

**Ministry of Public Works and Water Resources  
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Environmental Policy and Institutional Strengthening Indefinite Quantity Contract**

**APRP - Water Policy Reform Activity  
Contract PCE-I-00-96-00002-00  
Task Order 807**

**ANNUAL WORK PLAN  
YEAR 2  
(JANUARY – DECEMBER 1998)**

**Report No. 4**

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**Water Policy Reform Program**

**International Resources Group**

**Nile Consultants**

**Winrock International**

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# **EPIQ Water Resources Results Package**

## **Annual Work Plan**

### **Year 2**

**(January – December 1998)**

## **Purpose**

The purpose of this report is to present the 1998 Annual Work Plan for the APRP-Water Policy Reform Activity being implemented under the Environmental Policy and Institutional Strengthening Indefinite Quantities (EPIQ) Contract PCE\_1-00-96-00002-00, Task Order 807. A technical assistance team (EPIQ TA team) made up of long-term expatriate and local consultants, supported by short-term consultants, is carrying out the activity. The Water Policy Reform Activity is a USAID funded program to assist the Ministry of Public Works and Water Resources (MPWWR) in developing policy recommendations to help the Government of Egypt improve the efficiency and productivity of its water resources.

The Annual Work Plan covers the period from January – December 1998. This is the second year of a three-year program that began in June 1997 and has a completion date of September 1999 with an extension option that runs through June 2000. The work plan includes the activities to be undertaken during the work plan period, shows how these activities relate to the USAID water policy results package and to the overall implementation plan of the project. A time framework for the activities, indicating the beginning and completion dates for each activity is provided. The expected staffing requirements and the deliverables are also presented.

## **2. Activities in Support of Water Resources Results Package**

The terms of reference for the EPIQ task order is structured around a results package jointly designed by USAID and MPWWR which consists of integrated water policy and institutional reforms. The package has four major results:

1. Improved irrigation policy assessment and planning process;
2. Improved irrigation system management;
3. Improved private sector participation in policy change;
4. Improved capacity to manage the policy process.

Under each of these results, various activities are to be carried out by the MPWWR. USAID is supporting the ministry financially through a cash transfer mechanism. The cash transfer is through performance disbursements, reflecting the accomplishment level of the package benchmarks.

The overall objective of the result package is to “increase the global efficiency and productivity of Egypt’s Nile Water System”. The specific objectives are:

1. To increase MPWWR knowledge and capabilities to analyze and formulate strategies, policies and plans related to integrated water supply augmentation, conservation and utilization, and to the protection of the Nile water quality.
2. To improve water allocation and distribution management policies for conservation of water while maintaining farm income.
3. To recover the capital cost of mesqua improvement, and to establish a policy for the recovery of operation and maintenance cost of the main system.
4. To increase users' involvement in system operation and management.
5. To introduce a decentralized planning and decision making process at the irrigation district level.

## **Result 1 Improved Irrigation Policy Assessment and Planning Process**

Five activities have been identified to support Result 1.

### **Activity 1.1 Agricultural Water Demands:**

The goal of this activity is to assist the Ministry of Public Works and Water Resources (Ministry) in upgrading the methodology for estimating the annual demand for water in agriculture and for predicting future water demands.

### **Activity 1.2 Water Conservation and Management Alternatives**

#### **A.1 Water use in rice and sugar cane**

The goal of this activity is to help the GOE develop a strategy, or strategies, for the management of rice and sugar cane production in Egypt, given that the farmers have free choice in cropping patterns and that these crops both play important roles in the physical and economic systems of Egypt.

#### **A2. Water Allocation under Scenarios of Reduced Water Supply**

Current methodology for the allocation and distribution of water in Egypt's irrigation directorates and irrigation districts will be analyzed. Analyses will identify potential modifications and improvements necessary for the equitable distribution and efficient use of reduced water supplies at the directorate/district levels.

#### **B. A National Strategy for Irrigation Improvement Projects**

The goal of this activity is to help the Ministry develop a national strategy regarding Irrigation Improvement Projects.

### **Activity 1.3 Water Supply Augmentation**

#### **A. Deep Groundwater**

The goal of this activity is to help the Ministry develop a strategy for achieving the optimal use of deep groundwater reserves, over time.

## **B. Shallow Groundwater**

The goal of this activity is to help the Ministry develop a strategy for achieving the optimal use of shallow groundwater in the Nile Valley and Delta, over time.

### **Activity 1.4 Agricultural Drainage Water Reuse**

There are many technical and policy issues regarding drainage water reuse and the treatment of municipal and industrial wastewater. This activity will provide technical support to the Ministry in the development of a national policy on drainage water reuse by addressing issues of maximum reuse potential, environmental effects, and municipal and industrial wastewater impacts.

### **Activity 1.5 Agricultural Water Supply and Demand Scenarios**

The goal of this activity is to develop national water allocation policy recommendations for addressing long-term agricultural water supply and demand issues.

## **Result 2 Improved Irrigation System Management**

Two activities have been identified to support Result 2.

### **Activity 2.1 Policy Testing and Evaluation**

The goal of this activity is to help the Ministry implement and evaluate policy developments and policy enhancements, which contribute to improve irrigation system management.

### **Activity 2.2 Cost Sharing - Phase I**

The goal of this activity is to assist the Ministry of Public Works and Water Resources in developing a plan for implementing a cost sharing program.

## **Result 3 Policy Change in Private Sector Participation**

Three activities have been identified to support Result 3.

### **Activity 3.1 User Participation in Decision Making in non-IIP Areas**

The goal of this activity is to examine the feasibility of establishing water user associations in non-IIP areas, and forming federations of water user associations and district water boards in IIP areas. Results will assist the Ministry in developing a national policy that allows the formation of water user associations in non-IIP areas and federations of water user associations and district water boards in IIP areas.

### **Activity 3.2 Operational Privatization Above Mesqa Level**

The objective of Privatization in decision making can be extended from mesqa level operations to branch canals or secondary canals by forming federations of water user associations. The activities of federations might include the operation and maintenance of higher order canals and participation in discussions with the Ministry of Public Works and Water Resources regarding water allocation and system operations. The present project presents an opportunity for determining need and demand for functional grassroots organizations at levels above the mesqa.

### **Activity 3.3 Strengthening District Water Management Capability**

The goal of this activity is to recommend policy changes to improve the present procedures and facilities used by the Ministry in Nile system planning, management, operation, and maintenance, such that local participatory management of the system at the irrigation district level will be efficient and effective. This will include a determination of the best ways to enhance district level performance, and is expected to focus on: 1) appropriate role of district water boards in contributing to policy decisions regarding water allocation and delivery, and the operation and maintenance of the water delivery system, and 2) the necessary ministerial institutional changes and infrastructure needs to allow an efficient and effective devolution of system planning, operation and management responsibility and accountability to the directorate/district levels.

## **3. APRP Benchmark Support**

The Agricultural Policy reform program (APRP) is a four year grant program with a budget of US\$ 245 million for cash transfers to participating GOE entities. The program is designed to achieve policy reform in several key areas. One of these is in agricultural land and water resource investment utilization and sustainability. Annual cash disbursements are made to GOE based on the completion of policy reform benchmarks as established and agreed to through annual memoranda of understanding (MOU) signed by both the GOE and USAID/Egypt. The EPIQ TA team directly assists in identifying and achieving annual policy reform benchmarks, working closely with the MPWWR Steering Committee, water policy Advisory Unit (WPAU), and other key ministry officials.

The MOU for Tranche II benchmark activities was signed in September 1997 and are targeted for completion by June 30 1998. Draft Tranche III benchmarks are to be prepared by May 1998. The MOU between USAID and GOE covering Tranche III benchmarks is to be signed by September 1998. Tranche III benchmark activities are to be completed not later than June 30 1999.

The EPIQ team is assisting MPWWR with five Tranche II benchmarks that include:

- C.4. The GOE will establish a strategy for the optimal use of water for rice production.
- C.5. The GOE will establish a strategy for the optimal use of water for sugar cane production.
- C.6 The GOE will develop a policy to allow the formation of water user associations in areas that have not participated in the Irrigation Improvement Program and begin to promote such associations.
- C.7 The GOE will develop a national strategy for improving water-use efficiency and agricultural productivity through irrigation improvement projects.
- C.8 The GOE will develop and approve new policies, regulations and criteria to promote drainage water re-use with appropriate incentives and technical support.

The EPIQ Team will continue to work closely with the Water Policy Advisory Unit in the Ministry of Public Works and Water Resources and other APRP units to develop new Tranche III benchmarks. The benchmark topics to be addressed by the EPIQ TA team under Tranche III will be finalized through a participatory process with MPWWR, USAID and other APRP units between February to May 1998. Possible Tranche III benchmarks will look at policy recommendations on:

- Policy to improve water allocation strategy.
- Strategies/policies for increasing user participation and privatization in irrigation O&M.
- Strengthening district water management and O&M ability
- Water supply augmentation using deep groundwater.
- Irrigation cost sharing

#### **4. Policy Advisory Group**

To help support the EPIQ resident TA team, a small but senior group of specialists has been proposed as part of a policy advisory group (PAG). The purpose of this group is to assist the EPIQ Chief of Party to:

- Develop an overall conceptual framework and analytical agenda that grows directly out of the EPIQ scope of work.
- Clarify and develop terms of reference for a specified short list of analytic studies to support Tranche II water policy benchmarks.
- Develop, within the context of the overall scope of work and conceptual framework in consultation with MPWWR and USAID, benchmarks for subsequent APRP Tranches.

In addition individual members of the PAG will be expected under guidance of the EPIQ Chief of Party and the Chair of the Steering Committee:

- Develop sustained linkages and engagement with the most senior members of the Steering Committee and those others responsible for water policy
- Carry out specific analytic studies to support tranche benchmarks.

#### **5. Collaboration with Other APRP Units**

The Water Policy Reform Activity is one component of the larger Agricultural Policy Reform Program currently being implemented by USAID, the Ministry of Public Works and Water Resources, the Ministry of Agriculture and Land Reclamation, and the Ministry of Trade and Supply. Technical teams within the APRP include the EPIQ Water Policy Team, the MPWWR Water Policy Advisory Unit (WPAU), the Reform, Design, and Implementation Unit, the Food Security Unit, and the Monitoring, Verification, and Evaluation Unit. The EPIQ Water Policy Team will work closely with other units in the APRP group to ensure that policy recommendations are developed in coordination with the larger agricultural policy reform effort.

Collaboration with other APRP units will enhance interactions involving the EPIQ Water Policy Team and Ministries and agencies that influence water resource management. The EPIQ team will work very closely with the WPAU which is the GOE counterpart of the EPIQ Water Policy Reform Team within the MPWWR. Some of the policy recommendations that

will arise from efforts of the EPIQ Team will involve economic and policy issues that are of interest to the Ministry of Agriculture and Land Reclamation and the Ministry of Trade and Supply. The Reform, Design, and Implementation Unit works closely with those Ministries in the design of policy benchmarks to promote liberalization of the agricultural sector. Collaboration with the RDI Unit will be helpful in developing policy recommendations that recognize the economic factors that influence the use of water resources.

The EPIQ Team will contact members of the Main System Management group and the public awareness team to identify opportunities for collaborative efforts. The Team will also assist the Monitoring, Verification, and Evaluation Unit in defining policy verification indicators that can be used to assess compliance with policy benchmarks.

## **6. Management Plan**

The policy nature of the Results Package requires an effective, collaborative relationship involving the EPIQ Water Policy Team, USAID, and the Ministry of Public Works and Water Resources. This relationship will be achieved through regular meetings and workshops, and by sharing study results before deriving conclusions and policy recommendations.

Work progress, technical developments, and administrative issues will be discussed in weekly meetings with the USAID Project Officer and the Chairman of the project Steering Committee. Draft project reports will be submitted to the Project Officer for review and comments.

Close coordination with the Water Policy Advisory Unit (WPAU) of the Ministry will be maintained. Draft policy recommendations will be developed in close cooperation with the WPAU. Draft technical reports will be submitted to the project Steering Committee for review and comments. The EPIQ Water Policy Team will assist the WPAU in identifying policy benchmarks for Tranches III and IV. Benchmark recommendations will be generated as a result of technical and policy analyses described in the project work plan.

The EPIQ Water Policy Team expects the Ministry to provide information and data, as needed, to support technical and policy analyses described in the project work plan. In addition, the EPIQ Team expects the Ministry to support the field work, surveys, data collection, and other activities required to accomplish the goals of the Water Resources Results Package.

## **7. Project Schedule and Staffing Levels**

A schedule of activities to be carried out by the EPIQ Water Policy Team for 1998 is shown as Annex A. The supporting start and end dates for the activities are shown in Annex B. A description of the approach and methodology of the activities to be carried out under the 1998 annual work plan are presented in Annex C. A list of proposed long term and short term staff are presented in Annex D. Annex E presents a list of proposed reports and Annex F presents a list of supporting workshops.

## ANNEX C

## APPROACH AND METHODOLOGIES

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## Annex C

### Approach and Methodologies<sup>1</sup>

## Result 1 Improved Irrigation Policy Assessment and Planning Process

### Activity 1.1 Agricultural Water Demands

#### Background

The annual demand for water in agriculture is a function of many variables, including the crops grown by farmers, their expectation of crop prices and revenues, the price and availability of water, the costs of other inputs such as labor and capital, the technology available for irrigation, farmers' knowledge regarding irrigation methods and crop water relations, and weather conditions. An accurate estimate of agricultural water demand for one year, or for many years, must include analysis of these variables. Estimates that consider only estimated crop water requirements applied to an expected cropping pattern will not be robust with respect to changes in the value of important, underlying variables.

#### Objectives

The goal of this activity is to assist the Ministry of Public Works and Water Resources (MPWWR) in upgrading the methodology for estimating the annual demand for water in agriculture and for predicting future water demands.

#### Tasks

- 1.1.2 Review current methods used by the Ministry to estimate crop water requirements.
- 1.1.3 Develop a conceptual model of agricultural water demand.
- 1.1.4 If feasible, develop an empirical model of agricultural water demand.
- 1.1.5 Test the empirical estimates of agricultural water demand.

The Ministry currently estimates the volume of irrigation water to be delivered each year by considering the expected cropping pattern and the estimated crop water requirements for all crops. A more appropriate method for estimating actual water demands would address the economic variables that influence farm-level decisions regarding cropping patterns, cultural practices, irrigation methods, and water use. Estimates of agricultural water demand generated by such a process will be more accurate in predicting annual water use and more helpful in forecasting future patterns of water use in agriculture.

The most fundamental variables in any demand model are the quantities of a good or commodity purchased and the prices at which the good or commodity is offered. In Egypt, there are no data describing the actual quantities of water used by farmers in any season or

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<sup>1</sup> N.B.: Tasks for each Result area are drawn from the 1998 Implementation Plan and 1998 Work Plan (see Annexes A & B)

the price at which water is sold. Therefore, it will be difficult to generate statistical estimates of water demand models for Egyptian agriculture. As a result, much of the effort in this activity will be directed toward development of a conceptual water demand model that could be generated from alternative analyses (such as existing programming models of Egyptian agriculture). If possible, the model will be used to generate preliminary empirical estimates of agricultural water demands.

The literature regarding agricultural water demand will be reviewed, with particular emphasis on areas where crop water requirements are satisfied largely with irrigation water delivered by a water supply agency or the Ministry. In countries such as Egypt, where rainfall provides almost none of the water required for agricultural production, water demands are determined largely by explanatory variables that include pertinent prices, input costs, technological information, farm-level income, and preferences regarding crop alternatives and irrigation methods.

### **Deliverables**

An agricultural water demand model that will enable the Ministry to generate more accurate estimates of the volume of water demanded by farmers in any year, and to prepare better forecasts of agricultural water demands in the future.

#### **Needs from the Ministry of Public Works and Water Resources:**

- data describing historical water deliveries, by location, with as much detail as possible.
- data describing irrigation methods used by farmers, by location, with as much detail as possible.
- data describing water deliveries and irrigation methods in areas served by the Irrigation Improvement Project, where water user associations may have begun recording farm-level water deliveries and irrigation methods.
- information regarding the procedure for estimating agricultural water requirements.
- information and existing models, which might be used as the basis for generating estimates of agricultural water, demand.

#### **Needs from the Ministry of Agriculture and Land Reclamation**

- data describing actual, historical cropping patterns, by location, with as much detail as possible.
- crop budget information for all major crop and livestock production activities.
- crop budget information for minor crops and specialty crops that may be planted more extensively in the future.
- data describing crop prices, farm-level costs and returns, and other economic variables that influence farm-level water demands.
- data describing farm-level socio-economic characteristics, such as family size, education, off-farm employment, land tenancy and ownership, land rental rates, and land prices.
- information regarding existing agricultural models which might be used as a basis for generating estimates of irrigation water demand.

### **Partners in the Agricultural Policy Reform Project**

Water Policy Advisory Unit (WPAU), Reform, Design and Implementation (RDI), GTZ, Monitoring, Verification, and Evaluation Unit (MVE)

### **Partners in the Ministry of Public Works and Water Resources**

Planning Sector, Irrigation Sector, Irrigation Improvement Projects Directorate, and the National Water Research Center (NWRC) Water Distribution and Irrigation Management Research Institute

### **Partners in the Ministry of Agriculture and Land Reclamation**

Collaboration with the Ministry of Agriculture and Land Reclamation (MALR) is also required, along with the Agricultural Extension Sector, and others as needed.

## **Activity 1.2 Water Conservation and Management Alternatives**

### **A1. Water use in rice and sugar cane**

#### **Background**

The availability of water to farmers in Egypt has been such that, up to now, shortages have been experienced only during prolonged periods of drought. The relaxation of regulation on farm cropping choices has led to an expansion of rice acreage from about .7 to .8 million feddan in 1986 to about 1.5 to 1.7 million feddan in 1997. A significant portion of this expansion has occurred in areas in which rice is not an approved crop, or with the use of illegal pumping from drainage water. With the decision to expand irrigation to new land (Toshka, the Sinai, and others), water will become an increasingly scarce resource, with insufficient supplies to meet current demands on the “old” lands. Thus the MPWWR and the MALR are faced with identifying ways in which to conserve water in “old” lands in order to provide for “new” lands, while, at the same time, trying to mitigate the impact of water scarcity on farmers in the “old” lands. Both sugar cane and rice are crops that require large amounts of water, in terms of consumptive use and in terms of diversion requirements. Thus, these two crops are a major focus of interest for finding potential water savings. However, both crops also contribute broadly to the economy, and rice plays an important reclamation function in areas in the Northern Delta which are underlain with saline aquifers.

#### **Objectives**

The goal of this activity is to help the GOE develop a strategy, or set of strategies, for the management of rice and sugar cane production in Egypt, given the constraints that the farmers have free choice in cropping patterns and that these crops both play important roles in the physical and economic systems of Egypt.

Subsumed in this goal are several secondary objectives: 1) to understand the cropping patterns chosen by farmers in Egypt; 2) to understand the role which each crop plays in the economy and the physical system of Egypt and the Nile Basin; and, 3) to examine the constraints and potential opportunities for developing effective policy regarding these two crops.

#### **Tasks**

- 1.2.1.1.1 Review current publications and available information on rice and sugar cane production, including physical, economic, and social analyses.
- 1.2.1.1.2 Help GOE develop a strategy. Establish Working Groups for each of the crops, composed of APRP team members from EPIQ and DRI, members of the MPWWR and MALR who are directly involved in crop and water distribution, and members of private organizations which have important roles in the crop production choices.

- 1.2.1.1.3 Analyze cropping pattern choices including agronomic and socio-economic information, hydrologic impacts, and water savings potential both on-farm and basin-wide (globally).
- 1.2.1.1.4 Help the two Ministries develop appropriate alternative strategies for managing rice and sugar cane in the face of water scarcity, through the activity of the working groups.

Each Working Group will utilize presentations from outside experts as well as other sources of information to obtain details about particular issues. Such issues as reclamation needs, employment impacts, and economic incentives will be explored in these working groups. Discussion between the Ministries regarding potential strategies and possible constraints will provide the basis on which one or more strategies for managing each of the crops in question can be developed.

### **Deliverables**

- A report will be prepared detailing the possible strategies for managing rice and sugar cane to the water savings necessary for expansion with a minimum of economic or social cost to current water users.
- Findings and conclusions from the working groups will be presented to both of the involved Ministries.

### **Needs from the Ministry of Public Works and Water Resources**

- information regarding current water use and water reclamation requirements.
- information regarding the hydrological impact locally and globally of rice and sugar cane production.
- information regarding other hydrological constraints to rice and sugar cane production in the Nile Basin.
- information on potential water savings from on-farm irrigation alternatives.

### **Needs from the Ministry of Agriculture and Land Reclamation**

- information regarding irrigation requirements of rice and sugar cane.
- information on possible alternative varieties of these crops, or substitute crops.
- information on the sensitivity of farmers to crop prices, and its relationship to national policies regarding imports, subsidies, and other market interventions.
- information regarding the economic and financial impacts of various crop rotations on farmers and their cropping choices.

### **Partners in the Agricultural Policy Reform Project**

WPAU, RDI, DST, GTZ, MVE

### **Partners from the Ministry of Public Works and Water Resources**

Irrigation Department, Irrigation Sector, NWRC, Irrigation Advisory Sector

**Partners from the Ministry of Agriculture**

Agriculture Research Center (RRI, SCRI), Agricultural Extension Sector

**Partners from the Private Sector**

National Consulting Firm, Sugar Organizations

## **A2. Water Allocation under Scenarios of Reduced Water Supply**

### **Background**

The Ministry of Public Works and Water Resources releases water from Lake Nasser to the Nile River, with subsequent diversions to primary canals and secondary canals throughout Egypt, according to a national water allocation program in turn based on cropping patterns and estimated crop water requirements. Water distribution problems are experienced in many areas at the lower ends of the system: branch and distributary canals and mesqas. Among other factors, the problems arise from: 1) deteriorated watercourse condition resulting from poor maintenance practices, 2) inadequate water control and measurement facilities, 3) farmers illegally taking water directly from branch canals, 4) farmers taking water out of turn under the rotational deliveries, and 5) farm-level demands exceeding branch canal and mesqa delivery capacity (e.g., excessive rice cultivation).

To supplement the limited supply of fresh water, farmers located at the ends of branch canals and mesqas go to great lengths to pump drain water when it is physically advantageous. Large quantities of relatively good quality drain water are available, especially in the Nile Delta, due to excessive delivery system operational spills and on-farm water applications. The sustainability of agricultural land productivity under such practice is questionable. Concerns arise as to whether adequate leaching for soil salinity control and/or waterlogging of the soil due to excess water applications are occurring.

The GOE's plan for horizontal expansion of irrigated agriculture, (i.e., Toshka, Sinai), will effectively reduce the volume of water available for allocation to the "old" lands in the Nile Valley and Delta. Such fresh water supply reductions will exacerbate current distribution problems, because the current irrigation delivery system (particularly downstream of secondary canals) in Egypt is not well equipped for equitably distributing reduced water volumes. Concurrently, drainage water generation will also decline, reducing the ability of tail-end farmers to augment their water supplies.

The fundamental reality is Egypt will need to do more with less water. This requires increased water delivery system efficiency. Egypt's national strategy for irrigation improvements has the potential to result in significant improvements in irrigation efficiency at the branch and distributary canal levels. Mesqa and on-farm water management improvements have resulted in more uniform distribution of water and increased agricultural productivity, but without increased deliveries. An improved delivery system is necessary to utilize and effectively sustain the benefits of these positive changes.

The Ministry's main system management data collection and telemetry program can also contribute to improving delivery system efficiency. The high levels of agricultural productivity in the "old" lands and the livelihood of millions of Egyptian farmers will be negatively affected if the MPWWR is unable to equitably distribute reduced water supplies, particularly to the tail reaches of many command areas.

### **Objectives**

The current methodology for the allocation and distribution of water in Egypt's irrigation directorates and irrigation districts will be analyzed. Analyses will identify potential modifications and improvements necessary for the equitable distribution and efficient use of

reduced water supplies at the directorate/district levels. However, this activity will not focus on national water allocation plans or strategies.

Efficient and effective water distribution and management control requires knowledge of the volumes of water to be managed, i.e., water measurement. Ideally water measurement data (e.g., water levels, associated canal volumes) must be available in a real-time sense for day-to-day operations and decision-making. Enhanced utilization of the main system management data collection and telemetry program will be assessed in this regard. An analysis of the physical system, including the current ability to measure water volumes within directorates/districts is needed. An assessment needs regarding structural improvements, calibrations, equipment, and trained personnel for enhanced water measurement will be conducted.

This activity is concerned with the technical and physical aspects of allocation and equitable distribution of reduced water supplies at the directorate and district level. Complementary MPWWR/EPIQ activities include decentralization of government responsibility and accountability (Activity 3.2) and user involvement in system OM&M at the irrigation district level (Activity 3.1).

### Tasks

- 1.2.1.2.1 Develop a detailed work plan for this activity.
- 1.2.1.2 .2 Review the current MPWWR policies and methods for allocating and distributing water within irrigation directorates/inspectories/districts to identify opportunities and constraints for improving and promoting more efficient water management.
- 1.2.1.2.3 Examine the feasibility of implementing potential identified improvements in water allocation and distribution at alternative levels of the irrigation system (mesqa, branch and distributary canals, districts, inspectories, directorates) including enhanced water measurement capacity and utilization of the main system management telemetry program.
- 1.2.1.2.4 Help the Ministry draft a strategy and implementation/operation plan for improving water management based on improved water measurement and control at the irrigation directorate/inspectory/district levels.
- 1.2.1.2.7 Help the Ministry organize a workshop to present and discuss strategies for developing infrastructure, improved technology and associated institutional capabilities for equitable distribution of reduced water supplies
- 1.2.1.2.8 Revise strategy and action plans based on review comments and workshop discussions.

### Deliverables

- A written strategy summarizing the results of the assessment of current operation and management activities of the irrigation water distribution system within irrigation directorates and districts in the Nile Valley and Delta.

- The strategy will provide recommendations and a prioritized action implementation plan for developing infrastructure, improved technology and associated institutional capabilities for equitable distribution of reduced water supplies.

#### **Needs from the Ministry of Public Works and Water Resources**

- Information describing current MPWWR water allocation and delivery/distribution methods and policies at the directorate/inspectorate/district levels.
- Information and data describing the current water delivery system.
- Input from MPWWR engineers (central directorate, field directorate, inspectorate and district) regarding the current system and the potential methods for improving water management.

#### **Partners in the Agricultural Policy Reform Project**

Water Policy Advisory Unit, Greencom/Water Communication Unit, Main System Management Data Collection and Telemetry Unit, Reform Design and Implementation Unit, Monitoring Verification and Evaluation Unit.

#### **Partners in the Ministry of Public Works and Water Resources**

Irrigation Department, Central Directorate for Water Distribution in Cairo, Main System Management Data Collection and Telemetry Unit.

## B. A National Strategy for Irrigation Improvement Projects

### Background

The Irrigation Improvement Project (IIP) component of the USAID funded Irrigation Management Systems (IMS) Project has implemented irrigation system improvements with a goal to increase irrigation efficiency and crop production in various parts of Egypt. Improvements implemented during the project life (1988-1996) included: 1) main delivery system improvements serving about 125,000 feddans, 2) establishment of continuous flow capability in watercourses serving about 100,000 feddans, 3) improvements to 1100 mesqas serving about 67,000 feddans, 4) establishment of more than 1100 Water User Associations (WUAs), and 5) establishment of the Irrigation Advisory Service (IAS) within the Ministry.

The IIP project has been shown to improve the equity of water distribution within mesqa command areas and branch canal command areas serving improved mesqas. Farmers previously short of water receive a more firm supply. Losses to non-beneficial evapotranspiration are reduced. As a result, agricultural productivity in IIP areas has likely increased, although data collection and analysis are required to verify this supposition. Integrated irrigation delivery and on-farm water management improvement projects can also reduce diversions, thereby improving water quality and making water available for reallocation.

The impacts of the IIP program have not been fully identified for several reasons, including delays in implementation and lack of adequate baseline data collection for comprehensive pre- and post-implementation review. In addition, even though physical facilities for implementing continuous flow (as opposed to rotational deliveries) in branch and other distributary canals have been constructed, it is apparently not fully operational in IIP command areas, because not all mesqas in these areas have been improved. Improvements in branch and distributary canals, which allow downstream flow control/regulation, are important components. These improvements enhance the overall control of water within the system and are essential to operation of the improved mesqas.

Other issues regarding IIP include: 1) methods for prioritizing and selecting areas for improvement, 2) public vs. private sector involvement in construction/rehabilitation, 3) whether mesqa renovation should be included or left completely to farmers, 4) the appropriate level of water user association development and involvement, and, 5) financial issues such as cost recovery and the overall cost of the package.

A national strategy for irrigation improvements should integrate physical (structural), managerial, operational and institutional components to address improvements in both the irrigation delivery subsystem and on-farm water management subsystem. There is a perception among many Ministry officials that IIP focuses too narrowly at the mesqa (or farm) level. On-farm water management improvement activities under IIP apparently received little or no attention, and consequently considerable benefits of IIP may not have been achieved (IIP Final Report, 1996). On-farm water management improvement programs including technical assistance for physical on-farm irrigation system improvements and irrigation decision making education and support may be desirable to realize the full potential of IIP improvements.

A national strategy regarding IIP should identify criteria for evaluating and ranking areas where improvements are needed most. Additionally, laws and regulations, which may constrain irrigation improvement implementation or any component thereof, such as the formation, function and operation of water user associations, should be reviewed and revised as needed.

## **Objectives**

The goal of this activity is to help the Ministry develop a national strategy regarding Irrigation Improvement Projects.

## **Tasks**

- 1.2.2.1 Assess and evaluate the performance of IIP activities.
- 1.2.2.2 Help the Ministry establish a national strategy regarding Irrigation Improvement Projects.
- 1.2.2.5 Organize a workshop to discuss proposed irrigation improvement strategies.

The objective will be achieved by conducting an assessment of the IIP program and developing information on IIP performance. Methods will include field visits to IIP sites, reviews of previous studies of IIP (reports, feasibility studies, interim progress reports, interim evaluation reports/assessments of progress, socio-economic impact evaluations, etc.) and interviews with IIP staff, IAS staff, water user association leaders and other farmers.

Interviews with IIP/IAS officials will be conducted to discuss issues such as: major IIP implementation problems, private sector involvement, sustainability of IIP as an institution within the Ministry, sustainability and needs of the IAS, and documented IIP costs and benefits.

The key stakeholders in IIP, farmers and water user associations, will be interviewed to determine their perceptions of the IIP program, its strengths and weaknesses, expectations, major issues regarding cost sharing, maintenance and operation problems, perceived benefits of IIP, and recommendations for improvement of the program.

Irrigation district engineers in IIP areas will be interviewed to determine problems and constraints of implementing continuous flow in IIP command areas, and the potential impacts of IIP on water supply and demand.

Criteria for identifying priority areas for IIP implementation will be developed through discussions with appropriate Ministry officials and staff involved with IIP.

## **Deliverables**

- A draft IIP performance assessment report.
- A draft national strategy for irrigation improvement projects based on the performance assessment of the current IIP including: 1) criteria for identifying, evaluating and ranking priority areas for implementation, and 2) evaluation of institutional and legal requirements to support the strategy.

- Revised written report on draft national strategy incorporating workshop findings, conclusions, and recommendations. Final strategy report submitted by 30 June 1998.

### **Needs from the Ministry of Public Works and Water Resources**

- Information and data describing the USAID-funded Irrigation Improvement Project (IIP) pilot areas and the World Bank IIP implementation areas.
- Information and data describing pre-project irrigation water delivery and management problems, crop production levels, crop budgets, and farmers' perceptions of needs for improvements.
- Information and data describing post-project technical and economic impacts of IIP at the farm level.
- Perceptions of Irrigation Department staff (inspectorate and district irrigation engineers) on problems and opportunities related to implementing continuous flow.
- Input into a national strategy for irrigation improvement projects.

### **Partners in the Agricultural Policy Reform Project**

Water Policy Advisory Unit, GreenCom/Water Communication Unit, Monitoring Verification and Evaluation Unit

### **Partners in the Ministry of Public Works and Water Resources**

Irrigation Improvements Project Directorate, including the Central Directorate in Cairo and each IIP Field Directorate; the Irrigation Advisory Service in Cairo and in the field; NWRC Water Distribution and Irrigation Management Research Institute.

The Planning Sector, the Irrigation Sector, the Central Directorate for Water Distribution in Cairo, and the outlying irrigation operations field staff (irrigation directorates, inspectorates and districts).

## **Activity 1.3 Water Supply Augmentation**

### **A. Deep Groundwater**

#### **Background**

Deep groundwater is being used in Egypt, but the information required to develop a comprehensive national strategy for using the resource optimally, over time, has not been collected. In particular, better information regarding the location and extent of deep aquifers in Sinai and some portions of the Western Desert, and the estimated pumping and transportation costs, are required to evaluate opportunities for using deep groundwater in agriculture and other sectors. Economic analysis of crop production alternatives, and a review of potential legal issues that may arise and institutional reforms that may be required to promote optimal groundwater use are also required.

#### **Objectives**

The goal of this activity is to help the Ministry develop a strategy over time for achieving the optimal use of deep groundwater reserves.

#### **Tasks**

- 1.3.1.1 Review previous hydrogeologic investigations of deep groundwater aquifers in Sinai and the Western Desert.
- 1.3.1.2 Help the Ministry design a plan for developing better information describing hydrogeologic characteristics of deep aquifers, to support economic analysis of groundwater policy alternatives.
- 1.3.1.3 Help the Ministry analyze existing hydrogeologic data to estimate regional hydrogeologic characteristics and evaluate potential use of deep groundwater.
- 1.3.1.4 Summarize the current state of knowledge regarding deep groundwater aquifers in Sinai and the Western Desert.
- 1.3.1.5 Analyze economic issues regarding the optimal use of deep groundwater in agriculture and other uses, over time.

Previous investigations of deep groundwater reserves in the Western Desert and Sinai will be reviewed to develop a better understanding of the potential role of deep groundwater in Egypt's aggregate water supply. This review will also identify areas where hydrogeologic information is inadequate for assessing groundwater resources. We will assist the Ministry in designing a plan to improve the information available for describing deep groundwater aquifers and evaluating economic implications of alternative groundwater policies.

Economic issues regarding groundwater use will be examined after the physical assessment of groundwater aquifers is completed. Important issues include the cost of pumping and transporting the groundwater to its point of use, the economic values generated through irrigation or other uses, and the cost of an alternative water supply, such as surface water from the Nile River or de-salted seawater. To the extent possible the economic analysis will address pertinent issues such as the social costs and benefits of alternative groundwater development strategies.

## **Deliverables**

- A report describing regional hydrogeologic characteristics and a draft national strategy regarding the use of deep groundwater. The report will review previous deep groundwater investigations, summarize current knowledge regarding deep groundwater, and provide economic analysis of deep groundwater exploitation and utilization.
- A report detailing findings and recommendations from a combined workshop for deep and shallow groundwater development.

## **Needs from the Ministry of Public Works and Water Resources**

- Previous hydrogeologic investigations and reports describing deep aquifers in the Western Desert and Sinai.
- Data describing the existing production, test, and observation wells in the Western Desert and Sinai, including time-dependent data regarding extraction, potentiometric levels, and water quality.
- Reports of previous model studies of deep aquifers in the Western Desert and Sinai.
- Estimates of present and future use of deep groundwater in the Western Desert and Sinai.
- Current control practices for deep groundwater development and management in the Western Desert and Sinai.
- Implementation of field studies including monitoring of existing wells and conducting geophysical surveys and test drillings which will be recommended for areas with inadequate hydrogeologic information.

## **Partners in the Agricultural Policy Reform Project**

WPAU, RDI, MVE

## **Partners in the Ministry of Public Works and Water Resources**

Irrigation Sector, New Valley Irrigation Directorate, Research Institute of Groundwater, Water Resources Research Institute.

## **Collaborators in the Ministry of Agriculture and Land Reclamation**

General Authority for Rehabilitation Projects and Agricultural Development (GARPAD), Desert Research Center, and the Soil and Water Research Institute.

## **B. Shallow Groundwater**

### **Background**

The Nile Valley and Delta aquifers are continuously recharged by water from the Nile River, which infiltrates from the irrigation system and from irrigated lands. Therefore, the thick aquifers in the Nile Valley and Delta are actually large storage reservoirs, rather than new sources of water. The estimated total amount of fresh water stored in the aquifers is 500 billion m<sup>3</sup>. This groundwater reservoir can be used to supplement the annual supply of surface water from the Nile River.

Previous studies have identified areas where shallow groundwater is available for augmenting surface water supplies for irrigation. Those studies suggest using shallow groundwater primarily in areas where surface water shortages occur during peak water demands in and around the Nile Valley and Delta. Such a strategy will improve agricultural productivity directly by making more water available for irrigation, and indirectly by reducing the use of drainage water in areas where surface water supplies are inadequate. Shallow groundwater pumping can also alleviate subsurface drainage problems in areas where the water table is close to the root zone.

### **Objective**

The goal of this activity is to help the Ministry develop a strategy for achieving the optimal use of shallow groundwater in the Nile Valley and Delta, over time.

### **Tasks**

- 1.3.2.2 Review previous studies of shallow groundwater in the Nile Valley and Delta.
- 1.3.2.3 Help the Ministry select up to six locations where the use of shallow groundwater can be demonstrated and evaluated.
- 1.3.2.4 Help the Ministry describe and evaluate the use of shallow groundwater at the selected locations.
- 1.3.2.5 Analyze economic issues regarding the optimal use of shallow groundwater in agriculture and other uses, over time.
- 1.3.2.6 Help the Ministry develop a strategy for achieving the optimal use of shallow groundwater in the Nile Valley and Delta.
- 1.3.2.9 Conduct a workshop to discuss national strategies regarding the optimal use of deep and shallow groundwater resources.

Previous studies of shallow groundwater in the Nile Valley and Delta describe physical characteristics of the resource, but do not include a complete economic analysis of alternative strategies for using this resource optimally, over time. An appropriate economic analysis requires accurate estimates of the location and size of shallow groundwater aquifers and estimates of pumping costs and recharge rates. Results of the literature review, the monitoring activities, and the economic analysis will be used to develop a national strategy for optimizing the use of shallow groundwater in the Nile Valley and Delta. Legal issues that may arise and institutional reforms that may be required to promote optimal use of shallow groundwater will also be considered.

**Deliverables**

- A draft national strategy regarding the use of shallow groundwater. The report will review relevant studies, describe groundwater utilization practices in the selected locations, provide economic analysis and evaluation of conjunctive use of canal water and groundwater for different sectors, and present opportunities and constraints for future development of shallow groundwater.
- Findings and recommendations from the combined workshop on deep and shallow groundwater development.

**Needs from the Ministry of Public Works and Water Resources**

- Previous hydrogeologic investigations and reports describing shallow groundwater in the Delta and Nile Valley.
- Estimates of present extraction rates and potential future use of shallow groundwater.
- Current practices for shallow groundwater development and management.
- Description of areas where conjunctive use of shallow groundwater is practiced.

**Partners in the Agricultural Policy Reform Project**

WPAU, MVE

**Partners in the Ministry of Public Works and Water Resources**

Irrigation Sector, Central Department for Groundwater. Research Institute of Groundwater, Research Institute of Water Management, Irrigation Improvement Projects Directorate, Irrigation Department.

## **Activity 1.4 Agricultural Drainage Water Reuse**

### **Background**

Drainage water reuse for irrigation has been practiced extensively in the Nile Delta for many years. Organized drainage water reuse reaches an estimated 4 billion cubic meters each year, and an equally significant amount of drainage water may be reused by farmers, though there are no official records of their reuse. As agricultural irrigation demand continues to increase in Egypt, pressures are building for increased reuse of drainage water to supplement fresh water supplies. A national policy regarding drainage water reuse will provide guidance to farmers and Ministry staff regarding an appropriate strategy for using this resource.

Wastewater from municipal and industrial sources is often discharged to the Nile River, irrigation canals and drains, or is shunted to the Mediterranean Sea, with or without treatment to remove pollutants. As a result, municipal and industrial wastewater degrades the quality of agricultural drainage water, reducing its value for reuse in irrigation and other uses. Efforts to reduce the volume and improve the quality of municipal and industrial wastewater will enhance opportunities for reusing agricultural drainage water.

### **Objectives**

There are many technical and policy issues regarding drainage water reuse and the treatment of municipal and industrial wastewater. This activity will provide technical support to the Ministry in the development of a national policy on drainage water reuse by addressing issues of maximum reuse potential, environmental effects, and municipal and industrial wastewater impacts.

### **Tasks**

- 1.4.1 Review previous studies of residual flows from the Nile irrigation system to estimate an agriculturally sustainable and ecologically sound minimum drainage water outflow to the Mediterranean Sea.
- 1.4.2 Review previous studies on the potential of aquaculture (fisheries) as an agricultural enterprise for utilizing drainage water.
- 1.4.3 Review previous studies and existing information on M&I wastewater to evaluate its impact on agricultural drainage water quality in the Delta.
- 1.4.4 Review environmental issues associated with the reuse of drainage water.
- 1.4.5 Identify technical means, criteria, and necessary regulations for promoting drainage water reuse.
- 1.4.6 Help the Ministry develop new policies to promote drainage water reuse.
- 1.4.10 Organize a workshop to discuss proposed drainage water reuse policies.

The primary purpose of draining farmland in arid regions is to remove salts that accumulate in the root zone so that soil salinity can be maintained at levels that support crop production. The recycling of drainage water can augment fresh water supplies used in irrigation. However, this eventually results in higher salinity concentrations in drainage water, and at some point reuse of this water becomes infeasible. The maximum achievable drainage water reuse in the Nile irrigation system (or the minimum drainage water outflow to the sea)

presents an interesting and strategic question in the development of national drainage water policies.

Extensive drainage water reuse may constitute a threat to soil conditions and have negative impacts on agricultural crop production. In addition, the health of farmers directly exposed to poor quality drain waters may be affected. Treatment and/or separation of M&I wastewater will improve the quality of drainage water, reduce health impacts on farmers, and reduce the amount of drainage water consumed in transport and disposal of pollutants. The maintenance of drain water quality at an acceptable level will enhance opportunities for more drainage water reuse in the Delta.

Currently, centralized drainage water pump stations play a major role in drainage water reuse. Under current operating criteria, however, these pump stations have reached limiting capacities for more reuse development. More effective drainage water reuse in the Delta may be achieved by pumping water from second-level and third-level drains. This activity, also called *intermediate reuse*, can be used to augment local water supplies. The technical, economic, and operational feasibility of intermediate drainage water reuse will be examined.

The potential effects of improvements in irrigation practices and the possible formation of farmer associations to maintain agricultural drains will modify the volume of drainage water available for reuse in the future. These issues need to be addressed when developing a national policy regarding drainage water reuse.

### **Deliverables**

- A draft national policy for drainage water reuse. The report will summarize opportunities and constraints for increasing drainage water reuse in the Delta, including strategies to address environmental effects of drainage water reuse.
- Findings and conclusions from the workshop to be conducted under this activity.

### **Needs from the Ministry of Public Works and Water Resources**

- Information regarding the potential environmental effects of drainage water reuse, the construction of treatment plants for municipal and industrial wastewater, fishery development in the northern lakes, and existing criteria and regulations regarding drainage water reuse.

### **Partners in the Agricultural Policy Reform Project**

WPAU, MVE

### **Partners in the Ministry of Public Works and Water Resources**

National Drainage Authority (NDA), Drainage Research Institute (DRI)

### **Collaborators**

## **Activity 1.5 Agricultural Water Supply and Demand Scenarios**

### **Background**

The construction of the High Aswan Dam has brought in a full utilisation of Egypt's 55.5 bcm share of the Nile water and resulted in a dramatic increase of irrigation intensity and area. With the population growth and economic development, this trend will continue place even greater demands on the fixed Nile supply in the coming decades. Egypt will have to depart from a casual stand to a more structured water conservation policy stand on both supply and demand, or simply, do more with less.

The project activities under Agricultural water demands (Activity 1.1), Water allocation under reduced supply scenarios (Activity 1.2a), Deep groundwater augmentation (Activity 1.3a) and Conjunctive use of shallow groundwater (Activity 1.3b), and Agricultural drainage water reuse (Activity 1.4), will be integrated under this activity for combined and comprehensive engineering, economic and social feasibility evaluation and the prioritisation of implementing steps.

Agricultural water use will be the focus under this activity. Agricultural irrigation currently uses the largest portion of the annual Nile supply, a condition likely to remain for the foreseeable future. Efforts to improve the estimation and prediction of agricultural water supply and demand will enhance the values generated in agriculture and enable the Ministry to estimate more accurately the supplies available for other water use sectors.

With the projected agricultural water demands and identified supply conservation and augmentation, national water allocation scenarios will be developed and assessed under this activity so that the gaps between demand and supply can be effectively closed and the agricultural production can be best maintained and raised. This activity will be the vehicle to summarise Result Package #1: Improved Irrigation Policy Assessment and Planning Process, and deliver the overall national water resources development policy for Egypt.

A twenty-year projection towards the year 2017 will be the time span for this scenario.

### **Objectives**

The goal of this activity is to develop national water allocation policy recommendations for addressing long-term agricultural water supply and demand issues.

### **Tasks**

- 1.5.2 Review the current methods and processes for estimating agricultural water demand and supply in MPWWR and MALR and identify the opportunities and constraints for improvements based upon the analysis of Activity 1.1 and Activity 1.2a.
- 1.5.3 Develop agricultural water demand management scenarios based upon the analysis of Activity 1.1. Anticipated demand management scenarios include rice reduction and

substituting crop mix in selected areas, less-water-intense crop varieties, price-responding water demand, and etc..

- 1.5.4 Develop supply conservation options based upon the analysis of Activities 1.2a, 1.2b, and 1.4. Probable areas may include, among others, land expansion strategies, drainage water reuse, and regular and predictable efficient canal delivery system, deep groundwater use, and conjunctive shallow groundwater use. More broadly, the possible use of non-conventional resources such as M&I wastewater, brackish groundwater, and desalinized seawater will also be explored. Options will be evaluated regarding each individual option's feasibility and their interactive effect on total supply. Attention will also be given to each option's spatial specifics. For example, the Ministry may allocate adequate water to assigned regions or areas to ensure grain production, as a new policy different from the currently even-sharing allocation strategies.
- 1.5.5 Establish a Nile water accounting system in spreadsheet format, and use the accounting system to perform all scenario exercises. The spreadsheet accounting system will be based upon the Nile water balance work achieved in the recent past years by the Planning Sector and Irrigation Sector and the Strategic Research Program.
- 1.5.6 Conduct economic analysis of all the demand and supply scenarios and pertinent issues based upon the results from Activities 1.1, 1.2a, 1.2b, 1.3, and 1.4, and layout a comprehensive economic policy body for addressing applicable economic incentives or regulations.
- 1.5.7 Prioritize the agricultural water demand management options, and the supply conservation and augmentation options in an action plan.

### **Deliverables**

- A report on the long-term agricultural water demand and supply issues, particularly with the Toshka Project development perspectives.

### **Needs from the Ministry of Public Works and Water Resources**

- Information regarding the methods and processes currently used by MPWWR and MALR in estimating agricultural water demand and supply and the attempted demand management and supply conservation and augmentation options.

### **Partners in the Agricultural Policy Reform Project**

WPAU, RDI, MVE

### **Partners in the Ministry of Public Works and Water Resources**

## **Result 2 Improved Irrigation System Management**

### ***Activity 2.1 Policy Testing and Evaluation***

#### **Background**

Major policy developments and enhancements regarding water management, water conservation and water supply augmentation resulting from activities conducted under Result 1 are to be implemented and evaluated in up to three field level policy areas. Similarly, enhanced private sector participation in system operation and management at the local level resulting from activities conducted under Result 3 are to be implemented and evaluated.

Water conservation and water management policy will be the major focus in this activity. This will include, but not be limited to recommended enhancements to the IIP program to improve performance and enhance 1) effectiveness of a water allotment program, 2) private sector involvement in irrigation improvement, and 3) system management through distributed operational authority and accountability.

Result 1 activities are expected to generate policy recommendations for drainage water re-use, deep groundwater use, and conjunctive use of shallow groundwater. However, these water resources should be the focus for local water supply augmentation, where feasible, and should not constrain any implementation activities or selection of policy test areas. Similarly, Result 3 activities are expected to generate policy recommendations to enhance local private sector participatory management of the irrigation system. Thorough feasibility analyses of such private sector development must be conducted prior to implementation.

#### **Objectives**

The goal of this activity is to help the Ministry implement and evaluate policy developments and policy enhancements that contribute to improved irrigation system management.

#### **Tasks**

- 2.1.1 Establish criteria for the selection of policy test areas.
- 2.1.2 Help the Ministry select suitable locations for testing new policies.
- 2.1.3 Help the Ministry develop appropriate policy implementation packages for each policy test area selected.
- 2.1.4 Help the Ministry develop appropriate monitoring and evaluation plans for the policy enhancements to be tested in the policy test areas.
- 2.1.5 Develop scenarios of policy impacts on efficiency and productivity of the irrigation system.

Major criteria for selection of policy test areas should include, but not be limited to the following: 1) areas having improved infrastructure in place and not requiring major investments to develop infrastructure; 2) areas should have considerable baseline data and other information already developed; 3) areas having ministerial institutional support along with in place and commitment to fully participate in policy test activities. This must include

the IIP, the IAS, and the district irrigation engineer. Other criteria will be developed in consultation with Ministry officials.

Written descriptions of the selected areas, including physical characteristics, irrigation and other water resource related problems, etc. al., will be developed.

Plans will be developed to assist the Ministry with implementation as policy alternatives are identified for testing and evaluation. Monitoring and evaluation plans will be developed to assist the Ministry regarding estimation of the impacts of policy on Nile system efficiency and productivity.

### **Deliverables**

- A report on policy testing implementation and evaluation in the policy test areas. The report will present selection criteria for policy test areas, monitoring and evaluation approaches, and comparison of scenarios.

### **Needs from the Ministry of Public Works and Water Resources**

- Input regarding criteria for identifying and selecting policy test areas.
- Input regarding selection, implementation, and evaluation of policy alternatives in the policy test areas.
- Commitment of resources (professional staff, labor, infrastructure) to develop, implement, monitor, and evaluate policy alternatives in the policy test areas.

### **Partners in the Agricultural Policy Reform Project**

WPAU, GreenCom, RDI, MVE

### **Partners in the Ministry of Public Works and Water Resources**

Irrigation Sector, Water Distribution Directorate, Irrigation Improvement Projects Directorate, and the Irrigation Advisory Service.

## **Activity 2.2 Cost Sharing - Phase I**

### **Background**

The MPWWR is responsible for operating and maintaining Egypt's water delivery system, including all of the main canals and facilities that carry water from Lake Nasser to secondary canals, mesqas, and municipal and industrial water users throughout Egypt. At present, the Ministry does not charge water users for delivery service. As a result, the Government of Egypt currently subsidizes all of the operation, maintenance, and replacement of system facilities. GOE has expressed a desire to develop and implement an effective cost-sharing program with water users.

Several studies have been conducted in recent years detailing appropriate allocations of system costs among various categories of water users. For example, ISPAN and IIMI produced reports that describe the annual costs of operation and maintenance, with recommendations for implementing a cost allocation and recovery program. However, such a program has not yet been implemented.

### **Objectives**

The goal of this activity is to assist the MPWWR to develop a plan for implementing a program for cost sharing between the GOE and water users.

### **Tasks**

- 2.2.2 Review previous studies for consistency and accuracy, with particular attention to physical constraints and ability to pay and/or other socio-economic constraints. Identify possible mechanisms for cost sharing.
- 2.2.3 Select potential areas for pilot implementation of cost sharing.
- 2.2.4 Conduct public awareness campaigns for the pilot areas, the surveys, and on the general issue of cost sharing.
- 2.2.5 Conduct a survey of farmers' attitudes toward water delivery and cost sharing.
- 2.2.6 Evaluate, using both the results of the field survey and other sources, politically and socially acceptable options for cost sharing mechanisms for different water users, including individual farmers, WUA's, Federations, Water Boards, and Municipal and Industrial entities.
- 2.2.10 Assist GOE in holding workshop
- 2.2.12 Assist GOE develop work plan for implementation on pilot areas

Previous cost sharing studies to recover the annual costs of operation and maintenance will be reviewed. Cost estimates will be updated, as appropriate, to reflect current conditions and any changes in system operations that may have occurred since the original reports were prepared. Previous recommendations for implementing a cost-sharing program will also be reviewed. Estimates of ability to pay and willingness to pay for water delivery services will be reviewed and updated, as appropriate.

Policy testing areas will be identified. These areas should be a geographical cross-section of agricultural areas, including IIP and non-IIP farms, so that alternative cost sharing mechanisms can be tested with various levels of water control.

A public awareness campaign will be designed which will introduce the concept of cost sharing to farmers, and a specific campaign describing the policy testing will be developed for the areas selected for testing.

A survey of farmers' attitudes will be undertaken for all of the policy testing areas. Willingness and ability to pay, general acceptability, and other issues regarding the specific mechanisms will be examined.

Responses to the survey will be tabulated and analyzed, and conclusions drawn with regard to acceptable levels and mechanisms of cost sharing. As appropriate, the survey results will be used to develop a work plan and a policy action plan for Phase II of this activity.

### **Deliverables**

- A report specifying the selection of policy testing areas, and the rationalization of those choices will be prepared for GOE consideration.
- A survey will be conducted to examine the farmers' attitudes toward cost sharing, and their ability to pay and willingness to pay for irrigation services.
- A report will be prepared which presents the analyses of the survey responses, as well as an evaluation of those responses based on alternative sources of information and data. An evaluation of various cost sharing mechanisms will be included, and alternatives recommended for testing in the policy testing areas.
- A report detailing the public awareness campaign for the policy testing areas will be prepared.
- A detailed work plan and a policy action plan will be developed for implementation of cost sharing on the policy testing areas.

### **Needs from the Ministry of Public Works and Water Resources**

- information and data describing any current charges for water delivery service.
- input from Ministry officials regarding their perspectives on a cost-sharing program.
- input from the Ministry regarding collaboration required from other ministries and agencies to implement a cost-sharing program in a manner that provides revenue for system operation and maintenance.
- input from the Ministry regarding policy testing area identification.
- review of the farmer survey instrument.

### **Partners in APRP**

WPAU, GreenCom, RDI

### **Partners in the Ministry of Public Works and Water Resources**

Irrigation Department (in particular the Cost Recovery Fund), Irrigation sector, NWRC, National Water Policy Unit (NWPU), Administration and Finance Sector

### **Partners in the Ministry of Agriculture**

Agriculture Extension Sector, Agricultural Extension and Rural Sociology Institute

### **Partners in the Private Sector**

Water User Association Directors

### **Result 3 Policy Change in Private Sector Participation**

#### **Activity 3.1 User Participation in Decision Making in non-IIP Areas (Phase II)**

##### **Background**

The increasing reliance among governments and donors on farmer organizations for sustainable rural development illustrates the confidence that has emerged in these local institutions' capability to self-govern. In the case of irrigation, the proliferation of water user groups in one form or another indicates recognition on the part of most governments and communities that supporting user control over water resources yields long-term benefits. The establishment of nearly 1000 water user associations under the Irrigation Improvement Program (IIP) for the purpose of providing physical improvement to canals has been demonstrated to be an effective and reliable modality of operation in Egypt. These IIP WUAs provide a private sector platform for managing and financing the operation and maintenance of water delivery facilities, e.g. mesqas and pump stations. The Ministry of Public Works and Water Resources requires that farmers in IIP areas form water user associations, to facilitate payment of system improvement expenditures and to operate and maintain the improved mesqas and single-point pumping stations. Several studies have reviewed the experience gained in forming and managing water user associations in IIP areas.

Farmers engaged in agricultural production regard regularity and quality of water as one of the most crucial elements in the process along with quality of soil and, secondarily, availability of inputs, technical knowledge and expertise, and effective post-production measures. The process required to achieve a community organization with a holistic view of agricultural production functions is one, which will build slowly and purposefully over time. Functions and responsibilities can be enhanced as the users' organization matures. In due course the organization would be given the opportunity to develop from a "water focussed user group" to an "agricultural development group". In addition, water user associations can serve an important role in the implementation of a national program of water allotments or cost recovery.

Under the present situation few water user associations have been formed outside the IIP area; therefore little information exists regarding the favorable and constraining factors of establishing water user associations in non-IIP areas within Egypt. Farmers inured by generations of government control and management may find the prospect of a transfer to farmer organization management daunting, unless there are clear and discernible economic benefits. Therefore farmers' economic motivation and interest for forming water user associations in non-IIP areas will be studied and analyzed, following which a decision will be taken whether to introduce WUAs in non-IIP areas.

##### **Objectives**

The goal of this activity is to examine the feasibility of establishing water user associations in non-IIP areas, and to form federations of water user associations and district water boards in IIP areas. Results will assist the Ministry in developing a national policy that allows the formation of water user associations in non-IIP areas and federations of water user associations and district water boards in IIP areas.

## Tasks

- 3.1.1. Assess modality options for establishing WUAs in non-IIP Communities
  - 3.1.1.1.1 Assess replicability of IIP modality
  - 3.1.1.1.4 Review regulatory, legal and institutional constraints & opportunities
  - 3.1.1.1.5 Develop appropriate institutional structure for expanded water user programme.
  - 3.1.1.1.6 Assist in holding MPWWR workshops
- 3.1.1.2 Assist in policy formulation and process documentation of Phase II of WUAs in non-IIP areas.
- 3.1.1.2.3 Conduct policy review and prepare regulatory protocol for MPWWR
- 3.1.1.2.5 Prepare Participation Planning Manual for WUAs and district staff in non-IIP communities.

A review of the literature describing the formation and performance of water user associations in Egypt and other countries will be conducted. The goal of this effort is to review the social and economic incentives motivating formation and to review the social and economic issues affecting performance of water user associations, over time.

Farmers and representatives of water user associations will be interviewed to gain further information on the social and economic issues affecting formation and performance of water user associations. The experience of farmers and water user associations in IIP areas will be helpful in evaluating the potential for establishing similar associations in non-IIP areas. Farmers in non-IIP areas will be interviewed to determine their perspectives on the possible formation of water user associations in those areas. Topics of discussion will include the current status of farm-level cooperation in water delivery activities along a mesqa or branch canal, current desires and willingness to pay for improvements in mesqas or branch canals, and farm-level perspectives regarding the potential usefulness and feasibility of water user associations.

## Deliverables

- A set of policy recommendations regarding WUAs in non-IIP communities.
- Process Documentation reports of policy test trials (case studies) of WUAs in non-IIP communities.
- Participation Planning Manual for WUAs and District Staff in non-IIP communities.

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### **Needs from the Ministry of Public Works and Water Resources**

- Information and data illustrating the history and performance of WUAs in IIP areas.
- Input from MPWWR staff members at central and district levels regarding feasibility and utility of establishing WUAs in non-IIP areas.
- Assistance in organizing fieldwork, focus groups, and conducting interviews with farmers and representatives of WUAs.

### **Activity 3.2 Operational Privatization Above Mesqa Level**

#### **Background**

The objective of privatization in decision making can be extended from mesqa level operations to branch canals or secondary canals by forming federations of water user associations. The activities of federations might include the operation and maintenance of higher order canals and participation in discussions with the Ministry of Public Works and Water Resources regarding water allocation and system operations cost sharing.

#### **Objectives**

The goal of this activity is to assist the GOE develop an effective plan for organizing and supporting users' involvement in water management, system O & M and forward planning above the mesqa level.

**Water User Branch Federations.** Following the formation of a number of WUAs on a particular branch, the collective shareholder membership may feel the necessity to work together on activities that require operations on a scale larger than the mesqa level under some circumstances. The federation can be a creation of the WUAs and remain accountable to the WUAs. It will assume responsibilities assigned to it by the collective voice of the WUAs, especially in areas where individual WUAs may carry little influence, e.g. dialogue with MPWWR on water delivery. In other cases, e.g. non-IIP areas, branch level organizations may be formed as an initial step in farmer organization. During the first year, the project will carefully document both processes and report on performance efficacy relative to the stated objectives. Although the responsibilities and activities of the federation would be left to the discretion of the shareholders, there are typically five general types of federation function:

**Secondary Planning Functions:** the federation will be responsible for the second stage of planning from below (i.e. the collation, co-ordination and consolidation of WUA plans) and the preparation of its own plans based on the input received from the WUAs.

**Intermediary Channel Functions:** When WUAs have developed internal needs identification and plans, the federation will act as a stronger link between WUAs, credit agencies, input suppliers and co-operatives, as well as other NGOs (e.g. women's groups).

**Negotiating Functions:** On behalf of the WUAs the federation will be in a position to negotiate with outside bodies and authorities on matters of common concern to all.

**Economy-of-Scale Functions:** The WUAs may require the federation to arrange bulk purchases of agricultural inputs, animals, machinery and organize marketing, transport, supply, storage, processing and similar functions in which non-collective action for single groups is uneconomical and inefficient.

**Formalized Linking Functions:** The federation will be able to help the government agricultural extension agency, the IAS, and WUAs to organize training, demonstrations, and other educational activities in a manner that better utilizes the services and maximizes the efficiencies of the extension providers.

Any work of the federations can be carried out through subcommittees so that responsibilities are distributed and more people have an opportunity to develop competence and confidence.

Further extension of user involvement can be accomplished by forming district water boards at the district level, to develop strong bonds of communication and partnership between water users and government. Membership of the boards would include representatives from federations of water user associations and representatives of non-agricultural water users. The district water boards would assist the MPWWR in developing water allocation or water allotment programs, reviewing operation and maintenance plans, and resolving problems that arise during the course of operating the water delivery system.

The present project presents an opportunity for determining need and demand for functional grassroots organizations at levels above the mesqa.

## Tasks

- 3.2.1 Assist MPWWR in establishing an interdisciplinary Task Force on Privatization
  - 3.2.1.2 Develop Task Force protocol and conduct orientation process for member Designees
  - 3.2.1.3 Conduct Task Force study tour and follow-up activities
  - 3.2.1.4 Conduct regular (e.g. monthly) Task Force meetings
- 3.2.2 Assessment of feasibility of establishing water user federations in IIP and non-IIP communities.
- 3.2.3 Assessment of feasibility of forming district water user boards in IIP and non-IIP communities.
- 3.2.4 Process documentation will be conducted on policy test scale trials of federations and district water boards in IIP and non-IIP areas.
- 3.2.4.8 Implementation of a comprehensive training plan for district staff, and federation/district water board membership.

An interdisciplinary Task Force on Privatization above the mesqa level will be established under the MPWWR. Task Force members will participate in a series of activities designed to provide exposure to various international experiments with water user federations, and grounding in techniques and methods of institutionalization. Farmers and representatives will also be helpful in describing the potential usefulness and feasibility of forming federations of water user associations and water district boards in IIP and non-IIP areas.

Farmers in IIP and non-IIP communities and district staff will participate in workshops to determine interest in and functional priorities of federations and district water boards in those areas.

The first phase of the activity will be conducted for water user federations in at least 2 or more areas, to be designated by the interdisciplinary Task Force. The evolutionary process of formation and maturation will be documented in detail.

### **Deliverables**

- Establishment of an interdisciplinary Task Force on privatization above the mesqa level; to include a comprehensive orientation program and study tour for Task Force members.
- Process Documentation reports of policy test trials (case studies) of federations in IIP and non-IIP communities.

### **Needs from the Ministry of Public Works and Water Resources**

- Records and data indicating the process of formation and performance of WUAs in IIP communities.
- Input from MPWWR staff regarding their perspectives on feasibility and practicality of establishing WUAs in IIP and non-IIP areas.
- Assistance in organizing fieldwork and conducting interviews with central- and district-level staff, farmers, and representatives of WUAs and federations.

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### **Activity 3.3 Strengthening District Water Management Capability**

#### **Background**

Essential to an effective program for increasing user involvement in the process of water management is enhancing responsibilities and capacities of district level government staff. To foster this process the project proposes to assist the MPWWR institute a hierarchical schema and functional network of water boards, federations along with expansion of WUAs to non-IIP communities.

Activities to strengthen district level water management capabilities in line with increased responsibilities will commence during the last quarter of 1998. These devolving institutional development and strengthening activities focus primarily on training, but include also consolidation of national and district-level working groups, and staging of review workshops.

As indicated in 3.1 and 3.2 water user involvement at mesqa and above-mesqa levels will increase significantly. To maximize the advantages of this increased participation, ways channels and methods will be developed provide greater co-operative interaction with district staff of the Ministry. Organisation of water user branch federations and establishment of district water boards consisting of elected representatives of the federations and representatives of other water use sectors are proposed. These water user apex organizations will work along side district irrigation engineers to plan and manage water delivery operations for equitable and efficient water distribution. To make this participation effective and efficient, the Ministry will need to consider devolution of operational authority and accountability for managing water (i.e. allocating and distributing water) to staff posted at the district level.

By instituting this process, staff will gain useful knowledge (temporally and spatially) of water demands, and of practical problems with water delivery. Users will have an equal role in planning water supply and demand, and will be better informed about system operational constraints. Better communications between water users and the Ministry's Irrigation Sector, and the eventual development of a more collaborative partnership between staff and users, will result in long-term enhance overall irrigation system performance.

Efficient and effective water management requires knowledge of the volumes of water to be managed, i.e., water measurement. Additionally water measurement data (water levels, associated canal volumes) must be available in a real time sense for day to day operations and decision-making.

Greater user participation in water management decision making and greater responsibility of district engineers in day to day management will require a policy change and concomitant regulatory change by MPWWR. These would be reflected in allocation and management of resources (e.g. trained manpower, vehicles, field equipment, computers, etc.).

## Objectives

The goal of this activity is to recommend policy changes to improve the present procedures and facilities used by the Ministry in Nile system planning, management, operation, and maintenance, such that local participatory management of the system at the irrigation district level will be efficient and effective. This will include a determination of the best ways to enhance district level performance, and is expected to focus on: 1) appropriate role of district water boards in contributing to policy decisions regarding water allocation and delivery, and the operation and maintenance of the water delivery system, and 2) the necessary ministerial institutional changes and infrastructure needs to allow an efficient and effective devolution of system planning, operation and management responsibility and accountability to the directorate/district levels.

## Tasks

- 3.3.1 Assess and evaluate the current district capacities, functions and infrastructure.
- 3.3.2 Establish recommended policy criteria for enhancing district level performance for better management, operation and maintenance via devolution of responsibilities and authority to the district level.
- 3.3.3 Assess district staff training needs; prepare and conduct training programme for district teams. Assist MPWWR organize and conduct a national workshop to discuss study findings and recommendations for better Nile system planning, management, operation and maintenance at the national, directorate and district levels.
- 3.3.8 Assist MPWWR hold district level workshops for staff and users.

The institutional structure within MPWWR's irrigation sector, including the lines of communication, roles and responsibilities of the various directorates (distribution, maintenance, planning, etc.) and of the various levels, from the central directorates to the irrigation district level, will be examined. Irrigation district level decision-making and greater water user involvement is constrained by the overall system management and its multi-purpose nature. These constraints and the associated operational guidelines and rules need to be well defined and continually reviewed as irrigation system management improvements take effect. Current levels of utilization of the main system management telemetry system and data will be assessed. A needs assessment of structural improvements, calibrations, equipment, and trained personnel for enhanced water measurement throughout the system will be conducted.

## Deliverables

- Assessment and evaluation of the present planning, management, operation and maintenance procedures of the Nile system, and policy recommendations for better system management via greater water user participation in these activities at the irrigation district level.
- Training plan and programme for district staff.
- Findings and conclusions from the workshops to be conducted under this activity.

## Needs from the Ministry of Public Works and Water Resources

- Information, reports, and data describing current procedures for allocating and delivering water, the current status of Main System Management Telemetry construction and use, and the potential for improving main system water allocation and delivery by enhancing the involvement of district engineers, district water boards, and federations of water user associations.
- Daily collaboration with Irrigation Sector staff at all levels, to assess planning, operation, and management constraints and opportunities.

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**ANNEX D  
STAFFING LEVEL OF EFFORT**

Position	Name	Person/Month			
		Total		1998	
		Expatriate	Egyptian	Expatriate	Egyptian
Team Leader	J. Fredericks	48		11	
Co-Team Leader	A. Khattab		48		12
Senior Irrigation Eng.	Total	60	114	16.3	4.8
	T. Ley			12	
	E. Barakat			1.8	1.8
	J. Keller			2.5	
	TBA				3
Water Resources Management Specialist	Total	27	42	12	15
	Z. Zhu			12	
	I. Ellassuioty				12
	M. Allam				3
Sociologist	Total	36	48	12	
	R. Cardinalli			9	
	M. Lowdermilk			3	
Water Resources Economist	Total	10	12	13.5	10
	J. Keith			11	
	E. Mahdy				10
	R. Young			2.5	
Resource Economist	M. Rock	0	0	2.5	
Financial Analyst	TBD	5	6	3	3
Environmental Engineer	TBD	10	30		
Desalination Specialist	TBD	2	3		
Drainage Engineer	Total	3	6		12
	A. Ragab				11
	TBD				1
Institutional Specialist	TBD	5	12		
Agronomist	TBD	6	4		
Hydrogeologist	Total	6	21		13
	S. Nour				12
	TBD				1
Groundwater Management Specialist	TBD	12	21	4	6
Workshop facilitator	TBD	6		1	
Administrator	T. Burola	48		12	
Computer Specialist	TBD				6
Admin Staff	Total	0	480	0	112
	Admin K. Razik				12
	Secty F. Fouad				12
	Clerk A. Serry				12
	Clerk J. Rizak				12
	Clerk TBD				6
	Messenger K. Mokhtar				12
	Messenger A. Mahmoud				12
	Driver TBD				6
	Driver S. Maebed				11
	Driver A. Moustafa				11
	Driver TBD				6
	Total	284	847	87.3	193.8

## Annex E: Reports

Listed below are a list technical, policy development and progress reports to be produced during 1998 under this work plan.

No	Report	Due Date
	Estimating agricultural water demands.	
	Policy recommendations for improving water management (including rice and sugarcane issues).	
	Assessment of the Irrigation Improvement Project and a draft national strategy regarding IIP.	
	Regional deep aquifer hydrogeologic characteristics and a draft national strategies for utilization of deep groundwater.	
	Shallow groundwater potential and utilization strategies.	
	A draft national policy for drainage water reuse.	
	Agricultural water supply and demand scenarios.	
	Policy test implementation and estimated impacts on efficiency and productivity of the irrigation system.	
	Scenarios and recommendations for implementing water delivery service cost sharing.	
	Feasibility and policies regarding WUA formation in non-IIP areas, and WUA federations and water boards in IIP areas.	
	Assessment of present planning, management, operation, and maintenance procedures of the Nile system, and recommendations for better system management through decentralization at the irrigation district level.	
	Annual Technical Progress Report	Jan 1998
	Annual Work Plan	Jan 1998
	Quarterly Report: Jan-Mar 1998	Apr 1998
	Quarterly Report: Apr-Jun 1998	Jul 1998
	Quarterly Report: Jul-Sep 1998	Oct 1998

## Annex F: Workshops

Listed below are workshops proposed to be conducted as part of this work plan during 1998.

No	Proposed 1998 EPIQ WRRP Workshops
1	To discuss policy recommendations on improved water management for rice and sugarcane agriculture production issues.
2	To discuss the proposed national strategy regarding Irrigation Improvement Projects.
3	To discuss proposed national strategies regarding utilization of deep and shallow groundwater.
4	To discuss the draft national policy for drainage water reuse.
	To discuss water delivery service cost sharing scenarios.
	A round table meeting for senior officials of concerned ministries and other sectors to discuss results of the water delivery service cost sharing workshop.
	To discuss policy recommendations regarding water user associations in non-IIP areas, and federations of water user associations and district water boards in IIP areas.
	To discuss recommendations for better Nile system planning, management, operation and maintenance at the national, directorate and district levels.