Ministry of Public Works and Water Resources
US Agency for International Development
Agricultural Policy Reform Program
Environmental Policy and Institutional Strengthening Indefinite Quantity Contract

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

APRP WATER POLICY

TRANCHE III BENCHMARK WORK PLAN

Report No. 12

November 1998

Water Policy Program

International Resources Group Winrock International
Nile Consultants

APRP Water Policy
Tranche III Benchmark Work Plan

TABLE OF CONTENTS

ANNEXES

APRP Water Policy
Tranche III Benchmark Work Plan

Purpose

This report presents the Tranche III benchmark work plan for the APRP-Water Policy Program being implemented under the USAID/Egypt Agricultural Policy Division in support of the Ministry of Water Resources and Public Works (MPWWR). The work plan covers the period from July 1998 to June 1999.

Background

The Agricultural Policy Reform Program (APRP) is a four-year grant program (1996-2000) with a budget of US$ 245 million for cash transfers to participating GOE entities. The program is designed to achieve policy reform in five areas:

- Prices, markets and trade
- Private investment and privatization
- Agricultural land and water resource utilization and investment
- Agricultural sector support services
- Food security and poverty alleviation.

Annual cash disbursements are made to the GOE based on the completion of policy reform benchmarks, as established and agreed to through annual memoranda of understanding (MOU) signed by GOE and USAID/Egypt. The MOU for Tranche III was signed on 27 September 1998. The Tranche III memorandum includes 29 policy benchmarks to be completed by 30 June 1999.

To assist participating GOE ministries with policy reform measures, APRP manages nine technical assistance units having offices within MPWWR and MALR. There are five TA units working directly with MPWWR in support of water related activities. All of the APRP units participated in the preparation of the Tranche III benchmarks.

Land and Water Resource Benchmarks

There are eight benchmarks involving policy reform in the area of agricultural land and water resource investment. The MPWWR has sole responsibility for six of these benchmarks. The remaining two benchmarks (rice and sugar cane) are joint benchmarks with the Ministry of Agriculture and Land Reclamation (MALR). The Tranche III water policy benchmarks were approved by the MPWWR steering committee and HE Minister MPWWR. The benchmarks deal with the following topics:

- C.1: Main System Management Program Utilization
- C.2: Free Flowing Groundwater Management
- C.3: Branch Canal Water User Organizations
- C.4: Irrigation Advisory and Support Service
- C.5: Sugarcane Water Use Policies (MPWWR/MALR)

- C.6: Rice Water Use Policies (MPWWR/MALR)
- C.7: Intermediate Drain Water Reuse
- C.8: Water Quality Regulation--Law 48

Work Plans

The work plans for the Tranche III benchmarks were prepared with direct assistance from the following APRP TA units: Water Policy Advisory Unit (WPAU), EPIQ Water Policy Team (EPIQ), Greencom and MPWWR Water Communications Unit (WCU), Main System Management (MSM), Program Management Unit (PMU), Monitoring, Verification and Evaluation Unit (MVE), and the Reform Design and Implementation Unit (RDI). The draft Tranche III water policy benchmark work plans were presented to USAID AG Policy Team and the MPWWR Steering Committee at a workshop held in Sharm El-Sheik on 16-17 October 1998. The comments and suggestions provided at this workshop have been incorporated into the final work plans.

Report Organization

This report contains four annexes.

Annex A: Tranche III Water Policy Benchmark Work Plan Summary Matrix identifies the TA task leader for each benchmark activity and other associated resource requirements.

Annex B: Tranche III Water Policy Benchmark Summary (Statements and Indicators) provides a statement of the benchmark and the associated indicators.

Annex C: Tranche III Water Policy Benchmark Work Plan presents the individual work plans for each of the eight benchmarks to be accomplished by MPWWR. The work plans for each benchmark include a background statement; benchmark objectives; a description of tasks; a timeline for carrying out the benchmark activity; deliverables required to satisfy the benchmark indicators; and the resources, level of effort and non-TA funds, required to accomplish the benchmark.

Annex D: Tranche III MOU with Appendix is an extract of the Tranche III Memorandum of Understanding between USAID and GOE signed on 27 September 1998. The Annex includes all of the relevant information from the MOU on the eight agricultural land and water resource investment benchmarks being carried out by MPWWR.

Annex A: APRP Water Policy Tranche III Benchmark Work Plan Summary Matrix

Benchmarks	Task Leader(s)	Supporting Team Members	MPWWR Partners	Potential Short Term TA Needs		APRP Partners	Non-TA Cost Estimate
				Local	Expatriate		
C.1: Main System Management Program Utilization	S. Abou Zeid (MSM)	A. Tczap (MSM)	Irrigation Dept.	Irrigation Specialist	Irrig. Opn Spec.	WPAU MVE	LE 601,000
C.2: Free Flowing Groundwater Management	T. Ley (EPIQ)	S. Nour , A. Khattab (EPIQ) S. Fahmy,T. Nada (WPAU)	Irrigation Sector RIGW IAS WCU	GW Specialist Sociologist Field Msmt Team (1)	GW Mgmt. Spec.	Greencom MVE	Water Monitoring: LE 30,300
C.3: Branch Canal Water User Organizations	R. Cardinalli (EPIQ)	J. Keith, I. Elassiouti (EPIQ) N. Ezzat, Eng. Moemen, Eng. Amira (WPAU)	IIS/IAS Action Team	Irrig Partic. Spec. Field Agents (6)	Cost Sharing Spec.	Greencom RDI MVE	$205,800
C.4: Irrigation Advisory and Support Service	R. Cardinalli (EPIQ)		IAS IIS WCU	Irrig Partic. Spec. Institutional Spec.		Greencom MVE	$ 130,000
C.5: Sugarcane Water Use Policies	J. Keith (EPIQ)	S. Mahdy, T. Ley (EPIQ) N. Ezzat, Eng. T. Nada (WPAU)	Central Dir. for Water Dist./Irrig. Dept. WCU	Irrig Mngt Spec. Field MeasTeams (2-3)		Sugar Cane Work Group MVE Greencom	Water Monitoring: LE 56,300/canal On-Farm Impr. (MALR, SCC, etc).: LE 3.8 million Canal Maintenance: (MPWWR) Aswan Gov't:-TBD
C.6: Rice Water Use Policies	J. Keith (EPIQ)	S. Mahdy, T. Ley (EPIQ) S. Fahmy, M. El Margoshy (WPAU)	Central Dir. For Water Dist./Irrig. Dept. WCU	Irrig Mngt Spec. Field Meas. Teams (5-6 districts)		Rice Work Group MVE Greencom	Water Monitoring: LE 57,750/district Rice seed to be provided by MALR
C.7: Intermediate Drain Water Reuse	Z. Zhu (EPIQ)	R. Abdel Azim, A. Khattab, I. Elassiouti, S. Mahdy (EPIQ) S. Fahmy, T. Nada, M. Hamed (WPAU)	Salhia &Sharkia Directorates Abou Hammad District, Tanta Water Dist. Directorate, DRI	Irrig Mngt Spec. Field Meas.Teams (2) Environ. Spec. Sociologist		Greencom MVE	Water Monitoring: LE 36,000
C.8: Water Quality Regulation--Law 48	N. Ezzat (WPAU)	Elassiouti, Z. Zhu (EPIQ) Amira (WPAU)	Irrigation Dept.	Environ Spec Legal Spec.	Environ. Spec.	MVE	

ANNEX B:

APRP TRANCHE III WATER POLICY BENCHMARKS

SUMMARY

C.1: Main System Management Program Utilization (MSM)

Policy Benchmark

GOE (MPWWR) will implement policies and procedures to shift from distributing Nile River water based on water levels to distributing water based on water volumes using the Main System Management Telemetry System at Main Canal intakes, barrages on the River Nile and division points between Directorates for enhanced irrigation operations and decision making.

Verification Indicator(s):

C.1.1 Calibrate regulators located on the River Nile, at intakes to main canals and at points dividing Directorates where telemetry exists (53 regulators) and enter the calibration relationships into the telemetry system software to achieve volumetric flow measurements at these locations.

C.1.2 MPWWR approve a policy that water management will be based on volumetric flow and that telemetry data will be used for water management decisions at points where telemetry stations exist.

C.2: Free-Flowing Groundwater Management (EPIQ)

Policy Benchmark

The GOE (MPWWR) will adopt policies and procedures for reducing water loss and land degradation due to improper operation and management of free-flowing groundwater in the reclaimed areas of the Western Desert.

Verification Indicator(s)

C.2.1 MPWWR will approve a policy package for free flowing groundwater in reclaimed areas.

C.2.2 Initiate the formation of a groundwater user association in a selected reclaimed area in the Western Desert.

C.3: Branch Canal Water User Organizations (EPIQ)

Policy Benchmark

GOE (MPWWR) will decree a policy and initiate an action program for formation of water user organizations at the distributary and branch canal levels.

Verification Indicators

C.3.1 A ministerial decree allowing the formation of water user organizations above the mesqa level.

C.3.2 Process Documentation reports that organizations were formed on two branch canals (one in an IIP and one in a non-IIP community).

C.3.3 A cost sharing plan prepared for two branch canals in consultation with the stakeholders.

C.4: Irrigation Advisory and Support Service (EPIQ)

Policy Benchmark

GOE (MPWWR) will institutionalize an Irrigation Advisory and Support Service in the MPWWR.

Verification Indicator(s)

C.4.1 Ministerial decree establishing the Irrigation Advisory and Support Services Central Directorate under the MPWWR.

C.4.2 Submittal of necessary documents to the Central Authority for Organization and Management to establish an Irrigation Advisory and Support Services Central Directorate under the MPWWR.

C.5: Sugarcane Water Use Policies (EPIQ)

Policy Benchmark

GOE (MPWWR and MALR jointly) will designate two areas of private commercial sugarcane growers and promote improved sugarcane water management efficiency in Upper Egypt.

Verification Indicator(s)

C.5.1 Improved irrigation technologies installed, including laser leveling and gated pipe delivery systems; water application monitoring program established; and training provided to farmers in the use of improved irrigation methods in two pilot sugar cane areas in Upper Egypt.

C.6: Rice Water Use Policies (EPIQ)

Policy Benchmark

GOE (MPWWR and MALR jointly) will adopt policies for the substitution of short duration rice varieties for long duration rice varieties among private commercial growers and for changing water scheduling to achieve optimal use of water for rice production.
Verification Indicator(s)

C.6.1 Approval by the two Ministers (MPWWR and MALR) of a national policy package, including a timetable for adoption, provision of seeds, farmer training, and changes in water scheduling, for the substitution of short duration rice varieties for long duration rice varieties.

C.7: Intermediate Drainage Water Reuse (EPIQ)

Policy Benchmark

GOE (MPWWR) will establish an intermediate drainage water reuse program for the Bahr Bagar Drain as a model for other areas.
Verification Indicator(s)

C.7.1 Establishment of an intermediate drainage reuse program for Bahr Bagar Drain in at least one representative district to include preparation of an operations plan and tender documents for the pumps.

C.8: Water Quality Regulation (WPAU)

Policy Benchmark

GOE (MPWWR) will revise Law 48 of 1982 governing water quality management to more effectively control discharge of wastes and wastewater into the Nile and its waterways.

Verification Indicator(s)

C.8.1 A draft revision of Law 48 of 1982 and its by-laws to be presented to the Minister.

ANNEX C:

TRANCHE III WATER POLICY BENCHMARK WORKPLANS

TABLE OF CONTENTS

C.1: MAIN SYSTEM MANAGEMENT PROGRAM UTILIZATION

GOE (MPWWR) will implement policies and procedures to shift from distributing Nile River water based on water levels to distributing water based on volumes using the Main System Management Telemetry System at Main Canal Intakes, barrages on the River Nile and division points between Directorates for enhanced irrigation operations and decision making.

Background

The Nile River Irrigation System (NRIS) has historically been operated based on a predetermined annual water allocation plan. Daily monitoring and decision making has been, and is presently, based on one manual reading per day of water level. At times, this reliance on manual staff gage readings has led to inappropriate decision making. In addition, managing water distribution based on water levels rather than volumes results in inaccuracies under certain circumstances. Thus, historical water management in Egypt has been reactive instead of proactive and in some instances was carried out based on inaccurate data.

The USAID funded MSM Telemetry System was implemented in order to provide decision makers with accurate, real-time data required to improve efficiency of water distribution. This $51 million dollar system consists of a remote data collection network which allows water managers to have real-time data from 800 locations on the Nile River, Main Canals, Secondary Canals and Drains. It provides decision makers with accurate data on a timely basis; both of which are the cornerstones of efficient water management. The system is operational at present and provides water mangers with a potentially powerful tool to achieve improved and efficient management of agricultural water. However, the increased efficiency in water management achieved to date has been less than expected. Two main factors contributing to this situation are as follows:

1. The MSM Telemetry System measures water levels directly but is capable of computing flow rate and/or volume if the regulator in question has been calibrated to accurately define the level versus flow relationship. Few such accurate relationships exist at present and therefore the telemetry system output consists almost exclusively of water levels.
2. Operation of the NRIS continues to be based on water levels at present. Revised policies and procedures that require NRIS operation to be based on water volume are needed. Implementation of the new policies and procedures will require water mangers to fully utilize the potential of the telemetry system.

The specific activities required to achieve the stated benchmark are as follows:

- Calibrate all regulators equipped with telemetry (estimated to be 53) located on the Nile River, at intakes to main canals, and at regulators located at points dividing Directorates.

- Enter calibrations into the telemetry data bases and activate existing software modules that calculate and display volume data.

- Adopt a policy that the NRIS will be managed on the basis of flow volumes and not on the basis of water levels.

- Adopt a policy that telemetry, and not manually obtained data, will be the primary basis for water management at these critical points.

- Prepare an action plan for calibrating remaining telemetry sites.

- Adopt revised water management procedures based on fully utilizing the capabilities of the telemetry system. Such procedures will result in a dynamic, pro-active method of managing water to meet actual needs.

All of these activities, except for the last one are considered to be are achievable within the Tranche III timeframe at the designated locations.

Implementation of this policy change is expected to result in the following benefits:

1. Improved distribution of water which will minimize supply shortages at canal tailends and generally result in delivery of more accurate quantities of water at times when it is actually needed.

2. Increased agricultural production due to satisfying actual crop water requirements in a timely manner.

3. Identification of where and when illegal withdrawals of water take place. With this knowledge, appropriate steps can be taken to stop such withdrawals.

4. Monitoring volume of flow into and out of discrete service areas will result in actual figures of consumptive use and identify areas of above, or below average water use, i.e. areas of chronic inefficiency.

5. Long term monitoring of volumetric water usage along with agricultural productivity data will allow management to make rational decisions and plans regarding water duties and management techniques.

6. The above mentioned benefits will demonstrate the importance of the MSM Telemetry System to MPWWR thereby significantly enhancing the prospects for sustainability of the telemetry system.

Objectives

The primary objective of this activity is for MPWWR to adopt a policy that water management within the Nile River Irrigation System will be based on volumetric flow and to begin implementation of this policy at a minimum of 53 sites which are equipped with telemetry equipment.

Additional objectives are: prepare and adopt a plan to achieve full implementation of the policy; commence preparation of revised water management procedures to achieve a dynamic, proactive method of managing water to meet actual requirements; and issue a directive that where telemetry equipment exists, the telemetry data will be the primary basis for water management.

Tasks and Timeline

It is estimated that the overall timeline for this activity will encompass 15 August 1998 - 30 June 1999.

Envisioned tasks are listed below with a timeline for each and an estimate of the number of work days required to complete each task. Some of the tasks listed below will be executed by other than MSM project staff as indicated below with MSM staff providing monitoring and oversight only. In these cases, the estimated work days are shown for the MSM staff effort only.

1. Develop workplan. (15 days: 15 August - 1 November 1998).

2. Conduct coordination meeting with representatives of Irrigation Department, Central Directorate for Water Distribution and Water Policy Advisory Unit to discuss levels of cooperation and to refine work plan. (NLT 1 November 1998).

3. Obtain funding commitment from MPWWR. Required by 15 November 1998 or BM completion will be in jeopardy.

4. Perform a minimum of twenty flow measurements at 53 locations under various flow regimes and provide data to MSM Central Office. This task to be performed by MPWWR Directorate staff with no MSM input. (1 August 1998 - 1 April 1999).

5. Continue flow measurement at all 53 locations with minimum frequency of twice per month during the April through September timeframe as a post-BM verification/refinement of Task 4. (1 April - 30 September 1999).

6. Review results of flow measurements and develop head versus flow relationships for the 53 locations. (85 days: 1 September 1998 - 15 April 1999).

7. Continue this task for the flow measurements obtained during the 1 April - 30 September 1999 timeframe as a post-BM verification/refinement activity (50 days: 15 April - 15 October 1999)

8. Enter head versus flow relationships into VDCS telemetry computers operating software system. (30 days: 15 April - 15 May 1999).

9. Enter head versus flow relationships for locations where the relationship has changed significantly as a result of the post-BM verification/refinement activity (maximum LOE assuming all relationships require refinement; 30 days: 15 October - 15 November).

10. Prepare draft policy mandating that water management must be based on volumetric flow and that telemetry data will be the primary basis for water management activities at locations where telemetry equipment exists. Primary responsibility for this task will be with the WPAU with input/assistance from MSM as required. (15 days: 1-28 February 1999)

11. MPWWR review of draft policy and finalization. WPAU and MSM will be involved through meetings, discussions and revisions. (10 days: 1 March - 15 April 1999)

12. Formal issuance and distribution of Policy Statement. (15-30 April 1999).

13. Prepare position paper on how the present water management procedures can be modified to utilize real-time telemetry data to achieve increased efficiency in water distribution. This paper will include recommendations on modifications to daily water distribution procedures and on data archiving/publication for integration with agricultural census data for use in assessing performance of the NRIS and for global, strategic planning purposes. (90 days: 1 November 1998 - 1 March 1999 first draft; completion 15 April 1999).

14. Prepare workplan for continuation and expansion of flow measurement program for 1999 - 2000 (Tranche 4). (30 days: 1 April - 30 June 1999).

15. Prepare draft input to MVE monitoring plan demonstrating linkages between tasks and indicators (6 Days: 14-19 November 1998).

16. A number of coordination/review presentation meetings will be required during execution of this Bench Mark. Critical meetings are as follows:

    Flow Measurement Planning Meeting - October 1998

    Flow Measurement Follow-up Meetings - January 1999, March 1999

Policy Identification/Planning Meeting - December 1998

Policy Review Meeting - February 1999

Integrated Data Use Planning Meeting - November 1998

Telemetry-Based Water Management Meetings - December 1998, February & March 1999

Deliverables

1. Water level versus flow relationships for each of 53 locations within the Nile River Irrigation System entered into VDCS telemetry software for display of instantaneous and cumulative flow quantities. This deliverable will fulfill verification indicator number 1.

   MSM II responsible for this deliverable however fulfillment of this task is dependent of receipt of field measurement data from Directorate staff.

2. Policy statement, formally adopted, issued and distributed mandating that water management will be based on volumetric flow and that water distribution activities will be based on telemetry data at locations where telemetry equipment has been installed. This will fulfill verification indicator number 2.

   This deliverable is responsibility of WPAU with support of MSM II.

3. Report presenting suggestions on how present water distribution policies and procedures can be revised to utilize real time telemetry data to achieve improved efficiency. This deliverable is a study product in support of potential Tranche IV Benchmark and is not related to any verification indicator.

   MSM II will be responsible for this deliverable.

4. Written program for continued calibration of regulators during the 1999-2000 timeframe. Program will identify sites to be calibrated with timeline for calibration and integration of the new sites into the telemetry software. This deliverable is a study product in support of potential Tranche IV Benchmark and is not related to any verification indicator.

   This deliverable is responsibility of MSM II.

Cooperators

A. Needs from MPWWR:

- Flow measurement data for 53 preselected locations (minimum of twenty measurements at each locations) from Directorate staff.
- Detailed description of present water distribution practices from Central Directorate for Water Distribution and from several Directorates representative of Upper, Middle and Lower Egypt.
- Support of top management in drafting, reviewing and finalizing policy statement.

B. Partners in MPWWR:

- Irrigation Department
- Central Directorate for Water Distribution
- Directorate for Water Distribution, Upper Egypt
- Directorate for Water Distribution, Lower Egypt
- All Directorates

C. Partners in APRP:

- Water Policy Advisory Unit
- RDI
- EPIQ

Resource Needs

A. Level of Effort (LTTA)

1. MSM Project Director (150 Days)
2. MSM Team Leader (75 Days)
3. WPAU Team Support

B. Level of Effort (STTA)

1. Local Irrigation Specialist (45 Days).
2. Expatriate Irrigation Operations Specialist (45 Days).

C. Cost proposal/budget needs (non-LTTA)

Short term Manpower	
Local	LE 10,000
Expat	($ 15,000) LE 51,000
Flow Measurement Costs	LE 520,000
Miscellaneous	LE 20,000
TOTAL	**LE 601,000**

C.2: FREE-FLOWING GROUNDWATER MANAGEMENT

The GOE (MPWWR) will adopt policies and procedures for reducing water loss and land degradation due to improper operation and management of free-flowing groundwater in the reclaimed areas of the Western Desert

Background

The non-renewable groundwater of the Nubia Sandstone Aquifer is the only source of water in the Western Desert of Egypt, where agriculture and mining development activities are practiced. The Nubia Sandstone Aquifer System is considered one of the major aquifer systems in northeast Africa, having a huge storage capacity of about 200,000 bcm of fresh water. However, only a small fraction (about 2% or 4000 bcm) of this can be extracted in the Western Desert.

During the last four decades, important contributions to the understanding of the regional hydrogeologic conditions of the deep aquifer systems in the Western Desert were made, with a special emphasis on the Nubia Sandstone Aquifer and its groundwater potential. These studies were carried out by the Ministry of Agriculture and Land Reclamation, the Ministry of Development and New Communities, the Ministry of Petroleum, and the Ministry of Public Works and Water Resources. A comprehensive report on the hydrogeology of the deep aquifers in the Western Desert and the Sinai has been prepared by the EPIQ Water Policy Team.

The results from the studies indicate that the deep groundwater from the Nubia Sandstone Aquifer in the Western Desert can be extracted at a rate of 2.4 bcm per year over a period of 100 years. The previous studies focused primarily on the hydrogeologic characteristics of the deep Nubia Sandstone Aquifer, its groundwater potential, and proposed groundwater development plans for different use sectors; none of the studies sufficiently addressed the necessary policy and procedures required to properly utilize and manage the deep groundwater resources in the Western Desert development areas where conditions producing free-flowing wells prevail.

The development and utilization of groundwater resources in the Western Desert Oases started some centuries ago, but large-scale development was initiated in the early sixties. The current annual groundwater abstraction in the Western Desert is about 0.7 bcm, most of which is being utilized in irrigated agriculture, domestic and mining sectors. However, much of this aquifer is under artesian pressure. Deep wells in some reclaimed areas (200 m in Siwa and 800 to 1,000 m in El-Farafra and El-Dakhla) are free-flowing at relative high rates (5,000 to 30,000 m^3 per day) and high pressures (5 to 8 atmospheres at the well heads). Control of the flow from these wells is difficult, due to problems associated with sudden back pressure in the water-bearing formation if the well is subjected to rapid and frequent shut-down. The back pressure can result in a collapse of the formation around the well, and abandonment of the well. While these wells can be controlled on a longer term cycle (weekly or seasonally, for example), the continuous flow in the shorter term produces water in excess of demand during the irrigation period, unused flow during the night (the non-irrigation period), and

consequent water logging, drainage problems, and soil salinization. These environmental effects may seriously reduce agricultural productivity.

The aquifer is a classic common property, in which an individual well owner can derive no benefit from controlling flows from his or her well, since any water which he or she might save will simply be used (or wasted) by another. But because this aquifer is a non-renewable stock resource, the flows may be excessive relative to the optimal exhaustion (economic or physical) of the resources. Optimal management requires one of two approaches: individual control of the aquifer (or at least the local well-field) or group regulation (either a local or national organization).

In the areas of El-Dakhla, El-Farafra, and Siwa Oases, naturally flowing groundwater occurs. In these areas a total of 1,636 uncontrolled, continuously flowing wells produce at an annual rate of 0.675 bcm. Since water users practice irrigation only during the daylight hours, almost half of this water is wasted.

The artesian character of the aquifer suggests two phases of use: 1) the free-flowing, or naturally pressurized, stage, in which little or no cost is incurred, other than well investment and maintenance, to have access to the flows, and 2) the pumping stage, in which the artesian pressure is insufficient and external energy (pumping) must be applied to obtain the water. Proper policy and management would attempt to insure the optimal length of the first and second phases.

Further, the unused flows cause negative environmental effects such as water logging, drainage problems, and soil salinization, resulting in serious impacts on agricultural production in the Oases.

An improved policy framework to ensure appropriate management of the aquifer and its free-flowing wells needs to be developed. The Government of Egypt needs to adopt a policy package which will provide for reductions in the wasted water and land degradation. Components of the policy package will include:

- A public awareness campaign regarding both the problems inherent in the free flowing wells and the scarcity of ground water;
- Provision of economic incentives and aids, such as credit, cost sharing, etc., for structural improvements which can reduce water wastage;
- Enforcement of existing regulations regarding groundwater use; and
- Establishment of groundwater management organizations composed of public and private sector stakeholders, to operate and maintain the well-field and irrigation and drainage system.

Such a policy package will provide for the efficient use of the water resource, reduction of wasted water, reuse of drainage water and minimization of the environmental damage currently being suffered. A needed future activity in the Western Desert development areas is improvement of on-farm water management.

Implementation of this benchmark is expected to lead to the following:

- Better utilization, management and conservation of groundwater resources in the Western Desert development areas where free-flowing groundwater conditions prevail which, in turn, will lead to water savings, improved agriculture conditions in 75,000 feddan of old and newly reclaimed area, and more sustainable agriculture production.

- Saving 0.3 bcm of water per year.

- Mitigation of adverse environmental effects such as water logging, drainage problems, and soil salinization which have resulted in serious negative impacts on agricultural production in the Oases.

- Sustaining the economic life of the Nubia Sandstone Aquifer system.

- Transfer of responsibility of well drilling, operation, and maintenance and groundwater management from the MPWWR to local stakeholder management organizations with the continuing control and technical support from the Ministry.

- Development of a policy model that can be extended to other ground water areas.

Objective(s)

The primary objective of this activity is the development, approval, and adoption by the MPWWR of a policy package and procedures for better utilization, management and conservation of groundwater resources in the Western Desert development areas where free-flowing groundwater conditions prevail.

A primary goal in this development process is enhanced private sector participation in groundwater management in the Western Desert. A groundwater management association of stakeholders (users, GOE officials, etc.) will be formed in a selected reclaimed area in the Western Desert in support of this.

Tasks and Timeline

Expected activity timeline: 1 July 1998 – 30 June 1999. Envisioned tasks are listed below with an estimate of the number of workdays and the working period required for completing each task.

1. Develop a draft work plan. (5 days: 15 Aug – 31 Aug 1998).
2. Form a working task group of MPWWR officials, NWRC/RIGW researchers and EPIQ team members to conduct this benchmark work activity. Working group will then develop a detailed work plan based on task number 1. (5 days: 15 Sep 1998 – 31 Oct 1998).
3. Document criteria for selection of El Farafra area for development of model free-flowing groundwater management plan/policy package. Review and update information, data, inventory, etc. regarding free-flowing groundwater wells, cropping

patterns, irrigation and drainage networks and practices in the reclaimed areas of El Farafra Oasis (20 days: 1 Oct 1998 – 31 October 1998).

4. Plan and conduct a focus group workshop in El Farafra Oasis involving local officials, stakeholders and private water users (10 days: 1 Nov – 15 Dec 1998) to:
   - examine the issues and problems surrounding free flowing groundwater in the area;
   - discuss areas for specific detailed studies;
   - assess the extent and function of any existing informal management groups or activities;
   - develop interest and potential for formation of a groundwater management association (GWMA),
   - discuss potential functions and activities a GWMA could perform
5. Select a study area in El Farafra Oasis where groundwater management model policy will be developed. Develop and implement a water-monitoring program. Analyze the spatial and temporal distribution of free-flowing groundwater supplies and of irrigation and other uses in the selected study area (20 days: 1 Oct 1998–31 December 1998).
6. Develop and evaluate the feasibility of alternative strategies, including new well control technologies, night storage, etc., for managing free-flowing groundwater to reduce water wastage and negative environmental impacts. (30 days: 1 Oct 1998 – 31 January 1999).
7. Evaluate drainage practices and infrastructure in the selected area and the potential for, or enhancement of, drainage water reuse. (10 days: 1 Oct 1998 – 31 Dec 1998).
8. Assess existing regulations regarding groundwater use in the Oases and potential modifications that would enhance their enforcement. (10 days: 1 November 1998 – 31 December 1998).
9. Develop a public awareness campaign regarding both the problems inherent with the free-flowing wells and the scarcity of ground water. This will include a rapid appraisal by WCU/Greencom to determine current level of awareness of issues (10 days: 1 January 1999 – 28 February 1999).
10. Assess the potential of economic incentives and aids, such as credit, cost sharing, etc., for structural improvements (night storage, etc.) which can reduce water wastage. (10 days: 1 January 1999 – 28 February 1999).
11. Based on the results of task 4, work with identified focus group workshop participants to initiate the development of a groundwater management association in a specific command area in El Farafra Oasis and document the development process (45 days: 1 December 1998 – 30 April 1999).
    - Perform an assessment of potential membership of users and other stakeholders,
    - Plan and conduct initial general meeting of members,
    - Elect a board composed of both public and private sector stakeholders and users,
    - Outline functions of the association including operation and maintenance of the well-field and irrigation and drainage system,
    - Plan and conduct regular board meetings to work on issues and problems, and development of solutions,
    - Plan and conduct monthly general membership meetings to discuss issues, problems and solutions, management and maintenance,
12. Prepare a draft report describing the recommended policy package and procedures for management of free flowing groundwater in reclaimed areas of the Western Desert (20 days: 1 March 1999 – 30 April 1999).

13. Organize and participate in a workshop to discuss the recommended policy package and procedures for management of free flowing groundwater in reclaimed areas of the Western Desert (10 days: 1 May – 15 June 1999).
14. Prepare final report and submit to Minister of PWWR for approval and adoption (5 days: 15-30 June 1999).

Deliverables

The deliverables listed below directly support the verification indicators for the accomplishment of this benchmark.

1. A document describing the recommended policy package and procedures for management of free-flowing groundwater wells in reclaimed areas of the Western Desert.
2. Process documentation demonstrating initiation of the formation of a groundwater management association in a selected reclaimed area in the Western Desert.

Cooperators

A. Needs from MPWWR
   - Number of operating wells in El Farafra Oasis, irrigated area, irrigation and drainage network descriptions and maps, and irrigation and drainage practices in the reclaimed areas.
   - Maintenance of well heads in the selected study area in El Farafra Oasis (to eliminate water leakage) and preparation of main canal sections for discharge measurement. Measurement of present well discharges, area irrigated per well, drainage water flow, and a detailed map showing well locations, irrigation and drainage networks, and actual irrigated area.
   - Irrigation water requirements on a per feddan basis for crops grown in El Farafra Oasis.

B. Partners in MPWWR--Irrigation Sector, New Valley Irrigation Department, Research Institute for Groundwater, Irrigation Advisory Service, Water Communications Unit

C. Needs from MALR
   - Design parameters for land reclamation projects in the selected study area of El Farafra including: well time-dependent discharges and pressures, design discharge rates, irrigated area per well, planned crop patterns and irrigation practices, measures for groundwater night storage.
   - Present cultivated area per well in the selected study area, actual crop pattern, areas where unofficial irrigation is practiced using excess water from the free-flowing wells, drainage network and basins (location and size)

D. Partners in MALR--General Authority for Rehabilitation Projects and Agricultural Development (GARPAD), New Valley Agricultural Directorate

E. Partners in APRP--Greencom

Resource Needs

A. Level of Effort (LTTA)

1. EPIQ Task Leader—Senior Irrigation Engineer (4 pm)
2. EPIQ Team support
   - Senior Hydrogeologist (4 pm)
   - Senior Water Resources Engineer (2 pm)
3. WPAU Team support

- Senior Expert
- Junior Engineer

B. Level of Effort (STTA)

1. Expatriate GW Management Specialist (1.5 pm)
2. NVID Engineer to participate in Task Group activities including routine meetings and to supervise all field measurement activities (2 pm)
3. Sociologist (2 pm)

C. Cost proposal for monitoring and data collection activities in El Farafra Oasis. It is proposed a field measurement team composed of engineering staff of the New Valley Irrigation Directorate will carry out this work.

Short term manpower	LE 6740
Water Measurement Site Preparation	LE 10410
Travel and per diem	LE 10395
Contingency (10%)	LE 2755
Total	LE 30300

C-3: BRANCH CANAL WATER USER ASSOCIATIONS

The GOE will decree a policy and initiate an action program for formation of water user organizations at the distributary and branch canal levels.

Background

Egypt now has nearly a decade-long history of forming water user associations (WUAs) under the Irrigation Improvement Project (IIP). The objective of forming WUAs has been to privatize mesqa level irrigation under the operation of a nation-wide program of improved physical work combined with farmer organization and training. The WUAs have had a beneficial impact on improving farmer operation and maintenance, reducing water delivery inequities, and improving communication between farmers and MPWWR.

Farmer participation in irrigation management will be extended from mesqa level operations to branch canals by forming higher level organizations of water users.

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. The Branch Canal Water User Association (BCWUA) can be formed along two modalities. The first, is a creation of the previously formed WUAs; the BCWUA would remain accountable to these 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 the second scenario, i.e. unimproved areas, branch canal level organizations may be formed as an initial step in the farmer organization process. During the 1998-99 year, the project will carefully document both processes and report on performance effectiveness relative to the stated objectives. Although the responsibilities and activities of the BCWUA would be left to the discretion of the users, there are typically six general types of BCWUA function:

***Secondary Planning Functions*:** the BCWUA 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.

***Intermediate Channel Functions*:** When WUAs have developed internal needs identification and plans, the BCWUA will act as a stronger link between WUAs, credit agencies, input suppliers and co-operatives, etc.

Operation and Maintenance Functions: BCWUAs will share responsibility for O&M activities on the branch canals, as determined through negotiation and agreement with MPWWR.

Mesqa Organizing Functions: BCWUAs will assume mesqa-organizing and strengthening responsibilities in unimproved areas, as MPWWR and IAS will not have adequate manpower in future years.

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

***Economy-of-Scale Functions*:** The WUAs may require the BCWUA to arrange machinery, organize land-leveling, and other similar activities in which non-collective action for single groups is uneconomical and inefficient.

Formalized Linking Functions: The BCWUA will be able to help the MPWWR, MALR, the Irrigation Advisory Service, and WUAs to organize training, demonstrations, and other educational activities in a manner that better utilizes the serivces and maximizes the efficiencies of the extension providers.

Work of the BCWUAs shall be carried out through subcommittees so that responsibilities are distributed and more shareholders have an opportunity to develop competence and confidence. It is expected that strong bonds of communication and partnership between water users and government would be developed. BCWUAs would work with the MPWWR in developing water allocation or allotment programs, review operation and maintenance plans, develop stakeholder cost-sharing implementation plans, and resolve problems that arise during the course of operating the water delivery system.

The activities of these higher level organizations will include the operation and maintenance of branch canals and participation in negotiations and discussions with the Ministry of Public Works and Water Resources regarding water allocation system O & M cost and responsibility sharing.

Objectives

The goal of this benchmark will be that GOE formally promulgates a policy decree and implements an action program for organizing and supporting users' involvement in water management, system O & M and forward planning above the mesqa level in Egypt's irrigation system. It is expected that a Ministerial decree officially recognizing BCWUAs will be issued at the start of the implementation period. A MPWWR Action Team will be established to advise on matters related to participatory irrigation management.[1]

The project will carefully document the results of work in both improved and unimproved areas, and report on performance efficacy relative to the stated objectives. Documenting the evolutionary process of formation and maturation during this phase of implementation is another objective. Documentation will be carried out by the IAS field supervision teams.

The process will enable MPWWR and BCWUAs in unimproved areas to establish WUAs under the latter's operational umbrella. (Feasibility for this activity has been assessed as part of APRP Tranche II outputs.)

[1] This Benchmark is implemented by a Working Group, comprised of the EPIQ Sr. Sociologist, IAS General Director, WPAU Sr. Engineer, WPAU Jr. Engineer, and representatives from MALR and RDI.

An additional objective of this work plan is for each BCWUA to develop a cost sharing plan in consultation with stakeholders addressing issues such as O&M scheduling, allocation of responsibility for labor and equipment requirements in cost or in-kind, and public awareness. There are a number of models regarding water user cost-sharing, and one of the activities during this Tranche III period would be to help the project and the GOE understand what these various models are and how they might relate to the Egyptian context. (The proposed study tour for the Action Team will purposely explore examples of cost-sharing models and mechanisms in the western USA) It is premature at this stage to try to anticipate what model of cost-sharing may be most appropriate for Egypt. To help the stakeholders better understand the existing models for cost haring, EPIQ will engage the services of a short term international consultant. It is hoped that by the end of Tranche III implementation, the following will be in place: 1) results of cost sharing planning exercises Branch Canals selected for this Tranche III exercise; 2) an analysis of the various cost-sharing models and options understood by the stakeholders in Egypt; 3) decision to adapt an existing or design a new model suitable to the conditions and operating environment of Egypt. The results of this effort are expected to provide the foundation for a Tranche IV policy benchmark regarding cost-sharing.

A plan will be developed in preparation for a possible Tranche IV Benchmark for legalizing BCWUAs through parliamentary procedure.

Tasks and Timeline

The tasks to be included in this work activity are grouped according to physical output. Completion times are based on estimated LOE requirements by project team members.

1. Develop a Detailed Workplan (5 days; 1 Aug – 10 Aug)

2. Assist MPWWR in establishing a ministerial interdisciplinary Action Team on Water User Organizations (10 days; 1 Oct – 15 Oct)

3. EPIQ/WPRP Steering Committee recommends to H.E. Minister, MPWWR, for
    a) the formal recognition of Branch Canal Water User Associations (Oct. 17
    b) follow-up with a plan for legalizing BCWUAs by parliamentary act (Dec. 31)

4. Develop Action Team protocol and conduct orientation process for member Designees (10 days; 17 Sept – 1 Nov)

5. Conduct Action Team study tour to western USA and Mexico; follow-up activities in Egypt to focus on incorporating findings in work programs (25 days; 20 Jan – 15 Feb ’99)

6. Prepare manifest on incentives to water users to take over partial O & M responsibilities on branch canals (15 Nov – 30 Nov ’99)

7. Conduct regular (e.g. monthly) Action Team meetings (11 days)

8. Identify Branch Canals for BCWUAs; Survey of Branch Canals in Delta and upper Egypt (15 days; 1 Sept – 5 Oct)

9. Establishing BCWUAs on selected branch canals
   Staged phase-wise organizing of BCWUO shareholders (40 days; 15 Oct – 28 Feb '99)
   Drafting of BCWUA internal by-laws and procedures (10 days; 15 Dec – 31 Jan '99)
   Negotiation with MPWWR for O&M of branch canal (20 days; 15 Nov – 31 Jan '99)

10. Process documentation conducted on BCWU Associations IIP and non-IIP areas by supervision teams (200 work days; 1 Nov – 30 May '99)

11. Implementation of a comprehensive training plan for district staff, and BCWU Association membership.
   Training in Process Documentation (10 days; 5 Nov – 30 Nov)
   Training in Monitoring and Evaluation for IAS staff and BCWUA members using PRA techniques[2] (14 days; 15 Nov- 5 Dec)

12. Cost Sharing w/ BCWUA and MPWWR
   Analysis of international models in cost-sharing (60 days; 15 Feb – 15 Apr '99)
   Assess incentives and disincentives for BCWUA cost-sharing (15-25 Dec '98)
   Assess feasibility of partial rebate of land revenue water fees to BCWUAs for O&M; develop means for supplementing rebated fees with direct shareholder contributions (20 days; 1 Nov – Jan 31 '99)
   Negotiation between GOE and users organization on distribution of responsibilities and costs (20 days; 1 Feb – Apr 15 '99)
   Preparation of Cost Sharing Plan Draft (20 days; 1 Apr – 31 May '99)

13. Preparation of Draft Tranche III Report (20 days; 15 May – 15 June '99)

14. Organize and conduct Roundtable Workshop on Results and Final Report (20 June '99)

An interdisciplinary Action Team on Water User Associations above the mesqa level will be established under the MPWWR. Action Team 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 BCWUAs in IIP and non-IIP areas.

[2] PRA: participatory rural appraisal. Refers to a process of socio-technical assessment, relying on an integration of efforts between rural communities and field staff, for more accurate and efficient collection of monitoring and impact data, than is normally achieved through other methods, e.g. diagnostic analysis, which rely solely on field staff.

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

The first phase of the activity will be conducted on two to four Branch Canals to be designated by the interdisciplinary Action Team. The evolutionary process of formation and maturation will be documented in detail.

Deliverables

The second, third and fourth deliverables listed below directly support the verification indicators for the accomplishment of this benchmark.

- Establishment of an interdisciplinary Action Team on privatization above the mesqa level; to include a comprehensive orientation program and study tour for Action Team members.
- Ministerial decree formally recognizing BCWUAs
- Process Documentation reports of Branch Canal Water User Associations in IIP and non-IIP communities.
- MPWWR and Branch Canal Water User Association Cost Sharing Plans
- Tranche III Benchmark 4 Final Report

Cooperators

A. Needs from the MPWWR:
   - 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 Branch Canal associations.

B. Partners in the MPWWR:
   Water Policy Advisory Unit, Irrigation Improvement Sector, Irrigation Advisory Service, MPWWR Action Team, MPWWR Water Communications Unit

C. Partners in APRP:
   RDI (including one member of Working Group invited from RDI), GreenCom

Resource Needs

A. Level of Effort (LTTA):

1. EPIQ Team Task Leader – Senior Sociologist (143 works days)
2. EPIQ Team support

- Senior Water Resources Management Specialist (30 days)

3. WPAU Team support

- Senior Expert
- Junior Engineers (2)

B. Level of Effort (STTA):

1. Local PIM Specialist (initial 45 work days, with option to extend)
2. Expatriate O&M Cost Sharing Specialist (60 work days)

C. Budget requirements to successfully carry out this work plan would entail:

Additional technical and administrative staff support	$ 25,000
MPWWR Action Team study tour	$ 80,800
Training courses for IAS staff (in-country and external) and WUA and Branch Canal WUA members	$100,000
Total	$205,800

C.4: IRRIGATION ADVISORY AND SUPPORT SERVICE (IAS)

GOE (MPWWR) will institutionalize an Irrigation Advisory and Support Service in the MPWWR.

Background

Support to irrigation farmers, irrigation agency personnel, and decision-makers in the forms of educational programs; information development and dissemination; grass roots organization building (WUAs) and support; and technology demonstration, adaptation and transfer is an necessary component in the process to improve water management and sustain productivity.

In 1989, the Ministry of Public Works and Water Resources (MPWWR) established, by Ministerial decree, the Irrigation Advisory Service (IAS) as part of the Irrigation Improvement Project (IIP) component of the USAID-funded Irrigation Management Systems Project. The IAS purpose is to advise and assist private water users to establish, maintain, and manage their own sustainable water user associations (WUAs) for improving irrigation management. The IAS is also mandated to provide continuing water management technical assistance to WUAs and farmers in improved areas. IAS efforts to establish and support WUAs in their formative stages have been generally regarded as effective.

Several issues have been identified as major constraints on IAS performance and sustainability. Significant among these is that the IAS was formed and has existed as a component of a donor-sponsored project funding (i.e., the IAS is not a permanent organizational unit in the MPWWR).

Justification for establishing this unit is manifold and urgent. Project completion and loss of partial program funding has been disruptive to consistent IAS performance. Other foci to be considered are incomplete staffing, loss of trained staff, lack of training and career development opportunities, and inconsistent policy and support for developing and retaining highly skilled and motivated field staff. *A major consequence is that the IAS has not been able to adequately develop a comprehensive water management technical assistance program.* In order for the IAS to develop such service-orientated capabilities and become sustainable, the institution will need to be made independent from IIS identification, and over time strengthened in administrative, institutional management, and engineering technology, as well as water user organizing strategy and communications skills.

The MPWWR recently adopted the policy/strategy of developing and promoting WUAs outside of the IIP, and is actively pursuing increased stakeholder participation in irrigation operation, maintenance and management. The IAS must undoubtedly play a key role in these activities. In addition, the IAS will begin developing water user organizations at the branch canal level. These organizations will participate in branch canal management, operation and maintenance.

The new knowledge, attitudes and skills required for forming WUAs, and the provision of services and technologies to WUAs currently exists only in the IAS in Egypt. Agricultural

Extension (housed within the Ministry of Agriculture and Land Reclamation) provides extension education support to farmers regarding their crop production practices. Farmers need educational and technology transfer assistance in the areas of modern on-farm irrigation methods, on-farm water management, and soil-water-plant relationships. Currently, these services are not available. An institutionalized IAS together with Agricultural Extension may be uniquely positioned to jointly develop and provide this necessary technological support to farmers in the future.

Development and establishment goals of an MPWWR IAS Unit, among others, are:

- To maintain close operational linkages with the MPWWR Irrigation Improvement Sector in support of the Ministry's strategies for irrigation improvement;
- To develop new and close operational linkages with the MPWWR Irrigation Department in support of goals to strengthen irrigation district capabilities to deliver services to farmers;
- To develop new and close operational linkages with the Monitoring and Evaluation Unit to be established in the National Water Research Center;
- To review the exigencies can terms of Law 213 in light of IAS role in organizing users in New Lands---in terms of organizing strategy, institutional framework, functions, and linkages with Irrigation Department.
- To develop new and close operational linkages with the MPWWR Water Communications Unit in support of goals to strengthen irrigation district capabilities to disseminate information to farmers;
- To strengthen expertise and capacity to form WUAs and to develop capacity to develop and support branch canal water user organizations;
- To jointly develop with Agricultural Extension an on-farm water use and management technical assistance program, including introduction, demonstration and adaptation of modern irrigation methods;
- To strengthen and help coordinate research and extension linkages in the areas of irrigation water management and soil-water-plant relations with the National Water Research Center, Agricultural Extension, the National Agricultural Research Center, and pertinent Egyptian Universities. Cross-coordination and cooperation among each of the relevant units of each of the two Ministries is imperative so that scarce public resources are not wasted by duplicate and/or incomplete efforts.
- To develop and provide technical assistance support to private groundwater management and drainage associations and water user associations in the new lands.

This policy benchmark activity supports MPWWR objectives to strengthen the irrigation district, improve communications with farmers, encourage farmer participation in water management, modernize irrigation in Egypt and water conservation:

Irrigation advisory and support services are fundamental to the successful implementation of irrigation improvement programs; water user participation in irrigation system operation, management and maintenance; and adoption of modern irrigation techniques and practices at the farm level. The current and envisioned functions and purposes do not currently exist anywhere within the GOE. Private sector irrigation advisory and support services are limited in Egypt. Typically, larger commercial farms producing specialty crops will retain qualified consultants or employ their own technicians in this capacity. The vast majority of Egyptian farmers do not

have the resources to retain their own consultants. In this regard, an MPWWR Irrigation Advisory and Support Service Unit is the logical organization for building this capacity.

Objectives

The primary objective of this activity is to institutionalize the IAS as a permanent organizational unit in the MPWWR. To accomplish this objective requires: 1) the identification and development of the appropriate administrative structure and support needs, and, 2) institutional strengthening activities.

Administrative structure development will include recommendations regarding the organizational structure of IAS, the relationship of the IAS unit to other MPWWR units, a staffing plan, staff background and educational requirements, job descriptions, recruitment and promotion, staff training needs, staff career development opportunities, appropriate support mechanisms for developing and retaining highly skilled and motivated field staff, etc. An operational budget plan will be developed. Required documentation regarding the IAS unit will be prepared for submittal to the GOE Central Authority for Organization and Management.

It is envisioned the current IAS (housed within the IIP Sector) will move laterally into a new *IAS Unit*. This will include professional and support staff, office equipment, vehicles, etc. The new unit will, however, need to be strengthened with additional staff (professional and support staff), equipment, etc. to create the critical mass (personnel and equipment) necessary to move unit forward. Previous training needs assessments will be updated. A time phased plan for staff and unit development will be prepared and initiated.

Tasks and Timeline

Expected activity timeline: 15 Aug 1998 – 30 Apr 1999. Envisioned tasks are listed below with an estimate of the number of work days required to complete each task and the working period.

1. Develop a detailed work plan. (5 days: 15 Aug – 31 Aug 1998).
2. Review the current MPWWR organizational structure; determine the appropriate and acceptable organizational unit for IAS (i.e., central directorate, sector, etc.); review GOE policies and methods for establishing a new unit within the MPWWR (10 days: 1 Oct 1998 – 31 October 1998).
3. Conduct a visioning workshop for existing IAS staff to develop an IAS mission statement, outline of activities and programs for which it will be responsible, internal and external linkages, etc. and supporting justification (5 days: 1 Oct 1998 – 15 November 1998).
4. Develop IAS organizational structure (central directorate, directorate and field offices) and staffing plan with relevant job descriptions (20 days: 15 October 1998 – 31 December 1998).
5. Conduct an IAS staff training needs assessment and develop a long term training plan for IAS institutional strengthening, including introductory developmental on and off-shore training proposals fundable under APRP, and proposals for training of irrigation district engineers (10 days: 1 November 1998 – 31 December 1998).

6. Develop draft recommendations regarding IAS institutional support and budgetary requirements (20 days: 1 November 1998 – 31 January 1999).
7. Benchmark Working Group will work with MPWWR/WCU to prepare a public awareness package of materials to be used by IAS field agents in both improved and non-improved areas (Dec. 1, 1998 - Jan. 31 1999)
8. Prepare necessary draft documents required by the Central Authority for Organization and Management to establish an Irrigation Advisory Service Unit in the MPWWR (20 days: 1 October 1998 – 31 January 1999).
9. Organize and conduct a Round Table meeting of high level MPWWR officials to present and discuss the proposed IAS Unit (10 days: 1 March 1999 – 31 March 1999).
10. Revise documentation for the proposed IAS Unit based on the results of the Round Table and other review comments, and present to the Minister for necessary action (Ministerial decree establishing the IAS Unit and submission of necessary documentation to the Central Authority for Organization and Management) (10 days: 1 April 1999 – 30 April 1999).

Deliverables

The deliverables listed below directly support the verification indicators for the accomplishment of the benchmark. Each will provide documentation supporting a Ministerial decree to establish the new IAS Unit.

- Document outlining the recommended structure, staffing, activities, programs, institutional support, budget requirements, internal and external linkages, etc. for an Irrigation Advisory Service within the MPWWR

- Documents required by the Central Authority for Organization and Management to establish an Irrigation Advisory Service Unit in the MPWWR

Cooperators

A. Needs from the MPWWR
   - information describing current MPWWR organizational structure and requirements or constraints regarding establishment of new units.

B. Partners in MPWWR:
   - Irrigation Improvement Sector, IAS, Irrigation Department, National Water Research Center, Water Communications Unit

C. Partners in APRP
   Greencom

Resource Needs

A. Level of Effort (LTTA):

1. EPIQ Task Leader—Senior Sociologist (1.5 pm)

B. Level of Effort (STTA):

1. Egyptian participatory irrigation management specialist (1.5 pm)
2. Expatriate institutional specialist (2 pm)

C. Cost proposal to implement this benchmark:

Additional vehicles (jeeps, pickups)	$ 60,000
Additional equipment and furnishings for regional IAS offices to be established	$ 30,000
Operations	$ 40,000
Total	$130,000

C.5: IMPLEMENTATION OF SUGAR CANE WATER USE STRATEGY

GOE (MPWWR and MALR jointly) will designate two areas of private commercial sugarcane growers and promote improved sugarcane water management efficiency in Upper Egypt.

Background

The current release of water from the High Aswan Dam of 55.5 bcm, satisfying existing water allocation treaties, provides water for irrigation (36.5 bcm), municipal and industrial users (3.0 bcm) and releases to the Mediterranean Sea of 12.4 bcm. Given the system losses to deep groundwater, system evaporation, and other losses, the total amount of water is released is utilized. In order to divert water for the development of new lands, the GOE and the MPWWR must find up to 9 bcm of water within the 55.5 bcm of available water. Outflow to the sea and to Northern Lakes can potentially provide 4 bcm while maintaining the fisheries in the lakes; but the rest of the water to be diverted must be obtained from current users of water.

Sugar cane production, as one of the two most water-consuming crops, has been examined to determine if water use may be reduced. At present, approximately 300,000 feddans of sugar cane are being irrigated. Each feddan requires approximately 8,000 cubic meters (m^3) of water in consumptive use, and water application often exceeds 12,000 m^3 per feddan. These high rates of water application are a particular problem in the areas in which sugarcane is irrigated from gravity systems (generally in the Aswan area). In these areas, water application may exceed 16,000 m^3 per feddan. Improving on-farm irrigation efficiency could reduce water application to approximately 9,000 m^3 per feddan, or a total exceeding 1.0 billion m^3 (bcm)/year.

The sugarcane processing sector is an extremely important economic sector in Egypt, with high value added and employment. Thus, the GOE is reluctant to reduce current levels of sugarcane production. Therefore, reducing sugarcane water consumption must be accomplished through increases in productivity in order to offset reductions in cultivated area. The Sugar Crops Research Institute has found on experimental plots that sugarcane productivity can be increased by from 10 to 25 percent by improved irrigation and water management techniques.

To date, there has not been a larger scale test of this result on commercial (private) farms. The question is compounded by the fact that most farms on which sugarcane is grown are less than 10 feddans (for example, 78% of farms in the Beni-Suef Governorate are less than 5 feddans). Moreover, identifying substitute crops which are attractive to farmers in the sugar cane areas may be difficult. The climate favors sugar cane, as does the ease of farming.

Objective(s)

Improved irrigation technologies installed, including laser leveling and gated pipe delivery systems; water application monitoring program established; and training provided to farmers in the use of improved irrigation methods in two pilot sugar cane areas in Upper Egypt.

Tasks and Timeline

A. Overall timeline: July 1, 1998 – June 30, 1999

B. Specific Tasks
   1. Develop workplan with the Sugar Cane Working Group: July 1 – Sept 15, 1998
   2. Identify areas for pilot areas: Sept 15 – Oct. 1, 1998
   3. Develop coordinated plan for areas for implementation of training, irrigation technology, water management with Sugar Cane Working Group: Oct 1, 1998 – Jan 1, 1998
   4. Implement farmer training: Jan 1, 1999 – March 1, 1999
   5. Install irrigation technologies: Jan 1, 1999 – March 1, 1999
   6. Install water monitoring devices and program: Jan 1, 1999 – March 1, 1999
   7. Plant test areas: March 1 – March 31, 1999
   8. Complete draft benchmark report: April 1 – May 15, 1999
   9. Complete final benchmark report: May 15 – June 30, 1999.

Deliverables

Final report describing the pilot program and its implementation.

Cooperators

A. Needs from MPWWR
   1. Water monitoring plan for pilot areas
   2. Estimated costs of monitoring equipment and manpower
B. Partners in MPWWR
   1. Irrigation Sector
   2. WPAU
   3. Water Communications Unit
C. Partners in MALR
   1. Sugar Crops Research Institute
   2. Agricultural Extension Research Institute
D. Partners in APRP
   1. RDI
   2. MVE
   3. GreenCom
   4. PMU
E. Other
   1. Sugar Company
   2. Sugar Council

Resource Needs

A. Level of Effort (LTTA):
   1. EPIQ Task Leader—Senior Resource Economist (3 pm)
   2. EPIQ Team support

- Resource Economist (3 pm)
- Senior Irrigation Engineer (2 pm)
   3. WPAU Team support
- Senior Expert
- Junior Engineer

B. Level of Effort (STTA):
   1. Local Irrigation Management Engineer (1 pm)

C. Cost proposal/budget needs

Water Monitoring (**estimated budget per canal location**):

Gauges and water level recorders:	LE 13,000
Manpower (field measurement team)	LE 17,400
Travel and per diem	LE 20,800
Contingency (10%)	LE 5,100
Total (per canal)	LE 56,300

On-farm irrigation technology (provided by MALR, farmers, SCC, APRP)
LE 3.8 million

C.6: RICE WATER USE POLICIES

GOE (MPWWR and MALR jointly) will adopt policies for the substitution of short duration rice varieties for long duration rice varieties among private commercial growers and for changing water scheduling to achieve optimal use of water for rice production.

Background

The current release of water from the High Aswan Dam of 55.5 bcm, satisfying existing water allocation treaties, provides water for irrigation (36.5 bcm), municipal and industrial users (3.0 bcm) and releases to the Mediterranean Sea of 12.5 bcm. Given the system losses to deep groundwater, system evaporation, and other losses, the total amount of water is released is utilized. In order to divert water for the development of new lands, the GOE and the MPWWR must find up to 9 bcm of water within the 55.5 bcm of water available. Outflow to the sea and to Northern Lakes can potentially provide 4 bcm and still maintain the lake fisheries; but the rest of the water to be diverted must be obtained from current users of water.

Rice production, as one of the two most water-consuming crops, has been examined to determine if water use may be reduced. Rice production has grown from about 1 million feddans in 1986 to approximately 1.56 million feddans in 1997. MPWWR studies have shown that from 700,000 to 900,000 feddans of rice production each year are required for rehabilitation of soils and prevention of salt intrusion in the Delta. The "allowed" production, however, has also increased from about 1 million feddans in 1986 to about 1.08 million feddans in 1997. Rice consumptively uses about 4,700 m^3 per feddan, as compared to about 3,700 m^3 for cotton and about 2,700 m^3 for maize. Thus, water use in rice production has increased by about 2.6 bcm since 1986, and the net increase in consumptive use, as rice replaced cotton and maize, likely exceeds 1 bcm.

Studies have suggested that short season rice varieties (Giza 177 and Sakha 102) could reduce growing time for, and thereby consumptive use of water by the rice crop by about 25%, close to the same level as cotton, while producing the same, or even higher, rice yields. This represents a water saving (consumptive use) in rice production of about 1,200 m^3 per feddan, or about 1.9 to 2.0 bcm over the entire 1.56 million feddans of rice. However, it is likely that farmers will grow another crop in the inter-season between harvesting the short season rice and planting the winter crop, mitigating to some degree the water saving.

Note that the water savings results from a reduced growing season (about 120 days vs. about 160), allowing water scheduling changes, from rice rotation (5 days on and 5 days off) to the normal rotation (5 days on and 10 days off), much earlier in the summer irrigation season. Under a rotation system of water distribution, a mix of short season and long season rice varieties will not provide water savings, because the water rotation for rice must be "on" until the end of the growing season for the long duration varieties. Thus, the adoption of short season varieties must be consistent within a command area under a single rotation to allow the shifts in water rotations.

Policy testing areas are currently in place to identify how much water saving is likely with the introduction of short season varieties of rice (120 day Giza 177 and Sakha 102) on private farms in the Kafr El Sheikh area. In addition, production, revenue and cost data are being collected for those areas.

Objective(s)

To develop and to obtain the approval by the two Ministers (MPWWR and MALR) of a national policy package, including a timetable for adoption, provision of seeds, farmer training, and changes in water scheduling, for the substitution of short duration rice varieties for long duration rice varieties.

Tasks and Timeline

A. Overall timeline: July 1, 1998 – June 30, 1999

B. Specific Tasks

I. Sidi Gammee Pilot Area Activity

I.1. Complete data collection on Sidi Gammee Pilot Area: July 1, 1998 – Oct. 30, 1998
I.2. Complete analysis of data from Sidi Gammee Pilot Area: Nov 1, 1998 – Dec 31, 1998.
I.3. Complete draft report on results from Sidi Gammee Pilot Area: Jan 1, 1999 – Feb 15, 1999.
I.4. Complete final report on results from Sidi Gammee Pilot Area: Feb 15, 1999 – March 30, 1999.

II. National Campaign

II.1. Identification by Rice Working Group of areas for introduction of short season rice varieties to large scale commercial adoption: Sep 1 – Oct 15, 1998.
II.2. Develop implementation plan, - including seed provision, water monitoring and scheduling, and production and economic data collection - and budget by RWG: Oct 15 – Dec 31, 1998.
II.3. Develop information dissemination (farmer education) plan by RWG: Jan 1 – Feb 1, 1999.
II.4. Implement farmer education plan: Feb 1 – April 30, 1999.
II.5. Water monitoring facilities established: Feb 1 – April 30, 1999.
II.6. Seed distribution: April 1 – May 15, 1999.
II.7. Implement water monitoring/scheduling program – May 1 – June 30, 1999.
II.8. Coordinate agricultural production and economic data collection and monitoring: May 1 – June 30, 1999.

Deliverables

1. Final report on the results of the Sidi Gammee pilot area.
2. Final report on the program for implementing short season rice varieties on a large scale basis.

Cooperators

A. Needs from MPWWR
    1. Monitoring data from the Sidi Gammee pilot area.
    2. Development of a water monitoring and scheduling plan for the expansion areas.
    3. Implementation of the water monitoring/scheduling program.
B. Partners in MPWWR
    1. Irrigation Sector
    2. WPAU
    3. Water Communications Unit
C. Partners in MALR
    1. Field Crop Research Institute
    2. Agricultural Extension Research Institute
    3. Rice Research and Training Center
    4. Central Administration for Seeds
D. Partners in APRP
    1. RDI
    2. GreenCom
    3. MVE
    4. PMU

Resource Needs

A. Level of Effort (LTTA):

    1. EPIQ Task Leader—Senior Resource Economist (2.5 pm)
    2. EPIQ Team support

- Resource Economist (4 pm)
- Senior Irrigation Engineer (2 pm)

    3. WPAU Team support

- Senior Expert
- Junior Engineer

B. Level of Effort (STTA):

    1. Irrigation Management Engineer (1pm)

C. Cost proposal/budget needs (non-LTTA)

Water Monitoring (**estimated budget per district**):

Gauges and water level recorders:	LE 25,000
Manpower (field measurement team)	LE 24,500

Travel and per diem	LE 3,050
Contingency (10%)	LE 5,200
Total (per canal)	LE 57,750

C.7: INTERMEDIATE DRAINAGE WATER REUSE

GOE (MPWWR) will establish an intermediate drainage water reuse program for the Bahr Bagar Drain as a model for other areas.

Background

Agricultural drain water reuse is an important source of the irrigation supply in the Nile Delta. Promoting drainage reuse has been and will continue to be a major policy in Egypt's water management. There are three types of reuse practice in the Delta: official reuse - mixing main drain water with main canal at centralized reuse pump stations by the Ministry, unofficial reuse – direct pumping of drain water by individual farmers, and intermediate reuse – mixing branch drain water with branch canal water for reuse.

Due to the deteriorating drain water quality in main drains caused by municipal and industrial wastewater discharge, six main drain reuse stations were forced to stop operation and official reuse has been stagnant in the Delta region since mid 1990s. Unofficial reuse is rapidly expanding as farmers take measures to augment irrigation supply. However, unofficial reuse (or illegal reuse) takes drain water away from El Salam Canal and other national water allocation projects. This has become an increasing concern of the Ministry.

Intermediate reuse approach intends to pump drainage flow from branch drains before the flow gets mixed with the polluted water in main drains. It supplements canal supplies by organized drainage pumping and replaces farmer's unofficial pumping. When the main drain reuse is under pollution threats, intermediate reuse approach represents a practical resolution for sustaining drainage reuse in the Delta region.

To develop intermediate drainage reuse in the Bahr Bagar drain basin was a policy recommendation made by the Steering Committee of the Water Policy Reform Program at the Tranche II workshop held in Hurghada June 16-18, 1998.

Objectives

The objective of developing intermediate drainage reuse is to keep good quality branch drain water out of bad quality main drain water so that the losses of drainage resources to wastewater pollution can be reduced to a minimum level.

Intermediate drainage reuse will result in reduced drain flows at main drain reuse stations. However, this is a reallocation of drain water in different types of reuse instead of a reduction of total reuse. The driving force for developing intermediate reuse comes from a fact that the untreated sewage and industrial wastewater discharges in main drains will not be stopped soon and the pollution threats on drain water quality will likely continue in the next decades.

A recommended policy from the Tranche II drainage reuse benchmark was to implement the intermediate reuse approach in the Bahr Bagar drain basin, where the pollution of municipal and industrial wastewater severely undermines the reuse of drainage in the main drain of Bahr Bagar.

The verification indicator of this benchmark is to establish an intermediate drainage reuse program, including operations plan and tender documents for needed pumps, for the Bahr Bagar drainage basin in at least one representative Irrigation District,

Tasks and Timeline

Five tasks are planned for the benchmark implementation. Since the preparation of this benchmark was immediately started after the Tranche II workshop in June 1998, some of the tasks have been conducted and completed. The EPIQ team will focus on the incomplete part of the designed tasks in the remaining time of Tranche III.

1. **Select potential intermediate reuse locations in Abou Hammad**. The EPIQ drainage reuse group investigated the drainage generation and reuse in Abou Hammad, one of the irrigation districts in the Bahr Bagar drain basin, and selected ten potential sites for intermediate reuse development through intensive field visits and discussions with local irrigation engineers. Multiple criteria were applied in site selection, and the task was completed in mid August 1998.

2. **Set up drainage monitoring in Abou Hammad**. Drain water monitoring was organized in August 1998. Drainage flow weekly measurements and drain level daily observations at seven drain sites (by the Tanta General Directorate for Water Distribution), and water quality monitoring of PH, TDS, MPN of caliform bacteria count, BOD, and COD (by the Drainage Research Institute) at ten drain sites were started in August 1998. The monitoring work will be continued through May 1999.

3. **Analyze reuse potential in Abou Hammad**. In cooperation with the Drainage Research Institute (DRI) and other involved parties, the EPIQ team will harvest monitoring data, evaluate future availability of drainage quantity and quality, select pump facilities, evaluate costs and financial sources, promote public awareness of intermediate reuse, and specify institutional arrangements for intermediate reuse operations. GIS technique will be used in analysis. Based upon the Abou Hammad case, a standard planning procedure for intermediate reuse development will be generated.

4. **Extend analysis of intermediate reuse strategy in the entire Bahr Bagar basin**. This task is designed to study the feasibility of applying intermediate reuse strategy in other districts of the Bahr Bagar drain basin. Potential water savings, environmental and economic impact, and institutional changes of the basin-wise intermediate reuse strategy will be explored. The task will involve extensive field visits but minimum monitoring work.

5. **Develop report.** A report of intermediate drainage reuse development in the Bahr Bagar basin, including an operation plan for the Abou Hammad Irrigation District and a tender document of pump facilities will be produced.

Timelines of the each task are presented in the following table:

Working Tasks	1998		1999	
	Jul - Sep	Oct - Dec	Jan - Mar	Apr - Jun
1 Select potential reuse locations				
Field investigation	■			
Primary evaluation	■			
2 Set up monitoring				
Scope the monitoring work	■			
Contract the monitoring work	■			
3 Abou Hammad District				
Harvest monitoring data		■	■	
GIS technique application		■	■	
Determine drainage quantity and quality		■	■	
Select pump facilities		■		
Evaluate costs and finance sources		■		
Promote public awareness		■	■	■
Develop institutional arrangements			■	■
4 Other Districts in the Bahr Bagar Basin				
Extend field investigation		■	■	
Estimate water savings		■	■	
Assess environmental impact		■	■	
Conduct cost-benefit analysis		■	■	
5 Report development				
Operations plan report			■	■
Tender document on pump facilities			■	■

Deliverables

The deliverables indicated below directly support the verification indicators for the accomplishment of this benchmark.

- Report of intermediate reuse program, including operations plan and tender documents for the pump facilities in the Abou Hammad District of the Salhia Directorate, will be produced. The potential of applying intermediate reuse in other districts in the Bahr Bagar drain basin will also be addressed.

Cooperators

A. Needs from the MPWWR:

- Salhia and Sharkia Irrigation Directorates – intermediate reuse development in the Bahr Bagar basin,
- Abou Hammad Irrigation District – pilot district for intermediate reuse development,
- Water Distribution Directorate in Tanta – monitoring drain flows and levels, and
- Drainage Research Institute – monitoring drainage quality.

B. Partners in the MPWWR:

- Irrigation Department
- Drainage Research Institute (DRI), Environmental Research Institute (ERI) and Water Management Research Institute (WMRI) of the National Water Research Center (NWRC)
- Egyptian Public Authority for Drainage Projects (EPADP)
- Mechanic and Electric Department (M&E)
- Water Communication Unit (WCU)

C. Partners in APRP

- WPAU
- Greencom

Resource Needs

A. Level of Effort (LTTA)
   1. EPIQ Task Leader—Senior Water Resources Engineer (8 pm)
   2. EPIQ Team support
      - Senior Water Resources Engineer (5 pm)
      - Senior Water Resources Management Specialist (5 pm)
      - Irrigation Engineer (8 pm)
      - Resource Economist (2 pm)
   3. WPAU Team support

- Senior Expert
- Junior Engineers (2)

B. Level of Effort (STTA)

- Local Sociologist (1 pm)
- Local Environmentalist (1.5 pm)

C. Cost Proposal/ budget needs

Field Monitoring Program:

- Drain flows (weekly) and drain levels (daily) will be measured by the engineers of the Tanta General Directorate for Water Distribution and district engineer of the Abou Hammad Irrigation District during August 1998 – May 1999 at an estimated cost of LE 30,000.

- Selected drainage quality parameters will be measured in three times (August and November 1998 and February 1999) by Drainage Research Institute at a cost of LE 6,000.

C.8: LAW 48 -- REVISION OF WATER QUALITY REGULATIONS

GOE (MPWWR) will revise Law 48 of 1982 governing water quality management to more effectively control discharge of wastes and wastewater into the Nile and its waterways.

Background

One of the most serious and complicated problems facing MPWWR is the protection of water quality from degradation. The fresh waters of the main stem of the River Nile and many of the irrigation canals and agricultural drains are subject to the pollution hazard represented by municipal and industrial wastewaters discharging into these watercourses with no, or inadequate, treatment.

Law 48 of 1982 governs the discharge of wastes and wastewater into the River Nile and its waterways and sets standards for the quality of these discharge effluents. The law stipulates the responsibilities of the MPWWR and of other concerned Ministries.

Although the law is comprehensive, some of the details need additional review. Some clauses are inadequate, while others are contradictory. Law 4 of 1994 for environmental protection gives the Ministry of Environment increased powers and duties. Some clauses of Law 48 of 1982 should be reviewed to enhance the enforcement of Law 4 of 1994, as both laws are serving the same objective of water quality control and protection. Water quality standards are very strict, resulting in the failure of many users to comply with the regulations.

A high level committee chaired by the chairman of the MPWWR Irrigation Department with members from the Ministries of Agriculture and Land Reclamation, Health and Population, Environment, Housing and New Communities, , Industry, and Public Works and Water Resources has been formed. The main task of the committee is to review Law 48 of 1982 to guarantee better water quality control and protection on the River Nile and its associated waterways.

Objective(s)

Law 48 of 1982 was issued for the protection of watercourses from sources of pollution. In view of the difficulties facing the enforcement of the law, the law and its by-laws will be reviewed to accomplish the following objectives:

- Clearly define the roles of the relevant Ministries with respect to licensing procedures.
- Amend discharge effluent standards to be more realistic resulting in better compliance.
- Amend clauses to remove gaps, inadequate aspects, and contradictions between clauses in the law to ensure effective water quality control on irrigation and drainage watercourses.

Tasks and Timeline

It is expected the tasks described below will be completed during the period 1 October 1998 to 30 April 1999.

1. WPAU, with assistance from the EPIQ Team, will work closely with the proposed high level committee chaired by the MPWWR Irrigation Department Chairman in the review of all clauses of Law 48 and its by-laws.
2. WPAU will provide coordination assistance between all the involved Ministries (Health, Environment, Housing and New Communities, Agriculture and Land Reclamation, Industry, and Public Works and Water Resources) in the review of the law and by-laws.

Deliverables

The deliverable indicated below directly supports the verification indicator for the accomplishment of this benchmark.

- Report describing suggested draft revisions to Law 48 of 1982 and its by-laws to be presented to the Minister of Public Works and Water Resources.

Cooperators

A. Needs from the MPWWR
- Coordination of the high level joint ministerial committee chaired by the Chairman of the MPWWR Irrigation Department.

B. Partners in the MPWWR
- Irrigation Department

C. Partners in APRP
- EPIQ

D. Input from high level representatives of the other concerned Ministries.
Health and Population, Environment, Housing and New Communities, Agriculture and Land Reclamation, Industry.

Resource Needs

A. Level of Effort (LTTA):
1. WPAU Task Leader (7 pm)
2. EPIQ Team Liaison (3 pm)

B. Level of Effort (STTA):
1. Expatriate Environmental Specialist (2 pm)
2. Egyptian Legislative Consultant (2 pm)
3. Local Environmental Specialist (2 pm)

ANNEX D:

EXTRACT FROM APRP TRANCHE III MOU

WATER GROUP BENCHMARKS

MOU Annex

BENCHMARK BACKGROUND DOCUMENT

TRANCHE III

AGRICULTURAL POLICY REFORM PROGRAM

(APRP)

September 27, 1998

C. Agricultural Land and Water Resource Investments, Utilization and Sustainability

C.1. Nile Water Flow Measurement

GOE (MPWWR) will implement policies and procedures to shift from distributing Nile River water based on water levels to distributing water based on water volumes using the Main System Management Telemetry System at main canal intakes, barrages on the Nile River and division points between Directorates for enhanced irrigation operations and decision making.

Background: The current release of water from the High Aswan Dam of 55.5 billion cubic meter (bcm), satisfying existing water allocation treaties, provides water for irrigation (36.5 bcm), municipal and industrial users (3.0 bcm) and releases to the Mediterranean Sea of 12.4 bcm. Given the system losses to deep groundwater, system evaporation, and other losses, the total amount of water released is utilized. In order to divert water for the development of new lands, the GOE and the MPWWR must find up to an additional 9 bcm of water within the 55.5 bcm of available water. Regulating the outflow to the sea and to Northern Lakes can potentially provide 4 bcm while maintaining the fisheries in the lakes. This means that up to 5 bcm must be obtained from current uses of water.

The Nile River Irrigation System (NRIS) has historically been operated based on a predetermined annual water allocation plan. Daily monitoring and decision making has been, and is presently, based on one manual reading per day of water level. At times, this reliance on manual staff gage readings has led to inappropriate decision making. In addition, managing water distribution based on water levels rather than volumes results in inaccuracies under certain circumstances. Thus, historical water management in Egypt has been reactive instead of proactive and in some instances was carried out based on inaccurate data.

The USAID-funded MSM Telemetry System was implemented in order to provide decision makers with accurate, real-time data required to improve efficiency of water distribution. This $51 million dollar system consists of a remote data collection network which allows water managers to have real-time data from 800 locations on the Nile River, main canals, secondary canals and drains. It provides decision makers with accurate data on a timely basis, both of which are the cornerstones of efficient water management. The system is operational at present. However, the increased efficiency in water management achieved to date has been less than expected. Two main factors contribute to this situation:

1. The MSM Telemetry System measures water levels directly but is capable of computing flow rate and/or volume if the regulator in question has been calibrated to accurately define the level versus flow relationship. Few such accurate relationships exist at present and therefore the telemetry system output consists almost exclusively of water levels; and

2. Operation of the NRIS continues to be based on water levels. Revised policies and procedures that require NRIS operation to be based on water volume are needed. Implementation of the new policies and procedures will require water managers to fully utilize the potential of the telemetry system.

The specific activities required to achieve the stated benchmark are:

- Calibrate all regulators equipped with telemetry (estimated to be 53) located on the Nile River, at intakes to main canals, and at regulators located at points dividing Directorates,
- Enter calibrations into the telemetry data bases and activate existing software modules that calculate and display volume data,

- Adopt a policy that the NRIS will be managed on the basis of flow volumes and not on the basis of water levels,
- Adopt a policy that telemetry, and not manually obtained data, will be the primary basis for water management at these critical points,
- Prepare an action plan for calibrating remaining telemetry sites; and
- Adopt revised water management procedures based on fully utilizing the capabilities of the telemetry system. Such procedures will result in a dynamic, pro-active method of managing water to meet actual needs.

All of these activities, except for the last one are considered to be achievable within the Tranche III time frame at the designated locations.

Policy Issues and Reform Objectives: The MSM Telemetry System instantaneously provides water managers with accurate data and therefore has the potential to be a powerful tool in achieving improved allocation of water resources. Water Managers can utilize the telemetry system outputs to advance from the present static methodology of monitoring pre-ordained water releases to a pro-active, dynamic system of meeting demands that actually exist and not demands that were predicted one year in advance. In order to achieve this potential, the water managers must change their operation procedures. Adopting a policy that water distribution must be based on volumetric flow and that telemetry data will be the primary basis for water management at critical points will achieve this objective of improved water distribution. A secondary benefit of this policy change will be improved maintenance of the telemetry system since once the staff is required to rely on telemetry data they will be forced to maintain the system to keep it functioning properly.

Expected Effects: This benchmark will result directly and significantly to achieving improved allocation of water resources and to sustainability of the MSM Telemetry System. Improved water allocation will result in increases in agricultural production within Egypt's present water supply resulting in economic benefits to the country.

Implementation of this policy change will result in the following benefits:

- Improved distribution of water which will minimize supply shortages at canal tail-ends and generally result in delivery of more accurate quantities of water at times when it is actually needed,
- Increased agricultural production due to satisfying actual crop water requirements in a timely manner,
- Identification of where and when illegal withdrawals of water take place. With this knowledge, appropriate steps can be taken to stop such withdrawals,
- Monitoring volume of flow into and out of discrete service areas will result in actual figures of consumptive use and identify areas of above, or below average water use, i.e. areas of chronic inefficiency; and
- Long term monitoring of volumetric water usage along with agricultural productivity data will allow management to make rational decisions and plans regarding water duties and management techniques.

The above mentioned benefits will demonstrate the importance of the MSM Telemetry System to MPWWR thereby significantly enhancing the prospects for sustainability of the system for decision making.

Verification Indicators

C.1.1. Calibrate 53 regulators located 1) on the River Nile, 2) at intakes to main canals, and 3) at points dividing Directorates where telemetry exists. Enter the calibration relationships into the telemetry system software so that volumetric flow measurements are achieved at these locations.

C.1.2. Approve a policy that water management will be based on volumetric flow and that telemetry data will be used for water management decisions at points where

C.2. Groundwater

The GOE (MPWWR) will adopt policies and procedures for reducing water loss and land degradation due to improper operation and management of free-flowing groundwater in the reclaimed areas of the Western Desert.

Background: The non-renewable groundwater of the Nubia Sandstone Aquifer is the only source of water in the Western Desert of Egypt, where agriculture and mining activities are practiced. The Nubia Aquifer System is considered one of the major aquifer systems in northeast Africa, having a huge storage capacity of about 200,000 bcm of fresh water. However, only a small fraction (about 2% or 4000 bcm) of this can be extracted in the Western Desert.

During the last four decades, important contributions to the understanding of the regional hydrogeologic conditions of the deep aquifer systems in the Western Desert were made, with a special emphasis on the Nubia Sandstone aquifer and its groundwater potential. These studies were carried out by the Ministry of Agriculture and Land Reclamation, the Ministry of Development and New Communities, the Ministry of Petroleum, and the Ministry of Public Works and Water Resources. A comprehensive report on the hydrogeology of the deep aquifers in the Western Desert and the Sinai is under preparation by the EPIQ team.

The results from the studies indicate that the deep groundwater from the Nubia Sandstone Aquifer in the Western Desert can be extracted at a rate of 2.4 bcm per year over a period of 100 years. The previous studies focused primarily on the hydrogeologic characteristics of the deep Nubian aquifer, its groundwater potential, and proposed groundwater development plans for different use sectors. None of the studies sufficiently addressed the necessary policy and procedures required to properly utilize and manage the deep groundwater resources in the Western Desert development areas where conditions producing free-flowing wells prevail.

The development and utilization of groundwater resources in the Western Desert Oases started some centuries ago, but large-scale development was initiated in the early sixties. The current annual groundwater abstraction in the Western Desert is about 0.7 bcm, most of which is being utilized in irrigated agriculture, domestic and mining sectors. However, much of this aquifer is under artesian pressure. Deep wells in some reclaimed areas (200 m in Siwa and 800 to 1,000 m in El-Farfra and El-Dakhla) are free-flowing at relative high rates (5,000 to 30,000 m3 per day) and high pressures (5 to 8 atmospheres at the well heads).

Control of the flow from these wells is difficult due to problems associated with sudden back pressure in the water-bearing formation if the well is subjected to rapid and frequent shut-down. The back pressure can result in a collapse of the formation around the well, and abandonment of the well. The continuous flow produces water in excess of demand during the irrigation period, unused flow during the night (the non-irrigation period), and consequent water logging, drainage problems, and soil salinization. These environmental effects may seriously reduce agricultural productivity.

The aquifer is a classic “common property” in which an individual can derive no benefit from controlling flows from his or her well. Any water which he or she might save will simply be used (or wasted) by another. But,

because this aquifer is a non-renewable stock resource, the flows will be excessive relative to the optimal exhaustion (economic or physical) of the resources. Optimal management requires one of two approaches: 1) individual control of the aquifer (or at least the local well-field) or 2) group control through regulation (either a local or national organization).

Policy Issues and Reform Objectives: In the areas of El-Dakhla, El-Farafra, and Siwa Oases, naturally flowing groundwater occurs. In these areas a total of 1,636 uncontrolled, continuously flowing wells produce at an annual rate of 0.675 bcm. Since water users practice irrigation only during the daylight hours, almost half of this water is wasted. Further, the unused flows cause negative environmental effects such as water logging, drainage problems, and soil salinization, resulting in serious impacts on agricultural production in the Oases.

The artesian character of the aquifer suggests two phases of use: 1) the free-flowing, or naturally pressurized, stage, in which little or no cost is incurred, other than well investment and maintenance, to have access to the flows, and 2) the pumping stage, in which the artesian pressure is insufficient and external energy (pumping) must be applied to obtain the water. Proper policy and management would attempt to insure the optimal length of the first and second phases.

An improved policy framework to ensure appropriate management of the aquifer and its free-flowing wells needs to be developed. The Government of Egypt needs to adopt a policy package which will provide for reductions in the wasted water and land degradation. Components of the policy package will include:

- A public awareness campaign regarding both the problems inherent in the free flowing wells and the scarcity of ground water;
- Provision of economic incentives and aids, such as credit, cost sharing, etc., for structural improvements which can reduce water wastage;
- Enforcement of existing regulations regarding groundwater use; and
- Establishment of ground water user organizations composed of public and private sector stakeholders, to operate and maintain the well-field and irrigation and drainage system.

Expected Effects: Such a policy package will provide for the efficient use of the water resource, efficient use of water resources, reduction of wasted water, reuse of drainage water and minimization of the environmental damage currently being suffered.

Implementation of this benchmark is expected to lead to the following:

- Better utilization, management and conservation of groundwater resources in the Western Desert development areas where groundwater free-flowing conditions prevail which, in turn, will lead to water savings, improving agriculture conditions in 75,000 feddan of old and newly reclaimed area and consequently maximizing its agriculture production;
- Saving 0.3 bcm of water per year;
- Mitigation of adverse environmental effects such as water logging, drainage problems, and soil salinization which have resulted in serious negative impacts on agricultural production in the Oases;
- Sustaining the economic life of the Nubian aquifer;
- Transfer of responsibility of well drilling, operation, and maintenance and groundwater management from the MPWWR to the private sector through the groundwater user association with the continuing control and technical support from the Ministry; and
- Development of a policy model that can be extended to other ground water areas.

Verification Indicators

C.2.1. MPWWR will approve a policy package for free flowing groundwater in reclaimed areas.

C.2.2. Initiate the formation of a groundwater user association in a selected reclaimed area in the Western Desert.

C.3. Branch Canal Water User Organizations

The GOE (MPWWR) will decree a policy and initiate an action program for formation of water user organizations at the distributary and branch canal levels.

Background: Egypt now has nearly a decade-long history of forming water user associations (WUAs) at the *mesqa* level under the Irrigation Improvement Project (IIP). The objective of forming WUAs has been to privatize *mesqa* level irrigation under the aegis of a nation-wide program of improved physical work combined with farmer organization and training. The WUAs have had a beneficial impact on improving farmer managed operation and maintenance, reducing water delivery inequities, and improving communication between farmers and MPWWR. Shareholder irrigation management will be extended from mesqa level operations to branch canals distributaries by forming higher level organizations of water users.

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 Branch Canal Water User Organization (BCWUO) can be formed using one of two different approaches. The first approach is to be created by the previously formed WUAs. The BCWUO would remain accountable to these WUAs and assume responsibilities assigned to it by the collective voice of the WUAs, especially in areas where individual WUAs may carry little influence, such as dialogue with MPWWR on water delivery. The second approach is for non-IIP areas, where no WUAs exist. In this approach branch level organizations may be formed as an initial step in the farmer organization process. Subsequently WUAs would be formed at the *mesqa* level within this branch canal area.

During the 1998-99 work 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 BCWUO 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.

Intermediate Channel Functions: When WUAs have developed internal needs identification and plans, the BCWUO will act as a stronger link between WUAs, credit agencies, input suppliers and co-operatives, etc.

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

Economy-of-Scale Functions: The WUAs may require the BCWUO 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 BCWUO 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 BCWUOs can be carried out through subcommittees so that responsibilities are distributed and more people have an opportunity to develop competence and confidence.

The activities of the higher level organizations will include the operation and maintenance of branch canals and participation in negotiations and discussions with the Ministry of Public Works and Water Resources regarding water allocation and system operations cost and responsibility sharing.

Policy Issues and Reform Objectives: The goal of this benchmark will be that GOE formally promulgates a policy decree and implements an action program for organizing and supporting users' involvement in water management, system O&M and forward planning above the *mesqa* level in Egypt's irrigation system.

In IIP areas, where *mesqa* level WUAs have been formed on branch canals, the collective shareholder membership will work together on activities that require operations on a scale larger than the *mesqa* organization level. The branch canal organization will be instrumental in organizing WUAs at the *mesqa* level, reducing costs to the government for this process, and thereby contributing toward implementation cost sharing.

The project will carefully document both processes and report on performance efficacy relative to the stated objectives. The evolutionary process of formation and maturation will be documented in detail during the first phase of implementation.

A cost sharing plan will be prepared in consultation with the stakeholders addressing issues such as O&M scheduling, allocation of responsibility for labor and equipment requirements in costs or in-kind, and public awareness.

An interdisciplinary Action Team on water user organizations above the *mesqa* level will be established under the MPWWR. Action Team members will participate in a series of training and study tour activities designed to provide exposure to various international experiments with water user apex organizations, and grounding in techniques and methods of institutionalization. For IIP areas, i.e. where WUAs are already formed, farmers and WUA representatives will participate in the process by providing guidance to the Action Team in how to develop apex organizations that respond to water user requisites. Farmers in IIP communities and district MPWWR staff will participate in workshops to determine functional priorities of apex organizations in those areas. The process will enable MPWWR and branch canal organizations in non-IIP areas to establish WUAs under the latter's operational aegis.

Expected Effects: A well-oriented interdisciplinary Action Team with its terms of reference built through consensus will advise the GOE on all matters with respect to higher level water user organizations above the *mesqa* level. It is expected that GOE will decree a policy with respect to higher level organizations that will be the basis for legal registration, empowerment and system management turnover. The feasibility and most practical modalities of establishing higher level water user organizations in IIP and non-IIP communities will have been determined and action plans developed for implementation. Likewise, the feasibility of forming district water boards in IIP and non-IIP communities will have been assessed and recommendations made.

Through the application of process documentation methods, the GOE will have an archival record of the initial implementation phase of higher level organizations. This documentation will be critical in formulating details of broader application of the private participation process over an extended area and timeframe.

MPWWR will have implemented a comprehensive training program for district staff and user organization membership. The impact of this training will have four discernible benefits: 1) enhancement of technical capabilities in supporting WUAs, branch canal organizations and eventually, district or area water boards, 2)

establishment of sustained bonds of communication and trust between formal and non-formal water users' entities and government institutions, 3) incorporation of a broad base of staff input into policy development and institutionalization, and 4) effective monitoring and reporting of all field programs.

Preparation of cost sharing plans with stakeholders under this benchmark is a necessary evaluative step towards the development of a model, which will lead to a national policy for cost sharing.

Verification Indicators

C.3.1. A ministerial decree allowing the formation of water user organizations above the mesqa level.

C.3.2. Process Documentation reports that organizations were formed on two branch canals (one in an IIP and one in a non-IIP community).

C.3.3. A cost-sharing plan prepared for two branch canals in consultation with the stakeholders.

C.4. Irrigation Advisory and Support Service

The GOE (MPWWR) will institutionalize an Irrigation Advisory and Support Service in the MPWWR.

Background: Water conservation, water quality and environmental protection, water allocation management, user participation in irrigation management, and water supply augmentation are fundamental policy objectives impacting long-term sustainability of Egypt's intensive irrigation-based agricultural production system. Support to irrigation farmers, irrigation agency personnel, and decision-makers in the forms of educational programs, information development and dissemination, grass roots organization building (WUAs) and support, and technology demonstration, adaptation and transfer is key to efforts to improve water management and sustain productivity.

The Irrigation Advisory Service (IAS) was established by Ministerial decree in 1989 as a component of the Irrigation Improvement Program (IIP) areas. Its purpose is to advise and assist private water users to establish, maintain, and manage their own sustainable water user associations (WUAs) for improving irrigation performance. The IAS is also mandated to provide continuing water management technical assistance to WUAs and farmers in improved areas. IAS efforts to establish and support mesqa level WUAs have generally been regarded as effective in light of the innovative approach within the MPWWR and Egypt. However, the IAS has been significantly constrained by inadequate staffing, turnover of key trained staff, and inadequate training support. Due to these constraints the IAS has not been able to adequately develop a thorough water management technical assistance program.

In addition to extension education support regarding crop husbandry/production practices, farmers need educational and technical assistance in the areas of modern irrigation techniques, on-farm water management practices, and soil-water-plant relationships. These services are currently not available to the vast majority of farmers in Egypt. Institutionalization of the IAS within the MPWWR is expected to support and strengthen this portion of the IAS mission.

Policy Issues and Reform Objectives: The MPWWR has developed the beginnings of an effective irrigation support service in the IAS. However, the IAS currently does not have a permanent home in the Ministry. Staffing, retention of trained staff, training and career development opportunities, and appropriate support mechanisms for developing and retaining highly skilled and motivated field staff have been identified as key

issues in the current structure of IAS. The development of the IAS as an organizational unit within the MPWWR, with its own budget, would address these problems. In addition, this policy benchmark activity supports MPWWR objectives to:

- strengthen irrigation district capacity to work effectively with water user organizations (i.e., district water management centers offering irrigation technical support services, in addition to irrigation O&M support);
- strengthened and coordinated research and extension linkages in the areas of irrigation water management and soil-water-plant relations (i.e., IAS, National Water Research Center, Ag Extension, National Agricultural Research Center);
- improved on-farm water use and management, introduction and demonstration of modern high technology irrigation methods where feasible, scientific irrigation scheduling, etc; and
- improved information development and dissemination to both water users and decision makers through coordination with the MPWWR Water Communications Unit.

Irrigation advisory and support services are fundamental to the successful implementation of irrigation improvement programs; water user participation in irrigation system operation, management and maintenance; and adoption of modern irrigation techniques and practices at the farm level. The current and envisioned functions and purposes do not currently exist anywhere within the GOE. The Irrigation Advisory Service is the logical organization for building this capacity.

Expected Effects: The institutionalization of the IAS will result in improved capacity of the MPWWR to design and deliver needed irrigation advisory and support services such as:

- water management educational programs for water users,
- technical assistance to water users,
- demonstration and adaptation of appropriate technologies, including modern irrigation methods and practices,
- information development and dissemination to water users and decision makers,
- WUA development and support,
- water user organization development and support above the *mesqa* level, i.e., WUA federations, branch canal water user organizations, and district water boards,
- improved communication/coordination between water users and the irrigation department,
- feedback of important water management issues and problems requiring additional research study to the relevant research institutes of the NWRC and MALR; and
- awareness and information dissemination programs for water users and decision makers.

Verification Indicators

C.4.1. Ministerial decree establishing the Irrigation Advisory and Support Services Central Directorate under the MPWWR.

C.4.2. Submittal of necessary documents to the Central Authority for Organization and Management to establish an Irrigation Advisory and Support Services Central Directorate under the MPWWR.

C.5. Sugar Cane Water Use Policies

GOE (MPWWR and MALR jointly) will designate two areas of private commercial sugar cane growers and promote improved water management efficiency in Upper Egypt.

Background: Sugar cane production, as one of the two most water-consuming crops, has been examined to determine if water use may be reduced. At present, approximately 300,000 feddans of sugar cane are being irrigated. Each feddan requires approximately 8,000 cubic meters (cm) of water in consumptive use, and water application often exceeds 12,000 cm/feddan. These high rates of water application are a particular problem in the areas in which sugar cane is irrigated from gravity systems (generally in the Aswan area). In these areas, water application may exceed 16,000 cm/feddan. Improving on-farm irrigation efficiency could reduce water application to approximately 9,000 cm/feddan.

The sugar cane processing sector is an extremely important economic sector in Egypt, with high value added and employment. Thus, the GOE is reluctant to reduce current levels of sugar cane production. Therefore, reducing sugar cane water consumption must be accomplished through increases in productivity in order to offset reductions in cultivated area. The Sugar Crops Research Institute has found on experimental plots that sugar cane productivity can be increased from 10 to 25 percent by improved irrigation and water management techniques.

To date, there has not been a larger scale test of this result on commercial (private) farms. The question is compounded by the fact that most farms on which sugar cane is grown are less than 10 feddans (for example, 78% of farms in the Beni-Suef Governorate are less than 5 feddans). Moreover, identifying substitute crops which are attractive to farmers in the sugar cane areas may be difficult. The climate favors sugar cane, as does the ease of farming.

Policy Issues and Reform Objectives: The objective of this reform is to achieve improved production and efficiency in water use. During Tranche II of APRP, the sugar crops working group developed strategies for sugar cane policy reform. These strategies involved examining the impact of sugar self-sufficiency on the economy of Egypt, the long-run substitution of sugar beets for sugar cane as a water saving measure, and the examination of the water savings potential of improved irrigation techniques for sugar cane. The Ministers of MPWWR and MALR have approved the following principles with regard to sugar cane:

- Limit the area cultivated in sugar cane to meet only the current requirements of existing sugar cane processing factories;
- Improve on-farm efficiency and sugar cane productivity;
- Import sugar to meet a part of the growing Egyptian demand for sugar; and
- Limit the expansion of sugar production in Egypt to sugar beet cultivation.

The Ministers also approved the adoption of the following strategies:

- MALR and MPWWR should conduct a program for improving on-farm irrigation efficiency (including gated pipe systems, extending laser land leveling, and switching from gravity to pumped irrigation) to achieve reduced water application rates and increase productivity;
- Adopting better methods of maintenance for the water delivery and distribution systems;
- Limiting sugar cane production to satisfy existing processing capacity which entails, in part reducing sugar cane cultivation as productivity increases;
- Supporting the creation of water user associations in sugar cane plantation in Upper Egypt; and
- Improving the efficiency of processing mills.

This benchmark is a first step toward achieving the above policies and strategies. Two pilot (demonstration) areas, involving private commercial producers, for demonstrating on-farm irrigation improvements will be undertaken jointly by MPWWR and MALR in areas of Upper Egypt (jointly selected by the two ministries), in order to demonstrate the gains in productivity and reductions in applied water resulting from improved irrigation

techniques. Such improvement requires significant investment, a schedule consistent with the 4-6 year cycle of production, and coordination of water management. The selection of these areas will be based on criteria including sufficient size to demonstrate the effects of improved irrigation and water management, private commercial producers similar to the bulk of sugar cane growers in Egypt, and institutional infrastructure sufficient to support the demonstration. These areas will also furnish examples to other private investors relative to the efficacy of irrigation improvement.

The expected next step as a result of this benchmark will be the adoption of a policy package, including investment, implementation and water management strategies, using the results from the pilot areas as a template and guideline. Such issues as financial incentives, water delivery system improvement, extension and public awareness requirements, WUAs, and institutional improvement will be included in the policy package.

Expected Effects: Sugar cane is a perennial crop (with a 4-6 year rotation), requires significant investment for introducing irrigation improvements, and also needs increased water management and control associated with improvements. As a result, this benchmark consists of pilot (demonstration) areas to provide a template for the adoption of a national policy package.

Experimental plots have suggested that water application can be reduced to approximately 9,000 m3 per feddan through the use of gated pipes and drip irrigation. At the same time, these experiments suggest that yields of cane increase from 10 to 25% under improved irrigation, making it theoretically possible to incrementally shift from sugar cane to less water-consuming crops while maintaining the sugar industry. These experiments have not included large-scale adoption of modern irrigation by commercial farmers.

This benchmark will provide:

- A demonstration of the benefits of irrigation improvement in the form of alternative technologies for sugar cane production on private commercial farms in Upper Egypt.

- Irrigation improvements anticipated to reduce field application of water by a minimum of 3,000 m3 per feddan, and increase yields by as much as 25 percent.

- A template for a policy package and a plan for implementing improved irrigation practices on at least 60% of sugar cane production over the next 5 to 10 years. The package will include policies concerning:

  (1) water provision for the production of sugar cane and necessary delivery system enhancements;
  (2) social infrastructure needs, such as water user associations;
  (3) financial incentives necessary to encourage private producers to invest in technology; and
  (4) other requirements (such as potential substitute cropping patterns).

The benchmark will serve as a step toward reducing consumptive water use by sugar cane, achieving efficient water management, and developing a sustainable sugar industry. The national policy package will result in reduced water application requirements, potential improvements in water quality, increased involvement of private sector, and increasing values of a cubic meter of water use in sugar production.

Verification Indicators

C.5.1. Improved irrigation technologies installed, including laser leveling and gated pipe delivery systems; water application monitoring program established; and training provided to farmers in the use of improved irrigation methods in two pilot sugar cane areas in Upper Egypt.

C.6. Rice Water Use Policies

The GOE (MPWWR and MALR jointly) will adopt policies for the substitution of short duration rice varieties for long duration rice varieties among private commercial growers and for changing water scheduling to achieve optimal use of water for rice production.

Background: Rice production is one of the two most water-consuming crops, has been examined to determine if water use may be reduced. Rice production has grown from about 1 million feddans in 1986 to approximately 1.56 million feddans in 1997. MPWWR studies have shown that from 700,000 to 900,000 feddans of rice production each year are required for rehabilitation of soils and prevention of salt intrusion in the Delta. The "allowed" production, however, has also increased from about 1 million feddans in 1986 to about 1.08 million feddans in 1997. Rice consumptively uses about 4,700 m3 per feddan, as compared to about 3,700 m3 for cotton and about 2,700 m3 for maize. Thus, water use in rice production has increased by about 2.6 bcm since 1986, and the net increase in consumptive use, as rice replaced cotton and maize, likely exceeds 1 bcm.

Studies have suggested that short season rice varieties (Giza 177 and Sakha 102) could reduce growing time for, and thereby consumptive use of water by the rice crop by about 25%, close to the consumptive use of cotton, while producing the same, or even higher, rice yields. This represents a water saving (consumptive use) in rice production of about 1,200 m3 per feddan, or about 1.9 to 2.0 bcm over the entire 1.56 million feddans of rice. However, it is likely that farmers will grow another crop in the inter-season between harvesting the short season rice and planting the winter crop, mitigating to some degree the water saving.

Note that the water savings result from a reduced growing season (about 120 days vs. about 160), allowing water scheduling changes, from rice rotation (5 days on and 5 days off) to the normal rotation (5 days on and 10 days off), much earlier in the summer irrigation season. Under a rotation system of water distribution, a mix of short season and long season rice varieties will not provide water savings, because the water rotation for rice must be "on" until the end of the growing season for the long duration varieties. Thus, the adoption of short season varieties must be consistent within a command area under a single rotation to allow the shifts in water rotations.

Policy testing areas are currently in place to identify how much water saving is likely with the introduction of short season varieties of rice (120 day Giza 177 and Sakha 102) on private farms in the Kafr El Sheikh area. In addition, production, revenue and cost data are being collected for those areas.

Policy Issues and Reform Objectives: Under Tranche II, the Ministers of MPWWR and MALR approved the following principles with regard to rice production in Egypt:

- Preventing illegal rice production outside the officially permitted rice-growing areas;
- Preventing illegal cultivation of rice within officially permitted rice-growing areas;
- Introducing short-duration rice varieties and modern farming techniques;
- Providing better water control in officially permitted rice-growing areas; and
- Eliminating the rice import duty.

The Ministers also approved the adoption of the following strategies:

- Conducting a national campaign to introduce short duration rice varieties throughout all official rice-growing areas;
- Implement a program to eliminate the import tariff on white and baladi rice, and monitor the effects of that action;
- Conduct a public awareness campaign on water scarcity targeted at farmers in the official rice-growing areas;

- Reconsider how much rice should be legally grown in Egypt taking into consideration future needs and constraints;
- Plan and implement effective programs for control of illegal rice production; and
- Evaluate physical and economic impacts of introducing short duration rice varieties in a policy testing area.

As a step in the process of adopting short duration rice varieties throughout the official rice-growing areas, the current pilot area on the Sidi Gammee Canal was implemented by the two ministries Results from this pilot area should provide the basis for developing a national policy package, including adequate seed provision by the private and public sectors, adequate farmer preparation and training, and revising water delivery schedules.

Expected Effects: The introduction of short duration rice varieties, resulting from the national policy package, should provide:

- Increased productivity of land and value of water.

- Expected water savings of 1 to 2 bcm through reduced consumptive use of water.

Verification Indicators

C.6.1. Approval by the two Ministers (MPWWR and MALR) of a national policy package, including a timetable for adoption, provision of seeds, farmer training, and changes in water scheduling, for the substitution of short duration rice varieties for long duration rice varieties.

C.7. Intermediate Drainage Water Reuse

The GOE (MPWWR) will establish an intermediate drainage water reuse program for the Bahr Bagar Drain as a model for other areas.

Background: Drain water reuse in the Delta is practiced at three levels:
- Capturing drainage flows in main drains and mixing them with main canal water at centralized mixing pump stations is called the *official reuse*.
- Direct pumping of drainage water from a nearby drain by individual farmers is called the *unofficial reuse*.
- Between reuse at main drain mixing stations and reuse by individual farmers, there are other reuse opportunities, referred to as *intermediate reuse*.

In the past few years, the amount of official drainage reuse has been stagnant due to the deteriorating drain water quality caused by Municipal and Industrial (M&I) wastewater discharge. With the increasingly tight control of fresh canal water supply in the Delta, unofficial reuse has rapidly expanded as farmers take measures to augment the water supply. This takes drain water away from the Ministry's planned water projects like the Salaam canal. This new situation in drainage reuse has become of increasing concern to the Ministry.

Intermediate drainage reuse means mixing branch drain water with branch canal water for irrigation use. The main technical merit of intermediate reuse is to use the good quality drain water in branch or lower order drains before it gets mixed with polluted main drain water. Intermediate reuse will also help raise canal water levels, help to mitigate the water shortage faced by farmers at canal tail ends, and reduce unnecessarily large unofficial reuse pumping.

The timely development of intermediate drainage reuse as a potential new policy in Egypt's agricultural drain water management, is needed by the MPWWR.

Policy Issues and Reform Objectives: Intermediate reuse, unofficial reuse, and official reuse are all means of recycling water in the irrigation system. Within the total reuse capacity of a system, they supplement each other and all contribute to the operation of the system. One policy implication of developing intermediate reuse is to reallocate the drain water source among the three reuse levels for capturing more reuse benefits. Intermediate reuse development will transfer a certain amount of the current unofficial reuse into the official reuse through organized drainage pumping and distribution. Intermediate reuse will be a supplementary practice but not a replacement to the main drain reuse

Another policy implication of intermediate reuse is to keep good quality water out of bad quality water by using drain water before it gets polluted in main drains. Realistically, the untreated M&I wastewater discharge in agricultural drains will remain as a fact in the Delta Region over the next twenty years. In recapturing drain water before it is consumed by the M&I pollution, intermediate reuse represents an applicable, and perhaps exclusive, solution.

A first step in policy implementation is to start officially organized intermediate reuse in the *Bahr Bagar* drain basin, where M&I pollution presents a big threat to the use of main drain water. The *Bahr Bagar* has three main mixing pump stations, which, at one time, pumped 0.3 bcm of drain water to the canal system in the Salhia Directorate per year. However, one of the pump stations, the Wadi PS, has been shut down for the past few years due to unacceptably heavy pollution in the main drain. This has resulted in a 0.2 bcm loss of drainage reuse each year.

The objective of this benchmark is to demonstrate the technical merits of intermediate drainage reuse and begin implementation of the accompanying policies needed in drainage water management.

Expected Effects: This policy benchmark focuses on the implementation of intermediate reuse in the *Bahr Bagar* drain. Expected effects of the policy include:

- awareness of the advantages of intermediate reuse;
- recapture of the drain water lost in the *Bahr Bagar* main drain due to the closure of the Wadi mixing station;
- reduction of health hazards on farmers, who are unofficially using the polluted water in the *Bahr Bagar* drain;
- mitigation of water supply shortage in the *Bahr Bagar* basin;
- participation of farmer organizations in drain water use; and
- introduction of private sector involvement in drainage services.

Verification Indicators

C.7.1. Establishment of an intermediate drainage reuse program for *Bahr Bagar* Drain in at least one representative district to include preparation of an operations plan and tender documents for the pumps.

C.8. Law 48 on Water Quality

The GOE (MPWWR) will revise Law 48 of 1982 governing water quality management to more effectively control discharge of wastes and wastewater into the Nile and its waterways.

Background: The Law 48 of 1982 sets the discharge of wastes and wastewater into the Nile and its waterways and set standards for the quality of effluents. This Law stipulates clear responsibilities for the Ministry of Public

Works and Water Resources (MPWWR), the Ministry of Environment (MOE), and the Ministry of Health (MOH) in monitoring the conditions of effluents discharged into the various water bodies, including the Nile River and its associated drain system, lakes and groundwater, ensuring that the quality is within the water quality standards set by the law.

Even though the law is universal, integral and comprehensive, some of the details need additional elaboration. Some important aspects were either ignored, inadequate or outdated. This creates substantial room for improvements, which should be considered in any further revision of Law 48 of 1982

A high level committee chaired by the chairman of the MPWWR Irrigation Department with members from MOH and other concerned ministries and stakeholders has been established by Ministerial decree to study and formulate recommended revisions to Law 48 of 1982 concerning water quality management.

Policy Issues and Reform Objectives: Law 48 of 1982 was issued for the protection of the water courses from pollution. The law establishes stringent effluent standards for various organic and inorganic pollutants.

The water quality standards are strict and rigid. Shortly after the law was promulgated, GOE was forced to grant dispensations to polluters, many of whom were public sector companies, since it was not possible for them to comply with the regulations.

In view of the difficulties of law enforcement, the Government intends to promote public incentives to encourage better water management. The Law 4 of 1994 on Environmental Protection gives the Ministry of Environmental Affairs increased powers and duties. The Act includes rules for establishing and running environmental monitoring networks, and covers the handling and disposal of hazardous wastes.

Thus, Law 48 of 1982 should be revised to accommodate the following objectives:

- Clearly define the roles of relevant ministries with respect to licensing procedures,
- Amend discharge standards to a more realistic level, and
- Gradually enforce set standards for better compliance and efficient enforcement.

Expected Effects:

- Facilitate the enforcement of the law concerning the problem of waste and diminished water quality.
- Determine and impose Environmental Assessment procedures for new water related projects.
- Regulations that can be implemented and enforced.
- Promote the use of financial incentives for regulations.
- Minimize and mitigate adverse environmental impacts of new water-related projects.

Verification Indicators

C.8.1. A draft revision of Law 48 of 1982 and its by-laws to be presented to the Minister.

Rice Water Use Policies

The GOE (MPWWR and MALR jointly) will adopt for the substitution of short duration rice varieties for long duration rice varieties among private commercial growers and for changing water scheduling to achieve optimal use of water for rice production.

Background: Rice production is one of the two most water-consuming crops, has been examined to determine if water use may be reduced. Rice production has grown from about 1 million feddans in 1986 to approximately 1.56 million feddans in 1997. MPWWR studies have shown that from 700,000 to 900,000 feddans of rice production each year are required for rehabilitation of soils and prevention of salt intrusion in the Delta. The "allowed" production, however has also increased from about 4,700 m3 per feddan, as compared to about 3,7000 m3 for cotton and about 2,700 m3 for maize. Thus, water use in rice production has increased by about 2.6 bcm since 1986, and the net increase in consumptive use, as rice replaced cotton and maize, likely exceeds 1 bcm.

Studies have suggested that short season rice varieties (Giza 177 Sakha 102) could reduce growing time for, and thereby consumptive use of water by the rice crop by about 25% close to the consumptive use of cotton, while producing the same, or even higher, rice yields. This represents a water saving (consumptive use) in rice production of about 1,200 m3 per feddan, or about 1.9 to 2.0 bcm over the entire 1.56 million feddans of rice. However, it is likely that farmers will grow another crop in the inter-season between harvesting the short season rice and planning the winter crop, mitigating to some degree the water saving.

Note that the water savings result from a reduced growing season (about 120 days vs. about 160), allowing water scheduling changes, from rice rotation (5 days on and 5 days off) to the normal rotation (5 days on and 10 days off), much earlier in the summer irrigation season. Under a rotation system of water distribution, a mix of short season and long season rice varieties will not provide water savings, because the water rotation for rice must be "on" until the end of the growing season for the long duration varieties. Thus, the adoption of short season varieties must be consistent within a command area under a single rotation to allow the shifts in water rotations.

Policy testing areas are currently in place to identify how much water saving is likely with the introduction of short season varieties of rice (120 day Giza 177 and Sakha 102) on private farms in the Kafr El Sheikh area. In addition, production, revenue and cost data are being collected for those areas.

Policy Issues and Reform Objectives: Under Tranche II, the Ministers of MPWWR and MALR approved the following principles with regard to rice production in Egypt:

- Preventing illegal rice production outside the officially permitted rice-growing areas;
- Preventing illegal cultivation of rice within officially permitted rice-growing areas;

- Introducing short-duration rice varieties and modern farming techniques;
- Providing better water control in officially permitted rice-growing areas; and
- Eliminating the rice import duty.

The Ministers also approved the adoption of the following strategies:

- Conducting a national campaign to introduce short duration rice varieties throughout all official rice-growing areas;
- Implement a program to eliminate the import tariff on white and baladi rice, and monitor the effects of that action;
- Conduct public awareness campaign on water scarcity targeted at farmers in the official rice-growing areas;
- Reconsider how much rice should be legally grown in Egypt taking into consideration futures needs and constraints;
- Plan and implement effective programs for control of illegal rice production; and
- Evaluate physical and economic impacts of introducing short duration rice varieties in a policy testing area.

As a step in the process of adopting short duration rice varieties throughout the official rice-growing areas, the current pilot area on the Sidi Gammee Canal was implemented by the two ministries results from this pilot area should provide the basis for developing a national policy package, including adequate seed provision by the private and public sectors, adequate farmer preparation and training, and revising water delivery schedules.

Expected Effects: The introduction of short duration rice varieties, resulting from the national policy package, should provide:
- Increased productivity of land and value of water.
- Expected water savings of 1 to 2 bcm through reduced consumptive use of water.

Verification Indicators

C.6.1 Approval by the two Ministers (MPWWR and MALR) of a national policy package, including a timetable for adoption, provision of seeds, farmer training, and changes in water scheduling, for the substitution of short duration rice varieties for long duration rice varieties.

C.7. Intermediate Drainage Water Reuse

The GOE (MPWWR) will establish an intermediate drainage water reuse program for the Bahr Bagar Drain as a model for other areas.

Background: Drain water reuse in the Delta is practiced at three levels:
- Capturing drainage flows in main drains and mixing them with main canal water at centralized mixing pump stations is called the *official reuse.*

- Direct pumping of drainage water from a nearby drain by individual farmers is called the *unofficial reuse*.
- Between reuse at main drain mixing stations and reuse by individual farmers, there are other reuse opportunities, referred to as *intermediate reuse*.

In the past few years, the amount of official drainage reuse has been stagnant due to the deteriorating drain water quality caused by Municipal and Industrial (M&I) wastewater discharge. With the increasingly tight control of fresh water supply in the Delta, unofficial reuse has rapidly expanded as farmers take measures to augment the water supply. This takes drain water away from the Minister's planned water projects like the Salam canal. This new situation in drainage reuse has become of increasing concern to the Ministry.

Intermediate drainage reuse means branch drain water with branch canal water for irrigation use. The main technical merit of intermediate reuse is to use the good quality drain water in branch or lower order drains before it gets mixed with polluted main drain water. Intermediate reuse will also help raise canal water levels, help to mitigate the water shortage faced by farmers at canal tail ends, and reduce unnecessarily large unofficial reuse pumping.

The timely development of intermediate drainage reuse as a potential new policy in Egypt's agricultural drain water management, is needed by the MPWWR.

Policy Issues and Reform Objectives: Intermediate reuse, unofficial reuse, and official reuse are all means of recycling water in the irrigation system. Within the local reuse capacity of a system, they supplement each other and all contribute to the operation of the system. One policy implication of developing intermediate reuse is to reallocate the drain water source among the three reuse levels for capturing more reuse benefits. Intermediate reuse development will transfer a certain amount of the current unofficial reuse into the official reuse through organized drainage pumping and distribution. Intermediate reuse will be a supplementary practice but not a replacement to the main drain reuse.

Another policy implication of intermediate reuse to keep good quality water out of bad quality water by using drain water before it gets polluted in main drains. Realistically, the untreated M&I wastewater discharge in agricultural drains will remain as a fact in the Delta Region over the next twenty years. In recapturing drain water before it is consumed by the M&I pollution, intermediate reuse represents an applicable, and perhaps exclusive, solution.

A first step in policy implementation is to start officially organized intermediate reuse in the Bahr Bagar drain basin, where M&I pollution presents a big threat to the use of main drain water. The Bahr Bagar has three main mixing pump stations, which, at one time, pumped 0.3 bcm of drain water to the canal system in the Salhia Directorate per year. However, one of the pump stations, the Wadi PS, has been shut down for the past few years due to unacceptably heavy pollution in the main drain. This has resulted in a 0.2 bcm loss of drainage reuse each year.

The objective of this benchmark is to demonstrate the technical merits of intermediate drainage reuse and begin implementation of the accompanying policies needed in drainage water management.

Expected Effects: This policy benchmark focuses on the implementation of intermediate reuse in the Bahr Bagar drain. Expected effects of the policy include:

- Awareness of the advantages of intermediate reuse;
- Recapture of the drain water lost in the Bahr Bagar main drain due to the closure of the Wadi mixing station;
- Reduction of health hazards on farmers, who are unofficially using the polluted water in the Bahr Bagar drain;
- Mitigation of water supply shortage in the Bahr Bagar basin;
- Participation of farmer organizations in drain water use; and
- Introduction of private sector involvement in drainage services.

Verification Indicators

C.7.1. Establishment of an intermediate drainage reuse program for Bahr Bagar Drain in at least one representative district to include preparation of an operations plan and tender documents for the pumps.

C.8. Law 48 on Water Quality

The GOE (MPWWR) will revise Law 48 of 1982 governing water quality management to more effectively control discharge of wastes and wastewater into the Nile and its waterways.

Background:

The law 48 of 1982 sets the discharge of wastes and wastewater into the Nile and its waterways and set standards for the quality of effluents. This law stipulates clear responsibilities for the Ministry of Public Works and Water Resources (MPWWR), the Ministry of Environment (MOE, and the Ministry of Health (MOH) in monitoring the conditions of effluents discharge into the various water bodies, including the Nile River and its associated drain system, lakes and groundwater, ensuring that the quality is within the water quality standards set by the law.

Even though the law is universal, integral and comprehensive, some of the details need additional elaboration. Some important aspects were either ignored, inadequate or outdated. This creates substantial room for improvement, which should be considered in any further revision of Law 48 of 1982.

A high level committee chaired by the chairman of the MPWWR Irrigation Department with members from MOH and other concerned ministries and stakeholders has been established by Ministerial decree to study and formulate recommended revisions to Law 48 of 1982 concerning water quality management.

Policy Issues and Reform Objectives: Law 48 of 1982 was issued for the protection of the water courses from pollution. The law establishes stringent effluent standards for various organic and inorganic pollutants.

The water quality standards are strict and rigid. Shortly after the law was promulgated, GOE was forced to grant dispensations to polluters, many of whom were public sector companies, since it was not possible for them to comply with the regulations.

In view of the difficulties of law enforcement, the Government intends to promote public incentives to encourage better water management. The law 48 of 1994 on Environmental Protection give the Ministry of Environmental Affairs increased powers and duties. The Act includes rules for establishment and running environmental monitoring networks, and covers the handling and disposal of hazardous wastes.

Thus, law 48 of 1982 should be revised to accommodate the following objectives:

- Clearly define the roles of relevant ministries with respect to licensing procedures,
- Amend discharge standards to a more realistic level, and
- Gradually enforce set standards for better compliance and efficient enforcement.

Expected Effects:

- Facilitate the enforcement of the law concerning the problem of waste and diminished water quality.
- Determine and impose Environmental Assessment procedures for new water related projects.
- Regulations that can be implemented and enforced.
- Promote the use of financial incentives for regulations.
- Minimize and mitigate adverse environmental impacts of new water-related projects.

Verification Indicators

C.8.1 A draft revision of Law 48 of 1982 and its by-laws to be presented to the Ministry.