with each other or with the Governorates. One of the key functions of the Ministry, operation and maintenance of facilities, is split among various Departments and Authorities according to activity: water storage, water delivery, drainage, etc. Donor-funded projects, including IMS project components, are often located in special organizational units within Departments, Authorities and Sectors.

The Irrigation Sector is the unit within the Irrigation Department responsible for managing the water delivery system. Below the General Directorate for Central Water Distribution, there are five more levels (though these are not strictly hierarchical). These are the delta barrage and Upper and Lower Egypt Directorates, the regional directorates, and 23 irrigation directorates, each of which has two to three inspectorates, each of which again is divided into two to five irrigation districts. The district engineer is the lowest level professional engineer, covering an area of about 40,000 feddans. He supervises a large number of laborers, gatekeepers, and support staff. But he has little formal discretion in adjusting water deliveries. He officially provides information and makes requests upwards, and carries out decisions made at higher levels. In reality there is considerable informal "slippage" in terms of implementing rotations and the lines of communication often overlap and bypass each other.

4.2.2 Issues

The first draft of this report listed eight issues concerning organizational structure, which were also presented at the Workshop. Participants identified other issues related to organizational structure, and then summarized them under four topics in priority order as follows:

1. Overall organization of the MPWWR

2. Communication of data and information among MPWWR units

3. Span of duties of MPWWR senior staff

4. Relation of special projects to regular MPWWR units

Topic Number One - Overall Organization of the MPWWR

Peter Drucker, a famous management specialist, has pointed out that organizational structures that "just grew" are not likely to be appropriate to the needs of the organization. Although the best organizational structure will not guarantee good results, "the wrong structure is a guarantee of nonperformance." This is because such a structure creates its own problems which distract attention from the important issues, and accents weaknesses instead of strengths. He concludes, "the right organization structure is thus a prerequisite of performance" (Drucker 1974:519).

In the interviews of managers in the Ministry, most managers' statements concerned relatively minor changes in the organization. Some wanted more autonomy to manage their own programs, and thus suggested their unit be changed to an authority. Some wanted all Authorities and Departments to be the same in terms of authority for decision-making and program management and the way they are managed. While only one manager indicated that a radical change was needed to improve the functioning of the Ministry, twenty out of 36 senior managers interviewed at headquarters suggested some form of change in the Ministry's organization.

Directorate personnel that were interviewed were mostly concerned about organization at the directorate level and rarely mentioned the overall organization of the Ministry. Although they were not specifically asked about organizational structure, eight out of 107 Directorate personnel raised the issue on their own, and suggested some change in the organization of the Ministry at the Directorate level.

In the small group activity concerning organization at the Workshop, participants stated that ineffective information exchange is related to the organizational structure. They discussed the differences in management autonomy between authorities and departments, and the mixture of units organized according to function versus program. One of the small groups discussed organizing the Ministry along functional lines only: design, construction, planning, operation and maintenance, and regulatory.

One of IIMI's concerns is the *diffusion of functions* among various Ministry units. Operation of the Ministry's water storage, delivery and drainage facilities is spread among at least four units. Maintenance of various facilities is also spread among four or five units. Likewise, at least four units carry on construction activities. IIMI has not done an in-depth review of this situation, but in reviews of other government water resources organizations, it has been found that this type of structure results in inefficient use of personnel, supplies and equipment. Each unit has its own equipment sheds and inventories, supply inventories and personnel, usually leading to duplication and excessive human and equipment resources. Scheduling and coordination of maintenance activities is also much more difficult[10].

The existence of design and construction activities in several different units often leads to differing design and construction document standards. There is also no central cadre of technical specialists in the fields of design and construction.

Some Ministry officials have given thought to the diffusion of functions among Ministry units. The Director of IIP has prepared an "Ideal Area" proposal which would test a revised organizational structure at the district level (IIP 1995). This structure would incorporate most operation and maintenance responsibilities, including the responsibility of working with farmers through the IAS, into one district-level organization. This proposal has some of the elements of integrated management that have proven successful in water resource organizations in other countries.

Another issue under this topic of overall organization concerns the NWRC, which has been discussed in Section 3.3. Similarly, some of the problems faced in integrating other IMS components into the Ministry's management processes are organizational issues that have been discussed in Chapter 3. These include PSM, MSM and IIP.

Possible Opportunities for Change

- Perform a detailed management-organizational study of the Ministry, to investigate in more detail the issues that have been raised, define clearly the key functions of the agency; drawing on experiences in water resource organizations in other countries, develop alternative organizational plans for consideration.

- Review in more detail how the administrative activities are performed in the Ministry and the organizations which perform them, and develop recommendations for organizational changes to improve the effectiveness and efficiency of these activities.

- Identify Ministry activities which may be better accomplished by the private sector. These may be specific high-tech activities or a major function such as operation and maintenance of certain facilities in the water delivery and drainage system (see Goldensohn et al. 1995 for some suggestions).

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[10] After this report was completed, IIMI carried out a pilot study of maintenance management that has confirmed these inefficiencies and identified opportunities for improvement (Vissia 1995).

Topic Number Two - Communication of Information Among Ministry Units

This topic received considerable attention from personnel interviewed in all levels of the Ministry and at the Objectives Workshop. It has also been discussed in Chapter 3 (especially section 3.1.2). Seventeen out of 36 senior managers at headquarters expressed concern about the inadequacy of the coordination and exchange of data and information within the Ministry. Ten out of fourteen lower level field staff who were specifically asked about coordination and data exchange also expressed their concern that these activities need strengthening. Furthermore, 22 out of 107 field staff expressed concerns about this issue even though they were not asked about it. Typical statements received during interviews are as follows:

- Data are hoarded rather than shared.
- Charges are requested by NWRC for data.
- There is no data base available to all units for routine data needed for program accomplishment (financial cost data, hydrologic data, system operating data, etc.)
- Units which do not manage donor programs sometimes do not wish to take the time to assist units managing donor programs unless they can share in some of the benefits available to the donor programs units (incentives, higher per diem, special training etc.).
- Coordination at headquarters is somewhat effective, but coordination between headquarters and directorates needs strengthening.
- Coordination and exchange of information is often dependent on personal relationships between managers rather than on a desire to work together to accomplish the responsibilities assigned.
- The process for coordination and exchange of information is bureaucratic, requiring formal letters and decisions at higher managerial levels of the involved units.
- The process for information exchange between different Ministries is even more formal and bureaucratic, requiring considerable time to obtain information.

Participants at the April Workshop also attributed this problem of coordination and information sharing to the way in which the Ministry is organized and the different degrees of autonomy among the various units.

Possible Opportunities for Change

- Create a management process and environment which encourages managers to coordinate their activities with others and mutually share information and data. Outside help from a recognized management consulting firm could be hired to assist the Ministry to examine its management processes and environment and implement changes to address this as well as other management issues.

- As suggested in Section 3.1, review the objectives and role of the Management Information System, and develop it to serve Ministry managers by providing information and data they need.

- Review the formal process now used to communicate between Ministry units with the objective of simplifying it and increasing coordination and the flow of information between units of the Ministry.

- Identify ways to eliminate difficulties in coordination between units managing donor programs and other units (see Topic Number 4, below).

Topic Number Three - Span of Duties of Senior Staff

Research from many countries on organizational management indicates that a manager can effectively supervise no more than five to seven subordinates. Most public and private organizations follow this pattern.

Some managers in MPWWR have a span of control or supervision exceeding this norm. As discussed in section 3.1.2, the Minister has about ten major line units and three staff offices reporting to him. The Head of the Planning Sector has only five subordinates reporting to him; however he also has the responsibility of Deputy Minister and is a member of 13 committees. Many Authority Chairmen have five to six line organizational units and eight to ten staff offices under their direct control. The potential negative impact of the wide span of control of managers on the quality of decision-making is increased by the high degree of centralization of decision-making (Section 4.2.2).

Many managers stated that more delegation of authority is needed. An organization in which decision-making is highly centralized puts a considerable additional workload on the top managers, thus making a reasonable span of control more imperative for effective program direction and supervision.

At the Workshop, the working group that considered this issue concluded that there is a very wide span of control and supervision for some key senior staff in the Ministry, a conclusion which was not accepted by all participants. However, the IIMI team suggests that this is indeed a problem needing attention.

Possible Opportunities for Change

- Examine in more detail the span of control of managers to explore more thoroughly the issues raised, and if the problematic issues are substantiated, develop alternative suggestions to alleviate the problems.

- Managers could discuss this issue with their subordinates to identify any problems and jointly resolve the problems.

- Ministry officials could compare their organization and its span of control to other water resource organizations in other countries and adjust its organization where it might be beneficial.

Some of the opportunities for change listed in Section 4.3.2 also relate to this issue.

Topic Number 4 - Relation of Special Projects to Regular MPWWR Units

Based upon information from interviews and review of MPWWR documents, the following issues emerge:

- When donor projects are initiated in the Ministry, a separate organizational unit is often created for the activity. Sometimes these special units are created at the donor's request, on the assumption that a special dedicated unit is more likely to be able to achieve project objectives. However, this has led, in many cases, to a number of institutional problems. These include:

  - Separation of the activity from the normal program of the Ministry;

  - Placement in a unit other than the end user of the technology being introduced; and

  - Complications in coordination and data exchange with other units.

  These problems have clearly affected implementation of the IMS project.

- Donor programs include special benefits for the employees managing the programs (incentives, special training abroad and in-country, higher per diem rates and better transportation). This has created some problems by draining the most competent personnel from non-donor program units, and unwillingness of non-donor program unit personnel to cooperate with donor program unit personnel, because they are not able to share in the benefits of the program. The Ministry attempts to overcome the problem by paying special "variable income" (see Section 4.4.1).

- In many donor programs the turnover of key managers in the unit is high; in some cases the average time in position is slightly more than a year (the IIP is an example, while the MSM program is an exception; its Director has been in place since the program started). The turnover rate is in part due to the promotion policy of the Ministry in which vacancies are filled with the next eligible person on the seniority list. The high turnover of managers results in frequent change of management style, implementation procedures and coordination processes. This often slows down implementation of the project and delays its integration into day-to-day Ministry activities.

- In some cases, according to participants at the April Workshop, concerned units of the Ministry have not been involved in program formulation and the setting of implementation and coordination processes. This has created problems in acceptance of the program by the units which are to use the technology. One manager of a donor-

funded program stated that in spite of his many efforts to coordinate with the unit which is to use the project he is implementing, there are still problems in accepting and integrating the technology into the routine operating activities of the unit.

The issue concerning Ministry policy for coordination of donor programs has also been covered in Section 3.1.1 (Issue Number 2).

Possible Opportunities for Change

- Review the way in which donor program benefits are managed. Devise a system in which the benefits are more equally shared, so that coordination can be improved and personnel upheavals can be avoided. The Ministry can confer with donor agencies on this issue to obtain their assistance in resolving this problem.

- Develop a start-up process in which:

  - Concerned units are involved in program design and management processes;

  - A coordination plan is devised;

  - The appropriate unit for managing the program is evaluated and decided;

  - Proper authority is delegated for management of the program;

  - Personnel patterns are set;

  - Decision-making processes are developed.

- Develop a program to keep all Ministry employees informed of donor program activities and their relationship to other units in the Ministry.

- Devise a management plan which improves the relationship and coordination of donor program field staff with field staff of other Ministry units.

- Avoid creating special organizational units for each donor program, but instead assign the program to the proper existing organizational unit and strengthen it as necessary. The Ministry can consult with donor agencies to assist in making this type of change.

4.3 Decision-Making within the MPWWR

4.3.1 Background

There are two primary organizational forms of decision-making used within the MPWWR:

- *hierarchy*, in which a manager makes decisions for his subordinates; and

- *committee*, in which the group makes (or recommends) a decision for all.

Hierarchical decision-making is most effective when decisions are made at the appropriate level of the hierarchy. On the one hand, if decisions are made at too high a level, the decision-maker is overburdened and may be unable to deal with his broader responsibilities, while the quality of his decisions may suffer because of lack of local knowledge or decisions may be unduly delayed. On the other hand, pushing decisions too low in the hierarchy affects coordination of activities.

Information gathered through interviews and review of documents about the hierarchy decision-making process is summarized below:

- Decision-making within the MPWWR is centralized. Delegated authority for program and administrative decisions is limited.

- Limits on delegated authority for procurement of goods and services and financial transactions are often set by law. These delegations are partly based on Law 9 of 1983, which contains explicit limits to procurement and contracting authority. These limits are out of date because of inflation and other changes.

- Over half the managers interviewed considered task assignment, and authority to make decisions necessary to carry out the task, as separate items. They felt that official delegation of authority should accompany task assignments.

- A third of the managers also stated that many decisions are referred to higher levels, even when authority has been delegated.

Information obtained from interviews and review of documents on decision-making in committees is as follows:

Committees play an important role in the decision-making process of the Ministry. Permanent Ministry committees include the following fourteen committees:

- Public Policies Committee
- Investment and Foreign Countries Committee
- Committee for Coordinating between the MPWWR and the Agriculture Ministry
- Water Policy Committee
- Nile River Committee
- The Committee for Preparing Integrated Geographic Information of Floods
- High Committee for Floods
- Joint Committee for Coordination between Projects of Land Reclamation, Irrigation, and Drainage Authority
- Complaints Committee for Engineers in the Ministry
- The Committee for Leadership Jobs for Excellency or Higher Levels
- Central Committee of Promotion of Civil Engineers
- Personnel Affairs Committee
- Complaints Committees
- Technical committees formed for specific purposes.

Special projects are often overseen by a committee. Project committees include:

- Committee of the Project of the EEC
- IMS High Coordinating Committee
- The IMS Components Managers Committee
- Committee for Planning the Water Resources Project
- Project committees for each IMS project
- Project Committee for Reuse of Water Drainage after Treatment
- High Project Committee for Planning, Designing, and Following Up the Advertisement Campaign and Water Uses and Resources Improvement and Preservation

Authorities within the Ministry have Boards of Directors, a form of committee, which make major policy and decisions. The head of the Authority is the Chairman of the Board.

The committees exist primarily for three purposes:

- to make decisions;
- to provide advice to the Minister; and
- to coordinate among the organizations and units represented on the committees.

The decree establishing a committee usually specifies the committee's tasks, but not its authority. Of the 15 decrees examined, only one indicated that the committee had authority to make decisions on the issues it addressed. Many of the committees appear to be primarily advisory, rather than decision-making.

Further, many senior managers serve on several committees. For example, IMS committees have 45 positions. However, in addition to project managers, only 14 managers fill the remaining positions. The Head of the Planning Sector is chairman of seven committees, vice-chairman of one committee and a member of many of the other committees. Data on committee membership for five of the Ministry's top managers are given in Table 4.1.

4.3.2 Issues

In the first draft of this report, two issues concerning delegation of authority were listed. These two issues were presented at the Workshop for consideration. Participants at the Workshop added two others. Since all of the issues are related, they were consolidated under the title, "Decentralization of Decision Making".

Four issues concerning committees were listed in the first draft of this report and presented at the Workshop; participants summarized their discussion of committees under the heading "Modifying Committee Membership".

The following two sections discuss the two topics concerning decision-making which were developed at the April Workshop. They are in the order of priority set at the workshop.

Table 4.1

Committee Membership of Five Senior Officials

Manager	Number of Committees		
	Chairman	Member	Total
Head-Irrigation Dept.	3	4	7
Head-Irrigation Sector	2	2	4
Head-Min. Affairs Office	0	5	5
Head-High Coord. Com.	3	0	3
Head-Planning Sector	7	5	12

Note: The Head (Senior Undersecretary) of the Planning Sector is also Vice Chairman of another committee, making the total number of committees in which he is involved 13.

Topic Number One - Decentralization of Decision-Making

There are four issues under this topic:

- *Insufficient delegation of authority*

During interviews, 18 out of 36 senior managers stated that they would like more authority delegated to them in order to better carry out their responsibilities, reduce bureaucracy and speed up decision-making. They also stated that delegation of authority for procurement and financial decisions set by law should be reviewed, and the law should be updated. Fifteen of the 36 senior managers interviewed stated that the financial and procurement delegation authorities need updating.

One hundred seven field staff were interviewed, and although they were not asked about this delegation of authority issue, 11 of them expressed their concern about the issue, as did one of the Technical Advisors on an IMS project.

An example of how a centralized decision-making and management process slows program accomplishment is the decision on motorcycle allocation to the Directorate IAS staff under the IIP. It took six months to make the decision on allocation quantities and get the motorcycles partially distributed to the Directorates. This process started with the IIP IAS Director, and then proceeded through the Project Director to the Project Coordinating Committee and the High Coordinating Committee. Then after the motorcycles arrived at the Directorates, it took another 8 months to obtain licenses for the cycles and train the staff to use the cycles. This process started in 1992. Even now (1995) some motorcycles have not been distributed and are still in storage.

- ***Subordinates refer decisions to superiors***

Twelve out of 36 senior managers interviewed by IIMI stated that even when authority is delegated, many subordinates refer the making of the decision to their superiors. It was stated that some subordinates do not want to take responsibility for their decisions, and some feel incapable of making decisions.

- ***Limited number of decision-makers at all levels***

During small group discussions at the April Workshop, participants indicated that there were not enough decision-makers at the various organizational levels of the Ministry. Many participants felt that decision-making is too centralized among too few managers.

- ***Insufficient involvement of subordinates in decision-making***

During small group discussions at the Workshop, many participants stated that subordinates should play a greater role in assisting their superior to make decisions. They suggested that subordinates often have good ideas and information which would assist their supervisor, and perhaps lead to better decisions. Furthermore, involvement of subordinates in decision-making processes would give them important experience and prepare them for future responsibilities.

Possible Opportunities for Change

- Written job descriptions should be provided to an employee describing his responsibilities and the authority delegated to him for carrying them out. This official delegation of authority would both provide him with some security in making decisions, and would clarify that he is expected to make these decisions and not refer them to higher levels. A task force could be organized to examine this issue and make recommendations to the Minister.

- Levels of delegation of authority set by law could be reviewed to see if the law should be updated, and a proposal for changing the law could be prepared by the Ministry's attorney and submitted to the proper authorities for consideration.

- An effort to re-orient managers to make use of their delegated authority could be undertaken. Such an effort would include discussions and training to get managers at higher and lower levels to understand and agree to the use of decision-making authority at the appropriate level. The Training Center, with outside assistance, could develop courses in decision-making.

- Concerning the issue of subordinates referring decisions to their superiors, performance evaluations could include an item on how well they exercise their delegated authority. If they refer too many issues to their superior, they would receive adverse comments on their performance evaluation.

Topic Number Two - Modifying Committee Membership

Workshop participants agreed that most committees contain many of the same people as members. Many (not all) participants also suggested that where possible the Ministry should broaden participation in committees. Concerning the time and effort required of some senior mangers who sit on many committees, there was disagreement among the Workshop participants. Many senior mangers serving on committees said they did not feel overloaded, and pointed out that senior experienced officials must be members of the committees. Other participants suggested that the workload of some senior managers is excessive and may reduce their effectiveness. This topic proved very sensitive at the Workshop; but the IIMI team feels it needs to be carefully and objectively re-examined.

Based on their understanding of Ministry workloads, decision-making processes, literature on management effectiveness, and their own experiences, the IIMI team suggests the present system does have disadvantages. The IIMI team feels that some managers are overloaded with detailed work that could be delegated, as well as time-consuming committee meetings. They are therefore left with too little time for strategic thinking and decision-making. Further, the relatively narrow participation in committees, while having the advantage of including the most senior people, has the disadvantage of not including some of the key field-level people who know the situation first-hand. Further, as noted above, insufficient inclusion of subordinates in decision-making means the Ministry is losing an opportunity to give young professionals experience and prepare them for their future role as decision-makers.

Making decisions through committees has one more potential disadvantage that needs further investigation. To the extent that committees make decisions by consensus among all the members (which is generally the case in the Ministry), there is a risk that decisions will tend to be "safe" but suboptimal; there will be a tendency to avoid innovations which be creative but controversial. Ideally, committees should be used for brainstorming, generating and discussing ideas, and sharing information. They are less effective as decision-making mechanisms.

Possible Opportunities for Change

- Decrees establishing committees could be revised to define both the committee's role and authority.

- Membership of the committees could be re-examined. Perhaps membership could be distributed so that senior managers are not overloaded with committee work. This would allow individuals to give more attention to the committees on which they sit, would give the committees direct access to the knowledge and opinions of a wider number of managers, and would broaden the experience of younger professional staff.

- Examine in more detail the process and effectiveness of decision-making by committee. Explore eliminating all committees except a high level managerial committee to be concerned only with major items such as key water resource and Ministerial policy, and the strategy and contents for the Ministry's program and budget. Consider using

committees for brainstorming and sharing of information. All other decisions for accomplishing the program would be made by the responsible program or unit managers based on the level of authority delegated to them. They would also be responsible for coordinating with other unit heads as necessary for program accomplishment. Task forces can be organized as needed to address specific issues, problems or programs. These task forces would include the necessary technical personnel for addressing the subject. When the task force completes its work, it would be disbanded; it would not continue as a permanent committee.

4.4 Personnel Management

4.4.1 Background

The IIMI team examined various personnel policies in the Ministry (compensation, promotions, job descriptions, training, staffing levels and disciplines, retirement, and performance evaluations). The MPWWR has over 88,000 employees, including some 8,000 top managers, engineers, and other professionals. The Irrigation Department is the largest unit with over 38,000 employees. In addition to these full-time employees, there is a considerable number of part-time help and seasonal labor.

The professional staff is primarily made up of civil engineers except for some mechanical engineers and a few administrative staff who are trained and educated in accounting and administrative subjects. Table 4.2 summarizes the number of staff in two broad categories. Professional staff includes top management, engineers, professional administrative staff, lawyers, scientists and other professions. Non-professional staff includes office workers, technicians etc. Seasonal laborers and part-time staff are not included in the table. The ratio of non-professional to professional staff varies considerably, with the Survey Authority and Irrigation Department having relatively higher ratios than other units.

Another measure of staff is area per employee. For Egypt's Irrigation Department the ration of hectares irrigated per professional employee is about 1,000; it is 375 ha per professional employee of the entire Ministry, and if one takes the entire staff, the area irrigated per employee in the Department is 78 ha, and for the Ministry, 34 ha. In Pakistan, there are 2,900 ha per professional employee -- three times the area covered by Egypt's Irrigation Department and nearly eight times the area per professional employee of the Ministry. The comparable figure for all staff in Pakistan is 173 ha per employee. Clearly, even after allowing for differences in irrigation system design and management requirements, Egypt's water resources management agencies have a large staff[11].

[11] These figures are from Table 2 in Merrey (1995). Pakistan's system is less management-intensive than Egypt's by design.

Table 4.2

MPWWR Staffing Pattern

Unit	Professional Staff	Non-Professional Staff	Total Staff	Ratio Non-Prof. To Professional Staff
Headquarters	356	1,082	1,438	3.0
Survey Auth.	879	13,586	14,465	15.5
Drainage Auth.	1,677	12,749	14,156	7.6
Coast Protec. Auth.	111	162	273	1.5
NWRC	677	2,069	2,746	3.1
Irrigation Dept.	2,844	35,647	38,491	12.5
Mech.& Elec. Dept.	1,512	15,210	16,722	10.1
Total	8,056	80,505	88,561	10.0

Compensation of Employees

IIMI's study of compensation revealed the following:

- Base rates of pay are very low. Base salaries for engineers with additional increments added since 1990 plus regular allowances generally fall between LE 80 and LE 200 (US$ 23.50 to $58.80) per month[12]. For example, an IAS Engineer who has worked for the IIP for six years and is 31 years old, cannot get married because of his low salary. His base salary is LE 89 and he gets incentives of LE 126 making his total income LE 215/month ($63) (Max Lowdermilk, interview).

  Department chairmen (First Under Secretary) receive a basic salary of about LE 550 ($162) per month. They also receive special incentives, often doubling their basic salaries. Incentives include a representational allowance, payments for attending meetings and monthly incentives of differing levels.

- Housing is provided to some but not all persons, primarily engineers in the Irrigation Sector stationed in the field. Those staff who are not provided housing receive an extra payment of 15% of their annual bonus for housing. Other perquisites, such as transportation to and from work, are provided to other personnel.

[12]. In 1995, one U.S. dollar is equivalent to 3.4 Egyptian pounds (LE).

- Those assigned full time to donor-funded projects, such as IMS, get "incentives" that amount to 100% to 200% of their base salary. Headquarters staff assigned full time to the IMS projects currently get 150% of their base salaries, while field personnel get other incentives (overtime and payment for unusual effort). Some who work part time for donor funded projects also get incentives.

- Those who do not get incentives for full time work on donor funded programs get an annual bonus (called "variable income") that can be relatively large. The bonus system provides some sort of rough parity between those working on special projects and others.

- All engineers are eligible for per diem payments for various kinds of activities, including training sessions. Per diem rates for special projects are often much higher than regular MPWWR per diem rates. The number of days that per diem is allowed is limited and varies in amount according to the employee's rank. In IIP, for example, four days of per diem per month is allowed for IAS personnel. The most attractive per diems are those for training outside of Egypt. It is the per diems and better work facilities that make the special projects attractive to some MPWWR personnel.

- Overall then, most engineers in the Ministry can expect to take home between LE 200 and LE 500 ($58.80 to $147) per month in base salary, allowances, and incentives or bonus. Some of the Authorities pay more because of separate income or greater autonomy in giving additional pay. Reportedly, the National Water Research Center can pay up to LE 1,000 ($294) per month to engineers, not including top management. These rates are still considerably below what would be paid by a private company.

Compensation of employees in MPWWR is low in comparison to compensation for employees in water resource agencies in other countries. Table 4.3 compares compensation for entry level and top level engineers for Egypt, Pakistan, Sri Lanka, India and Bangladesh. It shows the other countries' wages as a percentage of Egyptian wages, and their GNP per capita as a percentage of Egypt's. For example, the compensation for an entry level engineer in Pakistan is 486% (almost 5 times) of the compensation of an entry level engineer in Egypt. Compensation includes base salary, incentives and bonuses.

These countries also provide housing or housing allowances to most of their professional staff; many provide vehicles as well. Two out of the four countries provide medical benefits. More striking is the fact that even though compensation of government employees in these countries is considerably more than in Egypt, the average per-capita income in these countries is substantially less than the per-capita income in Egypt.

These low salaries for Ministry personnel definitely affect performance. With compensation equivalent to the expected performance, most employees will concentrate on doing a good job on the tasks assigned. With low salaries, employees are looking for other means to make the money they need to meet living expenses such as trying to get hired on donor projects, seeking outside employment, and in some cases even taking payments from farmers or contractors for favors. Estimates of the percentage of Ministry

Table 4.3

Compensation for Engineers
(% of Egyptian compensation)

Country	Entry Level %	Upper Level %	GNP/Capita %
Pakistan	486	383	66
India	470	260	54
Sri Lanka	293	194	82
Bangladesh	230	198	36
Egypt	**100**	**100**	**100**

Source: Merrey (1995: Table 3).

staff having some kind of outside employment vary; further, some find it easier than others to find extra sources of income based on their qualifications, connections, and location. If all types of employment are included, including farming, consulting, teaching, etc, it may exceed 50%. Their time and energy is spent on these other activities rather than on their job responsibilities[13].

The team's examination of other personnel policies revealed the following:

- For employee training, the Ministry has an excellent facility, the Training Center in 6 October City. The training programs are well designed and generally relevant to needs of the jobs of employees. More training programs are available to the engineering staff than to administrative and non-technical staff (see Rao 1995).

- The promotion program in the Ministry is essentially a seniority system with some consideration for experience and performance. For example, promotions from second to first level use a criterion of 50% consideration for seniority and 50% consideration for performance for two and preferably three years. Promotions from third to second level are based on 75% for seniority and 25% for experience. Promotion procedures for administrative staff and engineering staff are different from the procedures for non-professional staff and laborers. The promotion procedures for civil engineers also differ from the procedures for mechanical engineers.

[13] A recent study of Egyptian Government employees found 89 percent of the sample admitted holding second jobs. Low salaries were found to be the major source of dissatisfaction, but when the sample employees were asked to rank a set of incentive values, high salary ranked second, and considerably below "prestige" (Palmer et al. 1988).

All promotions begin with an efficiency report from the supervisor which is approved by a higher level supervisor. For civil engineers the final approval for promotion is made by the Personnel Affairs Committee made up of all the heads of the departments and authorities and chaired by the Minister. Promotions for mechanical engineers and administrative staff are approved by the head of the department or authority. Each department and authority has a personnel committee which reviews candidates for promotion and refers recommendations to the head of the department or authority.

Promotions are made annually according to the budget, personnel requirements and position vacancies. There is a complaints committee which considers any complaints concerning promotions and bonuses.

The retirement policy requires retirement at age 60. A complete pension plan is provided at this age. Pension plans for those retiring before age 60 are reduced according to age and time of service. In the case of death of a retired employee, his named beneficiaries receive a reduced pension. There is also a disability retirement program which provides a pension based on the employee's age and length of service at the time of retirement.

- Written job descriptions exist, laying out the tasks of the position. However, as indicated in Section 4.3.2, the job descriptions do not state the authority for carrying out the tasks assigned. The job descriptions are about two pages in length, giving the title of the position, a list of the tasks of the position and the organization in which the position exists.

- Performance evaluations are normally done annually in writing. The form used is a subjective evaluation rather than an evaluation related directly to employee output of specific tasks. Personal conferences between the employee and the supervisor concerning the written evaluation are apparently rare. Almost everyone gets a high rating regardless of actual performance.

4.4.2 Issues

The first draft of this report included 12 issues concerning personnel management policies, of which ten were presented at the April Workshop. There, one additional issue was raised. Workshop participants grouped the issues concerning personnel policies under three topics in the following priority order:

1. Compensation

2. Staffing numbers, distribution and composition

3. Training and careers.

Topic Number One - Compensation

Some estimate that in Cairo it takes from LE 1500 to LE 3000 ($440 to 880) per month to support a family at a basic level appropriate for a professional (depending on the professional level of the employee). Even if the standard of living to which most professionals aspire costs only half of that, few MPWWR employees reach this level based on their government compensation.

Compensation is also not equitable:

- There are significant differences in work expected for the same rates of pay. For example, an engineer directly responsible for water distribution is on call 24 hours a day seven days a week during the irrigation season. An engineer assigned to headquarters is expected to work only six hours per day six days a week, although some do work overtime. Yet the two engineers are likely to get the same rate of pay if they have the same number of years of experience. This may have an impact on motivation of staff.

- The complicated system of giving incentives or bonuses based on participation in particular activities means that persons with similar experience and identical jobs may get different rates of pay.

- Because different types of government organizations (departments, authorities, public companies) have different sets of rules on salary, the compensation paid depends upon the organization as well as the person's experience and responsibility.

- The government pays its full contribution to an employee's pension plan on bonuses given by the government, but does not do so on incentives received from working on a donor funded program. Thus, those who get such incentives rather than bonuses may get lower pensions in the future. This is perceived by many as inequitable.

The interviews identified four issues concerning compensation:

- Compensation levels are too low to live on for most employees. This leads to:
  - loss of trained and experienced personnel to other jobs;
  - need to work at other jobs to make a living wage;
  - continuous concern for ways to increase incomes;
  - resentment because of poor living conditions or other consequences such as delayed marriage;
  - demand for training in order to make additional money from per diems;

- demands to be released from jobs for years at a time to take better paying positions; and finally,

- this situation may create some susceptibility to corruption.

- Ministry attempts to overcome the problem of the low basic salaries set by the Government of Egypt include both "incentives" and annual bonuses. "Incentives" are paid for participation in special (especially donor-funded) projects while "bonuses" are paid to those not on special projects once a year, to try to equalize compensation. However, this system has led employees to expect payments beyond their basic salary for the work they undertake. It has also led some employees to demand extra payments for work outside of the routine, such as putting together public data for another agency in the Ministry. This expectation of extra payments is now part of the "culture" -- basic shared values -- of the Ministry and will complicate further reform efforts.

- Employees' continuous concern for increasing their compensation means that other kinds of motivational devices, such as special recognition for good work, are generally not effective.

- The multiplicity of systems used to overcome low basic salaries leads to inequities in compensation between persons with essentially the same training, experience, and responsibility. Another consequence is that government contributions to the pension plan also differ among persons with the same level of compensation.

Possible Opportunities for Change

There is a real need to address these compensation issues to improve morale of the MPWWR staff and make it possible to increase their performance[14]. The Ministry has embarked on programs to use modern technologies, and has been investing heavily in specialized training to use them. The future use and sustainability of IMS investments, such as the telemetry system, will be at risk unless these problems are solved soon. To face the future challenges making best use of these technologies, the Ministry must be able to attract, hold, and motivate excellent professional staff. This will not be possible without significant improvements in compensation linked to personnel performance.

The opportunities for achieving this include:

- It would be useful to put together a group to investigate the relation between hours of work and pay rates to resolve the perceived inequities.

- The complicated system by which total compensation is calculated could be simplified greatly so that persons with the same qualifications and experience who perform at the

[14] This statement applies to the entire government. The morale and performance of the MPWWR is regarded as good compared to some other ministries; but there is a great potential for improvement.

same level would get the same total pay. The reform of the pay system should include provisions to ensure that the government makes the same pension contribution for all persons with equal pay.

- Reform of the compensation system should be linked to improved job descriptions and job classifications to ensure that those with the same responsibility are paid equally. At the same time, the reformed system should ensure that superior performance is rewarded, perhaps by more rapid advancement or through other means.

- Since public employees' pay in almost all Ministries is below a living wage, successful, and efficient implementation of donor projects is adversely affected. Perhaps donor agencies could jointly approach the government about establishing appropriate pay levels.

- Prepare a staffing program for the Ministry which includes only the types and numbers of staff needed, if pay levels were proper; estimate the cost of this new staffing level at proper pay levels; and submit a proposal to the government for staff reduction and increased pay from savings from staff reductions.

- Examine means of increasing funds for the MPWWR to be used to raise pay scales; develop sources of revenue that it can control. There are several possibilities that should be explored, including recovering the costs of water delivery from the users and ensuring that fines from farmers who do not obey the law are actually collected. However, further changes will be needed to have the funds come to the MPWWR rather than revert to the treasury[15].

- Reportedly, some ministries and some authorities are able to give their employees much higher compensation than the MPWWR provides. This implies that, although it may be difficult, improving the compensation for MPWWR employees may be possible and should be explored. The Government of Egypt could also consider more radical reform, including the creation of public water utilities or companies which would be financially autonomous, dependent on income earned from users' fees, and having sufficient flexibility to compensate staff appropriately. Such entities can be designed to provide incentives for being cost-effective providers of services. There are precedents in Egypt: some government-owned entities which earn an income, for example the Suez Canal Authority, are able to provide attractive compensation and demand good performance in return. Such an approach would have many other benefits, but would require strong political commitment and sufficient training and time, to make it work[16].

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[15] See IIMI (1995f) for more suggestions along these lines.

[16] The Action Plan (IIMI 1995d) provides a vehicle to plan and initiate such changes.

Topic Number Two - Staffing Numbers, Distribution and Composition

This study has collected data on the number, composition and deployment of staff, but has not yet been able to document the scale and scope of the concerns that have been expressed. It may be that there are critical shortages in some categories of staff or that the distribution of staff is not optimal. Issues resulting from information gathered during interviews and at the Objectives Workshop are as follows:

- Some managers said that they have more subordinates than they need, generally referring to lower level staff, including technicians and administrative personnel.

- Other managers said that they cannot get the personnel they need or that their key staff leave for more remunerative training or jobs. For the most part, this comment refers to engineers and other professional staff.

- There is some antipathy between engineering staff and others, particularly administrative staff, that may hinder interdisciplinary cooperation. To some, the MPWWR appears to be dominated by civil engineers, some of whom are perceived as not being interested in the help and insights of others. Some people claim that non-engineers (and non-civil engineers) do not get the same consideration or chance for promotions.

- Participants at the Workshop indicated the need for more non-engineering staff in special skill categories to create an interdisciplinary staff in light of the changing roles and functions of MPWWR, including making best use of IMS technologies.

Possible Opportunities for Change

- Further investigation of the reported staffing problems would provide a basis to suggest more effective ways to assign personnel and ways to retain needed personnel. A study is needed to find solutions to the difficulties created for staff who are transferred to new locations.

- Privatizing some of the functions of the MPWWR, such as some maintenance activities, might make it possible to release a significant number of employees and thus make staffing assignments easier to manage.

- It would be useful to carry out a comprehensive review of the overall needs of the MPWWR to determine whether a more interdisciplinary mix of staff, particularly professional staff, would serve the needs of the Ministry better.

- Resolution of the donor program benefits issue discussed above (section 4.2.2, Topic 4) may help in achieving proper distribution of capable staff.

Topic Number Three - Training and Careers

Certain issues were raised repeatedly in interviews with Ministry personnel, including:

- The job assignment policy for engineers makes all engineers into generalists. While generalists are appropriate for some positions, particularly for those which require solving users' problems, there is also a need for persons to specialize in particular areas, such as GIS, equipment maintenance, IAS work, construction oversight, facility design, O&M and water resource planning. Further, the assumption that all engineers can do any job sometimes leads to a mismatch between a person's strengths and the job to which he is assigned.

- Many professional staff (50%) reported a need for additional training, either for themselves or for their subordinates. Most requests were for training in technical subjects, but there were a significant number of requests for management training. The team noted that the motivations of the interviewees for requesting additional training were not totally clear. Some may have requested additional training to increase their income from the per diems they receive during training, particularly for training outside of Egypt.

- Except for some specific positions, job transfers, career advancement, and promotions are not linked to training requirements. In order to widen the scope of possible promotions for civil engineers, the Ministry has a policy of allowing promotions to any open position. Some managers recommended that promotions be made according to specific criteria based upon experience and a test procedure.

- There are few or no training courses for non-professional personnel.

- The IIMI-MPWWR team reviewed the progress and program of the Training Center (see Rao 1995). The team concluded that its training programs are well designed and are generally relevant to the needs of the jobs of the participants. However,

  - there is a need to link the technical training more strongly to research;

  - there is a need to develop more training programs in specific applied aspects of management; and

  - while the computer training is well conducted many of the trainees lack the computer facilities to use the training in their work.

  The Training Center also has excellent physical facilities and has started functioning at its new campus in 6 October City from early 1995. It has to be developed further to achieve its full potential.

Possible Opportunities for Change

- This issue can largely be resolved by establishing a career planning system within the MPWWR. With a career planning system, each professional employee would be

required to reconsider his career at regular intervals, in consultation with his superiors, to decide what kind of position he should look for next. In this planning, both the employee and his supervisor would take into account the employee's talents, training, desires, and aspirations, on the one hand, and the needs of the Ministry on the other. Training required for the next step or later steps in the employee's career would also be identified through this means.

Linking training and career planning would tend to ensure that the training is relevant to the needs of the employee in his career. Also, depending upon his desires and the needs of the MPWWR, an employee can opt for generalized water resources management or for a specialization useful to his agency.

A career planning system needs to be supported by a good system for distributing information about job requirements and current and future personnel needs in the various parts of the Ministry.

A career planning system would allow a better fit between personal desires, training and experience, on the one hand, and the Ministry's needs on the other, than can be provided by the current system. Also, since a career planning system takes the employee's desires and aspirations into account, it also serves to motivate staff and raise their morale.

- The MPWWR training program should be enlarged to respond to the reported demand. To make it more efficient, the training conducted by other units, particularly by the IIP, could be incorporated into the Training Center's program. Induction courses for non-professional staff, particularly gatekeepers, pump operators, and other critical operating personnel could be added. The links between the Training Center and training programs offered by some NWRC institutes could be further strengthened (Rao 1995).

- Where relevant, specific training and experience could be required for particular positions. Training and experience could be explicitly taken into account when reassigning or promoting engineers and other professional personnel. This could be accomplished through the career planning system described above.

- An improved set of job descriptions and job classifications would help to define the training and experience needs for specific jobs and would ease the problem of assigning personnel to specific jobs. It would also help individuals know their own responsibilities better. Such a set of job descriptions could be developed with the help of the persons now occupying the jobs to ensure that they accurately reflect reality.

4.5 Financial and Budget Management

4.5.1 Background

The IIMI-MPWWR team examined the existing financial accounting and reporting system to see how well it assists management in achieving targets and implementing programs.

Special efforts were made to identify existing cost reporting systems and examine their ability to respond to the needs of management. Also, the financial planning and budgeting system was investigated.

The team found that the both accounting and budgeting are decentralized within the MPWWR. Each unit (department or authority or occasionally subunits) maintains its own accounts separately. This is helpful in allowing each agency to deal with its peculiar problems. With a few notable exceptions, the existing financial management system can respond reasonably well to questions regarding "total expenditures" at sector and higher levels of organization. The budget formulation and planning processes are integrated to a large extent. Each unit prepares its own five year and annual plans and budgets. The MPWWR plans and budgets are compilations of the unit plans and budgets. Other government agencies are involved in donor funded project budgets. Overall, confidence in the existing system was expressed in the interviews.

A separate report on this topic has been written (Lewis and Hilal 1995). The following observations are based on this report. This topic was not discussed at the April Workshop.

4.5.2 Issues

- The present accounting and reporting systems are slow and cumbersome manual systems. Also, they appear designed largely to serve the needs of the financial managers rather than the needs of activity and function managers.

- The current accounting systems report costs under four headings for an entire unit. These headings are: labor, supplies and materials, equipment, and capital investment. This system makes it very difficult to identify the costs of particular activities. Therefore, the cost-effectiveness of particular activities cannot be evaluated. Also, any future cost recovery program will require establishment of an effective way to link costs to functions and activities, such as providing municipalities with water, or maintenance of specific canals (see IIMI 1995e; 1995f).

- Like the accounting systems, planning and budgeting systems are not organized on a functional basis. This makes it difficult to allocate limited funds to those activities which are the most effective or most important for the Ministry to undertake. It would help if the accounting and budgeting systems were integrated.

- While decentralization can make the financial units more responsive to unit managers, this has led to development of accounting and reporting systems unique to each unit. This complicates collection of comparative data from different units.

- Managers generally feel that existing delegation of procurement and contracting authority is inadequate; however, some complain that their subordinates are not willing to use the authority now delegated (see Section 4.3.2)..

Possible Opportunities for Change

- The present accounting and reporting systems could be revised for effective cost reporting by functions and activities. These changes would greatly improve the quality and timeliness of financial reports to managers.

- Planning and budgeting systems could also be revised on a functional basis and integrated with the accounting and reporting systems to make it possible to relate expenditures with achievement of plans.

- The budgeting staff could be combined with the accounting and finance staff into a single unit in each Authority or Department. This would facilitate integration of the accounting and budgeting systems. Location of all fiscal and fiduciary expertise in one organizational cell would also enable maximum use of the financial staff, minimize the need for supervision and support staff, minimize duplication of record keeping, and enhance development of expertise.

- Adoption of computer technology for the financial management systems would greatly improve the flexibility and usefulness of the systems.

- A central office for financial management within the Ministry could be established to set standards and develop more uniform systems for use by the separate departments and authorities.

  This office could:

  - review financial procedures for effectiveness;

  - recognize and take full advantage of opportunities for improvement including using new technology;

  - assure that management needs are satisfied as well as legal, financial and accounting requirements;

  - assure that new requirements of law and regulation are implemented evenly and in a timely manner throughout the Ministry;

  - recognize training needs and arrange for needed training programs.

- A review of the policy and practice regarding delegation of authority for procurement and contracting and other financial matters could be made (see Section 4.2.2).

- Managers could be trained in the use of financial management information systems designed for people without specialized training in financial management.

There may be difficulties in making changes in the planning and budgeting systems. The content and format of the final budget documents is prescribed by the Ministries of Planning and Finance. These Ministries are also involved in some aspects of the process. Thus the opportunities for improvement in the immediate future may be limited to the internal processes within the Ministry of Public Works and Water Resources.

Chapter 5

CONCLUSION

The Ministry of Public Works and Water Resources of Egypt has been successfully developing and managing Egypt's water resources for about two hundred years. During this period, there have been dramatic changes in every aspect of Egypt's society, economy, agriculture, and water resources. Today, Egypt's irrigated agriculture system is one of the most productive in the world. This is largely because of the modern irrigation canals, barrages and dams constructed and managed by the Ministry. The success of the Ministry over these two hundred years underlies the strong sense of commitment of its engineers to the Ministry, and the well-deserved pride in what they have accomplished.

It is now more than two decades after the completion of the High Aswan Dam (HAD). HAD brought about the most dramatic changes in Egypt's water resource regime and irrigated agriculture of the past two hundred years. During this period, there has generally been more than sufficient water to meet Egypt's demands, even in the drought years of the 1980s. However, there is considerable evidence that Egypt is moving to an era of water scarcity, when Egypt will have to stretch it water supplies more and more to meet increasing agricultural, industrial and urban demands. Population growth and economic development combined with the present horizontal expansion policy, in the context of a stable water supply, make this inevitable.

This is why the Ministry has continued investing not only in structural upgrading and modernization, but also in research, human resource development, a modern telemetry system, computer models to facilitate policy- and decision-making, and new technologies and institutional arrangements at the mesqa level. The IMS Project supported by USAID has been a major effort in this regard. But recognizing that more may be required to make optimum use of these innovations, the Ministry and USAID asked for assistance from IIMI in analyzing the institutional and human resource issues affecting integration of these products into the Ministry's management processes. Based on this analysis, IIMI has worked with the Ministry to develop an Action Plan to address the issues identified (IIMI 1995d).

The present document reports the findings of the institutional analysis. The analysis was carried out in a very short period. It was assisted by the Ministry itself through a Steering Committee, a Task Force of middle-level professionals, workshops, logistical support to the IIMI team, and most importantly, the willingness of Ministry officials at all levels to share information and their own ideas about the Ministry's problems and the possible solutions. It is a joint collaborative study by the Ministry and IIMI, with USAID assistance, in which IIMI has taken the lead in its implementation. Because of the short time period and the limitations of the methodologies used, there may be gaps in our understanding. Nevertheless, the IIMI team is confident that the issues and opportunities for change identified here, and the proposed approach to solving them, are valid and potentially very useful if the Ministry chooses to build on them.

The Study has deliberately taken a broad view, addressing a wide variety of issues, rather than focusing in-depth on a few issues; the latter would be appropriate as the next step of an institutional analysis. The IIMI team felt this broader approach was necessary to gain a better understanding of the specific problems facing the IMS Project. Because of the large number of issues addressed (and possible opportunities for change), it is not feasible to attempt a summary here. This chapter therefore makes a few concluding observations on the implications of the findings and next steps.

The major conclusion emerging from the Study can be stated as follows:

> *effective use of past and future technological investments will require improving the overall management processes and institutional framework for water resource management, especially within the MPWWR, as well as continued improvement in the human resources of the Ministry.*

The Ministry is obviously a "going concern." It is managing the water resources of Egypt every year, and implementing improvements. But all organizations need to change over time to adapt to new situations. In the private sectors of Europe and the USA, firms sometimes go bankrupt and disappear because they did not adapt successfully. In the public sectors of all countries, changes are sometimes more difficult to bring about, but are no less necessary.

The report highlights a large number of specific issues that are having an important impact on the current *effectiveness* of the Ministry. These issues are making it difficult for the Ministry to make full use of the new innovations being introduced through the IMS and other projects. There are many issues affecting the Ministry's functions and programs: policy-making, planning, operation and maintenance of the water delivery and drainage systems, research, and implementation of new donor-funded projects. Underlying these, there are important issues related to organizational structure and management processes of the Ministry: decision-making processes; communications and sharing of information among Ministry units; personnel management; financial and budget management; and the basic structure of the Ministry itself. For all these issues, a large number of *opportunities for change* are identified in the report, most of them suggested by Ministry officials themselves.

All organizations are *systems* by definition. The Ministry is both a large organization (with some 88,000 employees throughout the country) and a complex organization, in the sense that it has many different units carrying out a wide variety of functions. Further, it is a highly *integrated* system, such that making changes in one area has potential implications for or impacts on other parts of the system. Changing the water flow at one gate in a canal system has an impact at other levels, requiring adjustments throughout the system. Similarly, making changes in the Ministry's organizational setup or management processes can have impacts elsewhere in the Ministry. But organizational impacts are more difficult to predict than water flows.

This integration also means that "tinkering" or making small adjustments here and there may be inadequate to achieve the level of management effectiveness desired. In fact, the mixture of types of units with different kinds of responsibilities and authorities suggests

that the Ministry has grown over the decades precisely by adding bits here and there in response to new programs or problems. There has not been a systematic planned approach taken in the evolution of the Ministry. Therefore, a comprehensive, systematic approach to analyzing organizational and management process issues and identifying potential solutions is required to plan the next steps.

Another important difference between engineered physical systems and human organizations is that the latter cannot be designed and redesigned, then reconstructed, by applying a limited set of procedures and formulas. On the other hand, organizations as human and not physical systems can be changed and adapted; they are not "fixed in concrete." Specialists in organizations and management can offer blueprints but these are rarely implementable as such. But they can also offer guidance on basic principles for designing organizations, and on the *process* by which changes are brought about.

This change process requires time, effort, patience, leadership, and training in new skills and ways of doing things. A successful program for improving an organization and its management processes should ideally be internally directed and led; the leaders of the organization must take the initiative and provide overall leadership, while involving other levels of the organization in the process. Such a program can be greatly assisted by outside specialists who play a variety of roles: facilitators, advisers, mentors, mediators, trainers, etc.

This is why the report does not conclude with a set of specific recommendations for specific organizational and management changes. This could have been done -- the IIMI team does have a lot of suggestions. Indeed, many of these are given throughout the report under the heading, "Possible Opportunities for Change." Further, other reports, for example on cost sharing, budgeting and accounting, maintenance management, and training do make specific recommendations. But we have seen too many cases where such analyses have been made and recommendations presented -- and then shelved, with no further action. **The lesson is that the *process* by which necessary changes are identified, adopted by the leadership, implemented, and monitored to learn lessons from the experience will be the key determinant for success.**

Therefore, the strongest recommendation emerging from this analysis is that the Ministry itself, with assistance from outside specialists as needed, should follow a systematic comprehensive management and organizational review process for identifying and addressing issues at the macro level; and should follow an action-based process for testing, adapting and implementing changes in irrigation operations, which would also involve integrating IMS outputs to improve performance.

Such a process, if designed and implemented properly, will have several advantages: the Ministry will feel full ownership and commitment because it is its own program, and not an outsider's; it will be realistic and fit the Ministry's needs better; and by going through such a process, the Ministry will acquire the culture and skills it needs to continue adapting and changing in response to new opportunities and challenges, and can minimize the amount of external assistance required in future.

Therefore, in a separate report very much derived from the results of the institutional analysis, IIMI has described in detail an *Action Plan for Strengthening Water Resource Management in Egypt* (IIMI 1995d). This Plan was developed in collaboration with special task forces appointed by the Minister, and through a long process of informal and formal consultation with Ministry officials. The overall **objective** of the Action Plan *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.* If implemented, the Action Plan will be the first phase of a long term institutional change program which will be directed and led by Ministry officials themselves, with outside assistance as necessary.

The Action Plan has the following components:

- ***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 following a participatory action method to pilot testing and validating in the field a set of eight institutional and technical innovations which are largely based on IMS experience.

- ***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.

- ***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, responsibilities, and organizational structure, and the subsequent implementation of new policies and programs as well as institutional changes, including those emerging from work under the previous two components, and those suggested in the present report.

It is hoped the present report will be a useful starting point for the Action Plan activities, and other studies and change programs aimed at strengthening water resource management in Egypt.

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ANNEXES

ANNEX A

IIMI AND MPWWR TASK FORCE MEMBERS

IIMI Team Members Who Conducted the Study for this Report

Dr. Doug Merrey	Team Leader
Dr. Fouad El-Shibini	Co-Team Leader
Dr. Jeffrey Brewer	Institutional Specialist
Dr. Chris Perry	Economist
Dr. M. S. Shafique	Irrigation Engineer
Mr. Rodney Vissia	Water Resources Specialist
Dr. A. F. Metawie	Irrigation Engineer
Dr. Farid M. A. Shosha	Management and Organizational Design Consultant
Dr. Mohamed M Mohieddin	Sociological-Institutional Analyst
Dr. P. S. Rao	Human Resources Specialist
Mr. Charles Lewis	Financial Management Specialist
Dr. Mohamed Mahmoud Hilal	Financial Management Specialist

Members of the *MPWWR Task Force on Irrigation Operations*

Eng. Hessein Elwan	General Manager of Water Distribution in the Irrigation Sector (Coordinator)
Eng. Khaled Bekheit	Irrigation Improvement Project
Eng. Mahmoud El-Sayes	Irrigation Department
Eng. Tarek Hanafy Selim Kotb	Irrigation Department
Eng. Fayek Amin Fareg	Planning Sector
Eng. Kamal M. Amer	National Water Research Center
Eng. Ragab Abd El Azim	Central Directorate for Water Distribution
Eng. Ahmed Abu El Seoud	Main System Management Project

ANNEX B

LIST OF SENIOR PERSONNEL INTERVIEWED

LIST OF PERSONS INTERVIEWED

HEADQUARTERS/STAFF

The Minister's Office/Planning Sector/Administration

1) The Head of the Central Administration of Financial Affairs and Administrative Development

2) The General Manager of Organization and Management

3) The Head of the Central Administration for the Minister's Office of Affairs

4) The Head of the Planning Sector

5) The General Manager of the Management Information Center

6) The Consultant to the Management Information Center

7) The Financial Manager of the Information Center

8) The General Manager of Public Relations

9) The General Manager for Financial and Administrative Affairs

10) An Officer in the Minister's Affairs Office

11) Two Officers in Central Administration for Planning and Following Investment - Planning Sector

12) The Head of Central Administration for Planning and Following Investments Projects - Planning Sector

Irrigation Department:

1) The Chairman of the Irrigation Department

2) The Director General Administration of Personnel Affairs for the Irrigation Department

3) The General Manager of Legal Affairs

4) The Head of the Administration and Finance Sector

5) The Head of the Central Administration of Water Distribution

6) The Head of the Irrigation Sector

7) The Head of the Sinai Horizontal Expansion Project

8) The Head of the Groundwater Directorate, Irrigation Department

9) The Head of Reservoirs and Grand Barrages

10) The Head of Horizontal Expansion

11) The Head Assistant of the Planning and Followup Unit

12) The Manager of Financial Affairs

13) The Head of Planning and Followup Unit

14) Two Task Force Members

15) The Manager of Accounting for Current Expense Accounts

NWRC:

1) The Directorof Water Management Research Institute

Mechanical and Electrical Department:

1) The Chairman of the Mechanical and Electrical Department

2) The Head of the Planning and Followup Unit

Drainage Authority:

1) The Chairman of the Drainage Authority

2) The Head of Administrative and Financial Affairs

3) The Head of the Planning and Followup Unit

Coastal Protection Authority:

1) The Chairman of the Coastal Protection Authority

Survey Authority:

1) The Chairman of the Survey Authority

IMS Projects:

1) The Chairman of the IMS High Coordinating Committee

2) The Chief of Monitoring for the IMS

3) The Irrigation Improvement Project Director for Esna

4) The Undersecretary and Project Director for the Preventive Maintenance/Channel Maintenance Project

5) The Project Director for the Main Systems Management Project

6) The Project Director, Irrigation Improvement Project

7) The Chief of the Project Preparation Department

8) The Project Director of the Planning Systems and Modelling Project

9) The Director of Water Management Research Institute

ANNEX C

STANDARD QUESTIONNAIRES USED

FOR INTERVIEWS

QUESTIONNAIRES USED TO SECURE INFORMATION

HEADQUARTERS STAFF

WATER RESOURCE ISSUES - INTERVIEW QUESTIONS

WR-1. (First have the interviewee complete the attached questionnaire)
(Then proceed with the following questions)

WR-2. What other water resources problems face Egypt in the next 10 to 20 years?

WR-3. What is your vision or concept of how the water resources of Egypt should be managed in the future?

WR-4. What is your vision of the role that the Ministry should have in managing Egypt's water resources?

WR-5. What changes might be required in the Ministry in the future to cope with Egypt's water resource problems?

WR-6. Is there a need for a water rights system or water guarantee system for water users in Egypt?

WR-7. What roles should other Ministries play in future management of the nation's water resources?

WR-1. QUESTIONNAIRE - SITUATIONS FACING EGYPTs WATER RESOURCES

Following is a list of situations which may affect the water resources of Egypt. Rate, on a scale of 1 to 10, the seriousness of each item on the water resources of Egypt.(10 being most serious and 1 being least serious)

___ Population increase
___ Increasing water use by upper Nile River Basin countries
___ Pollution of the water from municipal and industrial effluents
___ Increasing energy costs
___ Increasing municipal and industrial water use
___ Expansion of new land irrigation
___ Sea water intrusion on the north delta coastline
___ Expansion of the amounts of high water use crops
___ Deterioration of the canal and drainage system
___ Water logging of agricultural lands
___ Increasing salinity of irrigation return flows
___ Maintaining navigation flows in the Nile River

Institutional Issues

1. What is your responsibility in the Ministry?

2. What are the strengths and assets of your organizational unit for accomplishing your responsibilities?

3. What, if any, Constraints and problems eep you from accomplishing your responsibilities as you would like?

4. What are the major assets and strengths of MPWWR for accomplishing its program?

5. What are the major constraints and liabilities keeping MPWWR from accomplishing its program?

6. Describe the decision making process in MPWWR.(Who makes what kinds of decisions?, who gives advice, who is consulted?)

7. Describe the policy setting process in MPWWR.(Who makes policy?, on what basis?, who is consulted?)

8. Is there a role for the private sector to carry out some of the ativities now conducted by the Ministry?

Yes No

- - Maintenance of canals and drains
- - Maintenance of telemetry system equipment
- - Structural design
- - Oversight and inspection of construction
- - Irrigation Advisory Service
- - Training and professional development
- - Project planning feasibility study
- - Monitoring and evaluation of Ministry activities
- - Public relations program

9. What are the objectives of the Ministry's public relations program, and what are its activities?

10. What is the relationship of MPWWR and its customers (water users)?

11. What other Ministries are highly involved in the water resource activities of Egypt, and what is MPWWR's relationship with these Ministries?

12. If you were the Minister of MPWWR, what changes would you make in:

*Personnel policies, procedures and training
*Program planning and budgeting
*Management of Ministry finance
*Organizational structure of the Minuistry
*Communications within the Ministry
*Public information and relations
*Relationships with water users, (farmers, villages, cities, industry)
*use of computers
*Procurement procedures and equipment / supply management
*Program tracking and monitoring
*Management style (delegation of authority; Use of interdisciplinary teams for problem solving , studies etc., policy development)

Middle Manager - IMS Questionnaire

1. Is your orgfanizational unit associated or involved withj one of the IMS projects?

2. If so, how, and is the association working well?

3. If yuo are not associated with an IMS and IMS project, should you be?

4. What is your opinion about the technology being developed in the IMS program in relationship to its value to the Ministry and its integration into the Ministry's normal operations?

QUESTIONNAIRE USED TO SECURE INFORMATION

FIELD STAFF

Questions for all Personnel

1. What is your present position?
2. How long have you been in your present position?
3. What were your previous positions?
4. What has been your training for this position?
5. What are your major responsibilities?
6. How do you carry out these responsibilities?
7. What is your daily schedule?
8. What tasks take up the major part of your time on the job?
9. Have your training and experience been adequate for this job? If not, what else is required?
10. To whom and how do you report?
11. How do your superiors check on your performance?
12. If you report to more than one person, how does this affect your ability to carry out your responsibilities?
13. How many and what kinds of persons do you supervise?
14. How do you ensure that your subordinates carry out their duties properly?
15. On what criteria do you evaluate the performance of your subordinates?
16. Do you feel that the training of your subordinates is adequate? If not, what more is needed?
17. What funds, transportation, equipment, and supplies, including gasoline, are provided for your use? Are these facilities adequate?
18. What are the major problems you face in carrying out your tasks?
19. What changes in departmental procedures, facilities, etc, are needed to make your performance more effective?

Specific Interview Questionnaire for Mechanical and Electrical Personnel

1. When, how often, and in what ways do you deal directly with farmers?
2. If there are water user associations (WUAs) in your area, do you interact with them directly? If so, with whom and over what questions do you interact?
3. In your opinion, do WUAs make interactions with farmers more effective? If so, how?
4. In your opinion, would federations of WUAs be useful? If so, in what way?

5. Is there a need to coordinate your activities with irrigation and/or drainage personnel? If so, in what ways? What are the problems in coordination?

6. Is there a need to coordinate your activities with agriculture personnel? If so, in what ways? What are the problems in coordination?

Specific Interview Questionnaire for Irrigation Improvement Project Directorates

1. When, how often, and in what ways do you deal directly with farmers?

2. What type and quality of water delivery service do farmers expect?

3. Are changes beyond the IIP needed to provide this service?

4. Would you say that the improved mesqa is as important to the farmers as is the continuous flow? Why or why not?

5. If continuous flow is implemented throughout the area, what problems will there be?

6. Are there major difficulties in getting farmers to form WUAs and, if so, what are they?

7. Are farmers willing to pay the costs of the mesqa improvements? Why or why not?

8. Would WUA federations be useful? If so, for what? Why would farmers want to support them?

9. Is there a need to coordinate your activities with irrigation, drainage and/or pump operation personnel? If so, in what ways? What are the problems of coordination?

10. Is there a need to coordinate your activities with agriculture personnel? If so, in what ways? What are the problems of coordination?

11. Is there a need to continue IAS activities with farmers after improved mesqas have been turned over to the WUAs? If so, what are the activities needed?

12. Once the IIP construction activities in an area are finished, how can IAS activities be continued? What organizational or other changes are needed?

Specific Interview Questionnaire for Drainage Personnel

1. When, how often, and in what ways do you deal directly with farmers?

2. If there are water user associations (WUAs) in your area, do you interact with them directly? If so, with whom and over what questions do you interact?

3. In your opinion, do WUAs make interactions with farmers more effective? If so, how?

4. In your opinion, would federations of WUAs be useful? If so, in what way?

5. Is there a need to coordinate your activities with irrigation and/or pump operation personnel? If so, in what ways? What are the problems in coordination?

6. Is there a need to coordinate your activities with agriculture personnel? If so, in what ways? What are the problems in coordination?

Questions for those directly responsible for drainage system maintenance (Director, maintenance engineers, District Engineers)

1. How do you select areas and plan for drainage system maintenance activities?

2. How are the actual activities carried out?

3. What are the major problems in carrying out system maintenance?

4. In your opinion, are current maintenance practices adequate to sustain the system indefinitely? If not, how fast are the drainage systems deteriorating? Also, what additional effort is needed?

5. What changes in departmental procedures, facilities, etc, are needed to make maintenance work more effective?

6. The IIP requires continuous flow instead of rotations. Would continuous flow require any changes in drainage maintenance practices? If so, what changes would be needed?

Specific Interview Questionnaire for PM/CM Field Personnel

1. How do you select areas and plan for canal and structure maintenance activities?

2. How are the actual activities carried out?

3. What are the major problems in carrying out maintenance activities?

4. Are you concerned with mesqa maintenance? If so, how do you see that it is carried out?

5. The IIP requires continuous flow instead of rotations. Would continuous flow require any changes in maintenance practices? If so, what changes would be needed?

6. In your opinion, are current maintenance practices adequate to sustain the system indefinitely? If not, how fast are the canals and structures deteriorating? Also, what more is needed?

7. What changes in departmental procedures, facilities, etc, are needed to make maintenance work more effective?

8. When, how often, and in what ways do you deal directly with farmers?

9. If there are water user associations (WUAs) in your area, do you interact with them directly? If so, with whom and over what questions do you interact?

10. In your opinion, do WUAs make interactions with farmers more effective? If so, how?

11. In your opinion, would federations of WUAs be useful? If so, in what way?

12. Is there a need to coordinate your activities with irrigation, drainage and/or pump operation personnel? If so, in what ways? What are the problems of coordination?

13. Is there a need to coordinate your activities with agriculture personnel? If so, in what ways? What are the problems of coordination?

Specific Interview Questionnaire for Irrigation Directorate Personnel

Questions for those directly responsible for operations (General Directors, Inspectors, District Engineers, Gatekeepers)

1. When planning for the season, what information are you expected to provide to higher levels for water allocation? Under the new policy of free crop choice, can you provide accurate information for water allocation?

2. If water allocation cannot be accurate, how do you assure that the farmers get the water they need?

3. Can you suggest solutions to the water allocation problem?

4. During operations, what information do you get from the field about water flows in different parts of the system?

5. How and on what schedule do you get this information?

6. How do you use this information to make decisions or take actions?

7. Is the information adequate? If not, what more is needed?

8. What problems do you face in achieving effective water distribution?

9. What changes in departmental procedures, facilities, etc, are needed to make it possible to deliver water more efficiently?

10. The IIP requires continuous flow instead of rotations. What changes will be needed to implement continuous flow throughout your area?

11. If continuous flow is implemented throughout the area, what problems will there be?

12. When, how often, and in what ways do you deal directly with farmers?

13. If there are water user associations (WUAs) in your area, do you interact with them directly? If so, with whom and over what questions do you interact?

14. In your opinion, do WUAs make interactions with farmers more effective? If so, how?

15. In your opinion, would federations of WUAs be useful? If so, in what way?

16. Is there a need to coordinate your activities with drainage and/or pump operation personnel? If so, in what ways? What are the problems of coordination?

17. Is there a need to coordinate your activities with agriculture personnel? If so, in what ways? What are the problems of coordination?

Questions for those directly responsible for canal maintenance (General Directors, Inspectors,Assistant Directors, and District Engineers)

1. How do you select areas and plan for canal and structure maintenance activities?

2. How are the actual activities carried out?

3. What are the major problems in carrying out canal maintenance?

4. Are you concerned with mesqa maintenance? If so, how do you see that it is carried out?

5. In your opinion, are current maintenance practices adequate to sustain the system indefinitely? If not, how fast are the canals and structures deteriorating? What additional efforts are needed?

6. What changes in departmental procedures, facilities, etc, are needed to make maintenance work more effective?

7. Is there a need to coordinate your activities with drainage and/or pump operation personnel? If so, in what ways? What are the problems of coordination?

8. Is there a need to coordinate your activities with agriculture personnel? If so, in

Specific Interview Questionnaire for MSM Field Personnel

1. What is your present position?

2. How long have you been in your present position?

3. What were your previous positions?

4. What has been your training for this position?

5. What are your major responsibilities?

6. How do you carry out these responsibilities?

7. What is your daily schedule?

8. What tasks take up the major part of your time on the job?

9. Have your training and experience been adequate for this job? If not, what else is required?

10. To whom and how do you report?

11. How do your superiors check on your performance?

12. If you report to more than one person, how does this affect your ability to carry out your responsibilities?

13. How many and what kinds of persons do you supervise?

14. How do you ensure that your subordinates carry out their duties properly?

15. On what criteria do you evaluate the performance of your subordinates?

16. Do you feel that the training of your subordinates is adequate? If not, what more is needed?

17. What funds, transportation, equipment, and supplies, including gasoline, are provided for your use? Are these facilities adequate?

18. What information does the telemetry system collect?

19. To whom and on what schedule do you provide this information?

20. For what is this information used?

21. Is the information adequate for this purpose? If not, what more is needed?

22. The IIP requires continuous flow instead of rotations. Would continuous flow affect the operations or effectiveness of the telemetry system? What changes, if any, would be needed to handle continuous flow throughout the area?

23. When, how often, and in what ways do you deal directly with farmers?

24. Is there a need to coordinate your activities with irrigation, drainage and/or pump operation personnel? If so, in what ways? What are the problems of coordination?

25. Is there a need to coordinate your activities with agriculture personnel? If so, in what ways? What are the problems of coordination?

26. What are the major problems you face in carrying out your tasks?

27. What changes in departmental procedures, facilities, etc, are needed to make your performance more effective?

Interview Questionnaire for Governorate Undersecretary

1. How long have you been in your present position?
2. What were your previous positions?
3. What are your major responsibilities?
4. How do you carry out these responsibilities?
5. What is your daily schedule?
6. What tasks take up the major part of your time on the job?
7. Have your training and experience been adequate for this job? If not, what else is required?
8. To whom and how do you report?
9. If you report to more than one person, how does this affect your ability to carry out your responsibilities?
10. How many and what kinds of persons do you supervise?
11. On what criteria do you evaluate the performance of your subordinates?
12. Do you feel that the training of your subordinates is adequate? If not, what more is needed?
13. What funds, transportation, equipment, and supplies, including gasoline, are provided for your use? Are these facilities adequate?
14. What are the major problems you face in carrying out your tasks?
15. If you were the Minister what changes in departmental procedures, facilities, etc, would you make to make your performance more effective?
16. What are the major issues that you must deal with in this Governorate on behalf of the Ministry?
17. What are the problems of coordination or communication among the MPWWR field organizations?
18. What should be done to achieve more effective coordination among MPWWR field units?
19. What are the problems of coordination or communication between the MPWWR field organizations and the field organizations of the MOALR?
20. What are the problems of coordination or communication between the MPWWR field organizations and other governmental agencies or local councils?
21. What should be done to get more effective coordination and communication between the MPWWR and these other agencies? What are the problems of coordination?

QUESTIONNAIRE - TECHNICAL STAFF

TS-1. How long have you worked for the Ministry?

TS-2. How long have you been in your current position?

TS-3. How many supervisors have you had in this position, and if more than one, how long have you had your most recent supervisor?

TS-4. How many people do you supervise?

TS-5. What are your primary responsibilities?

TS-6. Are there any changes you think should be made in your responsibilities?

TS-7. Does your work unit depend on data or assistance from other Ministry work units to accomplish its responsibilities? If so what are the one or two work units in the Ministry that your work unit relates to the most?

TS-8. How would you describe your relationship with these work units?

TS-9. What obstacles face you and your organization in accomplishing work?

TS-10. Are decisions in your unit made at too high a level or at about the right level?

TS-11. How would you describe the communications between groups and levels of the organization? good_____ unsatisfactory_____

TS-12. Is your organization involved with any IMS Project?

TS-13. If so, how, and is the association working well?

TS-14. If your unit is not associated with an IMS Project, should you be?

TS-15. What is your opinion about the technology being developed in the IMS program components listed below in relationship to their value to the Ministry and their integration into the Ministry's normal operations?
(IIP, MSM, PSM, PM)

TS-16. How would you integrate the above listed IMS programs into the Ministry's normal operations program?

TS-17. If you were the Minister, what changes would you make to improve the ability of the Ministry to accomplish its job?

*personnel policies, procedures and training
*program planning and budgeting
*management of Ministry finances
*organizational structure of the Ministry
*communications within the Ministry
*public information and relations
*relationships with water users, (farmers, villages, cities, industry)
*use of computers
*procurement procedures and equipment/supply management
*program tracking and monitoring
*management style (delegation of authority; use of interdisciplinary teams for problem solving, studies etc.; policy development)

Interview Questionnaire for Farmers

Land holdings?
- Own
- Rent
- Mixed
- Size
- On one or more mesqas

Water Pump Usage?
- Owned
- Rented

What are problems with rotation delivery of irrigation water?

How do you resolve disputes over water problems?

How do you manage water shortages?

Suggested ideas for improvement of the current irrigation system?

Are you willing to join the IIP?

What do you believe are the benefits of the IIP?

What do you believe are the problems with the IIP?

QUESTIONS - FARMER INTERVIEWS

F-1. How many farmers in your WUA?

F-2. Were you involved in the planning and selection of the type of mesqa you have?

F-3. Did you assist in the construction of the mesqa, (if so, how)?

F-4. Were there any problems for you during the construction process, (if so, what were they)?

F-5. What is your relationship with the IAS, and are what type of help do they provide?

F-6. What changes would you recommend in the form of IAS assistance?

F-7. How has the IIP benefitted you?

F-8. Are there any problems with receiving water on a continuous flow basis?

F-9. What role do you play in your WUA?

F-10. Do you think your WUA will be able to manage the pump and mesqa effectively in the future?

F-11. What is the most serious problem faced by tour WUA?

F-12. Do you favor combining WUAs on distributaries? If so, what role can the WUA play at this and higher levels?

ANNEX D

RESPONSES TO INTERVIEWS --

WATER ALLOCATION, DELIVERY AND DISPOSAL

I. IRRIGATION STAFF & JOB RESPONSIBILITIES

Question: What are your major responsibilities?

I-A. **Engineers = 15 (District Engineers 10, Assistant Directors 2, Inspector 1, and Under Secretaries 2)**

Ranking	Statements	Responses
1	Water distribution	15
2	Maintenance	13
3	Construction	8
4	Encroachments	5
5	Water quality control	4
5	Liaison / Coordination	4
5	Surveying	4
6	Follow up on Ministry's functions	2
6	Monitoring cropping patterns	2
7	Initiation of new projects	1
	Total Responsibilities / Tasks	58

* Note, nobody mentioned administrative responsibities!

Question: What are your major responsibilities?

I-B. Technicians = 10

Ranking	Statements	Responses
1	Maintenance	8
2	Construction	5
3	Water distribution & control	3
3	Administrative tasks	3
4	Encroachments related tasks	2
4	Surveys	2
5	Not clear	1
	Total Responsibilities / Tasks	24

Question: What are your major responsibilities?

I-C. Gatekeepers = 18

Ranking	Statements	Responses
1	Water control	18
2	Maintenance	10
3	Encroachment reporting	9
4	Not clear	2
5	Pump operation	1
	Total Responsibilities / Tasks	40

II. IRRIGATION STAFF & MAJOR TIME CONSUMING TASKS

Question: What tasks take up the major part of your time on the job?

II-A. Engineers = 15 (District Engineers 10, Assistant Directors 2, Inspector 1, and Under Secretaries 2)

Ranking	Statements	Responses
1	Water distribution	11
2	Maintenance	6
3	Monitoring of water levels	2
3	Survey work	2
3	Construction of structures	2
4	Discharge measurements	1
4	Calculations of water requirements	1
4	River Nile bank protection	1
	Total Tasks	26

* Note, nobody mentioned administrative responsibities!

Question: What tasks take up the major part of your time?

II-B. Technicians = 10

Ranking	Statements	Responses
1	Maintenance	6
2	Construction	3
3	Water distribution & control	2
4	Not clear	1
Total Tasks		12

Question: What tasks take up the major part of your time?

II-C. Gatekeepers = 18

Ranking	Statements	Responses
1	Water control	10
2	Maintenance	8
3	Encroachment reporting	3
Total Tasks		21

III. IRRIGATION STAFF & ADEQUACY OF FUNDS AND FACILITIES

Question: Funds and other facilites provided and their adequacy?

III-A. Engineers = 13 (District Engineers 10, Assistant Directors 2, and Inspector 1)

Ranking	Statements	Responses
1	Inadequate	11
2	Adequate	2
Total		13

Question: Funds and other facilites provided and their adequacy?

III-B. Technicians = 10

Ranking	Statements	Responses
1	Inadequate	8
2	Adequate	1
2	Not relevant	1
Total		10

Question: Funds and other facilites provided and their adequacy?

III-C. Gatekeepers = 18

Ranking	Statements	Responses
1	Inadequate	13
2	Adequate	3
3	Not sure	1
3	Not relevant	1
Total		18

IV. IRRIGATION STAFF & MAJOR PROBLEMS

Question: What are the major problems in carrying out your tasks?

IV-A. Engineers = 13 (District Engineers 10, Assistant Directors 2, and Inspector 1)

Ranking	Statements	Responses
1	Lack of transportation facilities	7
2	lack of funds	3
2	Unreliable water supply especially at the tail ends of canals	3
3	Encroachments (illegal activities by farmers)	2
3	Lack of skilled staff	2
3	No problems	2
4	Lack of service facilities for gatekeepers	1
4	Maintenance difficulties	1
4	Lack of motivated staff	1
4	Shortage of equipments	1
4	Shortage of technicians	1
4	Excessive water consumption (rice, fish-ponds)	1
	Total Responsibilities / Tasks	25

Question: What are the major problems in carrying out your tasks?

IV-B. Technicians = 10

Ranking	Statements	Responses
1	Lack of transportation facilities	6
2	No problems	3
3	Low incentives	2
4	Maintenance related health hazards	1
4	No delegation of authority	1
4	Lack of equipment	1
	Total	14

Question: What are the major problems in carrying out your tasks?

IV-C. Gatekeepers = 18

Ranking	Statements	Responses
1	Lack of communication & transportation facilities	8
2	Farmers' pressure	5
3	Manual gate operation problems	3
4	Low salaries & incentives	2
4	No problems	2
5	Encroachments (illegal activities by farmers)	1
5	Health hazards	1
5	Obstructions in canal-gates (dead animals)	1
5	Not clear	1
	Total Responsibilities / Tasks	24

V. IRRIGATION STAFF & WATER ALLOCATION

Question: What information is required for seasonal water allocation and its level of accuracy under the new liberalized cropping pattern policy?

Engineers = 12 (District Engineers 10, Assistant Director 1, and Inspector 1)

V-A. Information required

Ranking	Statements	Responses
1	Cropping pattern	9
2	Area planted	2
2	Rice areas	2
2	No involvement in planning process	2
3	Conveyance water loss estimates	1
3	Municipal water demand	1
3	Water duties	1
3	Planting dates	1
	Total	19

V-B. Accuracy of information under liberalized cropping pattern

Ranking	Statements	Responses
1	Difficult to get accurate information	5
2	No response	4
3	Not applicable	2
4	No problem (difference)	1
Total		12

VI. IRRIGATION STAFF & WATER WITHOUT ACCURATE ALLOCATION

Question: How do you assure that farmers get the water they need, if water allocation can be accurately assessed?

Engineers = 12 (District Engineers 10, Assistant Director 1, and Inspector 1)

Ranking	Statements	Responses
1	Ensuring equitable water distribution	7
2	Internal rotation adjustments	5
3	Consulting agricultural cooperatives	3
3	Farmers to stick to rotation	3
4	Lengthening rotation period	1
4	Requesting more water allocation	1
4	Better maintenance	1
Total		21

VII. IRRIGATION STAFF & ALLOCATION SOLUTIONS

Question: Can you suggest solutions to the water allocation problem?

Engineers = 12 (District Engineers 10, Assistant Director 1, and Inspector 1)

Ranking	Statements	Responses
1	Equitable water distribution	3
1	Irrigation Improvement Program	3
1	Better maintenance	3
1	Administrative control of gatekeepers at the interface of directorates by the Central Water Distribution Directorate	3
2	Research	2
2	Increased awareness	2
3	Training programs	1
3	Reuse of drainage water	1
3	Coordination within inspectorates for equitable water distribution among districts	1
3	Controlling flows to mesqas	1
3	Minimizing drainage from mesqas	1
3	Flexible water shares for directorates	1
3	Sticking to water distribution & allocation schedules	1
3	Delegation of authority to district engineers	1
3	Administered cropping patterns	1
3	Allocate more water	1
3	More maintenance equipment	1
3	No idea	1
3	Irrelevant answer	1
	Total	29

VIII. IRRIGATION STAFF & INFORMATION FOR WATER DISTRIBUTION

Question: During operations, what information is collected from the field about water flows in different parts of the system?

Engineers = 12 (District Engineers 10, Assistant Director 1, and Inspector 1)

Ranking	Statements	Responses
1	Water levels	11
2	Maintenance status	4
3	Water rotation to be followed	2
4	Transgressions (illegal activities by farmers)	1
4	Accuracy of field data being collected	1
4	Status of control structures	1
Total		20

IX. IRRIGATION STAFF & WATER DISTRIBUTION INFORMATION ACCURACY

Question: Is the information about water flows in the system adequate?

Engineers = 12 (District Engineers 10, Assistant Director 1, and Inspector 1)

Ranking	Statements	Responses
1	Information is adequate	8
2	Information is adequate to some extent	3
3	Information is not adequate	1
Total		12

X. IRRIGATION STAFF & WATER DISTRIBUTION PROBLEMS

Question: What problems do you face in achieving effective water distribution?

Engineers = 12 (District Engineers 10, Assistant Director 1, and Inspector 1)

Ranking	Statements	Responses
1	Maintenance problems	7
2	Inequitable water distribution in the system	4
3	Locational disadvantages in the system	3
4	Water shortages at the tail ends	2
5	Direct pumping from canals	1
5	Interface mismanagement between directorates	1
5	Reuse of drainage water is unreliable	1
5	Skewed water use pattern	1
5	Liberalized cropping patterns	1
5	Lack of trained perssonel	1
5	Lack of public awareness	1
Total		23

XI. IRRIGATION STAFF & CHANGES FOR BETTER WATER DISTRIBUTION

Question: What changes in departmental procedures, facilities, etc, are needed to make it possible to deliver water more efficiently?

Engineers = 12 (District Engineers 10, Assistant Director 1, and Inspector 1)

Ranking	Statements	Responses
1	More focus on maintenance	4
2	More water	3
3	Trained and well equipped staff for flow measurements	2
4	Effective communication facilities	1
4	Flexibility in operations at district levels	1
4	Farmers' involvement in water distribution	1
4	Controlled cropping patterns	1
4	Increased public awareness	1
4	Enforcement of stringent laws	1
4	Water pricing	1
4	Effective coordination within directorates	1
4	No proper response	1
Total		18

ANNEX E

RESPONSES TO INTERVIEWS --

MAINTENANCE

Summary

The diagnostic study of MPWWR field organizations has been performed in two governorates, both Kafr El-Sheikh and Minya. The attached tables present the analysis of the answers of the engineers to a set of specific questions in the questionnaires.

The number as well as the specialization of the engineers are listed below.

Type of engineer	Questionnaire #	Number of Interviewees
Irrigation engineers	4	15
Drainage engineers	5	13
Drainage Engineers	6	13
Mech. & Elect. Engineers	7	18
MSM Engineers	9	3
Preventive Maint. Engineers	10	5

How do you select areas and plan for canal and structure maintenance activities ?

Rank	Iteam	Number of Answer
1.	There is an annual time table program	5
1.	According to the degree of weed infestation	5
2.	After making surveying for the canals	4
3.	Whenever there is a structure to be replaced	3
4.	Priority for canals which has a lot of sediement	2
4.	According to the degree of unstable lengths of canals	2
4.	Through monitoring of canals	2
4.	According to complaints of users	2
4.	Information from gatekeeps	2
5.	Through experience	1
5.	Each season has its types of weeds	1
5.	The Program is felixiable and may be changed during excution	1
5.	Structure maintenance is done by the inspectorate	1
5.	The maintenance will be done when it is necessary	1

Q4/3

What are the mejor problems in carrying out canal maintenance?

Rank	Item	Number of answers
1.	Lack of funds and equipments	7
2.	Lack of labour	4
3.	lapid growth of weeds in a short time	3
3.	Delay in excuting the work by contractors	3
4.	fuel is not enough, and only one car	2
5.	Delay in clearing enchroachments	1
5.	Lack of facilities	1
5.	Submerged weeds	1
5.	Banning the use of chemical weed control	1
5.	Unknown boundaries of the proprities of the users in relation to the canals and structures.	1
5.	Short time for maintenance during winter closure and bad weather condition and choosing right time (March till June)	1
5.	Careless farmers in maintaining private meskas	1
5.	The suitability of equipment working in the River	1
5.	Need for small boats with shallow depth	1
5.	Hycinth coming from south out of khours	1
5.	Needs for equipment with lille fuel consumption	1
5.	People catch the Fish by T.N.T in case of Biological control.	1
5.	Manual cleaning is not effective	1
5.		1

What changes in departmental proceedures, facilities, etc, are needed to make maintenance work more effective?

Rank	Item	Number of answers
1.	More equipment	12
2.	More personnel (staff)	6
3.	More fuel	3
3.	More funds	3
4.	More of communication facilities	2
4.	Protect canals by lining	2
4.	Public awarness	2
5.	Transportation	1
5.	Computers	1
5.	More of projects such as P.M./IIP	1

Q4/7

Is there a need to coordinate your activities with drainage and/or pump operation personnel, if so, in what ways? what are the problems of coordination?

Rank	Item	Number of answers
1.	Yes, during (water rotations, winter closure)	11
2.	Held meetings between personnel in valued and direct contract	3
3.	No	2
3.	It is bureaucratic problems	2
4.	Implement Ideal Irrigation district	1

Is there a need to coordinate your activities with agriculture personnel ? If so, in what ways? what are the problems of coordination?

Rank	Item	Number of answers
1.	Yes to discuss irrigation problems	10
2.	Need to increase the awarness of both parties through meetings	7
3.	No	3

Q.#5/5

What are your major responsibilities?

Rank	Item	Number of answers
1.	Regular Maintenance of drains open and or tile	8
2.	Solving Problems reported by farmers concerning drains and water logging	7
2.	Review work concerning drainage project	7
3.	Implement the irrigation and drainage lows	5
4.	Supervise construction works on drains	4
5.	Prepare Progress reports	3
6.	Report water levels in drains and pump station	2
6.	Administrative work	2
7.	Give licences to citizens that there activities are not in conflict with the drainage network.	1
7.	Prepare time schedule for cleaning	1
7.	Maintain the drainage equipment	1

What tasks take up the major part of your time on the job?

Rank	Item	Number of answers
1.	Surveying works	4
1.	Follow up the excution of Projects	4
1.	Solving the problems of the farmers	4
2.	Enforce laws	2
2.	Field visits to drainage works	2
3.	Maintenance of Equipments	1
3.	Maintenance of the drainage system	1

Q.# 5/17

What funds, transportation, equipment, and supplies, including gosaline, are provided for your use? Are these facilities adequate

Rank	Item	Number of answers
1.	Facilities are not adequate (fuel, furniture, communication, survey instruments, field equipments)	9
2.	Low incenties for the employees	3
2.	Facilities are adequate	3
3.	Careless of Police for implementing the laws of encroachments	1
3.	Lack of Public awareness	1
3.	Facilities are reasonable compared to the quantity of work	1
3.	Staff need training	1

Rank	Item	Number of answer
1	Need for technical staff in the drainage district (Example Civil Engineer, Mechanical Eng., Survey)	6
2	Lack of communication facilities	4
3	Need more training (Technical) and (administrative)	3
4	Difficulties with removing encroachments	2
4	On Office facility in some areas where maintenance centers are suppose to be	2
4	No enough housing for engineers	2
5	Farmers objections to excute tile drains	1
5	Proceedures to clear the site for constructing drainage works (Tile) takes a lot of time	1
5	Rehabilitation of the subsurface drains	1
5	Need to increase the incertives	1
5	Pollution from Raw sewage	1
5	Lack of Public awareness	1
5	Lack of resources (Financial)	1
5	No workshop is available in the district	1
5	Contractors and companies are late in implementing the drainage projects	1
5	Shortage in equipment (surveying level set.)	1
5	The flushing machines for tiles are not effective	1
5	No problems	1
5	Should solve the temporary lahour problems	1

Q #5/24

Is there a need to coordinate your activities with irrigation and/or pump operation personnel, if so, in what ways? what are the problems in coordination.

Rank	Item	Number of answers
1.	Yes the is a need for coordination Examples (during winter closure and on and off rotations	13
2.	There are no problems of coordination	6
3.	There is no enough communication	5

Q 6/1

How do you select areas and plan for drainage maintenance activities?

Rank	Item	Number of answers
1.	Following up the predetermind schedule (Routine)	9
2.	Checking through field visits	3
3.	Weekly reports done by technicians (/monthly)	2
4.	According to recieved complaints	1
4.	Through reports by district engineers	1

Q 6/3

What are the major problems in carrying out system maintenance?

Rank	Item	Number of answers
1.	Lack of public awareness	8
2.	Drains passing through communities	4
3.	Delay of work assigned to contractos	3
3.	No enough office space	3
4.	Sewage in the drains	2
4.	Shortage of staff and their quality	2
4.	No sufficient equipment	2
4.	No communication facility	2
5.	Bad quality of implemented projects	1
5.	Lack of Communication between designers and implementors and people who maintain the system.	1
5.	Users damage manholes	1
5.	local bridges break the collectors	1
5.	Users close the collectors	1
5.	The large # of manholes is subject to damage	1
5.	Problems with main drains which are used for irrigation	1
5.	Expiry date of the subsurface drainage network	1

In your openion are current maintenance practices adequate to sustain the system indefinitely? If not, how fast are the drainage systems deteriorating? Also, what additional effort is needed?

Rank	Item	Number of answers
1.	Yes	6
2.	Lack of public awareness	5
3.	Soliving Sewage problem	2
3.	Soliving problems of drains near communities	2
3.	No	2
3.	Shortage in # of staff and training	2
3.	The life span of the project is short	2
3.	Increase routine Maintenance activities periodically	2
3.	If the installation is done properly the existing maintenance practices are okaye	2
3.	More funds and equipment	2
3.	Pitching of drain banks & off takes of collectors	2

Q 6/5

What changes in departmental proceedures, facilities, etc. are needed to make maintenance work more effective?

Rank	Item	Number of answers
1.	Increase # of staff (trained)	7
2.	More equipment and modern	5
3.	More communication facility	4
4.	Need more fuel	2
5.	Need office space	1
5.	Increase incentives	1
5.	Managers should be sharp not easy	1
5.	Divide the directorate in to inspectorate	1
5.	More transportation facility	1
5.	The extension service section needs to be in every directorate	1
5.	Rehabilitation of subsurface Network	1

What are your major responsibilities?

Rank	Item	Number of answers
1.	Maintenance works of gears, pumps, motors	9
2.	Monitoring of pump operation (electric current)	7
3.	Operation	6
4.	Regular rehabilitation for machines	4
5.	Sorting out certain defects (trouble shooting)	3
5.	Coordination between groups at districts and workshops	3
5.	Excution of works (Exchanging electrical network)	3
6.	Financial and administrative affairs	2
6.	Prepare Monthly report including discharge	2
6.	Increase the effeciency of the pump station	2
6.	Procurement of new matrial or improt spare parts from outside Egypt.	2
7.	welding	1
7.	Optimization of power and feul use	1
7.	Editing technical reports to insure the dept right	1
7.	Chairperson of all committees concerning recieving and final approval of New P.S	1
7.	Coordination with electricity distribution companies	1
7.	Improving the Ag. production by lowering W.T.	1
7.	Add new water resources	1
7.	Improve water distribution	1
7.		1

Q#7/8

What tasks take up the major part of your time on the job?

Rant	Item	Number of Answer
1.	Maintenance of stations	7
2.	Sudden defects (trouble shooting)	5
3.	Rehabilitation	3
3.	Administrative work	3
4.	Operation	2
5.	The renewable of pump units	1
5.	No answer	1
5.	Studying the local market	1
5.	Field visits	1
5.	Trying to communicate with others	1
5.	Lack of trained staff	1

Q # 7/17

What funds, transportation, equipment, and supplies, including gasoline are provided for your use, are these facilities adequate

Rank	Item	Number of answers
1.	Need transportation and communication	13
2.	Fuel is not enough and oil	10
3.	Advance in the form of 50 L.E is not enough	7
4.	The Governmental salary is not enough	6
5.	Need a special maintenance car	5
6.	Tool kits for maintenance are not enough	2
6.	No enough resources for the maintenance of the building	2
6.	Distributing the limited budget bet directorates	2
7.	Shortage of Spare parts	1
7.	The light in the Station is bud and weak	1
7.	Need mater cycles for supervisors to visit P.S	1
7.	Facilities are adequate	1

What are the major problems you face in carrying yout tasks?

Rank	Item	Number of answers
1.	The buildings and houses are subject to failure	9
2.	Difficulties with communication facilities	8
2.	Transportation is not enough	8
3.	Difficulties in living where P.S. are located (lack of potable water & sewerage facilities)	6
3.	No enough incentives	6
4.	Administrative problems in getting what we want	4
5.	Shortage of labours for maintenance works	3
6.	Need more office spare	2
6.	No enough spare parts	2
6.	Roads to the P.station is not good	2
6.	Problems with the power supply	2
6.	Sources of funds are very weak	2
7.	Pollution of drainage water is harmful to health	1
7.	Cranes need to be replaced	1
7.	Some of the P.S are too old Ex. P.S # 8	1

What changes in department procedures, facilities, etc., are needed to make your performance more effective?

Rank	Item	Number of answers
1.	Providing communication mean	7
2.	More staff to match with the volume of work	6
3.	Allowances to workers to cover infections and injuries	4
3.	Special car for maintenance	4
3.	Need to make changes in the organizational structure (the area of the district should be lessened)	4
4.	Rehabilitation of the P.S	2
4.	New pump station #8	2
4.	Replacement of cranes	2
4.	Transportation	2
4.	Need for special machines for manufacturing the spare parts	2
4.	Change the mode of operation to deal with external work for others to generate fund	2
4.	More of salary (increase it)	2
4.	Shifts of work should be 4 not 3/day especially at winter	2
5.	Food allowance for lahours	1
5.	Provide spare parts ASAP	1
5.	Storage Room	1
5.	Need for tap water	1
5.	Need for trained workers	1
5.	No enough fund	1
5.	More of supervision on contracters	1
5.	Pavement of roads to the station	1

What are your major responsibilites?

Rank	Item	Number of answers
1.	Give assigments to the technicians	3
2.	Supervise the store purhasing	2
2.	Prepare the project plan for the next year	2
2.	Monitor the project equipment	2
3.	Responsible for all mechanical work in the project	1
3.	Monitor the computer to show the project work	1
3.	Chief mechanical engineer	1
3.	Trouble shooting	1
3.	Bridge and gate maintenance	1
3.	Dredging works	1
3.	Surveying works	1
3.	Maintenance engineer in the workshop (administrative)	1
3.	Excute the maintenance schedule	1
3.	Cooperation with the GD's of different Depat's	1
3.	Technical civil work	1

What funds, transportation, equipment, and supplies, including gosaline, are provided for your use? Are these facilities adequate?

Rant	Item	Number of answers
1.	Need for one more vechile	3
2.	Need for enough fuel for motor cycle	2
2.	" " more of personal computer	2
2.	" " VAX machine	2
3.	" " motor cycle	1
3.	Funds and equipments are not adequate	1

What are the major problems you face in carrying out your tasks?

Rank	Item	number of answers
1.	No job description	2
1.	No problem	2
2.	Lack of engineers	1
3.	Need incentines	1

provided for your use, are these facilities adequate?

Rant	Item	number of answers
1.	Available and enough	5
2.	Only the problems with Ford dealer	1

What tasks take up the major part of your time on the job?

Rant	Item	Number of answers
1.	Following up the maintenance works in the workshop	5
2.	Field visits consume time	1
2.	Work is more than alloted time	1
2.	Channel maintenance near cities and villages	1

Rant	Item	number of answers
1.	Jab description for each assignment	1
2.	Hiring temporary engineers	3
3.	Additional equipment	2
4.	Regular maintenance	1
5.	Establishment of small workshop	1
6.	more incentives	1
7.		

What changes in departmental proceedures, facilities etc., are needed to make your performance more effective?

Rank	Item	Number of answers
1.	Hiring temporary engineers	3
2.	Additional equipment	2
3.	Job description for each assignment	1
3.	Establishment of small workshop	1
3.	More incentives	1
3.	Regular maintenance	1

Rank	Item	number of answer
1.	According to agreements between the irrigation dept. and the project director.	3
2.	District engineers send their orders and then set priorities	1

Are changes beyond IIP needed to provide this service?

Rank	Item	Number of answer
1.	No serious follow up from the disctict engineer	1
1.	No mechanical Engineer is in the field	1
1.	The nature of the Egyptian farmer	1

If continious flow is implemented through out the area, what problems will there be?

Rank	Item	Number of answers
1.	Need for training course in fixing the gates and pipes	1
1.	No change	1
1.	It will need more maintenance	1
1.	Need for special equipment for submerged weeds	1

In your openion, are current maintenance practices adequate to sustain the system indefinitely? if not, how fast are the canals and structures deteriorating ? Also, what more is neede?

Rank	Item	Number of answers
1.	No answer	3
2.	Enough	1
2.	Need to spread P.M. in other governorates	1
2.	Reached 70% in the governorate	1

What changes in departmental procedures, facilities, etc. are needed to make maintenance work more effective?

Rank	Item	Number of answers
1.	No answer	2
2.	Increase the incentive	1
2.	Rehabilitation and replacement of equipment	1
2.	Hire new mechanical engineer	1
2.	Not clear answer	1

Q 10/31

Is there a need to coordinate your activities with irrigation, drainage and/or pump operation personnel? If so, in what ways? what are the problems of coordination?

Rank	Item	Number of answers
1.	The coordination has to be done through the project director, with the district engineer and there are no problem	4

ANNEX F

RESPONSES TO INTERVIEWS --

IRRIGATION IMPROVEMENT PROJECT (IIP)

Forty farmers in the Menya area and forty farmers in the Kafr El Sheikh area were interviewed concerning their land and the IIP. The following tables show the results of these interviews.

TABLE 1

SAMPLE DISTRIBUTION OF LAND HOLDINGS ACCORDING TO THE PATTERN OF LEGAL POSSESSION

	AREA			
	Menya		Kafr el Sheikh	
Pattern of Legal Possession	No.	%	No.	%
Owned	28	(70.0)	21	(52.5)
Rent	2	(5.0)	2	(5.0)
Mixed	10	(25.0)	17	(42.5)
Total	40	(100.0)	40	(100.0)

TABLE 2

SAMPLE DISTRIBUTION ACCORDING TO SIZE OF HOLDING

	AREA			
	Menya		Kafr el Sheikh	
Size of Holding	No.	%	No.	%
< 3	25	(62.5)	15	(37.5)
3-10	8	(20.0)	18	(45.0)
+ 10	7	(17.5)	7	(17.5)
Total	40	(100.0)	40	(100.0)

TABLE 3

ONE OR MORE MESQAS

AREA

	Menya		Kafr el Sheikh	
Holdings on:	No.	%	No.	%
One Mesqa	11	(27.5)	9	(22.5)
More than one Mesqa	29	(72.5)	31	(77.5)
Total	40	(100.0)	40	(100.0)

TABLE 4

WATER PUMP USAGE

AREA

	Menya		Kafr el Sheikh	
Use	No.	%	No.	%
Owned	26	(65.0)	37	(92.5)
Rented	14	(35.0)	3	(7.5)

TABLE 5

STATED PROBLEMS OF THE OLD IRRIGATION SYSTEM*

	AREA			
	Menya		Kafr el Sheikh	
Stated Problem(s)	No.	%	No.	%
Water Shortage	14	(35.0)	20	(50.0)
Irregularity of Rotation	5	(12.5)	3	(7.5)
Inequity of Access to Water	4	(10.0)	10	(25.0)
Difficulty in Renting a Pump During Rotation	6	(15.0)	-	-
High Cost of Irrigation	7	(17.5)	2	(5.0)
Poor Maintenance of Mesqas	10	(25.0)	2	(5.0)
Poor Crop Production	6	(15.0)	8	(20.0)
Loss of Water	-	-	3	(7.5)
Other Problems**	-	-	3	(7.5)

* Absolute figures and percentages do not add up to 40 and 100% respectively because of multiple responses.

**Health problems related to the use of drainage water in irrigation, as well as crop losses resulting from drainage water and bad leveling of land.

TABLE 6

MODES OF RESOLVING IRRIGATION DISPUTES

	AREA			
	Menya		Kafr el Sheikh	
Mode	No.	%	No.	%
Direct Negotiation	11	(27.5)	12	(30.0)
Customary Law	9	(22.5)	6	(15.0)
IAS Engineers	10	(25.0)	-	-
Police	3	(7.5)	1	(2.5)
Use of Force	2	(5.0)	3	(7.5)
Kinship Ties	5	(12.5)	1	(2.5)
No Response	-	-	17	(42.5)
Total	40	(100.0)	40	(100.0)

TABLE 7

MODES OF MANAGING WATER SHORTAGE

	AREA			
	Menya		Kafr el Sheikh	
Mode	No.	%	No.	%
Use of Well Water	22	(55.0)	-	-
Use of Drainage Water	1	(2.5)	24	(60.0)
Complaints to MPWWR	5	(12.5)	11	(22.5)
WUA Meetings	1	(2.5)	-	-
Cultivating Crops Needing Less Water	1	(2.5)	-	-
Not Reported	10	(25.0)	5	(12.5)

TABLE 8

SUGGESTED IDEAS FOR THE IMPROVEMENTS OF THE CURRENT IRRIGATION SYSTEM

	AREA			
	Menya		Kafr el Sheikh	
Ideas	No.	%	No.	%
Raise the Water Level in the Main Canal	15	(37.5)	19	(47.5)
Lining of the Main Canal	5	(12.5)	2	(5.0)
Cleaning of Main canals and Mesqas	3	(7.5)	6	(15.0)
Restrict Continuos Flow to the Main Canals Only	5	(12.5)	-	-
Lining of Old Mesqas	-	-	2	(5.0)
More Reliable Rotation	-	-	1	(2.5)
No Ideas	10	(25.0)	10	(25.0)

TABLE 9

EXTENT OF READINESS TO JOIN IIP

	AREA			
	Menya		Kafr el Sheikh	
Response	No.	%	No.	%
Yes	33	(82.5)	11	(27.5)
No	7	(17.5)	29	(72.5)
Total	40	(100.0)	40	(100.0)

TABLE 10

BENEFITS OF IIP*

AREA

	Menya		Kafr el Sheikh	
Benefits**	No.	%	No.	%
Reduce Irrigation Problems	10	(33.3)	-	-
Permanent Availability of Water	20	(66.6)	12	(42.9)
Equity in Water Distribution	1	(3.3)	-	-
Reduced Irrigation Cost	12	(40.0)	-	-
Increased Crop Yields	6	(20.0)	13	(46.9)
Easy Access to Water	2	(6.6)	-	-
Wider Roads	4	(13.3)	-	-
Clean Mesqa	4	(13.3)	10	(35.7)
Increased Land Area	7	(23.3)	11	(39.3)
No Response	30	-	28	-

* This question was asked in areas where the project is already operative or under construction.

**Multiple Responses

TABLE 11

PROBLEMS OF IIP

AREA

Response*	Menya No.	Menya %	Kafr el Sheikh No.	Kafr el Sheikh %
Fear of Financial Burdens	4	(13.3)	15	(54.0)
Water Shortage Resulting from Competition for Irrigation	6	(20.0)	1	(3.6)
No Control Over Violators	2	(6.6)	-	-
Wary About Cost Recovery of the Project	2	(6.6)	-	-
Inability to Invest WUAs Bank Account	1	(3.3)	-	-
Technical Specifications of Mesqas are not Followed	3	(10.7)	-	-
Fake Promises on Part of Government Officials	1	(3.3)	-	-
Long Construction Time and Other Technical Problems	5	(16.7)	3	(10.7)
Oversupply of Irrigation Pumps	2	(6.6)	13	(46.4)
No Problems	11	(36.7)	-	-
No Response	30	-	28	-

* Multiple Responses

Questions were asked of ПР staff concerning their work. Following are the questions and responses.

WHAT ARE YOUR MAJOR RESPONSIBILITIES?

	Number
Supervision of IIP activities	2
Coordination between farmers and Irrigation Engineers	3
Formation of WUAs	2
Supervision and training of technicians, field staff and Agents and evaluation of their performance	6
Approval for purchasing of pumps	2
Planning and supervision of construction activities	6
Training of WUAs members	1
Monitoring of Mesqas	3
Supervising the measurement of water discharges and level	1

Number interviewed - 9

WHAT TASKS TAKE UP THE MAJOR PART OF YOUR TIME ON THE JOB?

	Number
Pump station operations	1
Meeting with farmers to solve their problems	3
Supervising construction	2
Design of mesqas and other structures	1
Formation of WUAs	1
Approval of purchasing pumps	2
Administrative work	3

Number interviewed - 9

WHAT FUNDS, TRANSPORTATION, EQUIPMENT AND SUPPLIES, INCLUDING GASOLINE, ARE PROVIDED FOR YOUR USE? ARE THESE FACILITIES ADEQUATE?

Adequate	Not Adequate	No Response
1	6	2

Items Provided	Number of Responses
Government Car	7
Bike	1
Fuel	7
Funds	2

Number interviewed - 9

WHAT ARE THE MAJOR PROBLEMS YOU FACE IN CARRYING OUT YOUR TASKS?

	Number
Farmers mentality and lack of awareness	3
Lack of media support for the project	1
Lack of appropriate facilities	3
Staff and administrative problems	2
Staff shortage	1
Identifying location of outlets	1
Poor incentives	1
Discriminatory policies on Part of MPWWR between Agricultural and Civil Engineers	1
Heavy work load	1
Extended or large area under supervision	1
Resistance of peasants to buying one pump	1

Number interviewed - 9

WHAT CHANGES IN DEPARTMENTAL PROCEDURES, FACILITIES, ETC., ARE NEEDED TO MAKE YOUR PERFORMANCE MORE EFFECTIVE?

	Number
Increase salaries and incentives	5
Organize media campaign for peasants to raise their awareness	1
More contact between IAS engineers and farmers	1
IAS should be a separate authority	1
Training for the administrative staff	1
Provision of computer facilities	1
Increase the means of transportation	1
More clear job descriptions	1
Simplify administrative procedures	1
Decentralization of authority	1
Implement the new Irrigation Law	2
Reduced work load	1
Workshop for repair of motorcycles	1

Number interviewed - 9

The following questions concern the Irrigation Advisory Service (IAS)

ARE THERE MAJOR DIFFICULTIES IN GETTING FARMERS TO FORM WUAs, AND, IF SO, WHAT ARE THEY?

YES	NO	No Response
7	1	1

What are the problems	Number
Inter village social problems	3
Lack of farmer's awareness	2
Availability of privately owned pumps	2
Internal village problems	3
Fear of cost recovery	2
Unequal land ownership	1
Loss of access to other irrigation sources i.e., wells	1
New type of system	1
No problems	2

Number interviewed - 9

ARE FARMERS WILLING TO PAY THE COST OF MESQA IMPROVEMENTS? WHY OR WHY NOT?

Yes	Some of them	No
2	2	5

Why yes?	Number
They feel that the project is useful to them	2

Why not?	
They are too poor to pay	3
They paid a lot for drainage	3
They pay a lot of taxes	1
They have their own pumps	2
They know that the project is U.S. funded	3
No explanation	1

Number interviewed - 9

IF THERE ARE WATER USER ASSOCIATIONS (WUAS) IN YOUR AREA, DO YOU INTERACT WITH THEM DIRECTLY? IF SO, WITH WHOM AND OVER WHAT QUESTIONS DO YOU INTERACT?

Yes	No	No WUAs	No response
19	1	6	4

With Whom?	Number
Not reported	15
Not required	10
WUA Leader	4

Over what questions do you interact with WUAs	Number
Irrigation issues	7
Water distribution problems	10
Maintenance of mesqas	8
Illegal activities	1
Lining of canals	2
Farmers awareness	1
Drainage problems	1
Organization of irrigation among farmers	1

Number interviewed - 30

IN YOUR OPINION, DO WUAS MAKE INTERACTIONS WITH FARMERS MORE EFFECTIVE? IF SO, HOW?

Yes	No	Don't know	No response
16	1	9	4

If so, how?	Number
Organizing irrigation among farmers	2
Reduce problems of maintenance	2
Dealing with fewer numbers of persons (WUA Leader)	8
No idea/experience	9
Not clear	1
MPWWR intervention whenever problems arise	1

Number interviewed - 9

IS THERE A NEED TO COORDINATE YOUR ACTIVITIES WITH IRRIGATION, DRAINAGE AND/OR PUMP OPERATIONS PERSONNEL? IF SO, IN WHAT WAYS? WHAT ARE THE PROBLEMS OF COORDINATION?

Yes	No	Only with one of them
7	1	1

In what ways?	Number
Stabilize water level for continuous flow	3
Handling illegal activities	2
Irrigation and drainage use to be one directorate	1
Solve problems resulting from construction activities	1
Solve irrigation and drainage problems	1
It already exists	2

What are the problems of coordination?

No problems	5
No reported	3
Additional work load for the engineers	1

Number interviewed - 9

IS THERE A NEED TO CONTINUE IAS ACTIVITIES WITH FARMERS AFTER IMPROVED MESQAS HAVE BEEN TURNED OVER TO THE WUAS? IF SO, WHAT ARE THE ACTIVITIES NEEDED?

Yes	No
9	0

What are the activities needed?	Number
Training of farmers	2
Providing farmers with irrigation information	2
Organization of irrigation	2
Monitoring of the operation of the system	7
Solve technical problems	1
Maintenance of the system	6
Help form WUAs and Federation	3

Number interviewed - 9

ONCE THE IIP CONSTRUCTION ACTIVITIES IN AN AREA ARE FINISHED, HOW CAN IAS ACTIVITIES BE CONTINUED? WHAT ORGANIZATION OR OTHER CHANGES ARE NEEDED?

	Number
Irrigation Engineers should be responsible for the operation of mesqas	3
IAS should be made a separate authority or directorate	5
Formation of a maintenance unit	1
More IAS staff	1
Formation of Federations	1

Number interviewed - 9

WOULD WUA FEDERATIONS BE USEFUL? IF SO, FOR WHAT? WHY WOULD FARMERS WANT TO SUPPORT THEM?

Yes	No	Don't know
7	0	2

For What?	Number
Organization of irrigation	4
Solve problems between farmers	1
Determining crop patterns	1
Facilitate maintenance	2
Reduce the number of farmers with whom to contact	3
It is a normal extension of the WUAs	1

Would farmers support it?	
Yes	3
Yes, with difficulty	1
No	0
Not sure/no response	5

Why would they support it?	
They feel they can participate with officials in determining water distribution	1
No response	8

Number interviewed - 9

IN YOUR OPINION, WOULD FEDERATIONS OF WUAS BE USEFUL? IF SO, IN WHAT WAYS?

Yes	No	Don't know	No response/experience
13	2	2	9

In what ways?	Number
Coordinating between the different WUAs	5
More contribution from the farmers	2
Dealing with fewer number of people	4
Help in water distribution	1
No explanation	2
Help in solving problems related to irrigation	2

Number interviewed - 9

IIP requires the provision of continuous water flow for irrigation. The present non-improved areas get water on a rotation basis. The following questions relate to changing water delivery to continuous flow under IIP

THE IIP REQUIRES CONTINUOUS FLOW INSTEAD OF ROTATION. WHAT CHANGES WILL BE NEEDED TO IMPLEMENT CONTINUOUS FLOW THROUGHOUT THE YEAR?

	Number
Lowering the mesqa level	3
Enforcement of canal banks	3
Automatic operation of gates	1
Providing enough discharge	3
Adjust gates and intake levels	2
Lining of canals	5
Increase the farmers awareness	3
Continuous maintenance and dredging	2
Remodeling mesqa and canal openings	3
No experience	5
No changes	1
Increase the drainage capacity	1
Removing direct intake points	1
No response	1

Number interviewed - 30

IF CONTINUOUS FLOW IS IMPLEMENTED THROUGHOUT THE AREA, WHAT PROBLEMS WILL THERE BE?

	Number
No answer	1
Increased water loss	6
Canal maintenance problems	1
Increased seepage	1
Increased water salinity	1
Water shortage	5
No problem	6
Night storage will be needed	2
Increased need for maintenance	5
Increase farmers awareness of the importance of the project	3
Drainage problems	4
Damage to the soil	3
Raising ground water	2
Pollution of ground water	1
Seasonal problems during rice cultivation	2

Number interviewed - 30

IF CONTINUOUS FLOW IS IMPLEMENTED THROUGHOUT THE AREA, WHAT PROBLEMS WILL THERE BE?

	Number
Farmers misconduct	2
Damage to land	2
Water loss	2
Increase seepage	1
Raising water table	1
No problem	7

Number interviewed - 9

THE IIP REQUIRES CONTINUOUS FLOW INSTEAD OF ROTATIONS. WOULD CONTINUOUS FLOW REQUIRE ANY CHANGES IN DRAINAGE MAINTENANCE PRACTICES? IF SO, WHAT CHANGES WOULD BE NEEDED?

Yes	No	No response
4	1	1

No change	Number
Tile drainage is designed on the basis of actual area served	1

Yes changes needed

Increase the efficiency of maintenance	1
Coordination with pump stations	1
Coordination with agriculture to arrange for maintenance	1
Reduce the amount of drainage water	1
Redesign of the networks of drains	1
Less need for maintenance	1
Maintenance operations will be more difficult	1

Number interviewed - 6

WOULD YOU SAY THAT THE IMPROVED MESQA IS AS IMPORTANT TO THE FARMERS AS IS THE CONTINUOUS FLOW? WHY OR WHY NOT?

More important	Equally important	Less important
1	3	5

Why is it more important?	Number
Continuous flow requires improved mesqa	1
Decrease irrigation problems for farmers	1
Decreases water loss	2
Because of the cost recovery of improved mesqas	1
Gives credibility to the system	1
Reduces irrigation cost	1

Why improved mesqas are more important	
The total length of the mesqas is greater than that of canals	1
No explanation	3

Number interviewed - 9