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International Development**



**Ministry of Water Resources  
and Irrigation**

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Task Order No. 802  
EPIQ II: Contract No. EPP-I-802-03-00013-00**

**Final Report**

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**International Resources Group**

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## **ACRONYMS AND ABBREVIATIONS**

AAU	Agricultural Administrative Unit
AED	Academy for Educational Development (a US based entity providing USAID funded assistance regarding environmental education and awareness)
APRP	Agricultural Policy Reform Program
ASC	Alliance Steering Committee
BC	Branch Canal
BCWUA	Branch Canal Water User Association
CADI	Computer Assisted Development Inc. (a Ft. Collins, Colorado based consulting firm)
CD	Central Directorate
CDA	Community Development Association
CDIAS	Central Directorate, Irrigation Advisory Service
CEDARE	Centre for Environment & Development for Arab Region and Europe
CTO	Cognizant Technical Officer. The USAID person responsible for supervising a technical assistance contractor
CY	Calendar Year
DAI	Development Alternatives, Inc. (a Washington DC based consulting firm working with IRG to implement the project)
DBAF	Dual Biological Aerated Filter (waste water treatment process)
EEAA	Egyptian Environmental Affairs Agency
EEPP	Egyptian Environmental Policy Program (a USAID funded program aimed at achieving environmental policy reform)
EPADP	MWRI Egyptian Public Authority for Drainage Projects
EPIQ	Environmental Policy and Institutional Strengthening Indefinite Quantity Contract
ET	Evapotranspiration
FAQ	Frequently Asked Questions
FWUO	Fayoum Water Users' Organization Project
GDA	Global Development Alliance
GD	General Directorate
GIS	Geographic Information System
GOE	Government of Egypt
GPS	Global Positioning System
GW	Groundwater
GWS	Groundwater Sector
HD	(Aswan) High Dam
IAS	Irrigation Advisory Service
IBRD	International Bank for Reconstruction and Development or World Bank
ID	Irrigation Department
IDS	Irrigation and Drainage system
IIIMP	Integrated Irrigation Improvement and Management Project
IIP	Irrigation Improvement Project
IRG	International Resources Group (a Washington DC based consulting firm that is prime contractor for the IWRMP)
IRU	MWRI Institutional Reform Unit
IRs	Intermediate Results
IS	Irrigation Sector of the MWRI

IT	Information Technology
IWMD	Integrated Water Management District
IWMU	MWRI Integrated Water Management Unit
IWRM	Integrated Water Resources Management
IWRMP	Integrated Water Resource Management Project
LAN	Local Area Network
LIFE	Livelihood and Income from the Environment (project)
LOE	Level of Effort
LTTA	Long-term Technical Assistance
M&E	Monitoring and Evaluation
MALR	Ministry of Agriculture and Land Reclamation
MED	MWRI Mechanical and Electrical Department
MIC	MWRI Ministry Information Center
MISD	Matching Irrigation Supply and Demand
MOE	Ministry of Education
MOH	Ministry of Housing
MOU	Memorandum of Understanding
MSEA	Ministry of State for Environmental Affairs
MS	Master of Science
MWRI	Ministry of Water Resources and Irrigation
NGO	Non-Governmental Organization
NWRC	MWRI National Water Research Center
O&M	Operation and Maintenance
OJT	On-the-Job Training
PB	Performance Benchmarking
PM&E	Performance Monitoring and Evaluation
PWM	Participatory Water Management
RSC/WP	Red Sea Coastal/Water Project, short name for USAID Red Sea Coastal and Improved Water Resource Management Project
RWP	Relative Water Supply
SIRs	Sub-Intermediate Results
SOs	Strategic Objectives
STTA	Short-term Technical Assistance
TA	Technical Assistance
TOR	Terms of Reference
TOT	Training of Trainers
UNICEF	United Nations International Children's Emergency Fund.
USA	United States of America
USAID	United States Agency for International Development
USCID	US Committee on Irrigation and Drainage
WCU	MWRI Water Communication Unit
WDC	MWRI Central Water Distribution Center
WPRP	Water Resources Results Package
WQU	MWRI Water Quality Unit
WRI	Water Resource Inventory
WUA	Water User Association
WWTF	Waste Water Treatment Facility
WWWHC	Water and Waste Water Holding Company

## **EXECUTIVE SUMMARY**

Under the USAID/Egypt funded Livelihood and Income from the Environment, Integrated Water Resources Management Project (LIFE IWRM), Contract No. EPP-I-802-03-00013-00 Task Order 802, International Resource Group (IRG) is responsible for assisting the Government of Egypt (GOE) to promote integrated water resources management. The period of performance of the project is from October 1, 2004 to September 30, 2008.

This Final Report was prepared as a deliverable under the project to document achievements and performance. It has the following content: Project Accomplishments (including tables showing targets vs. outputs); Project Results, Significant Changes in Implementation Strategy, Problems Encountered & Lessons Learned, and Recommendations.

The following items have been included as annexes:

- A. Strategic Objective Close Out Report (Draft)
- B. Financial Report
- C. Table of Reports
- D. Technical Assistance Table
- E. Training Report: Overseas and In-country
- F. Procurement Status Report

A list of significant events in the life of the project follows, and in turn is followed by a summary of project activities and accomplishments.

The contractor, IRG, mobilized on 1 October 2004 with the signing of the contract. The main project office was established at MWRI in Imbaba, Cairo. Two regional offices were established in Zagazig and Qena. MWRI has provided rent free space for these offices and assigned an engineer to assist each of the regional advisors.

A purchase order (PO) was signed with the Integrated Water Management Unit (IWMU) to provide support funding for Year 1 (i.e. through September 2005). This PO has been renewed annually. H.E. Minister, MWRI, signed a decree naming representatives for the MWRI Steering Committee. Eng. Gamil Mahmoud was assigned as the Chairman.

A workshop to present the Annual Work Plan was held at Ain Soukhna on 17-18 December 2004. Dr. Mahmoud Abou Zeid, H.E. Minister, MWRI; USAID project management staff (Dr. Ross Hagan, Eng. Wafaa Faltaous, and Ms. Inas Tawadrous); Steering Committee members; Undersecretaries and General Directors from the target directorates; IWMU staff; and LIFE IWRM TA team members attended.

The Annual Year 1 Work Plan, Life of Project Procurement Plan, Annual Year 1 Training Plan, and Monitoring and Evaluation Plan were approved by USAID and MWRI in January 2005.

Three subsequent annual workshops were held in Alexandria to present Annual Work Plans. These were all attended by Dr. Mahmoud Abou Zeid, H.E. Minister, MWRI; USAID project management staff; Steering Committee members; Undersecretaries and General Directors from the target Directorates; IWMU staff; and LIFE IWRM TA team. All the annual work

plans were signed by the various stakeholders and participating organizations and submitted to USAID.

US Ambassador Francis Ricciardone visited Qena and met with BCWUA representatives in Luxor IWMD on 5 April 2006.

Eric Viala (LTTA, Expatriate Water Resources Management Specialist) left the project on 28 February 2007 to take a position as Regional Water Advisor for the USAID Office of Middle East Programs.

A contract modification was issued by USAID on August 4, 2007 to fund the Global Development Alliance: Environmental Services for Improving Water Quality Management in Egypt.

A LIFE IWRM project evaluation was conducted by Weidemann Associates, Inc from April-June 2008.

A sustainability plan was discussed by the MWRI Steering Committee and approved by HE Minister MWRI on 22 May 2008.

The MWRI Final Project Workshop was held in Alexandria on 22-24 September 2008.

The EEAA Final Workshop (Task 6) was held in Luxor on 21 September 2008.

Throughout the course of the project, the MWRI IWMU provided excellent coordination with MWRI entities to facilitate implementation of project activities in the field and achievement of project objectives.

Eng. Wafaa Faltaous, who replaced Dr. Ross Hagan as USAID CTO in June 2005, attended monthly project coordination meetings at MWRI in Cairo, and made regular field visits to the 27 IWMDs and five directorates.

*Task 1 Formation of Integrated Water Management Districts* has been completed. Twenty three new IWMDs were formed, the number targeted at the outset of the project. The IWMDs are fully functioning and cover over 1.2 million feddan, 15 percent of Egypt's irrigated area. The total number of IWMDs, including those formed under RSC/WP, is 27 -- all of the districts in the five target directorates of West Sharkiya, New Zifta, East Qena, West Qena, and Aswan. An organization chart for IWMDs defining roles and responsibilities for IWMD staff was approved and implemented by MWRI. A training course on Establishment of IWMDs was given to all IWMD district managers and their four section heads. One of the five General Directors, three of the 27 IWMD managers, and 25 percent of the section heads are women. All administrative and technical staff were officially assigned to the IWMDs. Annual integrated maintenance plans were prepared by all districts. A maintenance database was installed at each IWMD. The IWMDs now have upgraded facilities, modern office equipment, training rooms, technical standards and guidelines. During the RSC/WP bridging period, it took one year to form four IWMDs. Under LIFE/IWRM the 23 new IWMDs were formed in less than six months, much more quickly than anyone had anticipated. This was a major success for the project because early and successful formation of the IWMDs provided the foundation for completion of Tasks 2 and 3. MWRI has prepared a sustainability action plan that has been approved by HE Minister MWRI. Establishment of IWMDs is now an

MWRI policy. IWMDs are also being established under the Dutch-funded Fayoum Water Management Project and the World Bank, EU, and Dutch funded Integrated Improved Irrigation Projects.

*Task 2 Formation of Branch Canal Water Users' Associations* has been completed. Under the project 600 BCWUAs covering all the branch canals in the 27 IWMDs were formed. They serve 500,000 users. The streamlined approach used by the project and the direct involvement of District Managers and staff to establish, activate, and implement the participatory water management program has proved highly successful. All BCWUAs completed activation activities, including signing MOUs, preparing internal regulations, defining maintenance priorities, and developing annual action plans for 2006/07, 2007/2008, and 2008/2009. Monthly, seasonal, and annual meetings were held involving BCWUA Boards, IWMDs, and directorate level staff. Regional orientation workshops were held for and with the BCWUA chairpersons. Annual meetings of the BCWUA representative assemblies and BCWUA board members were held in all IWMDs. BCWUA board members were provided with membership cards and established offices. Specific tasks and activities were assigned to all board members. Participatory water management activities were introduced to the BCWUAs, including procedures for monitoring branch canal rotation schedules, providing seasonal crop data to the IWMDs, resolving conflicts, sharing in canal and structure maintenance, monitoring branch canal maintenance contracts, and conducting public awareness programs. In several directorates BC maintenance activities were implemented using local laborers jointly supervised by BCWUA and the districts. Success stories were collected by the districts and process documentation was compiled for each of the 600 BCWUAs. Organizational and process documentation were compiled and transmitted to all BCWUAs. A BCWUA database was installed at district and directorate level.

Under *Task 3 Equitable Allocation of Water Resources* the project introduced to the IWMDs techniques for data-based decision making, equipment for measurement-based water management, procedures for matching irrigation supply and demand, and concepts of integrated water resources management.

Water monitoring plans were prepared by IWMDs, and water monitoring networks were established. Water discharge measurement programs were carried out in all five directorates. Calibration was completed at 84 irrigation canal flow monitoring sites enabling calculation of actual inflows into each IWMD. To evaluate water balance estimates for the IWMDs, 79 drainage sites were added to the flow monitoring program and, as of this writing 57, have been calibrated. A multi-year prioritized calibration program for branch canals was initiated. Water quality and groundwater monitoring equipment was delivered and training provided to all districts. Ground water inventories have been conducted by IWMD staff at over 9,000 wells. Water quality monitoring, including monitoring of dissolved oxygen, Ph, salinity, and temperature is being done at over 380 sites. The National Water Research Center, Hydraulic Research Institute provided the project with 25 current meters and the MWRI Telemetry Section provided 12. The project supplied 10 current meters purchased in the US. All current meters provided have been calibrated and distributed to IWMDs. Flow monitoring boats were fabricated, tested, certified, and delivered to IWMDs.

To demonstrate procedures for continuous flow monitoring, seven data loggers have been installed at several critical locations. Hourly water level and related flow data can be accessed easily at any time at district, directorate and central level via a low cost GSM/GPSR

communications system. As a result of this effort, MWRI will provide an additional 50 data loggers at critical locations within the Nile irrigation system.

Procurement, delivery, and transfer of IWMD computer and office equipment were completed. Over 120 computers were supplied and installed in the IWMDs. A comprehensive computer training program was carried out for a total of 1,812 participants. As a result, each district and directorate now has at least three or four capable staff members actively engaged in electronic database and digital mapping activities. After training, computer maintenance support is being provided by the directorates to the IWMDs. Early installation of computer equipment and the computer training allowed the project to begin installation of water resource databases that were a prerequisite for establishing information systems at the newly formed IWMDs.

Information on water quality and quantity is being recorded, analyzed, and reported by all of the 27 IWMDs. Water level, complaints, matching irrigation supply and demand, ground water, and water quality data bases were installed at each IWMD and at the directorates. Daily water levels for over 1,000 sites are being entered into the water level data bases. An information system assessment was conducted annually to adjust activities and to prepare annual work plans.

The Matching Irrigation and Supply and Demand (MISD) program was implemented in each of the IWMDs. Biweekly data on crops and cropping patterns from the Ministry of Agriculture are now collected by the 27 IWMDs. Seasonal coordination meetings between MWRI and MALR were held (one in each directorate) to review MISD procedures and irrigable areas. Water resource budgets were prepared by each IWMD manager. A water resource inventory (WRI) was carried out by each district. The WRI is being used by directorates and the Irrigation Sector to determine targets for water supply to each IWMD. Water resource budgets, water resource inventories, and integrated water resource plans were prepared by each IWMD.

Procedures for preparing digital project base maps using 1:25,000 scale topographic maps and satellite imagery were developed. Official irrigation and drainage schematic diagrams prepared by MWRI were updated for all districts. 1:50,000 and 1:25,000 scale maps and 15m x15m Landsat satellite imagery were procured for the project area. Boundary maps for all IWMDs were prepared by MWRI. Digital maps with district boundaries, canals, drains, water monitoring points, and water quality sampling sites over laid on 1/25,000 and Landsat base maps for all IWMDs were completed. Names, locations, and coverage area of the BCWUAs were added to the digital maps. A water structure inventory database was linked to the digital map.

GPS equipment and field training were provided to IWMD staff. Field measurement of BC command areas using GPS for all IWMDs was completed. Non-irrigated land was estimated from satellite imagery. This information was transferred to the digital maps. Reconciliation of branch canal areas between MALR and MWRI was completed.

The purpose of *Task 4, Improved Maintenance and Upgrading of Water Management Equipment*, was to assess the capacity of the governorate technical schools administered by the Central Department of Technical Education within the Ministry of Education (MOE) to provide training in the repair and maintenance of agricultural and irrigation equipment and business management. An assessment of the need for strengthening the capabilities of

technical schools was carried out. The scope was expanded to include an assessment of BCWUAs. Upon USAID request, the study was extended to additional BCWUAs and pump maintenance providers. Three focus group meetings were held involving 18 BCWUAs. Five pump repair workshops were visited in three directorates. An updated report was submitted. Irrigation pump maintenance awareness training was provided to users through the IWMDs and BCWUAs.

For *Task 5, Environmental Services for Improving Water Quality Management*, a pilot area was selected in Senbo Branch Canal, Zifta Directorate, Gharbiya Governorate. A feasibility study was completed; a survey of over 200 households was carried using former CIDA EEAA SEAM project staff; designs and tender documents for an agricultural solid waste and a liquid waste pilot were prepared; a local consortium made up of the CDA (Cooperative Development Authority), BCWUA (Branch Canal Water User Association), and local council was organized; and financial and organizational training for these groups was provided. Several interventions were demonstrated: disposal, liquid wastewater treatment and agricultural waste recycling. A water quality monitoring program was implemented.

The Senbo Community Development Association (CDA) purchased land for a waste water treatment plant. Construction was completed on the 600 m<sup>3</sup>/day Dual Flow Aerated Bio-Filters (DBAF) facility in July 2006. Training was provided to local persons selected by the CDA/BCWUA consortium formed to implement the project. These individuals are now operating the system under a project sponsored on-the-job training (OJT) program. Transfer of the DBAF system to the consortium or the local water and waste water company is under discussion at the time of this writing.

An agriculture waste recycling STTA consultant completed focus group meetings with farmers and submitted alternatives they selected. An environmental solid waste management and water quality awareness campaign was conducted.

Because of the success of the pilot waste water treatment facility, USAID decided to replicate the activity under a *Global Development Alliance (GDA) for “Environmental Services for Improving Water Quality Management in Rural Areas in Egypt”* between Coca Cola Africa Foundation, USAID, MWRI, IRG, and UNICEF. The activity was carried out in three rural communities, two in Gharbiya Governorate and one in Luxor. USAID provided additional funds to the project to carry out the work. Local councils committed land for construction of waste water treatment facilities (WWTF). Three WWTFs were constructed. Ag waste recycle equipment was provided to two locations.

*Task 6, Improved Wastewater Reuse Practices*, was implemented in coordination with MSEA/EEAA to demonstrate the environmental feasibility of using treated wastewater for commercial crops, and to promote private sector participation. Coordination between the project, USAID, EEAA, MALR, MOHP, and MWRI was excellent at all levels. A 10 feddan site in Luxor was approved by the Luxor Governor and permission was granted to use effluent from the Luxor treatment plant for the demonstration. The Luxor demonstration site was surveyed and basic data collected. Installation of the irrigation system was completed in December 2005. Crops were selected and agreed upon based on the newly approved Egyptian Wastewater Reuse Code. Six crops (flax, flowers, jojoba, jatropha, olive trees, and sorghum) were cultivated. Regular comprehensive environmental monitoring of water, soil, and plants was carried out. Long term training was completed for five agricultural graduates on safe agriculture practices utilizing treated wastewater. Seven additional graduates were selected

and started a six month OJT program in June 2007. An economic feasibility report was prepared and an environmental evaluation was carried out. A separate feasibility study was conducted on jatropha at the request of EEAA. Business and marketing plans that included data on market venues and the market situation were prepared. The demonstration site was transferred to EEAA in July 2008 and will be used as a regional training center. A final workshop attended by HE Minister MSEA was held in September 2008.

Funds were obligated to LIFE IWRM by USAID under *Task 7, Graduate Degree Training for MWRI Staff*, to provide academic degree training to MWRI staff. Originally eleven persons were sponsored for MS degree training. Training was provided at both U.S. and Egyptian institutions. Two persons completed their programs at Utah State University, USA, in irrigation and hydraulic engineering. Two others who enrolled in local universities completed their degrees. Two have left the program. The others are expected to complete their programs within the next year.

The purpose of the *Monitoring and Evaluation (M&E)* component of the project was to provide LIFE IWRM project stakeholders with the information needed to follow and manage the project's progress and assess its outcomes and impacts. During Year 1 an M&E Plan was developed that included establishment of project indicators and performance targets. As part of plan implementation, monthly meetings were held with the IWMDs. Each District Manager now submits a monthly status report. Regular data collection was started by the IWMDs to monitor complaints, cropping patterns, yields of main crops, rotations, water requests, and actual water allocations. Base line studies were completed with the IWMDs, and procedures for performance monitoring were developed, using indicators such as quality of irrigation service, water demands vs. deliveries, equity of water distribution, and areas covered by BCWUAs. Baseline farmer surveys were carried out in each of the 27 IWMD (5,000 respondents) using staff from the IWMDs as enumerators. Baseline conditions in each of the project IWMDs were evaluated. Follow-up annual M&E farmer field surveys in the 27 IWMDs (5,000 respondents) and annual monitoring and evaluation reports were prepared. Based on the results of the M&E findings, improved procedures for collecting, analyzing, and reporting the M&E IWMD data were introduced. Project activities were adjusted to respond to the annual M&E findings. Through a monthly district performance monitoring report, District Managers were introduced to procedures for performance monitoring using indicators such as quality of irrigation service, water demands vs. deliveries, equity of water distribution, complaints, violations, and BCWUA satisfaction. At the end of the fourth year of the project, indicators of project implementation showed complete achievement, while management outcomes, such as quality of service and equity of water distribution, had improved.

*Public Awareness, Education, and Communication Support* was provided to all project activities. The MWRI Water Communication Unit was the key partner for this effort. The project prepared and disseminated over 90,000 project brochures, folders, booklets, flyers, calendars, and posters; and prepared two videos on IWRM and BCWUA benefits. A 45 page, illustrated flip-book, communication tool kit "Discussion Guide to Share with Water Users" with accompanying CD was prepared to support formation of BCWUAs. Over 700 copies were delivered to IWMD BCWUA training teams and BCWUA boards. A 13 page flip-chart kit based on the "Discussion Guide" was printed and issued to each IWMD. The project conducted three awareness workshops for senior MWRI officials; prepared several large lobby display boards; printed and distributed 10,000 project awareness cards; participated in several conferences and exhibitions; collected and published a series of books that included

over 500 BCWUA success stories; published five quarterly newsletters; and established and maintained a project web site ([www.iwrmeq.org](http://www.iwrmeq.org)). One of the major achievements was the publication the Arabic and English version of the Guidelines for Implementation of Integrated Water Management Districts. Over 300 copies of the Arabic version of the Guidelines were distributed.

*Gender issues* were integrated into all activities. One General Director, three IWMD District Managers, 25 percent of the IWMD section heads and 10 percent of the BCWUA board members are women. Discussions of gender issues were included in all BCWUA training. Formal presentations by IWMU on gender issues were given to the Under Secretaries, General Directors, and IWMD District Managers at the monthly coordination meetings.

*Training* has been used to provide technical assistance through a combination of formal and on-the-job programs. The project conducted 43 formal training courses, approximately 500 classroom events, 66 classroom/field events, and 254 OJT programs. In total about 1,420 training days were provided for approximately 16,600 trainees, fifteen percent of whom were women. Topics included IWMD organization, integrated maintenance, management and communications, BCWUA formation and activation, participatory water management, computer use and maintenance, water monitoring, MISD, data bases, digital mapping, and English language.

The LIFE IWRM *Procurement* program supplied all the commodities approved under the original Life of Project Procurement Plan. In the first year over 90 percent of the commodities approved in the Life of Project Procurement Plan were procured and in place. Because most of the procurement was done locally, the procurement was done with major cost savings and in a very short time.

## INTRODUCTION

### 1.1 Authorization

Under the USAID/Egypt-funded Livelihood and Income from the Environment (LIFE) Integrated Water Resources Management (IWRM) Project (Contract No. EPP-I-802-03-00013-00 Task Order 802), International Resource Group (IRG) in association with the Academy for Educational Development (AED), Development Alternatives, Inc. (DAI), ECODIT, Environmental Quality International (EQI), Montgomery Watson Harza (MWH), and Training Resources Group, Inc. (TRG) was responsible for assisting the Government of Egypt (GOE) to promote integrated water resources management. The period of performance for the contract was October 1, 2004–September 30, 2008.

### 1.2 Program Overview

**Figure 1 LIFE/IWRM Project Location Map**



The GOE is implementing an aggressive irrigated agricultural area expansion program. This is in turn reducing the supply of water available for agriculture on a per feddan basis. The problem of reduced availability per feddan is further compounded by deteriorating water quality as the water conveyance system is increasingly used for waste disposal. In addition, the high cost of operating and maintaining the water delivery infrastructure is a serious strain on the national budget because farmers pay a very low portion of the actual costs.

In this context USAID designed the LIFE/IWRM program to provide technical assistance, training, and commodities in support of the decentralization of water management decision making and increased participation of all rural inhabitants in such decision making in two priority geographical areas and five irrigation directorates: New Zifta and West Sharkiya

in Lower Egypt, and West Qena, East Qena and Aswan in Upper Egypt, as shown in Figure 1.

With decentralization and participation, USAID expected greater civic responsibility in maintaining the water conveyance infrastructure and improvements in the quality of local water resources through better management of locally generated liquid and solid wastes. These objectives were to be achieved through the formation and development of functional and sustainable Branch Canal Water User Associations (BCWUAs) and Integrated Water Management Districts (IWMDs) and developing the capacity of stakeholders to manage solid and liquid wastes in the targeted directorates.

**SUB-OBJECTIVE 1.** Rural inhabitants receive immediate and long-term economic benefits from participating in water-management decision-making and governance of the water conveyance infrastructure.

**SUB-OBJECTIVE 2.** Local communities and private associations participate in water resources decision-making, accept responsibility for maintaining the water conveyance infrastructure, and adopt improved management practices for solid and liquid wastes.

Seven tasks under three performance requirement categories were to be implemented under the LIFE/IWRM Program:

**A.1 Performance Requirement I: Decentralized Management of Water Resources**

1. Formation of Integrated Water Management Districts
2. Formation of Branch Canal Water Users' Associations
3. Equitable Allocation of Water Resources

**A.2 Performance Requirement II: Stakeholder Engagement in Water Resources Management**

4. Improved Maintenance and Upgrading of Water Management Equipment
5. Environmental Services for Improving Water Quality Management
6. Improved Wastewater Reuse Practices

**A.3 Performance Requirement III: Capacity Building of MWRI staff**

7. Graduate Degree Training for MWRI staff

There were also a number of project activities that were common to all the tasks. These were commodity procurement; workshops and training; monitoring and evaluation; donor coordination; public awareness, information, education, & communications; and gender equity.

### 1.3 Program Management

The IRG team mobilized on 1 October 2004 with the signing of the contract.

Technical directions during the performance of this task order were provided by the USAID Cognizant Technical Officer, Eng. Wafaa Faltaous, who replaced Dr. Ross Hagen in June 2005.

The main project office was established at MWRI Imbaba, Cairo. Two regional offices were established in Zagazig and Qena.

LIFE/IWRM project personnel worked closely with the MWRI Integrated Water Management Unit (IWMU), four Undersecretaries, five General Directors, 27 IWMDs, and other key stakeholders. MWRI IWMU assigned an engineer to assist each of the project regional advisors.

To facilitate implementation and to resolve any issues requiring inter-sectoral coordination at a higher level within MWRI, a Steering Committee, appointed by H.E. Minister MWRI, was established. Members of the steering committee were:

- Eng. Gamil Mahmoud, Chairman (MWRI Special Consultant to H.E. Minister)

- Chairman, Irrigation Department
- Chairman, Egyptian Public Authority for Drainage Projects
- Chairman, Mechanical and Electrical Department
- Head of Sector - Minister's Office
- Director, Institutional Reform Unit
- Coordinator, Integrated Irrigation Improvement and Management Project
- USAID representative
- LIFE IWRM representative

To facilitate activities associated with Task 6: Improved Wastewater Reuse Practices and the Luxor Demonstration Site, a Steering Committee was formed under the direction of EEAA. Members of this steering committee were:

- Dr. Mawaheb Abu Elazm, Chairperson, EEAA
- Dr. Moustafa El Hakeem, Afforestation Consultant & Minister's Advisor, EEAA
- Eng. Mohamed Mostafa, Under Secretary for Forestation and Environment, MALR
- Eng. Awad Shafiq, Luxor Demo Site Field Engineer, MALR
- Eng. Mohamed Hamed, IWMU, MWRI
- Eng. Mohamed Abu Zied, General Director, Luxor Water and Waste Water Company
- Eng. Wafaa Faltaous, CTO, USAID
- Jeffery Fredericks, COP, LIFE IWRM
- Dr. Wadie Fahim, Task Leader, LIFE IWRM

To facilitate implementation of the Global Development Alliance of Environmental Services for Improving Water Quality Management in Rural Areas in Egypt an Alliance Steering Committee (ASC) was established by MWRI. All parties contributing and involved in implementation of this alliance were members of the committee, namely:

- United States Agency for International Development (USAID)
- The Government of Egypt (GOE) represented by MWRI
- International Resources Group (IRG)
- The Coca-Cola Africa Foundation (TCCAF)
- UNICEF

### **1.4 Organization of Report**

The purpose of this report is to present the end of project achievements and accomplishments of LIFE IWRM and to highlight problems and lessons learned in the course of project implementation, especially those germane to the conduct of follow-on activities. This Final Report covers the entire project period from October 2004 – September 2008, and has the following content: Project Achievements (including tables showing targets vs outputs), Project Results, Significant Changes in Implementation Strategy, Problems Encountered & Lessons Learned, and Recommendations.

The following items have been included as annexes:

- A. Strategic Objective Close Out Report (Draft)
- B. Financial Report
- C. Table of Reports
- D. Technical Assistance Table
- E. Training Report: Overseas and In-country
- F. Procurement Status Report

## **PROJECT ACHIEVEMENTS**

### **Task 1: Formation of Integrated Water Management Districts**

#### **Objective:**

The overall objective of this task was to assist MWRI in integrating all its district level delegations into Integrated Water Management Districts in the five target directorates of New Zifta, West Sharkiya, East Qena, West Qena, and Aswan. Subsidiary goals were to support MWRI in order to:

- Promote Integrated Water Resources Management (IWRM) as a decentralized and participatory approach to managing water resources in a sustainable manner;
- Simplify MWRI's organization at district level,
- Streamline communication flows among local delegations and with headquarters,
- Prevent the duplication of functions and consequently make staff available for new tasks such as monitoring water resources and supporting water user associations;
- Decentralize implementation and coordination of Operations and Maintenance (O&M) and project activities by empowering and using IWMDs as field units for MWRI activities; while central units provide guidance and key technical assistance, implementation is mostly to be done by IWMD staff so as to ensure sustainability after implementation; and
- Improve decision-making at the local level by making IWMDs the sole representative of the MWRI, and thus the single contact point for water users.

At the outset of the project it was envisioned that strong links would be created between IWMD staff and Water User Association (WUA) representatives leading to:

- Enhanced maintenance planning and reduced maintenance costs;
- Better knowledge of water needs and supplies; and
- Improved conflict management.

#### **Staff:**

Eric Viala (LTTA, Expatriate Water Resources Management Specialist) was coordinator for this task until his departure in March 2007. Eng. Nabil Fawzi (LTTA, Local Water Resources Management Specialist) was assigned as Regional Advisor for Upper Egypt. He was supported by Eng. Yehia Youssef (IWMU). Eng. Maher Khodary (LTTA, Water Resources Management Specialist) was assigned as Regional Advisor for Lower Egypt. He was supported by Eng. Mohamed El Hamrawy (IWMU). Eng. Tarek Kotb (I&D Maintenance Specialist) and Eng. Mohamed Hamed (IWMU) provided local STTA support for the maintenance program. Eng. Sarwat Fahmy (Local Senior Technical Advisor) provided STTA during Year 1 to assist with IWMD formation.

#### **Achievements:**

##### **Establishment (Year 1)**

- Establishment of two project Regional Offices to provide constant local support to project activities in Lower and Upper Egypt.
- Awareness meetings with MWRI managing staff (Undersecretaries and General Directors) within the five target directorates.
- Preparation of a template and guidelines for the IWMD organigram. These were approved and used to organize and staff the newly established 23 IWMDs.

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- Assistance to the identification and assignment of the IWMD directors and managing staff (engineers).
- Support to identification and allocation of facilities for IWMDs.
- Support to the preparation and ratification of decrees confirming the IWMDs, their definition, staffing, etc.

Table 1 IWMD Formation Decrees

Type	Lower Egypt (2 directorates)	Upper Egypt (3 directorates)
Initiation of process	Decree 541/2004 (Nov 10)	
Assignment of IWMD directors	Decree 916/2004 (Dec 21)	Qena decree 1008/2004 (Dec 28), Aswan decree 277/2005 (April 14)
Assignment of engineers to IWMDs	Decrees 94/2005 (Feb 2) and 102/2005 (Feb 15)	
Definition of boundaries	Decrees 144/2005 and 146/2005 (March 13)	Decrees 242/2005 (April 29), and 145/2005 (March 14)
Assignment of other technical and administrative staff	Two Under secretarial Decrees	Two Under secretarial Decrees

- Implementation of training activities in the five target directorates on organizational management and staffing of IWMDs. Trainees included director and four section heads for each IWMD (five training events, 160 trainees).
- Monthly coordination meetings were held with MWRI managing staff (Undersecretaries, General Directors, and IWMD directors) within the five target directorates to disseminate information, monitor progress, discuss upcoming steps, identify roadblocks, and share experiences.
- Preparation and approval of a template for IWMD monthly reports. These are now being prepared regularly by each IWMD manager.
- Support for dividing Qena directorate into two directorates (East and West).
- Facilitation of transfer of staff and equipment. A protocol was signed between EPADP and ID Chairmen to facilitate staff transfer and ensure IWMD support and collaboration with EPADP projects.
- Lobbying for MWRI maximal support to the newly established IWMDs. Several field trips were organized with Eng. Gamil, Head of IWMU, Dr. Bahaa Saad, Chairman of the Irrigation Department (ID), Eng. Abd-El Hakeem, Chairman of EPADP and others.
- Eng. Gamil Mahmoud, Head of IWMU, accompanied H.E. the Minister on a visit to Quesna and Zifta Districts in June 2005. H.E. the Minister showed significant interest and support in the establishment and functioning of the IWMDs. Additional resources and notably incentives were considered by the MWRI to support IWMDs.
- The Annual Workplan Workshop was held in Alexandria on September 16-18, 2005. Project achievements were presented, and the Year 2 Workplan was approved. Five IWMD managers were also invited to present their perspective of the IWMD concept and benefits. These presentations were very well received and contributed to strengthen MWRI support for the IWMD concept.

### Capacity Building (Year 2 and 3)

- Monthly coordination meetings were held with Undersecretaries, General Directors, and IWMD managers in the five target directorates. Outputs included dissemination of information, monitoring of progress, discussion of upcoming events, identification of roadblocks, and sharing of experiences.
- Drafting of report template and support to preparation of monthly reports by IWMD managers (reports submitted to General Directors).
- IWMD managers prepared and submitted IWMD monthly reports to General Directors, who in turn prepared directorate monthly reports.
- Continued technical and administrative empowerment and advice provided by the two regional project offices. Support to assignment and definition of responsibilities of all technical and administrative staff in the IWMDs.
- Establishment of a training room in each IWMD.
- Facilitation of transfer of equipment, facilities, budgets, and staff from EPADP and other MWRI entities to IWMDs.
- Training course on management & communications for IWMD managers and section heads.
- All managers of IWMDs, maintenance sections staff on the directorate and district level were trained during April 2006 in Integrated Channel Maintenance Planning (canals and drains maintenance planning). The IWMDs engineers (61 IWMD staff) were trained in establishment of canals and drains maintenance database, procedures for filling the “maintenance database templates”, proper maintenance methods, inspection on maintenance needs, participatory channel maintenance needs assessment at branch canal level, budgeting of maintenance works, prioritization of maintenance works, and formulation of annual maintenance plans.
- Integrated Maintenance Plans were prepared for 2006/2007 and 2007-2008 by all 27 IWMDs.
- Provision of digital base maps for each IWMD
- Lobbying for MWRI maximal support to the newly established IWMDs. Several field trips were organized with Eng. Gamil, Head of IWMU, and other MWRI officials.
- Refresher course on IWMD establishment and organization was held for IWMD and directorate management staff.
- Three LIFE IWRM awareness workshops were held for over 80 MWRI irrigation and drainage top officials (Undersecretaries and General Directors) from Upper and Middle Egypt; and East, West, and Middle Delta. Eng. Gamil Mahmoud (Steering Committee Chairman), Dr. Mohamed Bahaa El Deen Saad (Chairman Irrigation Department), Eng. Mohamed Reda El Bandary (Irrigation Sector Head), Eric Viala (USAID) all participated. Presentations were given by staff from the IWMDs. Participants visited an IWMD.
- Follow-up Annual Workshops were held in September 2006 and 2007. Project, IWMD & directorate staff made presentations. HE Minister MWRI, USAID staff, and members of the steering committee attended. The workplans for the following years were discussed and approved.

### Sustainability (Year 4)

- Monthly coordination meetings held with Undersecretaries, General Directors, and IWMD managers in the five target directorates (New Zifta, W. Sharkiya, E. Qena, W. Qena, and Aswan). The meetings were used for dissemination of information, monitoring of progress, discussion of upcoming events, identification of roadblocks, and sharing of experiences.

- IWMD managers prepared and submitted IWMD monthly reports to General Directors, who in turn prepared directorate monthly reports.
- IWMU sponsored several meetings with Irrigation Department and Drainage Authority (EPADP) to discuss budget arrangements for IWMDs.
- Conducted monthly coordination meetings at directorate level for the maintenance engineers. These meetings were held to coordinate, monitor, and follow up maintenance activities among IWMDs in each directorate.
- Integrated Maintenance Plans completed for 2008/2009 by all 27 IWMDs. At least 10% of BCWUA action plan items were included in the maintenance plans.
- Completed collection of process documentation on maintenance contracts.
- Maintenance data bases (DB) installed in all IWMDs. IWMDs are entering all records for over 100 contracts into the databases. Back data for 2006-2007 has been entered. All new contracts will be added to the DBs once it is awarded. The IWMDs staff are using the maintenance DB in the preparation of monthly reports submitted to Irrigation Sector concerning ongoing maintenance activities.
- Arabic and English Guidelines were prepared and distributed on process for formation of IWMDs, IWMD organization, and integrated maintenance.
- IWMU sponsored meeting held with Irrigation Department and Drainage Authority (EPADP) to discuss budget arrangements for IWMDs.
- A sustainability plan prepared by IWMU and approved by MWRI Irrigation Department was sent to USAID in March 2008. Project sustainability was discussed by the MWRI Steering Committee on 20 May 2008 and approved by HE Minister MWRI.
- The Final Project workshop was held in Alexandria 22-24 September. It was attended by HE Minister MWRI, Eng. Wafaa Faltaous (USAID), Steering Committee members, other MWRI invitees, and IWMU & LIFE TA team staff.

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**Table 2 Task 1 Accomplishments vs Project Benchmarks**

**Task No. 1: Formation of IWMDs - Life-of-Project Schedule**

Activities		Sub-Activities	Outputs	Completed			
				Yr 1	Yr2	Yr3	Yr4
1. Support to Establishment of IWMDs	1.1	Provision of guidelines for IWMD definition	MWRRI decrees to officialize IWMDs - Base maps for each IWMD	100%	75%	100%	100%
	1.2	Preparation of base maps					
	1.3	Facilitation until finalization through decrees					
2. Support to preparation of organizational plans and transfer of staff	2.1	Facilitation of assignment of IWMD Managers	Organizational plans approved	100%	100%	100%	100%
	2.2	Provision of guidelines for preparation of organizational plan					
	2.3	Support/training for preparation of organizational plans					
	2.4	Facilitation of transfer					
3. Support to transfer of facilities and equipment	3.1	Awareness raising at different levels of ID, EPADP, MED	Equipment /facilities transferred	75%	75%	100%	100%
	3.2	Support to inventory of facilities/equipment					
	3.3	Facilitation of transfer					
4. Support to preparation of maintenance plans and budget requests	4.1	Provision of guidelines for preparation of maintenance plans	Maintenance plans prepared by IWMDs - Improved implementation & monitoring	0%	75%	100%	100%
	4.2	Trainings on preparation of maintenance plans					
	4.3	Support for preparation of maintenance plans					
	4.4	Monitoring and Evaluation					
5. Revision/clarification of roles and responsibilities	5.1	Inventory of existing roles and responsibilities	Clear roles and responsibilities for all IWMD staff	30%	75%	100%	100%
	5.2	Revision and clarification of mandates					
6. Support to IWMD management and performance monitoring	6.1	Building of management capacity	Monthly reports and meetings	50%	60%	80%	100%
	6.2	Monitoring of IWMD performance					
7. Training and capacity building activities	7.1	Preparation of annual training plan	Number of training courses delivered	30%	60%	80%	100%
	7.2	Preparation of training modules					
	7.3	Implementation					
	7.4	Monitoring and Evaluation					

Direct activity  
 Facilitation, capacity-building, follow-up

### Task 2: Formation of Branch Canal Water Users' Associations

#### Objective:

The overall objective of this task was to enhance decentralized water management decision making and increased participation of all water users in such decision making. Greater civic responsibility can be expected in maintaining the water conveyance infrastructure and protecting the quality of local water resources through better management of locally generated liquid and solid wastes. To that end, the approach was to form and activate functional and sustainable Branch Canal Water Users Associations (BCWUAs).

#### Staff:

Eric Viala (LTTA, Expatriate Water Resources Management Specialist) was responsible for this task until his departure in March 2007. Eng. Moamen Mohamed Said El Sharkawy (IWMU) and Eng. Amira Abdel Hady (IWMU) assisted Eric Viala and managed this task after his departure. Dr. Khaled Wassif (MWRI) provided local LTTA support during Year 2. Dr. Fouad El-Sayed Abdalla Kheiralla, Senior Institutional/Organizational Specialist provided STTA training support throughout the project. CDIAS staff provided local STTA support during Year 1.

#### Achievements:

##### Establishment (Year 1 and 2)

- Awareness meetings held with MWRI managing staff (Undersecretaries and General Directors) within the five target directorates.
- Mobilization of local IAS managing staff in both Lower and Upper Egypt.
- Support to assignment of IAS staff within IWMDs for establishment of BCWUAs (eight districts selected for first year implementation, two per target directorate).
- Implementation of six BCWUA establishment training courses for district level IAS staff (120 trainees, total of 20 three-day training events) in the eight districts selected for first year (Year 1)
- Implementation of corresponding On-the-Job training activities by district level IAS staff under the supervision of IWMD directors. These activities focus on definition of BCWUAs to be formed, water user awareness and mobilization, and election of representative assemblies & BCWUA boards.
- Support to signing of MOUs between MWRI and BCWUAs for 175 BCWUAs established in 8 IWMDs. (Year 1)
- A strategy memo was prepared by IWMU and approved by H.E. the Minister to empower the IWMDs to form the BCWUAs using their own resources. (Year 1)
- Preparation of BCWUA initiation decrees for all 16 IWMDs without BCWUAs. These decrees were signed by H.E. the Minister. (Year 2)
- Completion of training activities on BCWUA establishment for IWMD staff in 16 IWMDs. All 16 IWMDs have established BCWUAs (total of 312 new ones): data on water users was collected, BCWUA areas were defined, water user representatives were selected, Board elections were held and Board members confirmed through decrees from MWRI Undersecretaries. (Year 2)
- Formation and restructuring BCWUAs in 5 IWMDs in Lower Egypt was carried out to increase BCWUAs coverage of branch canals, to provide participation opportunities for all water users at district level, and to increase the number of water users benefiting from the activities. (Year 2)

- Establishment of 601 BCWUAs covering all the branch canals in the 27 IWMDs completed. Sayalet Badran BCWUA in Luxor IWMD was later merged with El Salamayi BCWUA. There are now 600 BCWUAs covering all the branch canals in the 27 IWMDs. (Year 2)

### **Activation (Year 2 and Year 3)**

- Completion of training activities on BCWUA activation for IWMD staff in 11 IWMDs where BCWUAs were established during bridging period and Year 1. All concerned BCWUAs (273) subsequently approved Internal Regulations and prepared BC priorities. (Year 2)
- Completion of training activities on BCWUA activation for IWMD staff in 16 IWMDs where BCWUAs were established during Year 2. All concerned BCWUAs subsequently approved Internal Regulations and prepared BC priorities. (Year 3)
- Support to the 27 IWMDs for holding regular individual meetings and (twice) seasonal district-level meetings with their BCWUAs. (Year 2/3)
- Permanent office locations for BCWUAs established. (Year 3)
- IWMDs prepared membership cards for all board members and chairpersons. (Year 3)

### **Participatory Irrigation Management (Year 3 and 4)**

- These activities were designed to assist IWMD staff to engage BCWUAs in strengthening BCWUA organizations, encouraging BCWUA participation in decision making, and involving users in water management. Typical activities introduced to the BCWUAs included procedures for monitoring branch canal rotation schedules, providing crop data to the IWMDs, resolving conflicts, sharing in canal and structure maintenance, monitoring branch canal maintenance contracts, and conducting public awareness programs. These activities were provided for IWMD staff to engage BCWUAs in water management through specific activities regarding operation and maintenance of waterways, improvement of waste management and water quality, and communications with and within BCWUAs.
- Winter/Summer regular and seasonal meetings with BCWUA chairpersons and members were held by all IWMDs. These seasonal meetings were used for district-level information sharing and discussions between IWMD staff and BCWUAs representatives
- East and West Qena Directorates initiated BC maintenance activities using local labors jointly supervised by BCWUA and districts in 9 IWMDs and 18 BCs.
- Assigned specific tasks and activities to all BCWUAs board members under the framework of participatory water management.
- Branch canals maintenance priorities updated and annual action plans prepared.
- Central directorate level BCWUA meetings based on the MWRI request to directorates to review the list of prioritized maintenance activities proposed by BCWUAs for possible special funding.

### **Technical Assistance and Training Program**

- The project provided technical assistance for IWMDs and directorate staff, monitored progress, and followed up BCWUAs formation activities in all the 27 IWMDs.
- Decentralization of BCWUA formation through a process that streamlined training and simplified formation procedures allowed IWMD staff to directly establish and activate BCWUAs. The streamlined BCWUA establishment training program is presented in the following table.

**Table 3 BCWUA Establishment Training Program**

<b>Course</b>	<b>Objective</b>
Orientation (i)	To inform field staff of the process, training activities and objectives of establishment of BCWUAs in IWMDs.
Orientation (ii)	To provide field staff with general concepts and background on communication, conflict resolution, and gender equity
Data Collection & Stakeholders Analysis	To provide field staff with procedures and tools for data collection and stakeholders' analysis for establishment of BCWUAs.
Canal Grouping	To provide field staff with procedures and tools for canal grouping and identification of number of BCWUAs to be established at IWMD level.
Election & Roles & Responsibility of RA	To provide field staff with procedures and tools to conduct election process of representative assemblies (RAs) and define roles and responsibilities of RAs.
Election & Roles & Responsibility of BCWUA Board	To provide field staff with procedures and tools to assist election process of board members and define roles and responsibilities of board members.

- Orientation training given to all 27 IWMDs involving all General Directorate staff and IWMDs section heads.
- Preparation and Establishment training for 27 IWMDs involving IWMD Managers and WA staff.
- Activation training for 27 IWMDs involving IWMD section heads and Water Advisory (WA) teams.
- Participatory water management training phase 1 (Introduction), for directorate and IWMD Managers, section heads, and WA engineers.
- Participatory water management training phase 2 (Training of Trainers), for directorate and IWMD Managers, section heads, and WA engineers.
- BCWUAs Chairpersons Orientation Workshops for BCWUAs chairpersons to introduce common messages concerning participation concepts and benefits, participatory organization structure and legal base, participatory water management activities, gender equity, and roles of BCWUA women members.
- BCWUA water management operations training (BCWUAs). This training was introduced by IWMDs staff to BCWUA board members. The training included procedures for monitoring branch canal rotation schedules, providing crop data to the IWMDs, resolving conflicts, sharing in canal and structure maintenance, monitoring branch canal maintenance contracts, and conducting public awareness programs. 3,447 board members, out of which 238 female board members, attended this training.
- IWMDs trained their BCWUAs board members on PWM activities. Training was conducted for all assigned BCWUAs board members on their specific tasks and activities under the framework of participatory water management within their IWMDs. About 3,400 board members (7% women) participated in this training.
- BCWUAs Chairpersons Orientation Workshops for BCWUAs chairpersons to introduce common messages concerning participation concepts and benefits, participatory organization structure and legal base, participatory water management activities, gender equity, and roles of BCWUA women members.
- Guidelines were prepared on Process for Formation of BCWUAs, BCWUA Establishment, BCWUA Activation, and Participatory Water Management.

- Organizational and process documentation were compiled and transmitted to all BCWUAs in IWMDs. Process documentation included decrees, MOUs, internal regulations, maintenance priorities, and action plans for each all BCWUA.
- Preparation and dissemination of illustrated Discussion Guide on BCWUA formation to support IWMD staff during BCWUA establishment activities.
- Support and monitoring of BCWUAs activation and participatory water management activities.
- Followed up BCWUAs activation and participatory water management activities.
- BCWUA Chairpersons' survey was conducted.
- Assigned water advisory coordinators at directorate level.
- Conducted monthly coordination meetings at directorate level for the water advisory engineers. These meetings are held to coordinate, monitor, and follow up participatory water management activities among IWMDs in each directorate.

### Important Events

- US Ambassador Francis Ricciardone visited Qena and met with BCWUA representatives in Luxor IWMD on 5 April 2006.
- On Nov 16 2006, the new Governor of Aswan visited project activities in Edfu, and met with BCWUA representatives and IWMD staff. Eng. Nabil Fawzy (LIFE Upper Egypt Regional advisor) facilitated the visit.
- On Nov 28 2006, a USAID Team visited project activities in Quesna and Santa IWMDs. They met with BCWUA representatives at El-Gaafaria canal. The USAID Team included Richard Rousseau (PSD Office Director), Jeremy Gustafson (Team Leader, Infrastructure Office), Suzanne Polak (Team Leader, Small Development Activities), and Eng Wafaa Faltaous (project CTO). They were accompanied by Eng. Gamil Mahmoud (Chairman Steering Committee/Head IWMU), Dr. Jeff Fredericks (COP), Eng. Maher Khodary (Lower Egypt Project Regional Advisor), Dr. Wadie Mankarious and Eric Viala (Project Task Leaders).
- Eng Wafaa Faltaous (CTO) visited all the five target directorates and met with BCWUAs throughout the life of the project.

### Activities

- Development of streamlined process for formation of BCWUAs under the IWMD framework.
- Preparation of English and Arabic guidelines on Process for Formation of BCWUAs, BCWUA Establishment, BCWUA Activation, and Participatory Water Management.
- Formation of Water Advisory (WA) section under the IWMD organization structure including a WA engineer and WA team of technicians in the 27 IWMDs.
- Completion of hydrologic, hydraulic, and social data collection for all branch canals in the 27 IWMDs.
- Structuring and grouping all branch canals to be included and covered by BCWUAs in the 27 IWMDs to provide participation opportunities for all water users at district level, and to increase the number of water users benefiting from the activities.
- Issuance of BCWUA Initiation Ministerial Decree for the 27 IWMDs.
- Election of Water Users Representatives (WURs) and BCWUAs board members for 601 BCWUAs in the 27 IWMDs.
- Establishment of 601 BCWUAs covering all the branch canals in the 27 IWMDs was completed. The established BCWUAs include about 500,000 water user, 12,080 WURs, and 3,948 board members.

- Issuance of BCWUA Establishment Undersecretaries Decree for 601 BCWUAs in the 27 IWMDs.
- Development and issuance of BCWUA Memorandum of Understanding (MOU) and internal regulations for 601 BCWUAs in the 27 IWMDs.
- Development of maintenance needs assessments, maintenance priorities, and annual action plans for 601 BCWUAs in the 27 IWMDs.
- Support and monitoring of BCWUAs activation and participatory water management activities in 601 BCWUAs in the 27 IWMDs. These activities were designed to assist IWMD staff to engage BCWUAs in strengthening BCWUA organizations, encouraging BCWUA participation in decision making, and involving users in water management. Typical activities introduced to the BCWUAs included procedures for monitoring branch canal rotation schedules, providing crop data to the IWMDs, resolving conflicts, sharing in canal and structure maintenance, monitoring branch canal maintenance contracts, and conducting public awareness programs.
- Development and installation of WA-BCWUAs database at the 27 IWMDs and five directorates level.
- Supporting BCWUAs board members assignments with regard to PWM activities.
- Holding district-level Winter/Summer regular and seasonal meetings with BCWUA chairpersons and members in the 27 IWMDs. These seasonal meetings are used for district-level information sharing and discussions between IWMD staff and BCWUAs representatives.
- Holding directorate-level Annual Coordination meetings with BCWUAs chairpersons in five directorates.
- Initiation of BC maintenance activities using local labors jointly supervised by BCWUA and districts in 7 IWMDs.
- Conducting BCWUA Chairpersons' survey to monitor and evaluate BCWUA-IWMD participatory activities.
- Streamlining gender concepts through all BCWUAs formation activities in all 601 BCWUAs in the 27 IWMDs. Representation of females on Boards is 12%; 10 % representation on RAs. Most boards have at least one women representative. Female members were trained and play a key role in their BCWUAs community awareness.
- Compilation of organizational documentation and process documentation of all 601 BCWUAs. This included decrees, MOUs, internal regulations, maintenance priorities, annual action plans, and PWM forms.
- Documentation of BCWUA/IWMD success stories for 552 BCWUAs in the 27 IWMDs
- Holding directorate-level WA meeting for monitoring and follow-up purposes.

**End of Project Status**

The status of BCWUAs at the end of Year 4 is presented in **Table 4**.

**Table 4 Status of BCWUAs**

<b>Directorate</b>	<b>W. Sharkiya</b>	<b>New Zifta</b>	<b>E. Qena</b>	<b>W. Qena</b>	<b>Aswan</b>	<b>Total</b>
<b>Milestone</b>						
Established	151	105	102	124	119	601 <sup>1</sup>
MOU	151	105	101	124	119	600
Internal regulations	151	105	101	124	119	600
BC Priorities/ Maintenance Plans	151	105	101	124	119	600
Action Plans	151	105	101	124	119	600

<sup>1</sup> Sayalet Badran BCWUA, Luxor IWMD, E. Qena merged with El Salamayi BCWUA.

**Water Distribution:** Each BCWUA now monitors its own branch canal water delivery system. Each participates in planning the district level rotation schedule and monitors canal water levels and gate operations, providing feedback on performance and user satisfaction to the IWMD on a regular basis. BCWUAs develop their own internal rotation schedule for the water distribution between off-takes (mesqas) downstream and their branch canal intake. Each BCWUA assists the IWMD of which it is a part in the collection of accurate data regarding irrigated areas and cropping patterns. Water users effectively share in the operation and management of their irrigation system to improve allocation, distribution, and equity of allocating their water resources.

**Maintenance:** Together, the BCWUAs and IWMDs have conducted branch canal needs assessments and set maintenance priorities. The BCWUAs then participate with the IWMDs in monitoring and evaluating contractor maintenance activities. BCWUAs are informed of maintenance works and schedules, and are encouraged to develop and implement their own small-scale maintenance activities.

**Conflict Resolution:** BCWUAs have been given the authority and responsibility to deal directly with complaints and violations, and to resolve water user conflicts. Previously the District Managers had many people coming to see them directly to complain, often about the same issue. Now water users are instructed to register their complaints through their BCWUA. In many instances complaints can be solved internally by the chairperson. The involvement of the BCWUA in conflict resolution also makes it possible to settle many violations without involving the police.

**Communication and Awareness:** Activated and strengthened BCWUAs also play an important role in communicating and exchanging information about water management issues. Their representatives are expected to attend monthly and seasonal meetings with the IWMDs, implement awareness activities regarding water conservation and water quality, and disseminate information to water users and the community at large.

**Capacity Building:** Each IWMD has a water advisory team (WA) that works with the BCWUA chairpersons and boards to maintain a formal dialogue with the IWMD and to train BCWUA personnel in procedures for performing administrative and organizational services for their members. BCWUAs with assistance from the WA teams are expected to establish their own offices, keep their own records, and identify persons to work with the IWMD on various participatory water management (PWM) activities.

Table 5 Task 2 Accomplishments vs Project Benchmarks

Task No. 2: Formation of BCWUAs - Life-of-Project Schedule

Activities	Sub-Activities	Year 1				Year 2				Year 3				Year 4				Outputs	Completed			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		Yr 1	Yr2	Yr3	Yr4
1. Standardization of BCWUA formation process	1.1 Updating of process																					
	1.2 Updating of guidelines																					
	1.3 Updating of training material																					
2. Awareness raising activities	2.1 Preparation of materials																					
	2.2 Support to awareness events																					
3. Training of IWMD staff for BCWUA formation and activation	3.1 Orientation																					
	3.2 Preparation																					
	3.3 Establishment																					
	3.4 Activation																					
	3.5 Participatory Water Management (PWM)																					
4. Monitoring of BCWUAs	4.1 Updating of M&E tools																					
	4.2 Monitoring of BCWUAs																					
	4.3 Support to production of process documentation																					
5. Support Participatory Water Management	5.1 Update of guidelines for PWM																					
	5.2 Planning of PWM																					
	5.3 Support to PWM																					
	5.4 Support to BCWUAs Org/Inst. Strengthening																					
	5.5 Monitoring																					

Direct activity  
 Facilitation, capacity-building, follow-up

### Task 3: Equitable Allocation of Water Resources

#### Objective:

The objective of Task 3 was to improve water management decision making processes within the MWRI by providing decentralized tools for improved data collection, analysis and use. The first and most critical sub-task was to achieve equitable water allocation via the “Matching Irrigation Supplies and Demands” (MISD) program at both district and directorate levels through accurate assessment of demands and better control of allocations with improved water monitoring. The other sub-task was to build data base management capacity at both district and directorate levels to support Integrated Water Resource Management.

#### Staff:

Eric Viala (LTTA, Expatriate Water Resources Management Specialist) was responsible for this task until his departure in March 2007. Dr. Ragab Ali Abdel Azim (Water Resources Management Specialist) coordinated this task with assistance from Eng. Alaa Abbas (IWMU), Eng. Mohamed Hamed (IWMU), Eng. Hisham Shehab (IWMU), and Dr. Mohamed Rami Mahmoud (MWRI). Dr Tom Sheng (CADI) provided short-term technical assistance.

#### Achievements:

##### Establishment of Water Management Teams

- IWMD boundaries were defined.
- IWMD and directorate water distribution staff were identified and assigned.
- Initial awareness meetings on integrated water management were held with MWRI managing staff (Undersecretaries and General Directors) within the five target directorates.
- Water monitoring and distribution staff within IWMDs were identified and assigned with support from the project.
- Guidelines for responsibilities of water distribution staff were prepared.
- The water distribution section in each IWMD was established and staffed with capable people; each such section is headed by a civil engineer and assisted by trained technicians.
- Links were established between water distribution sections at IWMDs and directorates.
- With project support, monthly meetings for IWMD water distribution engineers and staff at directorates were introduced as a tool to achieve necessary linkages. The General Directorate Water Distribution Section is now taking the lead on conducting such meetings to assure sustainability after project phase out.
- Training of technicians on canal operation was completed in all IWMDs; over 435 technicians & baharies (gate keepers) were trained on water management.

##### Water monitoring networks established

- Defined and approved flow monitoring network within each district.
- Facilitated calibration and transfer to districts of 37 current meters (new equipment previously owned by Telemetry Department).
- Procured 10 current meters and distributed them to the districts.
- Procured 30 flow monitoring boats for the IWMDs.
- Prepared guidelines on principles of efficient water management, flow measurement, and calibration of canal flow rating curves.

- Prepared and implemented courses on flow monitoring and GPS use in each IWMD (3 training events, attended by a total of 65 IWMD staff).
- Initiated and carried out a water flow monitoring and structure calibration program both at directorate and district levels.
- Selected monitoring sites on canals to include all key sites that determine district water delivery volumes on a daily basis and sites on drains to measure the drainage water generated within each IWMD to assess water distribution efficiency. A flow monitoring program was implemented in each IWMD, with a total of 84 canal inflow/outflow sites monitored (three sites per IWMD on average) and 79 main drain inflow/outflow sites. 121 marble staff gages were installed to support flow monitoring.
- With assistance from the MWRI Water Quality Unit (WQU), 380 sites on canals and drains were identified for water quality monitoring. These sites included the key inflow/outflow sites.
- Conducted On-the-Job-Training activities on flow monitoring and of training activities on calibration for IWMD staff in all five target directorates.
- A calibration report compiling all 84 canal inflow/outflow sites & 57 drainage sites out of 79 was prepared.
- Supported evaluation of biweekly volumetric water supplies to all 27 IWMDs for the period May 04-present at the calibrated canal inflow/outflow sites.
- Extended the water monitoring program to cover measurements of flows to branch canals (BC) through a prioritized program set up by each IWMD so that within three years all BCs will be calibrated.

**Table 6 Water Flow Monitoring Points**

<b>Sites</b> \ <b>Directorate</b>	<b>W. Sharkiya</b>	<b>New Zifta</b>	<b>E. Qena</b>	<b>W. Qena</b>	<b>Aswan</b>	<b>Total</b>
Canals	19	22	10	14	19	84
Drains	17	14	9	11	28	79
Total	36	36	19	25	47	163

- In collaboration with MWRI Telemetry Section, procured and installed seven Campbell Scientific data loggers. GSM modem connections were established to allow water level and related flow data to be accessed and monitored on a continuous basis at different management levels of the MWRI. A report on the Data Logger Telemetry program was issued. The project also supported installation of two data loggers purchased by MWRI at two pump stations in Aswan Directorate.
- Procured equipment for groundwater and water quality monitoring to all (27/27) IWMDs.
- Completed training activities on groundwater and water quality monitoring for IWMD staff in all five target directorates.
- About 9,000 wells were inventoried and entered into the groundwater database.

#### **Information System Established**

The LIFE-IWRM project provided technical assistance, equipment, and training to the IWMDs and irrigation directorates to develop information systems to facilitate integrated water resources management activities and improve the quality of irrigation service. By the end of Year 4, all IWMDs were equipped with computer hardware and software, GPS receivers, and digital maps. A number of database applications for measurement-based water management practices were developed and put into place, including a water monitoring

system with dataloggers and databases for storing and retrieving information. Digital mapping was completed to support the IWMD boundary delineation and geo-referencing canal and drainage networks, monitoring sites, branch canals, and BCWUA service areas. The specific accomplishments were:

- Installed a large number of computer systems (117) in 27 IWMDs and five irrigation directorates.
- Implemented eight water resource databases/worksheets, namely MISD, Water Level/Discharge, Complaint, Violation, Groundwater, Water Quality, Maintenance, and BCWUA, at 27 IWMDs and five directorates.
- Installed seven data loggers with sensors to provide near real-time water data at four districts and one directorate.
- Trained selected staff from the IWMDs and directorates on computer basics, hardware maintenance, database O&M, and GPS use.
- Built capacity for digital mapping at all IWMDs and directorates.
- Conducted a survey of branch canal areas and supported an inventory of water structures at each IWMD using GPS receivers.
- Verified and finalized agreement on IWMD irrigable areas between MWRI and MALR based on the BC areas GPS survey.
- Constructed and printed geo-referenced IWMD and directorate maps, including water objects such as canals, drains, water structures, pump stations, and groundwater wells.
- Supported the IWMD M&E program with data from the project supported databases.
- Aggregated the IWMD water and agricultural data at each directorate using the built-in functionality of the project supported databases/worksheets.
- Linked some of the water resources tabular data to the geo-referenced map objects to provide additional analytical functionality and spatially distributed water information for managers.
- Annual and end of project information system assessments were conducted and related reports prepared.

As of June 2008, digital water data are readily available via computerized information systems at all IWMDs and directorates. Data quality has improved over the four years; standards and quality control measures have been initiated. The information system tools supported the establishment of IWMDs and formation of the BCWUAs. The IWMDs and directorates are using the tools to support their measurement-based water management activities. All managers are able to quantify their water inflows and outflows and crop water requirements via the water monitoring program and information systems, and use the data/information for making timely, informed management decisions to improve the quality of irrigation service.

### **Matching Irrigation Supply and Demand**

The Matching Irrigation and Demand (MISD) program is a joint effort of MWRI and MALR. The objective of MISD is to establish a system that improves the flow of information on water demands and supply at the local district level for use in determining and providing crop information to MWRI central level to determine High Aswan Dam (HAD) releases and allocations along the Nile. Specific achievements include:

- Implemented the MWRI policy on MISD in each IWMD and directorate.
- Completed MISD training activities for IWMD staff in all five target directorates. All IWMDs are now regularly collecting agricultural crop data and preparing biweekly water requests according to the MISD process.

- Coordination meetings involving MALR and MWRI staff of IWMDs and directorates were held to improve data collection and exchange. and to activate and strengthen the MISD process. One of the major issues facing MISD was the discrepancies in MISD command areas. These coordination meetings helped resolve the problem leading to agreement on the BC areas after conducting the GPS survey.
- Installation of MISD database in all 27 IWMDs. MISD data bases are working in all IWMDs. IWMD staff are now regularly collecting agricultural crop data and preparing biweekly water requests according to the MISD process. MISD directorate data base was prepared and installed at directorate level to assist in consolidating biweekly IWMDs crop data and water requests at directorate.
- MISD process ongoing in all 27 IWMDs and directorates. IWMDs now calculate biweekly water demands.
- MISD database consolidation at directorate installed. Under this activity, canal coding system was devised so that IWMDs canals can be linked to directorate main canals. This canal coding system was used as input to maintenance database.
- MISD database manuals were prepared for directorates and IWMDs.
- Guidelines were prepared on matching irrigation supply and demand.
- BCWUAs are collecting crop data.
- Biweekly IWMD inflow data and water demands calculated.
- Rotation schedules monitored by BCWUAs
- Supply adjusted to match demand at district level

### **Digital Mapping Introduced**

Digital maps are essential tools to compile and communicate water information and promote data-based water management decision-making. The project has developed digital mapping capacity by:

- Procuring and installing computer hardware and mapping software;
- Providing adequate support maps from the Survey Authority;
- Conducting mapping system training courses; and
- Supporting the integration of spatial databases.

Achievements under this activity included:

- Completed training activities on digital mapping for IWMD staff in all five target directorates.
- ARC-View GIS software delivered to directorates. Two training events were completed on ARC-View GIS for staff in all five target directorates.
- Guidelines were prepared on mapping branch canal areas.
- Field measurement of BC command areas using GPS for all IWMDs. Non-irrigable area for each BC was digitized from satellite imagery. This information was used to reconcile long standing differences between MALR and MWRI on irrigable area (MISD area) needed for accurate crop water requirement calculations.
- Digital mapping refresher training was conducted for all IWMDs
- 1/25,000 digital base maps for all IWMDs in all five target directorates were scanned and geocoded.
- Canals and drains were digitized for all IWMDs and entered into the digital maps.
- Digital map consolidation at directorate level was initiated.
- Using GPS field surveys, 1:25,000 survey maps, satellite imagery digital data and related attribute tables were prepared for:
  - District administrative boundaries: District gross area was calculated.

- Canals (Arabic name, English name, length of the canal, water management rating for the canals, number of farmers, Ministerial decree area, MARL area, GPS gross area, GPS urban area, GPS net irrigable area, and a unique code used for canal identification and tied to MISD program).
- Drains (Arabic name and English name).
- BCWUA locations (Arabic name, English name, associated BC, chairperson name, number of male and female users, and office location).
- BCWUA boundaries and coverage area.
- IWMD office (name, address, phone number, email, etc.)
- Well data (9000), canal water structures, water discharge monitoring network sites (165), and water quality monitoring network sites (380).
- Water structure inventory completed using GPS with all characteristics of the structures then transferred into digital format. This information was converted into a GIS format for map presentation.

### **Integrated Water Resource Management Plans Prepared**

Integrated water resources planning requires collecting accurate and reliable information on water uses, water availability and infrastructure. Monitoring water resources improves the knowledge of their availability and use (in terms of location, type, quality, quantity), and thus the planning of water management projects and activities. The project has assisted this process by providing procedures and guidelines to prepare inventories or assessments, and improve processes. The project supported the following activities and achievements:

- Preparation of guidelines for carrying out water resource inventories, developing water budget/water balances, and preparing integrated water resources management plans (IWRMP).
- Preparation of seasonal water budgets by each IWMD comparing water needs and supplies, for the 2006/2007 winter season and the 2007 summer season.
- Preparation of water resources inventories by IWMDs. Data were collected in all IWMDs and used by directorates and the Irrigation Sector to determine targeted water supply to each IWMD.
- Preparation and approval by the irrigation sector of targeted releases for IWMDs for year 2007/2008.
- Preparation of directorate water management plans for Year 2007/08.
- Completion of water control structure inventories by all IWMDs.
- Completion of training in IWRMP (Integrated Water Resource Management Planning).
- IWRMPs were prepared by each IWMD and submitted to Irrigation Sector for review and action.



## **Task 4: Improved Maintenance and Upgrading of Water Management Equipment**

### **Objective:**

The purpose of this Task was to assess the capacity of the Governorate technical schools administered by the Central Department of Technical Education within the Ministry of Education (MOE) to provide training in the repair and maintenance of agricultural and irrigation equipment and in business management. A rapid assessment of both vocational and technical schools in the project's priority governorates was conducted and a report submitted to USAID in September 2005. USAID requested an updated assessment that included data collected from additional focus group meetings with newly formed BCWUAs and an extended pump maintenance workshop survey. The final report "Updated Assessment of Egyptian Farmers' Need for Improved Maintenance of Irrigation Equipment and Training to Manage Water Users' Associations" was prepared and submitted to USAID in November 2006

### **Staff:**

Ms. Cheryl Groff (AED), Sr. Education, Communication, and Public Awareness and Participation Specialist, was the coordinator for this task for one year. Dr. Wadie Fahim Mankarious (IRG), Senior Organization/Institutional Development Specialist, followed Ms. Groff until end of the project.

### **Achievements:**

Activities carried out by LIFE IWRM included:

- The original assessment was carried out in Year 1 of the project and included three focus group meetings with 9 BCWUAs with 35 participants. In addition, interviews with 7 technical schools (agricultural, commercial and industrial) in Upper and Lower Egypt were conducted. A report was issued and submitted to USAID in September 2005. USAID reviewed the original report and recommended that the activity should be expanded to include input from additional BCWUAs and pump repair workshops.
- A follow-up work plan was prepared and approved by MWRI and USAID to prepare an updated assessment study.
- For the purpose of the updated assessment study, during Year 2 of the project additional focus group meetings and an extended pump maintenance workshop survey were conducted in three governorates. Focus group meetings (3) were conducted with 63 BCWUAs Board members from 18 BCWUAs. Five pump repair workshops were visited and 12 mechanics interviewed.
- A final report titled "Updated Assessment of Egyptian Farmers' Need for Improved Maintenance of Irrigation Equipment and Training to Manage Water Users' Associations" was submitted to USAID.
- The updated assessment recommended that:
  - Training and awareness material should be prepared on maintenance of irrigation pumps.
  - BCWUA chairpersons should be provided with this material and encouraged to conduct awareness programs among their members.
  - Training material for a pump maintenance course and a handout for BCWUAs should be prepared and delivered for distribution by IWMDs to BCWUAs.
- Training material for a pump maintenance course and a handout for BCWUAs were prepared. Training material was delivered to IWMDs for distribution to BCWUAs.

## **Task 5: Environmental Services for Improving Water Quality Management**

### **Objective:**

The extent of the problem of solid and liquid wastes and their adverse affect on the water quality of irrigation, drainage, and groundwater systems in the five target directorates is well documented (“Management of Solid and Liquid Wastes for IWMD and General Directorates”, H. Dorrah and H. El-Zonfely, September 2004). LIFE IWRM implemented a pilot activity to address this problem.

### **Staff:**

Dr. Wadie F. Mankarious (IRG) coordinated this task. He was assisted by Eng. Mohamed Hamed (IWMU). STTA was provided by Dr. Mohamed El-Hussaini (Waste Water Treatment Consultant) and Dr. Samir Ahmed El-Shimi (Ag Recycling Consultant). Environmental Quality International (EQI) provided technical assistance to prepare the feasibility study during Year 1. MWRI Water Quality Unit and MWRI Ground Water Sector assisted with the water monitoring program and the MWRI Water Communications Unit assisted with the public awareness activities.

### **Achievements:**

#### **Senbo Pilot Project:**

Senbo Branch Canal, (South Zifta IWMD, Gharbiya Governorate) was selected in Year 1 to implement a pilot to introduce environmental services for improving water quality management.

#### **Pilot Selection and Feasibility Study:**

- Prepared a work plan for implementing a pilot project. LIFE established cooperative linkage with key players of the activity.
- Several branch canals were identified for consideration as pilot and the decision was made to carrying out the pilot on Senbo Branch Canal, South Zifta IWMD, Zifta Directorate.
- Initiated public participation process by developing cooperative linkages with MWRI Zifta IWMD, Senbo Branch Canal Water User Association, Local Council, and Senbo Community Development Association.
- Senbo community stakeholders expressed full willingness to participate, and committed to contributing land for proposed solid and liquid waste alternatives.
- Designed and selected the most appropriate alternative solutions for the identified solid and liquid waste problems. Conducted several focus group sessions and structured meetings to discuss the proposed alternatives with Senbo stakeholder.
- Initiated water quality sampling for Senbo Canal and Damnhore El Wahsh Drain. Sampling was carried out by MWRI Water Quality Laboratory.
- Prepared a feasibility plan describing alternatives and interventions with recommendations for implementing the pilot project that included costs, economic and financial feasibility of alternatives, O&M requirements, identifies institutional constraints and requirements, etc.
- Stakeholder mapping plan prepared

- A field survey of over 200 households in Senbo was conducted to understand the status quo of solid waste collection, sanitation and water quality and also to know people satisfaction with the provision of these services.
- Initiated the design and selection of the most appropriate alternative solutions for the identified solid and liquid waste problems.
- A training course on “Financial Management” for the CDA and BCWUA Board Members was conducted.

### Liquid Waste Management:

- In order to cooperate with other donors, a proposal to the Japanese Embassy to leverage Japanese grant funds for construction and equipment for the Senbo Liquid Waste Water Treatment Pilot was submitted. A meeting was held with the Japanese Embassy, CDA, USAID, IWMU, and LIFE IWRM to discuss the proposal. There was no response, so the project relied on its limited resources to implement solutions to wastewater and solid waste problems.
- Prepared design, tender documents, and technical drawings for the DBAF wastewater treatment facility for Senbo Village.
- As a result of a letter sent by H.E. Minister MWRI to Minister of Agriculture, land for the DBAF in Senbo was reclassified from agriculture to public utilities land.
- A quotation for implementing the DBAF facility in Senbo was prepared, approved and published in Ahrum Newspaper. Four contractors out of 17 were selected through pre-qualification screening. High Technology Projects & Marketing was selected and a 90 day completion contract was signed in March 2006.
- Construction of the 600 m<sup>3</sup>/day DBAF was completed in June 2006.
- A letter was sent by H.E. Minister MWRI to Gharbiya Governor requesting assistance with electricity connection to the plant. The project paid the cost of electricity hook-up to the DBAF. The project supplied the DBAF site with a generator to be used as a backup power supply.
- DBAF water samples were collected with assistance from the MWRI Water Quality Unit and sent to MWRI central lab. Water samples were collected on 28 August and 11 September 2006. Both samples met LAW 48 standards for BOD, TSS, & COD. The samples did not meet the standards for fecal coliform. Adjustments to the DBAF’s chlorination process were made.
- Five participants, selected by the Senbo CDA, were given a one week O&M training course to learn how to operate the WWTF. The five trainees were employed under an OJT program by the project and are successfully operating and maintaining the WWTF.
- Senbo DBAF is operational. O&M is being conducted by local technicians selected by the CDA and trained by the project. O&M costs are being covered by the project.
- Numerous discussions were held between the CDA, MWRI, USAID, Tanta Water & Wastewater Company, and Minister of Housing on options for transfer of the WWTF.
- H.E. Minister MWRI sent a letter to Minister of Housing informing him of the success of the DBAF facility in Senbo and requested that after successful completion of performance testing Tanta Water & Wastewater Company assume responsibility for O&M with the assistance of CDA.
- After the close of the project it is expected that the facility will be transferred to Senbo CDA with financial and technical support to be provided by Tanta Water and Waste Water Company.

### Solid Waste Management Activity:

- The project team investigated the issue of the solid waste issue within the village. A meeting was held with the private sector contractor who has been successfully collecting domestic solid waste from 60 % of Senbo's residential area.
- Based on the investigation, an awareness program was designed to encourage participation of the remaining households. Meetings with Senbo village residents were held to begin preparation of the public awareness campaign to support the stakeholder environmental service activities.
- Clean-up week sponsored by MWRI WCU, South Zifta IWMD, and Senbo Youth Club was held 19-24 August 2006.

### Agricultural Waste Recycle Activity:

- A field visit for the CDA and BCWUA members to the Agricultural Waste Recycling Center at Moshtohor was arranged by the project. Thirteen participants attended. The purpose of the visit was to introduce the different techniques of agricultural recycling to the members.
- Agricultural Waste recycling design report prepared for Senbo Pilot area.
- Agricultural waste recycle STTA consultant was identified and P.O. signed. The Consultant met with farmers and discussed different alternatives for agricultural waste recycling for their final decision. The alternatives selected by farmers were submitted for review.
- Ag Waste recycle STTA consultant prepared an initial report summarizing farmer requirements with recommendations for implementation. A meeting with CDA/BCWUA representatives was conducted on January 29, 2007 to discuss the different alternatives.
- A decision was made by MWRI and the project to postpone procurement of any equipment until Senbo CDA can ensure availability of land for the activity.

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## Table 8 Task 5 Accomplishments vs Project Benchmarks (Senbo Pilot)

*Task No. 5: Environmental Services for Improving Water Quality Management Project Schedule - Life of Project Schedule*  
**Task No. 5.1: Senbo Pilot**

	Activities	Sub-Activities	Year 1				Year 2				Year 3				Year 4				Outputs	Completed			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		Yr 1	Yr2	Yr3	Yr4
Task No. 5.1: Senbo Pilot	1. Collect and Review Data on Existing Solid and Liquid	1.1 Collect and review secondary data	█	█															Waste Water Reuse Profile Prepared	100%	100%	90%	100%
		1.2 Collect and review field data	█	█																			
		1.3 Identifying areas requiring intervention and plan of action	█	█																			
		1.4 Water quality monitoring	█	█																			
	2. Stakeholders Mobilization	2.1 Identify and develop cooperative linkage with key players		█	█														Working Groups Formed	100%	100%	100%	100%
		2.2 Stakeholder focus group mtgs. & formation of working groups		█	█																		
	3. Assess Alternative Methods for Treatment and Disposal/Re-Use of Solid Waste and Wastewater	3.1 Identify disposal, treatment and re-use methods					█	█											Solid & Liquide Waste Reuse Alternatives	100%	55%	100%	100%
		3.2 Analysis of alternative and selection of methods					█	█															
	4. Pilot Projects	4.1 Selection of pilot project area		█															Pilot Project Implemented	10%	95%	95%	100%
		4.2 Implementation of pilot activities in pilot Areas		█	█																		
		4.3 Monitoring Operation of the pilot activities		█	█																		
	5. Formation of Management Consortia	5.1 Selection of members and setting up the institutional structure		█	█														Management Consortium Formed	50%	100%	100%	100%
5.2 Formalization of the consortia			█	█																			
6. Training and Awareness Raising	6.1 Inception workshop		█															Public Awareness Workshops held	30%	60%	90%	100%	
	6.2 Public Hearing		█	█																			
	6.3 Training workshops		█	█																			
	6.4 Public Awareness workshops		█	█																			

█ Direct activity  
 █ Facilitation, capacity-building, follow-up

### Global Development Alliance (GDA)

As a result of the success of the Senbo pilot program USAID expanded the LIFE IWRM contract scope of work and provided additional funds to accommodate a GDA initiative “Environmental Services for Improving Water Quality Management in Rural Areas of Egypt” between the Coca Cola Africa Foundation, USAID, MWRI, IRG and UNICEF.

The objectives of the GDA were to:

- Improve water resources quality
- Reduce water health hazards
- Increase water productivity

Activities carried out by LIFE IWRM team included:

- MOU was signed between USAID, MWRI, Coca Cola, and IRG on 4 December 2006.
- USAID signed a modification to the LIFE IWRM task order on 5 August 2007 providing scope of work and additional funds to support the implementation of the GDA.
- GDA Steering Committee was formed.
- Implementation plan was prepared.
- Three sites were selected for implementation: Damanhour El Wahsh (Gharbiya Governorate), Shobra Kas (Gharbiya Governorate), and El Toud/Ideis (Luxor).
- Data collection and preliminary technical baseline survey for the design of WWTF was carried out.
- Focus group meetings were held with the representatives of the two villages: Shobra Kas (Gharbiya) and El Toud (Qena).
- Work groups at Damanhour El Wahsh & Shobra Kas (Gharbiya Governorate) and El Toud & Odiesat (Luxor, Qena Governorate) were formed by UNICEF with assistance from LIFE IWRM. The members of the work groups included Community Development Association, Branch Canal Water User Associations, and local council representatives. The work groups were responsible for working with the WWTF contractors and receiving the ag waste recycle equipment.
- Damanhour El Wahsh & Shobra Kas (Gharbiya Governorate) and El Toud & Odiesat (Luxor, Qena Governorate) sent their commitments on providing land area for WWTFs
- A report on data collection for the design of WWTF prepared.
- Ag recycle consultant finished data collection.
- A project fact sheet was issued by USAID and Coca Cola under the Water & Development Alliance (WADA).
- Ag waste recycle activities were conducted at Shobra Kas (Gharbiya Governorate) and El Toud & Odiesat (Luxor, Qena Governorate). One rice straw press and two shredders were provided to Shobra Kas. Four shredders were provided to El Toud & Odiesat (Luxor, Qena Governorate). The equipment was tested and transferred to the nominated association in each village. The ceremony was documented on a video film.
- Construction of the three Wastewater Treatment facilities (WWTF) was completed in July 2008. The WWTFs were designed to serve the villages of Damanhour El Wahsh & Shobra Kas (Gharbiya Governorate) and El Toud & Odiesat (Luxor, Qena Governorate).
- Testing of the three WWTFs was completed in September 2008.
- O&M training was to be given to local technicians selected by the CDA consortiums. The only CDA ready to accept ownership was at Shobra Kas. There fore O&M training was provided only at Shobra Kas.
- Transfer of the WWTFs to Shobra Kas CDA was completed in September 2008.

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**Table 9 Task 5 Accomplishments vs Project Benchmarks (GDA)**

**Task No. 5.2: GDA**

Activities	Sub-Activities	Year 1				Year 2				Year 3				Year 4				Outputs	Completed			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		Yr 1	Yr2	Yr3	Yr4
1. Establishment of ASC and Selection of sites	1.1 Establishment of ASC																					
	1.2 Develop site selection criteria and selection of sites																					
	1.3 Baseline survey																					
	1.4 Data collection and monitoring water quality																					
2. Stakeholders Mobilization	2.1 Identify and develop cooperative linkage with key players																					
	2.2 Stakeholder mtgs. & formation of working groups																					
3. Assess Alternative Methods for Treatment and Disposal/Re-Use of Solid Waste and Wastewater	3.1 Analysis of alternative and selection of methods																					
	3.2 Get Approval on selected Alternatives																					
4. Design and Implementation	4.1 Design of Alternatives																					
	4.2 Procurement Process																					
	4.3 Implementation of Wastewater Treatment Facility in 3 Pilots																					
	4.4 Implementation of Agr. Waste recycle Scheme in two Pilots																					
	4.5 Test and Transfer																					
5. Training and Awareness Raising	5.1 Public Awareness Development																					
	5.2 Public Awareness Launch																					
	5.3 Training																					
6. Monitoring and Final Report	6.1 Monitoring																					
	6.2 Final report																					

IRG  
 UNICEF

### Task 6: Improved Wastewater Reuse Practices

#### Objective:

The project provided technical assistance, guidelines, and commodity support for a demonstration site for using treated waste water for irrigating a variety of commercial crops in accordance with the “Egyptian Code for Reuse of Treated Wastewater in Agriculture” issued in April 2005. The 10 feddan (fd) demonstration site was officially established in Luxor in January 2006. Regular comprehensive environmental monitoring of water, soil, and plants was carried out. The environmental and economical feasibility of reuse of treated wastewater to cultivate the approved commercial crops was evaluated. EEAA and MALR were the main partners for this task.

#### Staff:

Dr. Wadie Fahim Mankarious (IRG) was coordinator for this task. He was assisted by Eng. Mohamed Hamed (IWMU). Short term technical assistance was provided by Eng. Ayad Thapet Kariakos (ECODIT-Demo site coordinator), Eng. Awad Shafik (Demo Site Manager Consultant), and Dr. Medhat El Helepi (Ag Economist). Karim El-Jisr (ECODIT) provided expat short-term technical assistance.

#### Achievements:

Activities carried out by LIFE IWRM team included:

- A Task 6 committee, headed by Ministry State of Environmental Affairs (MSEA) with representatives from Ministry of Agriculture and Land Reclamation (MALR), Ministry of Water Resources and Irrigation, and LIFE-IWRM team, was formed.
- Base line data was collected at the demonstration site on water quality and soil type & quality.
- A topographic survey was conducted.
- Farmers’ associations established under AERI-El SHAMS Project in Luxor were briefed on the activity and asked to cooperate in marketing of crops from the demonstration site.
- Information was collected on the BCWUAs nearest to the demonstration site.
- A survey of agricultural technical school graduates was conducted.
- A 10 feddan site in Luxor was approved by the Luxor Governor and permission was granted to use effluent from the Luxor waste water treatment plant for the demonstration.
- The design of the irrigation system and pumping unit from the lagoon ponds of the Luxor WWTP was prepared and approved by EEAA and USAID. The main irrigation system was installed to serve 9 feddans. A drip system was installed to serve 7 feddans.
- MSEA/EEAA, MALR, USAID and LIFE IWRM team selected the crops for the demonstration site from the approved Egyptian Code. Roses, Bird of Paradise, Gladiolus, Indian Fig, Golden Dewdrop, Dodonea, Flax, olives, Jojoba and Jatropha were selected as crops to be cultivated.
- An Environmental Monitoring Plan and an Irrigation Crop Management Plan were prepared.
- Winter and summer crops were planted. A total of 7 fd were cultivated. The following crops were grown: flax (2.5 fd), flowers (1.5 fd), jojoba (2 fd), jatropha (1 fd). Supplemental flower seedlings were provided to the site. Flowers from the demonstration site were marketed in Luxor. Sorghum as a summer crop was planted on two feddan. The 1st and 2nd cuts of sorghum were sold to commercial vendors. Flax was cultivated with technical support from Tanta Flax Oil Company. A decision was made to sell only the

seeds. Table 10 summarizes the type and area of the crops cultivated at the Luxor demonstration site.

**Table 10 Luxor Demo Site Crop Data**

Crop	Growth Period	Cultivated Area (fd)	Plants per fd	Planting Date	Harvest date	Yield
Roses	All year	1	N/A	Jan-06	Every Week started from October 06	51500 roses/fd/yr
<b>Ornamentals: (Indian fig, ponsiana, Bird of Paradise and cactus)</b>	All Year	2	ponsiana 700	Jan-06	Every year	Ponsiana 700 tree/fd/yr
Flax	5 months	1.8	N/A	Winter 05	May-06	0.72 ton/fd
		2.5	N/A	Winter 06	May-07	2.59 ton/fd
Jojoba	Perennial	2	550	Dec-08	Preliminary 3rd yr. in July	0.27
Jatropha	Perennial	1	496	Nov-05	Summer 2007	0.5 kg/tree
					Summer 2008	0.2 kg/tree
Sorghum	3-4 months	2	N/A	Summer 06	Cut 1: Jun 06	5.1 ton/fd
					Cut 2: Aug 06	3.44 ton/fd
		0.5	N/A	Summer 07	Cut 3 : Sep 06	N/A
					Cut 1: Jun 07	4.7 ton/fd
				Cut 2: Jul 07	Weak Plant	
Olives	Perennial	3	170	Dec-08	N/A	N/A
Sarsooa Wood Trees	Perennial	1	180	Dec-08	N/A	N/A

- An observation well was installed to monitor groundwater quality. A groundwater pumping test was conducted to estimate the hydraulic conductivity.
- Environmental monitoring was carried out on a continuous basis. MALR Soil and Water Research Institute Lab conducted analysis on soils and crops. The local Ministry of Health lab in Luxor was used for microbiology analysis and water quality testing. Health tests for all the new and old graduates were conducted.
- Testing was done on all crops by the Soils and Water Research Institute. Results indicated that they were clean and safe. Samples from the milk of animals fed sorghum planted at the demonstration site were sent for analysis. The results showed no trace of contamination in the milk. Soil samples and GW samples were collected and analyzed
- Five agricultural graduates were appointed to conduct the field work. Two of them were women. Health check-ups for the five graduates were conducted.
- A training plan for the graduates was prepared and approved by the coordination committee.
- Business management training was conducted for the five graduates. As a product of the training sessions, the graduates prepared business plans.
- A market survey was carried out
- Local long term training was completed for five agricultural graduates on safe agriculture practices utilizing treated wastewater in May 2007. A new batch of seven graduates was selected and started a six month OJT program in June 2007.
- At the request of the Luxor Governor, 200 visitors representing 17 Arabian countries visited the demonstration site on 16 May 2007.
- USAID, EEAA, MALR, and LIFE IWRM conducted regular coordination meetings and site visits.

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- An “Environmental Evaluation Report” on the Luxor demonstration site was issued.
- An “Economic Feasibility Study of Using Treated Wastewater in Irrigation” was prepared.
- A report on “Economic Feasibility on Growing Jatropha Utilizing Treated Wastewater” was prepared.
- The demonstration site was transferred to EEAA in July 2008 and will be used as a training center.
- A final work shop was held in Luxor on 21 September 2008.

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## Table 11 Task 6 Accomplishments vs Project Benchmarks

### Task No. 6: Improved Water Reuse Practices - Life of Project Schedule

Activities	Sub-Activities	Year 1				Year 2				Year 3				Year 4				Outputs	Completed				
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		Yr 1	Yr2	Yr3	Yr4	
1. Site Selection				■															Demo site & project office identified	100%	100%	100%	100%
2. Crop Selection and Cropping Layout	2.1 Review existing water reuse crops in Egypt and the reuse area			■															Crops selected and approved	100%	60%	75%	100%
	2.2 Review Egyptian Water Reuse Code (MSEA)			■																			
	2.3 Reach agreement on crop selection (MSEA approval)				■		■			■		■											
	2.4 Prepare cropping layout (inc. spacing and number)				■																		
3. Participation of Agricultural Graduates	3.1 Investigate the situation of FAs and BCWUAs in Luxor			■														Graduates appointed and contracted	0%	100%	100%	100%	
	3.2 Selection of a BCWUA overlapping with FA				■																		
	3.3 Appointment of Graduates										■												
4. Orientation and training	4.1 Orientation to FA and BCWUA					■												NGOs oriented and graduates trained	30%	60%	100%	120%	
	4.2 Orientation to Graduates				■																		
	4.3 Training of Graduates on safe agricultural practices					■	■	■	■	■	■	■	■	■	■	■	■						
5. Baseline Assessment and Environmental Monitoring Plan	5.1 Baseline environmental survey of target site			■														Baseline data collected - EMP prepared and approved - Environmental evaluation complete	70%	100%	90%	100%	
	5.2 Environmental Monitoring Plan (EMP)				■		■																
	5.3 Environmental monitoring according to EMP																						
	5.4 Environmental Evaluation Report													■									
6. Irrigation and Crop Management Plan	6.1 Evaluate infrastructure needs			■														Irrigation and Crop Management Plan completed	90%	100%	100%	100%	
	6.2 Prepare irrigation plan (BOQs, specifications)				■																		
	6.3 Prepare crop management plan based on crop selection				■																		
7. Field Implementation	7.1 Provide shelter and storage room					■												Irrigation network installed - Crops irrigated according to Irrig & Crop Management Plan- Demo site transferred	0%	50%	80%	100%	
	7.2 Procure irrigation supplies and other ancillary equipment				■																		
	7.3 Execute land preparation works (e.g., leveling)				■																		
	7.4 Install irrigation system					■																	
	7.5 Purchase seeds/seedlings and plant them						■																
	7.6 Irrigate crops according to Irrigation & Crop Management Plan							■															
	7.7 Sample and analyze soil, water and plants according to EMP								■														
	7.8 Demo site transferred															■							
8. Private Sector Participation	8.1 Consultation workshops to discuss WWR with private sector			■														Awareness Prgram	0%	40%	65%	100%	
	8.2 Identify market outlets for existing water reuse crops				■																		
	8.3 Present and discuss findings with private sector					■		■															
	8.4 Prepare public awareness													■	■								
9. Preliminary economic evaluation of water reuse in Luxor	9.1 Review yield results of MOA water reuse project in project area																	Economic evaluation complete	0%	0%	75%	100%	
	9.2 Prepare report on economic evaluation of WWR in target area																						
	9.3 Prepare final report on findings of demo experiment															■							

■ Direct activity  
 ■ Facilitation, capacity-building, follow-up

## **Task 7: Graduate Degree Training**

### **Objective:**

Funds were obligated to LIFE IWRM by USAID to provide academic master degree training for MWRI staff at both U.S. and Egyptian institutions.

### **Staff:**

Dr. Ibrahim Elassiouti (LLTA, Deputy Chief of Party) was coordinator for this task. He was assisted by Dahlia Hamdy (LTTA, Institutional/Organizational Development Specialist).

### **Achievements:**

The following activities were completed during the project period (Table 13):

- Eleven persons were identified for Master of Science degree programs.
- All candidates took the TOEFL exam.
- Two MWRI staff, enrolled at Utah State University in the Fall of 2005, one in the Department of Irrigation and Biological Sciences; the other in the Department of Civil and Environmental Engineering.
- Two MWRI staff enrolled at American University in Cairo, Department of Environmental Engineering, also in the Fall of 2005 in the.
- Seven persons registered for M.Sc. Degree programs in Irrigation and Hydraulics and Environmental Engineering in Cairo and Ein-Shams Universities.
- The two persons who attended Utah State University completed their degrees, one in Irrigation Engineering, one in Hydraulic Engineering.
- Degrees are pending for the two persons who enrolled at the American University in Cairo, Department of Environmental Engineering.
- Two persons attending local universities have received their degrees.
- Periodic status reports were prepared for MS students.
- Financial and logistical support was provided for all trainees.

The status of the MS degree program at the end of the project is shown in Table 12 .

Table 12 Status of MS Degree Training

Name	Position	University	Department	Field of Study	Required Degree	Status	Expected Graduation Date
<b>US Institutions:</b>							
Hussein Aly Morsy Batt	Engineer - Irrigation Improvement Sector, MWRI	Utah State University	Biological & Irrigation	Irrigation Engineering	M.Sc.in Irrigation Engineering	Completed	Spring 2007
Mohamed Hamed Maamoun	Ass. Researcher, Hydraulic Research Inst. NWRC, MWRI	Utah State University	Civil & Environment	Fluid Mechanic & Hydraulics Engineering	M.Sc.in Civil & Environment Engineering	Completed	Summer 2007
<b>Cairo American University:</b>							
Heba Yaken Aref	Minister Technical Office - MWRI	American University in Cairo	Environmental Engineering	Water Quality	M.Sc.in Environmental Engineering	Preparing Thesis	Fall 2008
Doaa Lashien Dessouky Lashien	Nile Forcasting Center - planning Sector - MWRI	American University in Cairo	Environmental Engineering	Water Quality	M.Sc. in Environmental Engineering	Preparing Thesis	Fall 2008
<b>Egyptian Institutions:</b>							
Ahmed Abdel Hafeez Shalaby	Irrigation Improvement Sector	Ain Shams University	Irrigation & Hydraulics	Irrigation Engineering	M.Sc.in Irrigation Engineering	Working on the thesis on 'Evaluation of Irrigation Improvement Projects'	Spring 2009
Heba Hussein Bayoumi	Planning Sector - MWRI	Ain Shams University	Irrigation & Hydraulics	Environmental	Master in Environmental Engineering	Working on the Thesis	NA
Mona Fathy Allam	Chemical Engineer - Environmental Research Institute	Ain Shams University	Environmental Engineering	Wet Land Study	M.Sc. in Environmental Engineering	Thesis ready for discussion	Summer 2008
Dina Mamdouh El Damerdash	Planning Sector - MWRI	Ain Shams University	Biological & Irrigation	Irrigation Engineering	M.Sc.in Irrigation Engineering	Got a Scholarship in Germany	NA
Heba Abdel Aziz Abo Bakr	Groundwater Sector - MWRI	Cairo University	Irrigation & Hydraulics	Groundwater	M.Sc. in Irrigation & Hydraulic	Completed	Spring 2008
Mahmoud Rafa Mohamed	Asst. Director of Works - Grand Barrage Sector - MWRI	Cairo University	Irrigation & Hydraulics	Optimization of New Location for Old Hydraulic Structures	M.Sc. in Irrigation & Hydraulic	Working on the Thesis	Spring 2009
Hussein Mohamed Aly	Architect Administration of Buildings - MWRI	Helwan University	Architecture	Hydraulic Urban Design	M.Sc. in Architecture	On Leave from The Ministry (Working Abroad)	NA

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## Table 13 Task 7 Accomplishments vs Project Benchmarks

### Task No. 7. Graduate Degree Training for MWRI Staff - Life-of-Project Schedule

Activities	Sub-Activities	Year 1				Year 2				Year 3				Year 4				Outputs	Completed					
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		Yr 1	Yr2	Yr3	Yr4		
1. Determine MWRI Training Priorities	1.1 Review Training Needs Assessment	■																		MWRI Priorities for Graduate Degree Training	100%	100%	100%	100%
	1.2 Meet Senior MWRI Personnel																							
2. Design Procedure for Selection of Trainees	2.1 Screening Candidates for Academic Training		■																	MWRI selection panel convened - Candidates selected	100%	100%	100%	100%
	2.2 Organize Selection Panel			■																				
	2.3 Selection of Candidates				■																			
3 Selection of Training Institutes in USA & Egypt				■															Institution selected for prospective trainees	100%	100%	100%	100%	
4. Assist Trainees with Application Process				■															Candidates applications to US & Egyptian Universities	100%	100%	100%	100%	
5. Assist US bound Trainees	5.1 English Language Courses to candidates to pass TOEFL exams			■															TOEFL Exam passed Orientation Departure to US	100%	100%	100%	100%	
	5.2 Pre-departure Orientation for US-bound Candidate				■																			
	5.3 Assist US Candidates with Formalities: Visa, allowances, etc.					■																		
6. Monitor Progress of Trainees in US & Egypt	6.1 Trainees in USA																		Evaluation reports	0%	50%	90%	100%	
	6.2 Trainees in Egypt																							

Direct activity  
 Facilitation, capacity-building, follow-up

### Monitoring & Evaluation

#### Objective:

The purpose of the Monitoring and Evaluation (M&E) component of the project was to provide LIFE IWRM Project stakeholders with the information needed to follow and manage the project's progress and assess its outcomes and impacts.

#### Staff:

Dr. Ibrahim Ellassiouti (LLTA, Deputy Chief of Party) coordinated this component. Eng. Alaa Abbas (IWMU) provided local STTA support. Dr. Mark Svendsen (DAI) provided expatriate STTA support.

#### Achievements:

The following steps were taken during the project to maintain an effective project monitoring and evaluation program:

- Reviewed the applicable USAID SO results statements.
- Identified new or refined existing and illustrative objectives and indicators to measure results.
- Assembled secondary data to compute baseline and year 1 values of indicators.
- Developed a comprehensive M&E Plan that identified monitoring parameters with clear indicators and benchmarks for determining progress against applicable SO results statements.
- Established indicators and performance targets for years 1, 2, 3, and 4 of the contract with clear responsibilities delineated for data collection against targets and reporting mechanisms.
- Conducted a farmer baseline survey in each of the 27 IWMD with approximately 5000 total respondents.
- Carried out 3 follow-up annual farmer field surveys in the 27 IWMDs. For each survey over 4500 persons were interviewed.
- Developed a data base for storing basic data on the IWMDs and evaluated baseline conditions in each of the project IWMDs.
- Assembled data required to calculate all indicators contained in the M&E Plan.
- Advised and assisted USAID on input to the USAID/Egypt performance monitoring plan as it relates to LIFE/IWRM.
- Organized training for district staff on conducting field surveys.
- Advised and assisted District Managers and General Directors and their staff in establishing performance goals and monitoring their results in terms of those goals.
- Monthly District Performance Profiles prepared by IWMDs.
- Coordinated with the Information Systems teams to refine and regularize the IWMD information system to assemble, process, store and report data useful to managers at various levels.
- Evaluated and reported on the M&E Plan performance indicators for the life of the project.

### Education, Communication, Public Awareness and Participation

#### Objective:

To achieve success in the core activities of the project, namely formation and strengthening of IWMD and BCWUAs, public awareness, education, and communication support is essential. LIFE IWRM worked closely with MWRI Water Communication Unit staff (WCU) in support of these activities. The public awareness team engaged in various cross-cutting communication activities including planning, shooting and editing video, still photography, writing, and design and production of program materials.

#### Staff:

Dr. Khalid Wassif (MWRI) provided STTA support for this task with support from six members of the MWRI Water Communication Unit staff. Ms. Cheryl Groff (AED), Sr. Education, Communication, and Public Awareness and Participation Specialist, was the coordinator for this task for two years. Patrick Papania (AED) provided expatriate STTA support after Ms. Groff's departure.

#### Achievements:

During the project LIFE IWRM accomplished the following:

- Over 90,000 project brochures, BCWUA booklets, BCWUA FAQ flyers, project folders, notebooks with slogan and logo, cartoon posters, illustrated Nile water pollution posters, IWRM campaign mugs, IWMD booklets, calendars, tea glasses with the BCWUA campaign logo, BCWUA campaign logo hats, and LIFE Water hats in English and Arabic were designed, printed, and distributed to IWMDs and BCWUAs.
- A communication tool kit or "Discussion Guide" to support BCWUA field staff was prepared and over 700 Arabic copies and 50 English copies along with a CD data show were produced and distributed to IWMDs and BCWUA board members.
- Production of thirty, 13 page, flip chart kits based on the "Discussion Guide" with a carrying case was completed and distributed to each IWMD Office
- The project assisted the Water Communication Unit in preparing several videos to include one on Farmer Participation entitled "Start with Your Selves"; one designed to demonstrate the step-by-step process of BCWUA formation and activation; and a short video on the Luxor Waste Water Reuse demo for EEAA;
- A "Clean-up week" public awareness event on solid and liquid waste management was conducted at Senbo to support Environmental Services for Improving Water Quality Management pilot activities (Task 5).
- BCWUA membership cards were prepared for board members.
- Conducted three awareness workshops for all MWRI irrigation and drainage Undersecretaries and General Directors.
- Delivered the English and Arabic version of the ten USAID lobby display boards.
- Printed and distributed 10,000 3x7 cm awareness cards describing LIFE project and Egypt's water resources.
- Participated in several conferences and exhibitions.
- Collected over 500 IWMD and BCWUA success stories.
- WCU published five issues of a quarterly newsletter on success stories that were distributed to the IWMDs; journalists; ordinary irrigation & drainage districts; all Irrigation/ Drainage/ Groundwater Directorates & Undersecretaries; MWRI Staff in Ministry Building Cairo; and related projects i.e. World Bank IIIMP & W. Delta, Fayoum, CDIAS, & IIP

- Support was provided by WCU for video and photographic documentation of all project training and field activities.
- IWMD guidelines (Arabic and English) were printed and distributed.
- Assisted with training material development, enhance presentation and packaging; support training and workshops as required; maintain and update project website; prepare success stories; expand photo archives; and ensure gender is reflected in all communication materials and events (All tasks).
- Supported awareness events at central, governorate, district, and branch canal levels to be delivered by MWRI staff and BCWUAs through the development of presentation material and the handling of logistics (Task 1, 2).
- Developed awareness material that supported the fieldwork to activate and strengthen BCWUAs (Task 2).
- Developed an awareness program on irrigation equipment maintenance (Task 4).
- Assisted and supported UNICEF in the awareness program being developed for the Global Development Alliance: Environmental Services for Improving Water Quality Management in Egypt (Task 5).
- Developed an awareness program to inform private sector on findings of the Luxor wastewater reuse demo project (Task 6).
- Supported USAID related public awareness and communication efforts on behalf of the project (All tasks).
- Task 2 BCWUA Fact Sheets (6) completed.
- Developed video film on BCWUAs Participatory Water Management (PWM), a brochure on most frequent Asked Questions regarding IWMDs (FAQ), and a district template and brochure (Arabic).
- Investigated the promotion of project results and achievements through various media such as TV adds, newsletters, brochures, videos, awareness events, etc. (All tasks)
- Project web-site ([www.iwrmeg.org](http://www.iwrmeg.org)) was initiated and maintained.

## **Training**

### **Objective:**

Training was an important component of the LIFE IWRM and was used to support all the task activities. LIFE IWRM had a full time training/workshop coordinator to support this effort.

### **Staff:**

Dahlia Hamdy (LTTA, Organizational/ Institutional Development Specialist) coordinated this component.

### **Achievements:**

Activities carried out by LIFE IWRM team included:

- Prepared and organized start-up planning workshop.
- Prepared annual training work plans.
- Prepared and organized four project Annual Workshops and a Final Workshop.
- Organized and arranged for three Awareness Workshops for all MWRI irrigation and drainage Undersecretaries and GDs (80), held in both Lower & Upper Egypt (1 event in Luxor & 2 events in Mansoura).
- Coordinated the English languages training classes provided by AmidEast in Qena, Aswan, Zifta & W. Sharkiya Directorates. The 90 hour English Language Course was provided for 77 (25% female) MWRI staff at 9 locations. Training began in February 2007 and was completed end of June 2007.
- Entered and updated all the required data for US training in TraiNet.
- Prepared, coordinated, and followed up with the regional offices in Lower and Upper Egypt for all project related training programs.
- Carried out training evaluation for all courses.
- Identified, negotiated prices, and prepared purchase orders for services of training providers as required.
- Maintained project training data base.
- Prepared and published training manuals for 30 of the major training courses presented by the project.
- Coordinated the US and the local master degree programs.
- Sponsored one MWRI participant to attend and present a paper at the Third International Committee on Irrigation and Drainage Conference on “Water District Management and Governance” held in April 2005 in San Diego, USA.
- Sponsored three MWRI participants to attend and present papers at the US Committee on Irrigation and Drainage conference held in October 2007 in Sacramento, USA

The following table shows the number of participants which have been trained under the project:

**Table 14 Participants Trained**

<b>Type</b>	<b>Core (Without Repeating)</b>			<b>Actual No. of Participants</b>		
	<b>Total</b>	<b>Male</b>	<b>Female</b>	<b>Total</b>	<b>Male</b>	<b>Female</b>
MWRI Staff	700	525	175	12121	10168	1953
BCWUAs	3800	3230	570	3800	3230	570
Canal Operators	592	592	0	592	592	0

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Type	Core (Without Repeating)			Actual No. of Participants		
	Total	Male	Female	Total	Male	Female
WWTF Operators (Task 5)	3	3	0	3	3	0
CDA (Task 5)	5	5	0	5	5	0
Graduates (Task 6)	13	11	2	13	11	2
<b>Total</b>	<b>5113</b>	<b>4366</b>	<b>747</b>	<b>16534</b>	<b>14009</b>	<b>2525</b>

Training conducted is presented in Annex E. A summary is presented in **Table 15**.

**Table 15 Training Conducted**

No	Event	No. of Event	Year	Days	Persons	Female
<b>Task 1</b>						
1	Directorate Monthly Meetings	134	Monthly	134	1872	303
2	District's Establishment (IWMD Organization)	9	1 & 3	19	293	56
3	Integrated & Preventive Maintenance	6	2 & 3	9	122	22
4	Management Training Course	4	2 & 3	12	148	33
5	LIFE IWRM Awareness Workshop	3	3	6	127	9
6	Maintenance Monthly Meeting	20	4	20	207	69
7	Maintenance Database Training	4	4	4	48	19
8	Tiled Drainage Maintenance Training	3	4	8	33	16
9	Maintenance of Canals Linings	1	4	2	14	5
10	Internal Unit Cost	1	4	1	14	5
11	Internal Tender & Bids Training	1	4	1	14	5
<b>Task 2</b>						
12	Field Staff Orientation	8	1	24	364	69
13	Data Collection & Stakeholders Analysis	4	1	12	204	44
14	Canal Grouping	4	1	12	204	42
15	Election & Roles and Responsibilities of RA	4	1	16	201	39
16	Conflict Management & Internal Regulations	14	1	42	723	95
17	BCWUAs Introduction Workshop	4	2	8	82	12
18	Preparation & Establishment	9	2	30	298	34
19	BCWUA Activation Workshop	12	2 & 3	33	393	45
20	BCWUA Orientation Workshop	4	3	8	89	13
21	Participatory Water Management	6	3	16	203	39
22	BCWUAs Participatory Water Management	11	4	17	1027	29
23	BCWUAs Chairpersons Orientation Workshop	9	3	9	655	8
24	BCWUAs Annual Coordination Meeting	4	4	9	625	0
25	Water Advisory Monthly Meeting	28	4	28	253	83
<b>Task 3</b>						
26	Basic Computer Skills	11	1	132	246	92

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No	Event	No. of Event	Year	Days	Persons	Female
27	Computer Maintenance	10	1&4	35	154	67
28	Software Installation	3	1	4	43	19
29	GPS Training Course	3	1	4	67	7
30	MISD	11	2 & 3	24	414	48
31	Water Level & Complaint Database	6	2	12	87	38
32	ERDAS GIS	1	2	5	6	2
33	Water Flow Calibration	6	2	12	76	22
34	Water Quality & Ground Water	6	2	28	115	16
35	WL & Complaint Database Installation	6	2	12	81	33
36	Digital Mapping	6	2	24	111	31
37	Introduction to GIS	2	2	10	12	0
38	Assess of BC Areas & Localization of BCWUAs	6	3	12	106	25
39	Water Distribution Meeting	88	3 & 4	88	925	248
40	Operation of Data Logger & Logger Net Software	6	2 & 3	12	84	29
41	Water Quality Database-Database Consolidation	3	3	9	79	34
42	Ground Water Database-Database Consolidation	3	3	6	46	19
43	Digital Mapping Refresher Training	6	4	18	63	34
44	Canal Operation	5	4	10	592	0
45	Integrated Water Management Plan	4	4	12	66	12
46	Violation of Data Base	2	4	4	22	16
47	MALR/MWRI Seasonal Meeting	5	4	5	147	18
<b>Task 4</b>						
48	Focus Group Discussion with BCWUA Members	3	1	3	68	3
49	Farmers' Assessment on Pumps Repairs Focus Group Meeting	3	2	3	69	4
<b>Task 5</b>						
50	CDA/BCWUA Orientation Workshop	1	1	1	13	1
51	Financial Management	1	1	3	13	1
52	CDA/BCWUA O&M DBAF Senbo	1	3	6	5	0
<b>Task 6</b>						
53	Improving Wastewater Reuse Practices Coordination	9	1 till 4	9	8	2
54	Growing Flowers	2	2 & 4	2	6	2
55	Business Management	1	2	1	6	2
<b>M&amp;E Task</b>						
56	Survey Data Collectors	16	1 till 4	144	648	36
<b>Cross Cutting Task</b>						
57	USAID/MWRI Coordination Meeting	9	1 till 4	9	120	11
58	LIFE IWRM Annual Workplan Workshop	3	1 till 3	9	--	--

### Gender

#### Objective:

Gender equity was not pursued as a separate project component. It was, however, a theme that was infused into all of our activities.

#### Staff

Eng. Amira Abdel Hady (IWMU) was responsible for this activity. During project start-up Sue Telingator (IRG), Senior Gender Specialist, provided STTA.

#### Achievements:

- Discussions of gender issues were included in all BCWUA training. Formal presentations by the IWMU on gender issues were given to Under Secretaries, General Directors, and IWMD District Managers at monthly coordination meetings.
- Gender concepts were introduced and stressed in all BCWUAs formation activities beginning with BCWUA chairperson's orientation workshops
- Gender themes were reflected in all project communications material

Positive, if perhaps modest, results were achieved. For example, one General Director, three IWMD District Managers, 25 percent of the IWMD section heads and 10 percent of the BCWUA board members were women.

### Procurement

**Objective:**

LIFE IWRM was responsible for procurement of all project related commodities and equipment. All equipment was procured in accordance with USAID, GOE, and IRG standard procurement regulations. A procurement plan was submitted annually to USAID for approval.

**Staff:**

Mahmoud Said, (LLTA Procurement Coordinator) was responsible for this activity. He was replaced by Amany Mahmoud the last year of the project. They were assisted by Firras Traish (IRG Home Office Manager). During Year 1 Greg Olson, STTA Project Administrator provided STTA.

**Achievements:**

Activities carried out during the project by LIFE IWRM team included:

- Prepared and updated Life of Project (LOP) Procurement Plan on an annual basis. The plan was submitted annually to USAID and MWRI for approval.
- Prepared specifications and procured project equipment IAW LOP procurement plan.
- Custom clearance for all US air shipments.
- Successfully installed and transferred all supplied equipment to MWRI and EEAA.

The final status of the commodity procurement program is presented in Annex F End of Project Procurement Status Report.

## PROJECT RESULTS

The LIFE IWRM Project prepared a Monitoring and Evaluation (M&E) Plan during Year 1 that was approved by USAID. It presented the background, purpose, methodology, goals, indicators, and targets for the project. The Plan was part of the project management process, and, as such, it was adjusted periodically to accommodate changes occurring in the context and implementation of the project. Updated M&E reports were prepared each year. Changes made in the indicators in Years 1, 2, and 3 were documented in the M&E reports for those years. No significant changes were made in the M&E system in Year 4.

### Implementation Indicators

Objectives and indicators in the M&E Plan were divided into two basic categories. The first three objectives and associated *implementation* indicators related to progress achieved in implementing planned project activities as shown in Table 16.

Implementation indicator values showed satisfactory performance virtually across the board, indicating that the project succeeded in introducing the changes in organizational structure and processes that it set out to promote.

#### 1. IWMDs Created and Functioning

The section on Project Achievements provides descriptive material on objectives and activities carried out by LIFE IWRM. Table 16, *Implementation Objectives, Indicators, Targets, and Accomplishments*, compares targets and achievements for each project year. What stands out from the table is that all targets were achieved. By the end of year 1, all 27 planned IWMDs had been established, and were fully staffed and equipped with computer systems. During Year 2, digital mapping was completed for boundaries and major canals in all 27 districts, and all had completed integrated maintenance plans. All districts were preparing specifications and monitoring maintenance contract implementation by the end of Year 3. As noted in the recently completed LIFE evaluation report (Weidemann Associates, June 2008), “Implementation has proceeded well and all inputs will be delivered by project close. The 27 IWMDs cover 15 percent of Egypt’s irrigated area and now have a full set of trained staff and an impressive set of tools for improved water management ...”.

#### 2. Measurement-based Management

Under Task 3, Equitable Allocation of Water Resources, LIFE IWRM provided tools for near real time collection and analysis of data to enable directorate and district level personnel to manage Nile waters efficiently, and built capacity in the use of the tools provided. IWMDs have calibrated all inflow/outflow structures into and out of the districts, established water monitoring networks, reconciled irrigable areas, and installed a number of water management databases. This set of activities responded to a deficiency of information on cropping patterns and associated water requirements, so that there was frequently little correspondence between water supplied and water required, leading to oversupply to some agricultural areas and deficiency in others, and sometimes ill-timing of water deliveries, all of which reduced productivity at the farm level.

The objective therefore called for establishment and use of measurement-based management practices in all supported IWMDs. Indicators, targets set and actual achievements are shown in Table 16. As that table makes clear, all targets have been achieved.

**Table 16: Implementation Objectives, Indicators, Targets, and Accomplishments**

<b>LIFE IWMP M&amp;E Indicators - Year 4</b>				<b>Cumulative Targets and Accomplishments</b>								
				<b>Objective</b>	<b>Indicator</b>	<b>Units</b>	<b>Baseline</b>	<b>Year 1</b>		<b>Year 2</b>		<b>Year 3</b>
Target	Actual	Target	Actual					Target	Actual	Target	Actual	
<b>1</b>	<b>IWMDs created and functioning to cover completely the 5 project directorates</b>											
1.1		Number of IWMDs established by signed Ministerial decree	Number	4	27	27	27	27	27	27	27	27
1.2		Number of districts with geo-referenced maps showing district boundaries and canal layouts	Number	0	27	14	27	27	27	27	27	27
1.3		Number of IWMDs with completed integrated maintenance plans	Number	0	27	0	0	27	27	27	27	27
1.4		Number of IWMDs with fully-staffed senior positions according to new staffing plan	Number	0	27	27	27	27	27	27	27	27
1.5		Number of IWMDs with local computer networks installed and operational	Number	4	16	27	27	27	27	27	27	27
1.6		Number of IWMDs preparing and supervising maintenance contracts	Number	0	0	0	0	0	27	27	27	27
<b>2</b>	<b>Measurement-based management practices established and functioning in all IWMDs</b>											
2.1		Number of IWMDs with calibrations for all authorized inflow and outflow structures into and out from the District	Number	1	15	4	27	27	27	27	27	27
2.2		Number of IWMDs providing 15-daily reports of measured water inflows to the District Manager for one complete season	Number	0	0	0	0	27	27	27	27	27
2.3		Number of IWMDs with a completed water resource inventory in approved standard format	Number	0	9	0	27	0	27	27	27	27
2.4		Number of IWMDs with a completed water resource management plan in approved standard format (includes MISD)	Number	0	0	0	0	0	27	0	27	27
<b>3.0</b>	<b>BCWUAs participate in the management system in all IWMDs</b>											
3.1		Area covered by BCWUAs with signed MOUs with MWRI	1,000 Feddans	90	551	320	450	500	700	1,017	1,017	1,017
3.2		Area covered by BCWUAs providing written maintenance priorities to IWMD	1,000 Feddans	0	0	0	200	320	500	1,017	1,017	1,017
3.3		Area covered by BCWUAs with an agreed upon Action Plan	1,000 Feddans	0	0	0	50	100	150	900	1,017	1,017
3.4		Number of IWMDs holding Branch Canal-level meeting with representatives of at least 75% of existing BCWUAs at least once in the previous 6 months to discuss BC issues	Number	0	4	4	27	27	27	27	27	27
3.5		Number of IWMDs holding district-level group meetings with representatives of all BCWUAs at least once per season	Number	0	0	0	4	11	27	27	27	27

### 3. BCWUAs Participate in Management

As shown in Table 16, all targets for BCWUA participation were achieved and exceeded. 600 BCWUAs were formed covering all the branch canals in all the 27 districts in all the five target directorates. BCWUAs communicated maintenance priorities to their respective IWMDs and agreed upon Action Plans. All project supported IWMDs met regularly with representatives of BCWUAs. In addition BCWUAs working with the IWMDs participate in branch canal water distribution, maintenance, conflict resolution, communication and awareness, and capacity building activities. Results from the most recent client satisfaction survey (June 2008) suggested that BCWUAs were increasingly visible to the farmers they serve, the majority of the 500,000 users (62 percent, up substantially from 43 percent in year 3) were aware of their users' associations, suggesting that the services the BCWUAs provide were recognized by the users.

### Outcome Indicators

The second set of three objectives relate to the outcomes of project activities. As such, they were not concerned with the details of project implementation, i.e. the activities and inputs, but rather with results.

Because there were no absolute reference points for the values of these indicators, Year 1 values were used as a baseline, with all subsequent changes related to these baseline values. In all cases, values were computed for individual districts and weighted averages taken to obtain project-wide values<sup>1</sup>. In some cases, results for individual districts are also shown and compared to suggest how such indicators can be used for internal management through performance benchmarking. Results for Objectives 4 and 5 are shown in Table 17.

**Table 17: Outcome Objectives, Indicators and Accomplishments**

LIFE IWRM M&E Outcome Indicators			Accomplishments			
Objective	Indicator	Units	Baseline (Year 1)	Year 2	Year 3	Year 4
			Actual	Actual	Actual	Actual
<b>4 Quality of irrigation service to farmers improved in all IWMDs</b>						
4.1	Number of complaints filed by farmers with the IWMD	Number per 1000 feddan	1.91 1.02 summer 0.89 winter	1.90 0.88 summer 1.02 winter	2.13 1.11 summer 1.02 winter	1.46 0.69 summer 0.77 winter
4.2	Ratio of total seasonal IWMD canal inflows to target allocation for season	None	0.96 summer 1.13 winter	1.00 summer 1.16 winter	1.14 summer 1.26 winter	1.00 summer 1.32 winter
4.3	Share of number of 15-daily periods for which supply matched target within 10%	Percent	22% summer 15% winter	20% summer 22% winter	24% summer 17% winter	28% summer 14% winter
4.4	Percent of farmers in each IWMD satisfied with quality of irrigation service	Percent	74% summer 94% winter	78% summer 91% winter	65% summer 89% winter	76% summer, 94% winter
4.5	Percent of farmers reporting complete conformity with planned rotation	Percent	21% summer 30% winter	17% summer 28% winter	18% summer 35% winter	25% summer 41% winter
4.6	Percent of farmers reporting complete or partial conformity with planned rotation	Percent	73% summer 88% winter	78% summer 90% winter	65% summer 85% winter	73% summer 89% winter
<b>5 Equity of water distribution among and within all IWMDs improved</b>						
5.1	Percent of seasonal IWMD RWS values falling within ±10% of 25-District average	Percent	-	20% summer 28% winter	28% summer 28% winter	48% summer 44% winter
5.2	Ratio of satisfied farmers in head and tail reaches of Main Canals within the District	None	1.25 summer 1.04 winter	1.37 summer 1.22 winter	1.36 summer 1.05 winter	1.13 summer, 1.01 winter
5.3	Ratio of satisfied farmers in heads and tails of Branch Canals within the District	None	1.31 summer 1.09 winter	1.16 summer 1.04 winter	1.17 summer 1.03 winter	1.07 summer, 1.03 winter

<sup>1</sup> The outcome indicators are based on 25 of the 27 project Districts only. Wadi El Nokra and Wadi El Saaida in Aswan Directorate are excluded from the analysis because they are newly constructed irrigation systems and are still expanding in area and their datasets are sometimes incomplete.

In Year 4, the management capacity created under the project began to show up more strongly in improved management outcomes.

### **4. Quality of Irrigation Service**

Indicators of quality established at the outset of the project were formal complaints filed by farmers, the degree to which districts and directorates established and adhered to water delivery targets, farmer satisfaction with irrigation services provided and farmers assessment of the degree to which irrigation rotations were in conformity with plans. Over the course of the project, complaints (per 1,000 feddan) declined from a year 1 (baseline) level of 1.91 to 1.46 in year 4 a decline of almost 24 percent.

The annual user survey was used to measure farmer satisfaction. As shown in Table 17 the percent of satisfied farmers (objective 4.4) increased slightly between the baseline and Year 4 for the summer period (74% to 76%); and stayed about the same exceptionally high level of 94% satisfied for the winter period.

At the outset of the project, the concept of targets was a new one in the water management system as applied at the directorate and district levels, and it took some time to develop into a functional planning process whereby realistic target values were established, reported, and monitored for each season. Considerable progress was made, as evidenced by the fact that for all the districts taken together targets for water delivery have been reduced, while the ratio of actual deliveries to targets has improved, and is now close to ideal as shown in Figure 2 and 3. Demand was calculated from actual crop water requirements (CWR) without including system efficiencies (assumed by MWRI to be 70%). The CWR were determined from actual crop data collected and evaluated from the MISD program. The MISD data was not available for all districts at the start of the project (Year 1). Therefore the estimate for CWR for Year 1 was not included in the analysis. The accuracy of the CWR calculations improved over the period of the project due to more accurate estimates of irrigable area and improved coordination between MWRI and MALR.

There was variability among the districts. Actual deliveries ranged from 60 percent to 150 percent of targets indicating that there was still room for improvement. Realizing improvement in this area means allocating water resources in accordance with real requirements, thus minimizing waste and promoting increased productivity.

### **5. Equity of Water Distribution**

Equity among IWMDs, among branch canals within districts, and along branch canals refers to how well or badly water is distributed to the locations where it is needed. Crop yields can be expected to increase if water is diverted from areas where it is supplied in excess of requirements to those where requirements are not being met. The assumption here was that farmers in the former areas apply more than they need to, while those in water short areas do not have enough to produce at levels they could achieve if they did. With this in mind, improving equity of water distribution was a prime objective of the project.

M&E data for the LIFE IWRM project shows

- Improvement over time in the ratio of water delivered to IWMDs (the Relative Water Supply, or RWS) relative to crop water requirements..

Figure 2 Annual Targets, Actual Supply & Demand

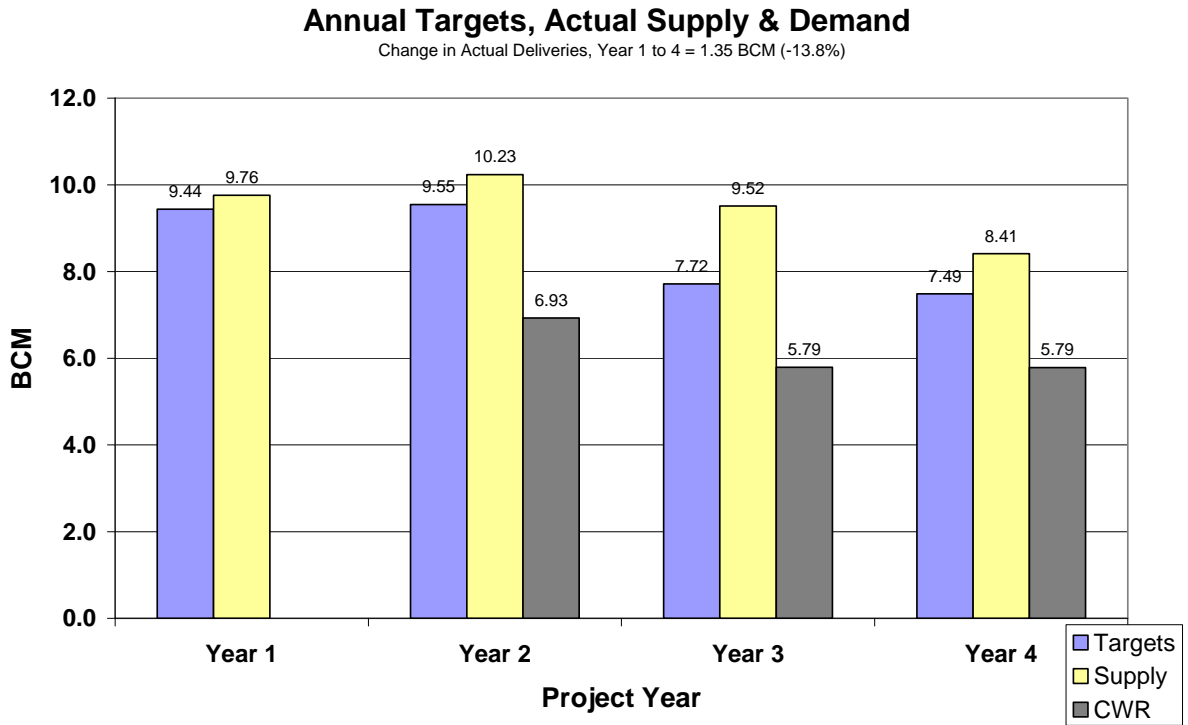
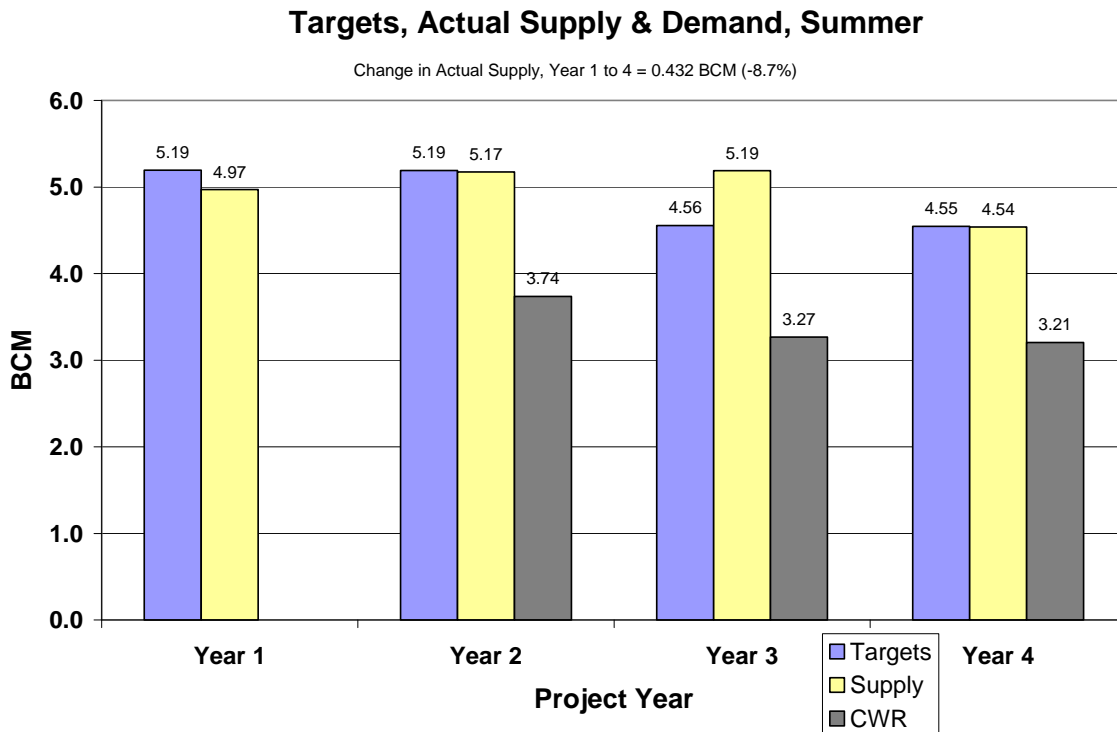


Figure 3 Summer Targets, Actual Supply & Demand



- Less variability among the districts in this ratio, indicating that in an increasing number of districts there is good correspondence between water supplied and water required
- Within districts, reduced differences between the percentages of farmers satisfied with irrigation services who cultivate areas in the “head” segment of the main canal passing through their district and those in “tail” areas. Tail areas are more difficult to provide with good irrigation service. But the majority of farmers in both areas indicate satisfaction with the services they are receiving. And the difference in the percentage of farmers in each of these areas indicating that they are satisfied has diminished.
- Within branch canals, similarly the ratio of satisfied “head” to “tail” end farmers has declined, indicating increasing, and successful, efforts to provide good service to harder to reach, i.e. tail end, farmers.

### **6. Real Gross Value of Agricultural Production**

While of obvious importance, it was regrettably concluded that obtaining sufficiently accurate and comprehensive data to compute indicator values was very difficult. Therefore, indicators of changes in agricultural output in physical and monetary terms were dropped from the M&E scheme. That said, and as indicated above, there is good reason to expect that the net effect of improving equity of water distribution – which has occurred – raises average crop yields by redistributing water from areas where it had been provided in excess of requirements (therefore wasted) to other areas where water shortages had constrained crop yields.

## **SIGNIFICANT CHANGES IN IMPLEMENTATION STRATEGY**

In most respects, LIFE IWRM was implemented as designed. However, in some instances experience in the early phases of project implementation suggested the need for changes. Those of significance are noted here.

### *Task 1 Formation of Integrated Water Management Districts:*

By the end of Year 2 it was evident that by and large district personnel were technically better trained than their directorate level counterparts, and those capacity deficiencies at the directorate level impeded project progress. Therefore, during Years 3 and 4 special efforts were made to strengthen the directorates. This initiative will help to ensure that the water management systems introduced under the LIFE IWRM project will be sustained.

### *Task 2 Formation of Branch Canal Water Users' Associations*

The original plan was to establish water users' associations to cover all the branch canals (BC) in all the districts within the four year project span, but only to provide strengthening support to the 93 BCWUAs formed earlier in conjunction with the USAID-supported Red Sea Sustainable Development and Improved Water Resources Management (RSC-W) bridging project. Instead, the project was able to establish, activate, strengthen, and implement participatory water management<sup>2</sup> in all 600 BCWUAs, that is to say all of the BCs in the 27 project districts, including those formed earlier under the RSC-W.

This change was accomplished by revising the procedures for implementing Task 2. After Year 1, instead of relying on the Central Irrigation Advisory Service, in collaboration with MWRI, and with the formal approval of H.E. Minister MWRI, the project developed a streamlined program to directly involve District Managers and staff in working with and supporting the BCWUAs. The results were an increase in the number of water users represented by activated BCWUAs. Training courses were streamlined, synthesized and simplified. The effort was very successful. All 600 BCWUAs were formed within two years. Project staff then used the remaining two years to concentrate on strengthening the BCWUAs and IWMDs in the procedures for implementing participatory irrigation management.

The approach of relying on IWMDs to work directly with BCWUAs proved cost-efficient, empowered IWMD staff, and ensured a direct and sustainable partnership between IWMD staff and BCWUA representatives. It also facilitated a smooth and incremental transition towards Joint Irrigation Management. The key factor explaining the success of the new strategy was that it accelerated the procedural steps of forming and activating the BCWUAs, leaving more time to focus on achieving tangible benefits for association members. This contrasts with previous pilot projects. By immediately solving conflicts and issues of concern to their members, BCWUAs brought tangible benefits, thereby demonstrating their capacity.

Originally, the strategy was to implement a number of different pilot BCWUA activities on selected branch canals to demonstrate that BCWUAs can bring tangible benefits to their

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<sup>2</sup> As used here, the terms "formation" and "establishment" of BCWUAs are interchangeable, and refer to the election of board members and the signing of an MOU. "Activation" is accomplished when an Association issues internal regulations, develops and documents its priorities for maintenance, and prepares action plans. At that point, strengthening support can be provided to enable the BCWUA to implement its plans and participate with the IWMDs in water management.

members. It was intended that the more advanced and promising BCWUAs would be supported through grants in order to perform the pilot activities. Start-up grants were to be similar to those used by the World Bank and Dutch Water Boards to help BCWUA leaders to establish viable organizations. Pilot activities were to include: preparation and implementation of internal rules for conflict resolution, water monitoring and water allocation within a branch canal (i.e. among mesqas); implementation of canal maintenance activities by water users; implementation of environmental services to improve water quality; and generation of internal funds through fee collection (if Law 12 was promulgated). However, due to budgetary constraints and the limitations of Law 12, it was determined not to provide financial assistance to any of the BCWUAs. Instead, it was decided that the project would work with all of the IWMDs to establish, provide training for, and implement participatory water management in all their BCWUAs. This proved to be a good decision. Instead of implementing a few select pilots, participatory management was introduced successfully to all the BCWUAs. This allowed the water users to partner with MWRI staff to provide improvements in water delivery services, system maintenance, water quality, conflict resolution, and communications and information exchange. The new strategy also served to encourage the BCWUAs to be self-reliant, which is crucial for sustainability after project completion.

Each BCWUA now monitors its own branch canal water delivery system. Each participates in planning the district level rotation schedule and monitors canal water levels and gate operations, providing feedback on performance and user satisfaction to the IWMD on a regular basis. BCWUAs develop their own internal rotation schedule for the water distribution between off-takes (mesqas) downstream and their branch canal intake. Each BCWUA assists the IWMD of which it is a part in the collection of accurate data regarding irrigated areas and cropping patterns. Water users effectively share in the operation and management of their irrigation system to improve allocation, distribution, and equity of their water resources.

Together, the BCWUAs and IWMDs conduct a Branch Canal needs assessment and set maintenance priorities. The BCWUA then participates with the IWMD in monitoring and evaluating contractor maintenance activities. BCWUAs are informed of maintenance works and schedules, and are encouraged to develop and implement their own small-scale maintenance activities. Activated and strengthened BCWUAs also play an important role in communications and information exchange on water management issues. Their representatives are expected to attend monthly and seasonal meetings with the IWMDs, implement awareness activities regarding water conservation and water quality, and disseminate information to water users and the community at large. BCWUAs have also been given the authority and responsibility to deal directly with complaints and violations, and to resolve water user conflicts. Previously the District Managers had many people coming to see them to complain, often about the same issue. Now water users are instructed to register their complaints through their BCWUA. In many instances complaints can be solved internally by the chairperson. The involvement of the BCWUA in conflict resolution also allows the settlement of violations without involvement of the police. Each IWMD has a water advisory team (WA) that works with the BCWUA chairpersons and boards to maintain a formal dialogue with the IWMD and to train BCWUA personnel in procedures for performing administrative and organizational services for their members. BCWUAs with assistance from the WA teams are expected to set up their own offices, keep their own records, and identify persons to work with the IWMD on various participatory water management (PWM) activities.

### *Task 3 Equitable Allocation of Water Resources*

Initially the canal monitoring program was to focus only on existing telemetry sites. Water level-discharge calibration curves were to be developed at these sites. Instead, within the first two years of the project 84 irrigation canal flow monitoring sites were calibrated. Later 65 main drain inflow/outflow sites were calibrated. This enabled calculations of actual inflows and the water budget for each IWMD.

### *Task 4 Improved maintenance and Upgrading of Water Management Equipment*

The purpose of this Task was to assess the capacity of the governorate technical schools administered by the Central Department of Technical Education within the Ministry of Education (MOE) to provide training in the repair and maintenance of agricultural and irrigation equipment and in business management. Interventions suggested illustratively in the IRG-USAID contract were considered in the study. These included using local currency grant funding to improve vocational training programs (including training in maintenance and simple repair techniques that can be presented to farmers), and assistance to small private businesses providing repair and maintenance services for water management equipment.

A rapid assessment found that availability of mechanics to repair pumps was not a major concern for farmers. The capacity of the technical schools in the governorates to provide training in the repair and maintenance of irrigation tools and equipment varies widely. And each school offers a limited array of career tracks. It was concluded that while improving the training available through these institutions is essential, it would require a far more comprehensive undertaking than could be attempted under the current project.

An updated study recommended several interventions to help assure that farmers will have better access to adequate and low-cost facilities for water management equipment including:

- Preparation of training and awareness materials on maintenance of irrigation pumps;
- Preparation of a handout on pump maintenance for distribution by IWMDs to BCWUAs.

Awareness material on irrigation pumps was prepared. Training of Trainers courses on maintenance of irrigation pumps were given to IWMDs, enabling them to provide training to the BCWUAs.

### *Task 5 Environmental Services for Improving Water Quality Management*

Several changes were made;

1. The Task 5 program was initially designed and budgeted for a two year implementation period. After review of the work plan in January 2005, USAID requested that activities be supported under the contract for its full four year duration.
2. Originally, two local government authorities and/or NGOs in the target directorates, one in Upper Egypt and the other in the Delta, were to be selected as the focal points for Task 5 implementation. It was clear from the start that working in two sites was impractical and beyond the budget capacity of the project.
3. Originally, the concept was to focus on domestic solid waste management recycling. However, when it became apparent that a local private sector provider was already working in the pilot village of Senbo and doing its own garbage recycling, the focus shifted to agricultural and liquid waste management.

4. In the early stages of the project, outside sources of funding to supplement those of the project were investigated. For example, working with USAID and MWRI, LIFE IWRM personnel tried to leverage funding from the Japanese Embassy (up to 10,000,000 Yen  $\approx$  \$90,000) to support the first pilot liquid and solid waste management project. The concept was that LIFE IWRM would provide funds for the soft side -- training and public awareness -- with the understanding that the Japanese funds would be used for construction and equipment. This initiative was unsuccessful. MWRI also requested supplemental funds from USAID in December 2005. This also did not come to fruition. And so, in August 2006 at the request of USAID it was decided that the project would provide funds from its existing budget for construction of a waste water treatment facility at Senbo.

### *Task 6 Improved Wastewater Reuse Practices*

The Task 6 program was originally designed and budgeted for implementation over two years. However, after review of our initial project work plan in January 2005, USAID requested that activities be supported under the contract for its full four year duration.

The Luxor demonstration pilot with an original design of five feddan was expanded to 10 feddan during implementation.

### *Task 7 Graduate Degree Training*

This task was implemented as originally designed.

### *Monitoring and Evaluation*

Only two farmer surveys were planned; one for the first and one for the final year of the project. However, to enable adjustments based on M&E findings each year, this was revised and four farmer surveys were carried out, one each year.

### *Education, Communication, Public Awareness and Participation*

The output of this activity far exceeded original plans and expectations, reflecting requests of USAID in the course of project implementation. Support from the MWRI Water Communications Unit was critical in achieving success in this activity. The project has prepared and disseminated over 90,000 project brochures, folders, booklets, flyers, calendars, and posters; and has prepared two videos on IWRM and BCWUA benefits. A 45 page, illustrated flip-book, communication tool kit "Discussion Guide to Share with Water Users" with accompanying CD was prepared to support formation of BCWUAs. Over 700 copies were delivered to IWMD BCWUA training teams and BCWUA boards. A 13 page flip-chart kit based on the "Discussion Guide" was printed and issued to each IWMD. The project conducted three awareness workshops for senior MWRI officials; prepared several large lobby display boards; printed and distributed 10,000 project awareness cards; participated in several conferences and exhibitions; collected and published a series of books that included over 500 BCWUA success stories; published six quarterly newsletters; and established and maintained a project web site ([www.iwrmeq.org](http://www.iwrmeq.org)).

During Year 4 alone an IWMD FAQ brochure; district brochures for each IWMD; a brochure, a video and 6 fact sheets on participatory water management; a pamphlet on Reuse

of Treated Wastewater for Agriculture in Egypt; and a brochure on Environmental Services for Improving Water Quality Management were prepared. In addition over 300 copies of “Guidelines for Implementation for Integrated Water Management Districts” in Arabic and English were printed and distributed and 10 Arabic banners printed as posters were distributed to all IWMDs and BCWUAs.

### *Training*

The original training budget was the equivalent to US\$ 330,000. Actual expenditures for training were US\$ 1,330,000 equivalent, of which only US\$ 153,000 was used for overseas and local academic training. The remainder was used to support project implementation activities, including the cost of training for Senbo O&M and the Luxor demonstration site staff. TA was implemented through an extensive training and OJT program. Approximately, 16,600 persons attended over 40 different courses.

### *Gender*

From the outset of the project, we have treated gender equity as an important cross-cutting consideration to be infused into all project initiatives rather than treated as a distinct project component. This strategy did not change in the course of project implementation.

### *Procurement*

The original procurement budget was US\$ 1,250,000 equivalent. Actual expenditures were the equivalent of US\$ 900,000. Significant savings were made by procuring many items locally instead of importing them from the US. A number of current meters (37) were supplied by MWRI to the project IWMDs, also resulting in a cost saving.

### *Cost Control*

Changes in strategy to contain costs are discussed in the section of this report captioned “Problems, Lessons Learned and Recommendations.”

## PROBLEMS, LESSONS LEARNED AND RECOMMENDATIONS

### Task 1: Formation of Integrated Water Management Districts

#### Problems and Lessons Learned

**IWMD Concept** -The IWMD concept works. The formation of 23 new IWMDs and capacity building for those, plus the four established before the start of the LIFE IWRM project, demonstrates that institutional reorganization and decentralization are achievable goals. Their achievements added benefits, not fully anticipated at the start of the project, namely a significant change in mentality of IWMD managers and staff. A general feeling of empowerment has been observed, leading to IWMD staff taking initiatives and responsibility for a wide range of water management activities.

**Budget Requirements** -IWMDs have greater responsibilities than the irrigation districts they replaced. Their needs in terms of budget, facilities, and resources are consequently greater. The project is of limited duration, and can therefore only provide temporary support, while the transfer of adequate resources to IWMDs from other MWRI entities has yet to be completed. Project personnel collaborated with and advocated for MWRI to identify IWMD needs and address them. To ensure sustainability it will be important to make sure the IWMDs have sufficient budget allocated for maintaining equipment supplied under the project.

**Directorate Role** - Involvement of directorate staff has strengthened their organizations. These staff are taking a leadership role in monitoring and coordinating IWMD activities. This will help to ensure sustainability of the tools and procedures introduced under LIFE IWRM.

**MWRI Staff** - Staff shortages (especially in Aswan) and rapid turnover are major issues for the IWMDs. Many engineers have temporary appointments at salaries that are lower than those of permanent staff of comparable capacity and experience.

**Integrated Channel Maintenance** -The use of MWRI staff to provide technical assistance for preparing IWMD maintenance plans helped to identify and resolve many of the problems resulting from the integration of the irrigation and drainage districts. Formal transfer of the drainage budget from EPADP to the Irrigation Department still has not been accomplished. This needs to be resolved.

In many cases, maintenance problems occur because of incorrect estimation of maintenance requirements. Usually funds are available based on the requests of general directorates; however there is no match between the allocated funds and expenditures.

Lack of qualified contractors capable of handling channel maintenance works is a serious problem in most of the directorates, especially in Upper Egypt.

Some IWMD managers were reluctant to follow the guidelines and planning procedures for integrated channel maintenance. They should be strictly instructed to implement new management and planning approaches.

An integrated channel maintenance program must be initiated immediately after establishing IWMDs; any delay will affect other tasks, such as water distribution, establishment and activation of BCWUAs, etc. Capacity building is crucial for the success of the integrated maintenance activities, especially for those who have a background in irrigation channel maintenance only. Other training programs, on such subjects as contracts preparation, law and regulation would be very useful.

Channel maintenance work in many cases fails to consider cost. More cost-effective maintenance can be achieved if maintenance work is prioritized and sufficiently supervised.

There are simple, but essential, channel maintenance tasks that can be done by the users themselves (because they do not need specialized engineering skills), contributing considerably both to budget optimization and work quality.

Self operation maintenance works by the districts themselves are very important, especially in emergency cases. The Ministry should give attention to this issue by providing the necessary machinery and equipment to the districts.

### **Recommendations**

The recently completed LIFE IWRM evaluation (Weidermann Associates, June 2008) concluded that prospects for sustaining the IWMDs organizations and systems put in place under this task order are moderate. Three factors will play a major role in determining whether they are sustained over the long haul, namely:

1. the level of budgetary resources made available
2. the extent to which well-trained and motivated staff are assigned to, and retained by, the IWMDs
3. the extent of involvement at the directorate level

In each instance, action on the part of the MWRI is required to maintain momentum. The nature of the actions we recommend are summarized below in general terms. Decisions about whether, how and when the Ministry implements them are critical to the sustainability of the systems put in place over the course of LIFE IWRM implementation. MWRI understands the importance of sustainability and approved a sustainability plan that addresses this issues.

**Budget** – As noted above, IWMDs will need larger budgetary resources than the districts they replaced. This is a matter with which the MWRI will need to grapple. The same holds true for formal transfer of the drainage budget from EPADP to the Irrigation Department.

**Staffing** – Staff shortages (especially in Aswan), rapid staff turnover, and the practice of engaging engineers on a temporary basis, and at salaries that are lower than those of permanent staff of comparable capacity and experience, are major issues for the IWMDs that need to be addressed. Better compensation should be provided to attract skilled and trained engineers; also minimum commitment to stay at work after training should be made. A ministerial decree should be issued to avoid the transfer of the current trained IWMD staff unless for justifiable reasons. Position vacancies should be filled with qualified permanent personnel.

**Directorate level involvement** – Directorate level involvement is critical to the success of IWMDs. Therefore, when forming IWMDs the current practice of forming all of them within a directorate at the same time should be continued; equivalent organizational sections at directorate and IWMD level should be formed concurrently at the time of IWMD formation.

**Central level involvement** - Head of Irrigation Sector and his staff should be responsible for reviewing the monthly reports prepared by Integrated Water Management Districts/Directorates. Corrective measures should be applied whenever needed.

**Integrated Channel Maintenance** – Integration of canal and drain maintenance budgets under the Irrigation Department is essential (and therefore recommended) to enhance contract management and provide opportunities for implementing integrated maintenance. Maintenance budget management at the IWMD level (including planning, tendering, contracting and implementation) should serve efficiency, effectiveness, and decentralization objectives.

For the future, it is recommended that maintenance contracts (for canals and drains) have a one year term to reduce the risk to IWMDs in the event of deficient contractor performance. This has been a problem, as report by Aswan IWMDs.

Equipment owned by directorates can be used for “self-operated-maintenance-works”. MWRI has approved this operational tactic, one that has been practiced in EPADP for a long time and which should reduce costs and improve work quality.

From time to time, IWMDs confront maintenance emergencies, e.g. clogging of important facilities by weeds or garbage disposal. In such instances, engaging a contractor to take the proper maintenance action may be too slow. It is therefore suggested that every IWMD have simple emergency maintenance equipment at its disposal. For complicated emergency problems requiring more sophisticated equipment, establishing a Unit for Preventative Maintenance to serve the whole governorate in which IWMDs are established is suggested.

## **Task 2: Formation of Branch Canal Water Users’ Associations**

### **Problems and Lessons Learned**

An important lesson, with implications for future activities is that the new approach introduced by the project of using IWMDs to work directly on the formation of BCWUAs is cost-effective, empowers IWMD staff, and helps ensure a direct and sustainable partnership between IWMD staff and BCWUA representatives. It also facilitates a smooth and incremental transition towards Joint Irrigation Management (JIM). The key feature of the new strategy has been to focus on achieving tangible benefits for BCWUA members instead of stressing the processes of formation and activation, unlike previous pilot projects. By actually resolving conflicts and issues, BCWUAs bring immediate benefits to their members and demonstrate their utility.

The introduction of participatory water management was a key step forward. The aim was to involve BCWUAs in all water management activities at the district level, including water distribution, water quality, maintenance, and management and administration of water resources. The approach in turn requires timely and routine data collection, data analysis,

and information exchange between BCWUAs and IWMDs staff. The more BCWUAs and IWMDs are involved in working together the more benefits they both get.

At present, BCWUAs have no legal standing to collect fees and enter into contracts. While some have nevertheless found ways of raising funds, absent enabling legislation and/or other means of giving them legitimacy and recognized mandates, their scope for providing services involving financial and contractual commitments to their members is and will remain limited.

Another challenge was how to involve all users in the participatory water management process. For the five target directorates there are 600 BCWUA chairpersons, almost 4,000 board members, more than 12,000 water user representatives, and about 500,000 users. The formation of water advisory teams led by a water advisory engineer at each district with a coordinator at directorate level proved to be a very successful tool in implementing the BCWUA activities. These teams because of their local knowledge, with minimum training, were able to easily transfer important concepts into practice by the BCWUAs. This success was not limited to one or two pilot BCWUAs, but instead was affectively introduced to all the BCWUAs in a district.

No financial interventions were used by the project to support the BCWUAs. This not only encourages the BCWUAs to be self-reliant, it also helps to ensure sustainability after project completion.

### **Recommendations**

**Legal Recognition** - Reform measures to recognize BCWUAs should be supported.

**The Implications of Growth** - Continued attention will be needed (and is recommended) to the practical issues of involving large numbers of people in a participatory process. One promising approach is to enlist district, BCWUA staff and farmers themselves in training and mentoring activities in new areas that become involved in decentralized management using a model similar to the one that was adopted for LIFE IWRM.

**Expansion** - Expansion of the decentralization concept to additional areas of the country will create further challenges that will need to be met if the participatory nature of the system is to be maintained, and farmers are to receive needed and wanted services (which in turn is a prerequisite for their support). However, if well managed, the success of current efforts can be used to help resolve the scaling up problem, as described here. Establishment of IWMDs is the first step. Formation of BCWUAs should be done by the IWMDs as part of their role and responsibilities. Water advisory teams led by a water advisory engineer should be formed at each district. A coordinator at directorate level should be assigned. These staff should be trained in procedures for establishing and activating BCWUAs; and principles of participatory water management. Assistance could be provided by enlisting district, BCWUA staff and farmers who have gained experience and perspective through their current involvement in decentralized management, as trainers and mentors in the new areas. Their experience would be germane since they would be employing a decentralized management model similar to that adopted for LIFE IWRM. There will also be a need to continue tailoring awareness and training programs to target the different needs of districts, BCWUA staff and farmers.

**Financial Support** – Continue the practice of not supporting BCWUAs financially.

### Task 3: Equitable Allocation of Water Resources

#### Problems and Lessons Learned

We have learned that equitable allocation of water resources is achievable among the districts, among the canals within districts, and along individual branch canals. We have also learned that near real time data on critical parameters related to water management can be collected and analyzed to enable information-based management.

**Coordination** - Monthly water distribution meetings chaired by the directorate level water distribution section and attended by IWMD water distribution engineers and representatives from the Central Directorate for Water Distribution have proved to be very useful for resolving many water management issues. This encourages directorate staff to be directly responsible for following-up and monitoring IWMD performance. These meetings are seen as an important mechanism for ensuring that the innovative activities for promoting integrated water management introduced to the five target directorates and 27 districts under the project are continued.

The project sponsored a series of coordination meetings between MALR and MWRI at directorate level to ensure proper implementation of the MISD process. These meetings proved very useful in facilitating assessment of the accuracy of data received from MALR.

**Flow Calibration** - Directorates and IWMDs can now use flow data based on water level/discharge calibration equations developed for the key inflow/outflow locations to allocate water resources at the district level. Current meter calibration is required after 100 working hours or after one year of the last calibration. This is essential to maintain the accuracy of the flow measurements and consequently to volume-based water distribution. Consequently, the directorates need to establish a systematic program for calibration.

**Data Loggers** - With assistance from the Telemetry Central Directorate, the project installed seven data loggers. Hourly data on water levels are being accessed by the IWMDs, General Directorate and Central Level of Water Distribution. Engineers of Telemetry sections at directorates were trained and need to be tasked to take on the responsibility of operation and maintenance of these data loggers in coordination with Central Telemetry Directorate in Cairo. Directorate and district staff should use the continuous flow data to get a more accurate estimation of canal flow taking into consideration the fluctuation of water levels during the day.

**MWRI Support** - The direct involvement of the Water Quality Unit and the Groundwater sector in the establishment and implementation of the water quality monitoring and groundwater well inspection programs has proved quite useful. It is expected that this involvement will continue after the completion of the project and will help to ensure sustainability.

**Information System** - The information system activities introduced by the project have also been very successful. To sustain this effort will require that IWMD computers and peripheral equipment continue to be properly maintained and upgraded. Appropriate budgets and trained staff need to be in place for this to happen.

**Data Bases:** Utilizing MWRI entities to develop and support the data base program in general has been a good approach. However, the Water Level and Complaints data bases are too complicated for the IWMDs causing many problems for their staff, particularly when modifications and/or debugging are required. In the future, all IWMD data bases should be “open-source” systems and based on standard MS-Access data base software. Many directorates and districts have developed their own simple but effective data bases. These can be used as prototypes.

**Digital Mapping:** A review of the digital map layers produced by the IWMDs shows that many small errors need to be corrected. It is necessary that the project technical assistance staff review the digital data and systematically identify and correct all errors. District maps are currently rare and generally not available. A majority of the 27 IWMDs have out-dated maps from the Egypt Survey Authority. The Survey Authority’s 1:25000 maps are old and require updating through field verification. Google earth proved to be a useful tool for identifying urban areas. However, corrections were often needed when digitizing areas from Google earth for analytical purposes. AutoCAD is a very useful tool for digital mapping because many of the district engineering staff already know how to use it.

**Data Consolidation and Utilization:** Water and agricultural data are not systematically organized and consolidated at the directorate level. The consequences are a mismatch between supply and demand. In order to improve directorate data management activities, the directorate and IWMD Groundwater, Water Quality, and BCWUA data bases should be updated with canal identifiers so the water resources data can be aggregated by branch canal to create comprehensive data sets to support IWRM at both district and directorate levels. Consideration should be given to strengthening GIS capabilities at the directorate level. With the use of Arc View GIS software provided by the project, water objects on the digital maps (i.e., wells, water monitoring sites, and BCWUA locations) can be linked to the data bases to provide additional attributes for GIS spatial analysis. Using GIS spatial analysis, many key spatial relationships can be derived, and results can be symbolized, visualized, and presented through thematic maps. This is an essential step in using GIS for data based decision making.

**Data Sharing:** In order to fully utilize the IWMD and directorate data, it is essential to improve coordination and two way transfer of information between the IWMDs, the directorates, and the central level through digital data transfer, monthly coordination meetings, and preparation of integrated water management plans. Additionally, MWRI needs to seriously promote data sharing, collaboration, and reuse of data at all levels.

**Data Base Consolidation:** Databases should be consolidated at the directorate level. This should be done in parallel with installation of databases at IWMDs. This will help the directorates to follow the progress of activities in each IWMD such as data entry in addition to producing directorate reports from the database instead of manual reports. This issue has been very critical during the LIFE project where data collected from directorates and IWMDs were different from those collected from databases. The directorates interpreted this issue to mean that some IWMDs haven’t completed data entry and/or some districts have some missing data. So, installation of databases at the directorate and IWMD levels simultaneously will ensure complete data entry and fast and accurate reports.

**Integrated Water Management Plans** -Successful application of the LIFE IWRM model for decentralized and integrated water resource management requires (among other things) that the IWMDs are capable of preparing integrated water resource management plans

(IWRMP). The project introduced a number of activities and procedures that enabled districts to achieve this milestone. These included water quality and quantity monitoring systems, calibration of control structures, an inventory of groundwater wells, introduction of a number of water management databases, a district water resource inventory, water budget studies, activation of MISD, MWRI/MALR coordination meetings, etc. During Year 4 the IWMDs were able to put everything together and finally prepare comprehensive IWRMPs. It would have been ideal if this important benchmark could have been achieved earlier in the project's life. Experience gained from the project shows that this could have been accomplished by initiating data collection, the water resources inventory, and continuous coordination with stakeholders during the first year of the project. This would have allowed IWMDs to start preparing IWRMPs during the second year and given central level MWRI personnel the opportunity to collect, review, and approve plans for implementation.

### Recommendations

**Irrigation Sector** - Irrigation Sector should take the lead on coordinating the water management measurements and information system activities within the five directorates. However directorates should be delegated to be directly responsible for following-up and monitoring of IWMD performance.

The Irrigation Sector should support and strengthen its links with the directorates to prepare targeted releases ahead of the agricultural year, i.e. before the first of October. Preparation of targeted releases requires data on changes in cultivated areas, the targeted cropping pattern, and other demands that should be submitted by each directorate. Then the Irrigation Sector can decide on targeted releases within the context of the national water allocation policy and inform each directorate of these targets.

IWRMPs, seasonal water budgets, and seasonal/annual evaluation of water distribution activities are now prepared by each IWMD and its respective directorate. These should be collected and analyzed by Irrigation Sector, and an annual meeting held to respond to the IWRMPs as well as other issues.

**Water Monitoring Program** - The program of measuring the flows of main canals, branch canals, and drains should be supervised by the directorates and supported by the regional and central water distribution directorates. Data on measurements and calibration should be checked regularly and approved by the regional and central water distribution directorates. Calibration of flow current meters and upgrading of flow measurement equipment is the responsibility of the directorates jointly with the Central Directorate of Water Distribution.

The Telemetry Central Directorate should continue supporting the maintenance and operation of the installed data loggers at 7 sites. Information collected from these data loggers has proved to be critical for water management at directorate and district levels as they are installed at critical sites.

The MWRI Water Quality Unit should continue support for the water quality monitoring program through checking results, upgrading measurement equipment and training.

**Coordination**- The MWRI undersecretary should be the focal point at the governorate for coordination between the directorates and stakeholders (MALR, holding companies for drinking water and sanitation, etc). This involvement will speed up initiation of activities,

such as the MISD program and the preparation of IWRMPs that involve multiple stakeholders. This type of coordination mechanism already exists and is easy to activate and include as part of any implementation program. Seasonal coordination with MALR and other stakeholders should continue under the supervision of the directorates to obtain feedback on water demand and IWRMPs

In the project targeted directorates the monthly water distribution meetings chaired by the head of water distribution at directorate level and attended by the head of water distribution at each IWMD and a Regional Central Directorate for Water Distribution representative should be continued. Meeting minutes, including the monthly performance profile for IWMDs and directorates, as well as problems and recommendations, should be given to the Central Directorate of Water Distribution in Cairo to respond and help resolve issues.

The Nile irrigation system has five recognized hydrologic irrigation regions, upper, middle, east delta, west delta, and middle delta. There are currently two regional directorates for water distribution, one in Assuit for Upper Egypt and one in Tanta for Lower Egypt. Establishment of decentralized water distribution sections in each of the five regions should be considered. These sections would remain under the regional directorates for water distribution. They would be the link between the local and central level, and would be responsible for operation of monitoring programs, localized planning, targeted releases, and distribution of the region's water quota to directorates and IWMDs. Monthly water distribution meetings would be supervised by these regional sections. Establishment of these regional water distribution sections is in line with the MWRI vision of institutional reform and would help implement the IWMD water management activities.

**Replication** -In the implementation of a new program the establishment of a water distribution section at each district should be done as soon as possible. Involvement of directorates should take a lead in this process. Monthly directorate water distribution meetings should be initiated as soon as possible in the project life cycle and include participation of the central water distribution directorates. This will strengthen the MISD and water monitoring programs of the IWMDs and directorates and increase understanding of the volume-based water allocation process.

**Equipment Budget** - To ensure sustainability, Irrigation Department should allocate sufficient budget for IWMDs to maintain water monitoring equipment supplied under the project (water quality meters, GPSs, current meters, etc). In the mean time a replacement plan should be prepared every year by the districts to substitute any obsolete device. The program budget for establishing the water monitoring program should include funds for preparation of flow measurement sites, including establishment of control sections particularly for branch canals and drains with widened cross sections. For newly formed IWMDs an inventory of water marble gauges should be made at the beginning of the project and installation should be done during Year 1.

**Digital Mapping**- GPS and digital mapping tools have been provided to districts and are used effectively by them. The Ministry should encourage their application by assuring that data are widely accessible. Training in digital mapping is essential for IWMDs, and the directorates should play an important part in this process. As a part of the digital mapping effort, the mapping staff in each directorate should consolidate all IWMD map layers, and generate and print the IWMD and directorate maps with the pre-defined map layout for the IWMDs. To meet the requirements of the IWMDs, the maps should have a minimum of nine

layers including boundaries (directorates and/or IWMD), canals, drains, water monitoring points, water quality sampling points, wells, control structure locations, BCWUA locations, and branch canal areas (total, urban and irrigable). This procedure will ensure standardization and the production of high quality, professional, multi-layer digital maps.

**Matching Irrigation Supply & Demand (MISD)** - It is well recognized that the output of the MISD program is very critical to the water allocation policy of the MWRI. MISD data should continue to flow from IWMDs to the directorate and regional levels and to the Central Directorates of Water Distribution. Flow measurements and actual water deliveries should also continue to be carried out in the context of volumetric water allocation policy. In fact, these activities are rather complicated, requiring coordination with various MWRI departments and other stakeholders as well as with MALR and others.

The MISD database is being maintained and supported by the IWMU. To ensure continuation of a two-way vertical flow of information from the directorates to the central level (and vice versa), the MISD database should be installed at regional and central water distribution directorates. The Irrigation Sector with training and support from IWMU should take over maintenance of the MISD database and prepare a plan for installing it at other non-LIFE IWRM project directorates and districts.

To help provide accurate and timely data on crops under the MISD program, more emphasis should be given to linking BCWUAs and agricultural cooperatives. MALR agricultural cooperatives prepare local cropping pattern plans in consultation with farmers and MALR. Currently, MISD crop data are collected by the cooperatives on a biweekly basis and by BCWUAs seasonally. The IWMDs use both data sets to compare and verify MISD data. Linking the two kinds of organizations will clearly increase the accuracy of the data and improve the MISD, IWMP and implementation processes.

**Information System Activities (IS)** - It is important that MWRI continue to support the IS activities of existing IWMDs, but at a lower intensity (refresher courses and database upgrades). It is always a good idea to keep empowering the IWMDs and directorates to continue using the information system tools to support the decentralized water management objective. The established information systems and databases at IWMDs and directorates should be supported by concerned MWRI departments. MIC should continue supervising the operation of water levels, complaints, and violation databases. The Central Water Quality Management Unit and the Groundwater Sector should supervise and support respectively the water quality and the groundwater database, with the latter also responsible for updating the well survey. A monthly report should be produced by these departments to show the status of databases, data entry and required support in terms of computers and training. This monthly report should be submitted to the Irrigation Sector/Irrigation Department when there is a need for coordination or decisions that require involvement at higher levels.

Specific recommendations include:

1. Three computer systems and two GPS receivers should be provided for each new IWMD and directorate and 600 EGP/month for equipment maintenance and replacement will be required. The recommended equipment is sufficient for the nine databases and one mapping system based on feedback from the IWMDs and directorates. The equipment maintenance and replacement budget is an average of figures reported by the managers from the 27 IWMDs and five directorates in March 2008.

2. Continue to have MWRI central level support the IS systems of existing IWMDs, but at a lower intensity (refresher courses and database upgrades). It is always a good idea to keep empowering the IWMDs and directorates to continue using the information system tools to support the decentralized water management objective.
3. Ensure that IS systems upgrades are fully compatible with existing systems at IWMDs and directorates. There are potential software issues with MS-Access 2003 vs. 2007 that should be considered when upgrading the existing databases and developing new database applications.
4. Implement data quality assurance measures and procedures. Currently, the districts do not exercise quality assurance measures for data collection and storage systems. Most data from the field are unchecked. It is recommended that a procedure to systematically identify and fix errors at both district and directorate levels be established to provide high quality data. The information systems will only be useful if there is widespread trust in the accuracy of the data.
5. Unlock all existing databases and ensure that all future IS tools are “open source”. The Water Level, Complaint, and Violation databases are too difficult for the IWMDs to maintain. IWMD staff members have experienced many problems (i.e. lost data and database functionality) in upgrading the databases from one version to another, and it is difficult, if not impossible, for the MIC staff to fix programming errors in the field due to the advanced software (Visual Studio and .Net) they used for the databases. The result is long turnaround times for error fixes because most of the programming issues need to be fixed and re-compiled in Cairo by the MIC staff. In the future, all IWMD databases should be “open-source” systems based on standard MS-Access database software.
6. Establish IWMDs for entire directorates at the same time. Establish only provisional area estimates at the time of creating the IWMDs. Establish true irrigable areas of the new units in conjunction with the Ministry of Agriculture using GPS and GIS technology once district staff are trained in these techniques.
7. Implement IS activities at both district and directorate levels at the same time. The project did not implement the information systems at the five directorates until Year 3. The current evaluation of IS performance shows overall the districts have outperformed the directorates. Four of five directorates will need more time to learn how to apply the GIS mapping software and database consolidation operations.
8. Implement three to four databases at a time, not all eight of them at the same time, perhaps with a 4-6 months gap. Based on experience from other projects, the stepwise approach was implemented under the LIFE IWRM project, and the results were positive. It is recommended that the MISD, Water Level/Discharge, and Complaint database be introduced first.
9. Upgrade the digital mapping system with the most recent high resolution images (1mx1m). The GPS canal, drain, and boundary survey work took about 12 months to complete. One of the problems is the existing Landsat ETM+ image is seven years old and no longer reflects what is on the ground. With high resolution images, the mapping teams would be able to delineate district, BC, and urban boundaries in a much shorter time (3-6 months).
10. Initiate GPS district boundary, water resources inventories and structure surveys early on to measurement based water management. These data are necessary for proper MISD implementation and preparation of integrated water resource management plans & integrated maintenance plans.
11. Conduct GPS BC area surveying in each district with local MALR staff. The MWRI decree area information for most of the districts is outdated and should be updated

with the GPS survey data through a process of review and reconciliation involving the MWRI directorates, IWMDs, and the local MALR staff. This procedure was carried out by the project with great success.

12. Purchase and install more electronic data loggers to support the MISD program. Experience shows that the data logger is a practical and relatively inexpensive device to collect continuous flow data, which should be integrated into the Water Level/Discharge Database and used by the district.
13. Provide the IS training program to the new IWMDs. Additional courses in MS-Access application and GIS spatial analysis should be considered. The IS training courses were excellent and successfully carried out by the MWRI staff members.
14. Continue to have directorates assist the IWMDs with all IS activities. This approach has proven effective over the past four years.
15. Establish computer maintenance sections at new IWMDs and directorates. IT staff members in the IWMDs will be responsible for computer maintenance activities under the supervision of IT persons from the directorate IT maintenance sections. The directorate IT staff members should visit the IWMDs weekly and prepare monthly reports on the status of the IWMD computers. The project used the same approach and procedures with excellent results at each of the 27 IWMDs.
16. Backup data files on a CD at each IWMD and submit a copy to respective directorates monthly for archiving.
17. Submit specific water data monthly from IWMDs to relevant directorates except that MISD 15-day water demand should be sent to the Irrigation Directorate fortnightly.

### **Task 4: Improved Maintenance and Upgrading of Water Management Equipment**

#### **Problems, Lessons Learned and Recommendations**

**Focus Meetings** - While the updated assessment was successfully completed, scheduling of farmer focus group meetings during the summer months created a problem and resulted in some delay; in future they should be timed to avoid seasons when farmers are especially busy.

**Local Organizations** - Where established, BCWUAs and other locally-based organizations should be considered as the main institutions to access farmers and other rural residents for water and community development initiatives; such organizations should be invited to participate at the very outset.

**Field Surveys** - Field surveys and direct field contacts are the most effective mechanisms to understand existing conditions, why people act as they do, and how they are likely to react to different interventions. Consequently, they should be undertaken to plan allocation of project resources.

The last two of these recommendations apply as well to Task 5.

### **Task 5: Environmental Services for Improving Water Quality Management**

### Problems and Lessons Learned

**Waste Water Treatment** - The low cost DBAF wastewater treatment plant is technically and economically feasible for rural villages with limited land. Construction of the DBAF treatment facility is complete, operators have been trained and the plant is fully operational. However, the capacity of the CDA to manage and finance the O&M is limited. Other options included transfer of the facility to a government agency. The Senbo CDA was unable to provide the land for implementation of the agricultural residual recycle activity. This delayed implementation of the activity.

**Stakeholder Coordination** -It is also important to involve the Ministry of Housing and water and waste water companies during the early stages of design and implementation.

### Recommendations

**Stakeholder Coordination** -For interventions in which multiple agencies have responsibilities, it is critical that means be found to enable all to participate in decision making.

**Beneficiary Commitment** -Get commitment of beneficiaries and other interested parties for all important design and operational requirements, e.g. provision of land and financing of O&M before implementation.

**Beneficiary Capability** - Assess the capacity of local partner institutions to take on management and technical responsibilities for operations. Provide support as required.

## Task 6: Improved Wastewater Reuse Practices

### Problems and Lessons Learned

**Awareness** - Changing attitudes and practices takes time. Although the Luxor demonstration site successfully demonstrated that a variety of commercial crops can be safely grown using treated wastewater, the government sector continues to support limiting the use of treated wastewater to growing trees for wood products.

**Private Sector** - Although to date there has been little or no private sector involvement in using treated wastewater for agriculture, there are indications that there may be investor interest; however there seems to be reluctance on the part of the government to release land to small (graduates) and/or large investors at this time.

### Recommendations

**Public Awareness** - Since increased reuse of treated wastewater in agriculture will clearly be needed, it is recommended that awareness programs should be conducted on safe use of treated waste water.

**Monitoring Agencies** - Identifying responsible agencies to monitor users' compliance with safety requirements will be needed.

**Government Incentives** - At least temporarily, it may be advisable for the GOE to offer incentives to invest in projects for growing commercial cash crops using treated wastewater.

### **Task 7: Graduate Degree Training**

The recently completed LIFE IWRM evaluation faulted the project design, indicating that graduate training “bore little relationship to the project objective”. Without arguing one way or the other, it should be noted that a good case can be made for graduate training, whether or not as a component of a successor project whose basic purpose is to extend decentralized, participatory, information-based water management to new areas of the country. Egypt will need to continuously offer training opportunities to its bright young water resources managers and technical people to assure that the next generation of senior decision makers are as well or better prepared as those currently in top positions. In some cases, training abroad will be advantageous.

#### **Problems and Lessons Learned**

1. During the implementation of the LIFE IWRM project graduate degree trainees at local universities pursued their degree on a part time basis. Some will not complete their programs by the September 2008 LIFE IWRM end date.
2. The two participants who completed master’s degree programs in the U.S. enrolled in doctorate programs rather than return to Egypt immediately as had been planned. They have been given permission to do so by MWRI, and are expected to take up positions in the Ministry upon their return.

#### **Recommendations**

1. In future, participants should be given paid leave from the MWRI to enable them to finish their academic work before the end of a project.
2. Candidates for graduate degree study abroad should be required to commit to return upon completion of the academic program they are being sponsored to pursue.

### **Monitoring and Evaluation**

#### **Problems and Lessons Learned**

1. As greater use is made of quantitative information on irrigation performance, it will be necessary to implement a quality control system for the data used. Such a system must insure that the data used are objective and accurate and must be, itself, transparent and open.
2. Data were sometimes developed in different ways and received in different forms from the IWMDs.
3. Available agricultural data were not sufficiently accurate, precise, or accessible to permit estimating the agricultural impacts of the project.
4. Continuing to devote ample resources for a robust M&E program is critical to demonstrate what does and does not have impact in the short- and long-term, and to inform water management decision making.
5. Given the responsibilities envisioned by the MWRI for assignment to BCWUAs at the present time, the streamlined creation and training processes developed by the project employing IWMD staff are effective and appropriate.
6. Significant positive results for many of the project objectives emerged only in the fourth year of the project. If performance outcomes of a project are to be measured, adequate time must be allowed to elapse before an evaluation is made. Four years

appears to be a minimum period for this type of project. This suggests that monitoring and evaluation be continued for several years following completion of four-year projects if outcomes and sustainability are to be assessed.

7. Measurement-based management, which was integrally linked to the M&E program during the project, is a powerful tool for improving irrigation performance and saving water. It provides the essential “demand” for information to drive its “supply”, which is the typical focus of project monitoring and data generation efforts.
8. As use of data generated by IWMDs in management becomes more common, there is a growing need to assure the quality and validity of that data. The Ministry needs to design and implement a system of quality assurance for such data.
9. BCWUAs need to assume increasing levels of responsibility if they are to thrive and persist over time. This means increasing their range of activities, providing additional training, and continuing incremental additions to their authority and responsibility.
10. Failure of IWMDs to follow prescribed rotational patterns is strongly associated with farmer dissatisfaction with the quality of irrigation service. More decision making authority is needed at general directorate and IWMDs levels to tailor rotational plans to local situations. IWMDs must then be held accountable for delivering water according to the established rotational schedules.
11. Transparency and broad regular dissemination of information related to IWMD operations is a powerful tool for improving irrigation performance. Open access to such information and “open source” database software work towards the culture of openness and access to information necessary for effective information-based management and performance improvement.
12. Multiple sources of information on system performance, at least some of which are independent of IWMDs, are important features of a reliable M&E system. There is no obvious substitute currently for periodic use of an externally-administered random sample survey to assess client satisfaction with irrigation service.

### Recommendations

**General-** Recommendations for the M&E program based on lessons learned include:

1. M&E findings and their interpretation should be discussed with all districts. This will close the loop between data collection, analysis, interpretation, and use, and will enhance ownership.
2. Standard data collection protocols and templates should be developed and provided to IWMDs, together with training.
3. The Ministry should develop and implement quality assurance measures for data collection and storage systems with particular attention to water delivery data. Any other data used in the performance benchmarking system for evaluating the quality of directorate and district level management should also be subjected to in-place and explicit independent quality assurance mechanisms.
4. The Ministry should decide whether or not it is possible to produce a reliable set of agricultural data for use in populating M&E indicators.
5. If complaints are to be used as an indicator of district performance, a number of preliminary steps need to be taken. These include:
  - a. Standardize categories of complaints and train staff from all districts in consistent recording practices
  - b. Review and revise software used to record complaints
  - c. Make the reporting functions of the software customizable and allow IWMDs to produce customized reports for their own use

- d. Revise the cumbersome software updating process that often results in lost data
  - e. Examine subsets of complaints (irrigation, drainage, particular types of complaints) for past seasons together with client satisfaction survey results for the same season to seek a category of complaints that correlates statistically with farmer satisfaction. Past analyses of total seasonal complaints per 1,000 feddans has shown no correlation with farmer satisfaction with irrigation service, which renders the use of complaints data as an evaluation tool for measuring district performance questionable.
6. Continue independently conducted client satisfaction surveys in the 27 pilot districts at regular intervals to document post-project performance. Basic survey questions must remain the same as those asked in previous surveys to allow comparisons to be made.
  7. Continue to refine the crop water requirements (CWR) and target values for IWMDs and incorporate them into standard operating procedures at all levels for the Nile system.
  8. Designate a person at the Water Distribution Center in the Ministry to continue to calculate and disseminate water demand, target, and delivery data and the M&E indicators based on those data.
  9. Establish a data quality monitoring unit at the General Directorate level to spot check and validate discharge data reported by IWMDs.
  10. Incorporate performance benchmarking (PB) data collected by the IWMDs into routine operating practices of IWMDs. Review and reassess the use, reliability, and value of the PB program after one full year of operation.
  11. In addition to satisfying donor specific M&E requirements, MWRI should establish a common set of indicators to be used by all donor funded capacity building programs.

**Expanding the Program to Other Areas-** Several lessons for expanding the decentralization program and its M&E component to other areas emerge from LIFE experience.

1. Don't abandon the original group of IWMDs. Continue training, M&E, and modest financial support to these districts. The level of this support can decline over time.
2. Focus a follow-on project on measurement-based management. Creating IWMDs and BCWUAs should be seen as important in their own right, but also as means to the end of measurement-based management. The second half of the project, and on-going support activities, should be directed primarily at this end and should focus on measured verifiable improvement of system performance.
3. Focus a follow-on project at all three levels of the water distribution chain – IWMD, General Directorate, and Cairo Ministry. Provide support at all three levels for measurement-based management and performance assessment.
4. Leverage MWRI maintenance funds for selectively improving (as opposed to simply maintaining) district water conveyance and control facilities. Tie release of these improvement funds to subsequent documented improvements in water use efficiency and delivery performance.
5. Review policies on data sharing and locking software coding within the MWRI; and eliminate those which constrain effective decentralized management at the district level and which lack a clear public purpose.

**Revised Indicators-** Indicators used in the LIFE M&E program evolved over the life of the project in response to lessons learned. The final set of indicators can serve as a useful

starting point for M&E in a follow-on project. The following are some observations on this set.

1. The quantified water delivery figures (crop water demands, targets, actual deliveries) can be combined to comprise a very useful set of multi-purpose performance indicators. These indicators are useful for (a) project M&E, (b) annual district performance evaluations, and (c) real time performance benchmarking.
2. Independent randomly-sampled client satisfaction surveys are a good method for assessing IWMD and BCWUA performance. These should be an integral part of any future project activity. BCWUAs can provide useful information on many dimensions of performance, but should be accompanied by independent assessments.
3. The frequency of complaints registered by farmers at IWMD offices does not appear to be correlated with farmer ratings of quality of irrigation service derived from random sample surveys. Caution is advised in using complaints as a primary performance indicator.
4. Yield and price information generated by MALR field units do not appear to be sufficiently precise or reliable at the present time to serve as a basis for measuring changes in value of farm output in response to project interventions. Moreover, agricultural yields and cropping patterns respond strongly to other factors in addition to changes in quality of irrigation service – particularly relative prices of inputs as well as commodity prices – making attribution to project interventions problematic. More accurate assessments of agricultural yields are possible using remote sensing-based SEBOL technology. Additionally, the influence of price movements on yields and cropping patterns can be separated out using econometric methods. Both of these techniques, however, require specialized expertise and entail additional costs. Project sponsors must decide at the outset if the additional insight gained from information on project impacts is worth the additional costs which would be entailed in generating this understanding.

## Education, Communication, Public Awareness and Participation

### Lessons Learned

1. Close cooperation between project personnel and the MWRI Water Communication Unit in carrying out communication and public awareness activities has been beneficial to both parties. The project provided direct support to the WCU and in return utilized the talents of the well-trained and equipped WCU staff. In particular, the project has taken advantage of WCU capacity to produce training and awareness videos and conduct awareness campaigns.
2. The awareness events sponsored by the project for Undersecretaries and General Directors were well received.
3. The compilation and publishing of Arabic language Guidelines on IWMD activities proved an excellent tool for disseminating procedures used by the project to implement its various activities.

### Recommendations

1. The close cooperation between the project and the MWRI Water Communication Unit should be continued under any successor project.
2. The BCWUAs are key to involving users in water management. Awareness activities and materials must be developed to target the different levels of the BCWUAs

including chairpersons, board members, water users' representatives, residential members and water users in general. Gender focused programs also need to be considered.

3. The three LIFE IWRM awareness workshops held for over 80 senior MWRI irrigation and drainage officials proved very effective in informing MWRI high-ranking staff about the concepts of IWMDs. These types of workshops should be extended to include inspectors, district engineers, and sector heads.
4. MWRI should encourage line agencies to follow the Guidelines prepared by the project. From time to time as necessary the Guidelines can be reviewed and updated by approval of the Irrigation Department.

## Training

### Lessons Learned

1. The decision to decentralize and institutionalize training by maximizing the use of MWRI staff as trainers and establishing training facilities at the district and directorate levels worked out very well. Training modules were developed and presented by MWRI staff. Each district provided a small training/conference room furnished with help from the project. Regional computer centers to serve the five directorates were also established with assistance from the project. For larger events, local community centers were used instead of more expensive hotels. Long distance participant travel was limited so that overnight accommodations were not required. For Tasks 1, 2 and 3 this strategy allowed the project to conduct over 40 formal training courses with 500 classroom events. In total about 950 training days were provided for 16,600 trainees, fifteen percent of whom were women. Topics included IWMD organization, integrated maintenance, management and communications, BCWUA formation and activation, participatory water management, computer use and maintenance, water monitoring, MISD, data bases, digital mapping, and English language. Average cost per event was EGP 4300 and average cost per participant was EGP 185.
2. Several Undersecretaries and General Directors recommended that training be limited during the summer irrigation season (June – August) because of the heavy work load of MWRI staff during this period. This suggestion was adopted by the project.
3. The On-the-Job Training (OJT) programs also proved very successful. Specific sub-tasks were assigned to each district. Implementation plans and schedules were prepared by the districts for the sub-tasks. Formation and activation of BCWUAs, calibration of water measurement structures, GPS of branch canal areas were all done through OJT programs. This concept provided a mechanism for mobilizing IWMD staff to participate in achieving project objectives and targets.
4. The 90 hour English language training program offered by AmidEast at nine locations was excellent and well received by the MWRI staff. Even though the course was given after working hours, attendance and participation were very good. A total of 77 persons attended the program.

### Recommendations

1. Directorates should build their own training programs with the IWMDs in their jurisdiction.

2. Staff who received training under the project should themselves now be used as trainers.
3. If there is interest and available funds the AmidEast English language training program should be continued.

## Gender

### Problems and Lessons Learned

Gender issues were integrated into all LIFE IWRM activities. One General Director, three IWMD District Managers, 25 percent of the IWMD section heads, 10 percent of the BCWUA board members and 15 percent of participants in the various training courses designed and carried out under the project were women. Discussions of gender issues were included in all BCWUA training. Formal presentations by IWMU on gender issues were given to the Under Secretaries, General Directors, and IWMD District Managers at the monthly coordination meetings. Special efforts were made to ensure that gender equity issues were reflected in all communications materials produced under the project. Gender equity nevertheless is still a problem area, a goal yet to be fully achieved – in Egypt and elsewhere. Projects like LIFE IWRM can make a contribution.

### Recommendations

Continue focusing on gender awareness and the need for gender equity in training, communications and other project activities.

## Procurement

### Lessons Learned

1. The use of FT800 funds and having a 263 geographic code for procurement has simplified the procurement process and greatly assisted us in containing costs.
2. The purchase of computer equipment and supplies at regional locations served to ensure that we received reliable and timely maintenance at costs that are lower than they would otherwise have been.
3. With the help of USAID and MWRI, LIFE IWRM established streamlined US procurement procedures, permitting supply and delivery of US purchased equipment within 30 days. This permitted project personnel to work with and build capacity earlier in the course of implementation than would otherwise have been the case.

### Recommendations

1. Continue aforesaid practices that resulted in cost savings, expedited delivery of commodities, and reliable service.

## Cost Control

### Lessons Learned

The project implemented a number of cost saving measures, including:

1. Making extensive use of MWRI IWMU and district staff, as well as Egyptian consultants instead of more expensive expatriate experts. For example, to reduce costs and in furtherance of water management decentralization objectives, IWMD staff were trained and were able to successfully establish and begin the work of activating the BCWUAs themselves instead of using Central Irrigation Advisory staff for that purpose.
2. Engaging Egyptian consultants directly instead of through locally-based firms.
3. As noted, procuring equipment locally to the extent possible; computers have been procured locally instead of from the US, and maintenance is being provided by local suppliers. The result was a tremendous savings both in cost and time.
4. Decentralizing and regionalizing project training programs to minimize travel and accommodation expenses of trainers and trainees; regional trainers and service providers have been used to the maximum extent possible, instead of bringing trainers from Cairo or the US.
5. Making special arrangements with the Ministry of Health Laboratory in Luxor and the MALR soils lab to reduce laboratory costs for water quality and soil sampling.
6. Renting vehicles, in many cases on an as needed basis, instead of purchasing them.
7. Posting reports on a project website to reduce printing and distribution costs.
8. Making arrangements with MWRI to utilize 37 current meters from its inventory instead of procuring them from the US.
9. Redistributing project administrative, financial, and procurement responsibilities with on-board staff rather than hiring a replacement local finance specialist when the incumbent departed.
10. Additionally, and with the strong support of the MWRI Integrated Water Management Unit and H.E. MWRI Minister, IRG was able to establish offices within the MWRI Ministry building in Cairo and on the MWRI premises in Zagazig and Qena. This resulted in major savings in rent and travel, allowed for considerable sharing of resources, including personnel, vehicles, furniture, and equipment, and supported the accelerated completion of a number of activities.

### **Recommendations**

Continue implementing cost saving strategies like the ones enumerated above.