

Knowledge, Attitudes, and Practices of
District Irrigation Engineers in Egypt:
Impact Survey

Final Report

Submitted to:
USAID/EGYPT
GOE/MPWWR

Submitted by:
GreenCOM/Water Communication Unit
Ministry of Public Works and Water Resources, Egypt

with research technical assistance from:
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October 1999

GreenCOM
Environmental Education and Communication Project
US Agency for International Development
Contract Number PCE-5839-Q-00-3069-00

This publication was prepared for USAID/Egypt by the Environmental Education and Communication (GreenCOM Egypt III) Project and the Water Communication Unit (WCU) of Egypt's Ministry of Public Works and Water Resources (MPWWR), with research technical assistance from Louise F. Kemprecos, Applied Communication Research Specialist with the GreenCOM Project. The findings, conclusions, and recommendations expressed in this document are those of the contractor and the WCU research team and do not necessarily reflect the official viewpoint of the US Agency for International Development.

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GreenCOM is jointly funded and managed by the Center for Environment, Center for Human Capacity Development, and the Office for Women in Development of the Bureau for Global Programs, Field Support, and Research of the US Agency for International Development (USAID), and by the USAID Regional Bureaus and Missions at collaborating sites. Technical services are provided by the Academy for Education Development [Contract No. PCE-5839-Q-00-3069-00] and its subcontractor, Chemonics International, Inc.

Acknowledgments

The Water Communication Unit research team and the GreenCOM Project would like to thank the Minister of Public Works and Water Resources, His Excellency, Dr. Mahmoud Abou Zeid, for his enthusiastic support of GreenCOM activities. Eng. Hussein El Altfi was instrumental in facilitating the baseline research through the Minister's Office. The research would not have been possible without the assistance of the Undersecretaries of the eighteen governorates covered in this study, who arranged that their district engineers be available to our interviewers. Dr. Hesham Ali, Director of the WCU, provided strong support and facilitation for the fieldwork.

We especially appreciate the work of Dr. Ahmed Ali, who conducted all of the district engineer training. There is no doubt that much of the credit for the impact of the training program is due to his skill in training. Eng. Yehya Abdel Aziz, Head of the Irrigation Division, and three senior colleagues from the Ministry made a substantial contribution to the training whose impact is measured here by presenting information during the training sessions: Eng. Ali Batt, Head of the Irrigation Sector, Eng. Hussein Elwan, Undersecretary of Water Distribution, and Eng. Salah El Shazly, General Director of the Minister's Office (Complaints Department).

The research team especially appreciates the effort made by the district engineers to respond to the broad range of questions posed in the questionnaire, and we hope that this report will provide useful information to respond to their needs.

The research is designed based on communication theories developed under the worldwide GreenCOM Project. Ms. Cheryl Groff, Chief of Party of the GreenCOM Egypt III Project, played a vital role setting the district engineers' research in the context of the whole project. Prof. Dan Hilleman, training specialist on the project, provided us with valuable insights into the impact of the training program.

Finally, I would like to recognise the eight members of the research team themselves, for their input in questionnaire modification, enthusiasm during fieldwork, and dedication during the hard work of coding.

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Baseline Indicators¹

	<i>Baseline value</i>	<i>Impact value</i>	<i>Target value</i>
<u>Knowledge</u>			
1. Able to explain rice policy easily	70%	86%	90%
2. Knows sugar cane policy	61%	86%	90%
3. Able to explain sugar cane policy easily	40%	71%	90%
4. Able to explain policy on reusing drainage water easily	68%	75%	90%
5. Know policy on farmer participation	60%	91%	90%
6. Know three main ways in which future water needs will be provided	18%	32%	80%
7. Know that Egypt might face water scarcity	66%	88%	90%
8. Know that pollution affects water quantity	53%	75%	90%
9. Know that Egypt has a fixed water supply	45%	64%	90%
10. Know that ten countries share the Nile	35%	90%	90%
11. Ever heard of a Water Users Association (WUA)	53%	100%	90%
12. Able to cite three reasons why a farmer would want to join a WUA	15%	27%	80%
Able to cite two or more reasons why a farmer would join a WUA	51%	76%	
13. Able to cite three ways a farmer can save water	33%	71%	90%
<u>Attitudes</u>			
1. Think farmer participation is a good idea	69%	84%	85%
2. Able to cite three advantages of farmer participation	20%	28%	65%
Able to cite two or more advantages of farmer participation	51%	67%	
<u>Communication</u>			
1. Heard of the Water Communication Unit (WCU)	75%	100%	100%
2. Received last issue of WCU Newsletter	28%	35%	100%
3. Read last issue of Newsletter	21%	33%	80%
4. Feels that there is a relationship between him and Ministry	36%	53%	64%
<u>Practice</u>			
1. Ever been trained to organize meetings	16%	99%	90%
2. Ever been trained to make presentations	13%	94%	90%
3. Currently doing two things to help farmers save water	12%	9%	50%
Ever held a meeting for farmers	33%	91%	
Number of meetings held for farmers	1.4	4.1	
Holding awareness meetings as a means of helping farmer save water	18%	38%	
Number of respondents	152	88	

¹ Impact values in **bold** indicate that the impact was statistically significant. Impact values not in bold indicate that there was no statistically significant impact. Lists of “reasons” and “ways” in indicators above are included as Appendix A. Indicators that are not numbered were not originally specified as baseline indicators.

Introduction

Training of district engineers was one of the focal activities of GreenCOM III. The training program was divided into three phases: a one-week training session, a reinforcement period, and a second one-week training session. The training program began in July 1998 and was completed in October 1999.

The main areas covered in the curriculum were communication skills, problem solving, conflict resolution, group dynamics, brainstorming, creative thinking, planning, meeting management, Ministry policies, water distribution, and the ideal role of the district engineer, (a summary of the training curriculum is included as Appendix B).

A total of 180 engineers were trained in the training program.

Methodology

Sample design

For the purposes of this survey, eligible respondents were defined as:

- all district engineers who had attended both training sessions under GreenCOM III and
- who were actually working as district engineers at the time of the survey.

This definition yielded a population of 128 engineers. Of the 180 engineers who were trained, 25 had not attended the second session of training before the fieldwork for this survey, and 27 of those fully trained had been transferred to other positions, including one or two who left the Ministry.

The geographic distribution of the respondents is given in Table 1.

The distribution of respondents by governorate does not differ significantly between the two surveys.

Table 1. Distribution of the sample by governorate and survey

Governorate	Baseline		Impact	
	n	%	n	%
Dumiat	5	3%	3	3%
Daqahlia	18	13%	5	6%
Ismailia	6	4%	0	0%
Sharqia	9	6%	4	5%
Alexandria	5	3%	2	2%
Beheira	14	9%	7	8%
Kafr ElSheikh	11	7%	7	8%
Gharbia	8	5%	10	11%
Menoufia	7	5%	6	7%
Qalyoubia	8	5%	5	6%
Giza	9	6%	8	9%
Fayoum	7	5%	3	3%
Beni Suef	8	5%	4	5%
Minya	11	7%	9	10%
Assiut	9	6%	4	5%
Sohag	8	5%	6	7%
Qena	4	3%	2	2%
Aswan	5	3%	3	3%
Total	152	100%	88	100%

Of the total 88 completed interviews, 49 were completed in Delta governorates, and 39 in Upper Egyptian governorates. This ratio, 56% Delta and 44% Upper Egypt, does not differ

significantly² from the regional distribution of respondents in the baseline survey (60% Delta and 40% Upper Egypt).

Because most of the interviews were completed on field trips outside Cairo, and due to the imminent end of the project, it was not possible to return to interview engineers who were not available on the scheduled date. The overall response rate, as shown in Table 2, was 70%. While this is not as high as the research team would have liked, it did appear that district engineers were generally busier than two years ago, and therefore harder to interview.

Table 2. Response rate for baseline and impact surveys

<i>Response rate</i>	Baseline		Impact	
	n	%	n	%
Completed interviews	152	84%	88	70%
Not available	29	16%	38	30%
Attempted interviews	181	100%	126	100%

Questionnaire Design

The questionnaire was essentially the same as the baseline questionnaire, with the addition of a few questions designed to assess the impact of the training program on engineers' roles in meetings with farmers and agricultural cooperatives.

The questionnaire is comprised of 139 questions covering background characteristics, exposure to communication messages, knowledge of the water situation in Egypt, relations with *bahara* and with farmers, relations with the Ministry, work skills, and general attitudes. All topics are directly related to improving district engineers' partnership with water users. The questionnaire took around 45 minutes to administer. The questionnaire is included as Appendix C.

Fieldwork, coding, and data entry

Fieldwork was conducted by eight interviewers, staff of the Water Communication Unit, between September 9 and October 3, 1999. Open-ended questions were coded using the same codes designed for the baseline questionnaire. Coding was greatly facilitated by the availability of the Arabic codebook from the baseline survey.

The data were entered using EpiInfo version 6, a program that was designed to prevent errors on entry by duplicating ranges and skips printed on the questionnaire. Data entry was greatly facilitated by the availability of the baseline data entry program.

Data analysis and report format

The data were analysed on SPSS version 8. Data analysis was greatly facilitated by the availability of SPSS syntax files which created the new variables required for data tabulation.

² Any difference described as "significant" indicates that the difference is statistically significant at $p \leq 0.05$.

This report is designed to evaluate the district engineer training carried out under the field partnership component in the areas of knowledge, attitudes, communication, and practice. All results compare baseline to impact data, and significant indicators of impact are highlighted in bullet form throughout the text.

The findings of the report are summarized in the impact values of the project indicators at the front of the report. Several indicators have been added to the list that was originally drawn up. Conclusions about the impact of the training on the baseline indicators and recommendations for the future are discussed in the final section of this report.

Results

Background characteristics of respondents

Table 3 compares the background characteristics of the respondents to both surveys. Respondents in the impact survey were significantly older than those in the baseline survey – older by two years on average, and had significantly more experience – one additional year. This makes sense given the fact that the same respondents were now about two years older than at baseline. Baseline and impact respondents do not differ significantly by the size of *handasa* or the number of *bahara* working under them, although Delta *handasas* continue to be significantly larger than those in Upper Egypt.

Table 3. Background characteristics of respondents, baseline and impact surveys

<i>Average age</i>	<i>Baseline</i>	<i>Impact</i>
Delta	36	37
Upper Egypt	33	37
Total	35	37
<i>Average years of experience</i>		
Delta	8	8
Upper Egypt	5	8
Total	7	8
<i>Average number of feddans per handasa</i>		
Delta	50,000	50,000
Upper Egypt	35,500	36,800
Total	44,200	44,000
<i>Average number of bahara per handasa</i>		
Delta	27	32
Upper Egypt	29	26
Total	28	29

The regional discrepancy in the number of *feddans* per *bahari* has diminished in the past two years. In 1997, Delta engineers had 1851 *feddans* per *bahari* compared to 1224 *feddans* in Upper Egypt. Table 3 suggests that the workload for *bahara* in the Delta has been reduced and is better balanced in 1999, with 1563 *feddans* per *bahari* in the Delta compared to 1415 *feddans* in Upper Egypt.

Knowledge

Knowledge of Ministry policies

We asked the engineers about the Ministry's four main policies, which concern rice cultivation, sugar cane cultivation, re-use of agricultural drainage water, and farmer participation in decision making. Information about these policies was provided to engineers on the first day of training by senior staff from the Ministry, and reflected in training activities over the two training sessions. The project sought to achieve greatest impact on engineers' knowledge of the Ministry's policy on encouraging farmer participation in decision making, and sought to reduce regional differentials in engineers' knowledge of Ministry policies.

Table 4 shows that the training had a significant impact on engineers' knowledge of Ministry policies.

- **Engineers' ability to explain the rice policy increased significantly, and regional differences apparent in the baseline were not significant in the impact survey.**

Table 4. Distribution of engineers by knowledge of basic Ministry policies before and after training

	<i>Baseline</i>			<i>Impact</i>		
	Delta	UE	Total	Delta	UE	Total
<i>Policy on rice cultivation</i>						
Able to explain easily	85%	48%	70%	90%	82%	86%
<i>Policy on sugar cane cultivation</i>						
Know policy	59%	62%	61%	84%	90%	86%
Able to explain easily	43%	36%	40%	65%	79%	71%
<i>Policy on farmer participation</i>						
Know policy	63%	56%	60%	96%	85%	91%
Engineers	91	61	152	49	39	88

- **Engineers' knowledge of and ability to explain the sugar cane policy increased significantly and uniformly across regions.**
- **Engineers' knowledge of the policy of encouraging farmer participation increased significantly with a significant reduction of regional differences.**

Knowledge of the water situation in Egypt

The baseline survey revealed a surprisingly low level of knowledge among district engineers of the “big picture” about Egypt’s situation regarding water, given their engineering education and years of experience. Table 5 below documents the project’s significant impact in communicating some of these essential facts to the engineers.

Table 5. Knowledge of the national water situation before and after training

<i>Percent who know that ...</i>	<i>Baseline</i>	<i>Impact</i>
Egypt has a fixed water supply	45%	64%
Ten countries share the waters of the Nile	35%	90%
Egypt might face a water scarcity	66%	88%
Water pollution affects the quantity available	53%	75%
Respondents	152	88

- **Engineers' knowledge that Egypt's water supply is fixed increased significantly.**
- **Engineers' knowledge that ten countries share the Nile increased significantly.**
- **Engineers' knowledge that Egypt might face a water scarcity increased significantly.**
- **Engineers' knowledge that water pollution reduces the amount of clean water available for use increased significantly.**

When asked why Egypt might face a water scarcity, in the baseline survey there was little consensus among engineers: the leading reason was cited by only 22% of engineers – misuse of irrigation water due to lack of awareness. In contrast, 72% of impact respondents cited population growth as the main reason for this possibility.

During the training, engineers received complex information about the nature of Egypt's quota. In addition to the knowledge that Egypt's 55.5 bcm quota is fixed by international treaty, engineers learned that the quota might be changed in 2017, and that if Sudan were to complete the Jonglei Canal project, the amount of water available might increase.

The baseline survey showed that most engineers (90%) felt confident they know how the water needs for new projects will be covered, but there was less specific knowledge of the exact sources of water for new projects (up to three sources were recorded per respondent).

- **A significantly higher proportion of engineers was able to cite three sources of water for the new irrigation projects after the training program.**
- **A significantly higher proportion of engineers was able to cite two or more sources of water after the training program.**

The main difference seems to be in the recognition of the role of decreasing cultivation of high water-consumption crops in freeing up water for new projects.

Table 6. Distribution of engineers by source of water for new projects cited (correct sources) before and after training		
	<i>Baseline</i>	<i>Impact</i>
<u>Number of correct sources cited*</u>		
None	20%	13%
One source	21%	14%
Two sources	41%	42%
Three sources	18%	32%
<u>Source cited**</u>		
Increase water recycling	75%	78%
Water conservation in agriculture	30%	40%
Reduce rice, sugar cane cultivation	14%	35%
New irrigation technologies	32%	31%
New projects, eg. Jonglei Canal	7%	9%
Respondents	152	88
*Up to three were recorded.		
**Percentages do not total 100% because multiple responses were accepted.		

Knowledge of Water User Associations

In the baseline survey, almost half of the district engineers (47%) had never heard of one of the most important Ministry efforts in water conservation - the establishment of Water User Associations (WUAs). By contrast,

- **Every single engineer in the impact survey had heard of WUAs.**

We do not attribute this increase to an expansion in the number of WUAs. The number of WUAs in any phase of development has increased by 27% between the baseline and impact surveys (10,667 compared to 8,403), and the number of fully operational WUAs has increased by only 8% (1,058 compared to 981).

When we asked all engineers if they could think of a reason why a farmer would want to join such an association,

- **Impact respondents were able to cite significantly more reasons why a farmer would want to join a WUA than baseline respondents.**

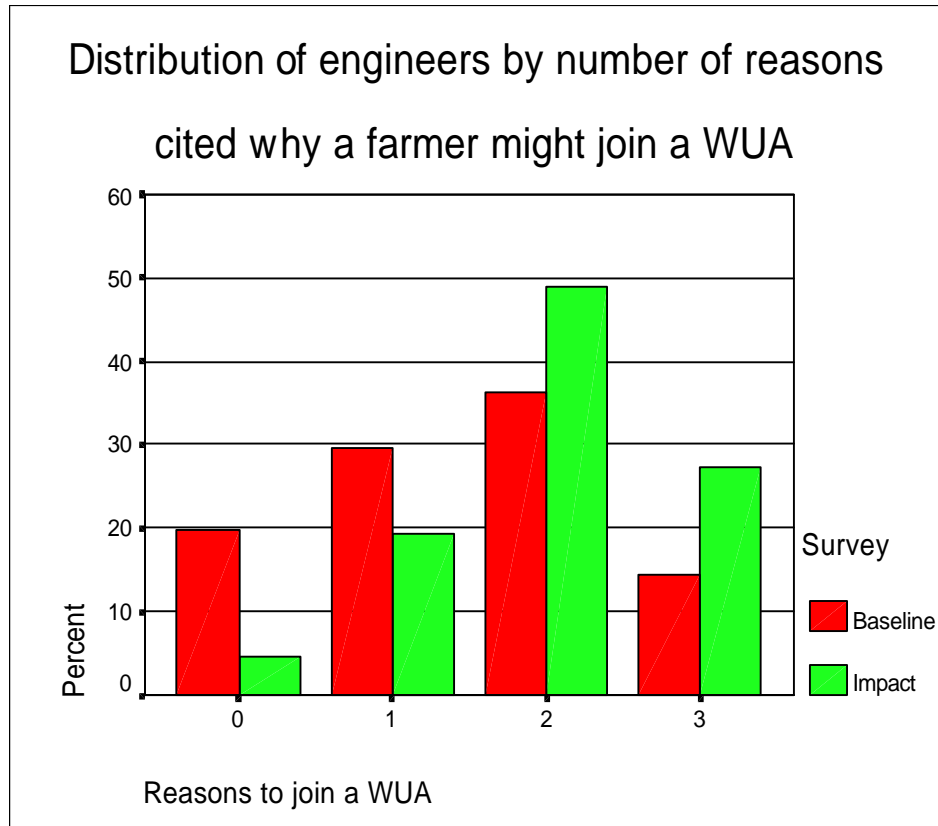
Although the increase in the number of reasons given was small, it was statistically significant, and reflects engineers' growing awareness of WUAs. However, there will certainly need to be ongoing efforts to inform engineers about how WUAs are to be formed and operate as well as their specific role.

Table 7. Distribution of engineers by reasons given for why a farmer might want to join a Water User Association before and after training

	<i>Baseline</i>	<i>Impact</i>
<u>Number of reasons cited*</u>		
None	20%	5%
One reason	30%	19%
Two reason	36%	49%
Three reason	15%	27%
<u>Reason cited**</u>		
To share in irrigation tasks	14%	34%
To provide water	26%	33%
To help solve farmers' problems	24%	26%
To help conserve water	20%	25%
To irrigate on rotation	15%	22%
It's to his advantage	20%	11%
So that his voice will be heard	7%	10%
Build relationship with engineer	5%	7%
Respondents	152	88

*Up to three were recorded.

** Percentages do not total 100% because multiple responses were accepted



Knowledge of water conservation techniques

The training program curriculum included information on how farmers could reduce water consumption.

In the baseline survey, virtually every engineer told us he knew how a farmer could save water.

But as the findings in Table 8 show, nine of ten baseline respondents was unable to name even one specific way of saving water on-farm, and 16% could only cite one way. In comparison,

- **Almost three-quarters of impact respondents could cite three specific**

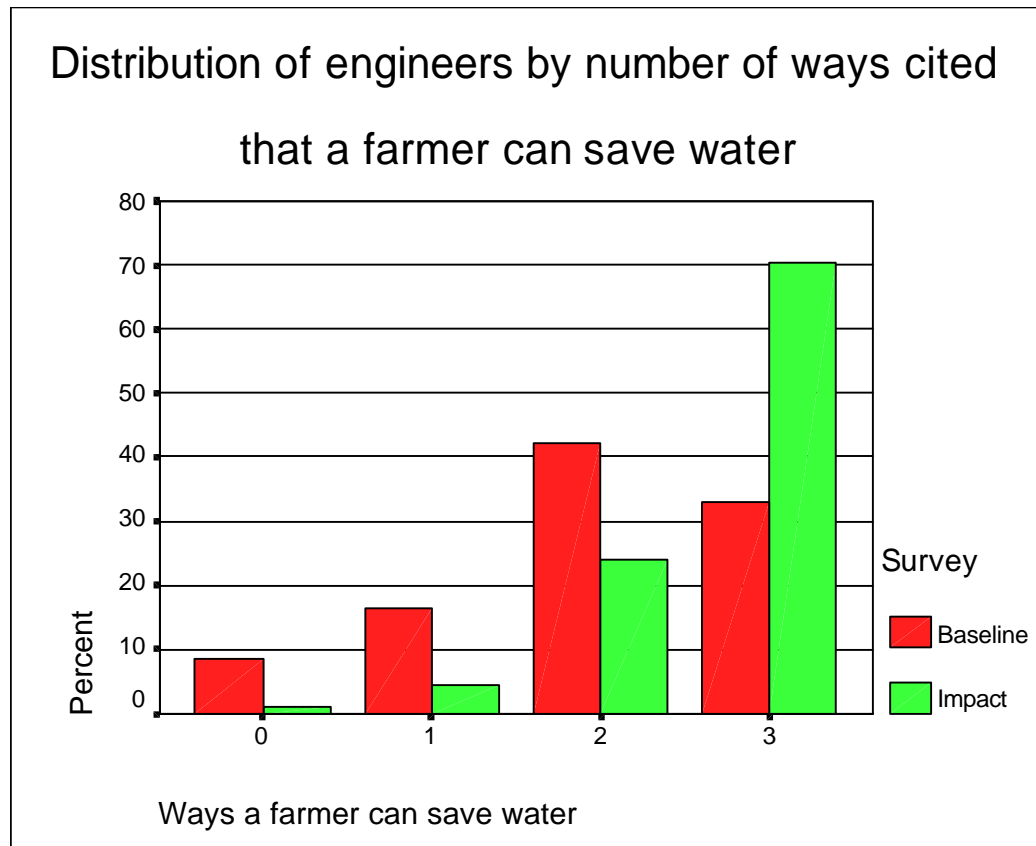
Table 8. Distribution of engineers by number of ways cited to save water before and after training

	<i>Baseline</i>	<i>Impact</i>
<u>Number of ways cited*</u>		
None	9%	1%
One way	16%	5%
Two ways	42%	24%
Three ways	33%	71%
<u>Way to save water cited**</u>		
Night irrigation	14%	58%
Crop selection	28%	47%
Land levelling	15%	47%
Clean <i>mesqa</i>	27%	46%
Not overwater	51%	23%
Stick to rotation schedule	20%	8%
Modern irrigation methods	26%	7%
Respondents	152	88

*Up to three were recorded.

**Percentages do not total 100% because multiple responses were accepted.

ways farmers could reduce water consumption.



Attitudes

GreenCOM III built on work begun under GreenCOM II which identified engineers' attitudes towards farmers as a topic which should be the focus of training under GreenCOM III. There are indications that engineers' attitudes have begun to change, but attitudes are built up over generations and changing them is a long-term process that will need to be continued over the long term as the Ministry begins to encourage increased farmer participation in decision-making.

Attitudes towards farmers

A number of different questions were asked to attempt to gauge changes in engineers' attitudes towards farmers. While many measures did not show significant change, there were improvements in some indicators.

When engineers were asked what they thought the farmers' most important problem was, the leading problem cited by baseline respondents was the availability of water, given by 36% of respondents. All other problems were cited by fewer than 5% of baseline respondents. In contrast, impact respondents cited two leading problems: lack of awareness and availability of water. Lack of awareness was cited by 22% of impact respondents compared to 8% of baseline respondents, and availability of water was cited by 20% of impact respondents. This

suggests that due to their training, engineers have new information in their hands and that they appreciate that farmers are lacking this valuable information.

Promoting the Ministry's policy on farmer participation in decision-making has been a main theme of the field partnership component. Respondents in both surveys were asked whether they thought farmer participation was a good idea. Table 9 shows the changes in engineers' views on the matter.

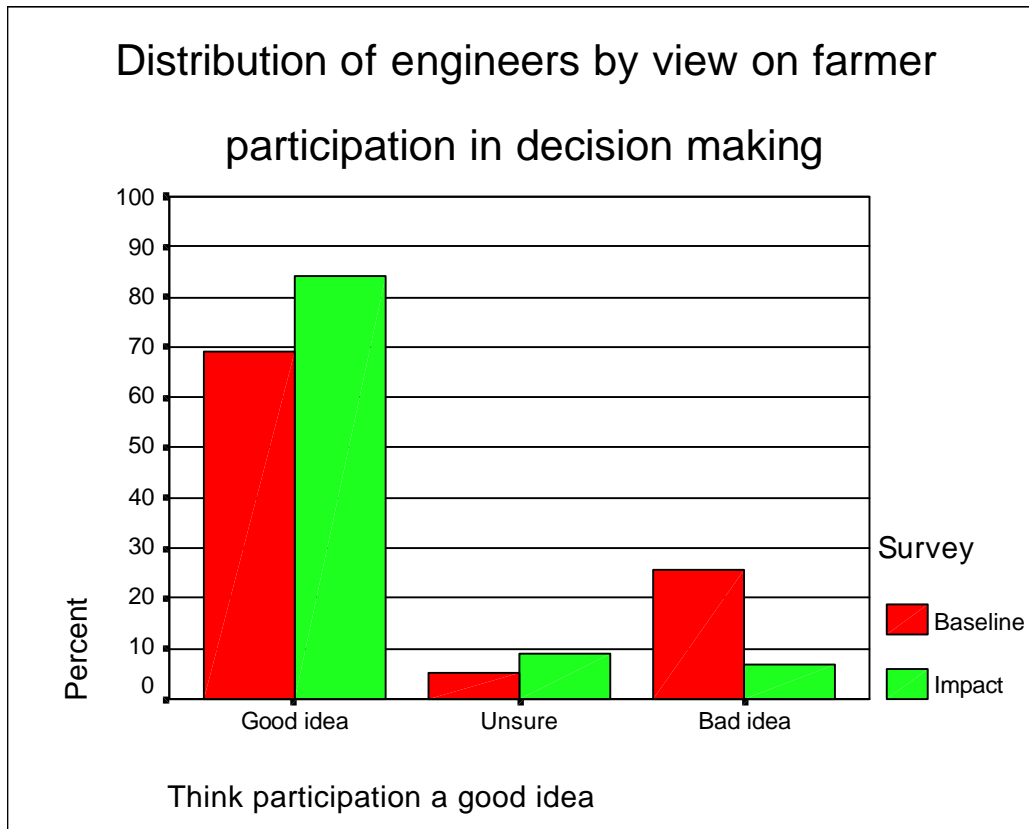
- **A significantly larger proportion of impact respondents thought that farmer participation was a good idea compared to baseline respondents (84% compared to 69%).**

Higher proportions of respondents cited water conservation (55% vs. 38%) and sharing responsibility (47% vs. 38%) as the main advantages of farmer participation in decision-making.

Table 9. Distribution of engineers by view on farmer participation in decision making before and after training

	<i>Baseline</i>	<i>Impact</i>
<u>View on farmer participation</u>		
Good idea	69%	84%
Unsure	5%	9%
Bad idea	26%	7%
<u>Advantage cited*</u>		
Water conservation	38%	55%
Share responsibility	38%	47%
Cooperate to solve problems	23%	23%
Realistic solutions for problems	14%	17%
Link between farmer and engineer	7%	8%
Farmer will appreciate engineer more	13%	3%
Respondents	152	88

* Percentages do not total 100% because multiple responses were accepted



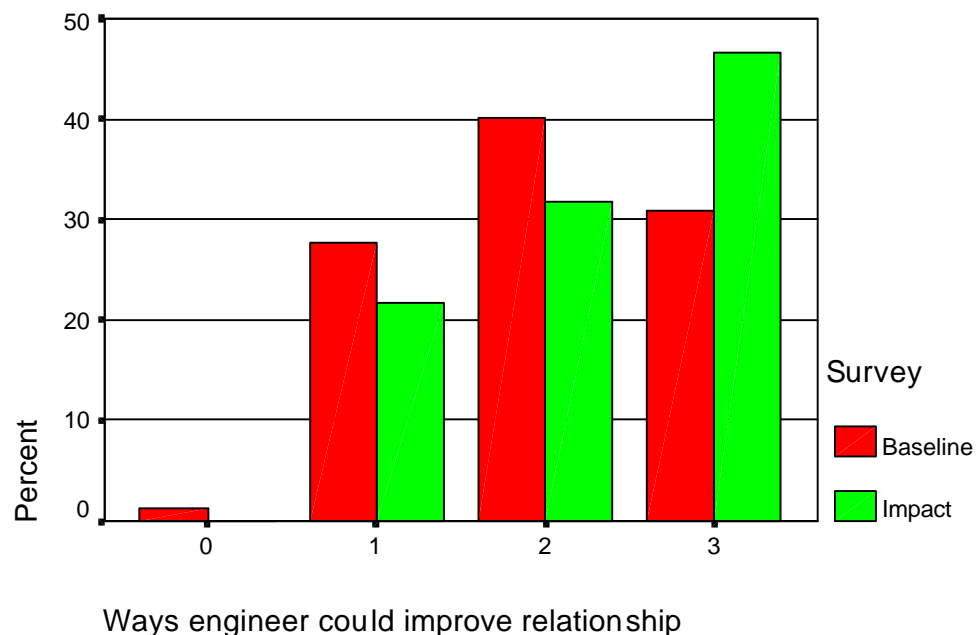
We also asked engineers what they felt they themselves could do to improve their relationships with farmers, and these are tabulated in Table 10. Increased citations of “meet farmer in field” and “at social events” suggest that engineers have an increased appreciation that more contact with farmers could make working together go more smoothly.

Table 10. Distribution of engineers by view on what engineers can do to improve their relationships with farmers before and after training

	<i>Baseline</i>	<i>Impact</i>
<u>Number of ways suggested*</u>		
None	1%	1%
One way	30%	19%
Two ways	37%	41%
Three ways	32%	39%
<u>Way to improve relationship cited**</u>		
Solve his problems	53%	53%
Meet farmer regularly in field	13%	30%
Greet him nicely	36%	27%
Keep my promises	25%	24%
Attend social events with farmers	7%	19%
Keep to the rotation schedule	22%	16%
Check the canals regularly	13%	16%
Establish a friendship	15%	9%
Provide him with information	9%	6%
Respondents	152	88

*Up to three were recorded.
 * Percentages do not total 100% because multiple responses were accepted

Distribution of engineers by number of ways an engineer could improve his relationship with farmers

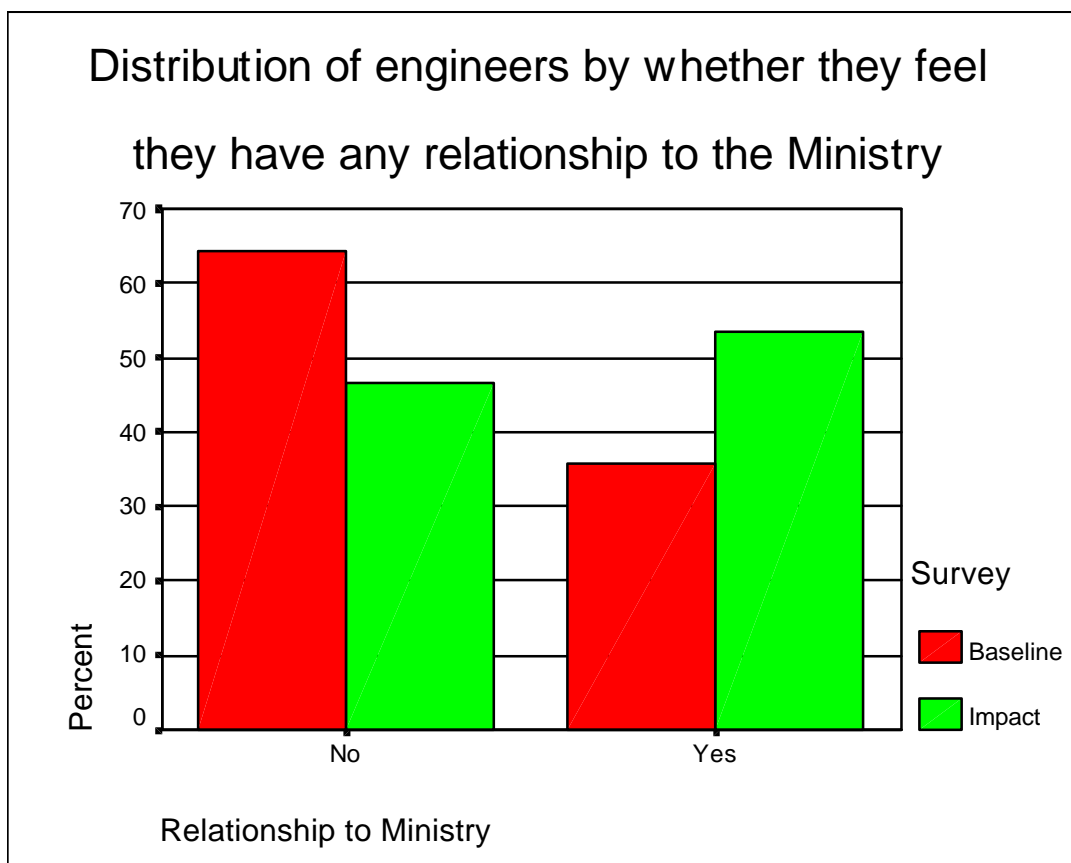


Attitudes towards the Ministry

The baseline survey showed that a discouragingly high proportion of district engineers felt they had “no relationship with the Ministry” in Cairo – almost two out of three engineers. The first week of the training curriculum was therefore designed to include presentations by a number of senior staff from Cairo, such as Engineer Yehya Abdel Aziz, Head of the Irrigation Division, who approached the task of getting to know their field staff with enthusiasm and humor, asking the engineers how many of them knew who he was. Engineer Salah ElShazly, head of the Complaints Department in the Minister’s Office, asked engineers for their phone numbers so that he could get in touch with them, and gave his number out. There is also anecdotal evidence that the participation of WCU staff at every training session has resulted in closer ties between district engineers and the WCU.

The result of this effort was a significant decrease in the proportion of engineers who volunteered that they had no relationship with the Ministry in Cairo.

- **Only 47% of impact respondents said they had no relationship with the Ministry compared to 64% of baseline respondents.**



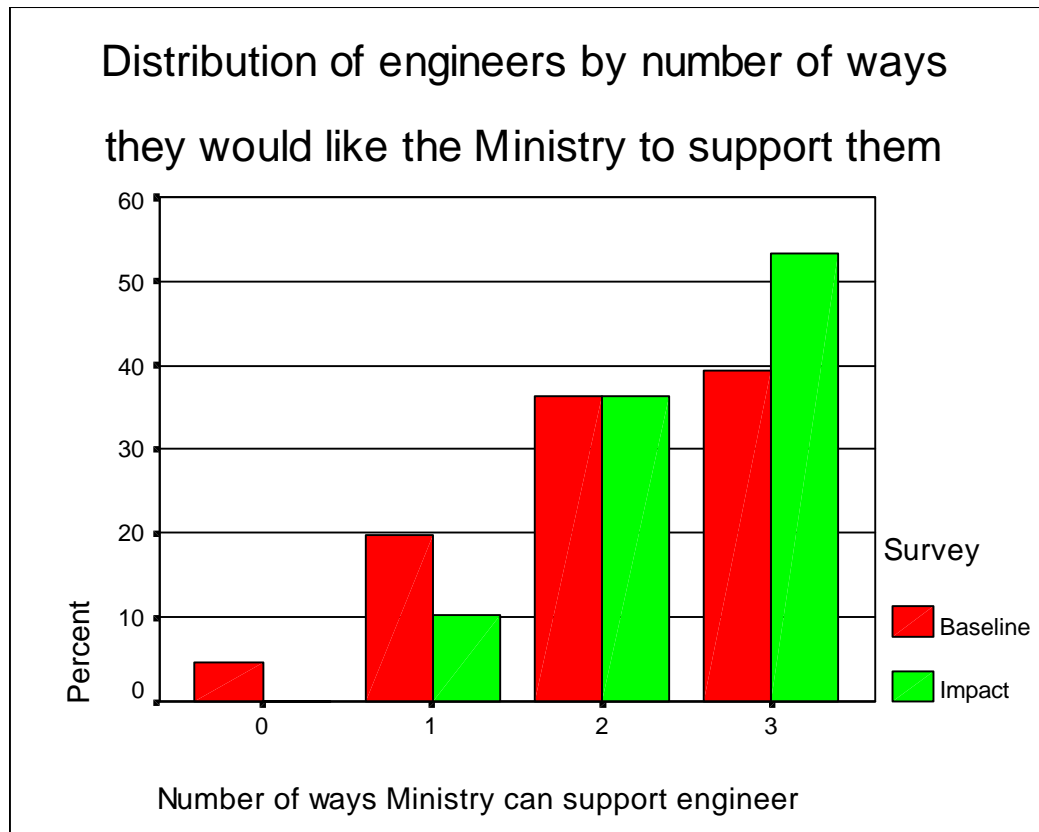
As in the baseline survey, we asked respondents how the Ministry could best support them in their work. Perhaps as a reflection of a generally closer relationship between engineers and the Ministry, the number of things requested by engineers has increased significantly. The leading request continues to be salary increases. There are small but interesting increases in the proportion of engineers requesting that the Ministry expand its communication programs in the media, and that engineers be allowed greater access to senior staff in the Ministry.

Table 11. Distribution of engineers by the types of support they would like from the Ministry before and after training

	<i>Baseline</i>	<i>Impact</i>
<u>Types of support requested*</u>		
None	5%	0%
One type	20%	10%
Two types	36%	36%
Three types	40%	53%
<u>Types of support requested**</u>		
Raise salaries	58%	50%
Provide services to district office	15%	26%
Training for district engineers	25%	24%
Provide equipment	24%	21%
Provide transportation	11%	17%
Provide additional staff for engineers	2%	14%
Raise awareness through media	4%	13%
Regular meetings with senior staff	6%	10%
Respondents	152	88

*Up to three were recorded.

** Percentages do not total 100% because multiple responses were accepted



Communication

Communication with Water Communication Unit

The Water Communication Unit has been in existence since July 1995, and as of November 1997, almost all district engineers (75%) had heard of the unit. By the impact survey,

- **Fully 100% of impact respondents had heard of the WCU.**

The newsletter, which has been distributed since October 1995, had not achieved a high degree of coverage of the district engineers. Although there was a significant increase in readership, it was a small increase.

- Significantly more impact respondents than baseline respondents had received the last issue of the newsletter (35% compared to 28%), and
- Significantly more impact than baseline respondents had read the latest issue (33% compared to 21%).

However, the distribution of the newsletter will need to receive more attention by WCU staff if it is to reach a higher level of coverage. Significant regional differences appear to remain in terms of who receives and reads the newsletter, as shown in Table 12.

Table 12. Distribution of engineers by exposure to WCU newsletter and region before and after the partnership program

	<i>Baseline</i>		<i>Impact</i>	
	Delta	Upper E.	Delta	Upper E.
Received newsletter	38%	15%	23%	49%
Read newsletter	30%	8%	18%	49%
Respondents*	84	61	44	39

*Data were missing on some cases.

We asked again what engineers would like to read about in the newsletter. Responses included new projects (59%), Ministry policies (37%), technical information (27%), and stories focusing on model district engineers (17%).

The WCU took the opportunity to ask engineers again what kind of problems they face in their work. This report represents the Unit’s opportunity to pass on to senior staff in the Ministry the following observations.

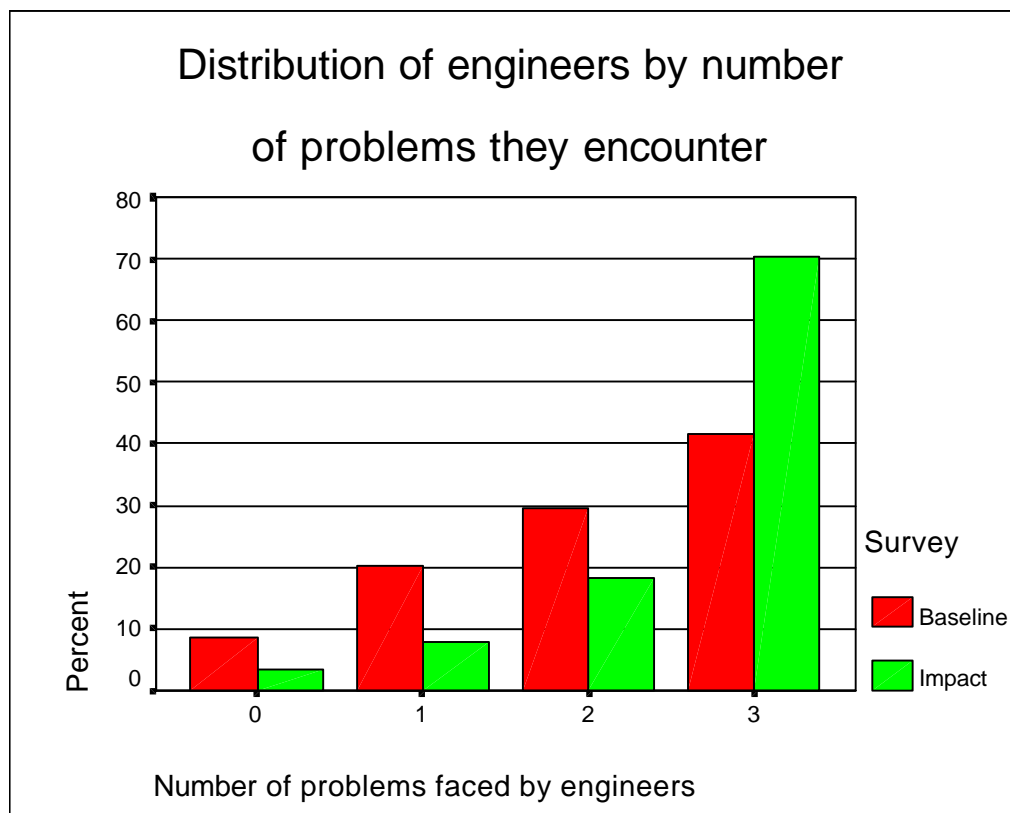
- **Impact respondents reported that they face a significantly higher number of problems than did baseline respondents.**

Table 13. Distribution of engineers by problems they are experiencing in their work before and after training

	<i>Baseline</i>	<i>Impact</i>
<u>Number of problems*</u>		
None	9%	3%
One problem	20%	8%
Two problems	30%	18%
Three problems	41%	71%
<u>Problems experienced**</u>		
Lack of technical capacity	17%	35%
Low salaries	40%	33%
Transportation	14%	33%
Lack of staff	14%	23%
Administrative burden	7%	14%
Corruption	6%	11%
Availability of water	20%	9%
Lack of cooperation with police	13%	7%
Respondents	152	88

*Up to three were recorded.

* Percentages do not total 100% because multiple responses were accepted



There are two interesting patterns in these problems. One is the increased burden being placed on the *handasa*'s technical capacity, transportation, and staffing levels, and a growing administrative load. A higher proportion of impact respondents reported that corruption was a problem compared to the baseline, while a lower proportion identified lack of cooperation with the police as a problem. The decrease in availability of water as a problem for district engineers is the second interesting finding, although we do not have data to suggest whether this is because water is now being better managed or for some other reason.

Finally, we asked impact respondents how the WCU could best support them in their work. These tasks tabulated in Table 14 are all within the mandate of the WCU, but will only be possible with increased staff and specialization of a field support unit.

Table 14. Distribution of engineers by the types of support they would like from the Water Communication Unit before and after training

	<i>Baseline</i>	<i>Impact</i>
<u>Support requested*</u>		
Get all publications to engineer	39%	63%
Increase engineer training	0%	36%
Raise farmer awareness thru media	45%	35%
Meet engineers about their problems	15%	24%
Present Ministry issues to councils	5%	23%
Respondents	152	88
Percentages do not total 100% because multiple responses were accepted		

Communication with the public

The engineers received training in a number of skill areas that were intended to equip them to communicate better with the public, especially at meetings. District engineers attend several kinds of formal meetings – namely with local councils, town councils, and agricultural cooperatives. Before the training, it was not common for engineers to arrange meetings with groups of farmers.

- **The data show a significant increase in the number of farmer meetings arranged by engineers. This is a highly significant accomplishment for the partnership component of the project.**

Table 15. Distribution of engineers by number of farmer meetings attended before and after training

	<i>Baseline</i>	<i>Impact</i>
Ever arranged meetings for farmers	33%	91%
Mean number of farmer meetings arranged	1	4
Respondents	152	88

Practice

Job description

Although there is a formal job description for the work of a district engineer, we were interested to hear the engineers tell us about the different tasks they do. The data show that district engineers are busier now than at the baseline.

In practice, all engineers must undertake all of these tasks. Despite this, the data in Table 16 do reflect an increased awareness of the prominence of these tasks in their daily work. Every difference between baseline and impact is significant.

Table 16. Distribution of engineers by tasks entailed in their work before and after training

	<i>Baseline</i>	<i>Impact</i>
Mean number of tasks*	5	8
<u>Work tasks**</u>		
Distribute water	83%	95%
Handle violations	70%	92%
Clean main canals	64%	92%
Solve farmers' problems	61%	90%
Administrative duties	56%	90%
Maintain water levels	53%	89%
Attend local council meetings	48%	85%
Make field visits	56%	72%
Attend Ministry meetings	11%	33%
Respondents	152	88

*Up to nine were recorded.
* Percentages do not total 100% because multiple responses were accepted

- **Of particular interest in this report are the significant increases in the proportion reporting that their tasks include solving farmers' problems, attending local council**

meetings, and making field visits, since these are all behaviors that have been heavily encouraged under the field partnership component of the project.

Fieldwork practices

Almost all baseline respondents (84%) said they were working even now to help farmers save water, but in the impact this was true of an even greater proportion of respondents (97%).

Table 17 details exactly what engineers are doing to help farmers save water.

- **A significantly higher proportion of impact respondents are holding awareness meetings for farmers as a means of helping farmers to make their on-farm water use more efficient.**

	<i>Baseline</i>	<i>Impact</i>
<u>Number of ways*</u>		
None	16%	3%
One way	27%	32%
Two ways	39%	35%
Three ways	18%	30%
<u>Ways helping to save water**</u>		
Clean main canals	42%	47%
Hold awareness meetings	18%	38%
Provide water on rotation schedule	36%	25%
Regular field visits	16%	14%
Extra water to canal ends	19%	7%
Get water to farmer	11%	8%
Respondents	152	88
*Up to three were recorded.		
* Percentages do not total 100% because multiple responses were accepted		

Distribution of engineers by number of ways currently helping farmers save water

Conclusion and recommendations

Conclusion

The project indicators demonstrate significant project accomplishments. Table 18 shows the baseline indicators sorted by level of impact. All impact values in bold show a statistically significant difference from the baseline. Table 18 shows that the project achieved a significant increase on twenty indicators.

- **Hit or exceeded target value on nine indicators, including impact on four practice indicators for which target values were not set or expected.**
- **Almost achieved the target value on four additional indicators.**
- **A good level of impact was achieved for seven indicators.**

Only six indicators failed to show satisfactory improvement.

	<i>Baseline value</i>	<i>Impact value</i>	<i>Target value</i>	<i>Achievement*</i>
Knowledge				
Ever heard of a Water Users Association (WUA)	53%	100%	90%	1
Know policy on farmer participation	60%	91%	90%	1
Know that ten countries share the Nile	35%	90%	90%	1
Know that Egypt might face water scarcity	66%	88%	90%	2
Able to explain rice policy easily	70%	86%	90%	2
Knows sugar cane policy	61%	86%	90%	2
Able to cite two or more reasons why a farmer would join a WUA	51%	76%	80%	3
Know that pollution affects water quantity	53%	75%	90%	3
Able to explain sugar cane policy easily	40%	71%	90%	3
Able to cite three ways a farmer can save water	33%	71%	90%	3
Know that Egypt has a fixed water supply	45%	64%	90%	3
Able to explain policy on reusing drainage water easily	68%	75%	90%	4
Know three main ways in which future water needs will be provided	18%	32%	80%	4
Attitudes				
Think farmer participation is a good idea	69%	84%	85%	2
Able to cite two or more advantages of farmer participation	51%	67%	85%	3
Communication				
Heard of the Water Communication Unit (WCU)	75%	100%	100%	1
Feels that there is a relationship between him and Ministry	36%	53%	64%	3
Received last issue of WCU Newsletter	28%	35%	100%	4
Read last issue of Newsletter	21%	33%	80%	4
Practice				
Number of meetings held for farmers	1.4	4.1		1
Ever been trained to organise meetings	16%	99%	90%	1
Ever been trained to make presentations	13%	94%	90%	1
Ever held a meeting for farmers	33%	91%		1
Holding awareness meetings as a means of helping farmer save water	18%	38%		1
Currently doing two things to help farmers save water	12%	9%	50%	4
Number of respondents	152	88		

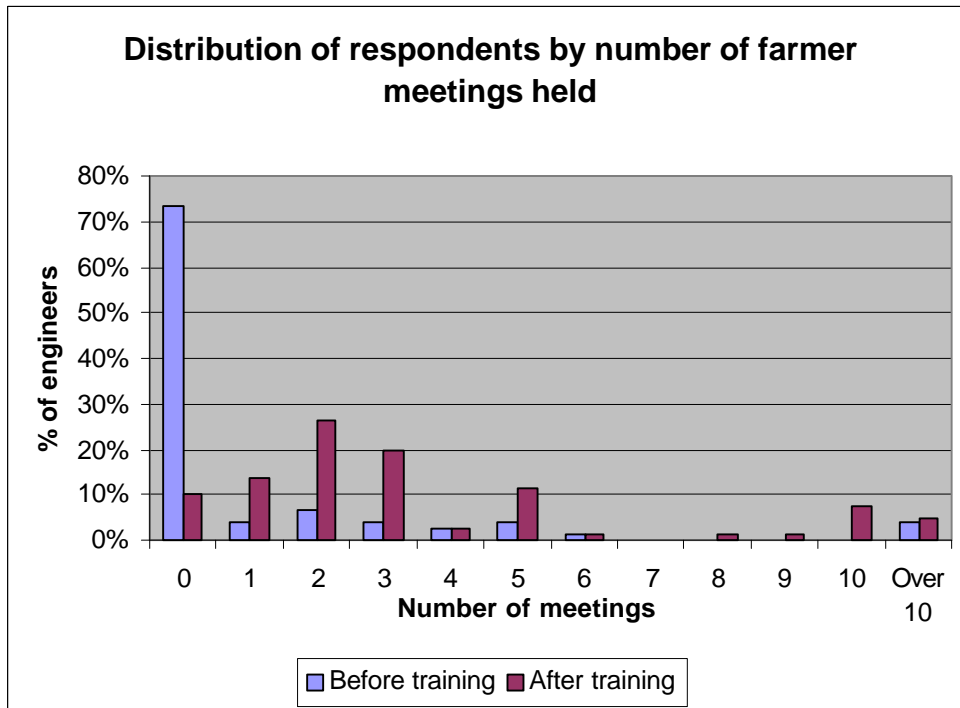
*Achievement: 1 – Hit or exceeded target, 2 – almost hit target, 3 – good impact, 4 – no impact or too low impact

Table 19 summarises the indicators into two scales, a knowledge scale and an attitude scale (Scale construction is provided in Appendix C).³ Reflecting behavioral theories concerning the diffusion of knowledge, the training achieved greater relative increases in knowledge than in attitudes. Finally, there are impressive and unexpected increases in the number of meetings held by district engineers with farmers, as shown in the graph below.

Table 19. Impact of the training on knowledge and attitude scales

<i>Scale*</i>	<i>Baseline</i>	<i>Impact</i>	<i>Max. possible</i>
Knowledge	10.5	14.8	19.0
Attitude	2.1	2.6	4.0
Respondents	152	88	

Impact values in bold indicate a significant difference.



³ The knowledge scale has a Cronbach alpha of 0.68 and the attitude scale has a Cronbach alpha of 0.71, indicating that each has statistically acceptable internal consistency.

Recommendations

The impact survey has documented significant increases in many skills which district engineers require to communicate well with farmers. On some indicators, there is also room for improvement.

Many of the recommendations below have come from the Ministry itself, and there is an intention to pursue some of them.

- The Ministry should establish a system of regular, perhaps semi-annual, meetings with engineers to ensure that they have the latest information on Ministry policies and technical information, to monitor and recognize the engineers' accomplishments, and to promote the relationship between engineers and the Ministry.
- The Ministry should repeat the same two training sessions as needed for new district engineers, to account for turnover.
- As the Ministry expands its definition of which staff are key to increasing farmer participation in decision making, it should provide the same training to additional groups of engineers, eg. drainage engineers (about 180 nationally).
- The Ministry should set up a curriculum for a follow-up training series focusing more on Water User Associations and the specific skills district engineers will need to help set them up.
- Continued support from the WCU to district engineers as they continue to increase their meetings with farmers.

Appendix A

“Reasons” and “ways” included in project indicators

Three main ways future water needs will be provided

Any three of the following:

1. Upgrade irrigation systems and management
2. Implement new irrigation technologies.
3. Reduce cultivation of crops with high water consumption.
4. Treat sewage and increase water recycling.
5. Implement new projects like the Jonglei Canal.

Three reasons why a farmer would want to join a WUA

Any three of the following:

1. To gain access to senior Ministry staff.
2. Help in water conservation.
3. Help to solve their water problems.
4. Share in irrigation work.
5. Establish a relationship between him and the district engineer.
6. It's in his best interests.
7. To provide water.
8. Other
9. In order to have water on rotation.

Three ways a farmer can save water

Any three of the following:

1. Use modern irrigation technologies.
2. Reduce cultivation of high water consumption crops.
3. Night irrigation.
4. Land levelling.
5. Clean the *mesqa*.
6. Don't overwater.
7. Stick to rotation schedule.
8. Other.
9. Stick to the established waterway openings.
10. Reduce drainage losses.
11. Don't break rules and maintain bridges.
12. Form WUAs.
13. Carry out district engineer's requests.

Advantages of farmer participation in WUAs

Any three of the following:

1. Sharing in responsibility.
2. Water conservation.
3. Realistic solutions to farmer problems.
4. WUA will function as a liaison between farmers and district engineers.
5. Farmers will better understand and appreciate engineers' work.

6. Farmer cooperation in solving problems, reducing violations, and reducing complaints.
7. Other.

Things the engineer is currently doing to help farmers save water

Any two of the following:

1. Providing water on rotation.
2. Cleaning branch canals.
3. Making field visits.
4. Bringing extra water to the ends of canals.
5. Following up on the work of the *bahara*.
6. Get water to farmers.
7. Hold awareness meetings.
8. Other.

Appendix B

Outline of District Engineers' Training Courses – Week One

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Morning	<p>Greetings</p> <p>Ministry video</p> <p>Briefing</p> <p>Introduction</p> <p>Vision, Planning for Job of District Engineer</p> <ul style="list-style-type: none"> ➤ Role in the district ➤ Value of his work ➤ The "doer" engineer 	<p>Water resources</p> <ul style="list-style-type: none"> ➤ Sources ➤ Consumption ➤ Future demand <p>Water quality</p> <ul style="list-style-type: none"> ➤ Sources ➤ Pollutants ➤ Legislation <p>Resource mgmt.</p> <ul style="list-style-type: none"> ➤ Rationalisatn ➤ Sustainable use ➤ Command & control 	<p>Presentation skills</p> <ul style="list-style-type: none"> ➤ Self-evaluatn ➤ Fields ➤ Phases ➤ Anxiety ➤ Audiences ➤ Preparation ➤ Technical skills ➤ Organising ideas 	<p>Participative problem solving and conflict resolution</p> <ul style="list-style-type: none"> ➤ Techniques ➤ Identify the problem ➤ Search for solutions ➤ Choosing the alternative ➤ Pitfalls ➤ Case study 	<p>Meeting management</p> <ul style="list-style-type: none"> ➤ Definition ➤ Procedures ➤ Exercise ➤ Types ➤ Preparation ➤ Engineer's role 	<p>Putting skills into practice - Develop action plans for the reinforcement period between training courses</p>
Afternoon	<p>Knowing your resources</p> <ul style="list-style-type: none"> ➤ The Nile today and tomorrow ➤ Policies and their impact <p>Current irrigation projects</p>	<p>Communication skills</p> <ul style="list-style-type: none"> ➤ Introduction ➤ The process ➤ The models ➤ The types ➤ Org'l comm. <p>Listening skills</p> <p>Barriers to communication</p>	<ul style="list-style-type: none"> ➤ Self-evaluatn ➤ Delivery skills ➤ Presentation workshop 	<p>Group problem solving</p> <ul style="list-style-type: none"> ➤ Teamwork ➤ Engineer's role ➤ Team thinking ➤ Democratic choices ➤ Decision making 	<ul style="list-style-type: none"> ➤ Communication ➤ Participants ➤ Controlling meetings ➤ Badly managed meetings 	
Objective	<p>Recognize their role and ideal tasks.</p> <p>Learn the Ministry's main policies and be</p>	<p>Efficient water use techniques, ideal behaviors for farmers.</p> <p>Personal communication,</p>	<p>Improve attitudes towards farmers and see themselves as a vital link</p>	<p>Develop problem solving and conflict resolution skills specific to farmers'</p>	<p>Enhance ability to organise and conduct successful meetings and make effective</p>	<p>Be able to develop personal plans to integrate course learning into their work.</p>

	able to explain them clearly	conflict resolution skills.	between farmers and the Ministry	needs	presentations	
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Outline of District Engineers' Training Courses – Week Two

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Morning	Creative thinking <ul style="list-style-type: none"> ➤ The problem ➤ Arranging thoughts ➤ Finding solutions ➤ Guaranteeing success 	Planning <ul style="list-style-type: none"> ➤ Phases ➤ Principles ➤ Techniques ➤ Tools ➤ Cornerstones ➤ Case study 	Presentation of individual action plans <ul style="list-style-type: none"> ➤ Presenting plans ➤ Managing discussions ➤ Time management ➤ Directing questions 	Group dynamics <ul style="list-style-type: none"> ➤ Identifying problems ➤ Describing problems ➤ Studying problems ➤ Solving problems ➤ Group technique 	Presentation of governorates' plans <ul style="list-style-type: none"> ➤ Four plans for four governorates ➤ Plan analysis ➤ Discussion 	Conference with beneficiaries and cooperating entities <ul style="list-style-type: none"> ➤ 3 sessions ➤ 3 main topics set by vote ➤ Managing dialogue
Afternoon	Brainstorming <ul style="list-style-type: none"> ➤ How to think creatively ➤ Using brainstorming sessions to find a collective solution ➤ Self-evaluation of brainstorming capabilities 	Workshop to set up individual action plans for engineers to solve an actual problem		<ul style="list-style-type: none"> ➤ Assigning roles ➤ Case study ➤ Problem solving plan ➤ Role play 		
Objective	Modifying behaviors from analytical to creative thinking	Developing scientific planning skills	Individual action plans to achieve one or more objectives	Developing group work skills, developing democratic dialogue	Develop presentation, discussion, time management skills	Working well together with Ministry, farmers, local authorities, and Water Comm. Unit

Appendix C

Scale construction

	Maximum points possible
Knowledge	
Able to explain rice policy easily	1
Knows sugar cane policy	1
Able to explain sugar cane policy easily	1
Able to explain policy on reusing drainage water easily	1
Know policy on farmer participation	1
Know ways in which future water needs will be provided	3
Know that Egypt might face water scarcity	1
Know that pollution affects water quantity	1
Know that Egypt has a fixed water supply	1
Know that ten countries share the Nile	1
Ever heard of a Water Users Association	1
Reasons why a farmer would want to join a WUA	3
Ways a farmer can save water	3
<i>Total points</i>	<i>19</i>
Attitudes	
<i>Towards farmer participation</i>	
Think farmer participation is a good idea	1
Advantages of farmer participation	3
<i>Total points</i>	<i>4</i>

Appendix D

District Engineers' Impact Questionnaire