



**LIFE Integrated Water Resources Management  
Task Order No. 802  
EPIQ II: Contract No. EPP-T-802-03-00013-00**

# **Monitoring and Evaluation Report: Year 4**

*Report No. 56*

**June 2008**

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**LIFE Integrated Water Resources Management  
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# **Monitoring and Evaluation Report: Year 4**

*Report No. xx*

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**June 2008**

## **DISCLAIMER**

**The authors' views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government**

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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
CD	Central Directorate
CDA	Community Development Association
CDIAS	Central Directorate, Irrigation Advisory Service
CTO	Cognizant Technical Officer. The USAID person responsible for supervising a technical assistance contractor
CWR	Crop Water Requirement
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
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
RSC/WP	Red Sea Coastal/Water Project, short name for USAID Red Sea Coastal and Improved Water Resource Management Project
RWS	Relative Water Supply
SIRs	Sub-Intermediate Results
SOs	Strategic Objectives
STTA	Short-term Technical Assistance
TA	Technical Assistance
TOR	Terms of Reference
USA	United States of America
USAID	United States Agency for International Development
WCU	MWRI Water Communication Unit
WDC	MWRI Central Water Distribution Center
WPRP	Water Resources Results Package
WQU	MWRI Water Quality Unit
WUA	Water User Association

## Executive Summary

At the end of the fourth year of the project, indicators measuring project implementation show complete achievement. Integrated Water Management Districts (IWMDs) have been established and equipped, and have completed digital mapping exercises, system inventories, and integrated maintenance planning activities. A number of tools for volumetric water management have been developed and put into place, including a water measurement system and databases for storing and retrieving information. Branch Canal Water User Associations (BCWUAs) have been established and are interacting with IWMDs on a regular basis. They contribute maintenance priorities to Districts and communicate District plans to farmers as well as working to even out the distribution of water along Branch Canals.

Expected outcomes of the project fall into two categories. Under “quality of service” the number of complaints fell somewhat and the level of total complaints per 1,000 feddans is now below the baseline level. Drainage complaints, in particular, have shown a steady decline over the life of the project. However, level of complaints is not correlated with survey-based “farmer satisfaction” and complaints do not seem to be a very reliable indicator for assessing IWMD operational performance.

The ratio of water deliveries to targets for the project in Year 4 was a perfect 1.00. However there is large variability among Districts and a need to further refine the targets and the target-setting process. In particular, the concept of “implied efficiency” could be employed, together with selected physical and management improvements, to raise further the actual efficiency of the irrigation system.

Farmer satisfaction levels have not shown a consistent trend over the life of the project in either season. In general about 3 out of 4 farmers report moderate to high satisfaction with irrigation service in the summer season, as they did in the baseline year. However, a relative handful of districts with very low satisfaction levels prevent the average from rising. Lax implementation of rotational schedules is strongly associated with high levels of dissatisfaction, as was the case in Year 3.

Under “equity of distribution” three indicators reported results at different levels – among Districts, among BCs within Districts, and along BCs. The “among District” distribution is measured by the percent of Districts having Relative Water Supply (RWS) values within 10% of the average for all Districts. In Year 4 this value rose to 48%, from a Year 3 level of just 28%, an impressive improvement. Consistent with this, the coefficient of variation of the RWS values for the two years also declined sharply, indicating a narrower range of values making up the average.

The “among-BC” equity ratio measures the effectiveness of the IWMD in distributing water among BCs within its boundaries. In Year 4, this indicator also declined sharply from its summer Year 3 and for the first time dropped below the baseline value, indicating greater equity among BCs. The winter value was already low and declined further to nearly unity.

This shows substantial improvement in improving the equity of water distribution among BCs by Districts.

The “within-BC” equity ratio measures distribution of water from head to tail of BCs and reflects the efforts of the BCWUA to distribute the water it receives from the IWMD among mesqas. In Year 4, this indicator continued the steady and encouraging decline from the baseline value that it had demonstrated in previous years. This suggests that the formation of the BCWUAs and improved communication between users and the IWMDs continues to improve water distribution equity along BCs.

## **Background**

The LIFE Project Monitoring and Evaluation (M&E) Plan lays out the background, purpose, methodology, goals, indicators, and targets for the project. The M&E Plan is a part of the project management process, and, as such, is adjusted periodically to accommodate changes occurring in the context and implementation of the project. 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.

## Data Sources and Quality

As described in the M&E Plan, data for the M&E activity comes from three principal sources: project recordkeeping, an annual client satisfaction survey, and IWMD data collection systems. In general these data collection systems, particularly the IWMD systems, represent a giant step forward from what existed prior to the project, and in comparison with similar systems in non-project irrigation districts.

### Project Recordkeeping

Project recordkeeping was used to populate the *implementation indicators*, i.e. those under Objectives 1, 2, and 3 (see Table 1). Project staff provided this data and have assembled an archive of documents which underlie the data provided to populate the indicators.

### Client Satisfaction Survey

The client satisfaction survey was conducted during May 2008. The work was carried out by El Zanaty and Associates, who administered the survey to approximately 4900 respondents across the 27 IWMDs, prepared a report describing their work, including Directorate and IWMD profiles, and provided reduced data, in spreadsheet form, to project M&E staff. IWMDs participated in the survey by generating the sampling frame—a list of all the farmers in the selected sample branch canals—and by providing staff to serve as field enumerators and supervisors. The result was a set of data that served as a basis for computing several important M&E *impact indicators*.

### IWMD Data

Data collected by the IWMDs was also an important source of information for computing *impact indicators*. Data collected by the IWMDs for the 2007-08 agricultural year included:

- Number of complaints filed with the IWMD
- Planned 15-day target inflows to each IWMD for the agricultural year (from the five General Directorates)
- Computed 15-daily demand figures for each IWMD (from Districts, using the MISD system)
- Actual measured 15-day net inflows to each IWMD (from Districts calculated from daily readings at calibrated inflow structures)
- Actual cropping patterns in each IWMD (from local Agricultural Administration units through MISD and the Districts)

## **Data Quality**

### **Client Satisfaction Survey**

According to the survey consultant, because of previous years of experience, no significant problems were encountered in carrying out the Year 4 survey. All participating staff received training in conducting field surveys from the survey contractor. Many of the staff members involved also participated in previous years' surveys. Two enumerators who turned in sub-par performances in the Year 3 survey were excluded from the Year 4 round. Consultant's supervisory staff re-surveyed one randomly selected questionnaire for each enumerator each day, resulting in a resurvey rate of an estimated five to ten percent. Consolidated data appear generally consistent, both internally and with previous years' surveys.

### **Water Allocation Process**

One of the innovations introduced by the project is that of establishing and reporting target values of water to be delivered to each project District and the comparing of these values regularly with the amounts actually delivered. Prior to the project, volumetric targets were established by the central Water Distribution Center down to the level of the Directorates only. During Year 3, the project initiated regular meetings at the General Directorate level among the regional branch of the Water Distribution Center, the Directorate, and the Districts in that Directorate to extend the volumetric target concept down to the level of the District and to refine the targets based on experience with using them. At the end of Year 4, target values have been set and refined several times and understanding of the target concept at the Directorate and District levels was enhanced. Some discrepancies and confusion remain. As of April 2008, for example, Districts in Aswan General Directorate continue to report an older (and higher) set of delivery target values on performance benchmarking reports rather than a more recent set of target values held by the Water Distribution Center.

### **Actual Water Delivered**

By Year 4, the water flow data are being collected and reported regularly with few gaps or missing data. Data appear reasonable and are presumed to give a fair picture of water deliveries to each District. Values reported on performance benchmarking sheets are generally consistent with values reported to the M&E system.

### **IWMD Area**

During Year 3, the areas of all 27 project IWMDs were re-measured using handheld GPS units as discussed in the Year 3 M&E report. During Year 4, this set of area values were adjusted again, through a process of review and negotiation involving the Ministry, the Districts, and local Agricultural Administration Units. As a result, many of the area values were adjusted to reflect a consensus view among the parties on the

irrigable area of each District<sup>1</sup>. The new set of approved values has been used in the Year 4 M&E Report, and was also used to update some of the data from earlier years where these data were used for comparison purposes in the current Report. In particular, complaints per 1,000 feddans were adjusted using the new area figures which resulted in some minor changes in the earlier years' results. The new figures have been approved at the General Directorate level by both Irrigation and Agriculture, and are awaiting final approval by the Minister, MWRI.

Unfortunately, Ministry restrictions on access to the digital mapping data that underlie the estimates and a prohibition on sharing this data among Districts, as reported last year, are still in effect.

### **Complaints Data**

A reliable system for classifying, collecting, and reporting farmer complaints data is not yet in place. Queries produce different results, depending on whether the data comes from the paper records of the Districts, the electronic database at the District level, or the centralized database of the MIC. Report generation capabilities of the electronic database system are limited. If managers expect to continue to use complaints data in the management process, this system needs to be carefully reviewed and rationalized.

### **Quality Control for Ongoing Data Collection**

As field data become more important factors in the Ministry's management systems, the importance of checking and controlling the quality of that data likewise becomes increasingly critical. Last year's recommendation is repeated here, that 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 have explicit independent quality assurance mechanisms in place. These systems will only be useful if there is widespread trust in the honesty of reporting and the accuracy of the data used.

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<sup>1</sup> Where differences were minor, the parties (agriculture and irrigation) simply agreed to keep different but similar accounts. Where there were more significant differences, technicians from Agriculture and Water Resources went to the field again together and conducted another GPS assessment that yielded a common set of figures. The analysis was done at the level of the individual branch canal command and aggregated to the District level.

## Results

### Implementation Indicators

Objectives and indicators in the M&E Plan are divided into two basic categories. The first three objectives and associated *implementation* indicators relate to the progress achieved in implementing planned project activities. Table 1 shows:

1. The 3 implementation objectives
2. The 15 associated indicators
3. The baseline values of the indicators at the beginning of the LIFE project
4. The target values for the indicators for the 4 years of the project
5. The actual values of the indicators achieved during Years 1, 2, 3, and 4 of the project.

#### Objective 1: IWMDs Established

As reported for Year 1, all 27 IWMDs were established, fully staffed, and equipped with computer systems during the first year of the project (Indicators 1.1, 1.4, and 1.5). During Year 2, digital mapping was completed for boundaries and major canals in all 27 Districts (Indicator 1.2) and all Districts completed integrated maintenance plans (Indicator 1.3). All Districts were preparing specifications and monitoring maintenance contract implementation by the end of Year 3.

#### Objective 2: Data-based Management

The second objective calls for the establishment and use of measurement-based management practices in all IWMDs. During the past 3 years the project has developed downstream rating curves for all 84 approved major inflow and outflow points and 57 other measuring points within the 27 Districts. They have been using these curves, together with daily water level readings, to provide regular, real-time reports on water deliveries to District Manager (Indicators 2.1 and 2.2).

The second pair of indicators under Objective 2 relate to planning for integrated water management at the District level. The first indicator counts the number of Districts that have completed an inventory of their water resources and structures (Indicator 2.3). After completing water resource inventories, Districts develop integrated water management plans that encompass all water sources within the District—surface, ground, and drainage (Indicator 2.4). All 27 Districts have completed inventories and draft water management plans. They are still working to finalize these plans.

# Year 4 Monitoring and Evaluation Report

**Table 1 Implementation Objectives, Indicators, Targets, and Year 4 Accomplishments**

Objective			Cumulative Targets and Accomplishments																		
			Indicator	Units	Baseline	Year 1		Year 2		Year 3		Year 4									
						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	27	27	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	27	27	27	27	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	27	27	27	27	27	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	27	27	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	27	27	27	27	27	27	27	27	27	27
1.6	Number of IWMDs preparing and supervising maintenance contracts	Number	0	0	0	0	0	0	27	27	27	27	27	27	27	27	27	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	27	27	27	27	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	27	27	27	27	27	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	27	27	27	27	27	27	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	0	27	0	27	0	27	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	1,017	1,017	1,017	1,017	1,017	1,017	1,017	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	1,017	1,017	1,017	1,017	1,017	1,017	1,017	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	1,017	1,017	1,017	1,017	1,017	1,017	1,017	1,017	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	27	27	27	27	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	27	27	27	27	27	27	27	27	27	27

\* Water resource management plans completed in draft form

### **Objective 3: BCWUAs Participating**

The third objective is for BCWUAs to participate in water management in all IWMDs. The five indicators shown in Table 1 track project progress toward this objective. All targets have been reached.

Results from the client satisfaction survey show that, overall, 62% of farmers know of the existence of a BCWUA on their branch canals (BCs) and can correctly name one of the board members, up from 43% in Year 3. Unlike Year 3 there are now few differences in BCWUA awareness on difficult/tail BCs compared with easy/head BCs. This is a positive trend.

There are no clear plans for continuing transfer of greater responsibility to the BCWUAs and their ongoing role appears to be limited to providing advice to the District and informally resolving disputes. Whether or this limited role will continue to generate sufficient interest among local farmers to sustain the WUA remains to be seen.

### **Outcome Indicators**

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

Because there are no absolute reference points for the values of these indicators, Year 1 values have been used as baseline values, with all subsequent changes related to these baseline values. Values are thus being computed for the baseline year (Year 1) and for Years 2, 3, and 4. In all cases, values are computed for individual Districts and weighted averages taken to obtain project-wide values<sup>2</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 2.

### **Objective 4: Quality of Irrigation Service**

#### *Complaints*

In Year 4 farmers filed 24% fewer irrigation and drainage complaints (1,503) than they did in the baseline year (1,968). As shown in Table 2, the number of complaints per 1,000 feddans was 1.46 in Year 4, compared with 1.91 in the baseline year<sup>3</sup>.

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<sup>2</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.

<sup>3</sup> As discussed earlier, the complaints data have been adjusted, retroactively, for all years using the new GPS-based area figures for the IWMDs. This has resulted in some changes in the “per 1,000 feddan” values of the data for Years 1, 2, and 3 compared with the results shown in the M&E Reports from those years. Results shown in this Report are all based on the new approved GPS-based areas.

This project-wide decrease in complaints from Year 3 to Year 4 was driven by sharp decreases in both irrigation complaints (30%) and drainage complaints (37%). Total complaints declined in 4 of the 5 directorates, compared with last year. East Qena was the exception, with total complaints in the 5 districts of that directorate increasing by 14% from 123 to 140.

As in past years, more complaints were filed in Lower Egypt (1.92 per 1,000 feddans) than in Upper Egypt (1.07 per 1,000 feddans). Aswan District recorded the highest complaint rate of the 25 Districts in Year 4, closely followed by Quesna District. The performance of individual Districts for Year 4 is shown in Figure 1.

Year to year changes in complaint rates for the 25 Districts, broken out by season and type of complaint, are shown in Table 3. As seen, there was a steady increase in the summer irrigation complaint rate from the baseline year to Year 3, but the rate then fell sharply in Year 4. Across the entire project, summer irrigation complaints are still somewhat higher than they were in the baseline year.

On the other hand, summer drainage complaints have fallen steadily over the same period across the project, and are now just a quarter of their value at the beginning of the project. One possible explanation for this strong decline is the transfer of responsibility for drainage system maintenance from EPAD to the IWMDs as a part of IWMD formation. When the IWMDs were formed, EPAD transferred hydraulic drain cleaning equipment and technicians to the Districts, who have been performing regular drain maintenance since that time. This may have resulted in higher quality, more responsive service.

The net result of the off-setting changes in drainage and irrigation complaints is a rate of total summer complaints per unit area that is down from 1.02 in the baseline year to 0.69 last year. Winter complaints been more variable but total winter complaints per unit area are now slightly less than they were in the baseline year. A complete set of complaints data is contained in Annex 1.

It is important to note that there is no significant correlation between the number of complaints recorded in District offices and farmer satisfaction as measured in sample surveys<sup>4</sup>. The number of recorded complaints per unit area is statistically unrelated to farmer satisfaction as measured by a large sample survey. The same absence of any connection between complaints and satisfaction was found in Year 3, suggesting that it is not particularly useful to count complaints as an indicator of quality of irrigation service or IWMD performance. Assessment of farmer satisfaction should be based on a more regular and comprehensive sampling process that that afforded by the complaints register at the District office.

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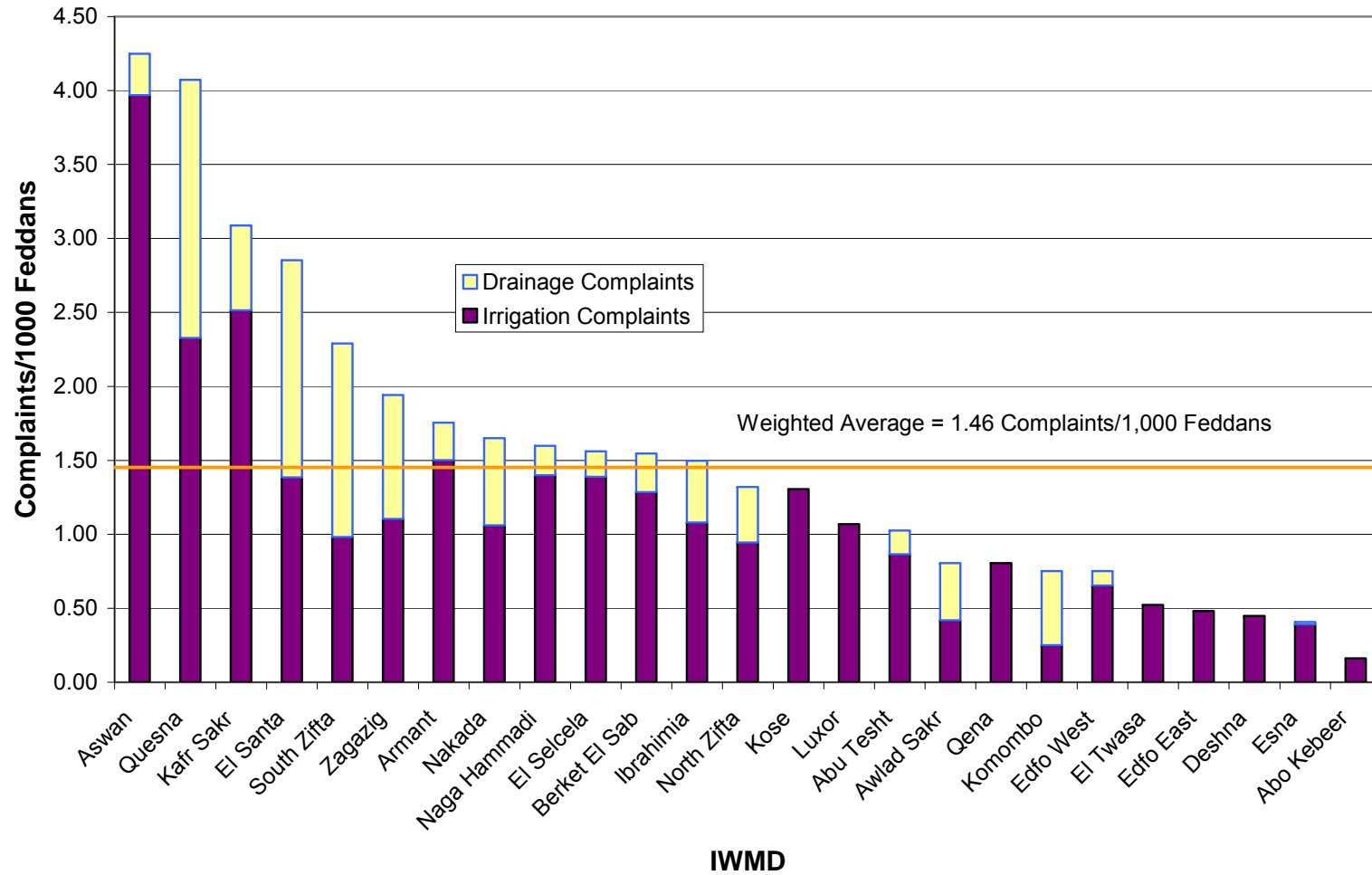
<sup>4</sup> The correlation for Year 4 data was -0.17, giving an  $r^2$  of 0.03.

Year 4 Monitoring and Evaluation Report

**Table 2 Baseline and Annual Values for Objectives 4, 5, and 6 Indicators**

Objective	Indicator	Units	Targets and Accomplishments						
			Baseline (Year 1)	Year 2		Year 3		Year 4	
				Target	Actual	Target	Actual	Target	Actual
<b>4</b>	<b>Quality of irrigation service to farmers improved in all</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</b>	<b>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
<b>6</b>	<b>Real gross value of agricultural output in all IWMDs increased</b>								
6.1	Real gross value of agricultural output per feddan in IWMD	LE/feddan							
6.2	Real gross value of agricultural output per 1,000 m <sup>3</sup> of water in IWMD	LE/1,000 m <sup>3</sup> of water							

Figure 1 Formal Farmer Complaints, 2007–08 Agricultural Year



**Table 3 Year to Year Changes in Complaints Rate for Years 1, 2, 3, and 4**

**Summer**

Complaints per 1000 feddan			Complaints per 1000 feddan			Complaints per 1000 feddan			Complaints per 1000 feddan		
Summer 2004 (Baseline)			Summer 2005			Summer 2006			Summer 2007		
1 May - 30 Sept.			1 May - 30 Sept.			1 May - 30 Sept.			1 May - 30 Sept.		
Irrigation	Drainage	Total	Irrigation	Drainage	Total	Irrigation	Drainage	Total	Irrigation	Drainage	Total
0.43	0.59	1.02	0.61	0.27	0.88	0.86	0.29	1.15	0.54	0.15	0.69

**Winter**

Complaints per 1000 feddan			Complaints per 1000 feddan			Complaints per 1000 feddan			Complaints per 1000 feddan		
Winter 2004-5 (Baseline)			Winter 2005-6			Winter 2006-7			Winter 2007-8		
1 October - 30 April			1 October - 30 April			1 October - 30 April			1 October - 30 April		
Irrigation	Drainage	Total	Irrigation	Drainage	Total	Irrigation	Drainage	Total	Irrigation	Drainage	Total
0.46	0.43	0.89	0.70	0.31	1.02	0.65	0.37	1.02	0.51	0.26	0.77

*Actual and Target District Inflows*

The LIFE project has introduced the concept of delivery “targets” along with “crop water requirements” and “actual deliveries” as management tools for district and directorate level managers. At the Directorate level, managers are asked to estimate, in consultation with District Managers, the target volumes of water they expect to deliver to each District for each 15-day period during the year. These target values can then be compared with actual measured deliveries as the season progresses, and at the end of the season, to see how close the match was and make adjustments. It is important to note that the targets are planning values, fixed before the beginning of each agricultural year.

Delivery targets are the predetermined volumes of canal water that managers plan to deliver to various levels in the system. They are different from computed crop water requirements in that they include estimates of losses en route to farmers’ fields as well as quantities of water required for non-irrigation uses. Targets also take into consideration the volume of water drawn from secondary sources within a District, such as pumping from drains and from groundwater. Targets are thus based on computed potential evapotranspiration (PET) for the expected areas of crops to be grown, but include explicit adjustment for the other factors mentioned above. Using volumetric targets makes the planning for seasonal water delivery much more open and explicit than do current practices.

The concept of targets was a new one in the water management system as applied at the Directorate and District levels, and it has taken some time to develop into a functional planning process whereby realistic target values are established, reported, and monitored for each season. During this two-year learning process, targets have been refined and generally lowered. This is a positive development as it reflects a more serious effort to estimate actual needs for Nile water at the District and Directorate levels. Additional adjustments will be needed to bring water use in some Districts down to more reasonable levels.

For M&E purposes, two indicators are computed from these data. The first is the ratio of water actually delivered to the target value for the season. These values for summer and winter 2007-8 are shown in Tables 4 and 5. Allocation targets and actual delivery volumes for the two seasons are presented in Annex 2.

As seen in Table 4, the ratio of total actual deliveries to the aggregate targets for the 25 Districts for summer is 1.00, which is ideal. The baseline value (2004) was 0.96. This 4% increase in the ratio reflects the effects of both a 12% reduction in the aggregate target value over the period and a 9% decrease in the total amount of water actually delivered.

Among Districts there is great variation, and actual deliveries range from 60% (Nakada) to 150% (Esna) of seasonal targets. Note that both extremes are located in West Qena General Directorate. In general, the range of variability decreased in summer 2007 compared with summer 2006, which is a positive development. Ratio values for individual districts for summer 2007 are shown graphically in Figures 2 and 3 for lower and upper Egypt respectively, along with the project-wide average.

For the winter season (Table 5), the average ratio of actual deliveries to targets for the 25 Districts is 1.32, which represents a sizeable increase over the baseline value of 1.13. However, the ratio resulted from a 31% drop in the aggregate target value over the period and a 19% decline in actual deliveries. Thus, even though the ratio increased, considerably less winter water was delivered in Year 4 than in Year 3 or in the baseline year. Among Districts, actual winter deliveries range from 72% (Ibrahimia) to 289% (Kafr Sakar) of seasonal targets. Interestingly, as in the case of the summer extremes, both of these values were from the same General Directorate.

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Table 4 Ratio of Actual and Target Allocation Values for Summer 2007

General Directorate	District	Approved Area May 08 (feddan)	Summer [% of target]										Total Summer
			May 2007		June 2007		July 2007		August 2007		September 2007		
			1-15	16-31	1-15	16-30	1-15	16-31	1-15	16-31	1-15	16-30	
New Zifta	North Zifta	37,102	89%	130%	141%	146%	139%	142%	143%	141%	199%	172%	143%
	El Santa	46,965	110%	122%	107%	140%	105%	103%	109%	78%	113%	103%	109%
	Quesna	49,847	86%	86%	89%	97%	77%	86%	105%	103%	114%	118%	95%
	South Zifta	36,684	129%	159%	115%	117%	87%	100%	137%	150%	198%	146%	127%
	Berket El Sab	38,164	75%	76%	67%	77%	54%	73%	68%	63%	93%	88%	72%
	<b>TOTAL</b>	<b>208,762</b>	<b>97%</b>	<b>113%</b>	<b>103%</b>	<b>116%</b>	<b>91%</b>	<b>101%</b>	<b>112%</b>	<b>104%</b>	<b>139%</b>	<b>124%</b>	<b>108%</b>
West Sharkia	Abo Kebeer	49,850	135%	133%	105%	103%	93%	87%	103%	99%	123%	108%	106%
	Kafr Sakr	45,343	92%	119%	99%	95%	90%	98%	96%	104%	150%	193%	110%
	Awlad Sakr	62,060	68%	84%	165%	129%	151%	157%	168%	164%	136%	81%	136%
	Ibrahimia	50,080	56%	73%	95%	124%	93%	99%	140%	134%	113%	79%	103%
	Zagazig	48,913	105%	123%	68%	68%	177%	180%	187%	114%	81%	45%	119%
	<b>TOTAL</b>	<b>256,246</b>	<b>91%</b>	<b>106%</b>	<b>108%</b>	<b>104%</b>	<b>123%</b>	<b>126%</b>	<b>141%</b>	<b>125%</b>	<b>120%</b>	<b>98%</b>	<b>116%</b>
West Qena	Esna	61,402	153%	190%	128%	121%	125%	118%	142%	159%	219%	196%	150%
	Armant	39,321	91%	91%	76%	77%	82%	89%	106%	96%	130%	140%	95%
	Nakada	33,945	59%	67%	53%	51%	54%	56%	63%	57%	76%	70%	60%
	Naga Hammadi	50,051	130%	125%	87%	87%	102%	104%	119%	102%	136%	140%	110%
	Abu Tesht	37,025	101%	87%	77%	66%	77%	74%	80%	84%	122%	93%	84%
	<b>TOTAL</b>	<b>221,744</b>	<b>108%</b>	<b>113%</b>	<b>85%</b>	<b>80%</b>	<b>88%</b>	<b>88%</b>	<b>102%</b>	<b>100%</b>	<b>136%</b>	<b>128%</b>	<b>100%</b>
East Qena	Luxor	36,545	62%	71%	68%	70%	65%	66%	81%	82%	104%	96%	75%
	Kose	32,944	64%	112%	82%	138%	78%	84%	85%	92%	106%	115%	95%
	Qena	45,990	175%	175%	84%	75%	77%	73%	113%	94%	119%	103%	101%
	Deshna	46,967	104%	106%	72%	80%	72%	86%	84%	98%	106%	101%	88%
	<b>TOTAL</b>	<b>162,446</b>	<b>98%</b>	<b>113%</b>	<b>76%</b>	<b>89%</b>	<b>72%</b>	<b>77%</b>	<b>91%</b>	<b>91%</b>	<b>109%</b>	<b>103%</b>	<b>89%</b>
Aswan	Aswan	14,360	78%	85%	68%	68%	73%	82%	78%	87%	94%	80%	79%
	El Twasa	34,511	102%	110%	99%	100%	100%	105%	102%	102%	111%	108%	104%
	Komombo	35,889	74%	76%	68%	68%	64%	68%	69%	76%	70%	63%	69%
	El Selcela	34,596	77%	62%	67%	78%	78%	75%	74%	80%	79%	93%	76%
	Edfo East	31,147	114%	109%	103%	103%	112%	115%	112%	117%	115%	116%	112%
	Edfo West	30,610	91%	96%	103%	99%	102%	111%	84%	87%	94%	93%	96%
	<b>TOTAL</b>	<b>181,113</b>	<b>89%</b>	<b>89%</b>	<b>85%</b>	<b>87%</b>	<b>88%</b>	<b>92%</b>	<b>86%</b>	<b>91%</b>	<b>92%</b>	<b>91%</b>	<b>89%</b>
All	<b>TOTAL</b>	<b>1,030,311</b>	<b>97%</b>	<b>106%</b>	<b>90%</b>	<b>94%</b>	<b>92%</b>	<b>96%</b>	<b>106%</b>	<b>102%</b>	<b>118%</b>	<b>108%</b>	<b>100%</b>
	Wady El Nokra	68,516	162%	239%	202%	196%	192%	203%	201%	208%	222%	221%	204%
	Wady El Saaida	36,802	45%	42%	45%	48%	49%	53%	59%	53%	57%	52%	50%

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Table 5 Ratio of Actual and Target Allocation Values for Winter 2007–08

General Directorate	District	Winter [% of target]														Total Winter
		October 2007		November 2007		December 2007		January 2008		February 2008		March 2008		April 2008		
		1-15	16-31	1-15	16-30	1-15	16-31	1-15	16-31	1-15	16-28	1-15	16-31	1-15	16-30	
New Zifta	North Zifta	144%	161%	110%	81%	125%	150%	151%	468%	111%	149%	143%	150%	153%	170%	145%
	El Santa	154%	129%	154%	160%	171%	97%	88%	542%	65%	198%	86%	103%	153%	126%	134%
	Quesna	205%	224%	91%	185%	217%	174%	147%	489%	93%	331%	194%	135%	164%	189%	182%
	South Zifta	182%	188%	216%	165%	191%	202%	176%	711%	82%	252%	153%	164%	153%	147%	180%
	Berket El Sab	130%	157%	167%	145%	113%	134%	112%	351%	47%	165%	96%	101%	122%	100%	124%
	<b>TOTAL</b>	<b>165%</b>	<b>173%</b>	<b>145%</b>	<b>150%</b>	<b>167%</b>	<b>150%</b>	<b>134%</b>	<b>514%</b>	<b>80%</b>	<b>224%</b>	<b>135%</b>	<b>130%</b>	<b>150%</b>	<b>148%</b>	<b>154%</b>
West Sharkia	Abo Kebeer	107%	149%	179%	133%	166%	142%	158%	657%	0%	224%	141%	97%	117%	141%	138%
	Kafr Sakr	423%	319%	245%	351%	605%	382%	352%	1398%	0%	414%	186%	190%	177%	262%	289%
	Awlad Sakr	144%	165%	163%	113%	130%	178%	130%	498%	0%	150%	213%	196%	160%	201%	154%
	Ibrahimia	27%	29%	132%	78%	111%	109%	58%	361%	0%	134%	44%	60%	75%	74%	72%
	Zagazig	126%	147%	273%	169%	214%	204%	192%	570%	30%	45%	146%	126%	149%	162%	158%
	<b>TOTAL</b>	<b>138%</b>	<b>145%</b>	<b>197%</b>	<b>155%</b>	<b>214%</b>	<b>188%</b>	<b>167%</b>	<b>647%</b>	<b>7%</b>	<b>179%</b>	<b>138%</b>	<b>125%</b>	<b>133%</b>	<b>162%</b>	<b>153%</b>
West Qena	Esna	98%	132%	118%	143%	185%	149%	195%	806%	74%	209%	146%	174%	126%	103%	142%
	Armant	83%	100%	120%	143%	103%	98%	101%	474%	#VALUE!	110%	119%	123%	99%	99%	103%
	Nakada	72%	71%	100%	87%	132%	118%	72%	634%	0%	233%	115%	98%	86%	85%	101%
	Naga Hammadi	90%	92%	80%	93%	115%	128%	110%	326%	61%	141%	142%	151%	107%	100%	107%
	Abu Tesht	171%	165%	101%	125%	145%	148%	128%	615%	44%	89%	158%	163%	114%	88%	128%
	<b>TOTAL</b>	<b>100%</b>	<b>112%</b>	<b>105%</b>	<b>122%</b>	<b>139%</b>	<b>130%</b>	<b>128%</b>	<b>581%</b>	<b>40%</b>	<b>158%</b>	<b>136%</b>	<b>144%</b>	<b>109%</b>	<b>97%</b>	<b>119%</b>
East Qena	Luxor	100%	114%	98%	115%	118%	115%	151%	327%	33%	162%	132%	207%	142%	146%	128%
	Kose	81%	99%	79%	113%	100%	158%	89%	569%	87%	92%	86%	85%	112%	64%	97%
	Qena	137%	137%	217%	261%	192%	167%	118%	878%	42%	135%	65%	103%	116%	132%	138%
	Deshna	80%	107%	134%	145%	140%	130%	136%	779%	26%	123%	132%	117%	115%	90%	117%
	<b>TOTAL</b>	<b>96%</b>	<b>113%</b>	<b>130%</b>	<b>154%</b>	<b>137%</b>	<b>142%</b>	<b>124%</b>	<b>666%</b>	<b>45%</b>	<b>129%</b>	<b>101%</b>	<b>120%</b>	<b>119%</b>	<b>104%</b>	<b>120%</b>
	Aswan	Aswan	126%	151%	148%	159%	149%	126%	945%	129%	149%	162%	150%	157%	140%	134%
El Twasa		68%	69%	79%	93%	106%	93%	648%	116%	127%	111%	114%	112%	102%	100%	99%
Komombo		107%	130%	140%	173%	139%	1199%	274%	320%	232%	195%	158%	149%	135%	115%	163%
El Selcela		64%	62%	93%	153%	159%	149%	168%	785%	29%	114%	159%	130%	98%	89%	112%
Edfo East		93%	106%	99%	122%	172%	144%	569%	42%	164%	146%	111%	115%	145%	146%	125%
Edfo West		85%	103%	86%	97%	143%	122%	847%	7%	132%	134%	126%	135%	121%	121%	117%
<b>TOTAL</b>		<b>85%</b>	<b>95%</b>	<b>102%</b>	<b>129%</b>	<b>143%</b>	<b>159%</b>	<b>322%</b>	<b>149%</b>	<b>140%</b>	<b>139%</b>	<b>135%</b>	<b>131%</b>	<b>121%</b>	<b>115%</b>	<b>125%</b>
All	<b>TOTAL</b>	<b>108%</b>	<b>120%</b>	<b>128%</b>	<b>141%</b>	<b>157%</b>	<b>152%</b>	<b>154%</b>	<b>386%</b>	<b>59%</b>	<b>159%</b>	<b>130%</b>	<b>131%</b>	<b>124%</b>	<b>121%</b>	<b>132%</b>
	Wady El Nokra	239%	275%	346%	325%	338%	249%	1806%	263%	319%	361%	240%	228%	174%	157%	266%
	Wady El Saaida	183%	192%	251%	262%	241%	205%	1787%	274%	261%	233%	231%	211%	174%	162%	67%

Figure 2 Actual delivery to target ratios for Lower Egypt IWMDs, summer 2007

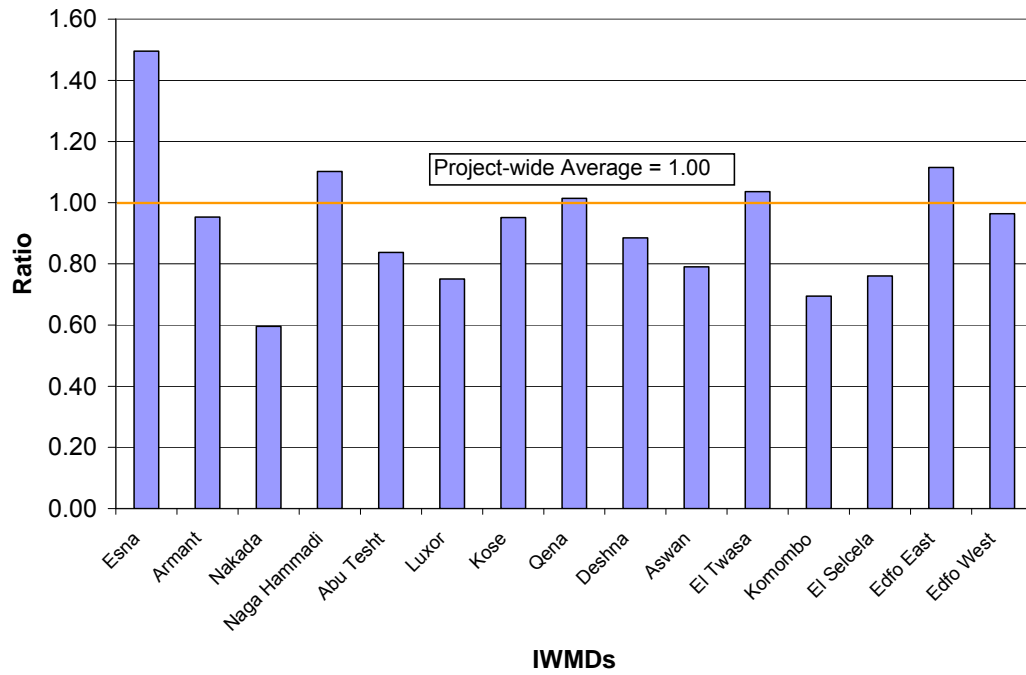
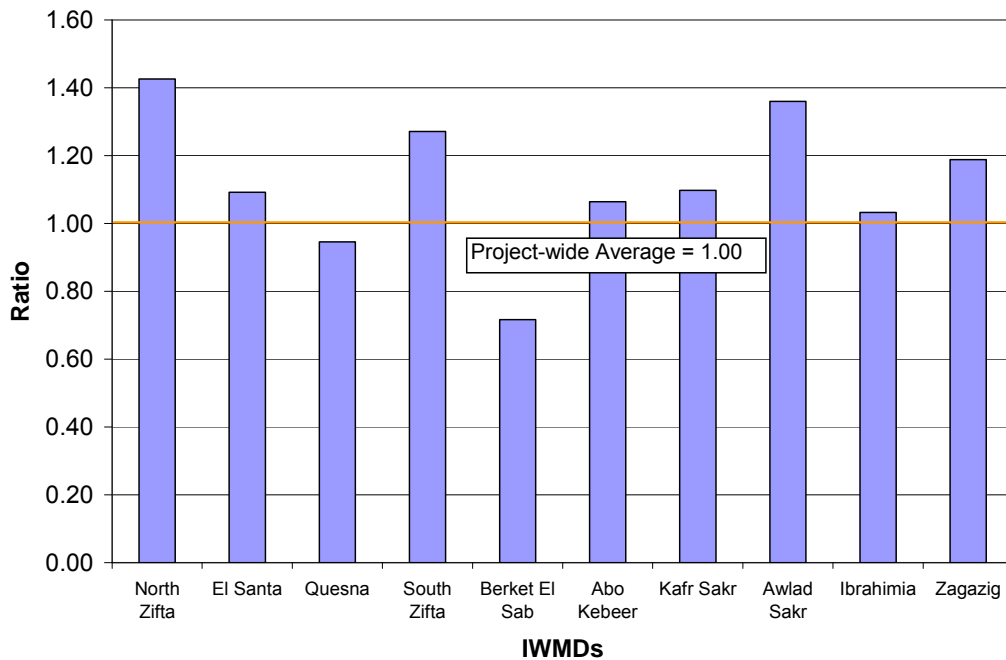


Figure 3 Actual delivery to target ratios for Upper Egypt IWMDs, summer 2007



Tables 4 and 5 provide the basis for a second indicator reported in Table 2 – the share of 15-day periods for which supply matched allocation targets within 10 percent. These periods are shown as shaded cells in the two tables. During the summer season, there were 69 such periods out of a total of 250 among the 25 IWMDs or an average of 28%, up from 24% in 2007 and from the baseline value of 22%. This means that, on average, water supplied matched target values ( $\pm 10$  percent) 28 % of the time. This is a positive change, reflecting both more realistic target values and greater attention to water management.

During the winter season, there were 59 matching periods out of a total of 350. Thus supply matched target 14% of the time, down from 17% the previous year and little changed from the baseline value of 15%. Many of the 15-day period ratios are very large and indicate that the canals systems are delivering much larger volumes of water than are actually needed. In part, this reflects the difficulty of operating the canals to deliver the requirement across the project. This is a result of enlarged canal cross-sections and a need for fresh water to mix with poor quality drainage water pumped back into irrigation canals to make the water useable downstream.

The shrinking targets for both summer and winter seasons indicate that General Directorates and Districts are slowly mastering the concepts of setting targets and matching deliveries with them. Targets have been steadily refined downward and water deliveries have also been pushed downwards. Net irrigable area figures have been refined, and Districts are now routinely recording, storing, and reporting volumetric deliveries. The wide range of the actual-to-target ratio values, however, suggests that there is still considerable scope for equalizing water allocations among Districts and consequently in increasing average yields across all of the Districts. Continuing efforts are needed to integrate measured deliveries and targets into annual planning and routine day-to-day management practices at both the District and General Directorate levels and to further refine targets.

#### *Farmer Satisfaction*

The client satisfaction survey provides information on farmers’ assessment of irrigation service. The surveys showed that 76 percent of project farmers were satisfied with summer season service, up sharply from 65 percent in Year 3<sup>5</sup>. In winter, 94 percent were satisfied, compared with 89 percent the previous year.

Overall farmer satisfaction for all four project years is shown in Table 6. As seen, satisfaction levels had fallen in Year 3 in both seasons, but recovered to pre-project levels in Year 4.

**Table 6 Overall farmer satisfaction with irrigation service**

	<b>Baseline (2004-5)</b>	<b>Year 2 (2005-6)</b>	<b>Year 3 (2006-7)</b>	<b>Year 4 (2007-8)</b>
<b>Summer</b>	74%	78%	65%	76%
<b>Winter</b>	94%	91%	89%	94%

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<sup>5</sup> “Satisfaction” is based on farmers rating overall quality of irrigation service as “moderate” or “excellent”.

Satisfaction is higher across the board in winter when demand is lower. Summer satisfaction levels in Year 4 vary from just 28 percent in Ibrahimiya and Awlad Sakr to 100 percent in Luxor and Nakada. The width of this range, though narrower this year, is still substantial and offers ample room for improvement in a number of Districts. Summer and winter satisfaction levels are shown graphically in Figures 4 and 5 and the best performing Districts in summer are shown in the box at the right. This year 15 Districts exceed a 75% satisfaction threshold, compared with only 8 in Year 3.

**Districts with More than  
75% Satisfied Farmers  
in Summer 2007**

- Abu Kabeer
- Abu Tesht
- Armant
- Birket el Saba'a
- Deshna
- Edfu East
- El Santa
- Esna
- Kom Ombo
- Luxor
- Nagaa Hammadi
- Nakada
- North Zifta
- Qena
- Quos

Figure 4 Farmer satisfaction, summer 2007

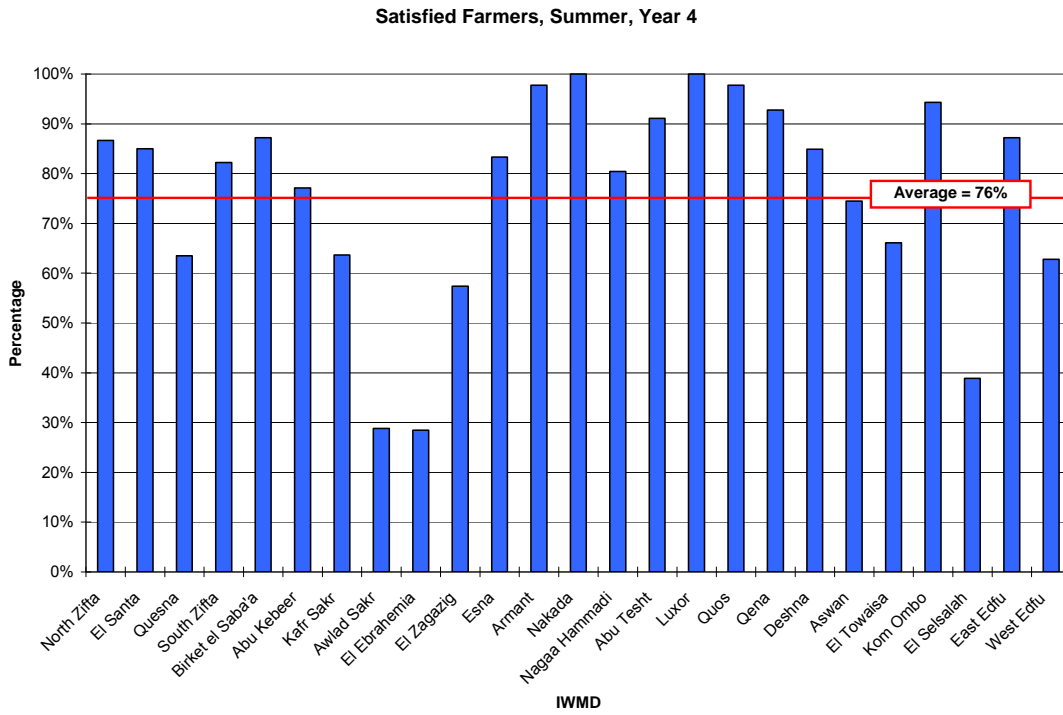
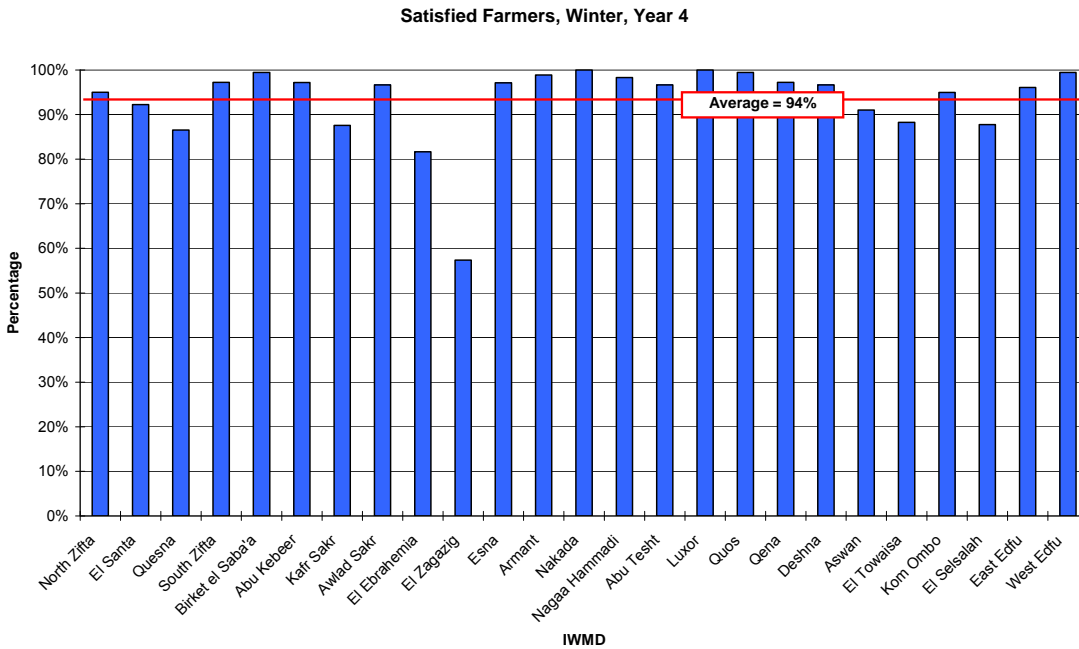


Figure 5 Farmer satisfaction, winter 2007-8



*Rotations*

Rotating irrigation service among branch canals is one of the most important tools managers have for allocating available water. It is standard Ministry practice to operate BCs on a fixed cycle of so many days on and so many days off. To assess the regularity of the rotation, farmers were asked to rate how well the actual rotation corresponded with the planned one in each season. Current values, together with values for previous years are shown in Table 7.

**Table 7 Percent farmers reporting IWMD compliance with rotational schedule**

**Percent Farmers Reporting Compliance with Rotational Schedule**

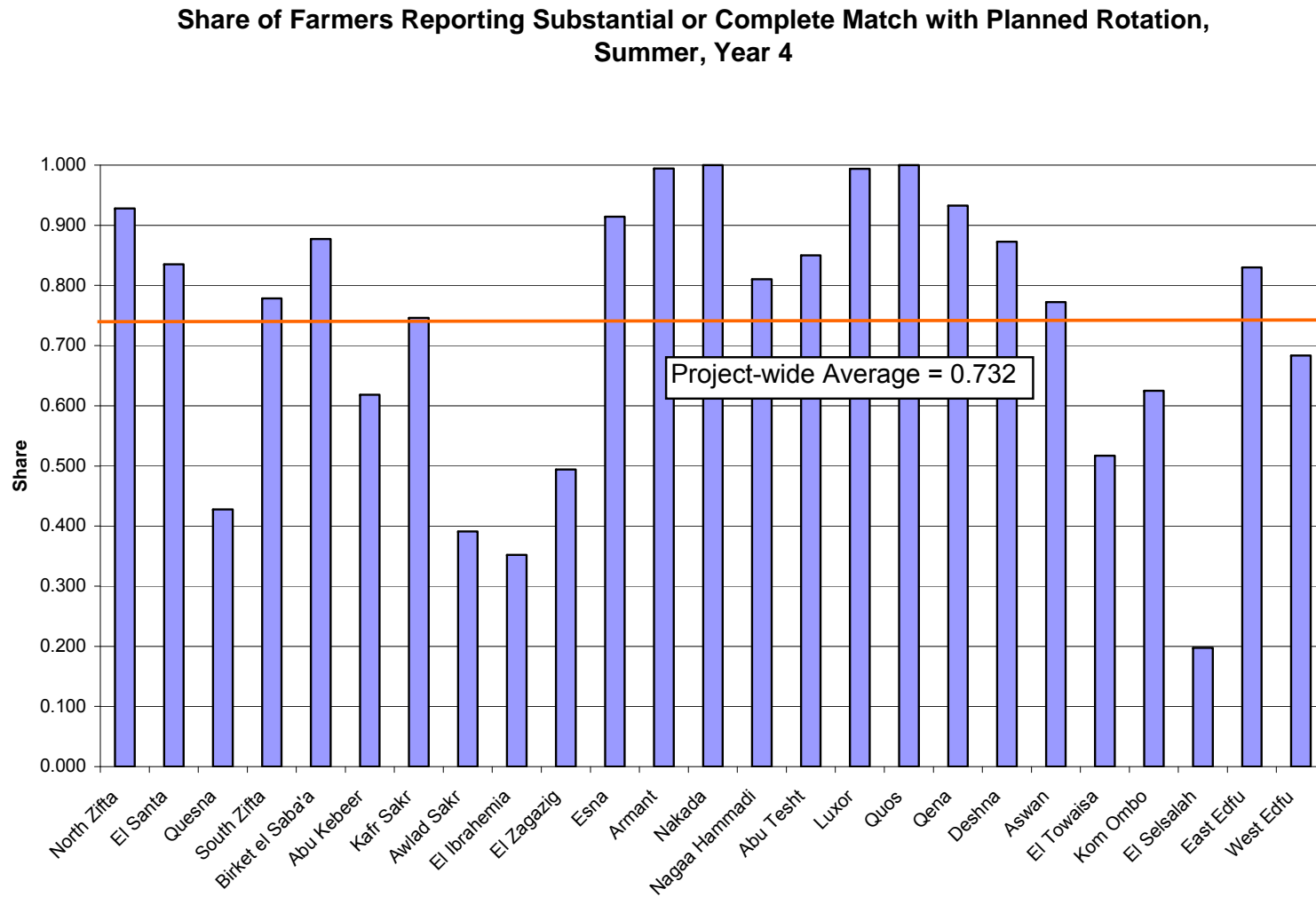
	Summer			Winter		
	None	Partial	Complete	None	Partial	Complete
<b>Baseline (2004)</b>	27%	51%	21%	27%	51%	21%
<b>Year 2 (2005)</b>	22%	61%	17%	10%	62%	28%
<b>Year 3 (2006)</b>	35%	47%	18%	15%	50%	35%
<b>Year 4 (2007)</b>	27%	49%	24%	11%	49%	40%

The table shows that IWMD performance in delivering water according to rotational schedules in the summer hasn't changed a great deal over the four years of the project, being very similar now to the situation during the baseline year. Performance of individual Districts for summer are shown in Figure 6.

By contrast, in winter there has been a substantial improvement in the extent to which Districts implement rotational plans, as seen in Table 7.

This inability to do a better job of implementing summer rotational schedules may represent a critical breakdown in the process of providing good irrigation service. A correlation analysis between “farmer satisfaction” and “adherence to rotational plan” shows a very strong correlation coefficient of 0.89 between the two responses. In other words, farmers in Districts which tend to follow the planned rotation were much more likely to be satisfied than those where the IWMD did not implement the rotation effectively. Put another way, more than three-quarters of farmer satisfaction is explained by the District following the rotation ( $r^2 = 0.79$ ). This suggests that a promising way of improving irrigation service is for Districts to follow their rotational plan in a disciplined way. The Year 3 analysis showed similar results. Winter correlations were not as strong, but “following the rotation” still explains about 50% of the differences in winter farmer satisfaction ( $r^2 = 0.52$ ). This appears to be a connection that holds up across seasons and years.

Figure 6 Share of farmers reporting match with planned rotation, summer 2006



### **Objective 5: Equity of Water Distribution**

This is a critical objective, as improved equity of water distribution generally means that crop yields in areas that have been short of water will increase, while areas receiving excess water will not suffer significant yield reductions. The net effect of improving equity of water distribution is thus to raise average yields. The assumption is that farms in relatively water abundant areas receive and apply more water than they need at present and that if some of this excess water were diverted to water short areas that total output and overall average yields would rise.

Equity indicators include one measure of equity among Districts, one measure of equity among the branch canals within a District, and one measure of equity along branch canals—from head to tail.

#### *Equity among IWMDs*

Relative Water Supply (RWS) is the amount of water actually delivered to an IWMD divided by the aggregate crop water requirement (CWR) for the District. The results are shown in Table 8.

Because the MISD program which calculates water demand includes a fixed “efficiency” factor of 0.7 to account for assumed losses in the distribution system, outputs from the MISD software have been adjusted, in this report, to remove this factor and produce water requirement data that simply reflect the computed crop water requirements. The results in Table 8 then represent the ratio of the water actually delivered to each IWMD to the aggregate computed CWR.

As seen in the table, the average value of the ratio for summer was 1.42, down from the Year 3 value of 1.59, which is a desirable change. RWS values ranged from 1.84 in Edfo East to 0.91 in Berket El Sab and Abo Kebeer, a narrower range than in Year 3, which is also positive. The shaded cells in the table represent those Districts in which the RWS ratio falls within  $\pm 10\%$  of the average for all 25 Districts.

Assuming equivalent canal loss rates in each District, Directorates should be supplying roughly this average amount of water to each of the Districts. Excellent performance would thus be represented by all 25 Districts receiving  $\pm 10\%$  of the average RWS of 1.42. This year, 12 Districts (48%) received supplies within this range in summer, up from 7 Districts in Year 3.

The average value of the RWS indicator for the winter season was 1.50, down from 1.71 the previous year, a positive change. The winter range was from a high of 2.08 in South Zifta to a low of 0.81 in Ibrahimia, which is narrower than the range in Year 3. In winter, 11 Districts (44%) received supplies falling within 10

**IWMDs with RWS Index within  $\pm 10\%$  of Project-wide average in both Summer and Winter, 2007-8**

- El Santa
- Nakada
- Naga Hammadi
- Qena
- Deshna
- Aswan

percent of the average, up from 7 last year. These values are shown as shaded cells in Table 7. Six Districts were within 10% of the average RWS value in both seasons (see box).

**Table 8 Districts with Relative Water Supply within 10% of average for all Districts**

General Directorate	District	Approved Area May 08 (feddan)	RWS ratio Summer	RWS ratio Winter
New Zifta	North Zifta	37,102	144%	124%
	El Santa	46,965	130%	135%
	Quesna	49,847	124%	166%
	South Zifta	36,684	179%	208%
	Berket El Sab	38,164	91%	113%
	<b>TOTAL</b>	<b>208,762</b>	<b>133%</b>	<b>147%</b>
West Sharkia	Abo Kebeer	49,850	91%	144%
	Kafr Sakr	45,343	133%	186%
	Awlad Sakr	62,060	121%	131%
	Ibrahimia	50,080	135%	81%
	Zagazig	48,913	135%	128%
	<b>TOTAL</b>	<b>256,246</b>	<b>121%</b>	<b>135%</b>
West Qena	Esna	61,402	149%	180%
	Armant	39,321	135%	134%
	Nakada	33,945	143%	141%
	Naga Hammadi	50,051	155%	143%
	Abu Tesht	37,025	168%	182%
	<b>TOTAL</b>	<b>221,744</b>	<b>150%</b>	<b>158%</b>
East Qena	Luxor	36,545	157%	142%
	Kose	32,944	182%	133%
	Qena	45,990	147%	145%
	Deshna	46,967	148%	162%
	<b>TOTAL</b>	<b>162,446</b>	<b>157%</b>	<b>146%</b>
Aswan	Aswan	14,360	154%	158%
	El Twasa	34,511	157%	157%
	Komombo	35,889	165%	181%
	El Selcela	34,596	116%	161%
	Edfo East	31,147	184%	169%
	Edfo West	30,610	174%	146%
	<b>TOTAL</b>	<b>181,113</b>	<b>158%</b>	<b>164%</b>
All	<b>TOTAL</b>	<b>1,030,311</b>	<b>142%</b>	<b>150%</b>
	Wady El Nokra	68,516	293%	159%
	Wady El Saaida	36,802	134%	73%

Note: Shaded cells show Districts falling within ±10% of the average RWS.

By comparing the computed Crop Water Requirement (CWR) and the Target value set by the General Directorates for each district, one can estimate the “Implied Efficiency” (IE) of the District in meeting its water needs. Implied Efficiencies are the values that would have to be applied to the District CWR to produce the target values actually assigned by the Directorate. Computed values of IE are shown in Table 9. Note that the overall average of 0.71 is almost identical to the average efficiency value of 0.70 used in the MISD software to compute district water requirements. However, there is a huge range of variability represented, extending from 0.42 in Komombo to 1.17 in Abo Kebeer. This means that only 42 % of the water targeted for Komombo is intended to meet crop water requirements, while the remainder is to account for losses and other uses. In Abo Kebeer, on the other hand, the target is 17% lower than the CWR, implying that water from other sources is being used to supplement canal water. In general, implied efficiency values are higher than average in the Nile Delta and below average, sometimes well below average, in upper Egypt.

These values provide an excellent basis for a concerted effort to improve water use efficiency across the 27 Districts, and eventually all of Egypt. The first step, as recommended last year, is to remove the standard hard-wired efficiency factor of 0.7 from the MISD program and make it a parameter which could be adjusted separately for each District. The IE values shown in Table 9 could be used as a first approximation for this parameter. Districts would then be challenged to raise this value. Measures such as changes in management practices, adjusted rotations, selective canal lining, replacement of worn gate seals, and installation of new cross-regulators could be discussed with the Directorate and agreed upon, with a special allocation of maintenance funds made to support the changes. The following year, the delivery target could be reduced by an amount equivalent to the water saved.

Table 9 Implied District efficiency factors, Target/CWR

General Directorate	District	Approved Area May 08 (feddan)	Implied Efficiency
New Zifta	North Zifta	37,102	0.99
	El Santa	46,965	0.84
	Quesna	49,847	0.76
	South Zifta	36,684	0.71
	Berket El Sab	38,164	0.78
	<b>TOTAL</b>	<b>208,762</b>	<b>0.81</b>
West Sharkia	Abo Kebeer	49,850	1.17
	Kafr Sakr	45,343	0.82
	Awlad Sakr	62,060	1.12
	Ibrahimia	50,080	0.77
	Zagazig	48,913	0.88
	<b>TOTAL</b>	<b>256,246</b>	<b>0.96</b>
West Qena	Esna	61,402	1.00
	Armant	39,321	0.71
	Nakada	33,945	0.42
	Naga Hammadi	50,051	0.71
	Abu Tesht	37,025	0.50
	<b>TOTAL</b>	<b>221,744</b>	<b>0.66</b>
East Qena	Luxor	36,545	0.48
	Kose	32,944	0.52
	Qena	45,990	0.69
	Deshna	46,967	0.60
	<b>TOTAL</b>	<b>162,446</b>	<b>0.57</b>
Aswan	Aswan	14,360	0.51
	El Twsa	34,511	0.66
	Komombo	35,889	0.42
	El Selcela	34,596	0.65
	Edfo East	31,147	0.61
	Edfo West	30,610	0.55
	<b>TOTAL</b>	<b>181,113</b>	<b>0.56</b>
All	<b>TOTAL</b>	<b>1,030,311</b>	<b>0.71</b>
	Wady El Nokra	68,516	0.70
	Wady El Saaida	36,802	0.37

*Equity among Branch Canals*

At the outset of the M&E program, branch canals within each District were divided into three equal groups by the District Manager and his staff, according to whether they were “easy,” “moderate,” or “difficult” to supply with water. This distinction corresponds roughly to the traditional terms “head,” “middle,” and “tail” of the main canal segment passing through the District. Farmer satisfaction with irrigation service in these three classes of branch canals for Year 4 and the previous year are shown in Tables 10 and 11 for the summer and winter seasons, respectively.

**Table 10 Farmer Satisfaction with Irrigation Service, Summer**

	<b>Overall</b>	<b>Easy/Head BCs</b>	<b>Moderate/Middle BCs</b>	<b>Difficult/Tail BCs</b>
<b>2007</b>	76%	81%	77%	71%
<b>2006</b>	65%	75%	65%	55%

**Table 11 Farmer Satisfaction with Irrigation Service, Winter**

	<b>Overall</b>	<b>Easy/Head BCs</b>	<b>Moderate/Middle BCs</b>	<b>Difficult/Tail BCs</b>
<b>2007-8</b>	94%	93%	95%	92%
<b>2006-7</b>	89%	92%	88%	88%

Year 4 shows considerable improvement for both seasons. Of special interest is the increase in satisfaction in summer in the one-third of the BCs and are regarded difficult to supply with water (Difficult/Tail BCs). These are the BCs that are particular targets of the project, and improvement in their water supply, without negatively affecting other BCs, is a key part of the strategy to improve system-wide output. This appears to have happened during Y4.

This information can be combined into a single indicator of equity by taking the ratio of satisfaction in the “easy/head” branch canals to satisfaction in the “difficult/tail” branch canals. This ratio reflects the performance of the Districts in allocating water equitably among Branch Canals. The ideal value of this indicator is 1.00, indicating that farmers in head and tail BCs along the main canal are equally satisfied. Table 13 shows the values of these indicators for the Baseline Year and Years 2, 3, and 4.

**Table 12 Ratio of satisfied farmers in head and tail reaches of District Main Canals**

<b>Summer</b>				<b>Winter</b>			
<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2004-5</b>	<b>2005-6</b>	<b>2006-7</b>	<b>2007-8</b>
1.25	1.37	1.36	1.13	1.04	1.22	1.05	1.01

As seen, for Year 4 the summer among-BC equity value showed a sharp drop relative to earlier years, and is now well below the 2004 baseline value. For winter, the Year 4 ratio declined below the baseline value to 1.01, which is nearly ideal.

This among-BC equity index can be computed separately for each of the 25 IWMDs to indicate their success in distributing water equitably among their branch canals. Graphs of these ratios for summer and winter seasons are shown in Figures 7 and 8. Note that

**Low-Equity IWMDs (RWS Equity Index 2.00 or greater in Summer 2007)**

- Awlad Sakr
- Ibrahimia

in summer, in Ibrahimia there were no farmers reporting satisfaction in Difficult/Tail BCs, making the equity

index impossible to compute<sup>6</sup>. Distribution in Ibrahimia

and Awlad Sakr is regarded as highly inequitable based on the equity ratio values (see box). However, that only 2 Districts fell into this category in Year 4 represents an improvement from Year 3, when 6 Districts had equity index values higher than 2.

In winter, farmer satisfaction is much more evenly distributed, suggesting that water distribution is more equitable, or at least that few farmers suffer from inadequate service. As seen in Figure 8, index values are generally much closer to the average and all of the Districts had an index values less than 2.

**High-Equity IWMDs (Satisfaction Equity Index of 1.00 ±10% in Summer 2007)**

- El Santa
- Abu Tesht
- Armant
- Nakada
- Luxor
- Quos
- Qena
- Deshna
- Aswan
- Komombo
- Selsalah

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<sup>6</sup> The value approaches infinity.

Figure 7 Equity Index of Irrigation Service among Branch Canals, Summer 2007

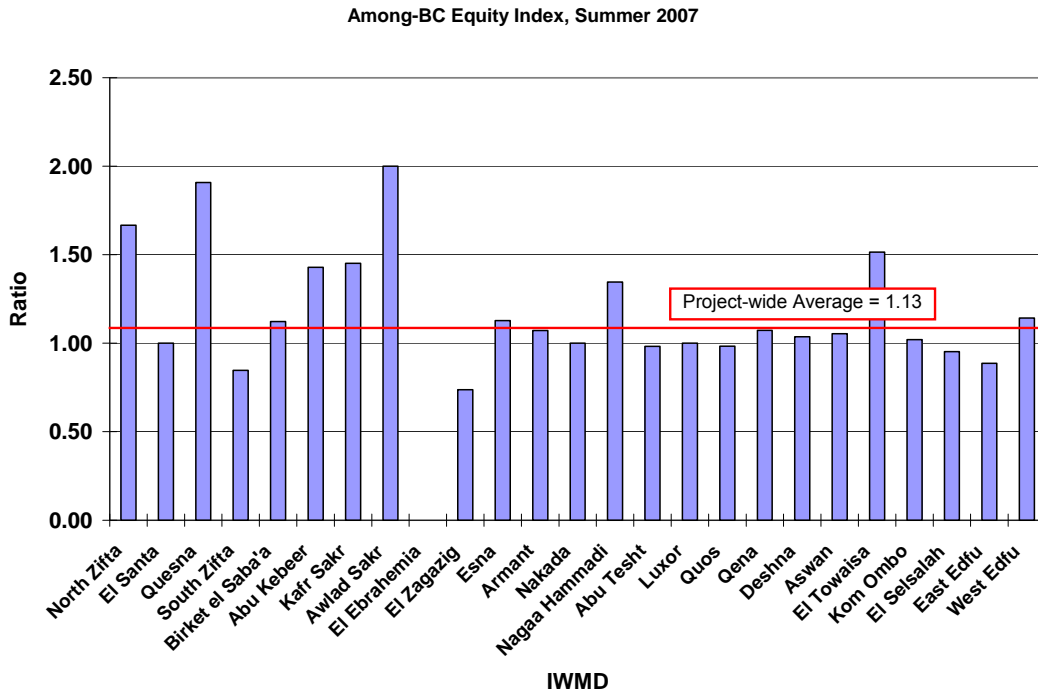
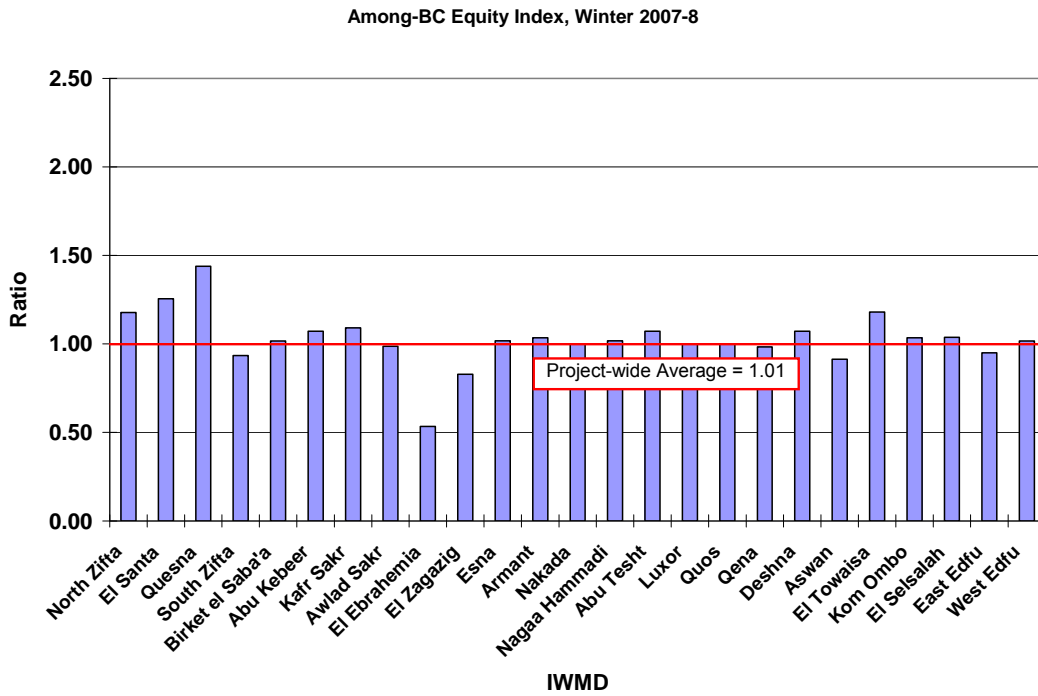


Figure 8 Equity Index of Irrigation Service among Branch Canals, Winter 2007-8



*Equity along Branch Canals*

Tables 13 and 14 show farmer satisfaction with irrigation service in the heads, middle, and tails of the Branch Canals. These are project-wide averages and thus represent average farmer satisfaction in the head, middle, and tail “thirds” of all of the BCs in the project. If service were equal in all three portions of the BCs, these values should be the same. As seen in Table 13, summer satisfaction declines from head to tail but differences are not drastic. In general, the range of satisfaction narrowed in 2007, with smaller differences between heads and tails of BCs than in the previous year. In winter, satisfaction differs very little along the length of the BCs.

**Table 13 Farmer Satisfaction with Irrigation Service in Different Parts of Branch Canals, Summer 2006**

	<b>Overall</b>	<b>BC Heads</b>	<b>BC Middles</b>	<b>BC Tails</b>
<b>2007</b>	76%	79%	76%	73%
<b>2006</b>	65%	71%	64%	61%

**Table 14 Farmer Satisfaction with Irrigation Service in Different Parts of Branch Canals, Winter 2006–7**

	<b>Overall</b>	<b>BC Heads</b>	<b>BC Middles</b>	<b>BC Tails</b>
<b>2007</b>	95%	94%	95%	92%
<b>2006</b>	89%	91%	89%	88%

By taking a ratio of percent satisfaction in the heads and in the tails of BCs, we create an indicator of equity of farmer satisfaction with irrigation service along the BCs. The ideal value of this indicator is 1.00, reflecting equal satisfaction in heads and tails of Branch Canals.

As seen in Table 15, these ratios have continued to fall in both summer and winter seasons since the baseline year of 2004. This suggests that the Branch Canal Water User Associations (BCWUAs) formed under the project are continuing to affect the distribution of water along the BCs in ways that makes distribution more equitable.

**Table 15 Ratio of satisfied farmers in head and tail reaches of District Branch Canals**

<b>Summer</b>				<b>Winter</b>			
<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2004-5</b>	<b>2005-6</b>	<b>2006-7</b>	<b>2007-8</b>
1.31	1.16	1.17	1.08	1.09	1.04	1.03	1.03

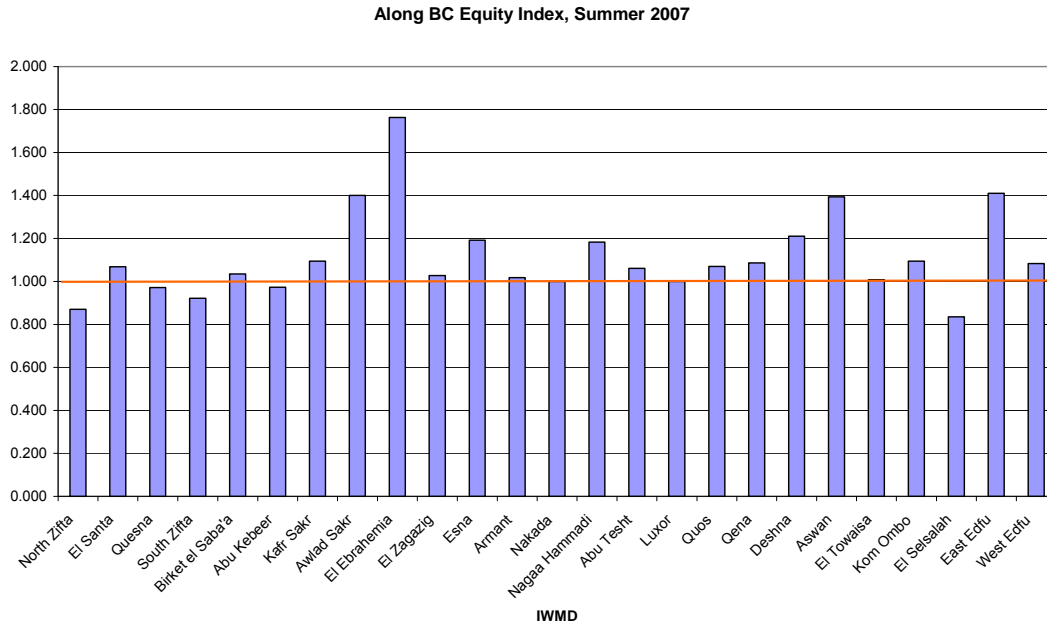
Along-BC equity indices can also be created for individual Districts. These indicators show the ratio of satisfied farmers in the heads and tails of all the sampled BCs in the District,

relative to other districts. Results for summer and winter of Year 4 are shown in Figures 9 and 10. Values closest to 1.0 reflect the most equitable head/tail distribution of water along the BC. While in summer most values lie relatively close to 1, the BCWUAs in four Districts stand out as being relatively ineffective at equalizing irrigation service along their BCs. In winter, only 2 Districts differ strongly from 1.0.

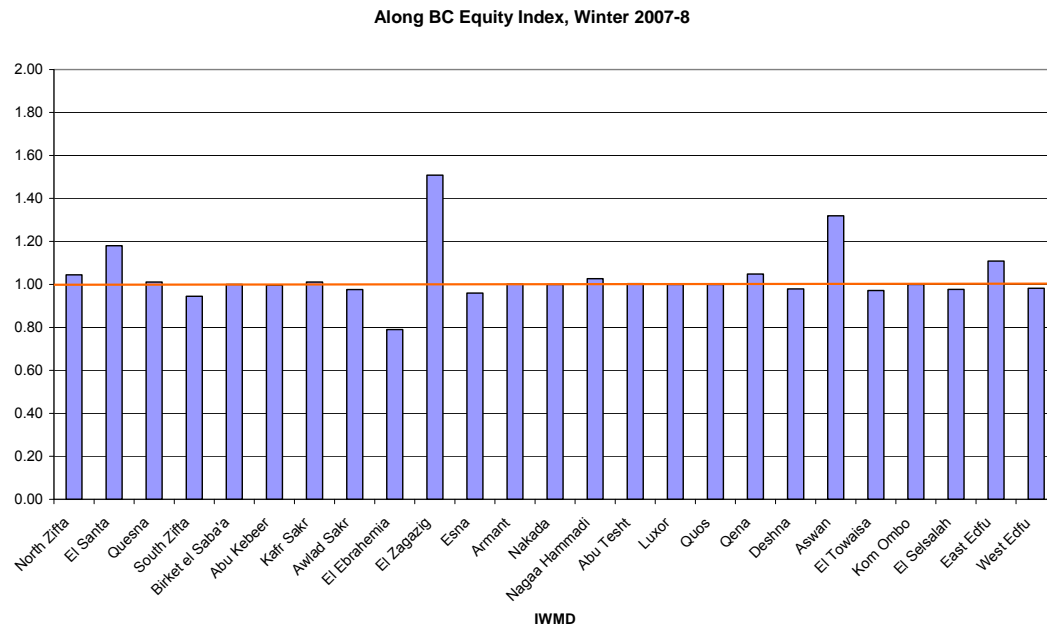
**Objective 6: Value of Agricultural Output**

This objective calls for the real gross value of agricultural output in all IWMDs to increase. As discussed in the Year 2 and Year 3 M&E reports, it proved virtually impossible to obtain sufficiently accurate and comprehensive data to allow computation of these indicators and they were consequently dropped from the M&E scheme.

**Figure 9 Along BC Equity Index values for 25 IWMDs, Summer 2007**



**Figure 10 Along BC Equity Index values for 25 IWMDs, Winter 2007-8**



## Summary

### Implementation Objectives

Implementation objectives show satisfactory values virtually across the board, indicating that the project has largely succeeded in introducing the changes in organizational structure and processes that it set out to promote.

### IWMD Establishment

IWMDs have been established, re-organized, staffed, trained, and equipped with computer facilities. Digital mapping of all Districts is completed and Districts have prepared integrated maintenance plans. Districts are preparing and supervising maintenance contracts for work within their Districts.

### Measurement-based Management

Districts have calibrated important water control structures within their boundaries and regularly provide reports of inflows to District Managers. They have completed inventories of water resources and water facilities within their boundaries and have drafted integrated water resource management plans.

### BCWUA Participation

All of the implementation targets for the BCWUAs have been completed. Results from the Year 4 client satisfaction survey show that 62% of farmers are aware of the existence of a BCWUA on their BCs and can correctly name one of the board members. Awareness is evenly spread among different kinds of BCs. However, BCWUAs still lack authority to collect fees and to operate the system at the Branch Canal level, powers that are needed for the Associations to move to the next level of functioning.

### Outcome Objectives

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

### Quality of Service

Complaints were down in Year 4 relative to Year 3 and to the baseline year. Breaking out irrigation and drainage complaints shows an increase in the former and a steady decline in the latter, relative to the baseline year. The decline in drainage complaints may be attributable to the taking over of the drain maintenance responsibilities formerly with EPAD by IWMDs following their formation.

In general, however, the number of formal farmer complaints registered with IWMDs per feddan is uncorrelated with farmer satisfaction, as measured by the client satisfaction survey of nearly 5,000 farmers ( $r^2 = 0.03$ ). This means that knowing the number of complaints filed in a given district will be of no help at all in predicting the level of farmer satisfaction

recorded in a random survey. This result is identical to the one obtained in a similar analysis in Year 3. The usefulness of counting complaints as an indicator of the quality of IWMD performance, is thus regarded as very questionable.

The ratio of water deliveries to targets for 25 project Districts in the summer of Year 4 was 1.00, which is ideal. Within the average, there is considerable variability among Districts. Districts in Lower Egypt tended to undershoot targets, probably because canal losses there are lower and reuse of drainage water is higher. Districts in Upper Egypt, on the other hand, tended to exceed their targets, due to higher canal losses in the lighter soils there and because much of the supply is pumped and comprises what amounts to an “on-demand” supply of water.

Breaking the seasons down into 15-day periods, actual deliveries matched targets ( $\pm 10$  percent) 28% of the time in the summer and 14% of the time in the winter season. This represents a modest increase from the summer baseline value of 22%, and little change for the winter value.

Farmer satisfaction ratings were up from Year 3, but show little change from the baseline year in either season. In general about 3 out of 4 farmers report moderate to high satisfaction with irrigation service in the summer season, along with more than 9 out of 10 in the winter, both in the baseline year and currently.

Percentage of farmers reporting “complete” adherence with the rotational schedule by the District in Year 4 (25%) was up slightly from the baseline year (21%) in summer and up substantially in winter (41%, up from 30%). However, farmers reporting “complete or partial” adherence with the schedule on the part of the District was similar to the baseline values in both seasons. This modest improvement, and the absence of more substantial improvement in administering scheduled rotations, is important because correlation analysis shows that the degree to which Districts follow a regular rotational pattern is strongly correlated with farmer satisfaction ( $r^2 = 0.79$  summer,  $r^2 = 0.52$  winter). In other words, the more farmers that report the rotational pattern was partially or completely followed in a given District, the larger the percentage of satisfied farmers in that District tends to be. The same connection was observed in Year 3.

### **Equity of Distribution**

Improving equity of water distribution was a prime objective of the project. Three indicators measured equity of distribution at three different levels – among Districts, among BCs within Districts, and along BCs. The “among District” distribution is measured by the percent of Districts having RWS values within 10% of the average for all Districts. In Year 4 this value rose to 48%, from a Year 3 level of just 28%, an impressive improvement<sup>7</sup>. The meaning of this is that District water supplies varied much less among individual Districts than in the previous year.

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<sup>7</sup> Data were incomplete for the baseline year, Year 1.

This conclusion is confirmed by a comparison of the coefficients of variation (CV) of RWS for the two years. The CV declined sharply from Year 3 to Year 4 in both seasons, indicating a narrower range of values making up the average.

The “among-BC” equity ratio measures the effectiveness of the IWMD in distributing water among BCs within its boundaries. In Year 4, this indicator also declined sharply from its summer Year 3 value to 1.13, at the same time dropping below the baseline value of 1.25, indicating greater equity. The winter value was already low and declined further to nearly 1. This shows substantial improvement in improving the equity of water distribution among BCs by Districts.

The “within-BC” equity ratio measures distribution of water from head to tail of BCs and reflects the efforts of the BCWUA to distribute the water it receives from the IWMD among mesqas. In Year 4, this indicator continued the steady decline from the baseline value that it had demonstrated in previous years. This suggests that the formation of the BCWUAs and improved communication between users and the IWMDs continues to improve water distribution equity along BCs, a notable achievement.

## **Annex 1. Year 4 Complaints Data**

Year 4 Monitoring and Evaluation Report

Number of Complaints Filed by Farmers with IWMD, 2007-8 Agricultural Year

General Directorate	District	Approved Area 5/08 (feddan)	Complaints				Sub-Total of Complaints		Total	Irrigation Complaints per 1000 feddan	Drainage Complaints per 1000 feddan	Total Complaints per 1000 feddan
			Summer 2007		Winter 2007-8		Irrigation	Drainage				
			1 May - 30 Sept.		1 Oct - 30 Apr.							
			Irrigation	Drainage	Irrigation	Drainage						
New Zifta	North Zifta	37,102	20	8	15	6	35	14	49	0.94	0.38	1.32
	El Santa	46,965	32	8	33	61	65	69	134	1.38	1.47	2.85
	Quesna	49,847	48	38	68	49	116	87	203	2.33	1.75	4.07
	South Zifta	36,684	7	17	29	31	36	48	84	0.98	1.31	2.29
	Berket El Sab	38,164	26	5	23	5	49	10	59	1.28	0.26	1.55
	<b>TOTAL</b>	<b>208,762</b>	<b>133</b>	<b>76</b>	<b>168</b>	<b>152</b>	<b>301</b>	<b>228</b>	<b>529</b>	<b>1.44</b>	<b>1.09</b>	<b>2.53</b>
West Sharkia	Abo Kebeer	49,850	6	0	2	0	8	0	8	0.16	0.00	0.16
	Kafr Sakr	45,343	80	19	34	7	114	26	140	2.51	0.57	3.09
	Awlad Sakr	62,060	9	4	17	20	26	24	50	0.42	0.39	0.81
	Ibrahimia	50,080	20	11	34	10	54	21	75	1.08	0.42	1.50
	Zagazig	48,913	35	35	19	6	54	41	95	1.10	0.84	1.94
	<b>TOTAL</b>	<b>256,246</b>	<b>150</b>	<b>69</b>	<b>106</b>	<b>43</b>	<b>256</b>	<b>112</b>	<b>368</b>	<b>1.00</b>	<b>0.44</b>	<b>1.44</b>
West Qena	Esna	61,402	22	1	2	0	24	1	25	0.39	0.02	0.41
	Armant	39,321	25	3	34	7	59	10	69	1.50	0.25	1.75
	Nakada	33,945	19	0	17	20	36	20	56	1.06	0.59	1.65
	Naga Hammadi	50,051	36	0	34	10	70	10	80	1.40	0.20	1.60
	Abu Tesht	37,025	13	0	19	6	32	6	38	0.86	0.16	1.03
	<b>TOTAL</b>	<b>221,744</b>	<b>115</b>	<b>4</b>	<b>106</b>	<b>43</b>	<b>221</b>	<b>47</b>	<b>268</b>	<b>1.00</b>	<b>0.21</b>	<b>1.21</b>
East Qena	Luxor	36,545	20	0	19	0	39	0	39	1.07	0.00	1.07
	Kose	32,944	28	0	15	0	43	0	43	1.31	0.00	1.31
	Qena	45,990	9	0	28	0	37	0	37	0.80	0.00	0.80
	Deshna	46,967	10	0	11	0	21	0	21	0.45	0.00	0.45
	<b>TOTAL</b>	<b>162,446</b>	<b>67</b>	<b>0</b>	<b>73</b>	<b>0</b>	<b>140</b>	<b>0</b>	<b>140</b>	<b>0.86</b>	<b>0.00</b>	<b>0.86</b>
Aswan	Aswan	14,360	33	0	24	4	57	4	61	3.97	0.28	4.25
	El Twasa	34,511	7	0	11	0	18	0	18	0.52	0.00	0.52
	Komombo	35,889	4	2	5	16	9	18	27	0.25	0.50	0.75
	El Selcela	34,596	28	1	20	5	48	6	54	1.39	0.17	1.56
	Edfo East	31,147	12	0	3	0	15	0	15	0.48	0.00	0.48
	Edfo West	30,610	9	1	11	2	20	3	23	0.65	0.10	0.75
	<b>TOTAL</b>	<b>181,113</b>	<b>93</b>	<b>4</b>	<b>74</b>	<b>27</b>	<b>167</b>	<b>31</b>	<b>198</b>	<b>0.92</b>	<b>0.17</b>	<b>1.09</b>
<b>All</b>	<b>TOTAL</b>	<b>1,030,311</b>	<b>558</b>	<b>153</b>	<b>527</b>	<b>265</b>	<b>1,085</b>	<b>418</b>	<b>1,503</b>	<b>1.05</b>	<b>0.41</b>	<b>1.46</b>
	Wady El Nokra	64,466	9	0	7	0	16	0	16	0.25	0.00	0.25
	Wady El Saaida	35,102	25	2	0	0	25	2	27	0.71	0.06	0.77

**Annex 2. Year 4 Allocation Target, Water Delivery, and Crop  
Water Requirement Data**

Table A2.1. Target Water Allocation Values for Summer 2007

General Directorate	District	Approved Area May 08 (feddan)	Summer [M m <sup>3</sup> ]										Actual Delivery for Summer
			May 2007		June 2007		July 2007		August 2007		September 2007		
			1-15	16-31	1-15	16-30	1-15	16-31	1-15	16-31	1-15	16-30	
New Zifta	North Zifta	37,102	10.696	15.575	21.271	23.618	23.838	24.745	22.066	17.690	19.859	16.659	196.015
	El Santa	46,965	15.430	17.060	19.200	27.700	20.920	19.550	18.540	13.300	13.660	11.390	176.750
	Quesna	49,847	13.800	13.800	18.550	19.950	17.680	19.930	19.880	20.150	16.770	15.740	176.250
	South Zifta	36,684	14.214	17.454	16.790	18.208	17.510	19.919	19.366	20.418	18.781	13.973	176.631
	Berket El Sab	38,164	8.200	8.400	10.400	11.400	9.700	11.000	10.500	9.160	9.550	9.000	97.310
	<b>TOTAL</b>	<b>208,762</b>	<b>62.340</b>	<b>72.289</b>	<b>86.210</b>	<b>100.875</b>	<b>89.648</b>	<b>95.143</b>	<b>90.351</b>	<b>80.717</b>	<b>78.619</b>	<b>66.762</b>	<b>822.956</b>
West Sharkia	Abo Kebeer	49,850	17.183	16.832	20.255	19.819	18.501	17.207	18.478	17.913	15.648	13.709	175.546
	Kafr Sakr	45,343	10.766	13.818	17.488	16.808	16.459	17.871	15.880	17.220	17.470	22.450	166.230
	Awlad Sakr	62,060	9.940	12.300	36.720	28.590	34.540	36.030	35.000	34.110	19.980	11.840	259.050
	Ibrahimia	50,080	7.100	9.300	18.447	24.019	18.484	19.688	25.328	24.338	14.430	10.080	171.214
	Zagazig	48,913	14.451	16.891	14.071	14.071	37.901	38.531	36.527	22.287	11.051	6.131	211.911
	<b>TOTAL</b>	<b>256,246</b>	<b>59.440</b>	<b>69.141</b>	<b>106.981</b>	<b>103.307</b>	<b>125.885</b>	<b>129.327</b>	<b>131.213</b>	<b>115.868</b>	<b>78.578</b>	<b>64.210</b>	<b>983.951</b>
West Qena	Esna	61,402	24.690	30.670	31.383	29.660	31.383	29.660	32.441	36.391	35.317	31.589	313.184
	Armant	39,321	13.440	13.533	17.059	17.200	19.000	20.510	22.317	20.250	19.220	20.738	183.267
	Nakada	33,945	9.630	10.900	13.140	12.600	13.608	14.100	14.535	13.200	12.300	11.400	125.413
	Naga Hammadi	50,051	24.264	23.295	24.630	24.440	29.760	30.190	31.530	27.030	25.290	26.070	266.499
	Abu Tesht	37,025	17.600	15.160	20.400	17.370	20.950	20.220	19.790	20.710	21.280	16.280	189.760
	<b>TOTAL</b>	<b>221,744</b>	<b>89.624</b>	<b>93.558</b>	<b>106.612</b>	<b>101.270</b>	<b>114.701</b>	<b>114.680</b>	<b>120.613</b>	<b>117.581</b>	<b>113.407</b>	<b>106.077</b>	<b>1,078.123</b>
East Qena	Luxor	36,545	11.050	12.700	18.700	19.200	19.200	19.700	20.700	21.000	18.450	17.050	177.750
	Kose	32,944	11.120	19.410	19.050	32.010	18.540	20.120	17.240	18.620	16.020	17.340	189.470
	Qena	45,990	24.836	24.836	20.336	18.236	20.806	19.736	26.306	21.776	18.646	16.196	211.710
	Deshna	46,967	18.465	18.842	19.775	22.055	21.385	25.535	21.515	25.085	18.915	17.985	209.557
	<b>TOTAL</b>	<b>162,446</b>	<b>65.471</b>	<b>75.788</b>	<b>77.861</b>	<b>91.501</b>	<b>79.931</b>	<b>85.091</b>	<b>85.761</b>	<b>86.481</b>	<b>72.031</b>	<b>68.571</b>	<b>788.487</b>
	Aswan	Aswan	14,360	5.891	6.406	5.840	5.802	6.260	7.054	6.466	7.173	6.843	5.821
El Twasa		34,511	16.300	17.500	17.850	17.960	18.040	18.880	17.640	17.750	16.880	16.560	175.360
Komombo		35,889	15.590	15.880	16.150	16.140	15.150	16.200	15.800	17.250	14.000	12.600	154.760
El Selcela		34,596	11.987	9.685	11.699	13.699	13.629	13.246	12.475	13.423	11.672	13.789	125.304
Edfo East		31,147	16.877	16.178	17.344	17.344	18.850	19.370	18.120	18.860	16.270	16.465	175.678
Edfo West		30,610	15.066	15.941	19.307	18.528	19.205	20.787	15.220	15.752	14.878	14.813	169.497
<b>TOTAL</b>		<b>181,113</b>	<b>81.711</b>	<b>81.590</b>	<b>88.190</b>	<b>89.473</b>	<b>91.134</b>	<b>95.537</b>	<b>85.721</b>	<b>90.208</b>	<b>80.543</b>	<b>80.048</b>	<b>864.155</b>
All	<b>TOTAL</b>	<b>1,030,311</b>	<b>358.586</b>	<b>392.366</b>	<b>465.855</b>	<b>486.426</b>	<b>501.299</b>	<b>519.778</b>	<b>513.659</b>	<b>490.856</b>	<b>423.179</b>	<b>385.668</b>	<b>4,537.672</b>
	Wady El Nokra	68,516	12.370	18.300	17.510	16.970	16.590	17.590	16.740	17.310	16.240	16.170	165.790
	Wady El Saaida	36,802	7.100	6.680	8.120	8.550	8.840	9.550	10.190	9.060	8.630	7.900	84.620

Table A2.2. Actual Water Deliveries for Summer 2007

General Directorate	District	Approved Area May 08 (feddan)	Summer [M m <sup>3</sup> ]										Allocation Target for Summer
			May 2007		June 2007		July 2007		August 2007		September 2007		
			1-15	16-31	1-15	16-30	1-15	16-31	1-15	16-31	1-15	16-30	
New Zifta	North Zifta	37,102	12.000	12.000	15.100	16.185	17.100	17.421	15.400	12.568	10.000	9.699	137.473
	El Santa	46,965	14.000	14.000	18.000	19.740	19.900	19.009	17.000	17.091	12.100	11.059	161.899
	Quesna	49,847	16.030	16.030	20.841	20.540	23.100	23.179	19.000	19.566	14.745	13.290	186.321
	South Zifta	36,684	11.000	11.000	14.555	15.599	20.102	20.000	14.100	13.568	9.490	9.565	138.979
	Berket El Sab	38,164	11.000	11.000	15.516	14.851	17.972	15.000	15.500	14.476	10.300	10.184	135.799
	<b>TOTAL</b>	<b>208,762</b>	<b>64.030</b>	<b>64.030</b>	<b>84.012</b>	<b>86.915</b>	<b>98.174</b>	<b>94.609</b>	<b>81.000</b>	<b>77.269</b>	<b>56.635</b>	<b>53.797</b>	<b>760.471</b>
West Sharkia	Abo Kebeer	49,850	12.684	12.684	19.243	19.243	19.844	19.844	18.013	18.013	12.684	12.684	164.932
	Kafr Sakr	45,343	11.647	11.647	17.671	17.671	18.222	18.222	16.541	16.541	11.647	11.647	151.454
	Awlad Sakr	62,060	14.648	14.648	22.223	22.223	22.917	22.917	20.802	20.802	14.648	14.648	190.471
	Ibrahimia	50,080	12.755	12.755	19.352	19.352	19.956	19.956	18.114	18.114	12.755	12.755	165.862
	Zagazig	48,913	13.718	13.718	20.813	20.813	21.463	21.463	19.482	19.482	13.718	13.718	178.385
	<b>TOTAL</b>	<b>256,246</b>	<b>65.451</b>	<b>65.451</b>	<b>99.300</b>	<b>99.300</b>	<b>102.400</b>	<b>102.400</b>	<b>92.950</b>	<b>92.950</b>	<b>65.451</b>	<b>65.451</b>	<b>851.104</b>
West Qena	Esna	61,402	16.108	16.108	24.439	24.439	25.201	25.201	22.876	22.876	16.108	16.108	209.464
	Armant	39,321	14.792	14.792	22.442	22.442	23.142	23.142	21.006	21.006	14.792	14.792	192.347
	Nakada	33,945	16.199	16.199	24.576	24.576	25.343	25.343	23.005	23.005	16.199	16.199	210.645
	Naga Hammadi	50,051	18.602	18.602	28.223	28.223	29.104	29.104	26.418	26.418	18.602	18.602	241.898
	Abu Tesht	37,025	17.422	17.422	26.432	26.432	27.257	27.257	24.742	24.742	17.422	17.422	226.549
	<b>TOTAL</b>	<b>221,744</b>	<b>83.123</b>	<b>83.123</b>	<b>126.111</b>	<b>126.111</b>	<b>130.048</b>	<b>130.048</b>	<b>118.047</b>	<b>118.047</b>	<b>83.123</b>	<b>83.123</b>	<b>1,080.902</b>
East Qena	Luxor	36,545	17.767	17.767	27.531	27.531	29.728	29.728	25.554	25.554	17.821	17.821	236.803
	Kose	32,944	17.279	17.279	23.136	23.136	23.834	23.834	20.296	20.296	15.044	15.044	199.177
	Qena	45,990	14.187	14.187	24.234	24.234	27.069	27.069	23.251	23.251	15.649	15.649	208.778
	Deshna	46,967	17.767	17.767	27.531	27.531	29.728	29.728	25.554	25.554	17.821	17.821	236.803
	<b>TOTAL</b>	<b>162,446</b>	<b>67.000</b>	<b>67.000</b>	<b>102.432</b>	<b>102.432</b>	<b>110.360</b>	<b>110.360</b>	<b>94.654</b>	<b>94.654</b>	<b>66.335</b>	<b>66.335</b>	<b>881.561</b>
Aswan	Aswan	14,360	7.580	7.580	8.569	8.569	8.569	8.569	8.239	8.239	7.251	7.251	80.415
	El Twasa	34,511	15.958	15.958	18.039	18.039	18.039	18.039	17.345	17.345	15.264	15.264	169.292
	Komombo	35,889	21.007	21.007	23.747	23.747	23.747	23.747	22.833	22.833	20.093	20.093	222.853
	El Selcela	34,596	15.525	15.525	17.550	17.550	17.550	17.550	16.875	16.875	14.850	14.850	164.697
	Edfo East	31,147	14.846	14.846	16.782	16.782	16.782	16.782	16.137	16.137	14.200	14.200	157.496
	Edfo West	30,610	16.579	16.579	18.741	18.741	18.741	18.741	18.020	18.020	15.858	15.858	175.876
	<b>TOTAL</b>	<b>181,113</b>	<b>91.494</b>	<b>91.494</b>	<b>103.428</b>	<b>103.428</b>	<b>103.428</b>	<b>103.428</b>	<b>99.450</b>	<b>99.450</b>	<b>87.516</b>	<b>87.516</b>	<b>970.629</b>
All	<b>TOTAL</b>	<b>1,030,311</b>	<b>371.098</b>	<b>371.098</b>	<b>515.282</b>	<b>518.185</b>	<b>544.409</b>	<b>540.844</b>	<b>486.100</b>	<b>482.369</b>	<b>359.060</b>	<b>356.222</b>	<b>4,544.667</b>
	Wady El Nokra	68,516	7.659	7.659	8.658	8.658	8.658	8.658	8.325	8.325	7.326	7.326	81.256
	Wady El Saaida	36,802	15.847	15.847	17.914	17.914	17.914	17.914	17.225	17.225	15.158	15.158	168.115

Table A2.3. Crop Water Requirements for Summer 2007

General Directorate	District	Approved Area May 08 (feddan)	Summer [M m <sup>3</sup> ]										CWR for Summer
			May 2007		June 2007		July 2007		August 2007		September 2007		
			1-15	16-31	1-15	16-30	1-15	16-31	1-15	16-31	1-15	16-30	
New Zifta	North Zifta	37,102	10.710	11.655	7.140	11.970	16.065	17.640	18.551	17.921	8.051	16.346	136.047
	El Santa	46,965	10.605	11.865	13.349	13.349	14.630	13.930	12.628	8.610	18.785	17.987	135.737
	Quesna	49,847	10.374	9.541	12.915	12.915	18.060	18.900	18.900	18.900	10.990	10.990	142.485
	South Zifta	36,684	4.179	4.064	3.717	10.028	12.737	13.850	14.994	14.648	14.144	6.468	98.826
	Berket El Sab	38,164	5.520	7.304	10.784	10.938	13.654	15.754	15.820	14.305	8.162	4.162	106.399
	<b>TOTAL</b>	<b>208,762</b>	<b>41.388</b>	<b>44.428</b>	<b>47.905</b>	<b>59.199</b>	<b>75.145</b>	<b>80.073</b>	<b>80.893</b>	<b>74.383</b>	<b>60.131</b>	<b>55.952</b>	<b>619.495</b>
West Sharkia	Abo Kebeer	49,850	2.310	4.368	12.810	21.420	25.200	31.136	31.710	33.488	26.670	3.570	192.682
	Kafr Sakr	45,343	4.657	4.947	14.630	15.610	17.745	17.745	11.893	11.893	12.809	12.809	124.739
	Awlad Sakr	62,060	6.461	9.758	29.960	29.960	32.683	32.683	28.805	28.805	11.690	3.150	213.955
	Ibrahimia	50,080	4.241	5.281	15.400	19.075	16.275	17.920	17.437	17.437	7.104	7.104	127.273
	Zagazig	48,913	7.931	12.607	13.377	13.377	27.048	27.048	25.844	16.317	6.601	7.357	157.507
	<b>TOTAL</b>	<b>256,246</b>	<b>25.600</b>	<b>36.961</b>	<b>86.177</b>	<b>99.442</b>	<b>118.951</b>	<b>126.532</b>	<b>115.689</b>	<b>107.940</b>	<b>64.874</b>	<b>33.990</b>	<b>816.155</b>
West Qena	Esna	61,402	19.152	20.986	22.092	21.462	20.622	21.994	22.270	22.321	19.970	18.744	209.613
	Armant	39,321	8.400	9.737	12.586	12.586	16.212	16.212	14.896	14.896	15.211	15.211	135.947
	Nakada	33,945	6.496	7.280	8.715	8.960	9.856	9.450	10.528	9.660	8.715	8.288	87.948
	Naga Hammadi	50,051	11.340	11.872	15.435	16.233	19.740	21.728	20.293	20.321	18.407	16.937	172.305
	Abu Tesht	37,025	8.505	6.720	8.085	9.030	12.936	15.190	14.490	14.560	12.751	10.570	112.837
	<b>TOTAL</b>	<b>221,744</b>	<b>53.893</b>	<b>56.595</b>	<b>66.913</b>	<b>68.271</b>	<b>79.366</b>	<b>84.574</b>	<b>82.477</b>	<b>81.758</b>	<b>75.053</b>	<b>69.749</b>	<b>718.649</b>
East Qena	Luxor	36,545	6.348	7.048	12.298	12.333	12.998	13.348	13.173	13.418	11.598	10.548	113.113
	Kose	32,944	10.000	7.048	11.550	10.395	11.165	12.880	9.450	11.312	10.605	9.975	104.380
	Qena	45,990	14.659	14.659	13.924	11.719	13.609	14.974	16.549	16.969	14.869	12.139	144.071
	Deshna	46,967	13.230	13.216	15.015	16.275	16.065	16.576	15.750	15.680	10.815	9.345	141.967
	<b>TOTAL</b>	<b>162,446</b>	<b>44.237</b>	<b>41.972</b>	<b>52.787</b>	<b>50.722</b>	<b>53.837</b>	<b>57.778</b>	<b>54.922</b>	<b>57.379</b>	<b>47.887</b>	<b>42.007</b>	<b>503.531</b>
Aswan	Aswan	14,360	3.628	3.978	3.943	3.733	3.943	4.538	4.468	4.874	4.305	3.885	41.295
	El Twasa	34,511	10.451	11.501	12.026	11.606	11.081	11.725	11.081	11.725	10.661	9.821	111.678
	Komombo	35,889	8.746	8.921	10.108	10.322	9.408	10.360	9.723	10.752	8.085	7.518	93.942
	El Selcela	34,596	10.227	11.245	11.802	11.487	11.015	11.015	11.278	10.563	9.986	9.093	107.710
	Edfo East	31,147	7.089	7.089	9.766	10.081	10.081	10.683	9.906	10.305	10.081	10.277	95.361
	Edfo West	30,610	10.395	11.008	9.870	10.185	9.450	10.192	9.135	9.856	8.610	8.610	97.311
	<b>TOTAL</b>	<b>181,113</b>	<b>50.536</b>	<b>53.741</b>	<b>57.515</b>	<b>57.414</b>	<b>54.978</b>	<b>58.513</b>	<b>55.592</b>	<b>58.075</b>	<b>51.728</b>	<b>49.204</b>	<b>547.297</b>
<b>All</b>	<b>TOTAL</b>	<b>1,030,311</b>	<b>215.653</b>	<b>233.697</b>	<b>311.297</b>	<b>335.048</b>	<b>382.277</b>	<b>407.470</b>	<b>389.573</b>	<b>379.535</b>	<b>299.673</b>	<b>250.903</b>	<b>3,205.126</b>
	Wady El Nokra	68,516	4.851	4.648	5.607	5.880	6.083	6.356	6.405	6.265	5.698	4.851	56.644
	Wady El Saaida	36,802	6.260	5.670	6.260	6.260	7.100	7.910	5.735	6.118	5.840	5.840	62.994

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Table A2.4. Target Water Allocation Values for Winter 2007–08

General Directorate	District	Approved Area May 08 (feddan)	Winter [M m3]														Allocation Target for Winter
			October 2007		November 2007		December 2007		January 2008		February 2008		March 2008		April 2008		
			1-15	16-31	1-15	16-30	1-15	16-31	1-15	16-31	1-15	16-28	1-15	16-31	1-15	16-30	
New Zifta	North Zifta	37,102	6.672	6.410	5.951	6.710	5.371	5.371	5.785	1.446	5.821	3.881	7.249	8.175	7.869	8.190	84.901
	El Santa	46,965	8.580	8.244	7.652	8.629	6.883	6.883	7.341	1.835	7.460	4.973	9.345	10.538	10.154	10.568	109.084
	Quesna	49,847	8.760	8.416	7.812	8.809	7.022	7.022	7.474	1.869	7.607	5.071	9.546	10.764	10.373	10.796	111.341
	South Zifta	36,684	6.952	6.679	6.200	6.992	5.577	5.577	5.948	1.487	6.044	4.029	7.572	8.538	8.227	8.563	88.385
	Berket El Sab	38,164	6.674	6.412	5.953	6.712	5.356	5.356	5.720	1.430	5.807	3.871	7.267	8.194	7.576	8.217	84.545
	<b>TOTAL</b>	<b>208,762</b>	<b>37.638</b>	<b>36.162</b>	<b>33.567</b>	<b>37.852</b>	<b>30.208</b>	<b>30.208</b>	<b>32.269</b>	<b>8.067</b>	<b>32.739</b>	<b>21.826</b>	<b>40.978</b>	<b>46.209</b>	<b>44.198</b>	<b>46.334</b>	<b>478.255</b>
West Sharkia	Abo Kebeer	49,850	8.499	8.009	6.643	9.174	6.356	6.356	5.811	1.453	6.889	4.593	9.389	10.588	10.967	10.123	104.849
	Kafr Sakr	45,343	4.516	4.256	4.326	5.973	3.767	3.767	3.700	0.925	5.111	3.407	6.668	7.520	9.035	8.340	71.310
	Awlad Sakr	62,060	8.305	7.826	6.451	8.909	5.878	5.878	4.346	1.086	6.197	4.131	6.198	6.990	7.530	6.950	86.676
	Ibrahimia	50,080	8.591	8.095	6.715	9.273	6.425	6.425	5.874	1.469	6.964	4.642	9.490	10.702	11.085	10.232	105.981
	Zagazig	48,913	9.358	8.818	7.314	10.101	6.998	6.998	6.398	1.600	7.585	5.057	10.337	11.657	12.074	11.145	115.440
	<b>TOTAL</b>	<b>256,246</b>	<b>39.269</b>	<b>37.004</b>	<b>31.449</b>	<b>43.430</b>	<b>29.424</b>	<b>29.424</b>	<b>26.129</b>	<b>6.532</b>	<b>32.745</b>	<b>21.830</b>	<b>42.083</b>	<b>47.455</b>	<b>50.690</b>	<b>46.791</b>	<b>484.255</b>
West Qena	Esna	61,402	24.865	21.768	18.012	14.822	11.564	11.215	12.371	1.790	13.441	12.998	15.518	17.671	20.451	22.839	219.325
	Armant	39,321	18.171	15.907	13.145	10.533	8.774	8.197	8.511	1.173	8.918	8.611	10.289	11.682	13.543	15.126	152.581
	Nakada	33,945	10.037	8.792	5.701	5.528	5.517	5.824	7.400	1.168	8.471	8.075	10.094	11.485	11.288	10.321	109.699
	Naga Hammadi	50,051	22.798	19.957	15.242	12.173	9.914	9.196	10.524	1.473	8.829	8.389	10.458	11.878	16.146	17.399	174.377
	Abu Tesht	37,025	11.655	10.202	8.950	7.852	6.402	6.216	7.038	1.008	10.640	10.254	7.509	8.532	11.075	11.234	118.567
	<b>TOTAL</b>	<b>221,744</b>	<b>87.526</b>	<b>76.625</b>	<b>61.050</b>	<b>50.908</b>	<b>42.171</b>	<b>40.648</b>	<b>45.845</b>	<b>6.612</b>	<b>50.301</b>	<b>48.327</b>	<b>53.867</b>	<b>61.247</b>	<b>72.503</b>	<b>76.918</b>	<b>774.548</b>
East Qena	Luxor	36,545	11.193	9.799	8.313	7.218	6.421	6.313	7.049	1.033	6.613	7.928	6.965	7.916	8.102	7.917	102.781
	Kose	32,944	15.253	13.353	10.122	8.128	6.911	6.465	7.352	1.128	7.974	7.618	9.339	10.607	11.923	12.707	128.879
	Qena	45,990	11.948	10.672	8.290	6.852	6.562	7.130	8.702	1.351	10.668	10.396	12.620	14.366	14.879	14.269	138.705
	Deshna	46,967	18.564	16.253	12.584	11.178	9.467	9.253	10.374	1.559	10.881	10.490	11.916	13.548	14.172	14.730	164.969
	<b>TOTAL</b>	<b>162,446</b>	<b>56.957</b>	<b>50.077</b>	<b>39.308</b>	<b>33.375</b>	<b>29.362</b>	<b>29.160</b>	<b>33.477</b>	<b>5.071</b>	<b>36.136</b>	<b>36.431</b>	<b>40.840</b>	<b>46.437</b>	<b>49.076</b>	<b>49.623</b>	<b>535.333</b>
Aswan	Aswan	14,360	4.245	3.720	3.056	2.721	2.619	3.037	0.386	1.826	2.566	2.371	3.392	3.862	4.129	4.409	42.340
	El Twasa	34,511	19.490	17.059	12.988	10.603	8.587	10.168	1.180	6.789	7.310	8.467	10.135	11.502	13.107	14.282	151.668
	Komombo	35,889	15.834	13.859	10.416	8.226	9.698	1.163	5.067	4.360	5.646	6.541	10.327	11.719	13.160	14.453	130.469
	El Selcela	34,596	16.144	14.132	11.019	8.818	7.223	6.104	6.911	0.943	4.836	8.407	8.378	9.512	11.013	12.303	125.741
	Edfo East	31,147	15.240	13.344	10.519	8.509	7.098	8.507	0.999	5.815	5.677	6.207	8.122	9.222	10.592	11.821	121.671
	Edfo West	30,610	12.226	10.705	8.292	6.893	5.840	7.009	0.827	3.218	5.414	5.492	6.980	7.923	8.857	9.689	99.364
	<b>TOTAL</b>	<b>181,113</b>	<b>83.178</b>	<b>72.819</b>	<b>56.289</b>	<b>45.769</b>	<b>41.065</b>	<b>35.987</b>	<b>15.371</b>	<b>22.950</b>	<b>31.450</b>	<b>37.484</b>	<b>47.334</b>	<b>53.741</b>	<b>60.857</b>	<b>66.957</b>	<b>671.253</b>
<b>All</b>	<b>TOTAL</b>	<b>1,030,311</b>	<b>304.569</b>	<b>272.686</b>	<b>221.664</b>	<b>211.335</b>	<b>172.230</b>	<b>165.426</b>	<b>153.092</b>	<b>49.233</b>	<b>183.371</b>	<b>165.898</b>	<b>225.103</b>	<b>255.090</b>	<b>277.325</b>	<b>286.624</b>	<b>2,943.645</b>
	Wady El Nokra	68,516	3.266	2.871	2.499	2.774	2.643	3.622	0.504	3.346	2.975	2.321	4.888	5.554	6.035	6.043	49.340
	Wady El Saaida	36,802	9.014	7.891	7.005	6.319	5.534	6.946	0.865	5.293	5.780	6.688	7.995	9.080	10.110	10.593	99.111

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Table A2.5. Actual Water Deliveries for Winter 2007-08

General Directorate	District	Approved Area May 08 (feddan)	Winter [M m3]														Actual Delivery for Winter
			October 2007		November 2007		December 2007		January 2008		February 2008		March 2008		April 2008		
			1-15	16-31	1-15	16-30	1-15	16-31	1-15	16-31	1-15	16-28	1-15	16-31	1-15	16-30	
New Zifta	North Zifta	37,102	9.575	10.330	6.543	5.430	6.719	8.047	8.731	6.766	6.484	5.783	10.400	12.263	12.051	13.898	123.020
	El Santa	46,965	13.200	10.600	11.800	13.800	11.790	6.660	6.470	9.940	4.830	9.830	8.000	10.850	15.500	13.300	146.570
	Quesna	49,847	17.930	18.890	7.080	16.300	15.260	12.220	11.000	9.140	7.080	16.800	18.490	14.540	16.970	20.420	202.120
	South Zifta	36,684	12.660	12.550	13.410	11.530	10.650	11.250	10.490	10.580	4.960	10.140	11.567	13.964	12.550	12.610	158.911
	Berket El Sab	38,164	8.700	10.040	9.940	9.730	6.046	7.200	6.420	5.020	2.715	6.380	6.962	8.236	9.240	8.250	104.879
	<b>TOTAL</b>	<b>208,762</b>	<b>62.065</b>	<b>62.410</b>	<b>48.773</b>	<b>56.790</b>	<b>50.465</b>	<b>45.377</b>	<b>43.111</b>	<b>41.446</b>	<b>26.069</b>	<b>48.933</b>	<b>55.419</b>	<b>59.853</b>	<b>66.311</b>	<b>68.478</b>	<b>735.500</b>
West Sharkia	Abo Kebeer	49,850	9.061	11.941	11.880	12.160	10.550	9.040	9.160	9.540	0.000	10.310	13.220	10.230	12.830	14.310	144.232
	Kafr Sakr	45,343	19.106	13.590	10.608	20.948	22.800	14.400	13.019	12.931	0.000	14.100	12.400	14.300	15.970	21.850	206.022
	Awlad Sakr	62,060	11.940	12.900	10.510	10.040	7.640	10.440	5.630	5.410	0.000	6.200	13.220	13.690	12.050	13.960	133.630
	Ibrahimia	50,080	2.340	2.350	8.870	7.270	7.140	7.020	3.400	5.300	0.000	6.200	4.200	6.400	8.350	7.610	76.450
	Zagazig	48,913	11.820	12.960	19.990	17.110	14.980	14.280	12.310	9.110	2.280	2.280	15.060	14.670	18.000	18.000	182.850
	<b>TOTAL</b>	<b>256,246</b>	<b>54.267</b>	<b>53.741</b>	<b>61.858</b>	<b>67.528</b>	<b>63.110</b>	<b>55.180</b>	<b>43.519</b>	<b>42.291</b>	<b>2.280</b>	<b>39.090</b>	<b>58.100</b>	<b>59.290</b>	<b>67.200</b>	<b>75.730</b>	<b>743.184</b>
West Gena	Esna	61,402	24.399	28.771	21.324	21.137	21.448	16.758	24.186	14.432	9.921	27.216	22.600	30.737	25.690	23.630	312.249
	Armant	39,321	15.080	15.951	15.728	15.042	9.080	8.060	8.625	5.564	—	9.440	12.210	14.330	13.465	14.948	157.523
	Nakada	33,945	7.200	6.260	5.720	4.800	7.300	6.900	5.300	7.400	0.000	18.800	11.600	11.200	9.700	8.800	110.980
	Naga Hammadi	50,051	20.610	18.300	12.190	11.360	11.362	11.725	11.585	4.804	5.343	11.796	14.824	17.993	17.244	17.460	186.596
	Abu Tesht	37,025	19.981	16.841	9.000	9.800	9.300	9.200	9.000	6.200	4.700	9.100	11.900	13.900	12.600	9.910	151.432
	<b>TOTAL</b>	<b>221,744</b>	<b>87.270</b>	<b>86.123</b>	<b>63.962</b>	<b>62.139</b>	<b>58.490</b>	<b>52.643</b>	<b>58.696</b>	<b>38.400</b>	<b>19.964</b>	<b>76.352</b>	<b>73.134</b>	<b>88.160</b>	<b>78.699</b>	<b>74.748</b>	<b>918.780</b>
East Gena	Luxor	36,545	11.200	11.200	8.114	8.283	7.560	7.240	10.670	3.380	2.180	12.860	9.190	16.350	11.470	11.520	131.217
	Kose	32,944	12.426	13.160	8.041	9.161	6.920	10.240	6.550	6.420	6.932	6.980	8.018	9.010	13.355	8.090	125.303
	Qena	45,990	16.336	14.636	17.976	17.866	12.596	11.936	10.226	11.856	4.496	14.056	8.247	14.806	17.186	18.866	191.085
	Deshna	46,967	14.850	17.440	16.820	16.190	13.240	12.010	14.070	12.140	2.790	12.930	15.740	15.790	16.360	13.310	193.680
	<b>TOTAL</b>	<b>162,446</b>	<b>54.812</b>	<b>56.436</b>	<b>50.951</b>	<b>51.500</b>	<b>40.316</b>	<b>41.426</b>	<b>41.516</b>	<b>33.796</b>	<b>16.398</b>	<b>46.826</b>	<b>41.195</b>	<b>55.956</b>	<b>58.371</b>	<b>51.786</b>	<b>641.285</b>
	Aswan	Aswan	14,360	5.360	5.605	4.517	4.337	3.895	3.840	3.653	2.360	3.820	3.840	5.100	6.070	5.780	5.890
El Twasa		34,511	13.230	11.800	10.200	9.880	9.090	9.440	7.650	7.900	9.302	9.382	11.546	12.907	13.348	14.282	149.957
Komombo		35,889	16.970	18.000	14.620	14.270	13.470	13.940	13.899	13.962	13.120	12.740	16.314	17.513	17.720	16.630	213.168
El Selcela		34,596	10.288	8.789	10.212	13.508	11.473	9.103	11.624	7.403	1.387	9.557	13.334	12.359	10.818	11.008	140.863
Edfo East		31,147	14.240	14.120	10.450	10.350	12.230	12.230	5.690	2.443	9.322	9.046	9.010	10.640	15.307	17.307	152.385
Edfo West		30,610	10.359	10.989	7.158	6.683	8.370	8.530	7.003	0.216	7.153	7.363	8.769	10.713	10.761	11.720	115.787
<b>TOTAL</b>		<b>181,113</b>	<b>70.447</b>	<b>69.303</b>	<b>57.157</b>	<b>59.028</b>	<b>58.528</b>	<b>57.083</b>	<b>49.519</b>	<b>34.284</b>	<b>44.104</b>	<b>51.928</b>	<b>64.073</b>	<b>70.202</b>	<b>73.734</b>	<b>76.837</b>	<b>836.228</b>
All	<b>TOTAL</b>	<b>1,030,311</b>	<b>328.861</b>	<b>328.013</b>	<b>282.701</b>	<b>296.986</b>	<b>270.909</b>	<b>251.709</b>	<b>236.361</b>	<b>190.217</b>	<b>108.815</b>	<b>263.129</b>	<b>291.921</b>	<b>333.461</b>	<b>344.315</b>	<b>347.580</b>	<b>3,874.977</b>
	Wady El Nokra	68,516	7.800	7.900	8.640	9.020	8.940	9.020	9.100	8.790	9.480	8.390	11.740	12.670	10.490	9.500	131.480
	Wady El Saaida	36,802	16.470	15.170	17.56	16.56	13.34	14.26	15.46	14.49	15.07	15.57	18.43	19.19	17.550	17.210	66.400

Table A2.6. Crop Water Requirements for Winter 2007-08

General Directorate	District	Approved Area May 08 (feddan)	Winter [M m3]														CWR for Winter
			October 2007		November 2007		December 2007		January 2008		February 2008		March 2008		April 2008		
			1-15	16-31	1-15	16-30	1-15	16-31	1-15	16-31	1-15	16-28	1-15	16-31	1-15	16-30	
New Zifta	North Zifta	37,102	4.733	4.040	3.714	4.271	5.226	5.132	6.245	7.841	8.502	9.899	8.145	9.153	12.156	10.130	99.184
	El Santa	46,965	5.880	5.355	7.350	8.050	6.846	6.416	6.846	6.416	6.517	7.560	9.051	10.605	11.466	10.563	108.920
	Quesna	49,847	12.705	8.715	6.825	7.462	7.004	7.004	6.909	6.909	6.825	7.462	9.534	9.534	12.285	12.600	121.772
	South Zifta	36,684	2.562	2.366	2.688	4.064	4.767	4.715	4.757	4.463	4.830	5.901	7.035	8.870	9.611	9.618	76.245
	Berket El Sab	38,164	4.200	4.004	4.725	5.376	4.725	4.830	5.775	6.090	7.959	9.209	8.516	9.135	9.345	8.792	92.680
	<b>TOTAL</b>	<b>208,762</b>	<b>30.080</b>	<b>24.480</b>	<b>25.302</b>	<b>29.222</b>	<b>28.568</b>	<b>28.095</b>	<b>30.531</b>	<b>31.718</b>	<b>34.633</b>	<b>40.030</b>	<b>42.281</b>	<b>47.297</b>	<b>54.863</b>	<b>51.703</b>	<b>498.801</b>
West Sharkia	Abo Kebeer	49,850	6.516	6.556	5.145	5.145	4.701	4.701	5.856	5.856	6.990	6.990	11.214	11.214	11.347	8.190	100.421
	Kafr Sakr	45,343	8.876	4.372	5.675	5.779	5.896	5.896	6.395	6.669	7.270	7.270	10.651	10.651	12.755	12.755	110.907
	Awlad Sakr	62,060	5.005	5.040	6.370	6.440	5.271	5.271	6.580	6.580	8.281	8.281	12.810	12.810	6.664	6.475	101.878
	Ibrahimia	50,080	0.744	0.904	5.922	6.093	6.391	7.606	5.968	5.968	7.018	7.105	10.927	11.340	10.745	7.273	94.002
	Zagazig	48,913	10.374	10.906	11.277	11.277	9.373	9.373	10.500	10.500	11.452	11.452	11.137	11.102	7.210	7.210	143.143
	<b>TOTAL</b>	<b>256,246</b>	<b>31.515</b>	<b>27.778</b>	<b>34.389</b>	<b>34.733</b>	<b>31.632</b>	<b>32.846</b>	<b>35.299</b>	<b>35.573</b>	<b>41.010</b>	<b>41.098</b>	<b>56.739</b>	<b>57.117</b>	<b>48.721</b>	<b>41.903</b>	<b>550.351</b>
West Gena	Esna	61,402	13.521	12.179	12.210	11.160	9.428	9.035	8.787	9.853	10.268	10.800	14.121	17.554	16.557	17.681	173.151
	Armant	39,321	11.028	11.028	11.033	11.092	5.047	4.970	5.530	5.835	6.164	6.693	8.411	10.674	9.608	10.062	117.174
	Nakada	33,945	4.550	4.536	4.515	4.102	4.620	4.305	4.760	5.460	5.740	6.104	7.560	8.610	7.350	6.440	78.652
	Naga Hammadi	50,051	12.103	12.103	7.700	7.035	7.560	7.504	7.319	7.795	7.991	8.389	9.776	12.275	11.645	11.435	130.628
	Abu Tesht	37,025	6.391	5.823	5.012	5.698	5.005	5.306	5.390	5.250	5.110	5.390	6.426	7.924	8.295	6.174	83.194
	<b>TOTAL</b>	<b>221,744</b>	<b>47.592</b>	<b>45.668</b>	<b>40.471</b>	<b>39.087</b>	<b>31.660</b>	<b>31.120</b>	<b>31.786</b>	<b>34.193</b>	<b>35.272</b>	<b>37.376</b>	<b>46.293</b>	<b>57.037</b>	<b>53.454</b>	<b>51.791</b>	<b>582.798</b>
East Gena	Luxor	36,545	6.348	6.348	3.828	4.668	4.584	4.752	5.368	5.578	6.418	6.628	8.938	9.498	9.771	9.960	92.691
	Kose	32,944	8.505	8.400	7.140	5.985	4.914	4.851	4.844	5.166	5.180	5.691	7.077	8.862	8.540	9.030	94.185
	Qena	45,990	9.030	7.770	6.615	6.720	6.300	6.300	6.405	7.952	10.269	10.003	11.550	14.896	14.396	13.482	131.688
	Deshna	46,967	8.715	9.296	7.875	7.350	6.881	6.734	6.384	7.133	7.581	7.994	9.884	13.314	10.290	10.395	119.826
	<b>TOTAL</b>	<b>162,446</b>	<b>32.598</b>	<b>31.814</b>	<b>25.458</b>	<b>24.723</b>	<b>22.679</b>	<b>22.637</b>	<b>23.001</b>	<b>25.829</b>	<b>29.448</b>	<b>30.316</b>	<b>37.449</b>	<b>46.570</b>	<b>42.997</b>	<b>42.867</b>	<b>438.390</b>
	Aswan	Aswan	14,360	3.463	2.337	2.113	2.022	2.155	2.023	2.155	2.368	2.508	3.243	3.943	3.943	4.048	4.123
El Twasa		34,511	8.218	7.448	5.628	5.208	4.851	5.096	5.145	5.488	5.807	6.205	7.970	9.884	9.100	9.408	95.455
Komombo		35,889	9.002	8.610	6.892	6.598	6.671	6.720	6.643	6.902	7.105	7.448	9.814	11.848	11.323	11.991	117.566
El Selcela		34,596	8.201	7.795	4.914	4.620	4.725	4.643	4.725	4.973	5.250	5.576	6.678	8.333	8.243	8.810	87.485
Edfo East		31,147	8.457	8.387	4.422	4.579	4.915	5.215	4.653	5.086	5.476	5.489	5.635	7.015	9.583	11.410	90.321
Edfo West		30,610	6.720	7.168	5.208	4.809	4.631	4.581	4.631	4.581	4.589	4.890	5.660	6.989	7.119	7.623	79.197
<b>TOTAL</b>		<b>181,113</b>	<b>44.061</b>	<b>41.746</b>	<b>29.176</b>	<b>27.836</b>	<b>27.948</b>	<b>28.278</b>	<b>27.951</b>	<b>29.398</b>	<b>30.734</b>	<b>32.851</b>	<b>39.699</b>	<b>48.012</b>	<b>49.415</b>	<b>53.365</b>	<b>510.468</b>
<b>All</b>		<b>TOTAL</b>	<b>1,030,311</b>	<b>185.846</b>	<b>171.486</b>	<b>154.796</b>	<b>155.602</b>	<b>142.486</b>	<b>142.976</b>	<b>148.568</b>	<b>156.710</b>	<b>171.097</b>	<b>181.671</b>	<b>222.461</b>	<b>256.033</b>	<b>249.449</b>	<b>241.628</b>
	Wady El Nokra	68,516	5.215	4.739	4.704	4.865	4.977	5.054	5.369	5.747	6.314	5.789	7.973	8.477	7.259	6.076	82.558
	Wady El Saaida	36,802	4.780	5.088	3.478	3.478	3.184	3.665	3.646	4.169	7.678	7.382	11.143	11.897	10.040	11.573	91.198

