



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

# **Monitoring and Evaluation Report: Year 3**

*Report No.38*

**September 2007**

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**September 2007**

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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                               |
| 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 |
| RWP    | 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 third year of the project, indicators measuring project implementation show nearly complete achievement. 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. 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.

However, indicators of project outcomes show little or no improvement in system performance compared with pre-project conditions. Complaints per unit area are higher, with increased summer irrigation complaints more than offsetting a reduction in drainage complaints. However this may not be very important in that number of complaints received appears to show no statistical relationship to farmer satisfaction, as measured by the client satisfaction survey.

The concept of delivery targets is becoming more familiar to managers at the District and Directorate levels and water delivery target levels have been declining as managers refine and make them more realistic. However the ratio of actual deliveries to delivery targets for Year 3 was 19% above the average baseline value, with individual Districts varying widely. Actual deliveries for 15-day periods matched targets only 24% of the time in the summer and 17% of the time in the winter season, nearly the same as during the baseline year.

Farmer satisfaction in summer dropped 13 percentage points from Year 2 to Year 3, with individual Districts also showing a wide range of values here. Farmer satisfaction shows a close correspondence with the effective implementation of a rotational schedule by the IWMD. “Compliance with the schedule” explained 74 percent of the variability in farmer satisfaction across all project IWMDs, suggesting that attention to implementing the rotation among branch canals (BCs) would have a high payoff.

Equity of water supply among IWMDs shows a very large range, varying from more than 3 times crop water demands to just 0.85 times crop water demand and suggests much scope for equalization. Allocation of water among BCs within Districts has become less equitable since the beginning of the project in summer and has held roughly constant in winter. Movement in the opposite direction was expected. Equity of distribution along BCs has improved and has been better than the baseline value for the past two years in both summer and winter. This suggests that the existence of the BCWUAs and improved communication with the IWMD may have been effective in improving distribution of water along the BC.

The project has given managers new powers and new tools with which to manage water. The challenge now is to employ these tools effectively to improve irrigation service to farmers. One quick approach may be to implement more strictly the scheduled rotation among BCs. More importantly, there is a need for an integrated system of volumetric water allocation

from Lake Nasser down to individual Districts, employing volumetric delivery targets and measured deliveries. Coupled with this, there is a need for a system of Performance Benchmarking which measures the performance of individual Districts against that of other Districts and uses that information to help managers improve their performance. Greater reliance on quantitative information requires a system of independent quality assurance for the data employed in planning, operating, and performance benchmarking.

## **Background**

The LIFE Project 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. As a result, minor changes were made in the indicators in Year 1 and Year 2 as documented in the M&E reports for those years. This year, one indicator has been adjusted and two others dropped.

Indicator 1.6, which refers to the awarding of maintenance contracts, was changed slightly to reflect revised Ministry policy. The indicator originally related to the Ministry's intention to transfer authority to award maintenance contracts to the District level. The Ministry now intends that, while Districts will prepare and supervise the contracts, General Directorates will continue to award and pay for the contracts as in the past. The indicator has been changed accordingly.

Indicators 6.1 and 6.2 related to changes in the value of agricultural output as a result of the project have been dropped. While the objective of increasing value of agricultural output remains valid, data sufficiently comprehensive and reliable to compute the two associated indicators have proven impossible to collect. Future developments may, at some point, justify the significant additional expense necessary to assess impacts along this dimension, which would likely involve the extensive use of remote sensing information.

One very interesting and positive development is the emergence from the M&E activity of interest in ongoing performance benchmarking (PB) of water service delivery. While relying on much the same data as project M&E, PB is a routine management tool which the Ministry can use to monitor the performance of IWMDs in an ongoing fashion and compare performance among Districts. During Year 3, this interest was translated into District Performance Profiles which are being introduced in all 5 project General Directorates.

## 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.

### Project Recordkeeping

Project recordkeeping was used to populate the *implementation indicators*, i.e. those under Objectives 1, 2, and 3 (see Table 1). Obtaining this data from project staff was simple and straightforward. Staff are currently assembling an archive of documents which demonstrate and support the data provided to populate the indicators, such as copies of water resource inventories prepared by Districts.

### Client Satisfaction Survey

The client satisfaction survey was conducted during June 2007. The work was carried out by El Zanaty and Associates, who administered the survey to approximately 4,900 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 and consultants. 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. All participating staff received training in conducting field surveys from the survey contractor. Many of the staff members involved also participated in last year's survey. 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 2006-07 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 daily readings at calibrated inflow structures)
- Actual cropping patterns in each IWMD (from local Agricultural Administration units through MISD)
- Crop yields from each District for each season (from local Agricultural Administration and District staff estimates)

- Prices for each crop for each District (from local Agricultural Administration and District staff estimates)

The water flow data for Year 3 was more complete and consistent than in the past, though the system for collecting, storing, organizing and controlling quality of the data needs to be regularized.

### **Data Quality**

#### **Client Satisfaction Survey**

Problems had emerged with the sample selection and coding process employed by the survey contractor in Year 2. The contractor re-coded and re-tabulated the data for those years which resolved many but not all of the problems.

For the Year 3 survey, a new contractor was chosen who applied more rigor to both the sampling process and supervision of the survey itself. Because of the critical nature of the survey data for both the final year of the M&E process and the emerging Performance Benchmarking (PB) activities, the new survey consultant recommended that, in the future, the personnel supervising the survey enumerators in the field be professionals engaged by the survey contractor rather than IWMD staff temporarily assigned to this task. This recommendation is valid and is strongly endorsed.

#### **Data Issues from Year 2 M&E Report**

In the process of assembling and analyzing the data for last year's (Year 2) Report, a number of anomalies were identified which were outlined in an annex to that report. Important responses by project and Ministry staff over the past year are indicated below.

#### *IWMD Area*

The area data that were being used for the 27 project IWMDs were old and the criteria used in establishing them unclear. The M&E Report recommended that these area values be reassessed. During Year 3, District staff, supported by the project, utilized handheld GPS units to outline the commanded areas of each branch canal in each District of the project. These data were overlaid with satellite imagery and project District digital maps, and after deducting standardized non-agricultural areas, area values were aggregated into a set of District-wise net area values. These ranged from 73% to 119% of the area values being used previously for each District. These new values have been adopted and used in the Year 3 M&E Report. The revised area data were also used to update some of the data from the Year 1 and 2 reports where these data were used for comparison purposes in the current Report. In particular, complaints per 1,000 feddan values were adjusted using the new area figures which resulted in some changes to the earlier years' results.

After collecting the GPS data and producing the new estimates of commanded area, the Ministry somewhat inexplicably restricted access to the digital mapping data that underlie the estimates and barred sharing of the data among Districts. This can only have chilling effect on future GPS and digital mapping work and may raise suspicions about the data themselves. Openness and transparency would be much better served if these restrictions were lifted.

### *Water allocation process*

The water allocation process at the General Directorate level and below is not fully developed. As a result, the concept of 15-daily “targets” for water allocation to IWMDs was not always well understood and the target values for water allocated to each District, as reported to the project, were sometimes inconsistent and misleading. The M&E Report recommended a number of steps to clarify and rationalize the target values and the target-setting process. During Year 3, the project initiated regular meetings at the General Directorate level involving the regional Water Distribution Center, the Directorate, and the Districts in that Directorate, to work on incorporating the target concept into water management practice. It would be useful for those involved to prepare a brief report on the results of this meeting process, including examples of forms used to document and communicate targets at the various levels.

### *MISD demand estimates*

During Year 3, the MISD program which estimates water demand values was reviewed by project staff, who indicate that it produces valid results. The project also retrained District staff in using the MISD software. Project staff express confidence that the MISD-based water demand information system is now working effectively. Because of the difficulty in going back and verifying actual crop areas provided by MALR, past years’ data were not adjusted or updated.

### *Actual water delivered*

Actual water delivery data from the baseline year were reviewed and adjusted where there were questions about their validity. The ability to measure actual water deliveries to the Districts as a result of the calibration program is a major success for the project.

### **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. The Ministry should develop and implement quality assurance measures for data collection and storage systems with particular attention to water delivery data and client satisfaction survey data. Any additional data used in PB systems which evaluate the quality of management at the Directorate and District levels should also have explicit and independent quality assurance mechanisms in place.

## 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, and 3 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).

At the outset of the project, the Ministry indicated its intention to shift responsibility for contracting maintenance work from the General Directorate level to the IWMD level (Indicator 1.6). This intention was reaffirmed by the project Steering Committee during Year 2. Some responsibilities associated with maintenance contracting have been shifted to the IWMD level – including preparing specifications for the work and supervising implementation by the contractors. The Ministry now feels, however, that administrative barriers, particularly the need to set up a financial unit under the Ministry of Finance at the District level if contracting is to be done there, will prevent the devolution of the actual contracting responsibility. It is now intended that this function will remain with the General Directorates. Consequently Indicator 1.6 has been modified to reflect this revised intention. All Districts were preparing specifications and monitoring maintenance contract implementation by the end of Year 3.

**Table 1 Implementation Objectives, Indicators, Targets, and Year 3 Accomplishments**

| <b>LIFE IWMP M&amp;E Indicators - Year 3</b>   |  |               | <b>Cumulative Targets and Accomplishments</b> |               |               |               |               |               |               |               |               |
|--|--|---------------|---|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
|  |  |               | <b>Baseline</b>                               | <b>Year 1</b> |               | <b>Year 2</b> |               | <b>Year 3</b> |               | <b>Year 4</b> |               |
| <b>Objective</b>   | <b>Indicator</b>   | <b>Units</b>  |   | <b>Target</b> | <b>Actual</b> | <b>Target</b> | <b>Actual</b> | <b>Target</b> | <b>Actual</b> | <b>Target</b> | <b>Actual</b> |
| <b>1 IWMDs created and functioning to cover completely the 5 project directorates</b>    |  |               |   |               |               |               |               |               |               |               |               |
| 1.1  | Number of IWMDs established by signed Ministerial decree   | Number        | 4   | 27            | 27            | 27            | 27            | 27            | 27            | 27            | 27            |
| 1.2  | Number of districts with geo-referenced maps showing district boundaries and canal layouts   | Number        | 0   | 27            | 14            | 27            | 27            | 27            | 27            | 27            | 27            |
| 1.3  | Number of IWMDs with completed integrated maintenance plans  | Number        | 0   | 27            | 0             | 0             | 27            | 27            | 27            | 27            |               |
| 1.4  | Number of IWMDs with fully-staffed senior positions according to new staffing plan   | Number        | 0   | 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            |               |
| 1.6  | Number of IWMDs preparing and supervising maintenance contracts  | Number        | 0   | 0             | 0             | 0             | 0             | 27            | 27            | 27            |               |
| <b>2 Measurement-based management practices established and functioning in all IWMDs</b> |  |               |   |               |               |               |               |               |               |               |               |
| 2.1  | Number of IWMDs with calibrations for all authorized inflow and outflow structures into and out from the District  | Number        | 1   | 15            | 4             | 27            | 27            | 27            | 27            | 27            | 27            |
| 2.2  | Number of IWMDs providing 15-daily reports of measured water inflows to the District Manager for one complete season   | Number        | 0   | 0             | 0             | 0             | 27            | 27            | 27            | 27            |               |
| 2.3  | Number of IWMDs with a completed water resource inventory in approved standard format  | Number        | 0   | 9             | 0             | 27            | 0             | 27            | 27            | 27            | 27            |
| 2.4  | Number of IWMDs with a completed water resource management plan in approved standard format (includes MISD)  | Number        | 0   | 0             | 0             | 0             | 0             | 27            | 0             | 27            |               |
| <b>3 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           | 1,020         | 1,020         | 1,020         |
| 3.2  | Area covered by BCWUAs providing written maintenance priorities to IWMD  | 1,000 Feddans | 0   | 0             | 0             | 200           | 320           | 500           | 1,020         | 1,020         |               |
| 3.3  | Area covered by BCWUAs with an agreed upon Action Plan   | 1,000 Feddans | 0   | 0             | 0             | 50            | 100           | 150           | 1,020         | 1,020         |               |
| 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            |               |
| 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            |               |

## **Objective 2: Data-based Management**

The second objective calls for the establishment and use of measurement-based management practices in all IWMDs. During Year 2, District staff developed simple linear downstream rating curves for all 84 approved major inflow and outflow points in the 27 Districts. They also began utilizing these curves, together with daily water level readings, to provide regular, real-time reports on water deliveries to District Managers. During Year 3, separate linear rating curves were developed for summer and winter seasons for each measuring point. This results, effectively, in a two-stage piece-wise linear rating curve for each structure. This approach is an improvement on the simple linear curves and probably adequate for the current purposes for which the data is used.

In addition, 70 drains removing water from the Districts and a number of internal measuring points within the Districts are slated for monitoring. Calibrations of 55 of the 70 were completed during Year 3.

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). None of the Districts had completed this task during Year 2. All Districts completed an inventory during Year 3.

After completing water resource inventories, Districts are expected to develop integrated water management plans that encompass all water sources within the District—surface, ground, and drainage (Indicator 2.4). Since a completed water resource inventory is a prerequisite for developing an integrated management plan, no District had completed a plan during Year 2. All 27 Districts were targeted to complete these plans during Year 3, though none of the plans were actually completed. The activity has been pushed over to Year 4.

## **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. During Year 3, full coverage of BCWUAs with signed MOUs was achieved, and all were providing written maintenance priorities to the IWMD (Indicators 3.1 and 3.2). All BCWUAs have prepared an action plan for themselves to follow, exceeding the modest target for the year (Indicator 3.3). IWMDs met regularly with BCWUA representatives, both individually (Indicator 3.4) and jointly in seasonal meetings of all BCWUAs within each District (Indicator 3.5).

Results from the client satisfaction survey show that, overall, 43% of farmers are aware of the existence of a BCWUA on their branch canals (BCs). More farmers on difficult/tail BCs are aware of the BCWUA (50%) than on easy/head BCs (39%), as would be expected. Of those farmers who say they are aware of the BCWUA, almost all can correctly name one of the officers, an indication that their responses are valid.

A critical task now facing the Ministry is to develop a plan for continuing to increase the powers and responsibilities delegated to the BCWUAs beyond the end of the project. The

BCWUAs are probably not independently sustainable entities at this point and additional delegations of responsibility and continuing support are necessary conditions for their continued functioning.

## 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 outputs.

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>1</sup>. In some cases, results for individual Districts are also shown and compared to suggest how such indicators can be used for internal management through performance benchmarking. Results for Objectives 4, 5, and 6 are shown in Table 2.

### Objective 4: Quality of Irrigation Service

#### *Complaints*

In Year 3 farmers filed 13% more irrigation and drainage complaints (2,190) than they did in the baseline year (1,968). As shown in Table 2, the number of complaints per 1,000 feddans was 2.18 in Year 3, compared with 1.95 in Year 2 and 1.96 in the baseline year<sup>2</sup>. This is disappointing, since it is counter to expectations.

This increase in complaints was driven by a 35% increase in summer season irrigation complaints in Year 3, with other categories showing much smaller shifts, both positive and negative. West Qena Directorate alone accounted for about three-quarters of the increase in summer irrigation complaints. In West Qena, the number of complaints tripled from Year 2

#### **Districts with Declining Complaints**

Four of the 25 Districts showed two successive declines in complaint rates from the baseline year. All are in Lower Egypt.

- El Santa
- Ibrahimia
- Abu Kebeer
- Awlad Sakar

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

<sup>2</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 and 2, compared with the results shown in the M&E Reports from those years. Results shown in this Report are all based on GPS areas.

to Year 3 – from 85 to 257, with all Districts within the Directorate showing increases from the previous year. Winter complaint levels changed only slightly.

As in past years, relatively more complaints were filed in Lower Egypt (2.98 per 1,000 feddans) than in Upper Egypt (1.52 per 1,000 feddans). Zagazig District recorded the highest complaints rate of the 25 Districts in Year 3, closely followed by Aswan District. East Qena and Aswan Directorates showed declines in complaint rates from Year 2 to Year 3, while the other three Directorates showed increases. The performance of individual Districts for Year 3 is shown in Figure 1 and a comparison of all three project years, by District, is shown in Figure 2.

Year to year changes in complaint rates for all 25 Districts, broken out by season and type of complaint are shown in Table 3. As seen, there has been a steady increase in the summer irrigation complaint rate from the baseline year to the present. Summer drainage complaints have fallen over the same period. A complete set of complaints data is contained in Annex 1.

It is important to note that the number of complaints recorded in District offices does not correlate well with farmer satisfaction as measured in sample surveys (see Annex 3). That is to say that the number of complaints per unit area is statistically unrelated to farmer satisfaction as measured by the client satisfaction survey. This calls into question the usefulness of counting complaints as an indicator of quality of irrigation service and IWMD performance.

**Districts with Increasing Complaints**

Five of the 25 Districts showed two successive increases in complaint rates from the baseline year.

- Zagazig
- Naga Hamadi
- Esna
- Abu Tesht
- El Sedsela

**Table 2 Baseline and Year 2 and 3 Values for Objectives 4, 5, and 6 Indicators**

| Objective | Indicator  | Units                            | Accomplishments                     |                                     |                                     |        |
|-----------|--|----------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|--------|
|           |  |                                  | Baseline (Year 1)                   | Year 2                              | Year 3                              | Year 4 |
|           |  |                                  |                                     | Actual                              | Actual                              | 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           | 1.96<br>1.05 summer,<br>0.92 winter | 1.95<br>0.90 summer,<br>1.04 winter | 2.18<br>1.13 summer,<br>1.05 winter |        |
| 4.2       | Ratio of total seasonal IWMD canal inflows to target allocation for season             | None                             | 0.96 summer,<br>1.13 winter         | 1.00 summer,<br>1.16 winter         | 1.14 summer<br>1.26 winter          |        |
| 4.3       | Share of number of 15-daily periods for which supply matched target within 10%         | Percent                          | 22% summer,<br>15% winter           | 20% summer,<br>22% winter           | 24% summer,<br>17% winter           |        |
| 4.4       | Percent of farmers in each IWMD satisfied with quality of irrigation service           | Percent                          | 74% summer,<br>94% winter           | 78% summer,<br>91% winter           | 65% summer,<br>89% winter           |        |
| 4.5       | Percent of farmers reporting complete conformity with planned rotation                 | Percent                          | 21% summer,<br>30% winter           | 17% summer,<br>28% winter           | 18% summer,<br>35% winter           |        |
| 4.6       | Percent of farmers reporting complete or partial conformity with planned rotation      | Percent                          | 73% summer,<br>88% winter           | 78% summer,<br>90% winter           | 65% summer,<br>85% 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 $\pm 10\%$ of 25-District average   | Percent                          | -                                   | -                                   | 28% summer,<br>28% winter           |        |
| 5.2       | Ratio of satisfied farmers in head and tail reaches of Main Canals within the District | None                             | 1.25 summer,<br>1.04 winter         | 1.37 summer,<br>1.22 winter         | 1.36 summer,<br>1.05 winter         |        |
| 5.3       | Ratio of satisfied farmers in heads and tails of Branch Canals within the District     | None                             | 1.31 summer,<br>1.09 winter         | 1.16 summer,<br>1.04 winter         | 1.17 summer,<br>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, 2006–07 Agricultural Year

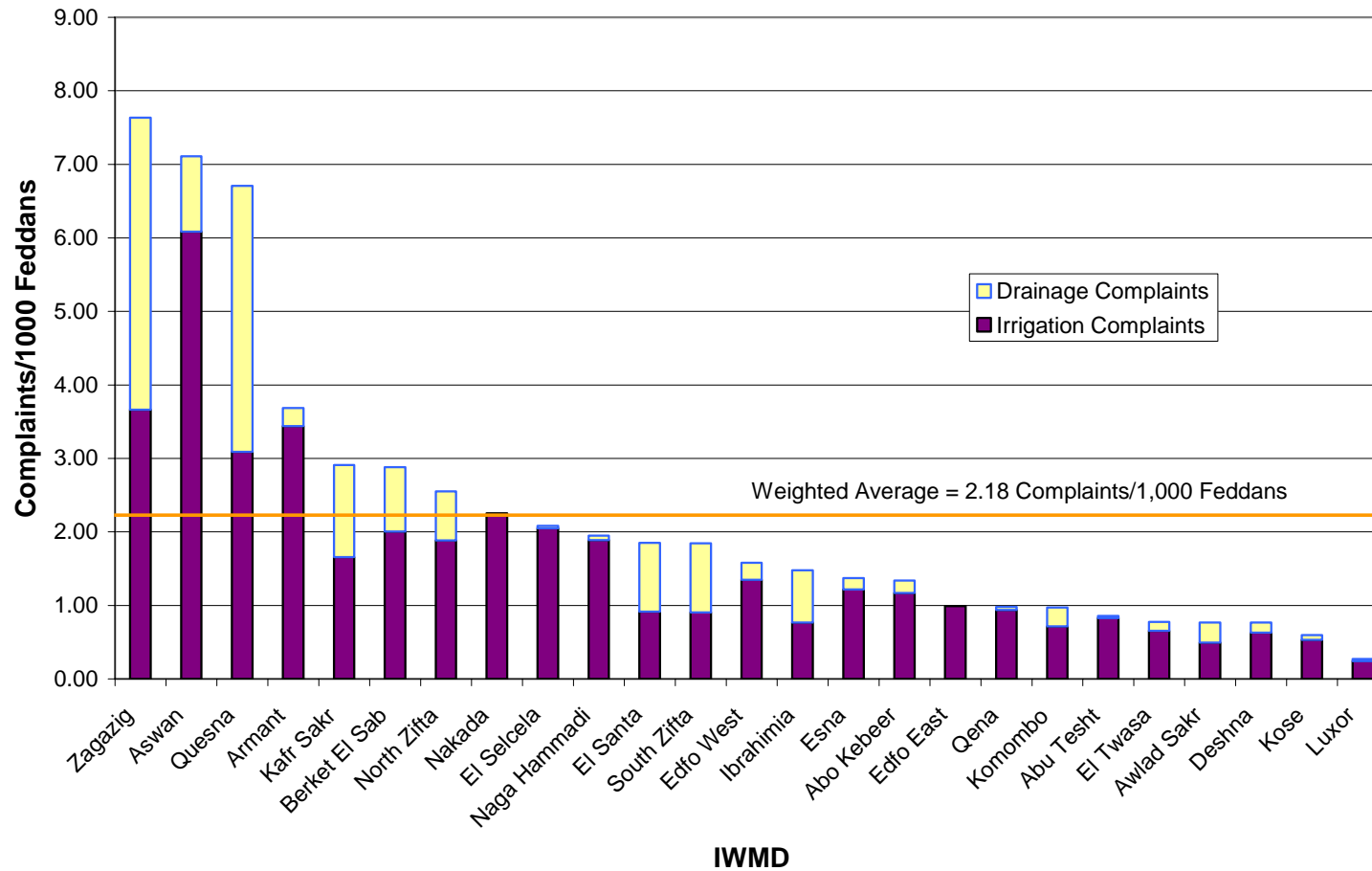
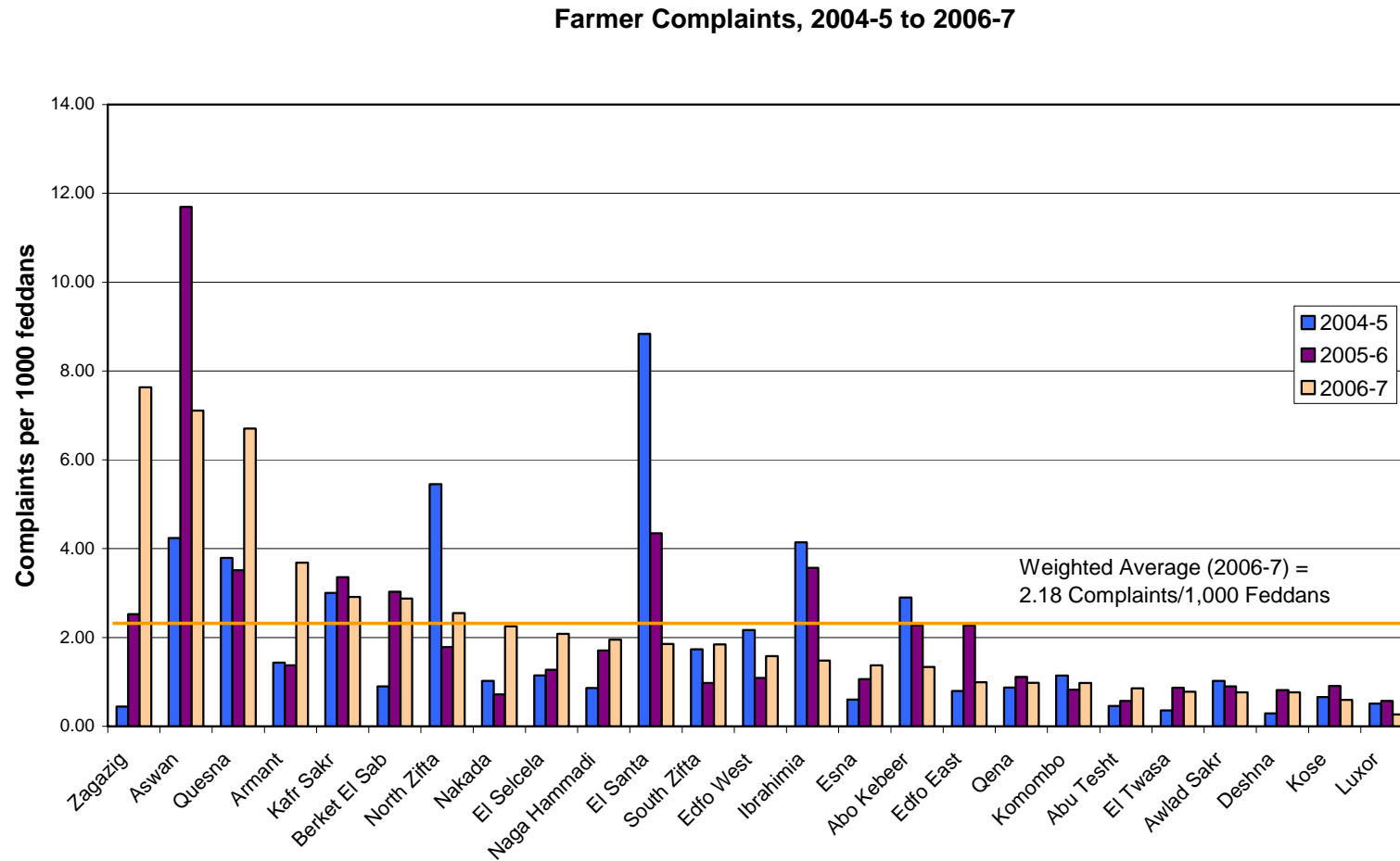


Figure 2. Formal Farmer Complaints, 2006–07 Agricultural Year



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

**Summer**

| Complaints per 1000 feddan |          |       | Complaints per 1000 feddan |          |       | Complaints per 1000 feddan |          |       |
|----------------------------|----------|-------|----------------------------|----------|-------|----------------------------|----------|-------|
| Summer 2004 (Baseline)     |          |       | Summer 2005                |          |       | Summer 2006                |          |       |
| 1 May - 30 Sept.           |          |       | 1 May - 30 Sept.           |          |       | 1 May - 30 Sept.           |          |       |
| Irrigation                 | Drainage | Total | Irrigation                 | Drainage | Total | Irrigation                 | Drainage | Total |
| 0.44                       | 0.60     | 1.05  | 0.62                       | 0.28     | 0.90  | 0.84                       | 0.29     | 1.13  |

**Winter**

| Complaints per 1000 feddan |          |       | Complaints per 1000 feddan |          |       | Complaints per 1000 feddan |          |       |
|----------------------------|----------|-------|----------------------------|----------|-------|----------------------------|----------|-------|
| Winter 2004-5 (Baseline)   |          |       | Winter 2005-6              |          |       | Winter 2006-7              |          |       |
| 1 October - 30 April       |          |       | 1 October - 30 April       |          |       | 1 October - 30 April       |          |       |
| Irrigation                 | Drainage | Total | Irrigation                 | Drainage | Total | Irrigation                 | Drainage | Total |
| 0.48                       | 0.44     | 0.92  | 0.72                       | 0.32     | 1.04  | 0.66                       | 0.38     | 1.05  |

*Actual and Target District Inflows*

One of the aims of the project, and a goal of the Ministry, is to move from management by canal water level to management by volumes of water delivered. This seemingly simple change, in fact, represents a huge shift in management philosophy, with greatly expanded data requirements and the use of new concepts in management. Among these is the concept of delivery “targets.” 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 far more open and transparent than do current practices.

To assist in this transition from management by levels to management by volumes, the project has introduced the concept of “targets” along with “demand” and “actual deliveries.” Thus, at the Directorate level, managers are asked to estimate 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 at the end of the season to see how close the match was. It is important to note that the targets are planning values, computed before the beginning of each agricultural year.

Because the concept of targets in an unfamiliar one in the management system as applied at the Directorate and District levels, it has taken some time to develop a planning process whereby realistic target values are established and reported for each season. As a result,

target values have changed from year to year as the concept has become more familiar and estimating procedures refined (Table 4).

**Table 4 Target delivery values for summer and winter, 2004-2006, in MCM**

| Summer |       |       | Winter |        |        |
|--------|-------|-------|--------|--------|--------|
| 2004   | 2005  | 2006  | 2004-5 | 2005-6 | 2006-7 |
| 5,193  | 5,190 | 4,555 | 4,243  | 4,355  | 3,435  |

This is a positive development as it reflects a more serious effort to estimate actual target delivery values for Nile water at the Directorate level. In the future, one would expect more modest changes in target values from one year to the next as estimates become increasingly realistic and less volatile. There remains a need to regularize the procedures used in the target-setting process and integrate target setting at the Directorate level with the Water Management Plans prepared in each District annually.

For M&E purposes, two indicators are computed from these data. General Directorates reported the target values of water deliveries which they planned to make to each District for 15-day periods throughout the agricultural year. Actual deliveries were computed by Districts using daily water level readings and calibration curves. The ratio of these two volumes for summer and winter 2006-7 are shown in Tables 5 and 6. Allocation target and actual delivery volumes for the two seasons are presented in Annex 2.

As seen in Table 5, the ratio of total actual deliveries to the aggregate targets for the 25 Districts for summer is 1.14. The baseline value (2004) was 0.96. This 19% increase in the ratio reflects both a 12% reduction in the total of target values over the period and a 4% increase in the total amount of water actually delivered. Among Districts there is great variation, and actual deliveries range from 55% (Luxor) to 181% (Kafr Sakr) of seasonal targets

For the winter season (Table 6), the average for the 25 Districts is 1.26 which also represents an increase over the baseline value of 1.13. It should be noted though, that the total target for winter came down by 19% over the period and actual delivery declined by 10%. Thus, even though the ratio increased, considerably less winter water was delivered in Year 3 than in the baseline year. Among Districts, actual winter deliveries range from 88% (Nakada) to 193% (Qena) of seasonal targets.

The decline in targets for both summer and winter seasons indicates that General Directorates are developing a better understanding of the target value concept and are making the targets more realistic. The wide range of the actual-to-target ratio, however, suggests that there is still enormous scope for equalizing water allocations among Districts and consequently in increasing average yields across all of the Districts.

Table 5 Ratio of Actual and Target Allocation Values for Summer 2006

| General Directorate | District       | Net GPS Area (feddan) | Summer [% of target] |             |             |             |             |             |             |             |                |             | Total Summer |
|---------------------|----------------|-----------------------|----------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|----------------|-------------|--------------|
|                     |                |                       | May 2006             |             | June 2006   |             | July 2006   |             | August 2006 |             | September 2006 |             |              |
|                     |                |                       | 1-15                 | 16-31       | 1-15        | 16-30       | 1-15        | 16-31       | 1-15        | 16-31       | 1-15           | 16-30       |              |
| New Zifta           | North Zifta    | 37,623                | 96%                  | 89%         | 94%         | 109%        | 124%        | 111%        | 98%         | 95%         | 98%            | 83%         | 101%         |
|                     | El Santa       | 46,965                | 148%                 | 199%        | 207%        | 138%        | 163%        | 172%        | 148%        | 168%        | 225%           | 247%        | 177%         |
|                     | Quesna         | 46,955                | 40%                  | 104%        | 92%         | 52%         | 28%         | 71%         | 71%         | 79%         | 61%            | 86%         | 67%          |
|                     | South Zifta    | 28,759                | 125%                 | 166%        | 102%        | 110%        | 83%         | 96%         | 108%        | 134%        | 163%           | 143%        | 117%         |
|                     | Berket El Sab  | 38,903                | 100%                 | 111%        | 74%         | 74%         | 59%         | 82%         | 63%         | 72%         | 88%            | 80%         | 78%          |
|                     | <b>TOTAL</b>   | <b>199,205</b>        | <b>99%</b>           | <b>134%</b> | <b>115%</b> | <b>96%</b>  | <b>89%</b>  | <b>106%</b> | <b>97%</b>  | <b>110%</b> | <b>125%</b>    | <b>127%</b> | <b>108%</b>  |
| West Sharkia        | Abo Kebeer     | 47,894                | 107%                 | 128%        | 129%        | 98%         | 128%        | 122%        | 135%        | 132%        | 186%           | 128%        | 128%         |
|                     | Kafr Sakr      | 44,643                | 219%                 | 257%        | 177%        | 148%        | 167%        | 169%        | 158%        | 159%        | 223%           | 183%        | 181%         |
|                     | Awlad Sakr     | 62,461                | 108%                 | 151%        | 112%        | 154%        | 156%        | 157%        | 154%        | 154%        | 144%           | 76%         | 139%         |
|                     | Ibrahimia      | 50,711                | 158%                 | 202%        | 131%        | 148%        | 121%        | 142%        | 147%        | 152%        | 196%           | 123%        | 149%         |
|                     | Zagazig        | 49,118                | 102%                 | 180%        | 132%        | 142%        | 142%        | 140%        | 144%        | 145%        | 188%           | 96%         | 141%         |
|                     | <b>TOTAL</b>   | <b>254,827</b>        | <b>136%</b>          | <b>181%</b> | <b>135%</b> | <b>139%</b> | <b>143%</b> | <b>146%</b> | <b>148%</b> | <b>148%</b> | <b>186%</b>    | <b>119%</b> | <b>147%</b>  |
| West Qena           | Esna           | 58,267                | 167%                 | 193%        | 129%        | 125%        | 118%        | 137%        | 150%        | 163%        | 214%           | 196%        | 154%         |
|                     | Armant         | 36,342                | 68%                  | 97%         | 75%         | 80%         | 80%         | 83%         | 91%         | 97%         | 116%           | 131%        | 90%          |
|                     | Nakada         | 33,276                | 75%                  | 102%        | 67%         | 63%         | 62%         | 69%         | 72%         | 77%         | 99%            | 60%         | 73%          |
|                     | Naga Hammadi   | 49,757                | 172%                 | 192%        | 120%        | 136%        | 129%        | 138%        | 137%        | 145%        | 205%           | 205%        | 152%         |
|                     | Abu Tesht      | 35,051                | 106%                 | 129%        | 86%         | 79%         | 74%         | 76%         | 89%         | 94%         | 115%           | 121%        | 94%          |
|                     | <b>TOTAL</b>   | <b>212,693</b>        | <b>120%</b>          | <b>144%</b> | <b>96%</b>  | <b>98%</b>  | <b>94%</b>  | <b>102%</b> | <b>109%</b> | <b>116%</b> | <b>152%</b>    | <b>145%</b> | <b>114%</b>  |
| East Qena           | Luxor          | 36,978                | 32%                  | 59%         | 24%         | 45%         | 56%         | 54%         | 67%         | 70%         | 82%            | 70%         | 55%          |
|                     | Kose           | 31,805                | 161%                 | 228%        | 106%        | 103%        | 90%         | 91%         | 90%         | 88%         | 69%            | 72%         | 108%         |
|                     | Qena           | 46,847                | 130%                 | 162%        | 94%         | 88%         | 82%         | 85%         | 96%         | 84%         | 132%           | 133%        | 103%         |
|                     | Deshna         | 44,360                | 90%                  | 92%         | 57%         | 75%         | 61%         | 68%         | 76%         | 84%         | 103%           | 101%        | 78%          |
|                     | <b>TOTAL</b>   | <b>159,990</b>        | <b>101%</b>          | <b>133%</b> | <b>68%</b>  | <b>76%</b>  | <b>71%</b>  | <b>73%</b>  | <b>81%</b>  | <b>81%</b>  | <b>97%</b>     | <b>94%</b>  | <b>84%</b>   |
| Aswan               | Aswan          | 14,625                | 82%                  | 113%        | 86%         | 95%         | 92%         | 96%         | 101%        | 103%        | 117%           | 108%        | 99%          |
|                     | El Twasa       | 33,511                | 114%                 | 109%        | 105%        | 122%        | 135%        | 144%        | 127%        | 145%        | 143%           | 122%        | 127%         |
|                     | Komombo        | 34,978                | 129%                 | 137%        | 119%        | 119%        | 110%        | 118%        | 125%        | 129%        | 139%           | 140%        | 126%         |
|                     | El Selcela     | 32,189                | 95%                  | 105%        | 86%         | 100%        | 98%         | 100%        | 107%        | 98%         | 101%           | 119%        | 101%         |
|                     | Edfo East      | 31,288                | 116%                 | 110%        | 103%        | 106%        | 105%        | 113%        | 115%        | 126%        | 128%           | 145%        | 116%         |
|                     | Edfo West      | 30,408                | 83%                  | 111%        | 107%        | 104%        | 94%         | 112%        | 137%        | 140%        | 158%           | 174%        | 118%         |
|                     | <b>TOTAL</b>   | <b>176,999</b>        | <b>107%</b>          | <b>115%</b> | <b>104%</b> | <b>109%</b> | <b>107%</b> | <b>116%</b> | <b>120%</b> | <b>126%</b> | <b>132%</b>    | <b>136%</b> | <b>117%</b>  |
| All                 | <b>TOTAL</b>   | <b>1,003,714</b>      | <b>112%</b>          | <b>140%</b> | <b>103%</b> | <b>103%</b> | <b>100%</b> | <b>108%</b> | <b>111%</b> | <b>116%</b> | <b>139%</b>    | <b>126%</b> | <b>114%</b>  |
|                     | Wady El Nokra  | 68,516                | 87%                  | 107%        | 84%         | 100%        | 108%        | 121%        | 72%         | 99%         | 67%            | 120%        | 97%          |
|                     | Wady El Saaida | 36,802                | 87%                  | 116%        | 117%        | 113%        | 105%        | 125%        | 123%        | 126%        | 132%           | 146%        | 119%         |

Table 6 Ratio of Actual and Target Allocation Values for Winter 2006–07

| General Directorate | District       | Net GPS Area (feddan) | Winter [% of target] |             |               |             |               |             |              |             |               |             |             |             |             |             | Total Winter |
|---------------------|----------------|-----------------------|----------------------|-------------|---------------|-------------|---------------|-------------|--------------|-------------|---------------|-------------|-------------|-------------|-------------|-------------|--------------|
|                     |                |                       | October 2006         |             | November 2006 |             | December 2006 |             | January 2007 |             | February 2007 |             | March 2007  |             | April 2007  |             |              |
|                     |                |                       | 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    | 37,623                | 73%                  | 65%         | 57%           | 71%         | 113%          | 112%        | 115%         | 90%         | 91%           | 130%        | 78%         | 122%        | 112%        | 88%         | 92%          |
|                     | El Santa       | 46,965                | 143%                 | 165%        | 167%          | 217%        | 25%           | 69%         | 131%         | 179%        | 120%          | 150%        | 100%        | 109%        | 133%        | 129%        | 134%         |
|                     | Quesna         | 46,955                | 61%                  | 67%         | 86%           | 92%         | 95%           | 105%        | 85%          | 85%         | 144%          | 144%        | 98%         | 116%        | 99%         | 110%        | 97%          |
|                     | South Zifta    | 28,759                | 171%                 | 141%        | 160%          | 147%        | 241%          | 166%        | 252%         | 229%        | 210%          | 178%        | 166%        | 178%        | 154%        | 139%        | 174%         |
|                     | Berket El Sab  | 38,903                | 65%                  | 106%        | 68%           | 88%         | 137%          | 146%        | 133%         | 82%         | 77%           | 115%        | 86%         | 116%        | 87%         | 119%        | 100%         |
|                     | <b>TOTAL</b>   | <b>199,205</b>        | <b>101%</b>          | <b>108%</b> | <b>108%</b>   | <b>124%</b> | <b>116%</b>   | <b>117%</b> | <b>135%</b>  | <b>123%</b> | <b>132%</b>   | <b>145%</b> | <b>105%</b> | <b>126%</b> | <b>117%</b> | <b>115%</b> | <b>118%</b>  |
| West Sharkia        | Abo Kebeer     | 47,894                | 158%                 | 108%        | 97%           | 182%        | 180%          | 179%        | 270%         | 0%          | 7%            | 150%        | 196%        | 156%        | 159%        | 158%        | 144%         |
|                     | Kafr Sakr      | 44,643                | 83%                  | 60%         | 101%          | 134%        | 139%          | 88%         | 179%         | 0%          | 0%            | 77%         | 81%         | 83%         | 121%        | 138%        | 93%          |
|                     | Awlad Sakr     | 62,461                | 161%                 | 106%        | 175%          | 217%        | 147%          | 142%        | 161%         | 183%        | 0%            | 97%         | 128%        | 128%        | 129%        | 64%         | 129%         |
|                     | Ibrahimia      | 50,711                | 56%                  | 67%         | 123%          | 139%        | 85%           | 77%         | 151%         | 0%          | 0%            | 116%        | 147%        | 122%        | 89%         | 118%        | 94%          |
|                     | Zagazig        | 49,118                | 39%                  | 79%         | 123%          | 128%        | 96%           | 95%         | 284%         | 0%          | 0%            | 113%        | 154%        | 156%        | 141%        | 88%         | 106%         |
|                     | <b>TOTAL</b>   | <b>254,827</b>        | <b>100%</b>          | <b>85%</b>  | <b>126%</b>   | <b>162%</b> | <b>129%</b>   | <b>117%</b> | <b>209%</b>  | <b>41%</b>  | <b>1%</b>     | <b>111%</b> | <b>142%</b> | <b>130%</b> | <b>128%</b> | <b>111%</b> | <b>114%</b>  |
| West Qena           | Esna           | 58,267                | 154%                 | 147%        | 152%          | 137%        | 173%          | 140%        | 197%         | 18%         | 196%          | 127%        | 116%        | 140%        | 111%        | 109%        | 135%         |
|                     | Armant         | 36,342                | 111%                 | 119%        | 107%          | 90%         | 81%           | 90%         | 305%         | 17%         | 160%          | 104%        | 107%        | 102%        | 101%        | 94%         | 107%         |
|                     | Nakada         | 33,276                | 108%                 | 100%        | 63%           | 100%        | 75%           | 96%         | 107%         | 0%          | 108%          | 91%         | 100%        | 99%         | 87%         | 77%         | 88%          |
|                     | Naga Hammadi   | 49,757                | 210%                 | 186%        | 241%          | 208%        | 183%          | 206%        | 193%         | 0%          | 127%          | 151%        | 88%         | 127%        | 121%        | 122%        | 152%         |
|                     | Abu Tesht      | 35,051                | 170%                 | 148%        | 144%          | 129%        | 108%          | 13%         | N/A          | N/A         | 203%          | 143%        | 233%        | 239%        | 205%        | 216%        | 171%         |
|                     | <b>TOTAL</b>   | <b>212,693</b>        | <b>150%</b>          | <b>141%</b> | <b>143%</b>   | <b>130%</b> | <b>123%</b>   | <b>100%</b> | <b>229%</b>  | <b>50%</b>  | <b>165%</b>   | <b>125%</b> | <b>121%</b> | <b>136%</b> | <b>120%</b> | <b>118%</b> | <b>132%</b>  |
| East Qena           | Luxor          | 36,978                | 140%                 | 127%        | 198%          | 161%        | 147%          | 150%        | 155%         | 0%          | 67%           | 108%        | 81%         | 75%         | 71%         | 63%         | 98%          |
|                     | Kose           | 31,805                | 302%                 | 320%        | 243%          | 277%        | 71%           | 52%         | 29%          | 0%          | 109%          | 132%        | 46%         | 40%         | 34%         | 66%         | 103%         |
|                     | Qena           | 46,847                | 324%                 | 335%        | 356%          | 364%        | 262%          | 288%        | 192%         | 0%          | 187%          | 168%        | 164%        | 151%        | 127%        | 144%        | 193%         |
|                     | Deshna         | 44,360                | 224%                 | 249%        | 406%          | 362%        | 183%          | 181%        | 105%         | 15%         | 70%           | 97%         | 106%        | 142%        | 111%        | 116%        | 137%         |
|                     | <b>TOTAL</b>   | <b>159,990</b>        | <b>243%</b>          | <b>252%</b> | <b>298%</b>   | <b>288%</b> | <b>170%</b>   | <b>173%</b> | <b>123%</b>  | <b>5%</b>   | <b>108%</b>   | <b>125%</b> | <b>102%</b> | <b>105%</b> | <b>84%</b>  | <b>95%</b>  | <b>133%</b>  |
|                     | Aswan          | Aswan                 | 14,625               | 216%        | 195%          | 199%        | 193%          | 203%        | 175%         | 141%        | 236%          | 134%        | 138%        | 104%        | 112%        | 95%         | 98%          |
| El Twasa            |                | 33,511                | 127%                 | 120%        | 162%          | 164%        | 231%          | 211%        | 177%         | 126%        | 121%          | 160%        | 126%        | 126%        | 112%        | 114%        | 141%         |
| Komombo             |                | 34,978                | 102%                 | 113%        | 136%          | 130%        | 149%          | 142%        | 131%         | 108%        | 88%           | 116%        | 94%         | 101%        | 78%         | 89%         | 109%         |
| El Selcela          |                | 32,189                | 110%                 | 109%        | 154%          | 149%        | 192%          | 162%        | 0%           | 152%        | 156%          | 98%         | 91%         | 100%        | 78%         | 81%         | 112%         |
| Edfo East           |                | 31,288                | 134%                 | 134%        | 186%          | 186%        | 275%          | 277%        | 204%         | 233%        | 183%          | 191%        | 148%        | 171%        | 120%        | 122%        | 171%         |
| Edfo West           |                | 30,408                | 147%                 | 106%        | 188%          | 138%        | 177%          | 161%        | 0%           | 230%        | 118%          | 91%         | 85%         | 96%         | 104%        | 99%         | 120%         |
| <b>TOTAL</b>        |                | <b>176,999</b>        | <b>127%</b>          | <b>120%</b> | <b>166%</b>   | <b>154%</b> | <b>200%</b>   | <b>186%</b> | <b>105%</b>  | <b>170%</b> | <b>130%</b>   | <b>130%</b> | <b>107%</b> | <b>116%</b> | <b>97%</b>  | <b>100%</b> | <b>130%</b>  |
| All                 | <b>TOTAL</b>   | <b>1,003,714</b>      | <b>137%</b>          | <b>132%</b> | <b>150%</b>   | <b>154%</b> | <b>146%</b>   | <b>134%</b> | <b>157%</b>  | <b>78%</b>  | <b>109%</b>   | <b>126%</b> | <b>115%</b> | <b>123%</b> | <b>108%</b> | <b>107%</b> | <b>126%</b>  |
|                     | Wady El Nokra  | 68,516                | 140%                 | 148%        | 246%          | 240%        | 242%          | 241%        | 259%         | 247%        | 213%          | 193%        | 191%        | 174%        | 127%        | 105%        | 189%         |
|                     | Wady El Saaida | 36,802                | 131%                 | 137%        | 207%          | 213%        | 253%          | 199%        | 238%         | 224%        | 168%          | 175%        | 149%        | 162%        | 124%        | 113%        | 167%         |

Note: N/A (Target value = 0 for winter closure)

Tables 5 and 6 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 60 such periods out of a total of 250 among the 25 IWMDs or an average of 24%. This means that, on average, water supplied matched target values ( $\pm 10$  percent) about one-quarter of the time. This is similar to the baseline value of 22%.

During the winter season, there were 59 matching periods out of a total of 350. Thus supply matched targets 17% of the time. This is similar to the baseline value of 15% but represents a decline in performance from the Year 2 value of 22%.

The performance of the Districts and the General Directorates in matching supply with targets and is unimpressive. During the year just past, it is unlikely that many, if any, of the Districts used the target and actual values in requesting water deliveries from the General Directorate or that the General Directorates attempted to deliver water on this basis. However as noted above, the specification of 15-day target allocations for each District has steadily improved, net irrigable area figures have been refined, and Districts are gaining experience with volumetric measurement of water and with operating databases containing this information. The next step in improving delivery performance, as measured by these indicators, is to integrate measured deliveries and targets into annual planning and routine day-to-day management practices at both the District and General Directorate levels.

### *Farmer Satisfaction*

The client satisfaction survey provides information on farmers' assessment of irrigation service. The surveys showed that 65 percent of project farmers were satisfied with summer season service, down significantly from 78 percent in Year 2<sup>3</sup>. In winter, 89 percent were satisfied, compared with 91 percent the previous year. The change in wintertime satisfaction represents a small drop from an already high value and so is not particularly important. The 13 percentage point drop in summer satisfaction is worrisome, however, indicating that farmers were considerably less satisfied with the irrigation service they received in Year 3 compared with the previous year, and were actually more dissatisfied than they were in the baseline year at the outset of the project. At the end of the day, project-induced changes in organizational structure and information systems at the District level must be translated into better irrigation service, as measured by farmer satisfaction, if the project is to have the desired impact on farmer well-being.

Supporting this result, two other questions in the survey asked farmers to rate the timing of irrigation water and its abundance, the two principal components of "overall quality of irrigation service" reported above. Just 65 percent of farmers reported that, in summer, water was either always or sometimes available when they needed it and 62 percent reported that the amount of water, i.e. water abundance, was either excellent or moderate. Summary

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<sup>3</sup> "Satisfaction" is based on farmers rating overall quality of irrigation service as "moderate" or "excellent".

results for both summer and winter of the past two years and the baseline year are shown in Table 7.

As seen in Table 7, farmer ratings of the (a) abundance and (b) timing of water supplies are consistent with (c) their overall rating of quality of irrigation service. Since the frequency of responses to the three questions is usually similar, though, it appears that farmers do not readily distinguish between the timing of water delivery and amount of water supplied. Hence in the M&E activity, primary reliance has been placed on the overall rating of “quality of irrigation service” as an indicator.

**Table 7 Farmer satisfaction with overall quality quantity of irrigation service, and timing and abundance of water deliveries**

| <b>Farmer Satisfaction</b>                   | <b>Summer</b>    |                  |               | <b>Winter</b>    |                  |               |
|--|------------------|------------------|---------------|------------------|------------------|---------------|
| <b>Overall quality of irrigation service</b> | <b>Excellent</b> | <b>Moderate</b>  | <b>Poor</b>   | <b>Excellent</b> | <b>Moderate</b>  | <b>Poor</b>   |
| <b>2004-5</b>                                | 22%              | 52%              | 26%           | 42%              | 52%              | 6%            |
| <b>2005-6</b>                                | 22%              | 56%              | 22%           | 44%              | 47%              | 9%            |
| <b>2006-7</b>                                | 19%              | 47%              | 35%           | 41%              | 49%              | 11%           |
| <b>Water abundance</b>                       | <b>Excellent</b> | <b>Moderate</b>  | <b>Poor</b>   | <b>Excellent</b> | <b>Moderate</b>  | <b>Poor</b>   |
| <b>2004-5</b>                                | 23%              | 50%              | 27%           | 41%              | 51%              | 8%            |
| <b>2005-6</b>                                | 23%              | 55%              | 23%           | 46%              | 45%              | 9%            |
| <b>2006-7</b>                                | 21%              | 41%              | 38%           | 51%              | 39%              | 10%           |
| <b>Water available when needed</b>           | <b>Always</b>    | <b>Sometimes</b> | <b>Seldom</b> | <b>Always</b>    | <b>Sometimes</b> | <b>Seldom</b> |
| <b>2004-5</b>                                | 21%              | 55%              | 25%           | 41%              | 52%              | 6%            |
| <b>2005-6</b>                                | 18%              | 64%              | 18%           | 37%              | 54%              | 9%            |
| <b>2006-7</b>                                | 17%              | 48%              | 35%           | 39%              | 53%              | 8%            |

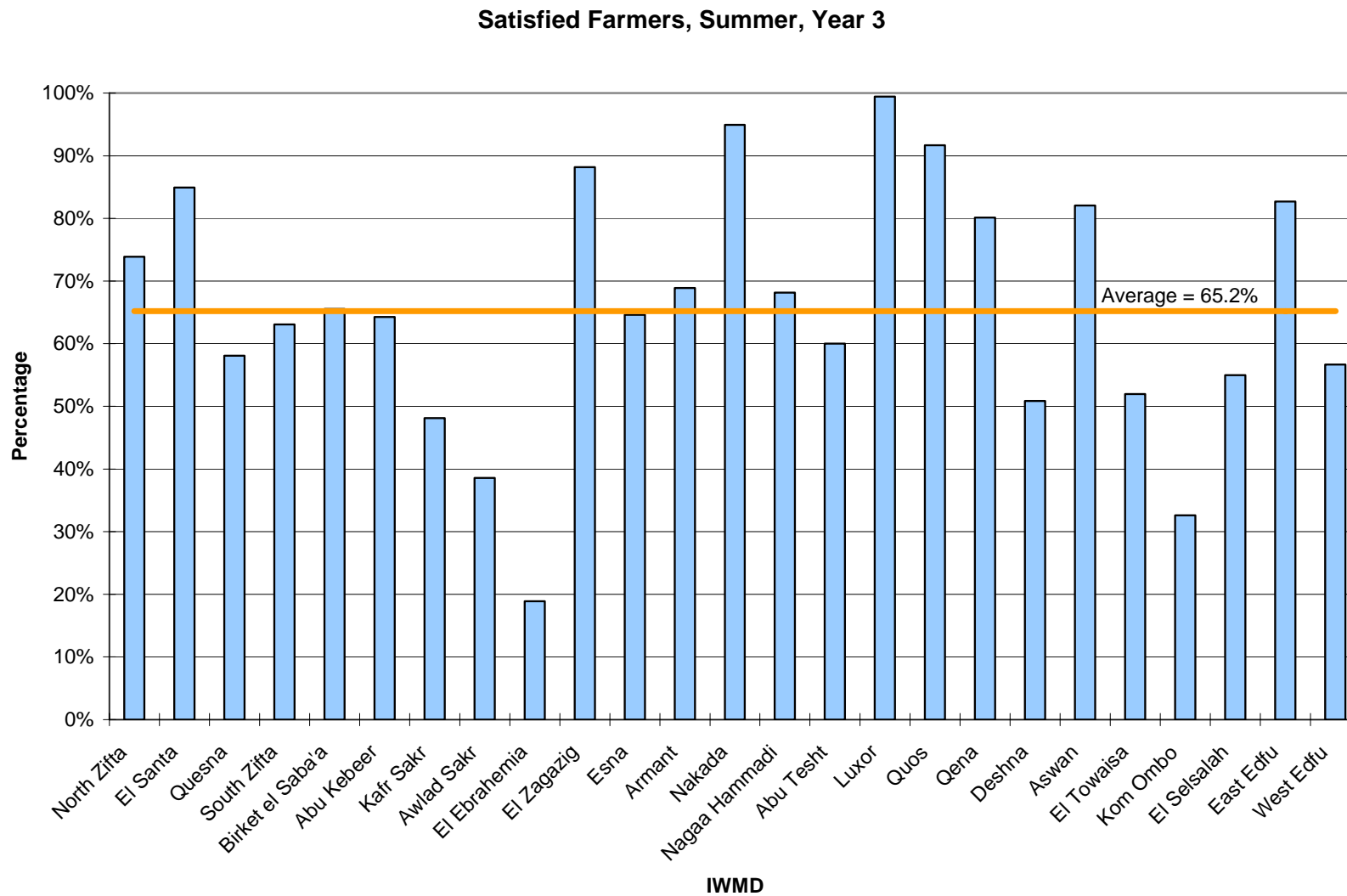
Overall satisfaction values for individual Districts for 2006-7 are shown in Table 8. As seen, satisfaction is higher across the board in winter when demand is lower. Most Districts were over 90 percent satisfaction during the winter, with the exceptions concentrated in West Sharkiya Directorate, just as they were in Year 2. Summer satisfaction levels vary from just 19 percent in Ibrahimiya to 99 percent in Luxor. This huge range suggests substantial room for improvement in some Districts. Satisfaction levels are shown graphically in Figure 3 and the best performing Districts are shown in the box at the right. Ibrahimiya District in W. Sharkiya had a farmer satisfaction response of less than 20% for summer season 2006.

- |  |
|--|
| <p><b>Districts with More than 75% Satisfied Farmers in Summer 2006</b></p> <ul style="list-style-type: none"> <li>• Luxor</li> <li>• Nakada</li> <li>• Kose</li> <li>• Zagazig</li> <li>• El Santa</li> <li>• Edfo East</li> <li>• Aswan</li> <li>• Qena</li> </ul> |
|--|

Table 8 Farmer satisfaction with irrigation service

| General Directorate | District       | Summer 2006 |             | Winter 2006-7 |             |
|---------------------|----------------|-------------|-------------|---------------|-------------|
|                     |                | Satisfied   | Unsatisfied | Satisfied     | Unsatisfied |
| New Zifta           | North Zifta    | 74%         | 26%         | 73%           | 27%         |
|                     | El Santa       | 85%         | 15%         | 92%           | 8%          |
|                     | Quesna         | 58%         | 42%         | 94%           | 6%          |
|                     | South Zifta    | 63%         | 37%         | 94%           | 6%          |
|                     | Berket El Sab  | 66%         | 34%         | 86%           | 14%         |
|                     | <b>TOTAL</b>   | <b>69%</b>  | <b>31%</b>  | <b>88%</b>    | <b>12%</b>  |
| West Sharkia        | Abo Kebeer     | 64%         | 36%         | 83%           | 17%         |
|                     | Kafr Sakr      | 48%         | 52%         | 72%           | 28%         |
|                     | Awlad Sakr     | 39%         | 61%         | 90%           | 10%         |
|                     | Ibrahimia      | 19%         | 81%         | 76%           | 24%         |
|                     | Zagazig        | 88%         | 12%         | 61%           | 39%         |
|                     | <b>TOTAL</b>   | <b>51%</b>  | <b>49%</b>  | <b>77%</b>    | <b>23%</b>  |
| West Qena           | Esna           | 65%         | 35%         | 87%           | 13%         |
|                     | Armant         | 69%         | 31%         | 98%           | 2%          |
|                     | Nakada         | 95%         | 5%          | 94%           | 6%          |
|                     | Naga Hammadi   | 68%         | 32%         | 96%           | 4%          |
|                     | Abu Tesht      | 60%         | 40%         | 93%           | 7%          |
|                     | <b>TOTAL</b>   | <b>71%</b>  | <b>29%</b>  | <b>94%</b>    | <b>6%</b>   |
| East Qena           | Luxor          | 99%         | 1%          | 100%          | 0%          |
|                     | Kose           | 92%         | 8%          | 99%           | 1%          |
|                     | Qena           | 80%         | 20%         | 94%           | 6%          |
|                     | Deshna         | 51%         | 49%         | 100%          | 0%          |
|                     | <b>TOTAL</b>   | <b>81%</b>  | <b>19%</b>  | <b>98%</b>    | <b>2%</b>   |
| Aswan               | Aswan          | 82%         | 18%         | 91%           | 9%          |
|                     | El Twasa       | 52%         | 48%         | 88%           | 12%         |
|                     | Komombo        | 33%         | 67%         | 95%           | 5%          |
|                     | El Selcela     | 55%         | 45%         | 88%           | 12%         |
|                     | Edfo East      | 83%         | 17%         | 96%           | 4%          |
|                     | Edfo West      | 57%         | 43%         | 99%           | 1%          |
|                     | <b>TOTAL</b>   | <b>60%</b>  | <b>40%</b>  | <b>93%</b>    | <b>7%</b>   |
| <b>All</b>          | <b>TOTAL</b>   | <b>65%</b>  | <b>35%</b>  | <b>89%</b>    | <b>11%</b>  |
|                     | Wady El Nokra  | 50%         | 50%         | 86%           | 14%         |
|                     | Wady El Saaida | 31%         | 69%         | 95%           | 5%          |

Figure 3 Farmer satisfaction, summer 2006



*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. Overall, in summer, 18 percent reported complete correspondence, 47 percent reported partial correspondence, and 35 percent reported no correspondence. In winter the figures were 35 percent, 50 percent, and 15 percent, respectively. Current values, together with values for previous years are shown in Table 9.

**Table 9 Percent farmers reporting IWMD compliance with rotational schedule**

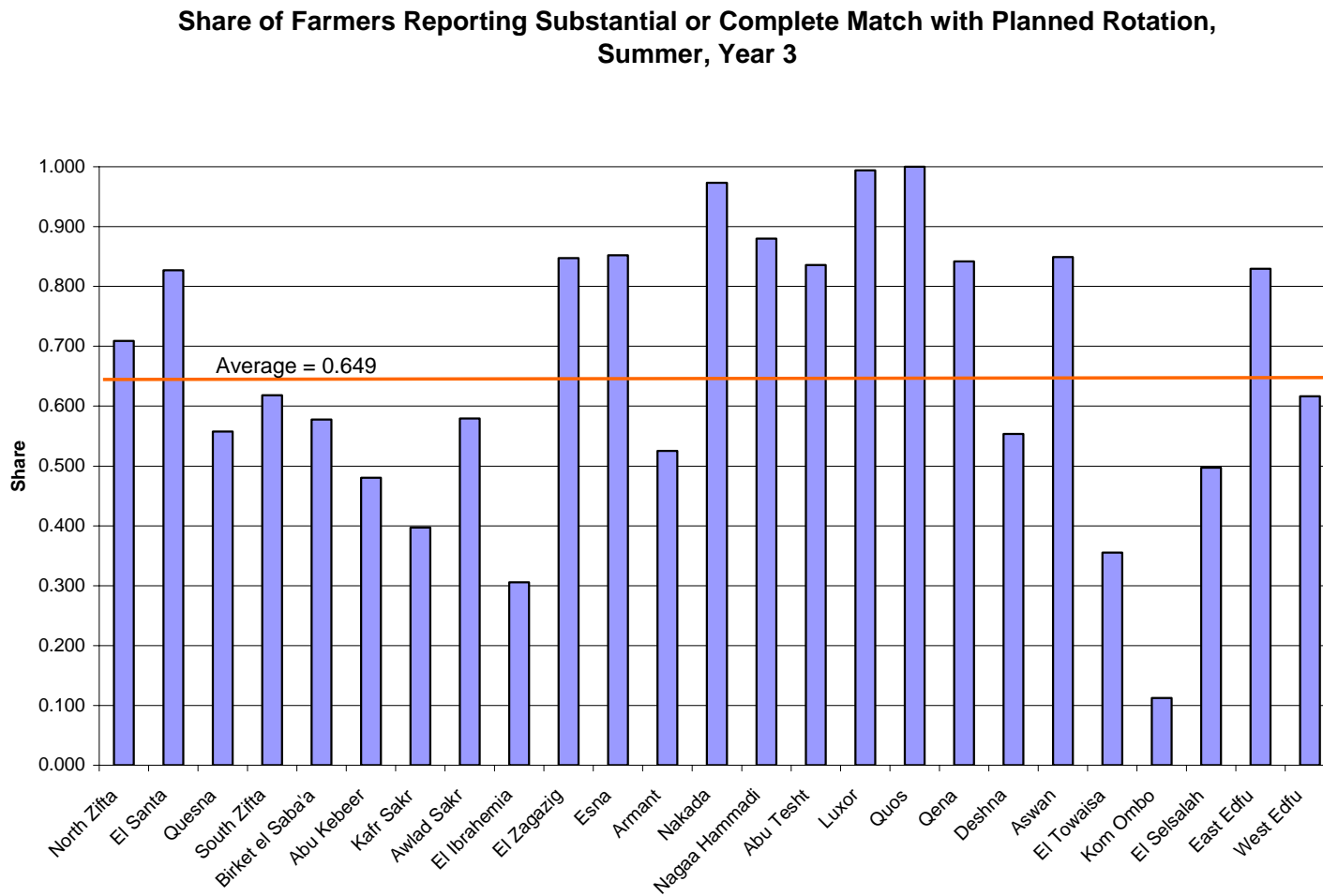
|                        | Summer |         |          | Winter |         |          |
|------------------------|--------|---------|----------|--------|---------|----------|
|                        | None   | Partial | Complete | None   | Partial | Complete |
| <b>Baseline (2004)</b> | 27%    | 51%     | 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%      |

The table shows that IWMD performance in delivering water according to summer rotational schedules became poorer in Year 3, after improving somewhat in Year 2 from Baseline conditions. Percent of farmers reporting *no correspondence* between the planned and actual rotational schedules increased to 35 percent, from 22 percent in Year 2. This suggests that Districts are doing no better at providing water according to a planned schedule than they were prior to the project and may be doing worse.

Performance of individual Districts for Summer are shown in Figure 4. In only 10 of the 25 Districts did at least three-quarters of the farmers report that the actual water delivery pattern “substantially or completely” matched the plan. This suggests a lack of discipline on the part of many Districts in supplying water according to a promised schedule.

This failure may represent a critical breakdown in the process of providing good irrigation service. A correlation analysis of farmer responses to questions relating to “satisfaction” and “adherence to rotational plan” shows a correlation coefficient of 0.86 between the two responses. In other words, farmers in Districts in which the IWMD tended 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, about three quarters of farmer satisfaction is explained by the District following the rotation ( $r^2 = 0.74$ ). This suggests that a promising way of improving irrigation service is for Districts to follow their rotational plan in a disciplined way.

Figure 4 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 more water than they need will not suffer yield significant reductions. The net effect of improving equity of water distribution is thus to raise average yields. The assumption here 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 demand for the District. This is the first year in which sufficiently comprehensive and reliable water demand data from the MISD system have been available to allow calculation of this indicator. The results are shown in Table 10.

Because the MISD program includes a fixed “efficiency” factor of 0.7 to account for losses in the distribution system, the output from the MISD software has been adjusted, in this report, to remove this factor and produce demand data that simply reflect the computed crop water requirements. The results in the table then represent the ratio of the water actually delivered to each IWMD, divided by the aggregate computed crop water requirement at the field level.

As seen in Table 10, the average value of the ratio was 1.59 for Summer and 1.71 for Winter. For Summer, the RWS ranged from 3.08 in Naga Hammadi to 0.85 in Quesna. 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 falling within  $\pm 10\%$  of the average RWS of 1.59. In this instance, 7 Districts satisfied this criterion in Summer of Year 3 and 7 (generally different) Districts in the Winter. These values are shown as shaded cells in Table 10.

In fact, however, seepage loss rates in the different Districts are not equivalent, especially comparing Upper and Lower Egypt, and RWS ratios will thus vary somewhat among Districts on this account. The RWS range for summer, however, is very large and it seems unlikely that the measured differences are simply a result of different canal loss rates. This suggests that greater equity could be achieved, yields increased, and water saved, by better water delivery management by the Directorates.

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

| General Directorate | District      | Net GPS Area (feddan) | Total Summer (*1/0.7) | Total Winter (*1/0.7) |
|---------------------|---------------|-----------------------|-----------------------|-----------------------|
| New Zifta           | North Zifta   | 37,623                | 1.27                  | 1.21                  |
|                     | El Santa      | 46,965                | 1.90                  | 1.87                  |
|                     | Quesna        | 46,955                | 0.85                  | 1.42                  |
|                     | South Zifta   | 28,759                | 1.29                  | 2.60                  |
|                     | Berket El Sab | 38,903                | 0.96                  | 1.10                  |
|                     | <b>TOTAL</b>  | <b>199,205</b>        | <b>1.27</b>           | <b>1.59</b>           |
| West Sharkia        | Abo Kebeer    | 47,894                | 1.00                  | 1.08                  |
|                     | Kafr Sakr     | 44,643                | 1.79                  | 1.05                  |
|                     | Awlad Sakr    | 62,461                | 1.28                  | 1.69                  |
|                     | Ibrahimia     | 50,711                | 1.70                  | 1.16                  |
|                     | Zagazig       | 49,118                | 1.58                  | 1.25                  |
|                     | <b>TOTAL</b>  | <b>254,827</b>        | <b>1.43</b>           | <b>1.24</b>           |
| West Qena           | Esna          | 58,267                | 1.56                  | 1.93                  |
|                     | Armant        | 36,342                | 1.50                  | 1.52                  |
|                     | Nakada        | 33,276                | 1.36                  | 1.26                  |
|                     | Naga Hammadi  | 49,757                | 3.08                  | 2.17                  |
|                     | Abu Tesht     | 35,051                | 2.48                  | 2.22                  |
|                     | <b>TOTAL</b>  | <b>212,693</b>        | <b>1.92</b>           | <b>1.85</b>           |
| East Qena           | Luxor         | 36,978                | 1.35                  | 1.79                  |
|                     | Kose          | 31,805                | 1.93                  | 1.54                  |
|                     | Qena          | 46,847                | 1.33                  | 1.83                  |
|                     | Deshna        | 44,360                | 1.28                  | 1.56                  |
|                     | <b>TOTAL</b>  | <b>159,990</b>        | <b>1.45</b>           | <b>1.69</b>           |
| Aswan               | Aswan         | 14,625                | 1.44                  | 2.01                  |
|                     | El Twasa      | 33,511                | 1.94                  | 2.57                  |
|                     | Komombo       | 34,978                | 2.64                  | 1.93                  |
|                     | El Selcela    | 32,189                | 1.72                  | 1.78                  |
|                     | Edfo East     | 31,288                | 1.47                  | 2.89                  |
|                     | Edfo West     | 30,408                | 2.33                  | 2.22                  |
|                     | <b>TOTAL</b>  | <b>176,999</b>        | <b>1.93</b>           | <b>2.22</b>           |
| <b>All</b>          | <b>TOTAL</b>  | <b>1,003,714</b>      | <b>1.59</b>           | <b>1.71</b>           |

Note: Shaded cells show Districts falling within  $\pm 10\%$  of the average RWS.

To better assess District and Directorate performance in terms of equity of water distribution, several changes in management practices are suggested.

- First, the automatic standard efficiency factor of 0.7 should be removed from the MISD program and made a parameter which could be adjusted separately for each District. Each District would propose a District-wide efficiency value for itself annually to its Directorate and be required to justify the value proposed. Once a District’s value was approved, both the District and the Directorate would use that value in computing water demand for the year. Following completion of rehabilitation or modernization works, a District would reassess its efficiency factor and propose an adjusted value to the Directorate for the following year.
- Second, the concept of District water allocation targets should be formally introduced in the water allocation process. Targets would be based on the computed MISD demand and the agreed efficiency factor, as described above, together with consideration of the non-irrigation uses of water within the District and additional water resulting from drainage reuse and groundwater pumping within the District. The targets would thus reflect the computed amount of Nile water to be delivered to the District during each 15-day period. They would be similar to the targets used informally in the water allocation process developed under the project M&E activity, but procedures would be regularized and the use of targets in routine operations would become a formal part of the Ministry’s water allocation process.

*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 is shown in Tables 11 and 12 for the summer and winter seasons, respectively.

**Table 11 Farmer Satisfaction with Irrigation Service, Summer 2006**

|                    | Overall | Easy/Head BCs | Moderate/Middle BCs | Difficult/Tail BCs |
|--------------------|---------|---------------|---------------------|--------------------|
| <b>Satisfied</b>   | 65%     | 75%           | 65%                 | 55%                |
| <b>Unsatisfied</b> | 35%     | 25%           | 35%                 | 45%                |

**Table 12 Farmer Satisfaction with Irrigation Service, Winter 2006–7**

|                    | Overall | Easy/Head BCs | Moderate/Middle BCs | Difficult/Tail BCs |
|--------------------|---------|---------------|---------------------|--------------------|
| <b>Satisfied</b>   | 89%     | 92%           | 88%                 | 88%                |
| <b>Unsatisfied</b> | 11%     | 8%            | 12%                 | 12%                |

The higher satisfaction of farmers in the Easy/Head BCs is clearly evident, particularly in Summer.

The indicator of equity used in the M&E activity is 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 are equally satisfied in the head and tail of the main canal. For the project, these ratios are 1.36 for the summer season and 1.05 for the winter season. Table 13 shows the values of these indicators for the Baseline Year and Years 2 and 3.

**Table 13 Ratio of satisfied farmers in head and tail reaches of District Main Canals**

| Summer |      |      | Winter |        |        |
|--------|------|------|--------|--------|--------|
| 2004   | 2005 | 2006 | 2004-5 | 2005-6 | 2006-7 |
| 1.25   | 1.37 | 1.36 | 1.04   | 1.22   | 1.05   |

As seen, for Year 3 the summer value held roughly constant, compared with Year 2 but remained above the 2004 baseline year value. For winter, the Year 3 ratio declined to roughly the baseline level. This suggests that in the important summer season, the among-BC equity index failed to improve over the previous year and continues to indicate less equitable water distribution than at the outset of the project.

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 5 and 6. Note that in summer, 5 of 25

**IWMDs with RWS Equity Index greater than 2.00 in Summer 2006**

- Abou Kabeer
- Awlad Sakr
- Ibrahimia
- Abu Tesht
- El Towaisa

Districts have equity values greater than 2.0, indicating that more than twice as many farmers along head end BCs are satisfied with service compared with those in the tail end BCs. Distribution in these Districts is regarded as highly inequitable. This represents an improvement from Year 2, when 7 Districts had equity index values higher than 2 and suggests that the very high values in these 5 Districts are an important cause of the increased average value of the index.

**IWMDs with RWS Equity Index of 1.00 ±10% in Summer 2006**

- El Santa
- South Zifta
- El Zagazig
- Nakada
- Luxor
- Quos
- Qena
- East Edfo

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 6, index values are generally much closer to the average and all of the Districts have an index values less than 2.

Figure 5 Equity Index of Irrigation Service among Branch Canals, Summer 2006

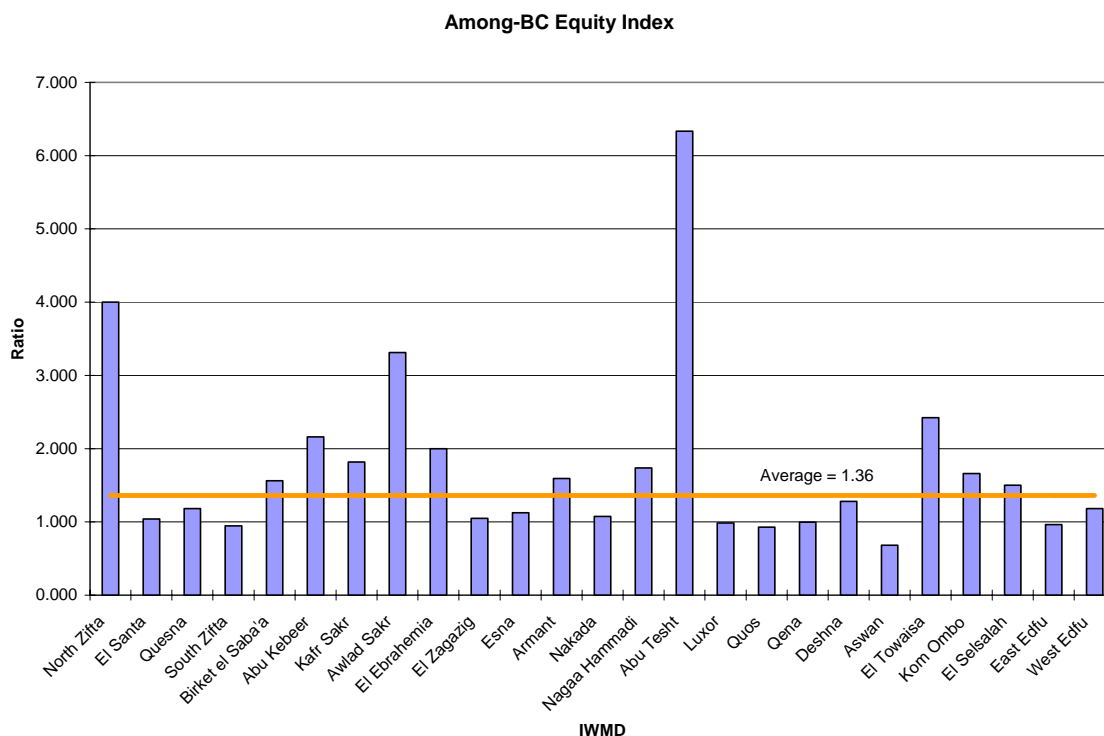
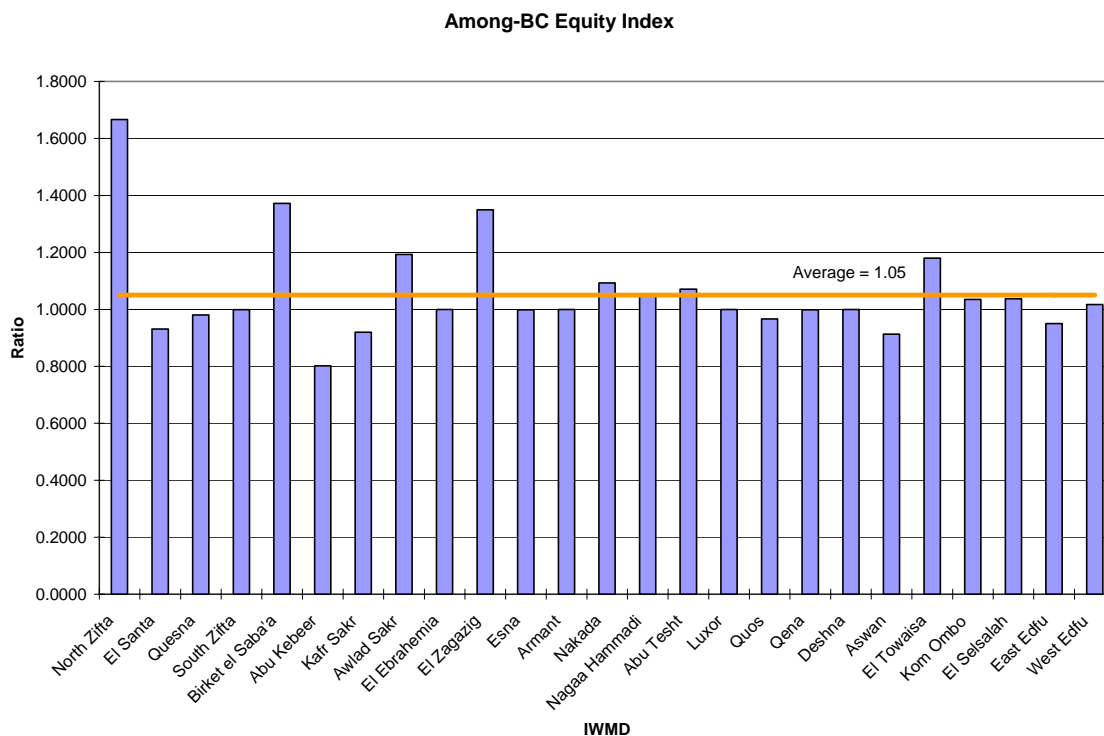


Figure 6 Equity Index of Irrigation Service among Branch Canals, Winter 2006-7



*Equity along Branch Canals*

Tables 14 and 15 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 similar. As seen in Table 14, summer satisfaction declines from head to tail but differences are not drastic. In winter, satisfaction differs very little in heads and tails of the BCs.

**Table 14 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>Satisfied</b>   | 65%            | 71%             | 64%               | 61%             |
| <b>Unsatisfied</b> | 35%            | 29%             | 36%               | 39%             |

**Table 15 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>Satisfied</b>   | 89%            | 91%             | 89%               | 88%             |
| <b>Unsatisfied</b> | 11%            | 9%              | 11%               | 12%             |

By taking a simple 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 16, these ratios have changed little between Years 2 and 3 of the project in both summer and winter seasons. It is also seen that Years 2 and 3 values are both substantially improved (lower values) from the respective baseline year (2004-5) values. A possible explanation for this is that the Branch Canal Water User Associations (BCWUAs) formed under the project have been effective in improving water distribution along the BCs. By this interpretation, the formation of the BCWUAs caused the initial improvement in the index from the baseline values, and their continuing activity has held the BC equity indicator at this new lower level for a second year.

**Table 16 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>2004-5</b> | <b>2005-6</b> | <b>2006-7</b> |
| 1.31          | 1.16        | 1.17        | 1.09          | 1.04          | 1.03          |

**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 M&E report, it has proven very difficult to obtain sufficiently accurate and comprehensive data to allow computation of these indicators. These difficulties have persisted and we have now concluded that further attempts to compute and utilize indicators related to changes in agricultural output and value of agricultural output are unlikely to be successful. They are therefore being dropped from the M&E scheme.

## **Summary and Conclusions**

### **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. The only original tasks remaining is to complete the water resource management plan in each District.

#### **IWMD Establishment**

IWMDs have been 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.

#### **Data-based Management**

During Year 3, rating curves for the eighty-four inflow and outflow structures in the 27 Districts were refined and 55 drains removing water from Districts were rated. Rating curves have been incorporated into the database Districts use to record water levels so that the software will report discharge in addition to water levels in canals. Districts completed inventories of water resources and water facilities within their boundaries and have begun to develop integrated water resource management plans, which are scheduled for completion in Year 4.

#### **BCWUA Participation**

All of the process targets for the BCWUAs have been completed. Results from the client satisfaction survey show that 43% of farmers are aware of the existence of a BCWUA on their BCs, with greater awareness in difficult/tail BCs compared with easy/head BCs. Of those farmers who say they are aware of the BCWUA, almost all can correctly name one of the officers, an indication that their responses are valid. 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**

Although Districts' authority and capacity to manage has been upgraded under the project, that authority and capacity has yet to be reflected in improved management outcomes. This remains the final challenge.

#### **Quality of Service**

Complaints increased by 13% from Year 2 to Year 3, with the increase driven by more summer irrigation complaints. The rate of complaints in Lower Egypt was nearly twice that in Upper Egypt on a per feddan basis. However, the number of formal complaints registered

by IWMDs per feddan does not correlate at all with farmer satisfaction, as measured by the client satisfaction survey of nearly 5,000 farmers. This calls into question the usefulness of counting complaints as an indicator of IWMD performance.

Values of delivery targets for all Districts were further refined, falling to new, presumably more realistic, values as familiarity and experience with them is gained. The seasonal ratios of actual deliveries to delivery target values for both summer and winter increased, indicating a movement away from optimal. There are large differences among the Districts in their actual/target ratios, which range from 0.55 to 1.81 for summer. Breaking the seasons down into 15-day periods, actuals matched targets ( $\pm 10$  percent) 24% of the time in the summer and 17% of the time in the winter season. These values do not represent sharp changes from either Year 2 or baseline values.

Overall farmer satisfaction with irrigation service in summer fell 13 percentage points from Year 2 to Year 3, while winter season satisfaction dropped 3 percentage points. One primary reason for this appears to be the lax implementation of rotational water distribution by the IWMDs. Thirty-five percent of farmers surveyed reported “no correspondence” of actual timing of deliveries with the official rotation pattern, up from 22 percent in Year 2. Correlation analysis shows that this perceived failure to follow a rotational pattern accounts for 74 percent of farmers’ dissatisfaction with irrigation service.

### **Equity of Distribution**

The Relative Water Supply ratio was computed for the first time this year. The ratio of actual deliveries to crop water demand showed an average value of 1.59 for summer and 1.71 for winter. The summer range was very large (0.85 to 3.08) reinforcing the conclusion from considering the actual/target ratios, that there is ample room for water saving in high-end Districts with redistribution to low-end Districts.

The “Among-BC” equity ratio measures the effectiveness of the IWMD in distributing water among BCs within its boundaries. For summer, the value of this indicator was about the same in Year 3 as it was in Year 2, but both values are somewhat higher than the baseline level. This indicates that equity in the baseline year was better than in subsequent years. The winter “Among-BC” equity ratio improved (became smaller) in Year 3 and is now approximately equal to its level during the baseline year.

The “Within-BC” equity ratio measures distribution of water along BCs. It measures the effectiveness of BC management in sharing available water along the length of the BC. This value was nearly the same in Year 3 as it was in Year 2 for both seasons. Its value in both years 2 and 3 was lower (better) than in the baseline year, showing significant improvement post-project. This suggests that the formation of the BCWUAs and improved communication between users and the IWMDs may be improving water management equity along BCs.

## Conclusions

- The project has successfully increased the authority and capacity of Districts to manage. The major remaining task is to employ this new authority and capacity to improve the quality of irrigation service to farmers. Output performance indicators thus far show little or no impact on quality of service. To be fair most of the IWMDs were formed less than three years ago and many of the BCWUAs were established only one year ago. To expect real impacts in such a short time may be over optimistic. This emphasizes the importance of continuing a comprehensive M&E program.
- The project has greatly expanded the amount and quality of volumetric water information available to irrigation managers. Tools and concepts to employ this information in an improved management system are now available and widely-understood. The task which remains is to integrate the concepts of estimated demand, delivery targets, and actual deliveries into a coherent volume-based water management system.
- The Ministry's primary intended tool for managing water among branch canals within a District is a system of rotating water supply among BCs. About one-third of the farmers interviewed in the client satisfaction survey indicate that the rotation is seldom applied on their BCs. This failure is strongly linked to farmer dissatisfaction with the quality of irrigation service. More rigorous application of the nominal rotation, particularly in summer, should receive attention as a possible way of quickly improving the quality of irrigation service.
- The basic elements of a Performance Benchmarking system are now available in all project Districts and Directorates. The task which remains is applying these PB tools in a regular way and integrating them into a performance-based management system for Districts.
- As greater use is made of quantitative information on irrigation performance, it will be necessary to implement a quality control system for the data used. Such a system must insure that the data used are objective and accurate and must be, itself, transparent and open.
- Future rounds of the client satisfaction survey should utilize professional field supervision, as recommended by the survey contractor.
- GPS and digital mapping tools have been provided to Districts and are being used effectively by them. The Ministry should refrain from stifling their application by cloaking the resulting data in unnecessary secrecy.
- Available agricultural data are not sufficiently accurate, precise, or accessible to permit estimating the agricultural impacts of the project at this time.