

PD-AAW-981  
2630017/53  
ISN-33750

**QUARTERLY REPORT**

Oct. 1, 1983 to Dec. 31, 1983

**EGYPT WATER USE AND MANAGEMENT PROJECT**

Contract No.

AID/NE-C-1351 (Egypt)  
Project No. 263-017

Consortium for International Development  
Executive Office  
5151 East Broadway  
Suite 1500  
Tucson, Arizona 85711

TABLE OF CONTENTS

	Page
I. PROJECT STATUS IN EGYPT . . . . .	1
II. BACKSTOPPING . . . . .	46
Planning & Coordinating Committee. . . . .	46
Fort Collins Staff. . . . .	47
Long Term Training. . . . .	49
Short Term Participant Training . . . . .	51
American TDY's . . . . .	52
Egyptian TDY's . . . . .	54
Salt River Exchange Program. . . . .	54
Equipment. . . . .	55
Work Plans . . . . .	56
III. PERSONNEL. . . . .	57
Field Staff. . . . .	57
Campus. . . . .	57
IV. APPENDIX. . . . .	58

## I. PROJECT STATUS IN EGYPT

During the fourth quarter of 1983 emphasis was given to preparing progress reports on all Project activities for the National Conference on Improving Egypt's Irrigation System in the Old Lands. The conference, to be held in Cairo March 18, 19 and 20, 1984, represents a major report to the people of Egypt on the findings and recommendations of the Project from six years of investigations.

The recommendations to be included in the reports are:

1. Each water delivery system has site-specific problems and opportunities which should be subjected to appraisal, feasibility analysis and planning before implementing any remedial measures. This should be carried out by a trained interdisciplinary irrigation improvement team of engineers, sociologists, agronomists and economists.

Various interventions for improving water delivery systems have been planned and tested at Project sites. Determining the interventions most appropriate for a given site is a complex process requiring a broad system approach. A system renovation scheme that is very beneficial at one site may be less effective when transferred to another. Many physical and socio-economic factors must be considered in the analysis.

A systematic set of procedures has been developed by the Project to provide guidance to professionals responsible for developing plans for water delivery system renovation. These procedures can facilitate design and evaluate alternative plans for system improvement at the distributary canal system level. Several computer programs were developed as tools to expedite the implementation of the procedures. These procedures should be applied by interdisciplinary teams working throughout Egypt.

2. Although adequate knowledge is available now to begin a National Irrigation Improvement Program, the future viability of such a program will require adequately funded applied research. It will be necessary to monitor and evaluate on-going programs and develop solutions to new problems as they arise. For example, research

is needed to determine the quantity of water supplied to meet crop demands under high water table conditions and potential salinity problems. The impacts of irrigation improvements are complex, continued research is important and improvement alternatives are numerous. Socially responsible analyses, under such circumstances, require an on-going program of in-service training for research personnel. The present EWUP organization serves as a model.

3. Continued training of irrigation improvement teams should include project management, team-building and integrated planning as well as technical subject matter. Training should be given very high priority.
4. Package programs, including improvement of the water delivery system, on-farm water management and associated agronomic practices are essential and should be encouraged. EWUP experience indicates that farmers are enthusiastic about such approaches because they improve irrigation, save labor, increase yields, accomodate mechanization and generate higher net incomes.
5. The development and maintenance of proper drainage systems should continue where it is desired to lower the water table. At EWUP field sites, it has been learned that very little vertical drainage occurs from the water table aquifer. It is not practical with the traditional surface irrigation methods to achieve high enough irrigation efficiencies to avoid contributing to the water table. Consequently, good irrigation management alone cannot be expected to eliminate excessively high water tables.
6. Water allocations should be based on the total needs of the farming system. Water demand diminishes during the time between shifts to different crops and it increases at special times, such as for the first irrigation after harvest and when rice paddy-land is puddled. EWUP experience has demonstrated opportunities for saving substantial quantities of water by coordinating delivery with the total farming system needs.
7. The water table contribution to consumptive use should be considered when determining the amount of water to allocate to

delivery canals. Smaller allocations would save water and reduce the pressure on drains. Although this issue is complex and needs further study, EWUP experience indicates that the water table makes a significant contribution to consumptive use.

8. Well managed, gravity water delivery systems should be encouraged at the distributary canal and *mesqa* level. EWUP has demonstrated that farmers can manage such systems without wasting water. The saving in energy and farm labor is significant. This development should proceed slowly in areas where upstream head is adequate to serve the distributary canals and *mesqas*. Farmers must be involved to ensure that gravity systems are well maintained and managed.
9. Conjunctive use of water from canals and drains should be given consideration in the future development of the nation's irrigation system. EWUP studies indicate that water from drains at field sites is of adequate quality, at certain times of the year, to extend irrigation opportunities when mixed with canal water. This alternative should be studied in each water delivery system selected for improvement.
- 10 Precision land leveling and appropriately designed long level furrow and basin irrigation should be encouraged in order to increase irrigation efficiency, save irrigation time and labor, and accommodate increased agricultural mechanization. Controlled application of water, under such methods of irrigation, requires proper balancing of advance and recession times with an appropriate rate of flow onto the land. This balance must consider field slopes and soil infiltration characteristics. As in all irrigated areas of the world, farmers in Egypt need technical help to effectively achieve this balance.
11. Farmers should be involved whenever any proposed water delivery system improvement is considered. The legitimacy of such improvements must be established with local farmers to help ensure efficient operation, routine maintenance, and long life.
12. Farmers should be encouraged to become involved in the management of water delivery at the *mesqa* level. This will require active professional assistance to help farmers organize and to help MDI officials identify leaders and utilize these valuable resources.

Farmer involvement is necessary for efficient PLL, distributary canal and *mesqa* renovation, water scheduling, *mesqa* maintenance and implementing recommended changes to long level basin or furrow irrigation.

13. Contractors, who are expected to implement improvements of water delivery systems, should be provided training. EWUP has experienced repeated failures on the part of contractors to assemble necessary resources, follow specifications and complete work according to schedule. Improvement of contractor capability is vital to programs on national irrigation improvement.
14. Consideration should be given to modifying the present rules regarding the specified turnout sizes at the heads of *mesqas*. This is a complex issue. As a general rule, the specified turnout sizes deliver an adequate total amount of water if irrigation is practiced 24 hours per day. One problem is that most farmers irrigate during daylight hours only. This overtaxes the capacity of the delivery system during daylight hours and many farmers are unable to consistently get sufficiently large stream flow rates to achieve high water application efficiency. Unless night irrigation is enforced, it may be better to use larger turnouts with turnout control gates and a system of delivery scheduling. However, implementation would require coordination with or modification of water rotation schedules.
15. An irrigation advisory service should be established. EWUP experience has shown that farmers will adopt new irrigation technology. This could save water. It could also help coordinate water delivery with the actual needs of crops which would increase crop production.
16. Cooperation and planning among agencies and authorities concerned with cropping sequences should take place on a timely basis to match crop water needs with water deliveries. Water scheduling for Egyptian agriculture originates at the High Aswan Dam and cannot be altered without allowing for time lags. It is therefore necessary that agricultural and irrigation systems should be carefully coordinated for efficient use of water in achieving high levels of production.

17. Crop management and soil technology should be emphasized in order to maximize returns from irrigation improvement programs. Soil surveys permit mapping of soil types which have special irrigation requirements and limitations. Soil fertility improvement will permit better crop management and higher returns.
18. Cost studies indicate that cast-in-place concrete lining, for all potential canal sizes, has a lower annual cost than other forms of lining. However, other lining types should be considered where rigid-boundary canal linings are not physically or economically justified due to special conditions. For example, areas with highly expansive clays may prove to be too unstable, thereby causing rapid deterioration of rigid-boundary linings.
19. Gates, calibrated for water measurement, should be installed and carefully regulated at the head of distributary canals. It has been clearly demonstrated at Beni Magdul canal that this permits regulation of water according to crop needs and the irrigation practices of farmers, thereby saving water.
20. The relocation and construction of farm roads should be considered at the time water delivery systems are improved and modified. Where it is possible to close *mesqas* they can be replaced with roads if farmers agree. Farm roads are popular with farmers because roads improve marketing efficiency and access for machines.
21. Given the present plans to mechanize agriculture in Egypt, action should be taken to further introduce long furrow and long basin systems of on-farm irrigation. This will require precision land leveling. Attention must be given to the development of appropriate technology for precision land leveling which is compatible with small holdings and limited periods of fallow land. Also, training is needed for technicians and machine operators and capital is needed to finance machines and equipment.
22. Adequate sized inlets (vents) to *mesqas* should be installed in areas where mechanization with long furrow and long basin irrigation will be introduced. This is due to the fact that flow rates

from existing designed vents are often too small to permit practical scheduling and efficient application for long furrow and long basin irrigation.

23. Single-point lift systems should be considered, especially for areas with reliable sources of water. Farmers along a *mesqa* can join together to lift from one point at the head of a *mesqa* with an appropriate pump size. Lifting water with *tambours*, *saqias* and small pumps is expensive and wastes labor and energy. Single-point lift systems on *mesqas* can conserve these valuable resources and at the same time contribute to strengthening social ties among farmers.

The main office staff continued emphasis, this past quarter, on assisting field teams to extend their work outside the original field sites. The team at El-Minya is completing *mesqa* renovation on the Abyuha Canal and providing preliminary surveys for the Serri Canal which serves 126,00 *feddans* south of Minya. The team leader at Minya also provided leadership for developing an irrigation improvement program in the Fayoum Oasis. The Kafr El-Sheikh team is developing a water delivery improvement program for the Daqalt Canal while the Mansuriya team has extended its activities to the Nahia Canal. The teams are working productively on interdisciplinary problems, utilizing training obtained through EWUP during the past six years.

A new contract has been prepared by the Water Distribution and Irrigation Systems Research Institute to complete installation of the buried pipeline at El-Hammami. Two companies have submitted bids on the project. The bids will be evaluated in late January. The pumps and pump stations from the previous construction effort will be utilized in the new contract.

The contractor working on *mesqa* renovation at Minya has experienced many problems working with farmers and conducting construction operations on private land. It is clear that *mesqa* renovation requires a coordinated effort that involves working closely with farmers and farm leaders. The contractor did not have the qualifications or staff to provide such coordination and had to rely on EWUP professionals. Arrangements were made to have tractors and laser leveling units on hand during the time land is fallow between winter and summer crops to level land and at the same time obtain soil for rebuilding *mesqas*. The Egyptian Agricultural Mechanization Project will provide the

equipment for the land leveling. It is expected that the construction work on the entire project can be completed before June 30.

The American resident and TDY staff provided approximately five person months of assistance to the Kafr El-Sheikh team in planning the Daqalt water delivery system. Data are being gathered regarding the hydraulic and other physical characteristics of the delivery system as well as sociological, agronomic and economic information. These data are being processed and stored in an IBM personal computer system which has recently been installed at the Kafr El-Sheikh field office. This work is progressing well and alternative improvements will soon be evaluated for consideration by MOI authorities as appropriate alternatives for implementation.

The Project received four IBM personal computers and ordered a fifth during the past quarter. A three weeks training course was conducted for field and main office staff. It has been found that the IBM personal computers are extremely well adapted to assist with evaluating irrigation improvement alternatives. EWUP programs, originally written in a special languages for the Hewlett Packard 9825A computer, are now being translated into the BASIC language used by the IBM computers. These programs and the evaluation procedures will be included in a technical report scheduled for completion before June 30.

The Professional Employees Exchange Program (PEEP) operated jointly by the Ministry of Irrigation and the Salt River Project through EWUP has sponsored two Egyptian engineers who worked for eight weeks at SRP headquarters in Phoenix, Arizona. At the same time two American engineers from SRP worked in Egypt emphasizing management of water storage and release and personnel training. In both cases the MOI and SRP engineers traveled widely to study the respective irrigation systems and held meetings and seminars along the way. It is planned to bring two more SRP engineers to Egypt and send four Egyptian engineers to Arizona during the next quarter.

EWUP continued its assistance to the IMS Project by exchanging reports and providing computer analysis while IMS is awaiting its computer equipment. Dr. James Layton continued to serve as advisor to the IMS Manpower and Training Project in its OFWM training at Kafr El-Sheikh. He also served as liaison person with the AID/Cairo Training Office in arranging travel and training in the U.S. for OFWM trainees. The OFWM tour of irrigation facilities in Colorado and SW United States was completed late in November and early December. Thirty-two Egyptian

professionals from the MDI participated in the tour. The itinerary and completion report is included in the appendix.

Mr. David Martella was released from the Project, at the request of USAID, to work in the Sudan. His vacancy for the remaining nine months of the current CID contract is being filled with TDY economists from Colorado State University.

EWUP cooperated with the University Linkage Project to sponsor a seminar on water pricing and a seminar on constructing stable channels. Dr. Robert Young from the Department of Agricultural and Natural Resource Economics at Colorado State University delivered a lecture at the water pricing conference and worked with EWUP economists for three days. Dr. Mostafa, a civil engineer from San Jose State University, California, delivered the lecture on stable channels.

Several airfreight shipments are still being held by the Egyptian Customs Department. A committee from the Ministry of Irrigation has reviewed the situation and written a letter to the Customs Department which verifies that these shipments are for Project use as described in the Grant Agreement and in accordance with the Bilateral Agreement between the governments of Egypt and the U.S.A. The Customs Department, however, is demanding payment of duties. A bill for the customs fees is still under negotiation in the MOI.

Project work is now organized among six pilot program groups and nine active task groups.

#### Pilot Programs

Kafr El Sheikh Site: Manshiya *Mesqa*  
Hammad *Mesqa*

El Mansuriya Site: El Hammami Pipeline  
*Mesqa* #10 Raised Channel

El Minya Site: Abyuha Canal Raised Channel  
*Mesqa* Improvement

<u>Task Group</u>		
TG	1	On-Farm Water Management
TG	2	Water Distribution Systems
TG	3	Farmer Organization
TG	4	Farm Management and Planning
TG	5	Water Budget
TG	6	Land Leveling
TG	8	Soil Characterization
TG	10	Conjunctive Use of Water
TG	11	Irrigation Advisory Service

Task groups #7 and #9, Soil Fertility and Pest Control respectively, have completed their objectives and have been terminated.

A detailed report of each pilot program and task group follows.

MANSURIYA

The pilot programs of Mansuriya include the elevation of *Mesqa* #10, forming a lined concrete structure and construction of a buried pipeline replacing the El-Hammami Canal.

The objectives of these structures are basically to:

1. Deliver proper quantities of water to all farmers served by the system.
2. Reduce the conveyance losses which now occur.
3. Deliver water to farmers with sufficient head to allow for faster irrigations by gravity.
4. Eliminate the need for lifting water on an individual basis by providing centralized lifting.

A. Accomplishments and Future Plans for the El-Hammami Pipeline Pilot-Program:

1. The following table lists the amount of pipeline construction that has been accomplished to date. (No work has been completed this quarter).

	Unit	Total amount to be installed	Pipes actually laid	
			No.	%
Pipes with diameter 60cm	meter	3084	2298	75
Pipes with diameter 50cm	meter	1667	1224	73
Horizontal pipes, 10 cm	Unit	768	176	23
Vertical Pipes, 10 cm	Unit	---	---	--
Elbow pipes	Unit	64	8	12.5
T Connection pipes	Unit	64	30	47

2. New bidding has been advertised for new contractors.
3. No on-farm water management data were collected due to the complaints of the F<sup>1</sup>-Hammami farmers with respect to the pipeline problems.
4. The farm record data are being maintained and will continue. Several new crop enterprise cost studies have been completed as well. Work is being done on farm management surveys.
5. Collection of selected water budget and water quality data will continue.

B. Accomplishments and Future Plans for Mesqa #10, Beni Madul

1. OFWM data continues to be collected.
2. Data collection has included documentation of the farmers' irrigation schedule. This will be continued and will be used to evaluate the performance of the new *mesqa*.
3. *Mesqa* #10 operation continues to be complex with three sources of water being used this quarter; the old *mesqa*, the pumping wells, and the new *mesqa*. Beni Magdul Canal was cleaned using the tractor and a drag which improved the flow to the *mesqas*.

There is now sufficient discharge into the *mesqa* since a second pump has been installed. This has helped to accomplish scheduling satisfactorily. A schedule has been established to have two outlets assigned to operate simultaneously on fixed days. Irrigation will be conducted 6 days a week which will allow each of the 12 outlets to be operated one day each week. The farmers have expressed satisfaction with the new schedule.

C. Special Studies:

1. The water budget work is being continued in the Beni Magdul area. Full details are reported by the water budget task group.
2. The cropping sequence studies are continuing.
3. The farm record data on numerous sites and the farm management surveys in the Beni Magdul Canal area continue.
4. The soil testing program that was started by Dr. Warner has been continued by the team. It consists of obtaining soil samples in the field and making consolidation and permeability tests in the laboratory. It will continue through the next quarter.
5. Special study for the water budget on *Mesqa #6* has been started to find out the contribution of ground water on the plant growth.

D. Training:

Agronomist Sabah Mahmoud, Engineer Tarif Zeitoun, and Sociologist Farouk Abdel-Al went to the U.S. for nine months of training.

Mansuriya Field Staff

I. Professional

Wadie Fahim	Team Leader	Ahmed El Atar	Sociologist
Eldon Hanson	Eng.(Half time)	Moheb Semaika	Agr.(1/3 time)
Shinawy A. Atty	Economist	Mohamed Naguib	Sociologist
Ahmed Tahoun	Agronomist	Sabah Mahmoud	Agronomist
Farouk Abedl Al	Sociologist	Sohair Mahmoud	Sociologist
Gamal Fawzy	Economist	Mahmoud Khadr	Agronomist
Hossam El Naggar	Economist	Tarif Zeitoun	Engineer
Ahmed Talat Abd Al	Agronomist	Samir Ibrahim	Engineer

II. Non Professionals

Ibrahim Hussein	S. Tech.	Cherifa El Yazeed	S. Tech.
Ibrahim Abdou	S. Tech.	El Said Kamal	S. Tech
Ibrahim Zakaria	S. Tech.	Mohamed Abdel Hamid	S. Tech.
Adel Abdel Moneim	S. Tech.	El Said Hamed	S. Tech.
Mohamed El-Dash	S. Tech.	Mohamed Farrag	S. Tech.
Abdel Rahim Mohamed	J. Tech.	Shawky El Awady	J. Tech. Lab.
Abdel Maaboud Ibrahim	J. Tech.	Abdel Rahman Eid	J. Tech.
Mohamed A. El Mounem	J. Tech. Lab.	Ahmed Ragab	J. Tech. Lab.
Hamed Aly Tahoun	J. Tech. Lab.	El Shimi Ismail	J. Tech. Lab.

III. Drivers

Abdel Latif El Tawil	Mohamed Rezk
Salah Sadek	Aly Habashy
Nagy Hassan	

KAFR EL SHEIKH

1. Summary of Progress

During the fourth quarter of 1983, work at the Kafr El-Sheikh EWUP site focused on activities as described below:

1. Routine data collection and analysis activities were carried-out on winter pilot program sites of wheat, sugarbeets and berseem. Applied irrigation water was measured. Observation well and irrometer readings in the sites were taken. Soil moisture samples were taken before and after irrigation and weekly.
2. Routine sociological contact records and economic farm records work continued. Additional work was done on the crop calendar study and water requirement study. Climatological measurements were taken at Karada station.
3. Finished summer season soil and water data analysis.
4. Finished sociological evaluation of summer season 1983.
5. Worked on water quality experiments in El-Karada continued.
6. Routine data collection was carried out for the water budget including water levels and quality for surface and subsurface water. Meterological data and crop surveys were taken. Monitoring of irrigation practices along Om-Sen Mesqa (users' practice) continued.
7. Daqalt Canal data collection and analysis continued.
8. Sociological questionnaire of Daqalt Canal started.
9. Discharge measurements by current meter in Daqalt Canal continued.
10. Finished redesign of Daqalt system.
11. Continued the computer training for the professional staff.

### III. Training Status and Changes

1. Eng. Abdel Fattah Metawie finished one semester of academic training at Colorado State University and got his master degree (returned back on January 3, 1984).
2. Eng. Ahmed Abdel Monsef and Sociologist Hoda Hussein returned back from short training tour in U.S.A.
3. Econ. Ragy Darwish is at CSU for two semesters of academic training (since Aug. 20, 1983).
4. Eng. Saad Hussein and Agr. Ahmed Ismail attended computer training in the main office (3 weeks) training in October - November.
5. New sociologist replacing Ahmed El-Attar start working in Kafr El-Sheikh since October 15 is Esam Ezz El-Din.
6. Eng. Amany El-Kayal transfered to another research institute in Alexandria.

### IV. Work Plans for the Next Quarter

1. On-farm work will continue.
2. Water budget work will continue.
3. Work in Daqalt report will continue.
4. Seasonal reports will be written.
5. Water quality experiments will continue.
6. Computer training will continue.

## II. Personnel Assignments

### 1. Professional Staff

Kamal Ezz El-Din	Team Leader	Ahmed A.Monsef	Engineer
Abdel Fattah Metawie <u>3/</u>	Ass. T.L.	Esam Ezz El Din	Sociologist
Magdy Awad	Agronomist	Ahmed El-Attar	Sociologist
Ahmed Ismail	Agronomist	Safaa Fahmy	Engineer
Mohamed I. Meleha	Agronomist	Hoda Hussein	Agronomist
Magdi Badawi	Economist	Ragy Darwish <u>3/</u>	Economist
Sohair Kamal Youssef	Sociologist	Saad H. Zaki	Engineer
Mahmoud Moh. Said <u>2/</u>	Agronomist	Sobhi Elewa <u>1/</u>	Economist
Hassan El-Rafaey	Sociologist		

### 2. Technicians

#### Hammad Group

Moh. Ahmed Badr  
Moh. Omer Abdel Meguid  
Kamal Moh.Abu-Omar

#### El-Manshiya Group

El-Said Abdel Hamid  
Salah El. Sayed Abdel Hafeez  
Moheb Abdel Sama El-Sawy

#### Water Budget

Farag El-Masry  
Ramadan Gazal

#### Laboratory

Atef Hamed Sayed Ahmed

#### Equipment & Cars

Abdel Hamid Sayed

### 3. Secretary & Administrative

Mohamed Abu Omar	Admin. Assistant
Nadia Mahmoud Arafa <u>4/</u>	Secretary
Esmat Mostafa	"

### 4. Drivers

Asel Ahmed A.Aziz  
Osana Moh. Sobh  
Fawzy Fathi Abdel Hamid  
Attia Mostafa Abdu

### 5. Laborers

Saber Ahmed Ismail  
Ibrahim Said Ahmed  
Abdel Raouf Mazal  
Mohamed Mostafa Omar  
Osman Abdel Rasoul  
Ibrahim Moh. El-Besawy

### 6. Guards

El-Sayed Ahmed El-Falawi  
Moh. Mahmoud Al-Mashaly  
Mostafa Basyouni El-Gamal

-----  
1/ Vehicles    2/ Laboratory and Karda station manager  
3/ On training Leave (arrived on January 3, 1984).  
4/ On leave.

MINYA

I. Summary of Accomplishments

During the fourth quarter of 1983 work at El-Minya continued to emphasize canal, *mesqa* and road improvement, according to the Master Plan for Unit Area Development.

A. Abyuha Canal Pilot Program

1. Head gates were installed at all *mesqas* except for #7 and #20. Gates for these *mesqas* have not yet been received at the field site.
2. Leaders have been identified for each *mesqa* and have been given keys to the locks securing the gates. They are accepting the responsibility for controlling water into the *mesqas*.
3. Weeds along Abyuha Canal have been controlled by burning. Aquatic weeds have been removed by laborers. These are only temporary measures until chemicals can be obtained for longer lasting control.
4. In cooperation with the Irrigation District the field team repaired some eroded sections of the Abyuha Canal with pitching.
5. Water scheduling among *mesqa* intakes was started. By closing intakes in the first reach, water was permitted to flow to the lower reaches with adequate head for gravity flow irrigation.

B. Mesqa Improvement

1. The rate of performance in constructing *mesqa* improvements by the contractor has been very slow. The contractor has had difficulty following specifications. *Mesqas* #11, 12, 16, 19 and 25 were worked on but they are not yet satisfactory.

2. A meeting of all field staff was held to develop a plan for completing *mesqa* construction work during the harvesting period in April-May.
3. Plowing and leveling fields continued adjacent to *mesqas* #27, 28, 29 and 30. Soil was collected for building *mesqas* by scraping up to 3 centimeters from the fields with bulldozers, prior to leveling. EWUP engineers and technicians checked the level of fields before farmers planted winter crops.
4. The contractor was persuaded to fill *mesqas* by layers so that compaction could be achieved by wetting and rolling with a sheeps foot packer. This is improving the construction process.
5. Farmers have been provided with canvas dams and the field staff has helped them use the dams and schedule irrigation so as to provide sufficient head for gravity irrigation.
6. Four pipes and gates have been installed to eliminate the need for cutting *mesqa* banks. An attempt is being made to encourage farmers to use pipes and gates in order to reduce erosion, silting of *mesqas* and damage to banks. Farmers may not be willing to incur the expense of providing pipes and gates. This must be investigated further.
7. Tail escapes were constructed on *mesqas* #28, 29 and 30.
8. A road was constructed between *mesqas* #25 and 26.
9. Plans are ready to employ three laser leveling units, three bulldozers and three tractors with plows to complete the *mesqa* work during the winter harvest period.

C. Land Leveling

1. Land along *mesqas* which have been improved is given first priority for leveling. This helps the farmers to fill in the borrow areas along the *mesqa* from which soil was taken in construction of the improved banks. *Mesqas* #27, 28, 29 and 30 were completed after leveling about 80 *feddans*.

2. Work is continuing with farmers to arrange and schedule new areas for leveling during the period of harvesting winter crops.
3. *Mesqas* #11 and 16 were supplied with enough soil for renovation after leveling about 20 *feddans*.

D. Other Activities

1. The sociological discipline held many meetings with farmers to convince them to take soil from their land to renovate *mesqas*. These meetings were used also to coordinate farm activities with the work of the contractor.
2. The sociologists helped the farmers on *Mesqas* #28, 29 and 30 to use canvas dams in place of mud dams.
3. The agronomy discipline analyzed data from the 1981 and 1982 seasons for broad beans, wheat and cotton. The agronomist helped farmers on *Mesqas* #26, 27 and 30 to make long furrows for broadbeans and long basins for wheat.
4. The economists completed 1983 record books and starting English and Arabic versions for 1984. They established a sample of farms for study on *Mesqa* #13 and arranged for measuring irrigation water on the sample farms.
5. The engineering discipline continued collection of data for water budget work, made surveys prior to land leveling, maintained observation wells, and supervised construction work which is underway on *mesqas*.
6. The team leaders spent one month on problem identification and irrigation improvement planning for an area in the Fayoum Oasis. A report in Arabic was submitted to the chairman of the Water Research Center.
7. A preliminary visit was made with MOI and USAID officials to the Serri Canal. The 126,000 *feddans* served by this canal has been selected for improvement under the Regional Irrigation Improvement Program.

## II. Plans for the next quarter

1. Complete the installation of iron headgates on *Mesqas* #7 and 20 and the direct irrigation intakes from the canal.
2. Continue training of farmers to use canvas dams to aid in gravity flow irrigation.
3. Complete *mesqa* improvement during the next harvest period.
4. Complete installation of tail escapes and check structures during the winter closure.
5. Collect information during improvement of *mesqas* to make final evaluation.
6. Continue development of the water users organization.

## III. Personnel Assigned to Minya

### Professionals

Abdel Raouf Hassan	Team Leader		
Tim Gates	Eng.(Halt T.)	Abdalla Saber	Sociologist
Farouk Hassanein	Sociologist	Mohamed Awad	Agronomist
Ahmed Abdel Naim	Engineer	Nabil Farag	Economist
Esmat Wafik	Engineer	Elia Sorial	Economist

### Technicians

Abdel Kany Hatiz  
Nashat Younis  
Mahmoud Noman  
Bekhit Nazer  
Mohamed Allah

### Drivers

Khalaf Moh. Khalaf  
Farouk Hassan  
Mohamed Esawy

### Laborers

Khalaf Saad  
Kamel Ahmed  
Hemid Said  
Said Abdel Fattah

## TASK GROUP 1 : ON-FARM WATER MANAGEMENT

### Objectives

1. Develop criteria for the proper frequency and amount of irrigation and develop an acceptable procedure for implementing the criteria in the pilot areas.
2. Determine the impact of various on-farm water management practices on soil properties, water table, and crop production.
3. Evaluate the cost and benefits associated with the changes in delivery system for selected sites.
4. Evaluate the sociological changes brought about by the various changes in *marwa* delivery systems and on-farm water management practices.
5. Evaluate the on-farm water management practice of long furrows and/or borders as compared to conventional basins.

### Work Completed During The Quarter

Evaluating data and writing material for the National Conference Report has been a major activity pertaining to Task Group #1. Some additional measurements were made in Manshiya *Mesqa* and the Daqalt Canal to evaluate the adequacy of water deliveries. Results of these measurements will be presented. This material is included with Task Group #1 activities even though it pertains to conveyance and delivery systems. Adequacy of water to satisfy crop growth will be the main emphasis of this report.

### Comparison of Theoretical with Measured Flow Conditions

Table 1 shows results of measurements of water deliveries from the Daqalt Canal to Manshiya *Mesqa* through a 40 cm diameter legal turnout which is supposed to deliver water at a rate of 50 m<sup>3</sup>/day *fed-dan* under an operating head of 25 cms. The theoretical quantity equals 11.9 mm/day. As shown in the table the actual operating head was never as large as 25cms. It ranged from 4.5 to 18.6 cms. The total computed inflow volume of 31875 m<sup>3</sup> was equivalent to

11.67 mm/day depth of water on 246.5 *feddans*. The depth was almost equal to the 11.9 mm or 50 m<sup>3</sup>/day/*feddan* allowed for a legal turnout. If the area served had been 316 *feddans*, the maximum allowed for a 40 cm turnout, the depth would have been 9.13 mm/day or 77 percent of the allowable 11.9 mm/day. A "77 percent delivery condition" could be a rather severe constraint to farmers located in areas of unfavorable topography where the distribution is inequitable or short, even when general or overall flow rates are at or above design levels.

#### Inadequancies of legal flows During July

Table 2 shows the extent that legal flows are unable to satisfy crop needs during July which is the normal month for peak consumptive use. Where 25 cms. of head exists the legal turnout will provide 11.9 mm per day which is almost ample in lower Egypt even during peak consumptive use months if flow continues through turnouts 24 hours per day each day during the month. The 11.9 mm/day could satisfy on overall average daily consumptive use as high as 5.95 mm/day where irrigation efficiency is 50 percent. This efficiency would apply to unlined *marwas* and *mesqas*. Continuous flow through turnouts would be required to permit "local" rotations within each farm.

But with a two-turn rotation with 7 days on and 7 days off, for example, the average available flow would be half of 5.95, or 2.98 mm/day for storage in the root zone. Dividing 2.98 mm/day by potential evapotranspiration values in Master Plan 17 will produce crop coefficients as shown in Table 2. An example of computing a crop coefficient is shown at the bottom of the table.

This type of analysis has been accomplished to prepare Table 2 which compares July crop coefficients that are recommended for use in Egypt with crop coefficients which prevail with inadequate rates of flow through legal turnouts. The last column of Table 2 shows that crop coefficients will be 31 to 52 percent of those recommended by MOI during July where channels are unlined and a 50 percent irrigation efficiency prevails. If channels are lined to effect a 75 percent irrigation efficiency, crop coefficients will be 45 to 79 percent of those recommended in Master Plan 17 for July. Analyses for the months of June and August show some shor-

Table 1. Inflow to Manshiya *mesqa* from the Daqalt canal between 3:30 p.m. on August 3 and 6:30 a.m. on August 6, 1983 (Area served by the *mesqa* was 246.5 *feddans*).

Date	Relative Water-Surface Levels, High or Low <sup>1/</sup>	Time of Day (hr)	Head Loss (H) in Turnout (m) <sup>2/</sup>	Rate of Inflow from Canal to <i>Mesqa</i> (m <sup>3</sup> /sec.) <sup>3/</sup>	Volume of Inflow During Time Periods (m <sup>3</sup> )
Aug. 3	High	3:30 p.m.	0.150	0.151	2440
	Low	7:45 p.m.	.186	.168	
Aug. 4	High	5:30 a.m.	.093	.119	5037
	Low	2:37 p.m.	.170	.160	
Aug. 5	High	3:07 p.m.	.109	.128	1300
	Low	7:52 p.m.	.134	.142	
Aug. 5	High	5:37 a.m.	.123	.136	2315
	Low	0:15 a.m.	.157	.154	
Aug. 5	High	3:45 p.m.	.158	.155	4879
	Low	7:15 p.m.	.165	.158	
Aug. 6	High	6:30 a.m.	.045	.083	2419
Total Time : 2.63 days				TOTAL	31875

<sup>1/</sup> High and low water-surface levels in the canal and *mesqa* occurred almost simultaneously.

<sup>2/</sup> Size of turnout: diameter (D) = 40 cm; length (L) = 10 m.

<sup>3/</sup> Computed using formula:  $H = \left( f \frac{L}{D} + 1 + K_e \right) \frac{v^2}{2g}$ , where  $f = 0.02$ ,  $K_e = 0.50$  (D, L, H = measured dimensions).

# Best Available Document

Table 2. Comparison of peak month crop coefficients as limited by inadequate capacity of legal turnouts with crop coefficients recommended in Master Plan 17 by the Ministry of Irrigation.

Area of Egypt	Month of Peak Consumptive Use	Crop Coefficient, "K <sub>cl</sub> " as Limited by Legal Turnouts during a two-turn <sup>1/</sup> Rotation with Irrigation Efficiencies, E <sub>i</sub>		Crop Coefficient, "K <sub>cr</sub> " for Crops as Recommended by the Ministry of Irrigation in Water Master Plan Tech. Report 17				Range of Ratios, R <sub>c</sub> (expressed as percentage, of K <sub>cl</sub> to K <sub>cr</sub> Among Crops by Irrigation Efficiencies	
		E <sub>i</sub> = 75% <sup>2/</sup>	E <sub>i</sub> = 50% <sup>3/</sup>	Cotton	Corn	Sugar Cane	Sorghum	E <sub>i</sub> = 75% <sup>2/</sup>	E <sub>i</sub> = 50% <sup>3/</sup>
								Percent	Percent
Upper	July	0.49	0.33	0.83	0.85	1.08	0.68	45 to 72	31 to 49
Middle	July	0.58	0.39 <sup>4/</sup>	0.92	0.95	0.86	-	61 to 67	41 to 45
Lower	July	0.66	0.44	0.84	0.96	-	-	69 to 79	46 to 52

<sup>1/</sup> A two-turn rotation example is 4 days on and 4 days off, or 7 on and 7 off etc.

<sup>2/</sup> Estimated irrigation efficiency with lined *marras* and *mesqas* (TR 41)

<sup>3/</sup> Estimated irrigation efficiency with unlined *marras* and *mesqas* (TR 41)

Example: Legal turnouts provide theoretically 11.9 mm depth of water per 24 hour day. With unlined channels, the depth is 5.95 mm per day or  $11.9 \times 0.50$ <sup>3/</sup>. With a two-turn rotation, the average per irrigation cycle is 2.98 mm/day or half of 5.95.

<sup>4/</sup> Dividing 2.98 mm/day by 7.64 mm/day (average potential evapotranspiration, E<sub>po</sub>, for July in Middle Egypt) equals "0.39" for the crop coefficient as limited by the legal turnout.

tages but they are relatively minor as compared to the shortages in July.

Determining how serious these shortages are in July will require further analyses of the cropping pattern. If an appreciable part of the land should be fallow or cropped with other plants having relatively low peak consumptive use, the problem would not be as serious as the table indicates. Also, some of the shortage may be supplied by upward flow from the water table.

Two turn rotations are commonly used during summer months. Three turn rotations, which reduce the 11.9 mm/day to one third or 3.97 mm/day, are commonly used during winter months of low daily consumptive use.

#### Plans for the Next Quarter and the Future

A draft has been completed of TR #61, "The Effect of Irrigation Water Management in the High Water Tables in Egypt". It will be submitted for approval in February.

To work with Task Group members to summarize the EWUP findings for inclusion in a general final summary report.

To encourage and assist teams to continue to collect field data pertaining to irrigation frequency, amounts and efficiencies and to evaluate results.

John Wolfe will serve on TDY from January 20 to February 28 to prepare a Technical Report on "Criteria for Irrigation Frequency".

#### Personnel Assigned

Mona El-Kady, Hanson, Semaika, Assia, Taher, Farouk and Nadia.

## TASK GROUP 2 : WATER DISTRIBUTION SYSTEMS

### Objectives

1. Prepare and evaluate procedures for designing gravity distribution systems through canals and *mesqas*. Along with hydraulic principles consider aspects of minimum and maximum stream sizes required at the field inlet, and delivery by continuous flow, rotation, and demand schedules for peak demands and period of reduced demands.
2. Organize and evaluate operation and scheduling procedures for the El-Hammami pipeline.
3. Describe how farmers are organized around their present distribution systems and analyze how different types of farmer organizations may be established in response to changes in those distribution systems.
4. Measure and evaluate seepage losses in the El-Hammami Canal and in improved *mesqas* (lined and/or elevated) and other selected *mesqas*. Evaluate the effect of the improvements on seepage losses.
5. Using data obtained in seepage tests, evaluate the aspects of *mesqa* maintenance with respect to the efficiency of water delivery.

### Activities During the Quarter

#### Abyuha Area

The contractor at Abyuha completed for the reconstruction of the *mesqas* #28, 29 and 30 according to the design cross sections. He also moved earth to the sides of *Mesqa* #27 to be used for filling the old *mesqa* and constructing the banks during the closure period. He began construction of check structures for *Mesqas* #29 and 30.

### Kafr El-Sheikh

The effort to renovate Daqalt Canal continued to follow the guidelines of "Design and Evaluation Procedure for Water Course Improvement" as developed through EWUP experience at Abyuha. During the quarter, activities included baseline data collection, development of computer programs for data analysis, and actual data analysis including preliminary analysis of alternatives for improvement.

The Kafr El-Sheikh team under the directorship of Eng. Kamal Ezz El-Din continued to collect baseline data. Longitudinal and cross-sectional survey data for Daqalt Canal and its branches was compiled and in some cases cross-sections were plotted. Tours were taken of several *mesqas* on which special problems are known to exist. Examples are (1) El-Ghait El-Bahari *mesqa* which is 6 km long and has waters shortages at the tail, (2) El-Wazaria *mesqa* which has had 3 branches yet has gravity irrigation at its tail and (3) El-Shahina and Helal *Mesqas* which are joined together at the tail. Several current meter tests were conducted to calibrate the Daqalt headgate. A winter crop survey was begun as a follow-up to the summer crop survey. Economists Sobhi Elewa and Magdy Badawi collected data from the coops concerning annual costs of canal and *mesqa* maintenance. The sociological baseline study of Daqalt canal has begun. A sample of 10% of the farmers (N = 291) using the canal had been selected. Administration of the questionnaire started during the last week of December and by mid-January, one-fourth of the sample has been interviewed. The interviews will be completed by the end of February and analysis of the data will commence from them.

Bill Ree worked with Daqalt data and renovation effort from September 7 to January 7 and compiled a valuable report covering his efforts. The report included ten HP 41 CV computer programs developed to analyze baseline data and evaluate alternatives for improvement. Eng. Azza Nasr developed an IBM-PC program to store cross-sectional data and to calculate hydraulic properties of a channel of irregular cross-section. Work was begun on an IBM-PC program to calculate the water surface profile for irregular cross-sectional channels.

Engineers Safaa Fahmy, Ibrahim Metawie, and Saad Zaki at Kafr EL-Sheikh begun to store cross-sectional data on IBM-PC disks by using the above programs. Agr. Magdy Awad and Eng. Ken Litwiller begun work to accurately predict the water requirement at Abu Raya for 10 day periods throughout the year. Agr. Ahmed Ismail worked on tabulating data concerning farmers irrigation timing preference.

Water surface profiles were calculated for Daqalt Canal by using design and actual cross-sections. Results revealed that sedimentation in the channel bottom is most critical in the first reach of Daqalt Canal since water levels are increased and possible inflow through the Daqalt gate is reduced.

#### Mansuriya

Negotiations have been completed for a new contract to be awarded for the construction of El-Hammami pipeline. Under the new contract the existing pump stand structures will be added to for completion by the new contractor. None of the pipeline installed by the previous contractor will be used. The old pipeline may be left in place or removed according to the discretion of the new contractor. It is expected that the contract will be awarded in January 1984.

#### Plans for Next Quarter

##### Abyuha

The contractor plans to complete the reconstruction of *Mesqa* #27 during the winter closure period. He will then continue the construction of check structures on the *mesqas*.

##### Kafr El-Sheikh

1. The study by sociologists which describe existing irrigation patterns by farmers will be completed.
2. Store all cross sectional data on IBM PC disks.
3. Finish sociological survey and analyze.

4. Develop alternatives for canal renovation.
5. Write technical report including all baseline data.
6. Begin evaluation of alternatives.

Bill Ree continue to assist with these activities during a TDY tour scheduled for April 1 to May 1, 1984.

Mansuriya

A main activity for the new quarter is the start of construction of the El-Hammami pipeline.

Personnel Assigned

Mona, Hanson, Gates, Layton, Tinsley and Gamal.

### TASK GROUP 3: FARMER ORGANIZATION

#### Objectives

1. To define the purpose and nature of a farmer organization.
2. To examine the existing organizational capabilities of the farmers.
3. To develop and analyze strategies for implementation of specific farmer organizations.
4. To analyze the procedures and administrative structure encompassing the farmer organizations at the specific field sites.

The work of this task group involves three major forms of activities: (1) the actual development and sustaining of various farmer organizations, (2) the documentation of this process, and (3) the documentation of the existing situation of which the organization is part. Activity 1 is designed to accomplish objective 3 while activity 2 is designed to complete objective 4. Activity 3 is matched with objectives 1 and 2.

#### Work Completed During The Quarter

- A. Developing and sustaining farmer organization.

1. Minya

The development of both the *mesqa* organization and the canal organization proceeded concurrently with canal-area renovations. There have been organization meetings of *mesqa* leaders throughout Abyuha to further explain the work and to receive feedback from the farmers. Also, each *mesqa* has been consistently visited by the Project sociologists to discuss the progress of the work with the leaders and farmers as related

to their particular *mesqas*. The major effort this past quarter has been to work with the leadership of the *mesqa* and farmers in order to develop a viable organizational pattern of behavior in which the leaders function as leaders and problems are solved in a collective manner when necessary.

2. Mansuriya

Farmers along *Mesqa 10* were organized to schedule irrigation turns. For the winter season, the schedule has proceeded smoothly. In El-Hammami, the farmers were visited by the sociologists to discuss the problems of the pipeline.

B. Documentation of farmer organization work

The documentation of the organizational work is being compiled and analyzed. The major report to be written will examine the following aspects of developing a water users's association.

1. identifying the local leadership
2. contacting that leadership
3. contacting the farmer
4. establishing the organization
5. sustaining the organization
6. evaluating the organization

C. Documentation of the existing situation

A study was performed looking at the relationship between the authority of farmers along a *mesqa* and their respective ability to control their irrigation practices. The data were collected this past quarter.

Work to be Performed Next Quarter

A. Developing and sustaining farmer organizations.

The present work in Minya and Mansuriya will continue with respect to the circumstances in each area.

B. Documentation of farmer organization work.

Draft copy of the final report on water users' associations will be completed.

C. Documentation of existing situation.

Draft copy of a report about authority and irrigation control will be completed.

Personnel Assigned

Mohamed Naguib, Jim Layton, Farouk Abdel Al, and Eldon Hanson.

#### TASK GROUP 4: FARM MANAGEMENT AND PLANNING

##### Objectives

Farm Management and planning task group objectives are to evaluate alternative farming systems on Egyptian farms, to evaluate current agronomic practices as contrasted to recommended practices, and to evaluate the farmers' ability to implement improved agronomic practices.

##### Activities Completed During Past Quarter

- Conducted the farm record summary for the three project sites for year 1982/1983.
- Farm record summary and analysis (computer outputs) for El-Hammami area, year 1982/83 have been completed and revised.
- Worked on the proposed Technical Report #49 (Farming System of Egypt with Special Reference to EWUP Study Cases).
- Revised proposed Technical Report #50 (Farming System Economic Analysis).
- *Mesqa* #13 survey was completed, and work continued on a procedure to select a representative sample for *Mesqa* #13.
- Revised proposed Technical Report #45 (Irrigation practices of EWUP Study Cases - Abyuha and Abu Raya sites).

##### Plans for Next Quarter

- Continue work on second year of crop calendar report at Kafr El-Sheikh and Mansuriya.
- Revise report on farm land accessibility as a draft working paper and project technical report.
- Work on farm record summary and analysis (computer outputs) for Kafr El-Sheikh and Abyuha sites for year 1982/1983.

- Work on the Farm Record Manual (Part II).
- Continue to keep farm record-books with the selected farmers to evaluate the alternative farming system.
- Work on the analysis of farm management surveys for El-Hammami, *Mesqa* #10 in Beni Mağdul and *Mesqa* #26 in Abyuha.

Personnel Presently Assigned to Task Group #4

Farouk Abdel Al and Dick Tinsley.

### TASK GROUP 5: THE WATER BUDGET

#### Objectives

The objective of the water budget work for the remainder of the project are as follows:

1. To continue to collect complete water budget data (surface inflow and outflow, precipitation, weather station data for evaporation and evapotranspiration, water table elevations, specific yield, hydraulic conductivity, water quality, surface outflow) at each of the project sites.
2. To conduct regular periodic analysis of water budget data for each site with subsequent reports of results.
3. To produce an annual water budget report for each site.
4. To produce a final comprehensive report of the water budget work.

#### Activities and Progress this Quarter

Additions and revisions were made to proposed TR No. 47, "Water Budgets for Irrigated Regions in Egypt".

Begin preparation of proposed TR #60, "Hydraulic Conductivity and Vertical Leakage in the Clay-Silt Layer of the Nile Alluvium in Egypt".

Analysis was completed on soil core samples collected from seventeen locations in Beni Magdul for determination of the vertical saturated hydraulic conductivity of the clay-silt layer.

Soil core samples were extracted from eight locations in Abyuha and consolidation/permeameter analyses were begun for determination of vertical saturated hydraulic conductivity.

Three deep observation wells intersecting the lower coarse sand and gravel aquifer were installed in Beni Magdul and daily records of water levels collected.

Plans for Next Quarter

Continue analysis of soil samples from Abyuha.

Collect soil samples for hydraulic conductivity analysis from an additional seventeen locations in Abyuha and begin collection of samples from Om-Sen.

Install four deep observation wells in Abyuha to monitor the water levels in the lower aquifer.

Complete the first draft of proposed TR #60, "Hydraulic Conductivity and Vertical Leakage in the Clay-Silt Layer of the Nile Alluvium in Egypt".

Personnel Presently Assigned

Main Office Professional Staff:

M. Helal- Coordinator

M. Ibrahim - Engineering, Data Analysis

A. Nasr - Computer Programming, Data Analysis

M. Semaika - Consumptive Use Calculations

T.K. Gates - Co-coordinator, Engineering, Computer Programming

Main Office Support Staff

Iman Saber - Computer Technician

Field Professional Staff

Wadie Fahim - Water Budget Coordinator, Beni Magdul

Ahmed Ismail - Water Budget Coordinator, Om Sen

TDY Staff

James Warner - Groundwater Specialist

## TASK GROUP 6: LAND LEVELING

### Objectives

To collect and analyse all EWUP information on land leveling and:

1. Evaluate farmers acceptance of new standards and practices.
2. Analyse costs of precisions land leveling.
3. Assess the impact of leveling on on-farm water management.
4. Establish training for farmers to improve their own land leveling skills.

### Activities and Work Completed this Quarter

The major land leveling activities this quarter were accomplished at El-Minya where approximately 100 *feddans* were leveled. Eighty of the *feddans* pertained to *Mesqas* #27, 28, 29 and 30; twenty were by *Mesqas* #11 and 12.

### Plans for Next Quarter and the Future

It is planned to meet with engineers of the Eyypt Agricultural Mechanization Project about using their laser-leveling equipment for leveling in the Abyuha area commencing this spring. There are about 600 *feddans* that need to be leveled at Abyuha which will required about 1200 hours of tractor/scrapper time to finish.

It is expected that some land leveling will be accomplished in Kafr El-Sheikh before cotton planting but plans have not been completed to date.

### Personnel Assigned to Task Group #6

Bayoumi, Hanson, Assia and Gamal.

TASK GROUP 8: SOIL CHARACTERIZATION

Objectives

1. To determine what soil management techniques are needed for best use of soil and improving water management.
2. To develop water management recommendations based on soil characteristics.

Accomplishments

- Continued working on the final technical report summarizing irrigation management as related to soil characterization studies. This will be the final report of Task Group #8 and will conclude the output of its activities.
- Shared the activities of planning for the National Conference.

Plans for Next Quarter

Prepare final Technical Report summarizing all irrigation related soil interpretation studies. This will be the final report of Task Group 8 and conclude its activities.

Personnel Presently Assigned

Taher, Tinsley, Assia and Semaika.

TASK GROUP 10: CONJUNCTIVE USE OF WATER

Objective

1. Evaluate water collected from the main drains, canals and irrigation wells from the three project sites.
2. Classify the water from various sources for its suitability for irrigation.
3. Determine the consequences of using drainage water for alternative soil and crop situations.
4. Indicate special management practices necessary for using water of different qualities.
5. Determine the effect of using different combinations of water on the leaching requirements for alternative soil-crop situations.

Work Completed During The Quarter

1. A proposed technical report titled "The Water Quality of Irrigation Canals, Drains and Groundwater in El-Minya, Mansuriya and Kafr El-Sheikh", has been completed and submitted to the editorial office, under joint authorship of Dr. Assia El-Falaky and Dr. Verne Scott.
2. A revised draft of the proposed technical report titled "Conjunctive Water Use - The State of the Art and Potential for Egypt " will be typed in Davis and returned to the Project. The proposed report will be co-authored by Dr. Verne Scott and Dr. Assia.

Plans for Next Quarter

- Monitoring of water quality will be continued over a minimum of three years as recommended by Dr. Verne Scott.

Personnel Presently Assigned

Assia, Hanson, Taha and Ikram.

### TASK GROUP 11: IRRIGATION ADVISORY SERVICE

The Irrigation Advisory Service (IAS) task group has focused on two major areas of analysis in order to examine the existing situation in terms of establishing such a service. First, there is the need to document how EWUP presents its different pilot programs to the farmers with the purpose of describing how a possible prototype to an IAS may actually perform. Next, an examination of the organizational environment into which the IAS must implement its objectives needs to be described. From these two areas of analysis, the objectives of the task group have been created and the work activities have been designed.

#### Objectives

1. To examine how technical advice and assistance to farmers and farmer organizations is extended and developed into viable programs.
2. To Develop criteria and procedures for establishing a countrywide IAS. This requires that the purpose and parameters of a IAS be defined and that a discussion on how the organization may be institutionalized be presented.

#### Tasks Completed

- Evaluation studies of the Kafr El-Sheikh work concerning EWUP interaction with the farmers have been completed.
- The Project's work with the farmers on *Mesqa #10* in Mansuriya has been documented for the past year through a special study examining how an innovation is presented to a receiver group. Data from that study are now being tabulated and analyzed.
- Analysis has begun on a study concerning objective #2.

#### Future Tasks for Next Quarter

- The major report describing an IAS will be completed. Included in the report will be analyses of the evaluation studies, the Project's work with the farmers, and the organizational environment of the IAS.

#### Personnel Presented Assigned

Mohamed Naguib, Jim Layton, Moheb Semaika and Gamal Awad.

TRAINING

The following individuals were enrolled at CSU for 9 months of academic training:

Sabah Mahmoud Ahmed El Sayed  
Mohamed Ragy Salah El-Din Darwish  
Tarief Ali Fahmy Zaitoun  
Farouk Ahmed Abdel Al Omar

Mohamed Naguib spent six weeks at CSU working with the Sociology Department on a report evaluating procedures used by farmers to determine irrigation strategies.

Abdel Fattah Metawie returned January 3, 1984 from one semester of additional training in irrigation management at CSU. He received a Master of Science degree. His assignment with the Kafr El-Sheikh field team continues.

Mohamed Lotfy Nasr completed six weeks of training at CSU in economics studies and is continuing work with the Project on economic evaluation of irrigation improvement alternatives.

Programs of short term study were arranged for Shinawi Abdel Aty Shinawi, Moheb Semaika and Ahmed Bayoumi. Shinawi left for CSU on Dec. 31 for five weeks study of program evaluation. Moheb Semaika will visit Western United States irrigation systems in May to observe irrigation scheduling programs and work with managers responsible for such programs. Ahmed Bayoumi will visit engineering firms in Arizona, Colorado and Washington State to review technology for renovation, modification and cleaning of small distributary canals.

In collaboration with the Manpower and Training Center, EWUP provided a tour for 26 trainees from the summer on-farm water management short course and six senior MOI officials to southwestern United States to observe irrigation systems and water management research. The group was provided orientation services and tour coordination at CSU. See appendix for details.

EWUP assisted the MOI to host two engineers from the Salt River Project for two months in Egypt. The two were:

Ron Grosch  
Sid Wilson

Arrangements are being made for visits to Egypt in the spring of 1984 for two SRP engineers. Four MOI engineers will visit SRP in Arizona.

### PUBLICATIONS REPORT

The main activity of the Editorial Office during the past quarter was concentrated on reviewing and polishing the National Conference Report "Improving Egypt's Irrigation System in the Old Lands".

A meeting with the members of the Advisory Committee was held on Dec. 19, 1983, to discuss the important technical issues in this report. All the comments of the members were considered in preparing the final draft of the report.

The date of the National Conference was finally decided to be March 18 through 20, 1984. A Brochure (English & Arabic) will be circulated one month prior to the Conference to announce the date and program. The Brochure is presently with the artist, Mr. Elhamy Naguib, for Layout and printing of 600 copies.

A list of EWUP Personnel (present and former staff) has been prepared to be included as an Appendix in the National Conference Report. It will be an acknowledgement to all people who have worked and are still working with the Project. It was distributed to the Discipline and Team Leaders for their review.

An updated status report was also prepared for all the proposed technical reports. A meeting with the Main Office Staff was held on Dec. 20, 1983, to discuss the priorities and determine the exact dates of submitting those reports to the Editorial Office before March 15, 1984, as a deadline. A broad outline of the work schedule and some modifications in the follow-up procedure were suggested.

Furthermore, a new report was printed in December 1983:

PTR #38 Precision Land Leveling on Abu Raya Farm, Kafr El-Sheikh Gov., Egypt. By T. W. Ley.

MAIN OFFICE

The technical work of the main office is done through eleven task groups. The work is performed by 27 professional staff members with TDY assistance as indicated in the "Backstopping" portion of this report. The main office and TDY staff work with field team personnel at each of the three Project sites to conduct demonstrations and field tests, collect data, and carry out plans for interaction with farmers and local government officials.

The following is a complete list of personnel assigned to the Main Office as of Sept. 30, 1983.

Hassan Wahby	Project Director
Gene Quenemoen	Technical Project Director
Farouk Abdel Al	Economics Discipline Leader
Gamal Ayad	Senior Economist
Ahmed Taher	Agronomy Disc. Leader
Richard Tinsley	Agronomy Disc. Counterpart
Assia El-Falaky	Senior Agronomist
Moheb Semaika (66% time)	Senior Agronomist
Mona El-Kady	Engineering Disc. Leader
Eldon Hanson	Engineering Disc. Counterpart
James Layton	Sociology Disc. Counterpart
Mohamed Naguib	Sociologist Disc. Leader
Mohamed Helal	Computer Engineer
Azza Nasr	Computer Engineer
Tim Gates	Engineer-Water Budget
Mahmoud Ibrahim	Computer Engineer
Iman Saber	Technician
Ahmed Bayoumi	Farm Mechanization Engineer
Nadia Wahby	Senior Eng. Water Requirements
Abdel Atti Allam*	Engineer - Water Requirements
Wadie Ragy	Engineer - Water Requirements
Mohamed Nabil Naguib	Engineer - Water Requirements

-----  
\* On leave without pay.

Farida Abdel Meguid *	Engineer - Water Requirements
Mohamed Ahmed Salem	Senior Adminis. Personnel
Abdel Aziz El-Kady	Senior Adminis. Expeditor
Ahmed Zaki	Junior Adminis. Expeditor
Salah El-Din Salem	Junior Adminis. Secretary
Sayed Sakr	Junior Adminis. Storekeeper
Zeinab Abdel Ghany	Junior Adminis. Inventory
Ekhlal Abdel Ghaffar	Junior Adminis. Secretary
Magda Yassin Mahmoud	Junior Adminis. Arabic Typist
Ashgan Abdel Zaher	Junior Adminis. Photocopier
Bamba Shaarawy	Junior Adminis. Photocopier
Ibtessam El-Shatter	Junior Adminis. Photocopier
Nahed El-Husseiny	Junior Adminis. Photocopier
Iman Abdel Gaber	Junior Adminis. Accountant
Maher Attallah	Junior Tech. Mechanical Work
Abdel Naby Youssef	Techn.-Mechanical, Motor Pool
Ahmed Soliman Abdallah	Techn.-Mechanical, Motor Pool
Ahmed Ibrahim	Junior Administrative, M.P.
Said El-Said Elwi	Junior Administrative, M.P.
Imam Sayed Washba	Technician
Osman Shaker	Junior Admin.
Shaaban Mohamed Abdou	Telephone Operator
Ahlam Abdel Rahman *	Junior Admin. Accountant
Taha Moustafa	Eng.-Water Laboratory
Ikram Mohamed *	Eng.-Water Laboratory
Ahmed Ghanem	Technician-Water Lab.
Abdalla Gad	Technician-Motor Pool
Ahmed	Guard-M.P.
Moustafa Mahmoud Mahran	Electrician-M.P.
Saad Mansour	Management Ass. for Finance
Nawal Abdallah Ahmed	Accountant - Main office
Magda Mh. Mahrous	Ex. Secretary - Main Office
Mervat Hassan	Secretary - Main Office
Hannan Samuel	Secretary - Main Office
Hala Mokhtar Awad	Secretary - Main Office
Mary Halim	Editor - Main Office
Handi Ahmed Handi	Translator- Main Office

-----  
\* On leave without pay.

## II. BACKSTOPPING

### Planning and Coordinating Committee

This quarter the Planning and Coordinating committee focused its efforts on summarizing the project findings and planning the ongoing transfer of all project research and implementation activities to the Water Distribution and Irrigation Systems Institute in the Egyptian Ministry of Irrigation. The committee reviewed and revised the drafts of the Project Summary Reports and the Project Technical Reports. Several committee members as TDY's in Cairo this quarter worked directly with the Project task groups drafting the Summary Reports.

The Planning and Coordinating Committee in consultation with the Cairo staff developed work plans for the TDY personnel. These work plans continued to be reviewed as the needs of the Task Groups and Pilot Programs changed. With the departure of Dave Martella from the project, additional TDY's were scheduled to assist with the Project's economic studies.

The committee members continued their training and advising activities for the Egyptian professionals who are participating in non-degree graduate training programs at Colorado State University. Specifically, courses were selected and independent study programs were developed for the four long term Egyptian trainees at Colorado State University this quarter. A training

tour of irrigated agriculture in California was organized for these same students during the upcoming semester break. Additionally, the committee helped with the orientation of and lectured to the IMS training tour participants.

Planning for the National Conference this coming March in Cairo continued. The Egyptian universities, the Ministry of Irrigation, the Ministry of Agriculture and other interested Egyptian professionals have been invited to attend the conference. The committee has also continued planning for the International Conference to be held in Spring 1985.

#### Fort Collins Staff

The training, advising, reviewing and publishing activities of the Fort Collins staff continued this quarter. Dr. Dan Sunada, Bob Vandenberg and Henry Horsey continued to provide support for the IBM software and hardware sent to Egypt this quarter.

No new Project Technical Reports were produced by the Fort Collins staff this quarter. Editing, reviewing and retyping of Fort Collins draft reports continued as did the reviewing of draft Project Technical reports from Cairo. Two papers were produced for presentation at the American Society of Agricultural Engineers winter meeting in Chicago. Additionally, Henry Horsey's Masters Thesis "A Technical and Economic Analysis of Low Lift Irrigation Pumping In Egypt" was printed this last quarter. An abstract of these papers are in the Appendix of this report. A status report of papers reviewed by the Fort Collins staff and the P & C Committee is also attached.

Travel arrangements for the TDY's continue to be handled by the Fort Collins staff. Airline and hotel reservations, insurance arrangements, visa requirements, per diem checks and orientation were all handled by the Fort Collins staff along with the engendered administrative and accounting tasks.

Four IBM personal computers purchased by the Fort Collins staff for the project were shipped to Egypt this quarter. Prior to shipment the computers were assembled and all hardware components were tested thoroughly. A portable power supply system for the computers was designed, built and tested by Bob Vandenberg. An extensive software library and ancillary supplies were also purchased. This equipment was carried to Egypt in specially constructed shipping containers by Dr. Redgrave and Mike Moravan, a computer specialist. All equipment with the exception of one disc drive arrived in working order.

At the request of Cairo, additional hardware and software products have been reviewed and/or tested, purchased and shipped. Repairs of broken components returned by Cairo have been arranged and replacement parts shipped. An additional IBM computer has been purchased to be used as a word processor in the Cairo office. Delivery of this computer is expected in the first quarter of 1984.

A three week irrigation training tour was arranged for 32 Egyptian officials and professionals of the Irrigation Management Systems (IMS) Project by Cheryl Stevens and Henry Horsey. The tour began on November 16, 1983 with a three-day orientation at Colorado State University in Fort Collins. For the remainder of the tour the participants visited irrigation projects, districts and irrigation equipment manufacturers in the Southwestern United States.

Drs. Abbas Fiuzat and Omnia El-Hakim were this years tour leaders and reported that the tour went exceptionally well. An itinerary of the tour and the tour leader's report is in the appendix of this report.

Dr. Dave Redgrave arranged a semester break training tour for the four long term trainees. The twelve day tour will focus on the irrigated agriculture and related industries in the San Joaquin Valley of California. A copy of the proposed itinerary is in the appendix.

Dr. Mel Skold was on sabbatical this last quarter. During his sabbatical he presented a paper entitled, "Irrigation Water Distribution Along Branch Canals in Egypt," at Wye College, University of London and at Oxford University in England. Dr. Skold also presented a paper entitled, " Evaluation of Irrigation System Performance - Economics," at a workshop sponsored by the Water Resources, Development and Management Service, Land and Water Development Division, Food and Agriculture Organization of the United Nations, Rome, Italy.

#### Long term Training

Four trainees are continuing their long term training at Colorado State University. A list of the trainees, the courses they took, and the grades they received this fall semester follow.

<u>NAME</u>	<u>GRADE</u>	<u>CREDITS</u>	<u>COURSES</u>
		<u>Economics</u> - (Lybecker)	
Ragy Darwish	B	EA 405	(3) Ag Production Management
	B	EC 306	(3) Price and Allocation Theory
	B	EC 342	(3) Economic Analysis of Water Resource Development
	B	EC 670	(3) Methodology of Economic Research

Darwish's advisor reported that Darwish now has a better understanding of the U. S. University system and expects continued academic progress in the spring semester.

Engineering - (Sunada)

Tarif A. Zaitoun		CE 614	(audit)	Closed Conduits
	C	AE 505	(3)	Irrigation Scheduling
	B	GS 581	(3)	Farming Systems
	A	CE 300	(4)	Fluid Mechanics

Mr. Tarief will take 15 credits next semester and will work on the evaluation of El Hammami Pipeline with Dr. Ruff and Dr. Sunada.

Agronomy - (Schmehl)

Sabah El-Sayed	C	AG 415	(3)	Crop Response to Environment
	D	AE 505	(3)	Irrigation Scheduling
	B	GS 581	(3)	Farming Systems Research
	NG	AG 795V	(3)	Independent Study

Sociology - (Knop)

Farouk Abdel Al Omar

	A	S 100	(3)	General Sociology
	A	AD 590 bv	(3)	Workshop Community Education
	I	S695v	(2)	Independent Study
	Audit	CO 100	(2)	Composition Fundamentals

Farouk's advisor reports that Farouk is doing very well and is a serious, hard working student.

### Short Term Participant Training

Two Egyptian Project personnel were on short term training assignments this quarter.

Abdel F. Metawie attended a four month training program at CSU this fall semester (September 27 - December 31, 1983) and took the following courses:

	<u>GRADE</u>	<u>CREDITS</u>	<u>COURSE</u>
AE 505	(B)	(3)	Irrigation Scheduling
AE795CV	(S)	(1)	Environmental Engineering
CE613	(B)	(2)	Hydraulics
CE712	(B)	(3)	Hydraulics Structure Design
EC342	Audit	(3)	Economic Analysis of Water Resource Development

Lotfi Nasr - (September 25 - November 16, 1983) reviewed the theoretical and empirical literature on the economic analysis of water response functions. Three online data bases as well as the inter-library loan facilities at CSU were utilized. A report on the potential applications in Egypt of water response functions will be prepared.

This quarter two project personnel received Masters Degrees from Colorado State University. Abdel F. Metawie received a Masters Degree in Civil Engineering while at Colorado State University this quarter.

Esmat Wafik received a Masters Degree in Civil Engineering upon the successful completion of his oral exam which was held in Cairo. Esmat began his Masters program while at C.S.U. He completed his program in Cairo under the supervision of Dr. Richard Tinsley, Dr. Daniel Sunada, and Dr. E. V. Richardson. The use of video taped lectures (part of the SURGE Program at C.S.U.) made it possible for Esmat to complete his degree requirements in Cairo.

#### American TDY's

A list of the TDY's in Egypt this quarter follows.

Dr. Bill Ree, Engineer (September 6, 1983 - January 6, 1984) to assist in developing programs and procedures for use in the design and evaluation of alternatives for water system improvement in Egypt. Assist with the revision of existing computer programs and the development of new programs for use in hydraulic design of systems.

Daniel Hilleman, Assistant Professor, Technical Journalism, CSU (October 5, 1983 - December 7, 1983) - work with Jim Layton on papers for the National Conference. Revise and present Water Users Association video tape and land leveling tape.

Michael Moravan, Systems Analyst, (October 8, 1983 - November 15, 1983) to set up 4 IBM personal computers in Cairo, run the diagnostics to make sure the equipment is functioning properly, teach the disk operating system, teach the programs needed to utilize the special hardware EWUP has purchased and teach Basic programming.

David Redgrave, Agronomist, (October 8, 1983 - November 2, 1983) - to complete the report establishing procedures for determining optimum irrigation frequency. To analyze EWUP data regarding irrigation efficiencies achieved by Egyptian farmers and compare it with practical attainable efficiencies.

Verne Scott, University of California at Davis (November 2, 1983 - December 3, 1983) - to help analyze data and write reports for Task Group 10, Conjunctive Use of Water.

E. V. Richardson, EWUP Campus Project Director, (November 25, 1983 - December 14, 1983) - to review project progress and develop detailed plans for the remaining year of the EWUP contract.

Dan Sunada, Engineer, (November 20, 1983 - December 14, 1983) - to work on soil permeability at Minya and Kafr El-Sheikh and groundwater problems at Mansuriya.

John Andrew, Engineer, (December 2, 1983 - February 15, 1984) - to work with Task Group #2 to complete planned reports describing "Computer Assisted Design and Evaluation Procedures" (CADEP). To provide guidance to professionals responsible for developing plans for water delivery system renovation.

Mr. Ron Grosch and Mr. Sid Wilson, SRP (September 28, 1983 – November 8, 1983) to increase the professional competence of the Professional Employees Exchange Program by an exchange of literature, information and on the job training relative to irrigation problems and practices in Egypt and the USA. Exchange between MOI and SRP.

#### Egyptian TDY's

Mohamed Naquib, Sociologist (September 25, 1983 – November 3, 1983) worked with Drs. Ed Knop and Frank Santopolo on a report evaluating the procedures used by farmers to decide irrigation strategies.

#### Salt River Project Exchange Program

Mohamed F. Saoudi and Ahmed Darwish trained at the Salt River Project this quarter. The 8-week training tour was designed to increase the professional competence of the participants. Specific subject areas included water operations, construction and maintenance of irrigation delivery systems and water resources and services.

Ron Grosch and Sid Wilson from the Salt River Project arrived in Cairo on September 28th to begin a 5-week tour with the Ministry of Irrigation.

Equipment - October 1 - December 31, 1983

Four IBM personal computer systems were sent to Egypt with Dave Redgrave and Mike Moravan.

A Brothers model HR-1 printer was hand carried to Egypt by E. V. Richardson.

A Hewlett-Packard model 7470A plotter was sent to Egypt with D. K. Sunada. This plotter is to be used with the IBM personal computers in Egypt.

All of the instruments and supplies for the mobile soil lab have been received. We have received approval to ship these items and they will be sent during January 1984.

Two spare CDC disk drive units have been ordered. When they are received, they will be sent with the next person going TDY to Egypt.

One spare Terado inverter has been ordered and received. This unit will be sent with the next person going TDY.

An IBM computer power supply was purchased to replace one damaged in Egypt. This power supply was hand carried by Jim Warner December 27, 1983.

One additional IBM personal computer system has been ordered for use in Egypt.

The diesel generator for El-Hammami is on hand but we have not received approval to ship it.

### Work Plans

Efforts to facilitate the smooth transition of the projects research and implementation activities to the Water Distribution and Irrigation Systems Institute in the Egyptian Ministry of Irrigation will continue.

Review of the Project Summary Reports and Project Technical Reports will continue in preparation for the National Conference this Spring. The entire Planning and Coordinating Committee, representatives of the Consortium for International Development, and the Associate Dean of Engineering at Colorado State University will travel to Cairo to attend the National Conference.

Advisory services, short courses and special study plans will be provided to the Project personnel studying at Colorado State University this next quarter. A study tour of irrigated agriculture and related topics will be provided in January for these personnel.

The computer support for the Project will be continued. The focus of the computer activities this next quarter will be to complete the transfer of computer programs from the HP 9825 to the IBM PC's. An additional IBM PC will be sent to Egypt this quarter for use as a word processor. This will allow the four other IBM PC's to be used solely for research purposes including data analysis.

## PERSONNEL

Field Staff

Dave Martella left the Project this quarter. Additional TDY's are being sent to replace Martella.

Campus

Dr. Skold was on sabbatical leave this quarter. Dr. Lybecker replaced Skold on the Planning and Coordinating Committee. Dr. Skold will return at the beginning of the next quarter.

The following people will be in Egypt TDY next quarter:

John Andrew	December 2, 1983 - February 22, 1984
Jim Warner	December 27, 1983 - January 30, 1984
Don Lybecker	January 8, 1984 - February 16, 1984
John Wolfe	January 21, 1984 - February 28, 1984
Rex Rehnberg	January 31, 1984 - March 30, 1984
David Molden	February 1, 1984 - April 1, 1984
Jim Ruff	February 5, 1984 - March 14, 1984
Mohammed Haider	March 1, 1984 - May 1, 1984
Alan Early	March 1, 1984 - May 1, 1984

**APPENDIX**

## REPORT ON IMS FIELD TOUR

A tour of irrigated agriculture and irrigation water delivery systems in the American southwest was provided for 33 Egyptian engineers and Ministry of irrigation officials. The tour, requested by the Irrigation Management System Project through US/AID, began on November 16 and ended December 7, 1983.

The purpose of the tour was to instruct the participants in the equitable and efficient management of irrigation delivery systems and the positive impact such management has upon on-farm water management. Several specific goals were established. First, to increase the awareness of the participants of the significant impact the management of the delivery system has on farm water use. Second, to demonstrate that the management of the delivery system should be, and can be based upon the farm water management irrigation practices. Farm water use and management must dictate the operating policies of the delivery system and not vice-versa. Third, to review farm water management practices and to view field application of these practices. Fourth, to introduce and demonstrate different delivery system technologies and management techniques that may be appropriate in Egypt. And finally, to introduce multiple use project planning and coordination methodologies and issues.

The tour was designed to provide a learning opportunity. The majority of the tour lectures were provided by individuals with practical in-field working experience. The lectures were supplemented with visits to irrigation projects, private irrigation delivery companies, individual farms and research facilities.

The tour participants arrived in Fort Collins, Colorado on the evening of November 16. The next two days were devoted to orienting the participants to the American culture and providing a brief history of irrigation in the American southwest. Lecture topics included "Egypt From an American Perspective," "Cross Cultural Perspectives," and "Water Use in the Western U. S." A tour and discussion of research projects in the hydraulics laboratory at Colorado State University and a discussion of the work of the Egypt Water Use and Management Project was provided.

Monday, November 21, the group visited the Fruita Research Station and surrounding irrigation projects in the Grand Valley of Colorado. The visit focused upon different types of irrigation, their implications with regard to water management and salinity control, and the demands the different irrigation methods placed upon the management of the local irrigation delivery systems.

Wednesday, November 23, the group visited the Salt River Project, in Phoenix, Arizona. The subjects discussed by the Salt River Project personnel included, multiple use project planning, the daily management of a large irrigation delivery system, maintenance, operation procedures and different delivery system technologies. A tour of the delivery system command center, regulating structures in the delivery system and several farms was included. Mr. Ed Kirdar arranged for and served as host for the visit.

Friday, November 25, the group visited the Water Conservation Laboratory of the United States Department of Agriculture located in Phoenix, Arizona. Dr. Al Dedrick and other researchers at the lab, discussed the impact a delivery system has upon the farm water use and the importance of a careful analysis of farm water use and needs prior to the design of a delivery system. Additional topics covered included: current research in water conservation at the lab and simple, but very accurate, flow measuring devices.

Monday, November 28, the participants visited the Wellton Mohawk Project in Yuma, Arizona. The project personnel discussed the water management techniques they have utilized to decrease the salt load of the irrigation return flow, the reuse of drainage water and the necessity for a total agricultural package approach to water management. A tour of the project area and its pumping and drainage facilities was provided.

Tuesday, November 29, the group visited the Imperial Irrigation District in El Centro, California. Officials of the district discussed the management of the district's divisions, including regulating, communication and maintenance operations, the role of the farmers in the daily operation of the district, and the water management experiences of the district. A tour of irrigated agriculture in the area and discussions with farmers about their irrigation practices was also provided.

Wednesday, November 30, the group visited the Coachella Irrigation District in Indio, California. Topics discussed by Mr. Dennis Mahr and other officials of the irrigation district included: the control and operation of their buried pipe delivery system, drainage problems and their solutions in the district, the introduction of computers into the system management and the development of technologies and management techniques to control the weed growth in open channels.

Friday, December 2, the group visited the Grove Chemical Company in San Diego, California. Bob Hasegawa discussed Grove Chemical's extensive experience in drip irrigation, the conditions under which drip irrigation is appropriate, the water filtration requirements of drip systems and the integration of irrigation delivery systems into a total agricultural management system. Several farms and orchards utilizing drip systems were visited.

Monday, December 5, the group visited the United States Department of Agriculture Salinity Laboratory in Riverside, California. Current research at the lab was presented and its potential application in the field was discussed. An

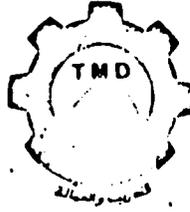
analysis of the problems of and potential solutions for the water delivery system in Egypt was provided by the lab's director, Dr. Van Schilfgaard. Dr. Van Schilfgaard has visited Egypt and studied it's delivery system extensively.

Wednesday, December 7, the tour participants boarded a flight at Los Angeles, California for their return to Cairo.

The delay in the tour funding postponed the tour till mid-November and consequently several visits had to be cancelled because of the Thanksgiving Holiday. These included irrigation projects in Colorado and Northern Arizona. Additional subject areas that might be considered in the future would include discussions of the economic and sociological impacts of delivery system management. Additionally, several tour participants have suggested that the Grove Chemical stop be replaced with a visit to the Rainbird Irrigation Sprinkler Company. In general, lodging accommodations were well received. However, participants have suggested that the hotels in Phoenix and in Indio were too far from those citys' downtown areas. Unfortunately, in those two cities the projects visited are a considerable distance away from the downtown area.

This tour provided the participants with an understanding of the extensive relationship between on-farm water management and the management of the Irrigation delivery system. Additionally, alternative delivery system technologies and management techniques were introduced. Project planning and coordinating concepts, operation and maintenance procedures and flow measurement and regulation techniques were discussed. The tour participants returned to Egypt with a broadened understanding of the irrigation delivery system and the implications of management and institutional constraints on the operation of that system.

The tour itinerary and a report written by the Egyptian coordinators, Engineer M. Saif Issa and Abdol H. Fahim follows.



2699-14-1-5  
 11/12/83

TO : FAROUK SHAKIEN  
 FROM : M.Saif Issa & Abdel Hamid Fahim  
 Sub., : A Field trip to U.S.A. 1983

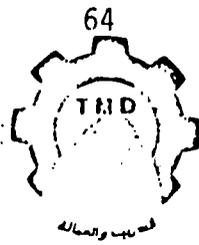
Dear Sir:

Attached is a field trip report concerning the IMS tour to U.S.A. which started Nov., 16 and ended Dec., 8, 1983. The trip is well organized and every body is satisfied either from the genior or the seniour participants. Every body return back home in time except HODA HUSSEIN who left LOS ANGLOS to FORT COLLINS at the end of the trip. She will return at the end of December.

Coordinators

MS  
 Eng.M.Saif Issa & Eng.Abdel H.Fahim

cc. Dr. M.Abu-Zied



A FIELD TRIP TO U.S.A. REPORT

by

M.Saif Issa & Abdel H. Fahim  
Coordinators

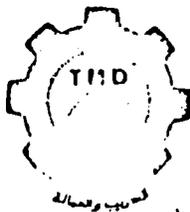
The IMS tour to U.S.A. started November 16, and ended Dec.,7,1983. This tour involves 25 from the geniouir staff and 6 from the Senior staff from the Ministry of Irrigation, two from colorado state University, one as a translator & the other is an assistant professor at the University, besides two coordinators from Egypt. The attached list indicates the names & position of each participant. The following report indicates day by day activity of the tour:-

Wednesday, Nov.,16:

The Egyptian participants left Cairo to U.S.A., After their arrival to Denver, a bus transportation to Fort Collins was used.

Thrusday, Nov.,17:

The participants left the hotel to lory Student Center at C.S.U.,Mr. GERRY HORAK, the assistant Magor of Fort Collins commeded the trainess and gave a talk about Fort Collins City. Dr. WILLIAM GRISUVOLD, from the department of history at C.S.U. spoke on "Egypt from an American Prespective". After noon, a buffet dinner was done,Dr.RICHARDSON and some of his colleagues at C.S.U. talked about the cooperation programs between U.S.A.and Egypt The Egyptian coordinator talked also about this cooperation and thank the American counter parts for their hospitality.



(2)

Friday, Nov., 18:

Dr. E.V.RICHARDSON spoke to the group about this training tour, then the group made a tour at the Engineering Research Center laboratories and facilities. Dr. RAY ANDERSON, department of economics at C.S.U. spoke on "Water use in the Western U.S." and then Martha Denney talked about "Cross cultural perspectives".

Saturday, Nov., 19:

It is a free day, at night, the group attended the international festival at C.S.U.

Sunday, Nov., 20:

The trip started to Grand Junction.

Monday, Nov., 21:

Dr. Harold Golus accompanied the group from the hotel to Fruita Research Station. The group were informed with the different activities of the station, the different systems of irrigation, (sprinkler gated pipes and cablegation with gated pipes,...)

Wednesday, Nov., 23:

The group visited the Salt River Project at Phoenix, Eid Kirdar and his colleagues gave a general view about the project and its different activities.

Friday, Nov., 25:

They visited the Water Conservation laboratory at Phoenix, Dr. ALLEN DEDRICK an ag. engineer at the project explained the different activities of the lab.



(3)

Monday, Nov., 28:

The participants visited WELLTON MOHAWK project at Yuma, soil conservation service, Mr. CHARLES SLOCUM civil engineer with the project and his colleagues gave a general view about the project and its activities.

Tuesday, Nov., 29:

They visited IMPERIAL irrigation district at El Centro-California, Miss LINDA SONCHEZ explained the different activities of the project, some engineers gave detailed explanations about the different divisions of the project.

Wednesday, Nov., 30:

The group visited COACHELLA Irrigation district at Indio-California, Mr. DENNIS MAHR and his colleagues made a good representation about the district and its activities.

Friday, Dec., 2:

The group visited Grove Chemical- San Diego- drip irrigation - Chula Vista Warehouse Mr. BOB HASEGAWA explained the different equipments of drip irrigation and visited private farms which are dealing with drip irrigation system.

Saturday, Dec., 3:

We visited Sea World

Sunday, Dec., 4:

We visited Disney land at Anaheim.



(4)

Monday, Dec., 5:

We visited Salinity laboratory at River side, Dr. JACK GOENTZEN and his colleagues explained the different activities of the lab and how we can made benefit between the lab and Egypt. using high salinity water to irrigate some specified crops and its effect on soil properties and yield.

Tuesday, Dec., 6:

We visited Hollowood stadious

Wednestay, Dec., 7:

The Egyptian participaints left los Angles to Cairo. Every body return back home except HODA HUSSEIN who left to Denver with the American staff to Fort Collins. She will return with her husband ABDEL FATTAH MOTTAWIE at the end of Dec., to Cairo.

Proposals:

1. The hotel at Phoenix: Howard Johnson's at the Coachella Int.1 Motel Indio are very far from down towns. It is proposed to chose another hotels as near as possible to down town.
2. We propose to visit RAIN Bird factories and activities at California as specilests in drip irrigation activities instead of Grove Chemical - San Diego.

0028T/11/15/83

IMS TOUR PARTICIPANTS  
November 16 - December 7, 1983

<u>NAME</u>	<u>DEGREE</u>	<u>OCCUPATION</u>	<u>WORK DESCRIPTION</u>
Ahmed Hussein Abdel Halim El Garnousy	BS	Ag Economist	Field Worker Collecting economic information for Water Master Plan
Aly Moursi Mohamed BATT	BS	Civil Engineer	Administrative Engineer in charge of designing irrigation structures
Abou Zeid Ahmed Abouzeid	BS	Assistant District Engineer Civil Engineer	Administating the installation of the Drainage Program in Kena
Ahmed Senousy Sayed	BS	District Engineer	Administrator of the MOI at Beni Shef District
Ahmed Abd El Monsef Ibrahim	BS	District Engineer	Perform irrigation engineering work at project field site in site in Kafr El Sheikh
Abdel Hamed El Sadik Hassan	BS	Deputy Director	Administrative Assistant to the General Director at Esna (drainage)
Abdel Galil Sabir Ahmed	BS	Deputy Director Civil Engineer	Administrator for Ministry of Irrigation at Kom Ombo (drainage)
Abd El Raheem Abd El Wahab Mohamed	BS	Assistant Director of Irrigation	Administrative Officer in the MOI at Assiut
Abdel Hak Hassan Khatteer	BS	District Engineer Civil Engineer	Administrator of the Irrigation system in Menia El Khamh District
Galas Ahmed Mahmoud Beda	BS	Civil Engineer	Perform engineering work designed for maintenance and operation of irrigation system in Menofia
Hani Galal Sadek Sayed	BS	District Engineer	Administrative Officer for the District Irrigation network
Ibrahim Ahmed Mohamed Lashen	BS	Ag Engineer (Soils)	Economic evaluation of Water Drainage program
Lotfy Mohamed El Taher Hassan	BS	Civil Engineer	Engineer for construction and water distribution activities, MOI

Jhamed Hassan Abd El Karim	BS	Assistant Director - MOI (Sohag)	Administrative Officer in Sohag District (MOI)
Mohamed Abd El Hakim Omar Hassan	BS	District Engineer	Administrator for the MOI at Talkha District
Mohey El Din Fathi El Hawal	BS	Ass't Director	Administrator Officer in MOI/Kafr El Sheikh
Magdy Mohamed Abdel Nabbi Said	BS	Ag Engineer (Soil Science)	Perform economy evaluation for specific drainage programs
Magdy Ali Mohamed Ragab	BS	Ag Engineer	Economic evaluation of drainage problems
Shehata Kamel Shehata	BS	Ass't Director	Design and supervising work pertaining to irrigation structures and housing for MOI/Kalyoubia.
Youssef Abbas Hassan Jumborok	BS	Civil Engineer Director - MOI Aswan	Administrator for the MOI in Aswan
Mohamed Rashed Ali	BS	Ag Engineer (biochemistry)	Performs field studies and water analysis work
Nabil El Said Ibrahim El Desouky	BS	Ag Engineer (biochemistry)	Field worker for the institute/performs water analysis
Hossam Mohamed Ahmed El Nagar	BS	Ag Economist	Field Economist for the Kafr El Sheikh Project Site
Hoda Hussein Dweeb (female)	BS	Field Sociologist (Genetics)	Performs field sociological work for Egypt Water Use Project
Khairy Mohamed Mohamed El Basiry	BS	Agronomist (Agriculture)	Performs field work pertaining to drainage problems
Mohamed Hassan Hassanien	BS	Undersecretary MOI/Beni Suef Civil Engineer	Administrator in charge MOI/Beni Suef
Mohamed Abdel Haleem Abdel Megead	MS	Undersecretary MOI/Ismailia (Hydraulics)	Administrator in charge MOI Kaliub, Ismailia & Port Said Governorates
Fares Corgi Mikhail	BS	Director General MOI/Minya	Administrator in charge of Minya Irrigation Directorate
Abdel Gamil Abdel Galil Ali El Hag	MS	General Director East Dakahlia Irrigation Dept.	Administrator in charge East Dakahlia District/MOI

Sobhy Hassan Nada	MS	Deputy Director Drainage - MOI (Soil Mechanics)	Design & implement various drainage projects
Hussein Ahmed Abdel Halim Lasheen	BS	General Director MOI	Administrator in charge of of developing, operating irrigation projects
ABEEL HAMID IBRAHIM FAHIM MOHAMED	BS (male)	Civil Engineer Coordinator	Deputy Director of the Water Research Institute
AHMOUR IBRAHIM ISSA	(male)	Coordinator	Egypt
DMNIA EL-HAKIM	(female)	Translator & Coordinator	Colorado State University
DR. ABBAS ALI FIUZAT	(male)	Asst. Professor	Colorado State University
MR. MIKE PHELAN	(male)	BUS DRIVER	

## M E M O R A N D U M

DATE: December 22, 1983  
 TO: E. V. Richardson  
 FROM: D. J. Redgrave  
 SUBJECT: Study Tour of the San Joaquin Valley of California

I have contacted Dr. James Brownell (209-294-2850) at California State University-Fresno about the tour arrangements for the EWUP graduate students. He has asked Ed Mastropalo of the Center for Irrigation Technology to handle the tour. Ed and I have discussed the general outline and purpose.

The specifics still need to be worked out but the following is an outline of activities being planned.

Schedule

Denver to Fresno - January 9-10.  
 Based in Fresno with day trips.  
 Fresno to San Francisco January 20.  
 Free day in San Francisco January 21.  
 Return to Denver January 22.

Activities

1. Fresno Farm Equipment Show - January 10, 11, 12
  - 485 exhibits
  - Farm equipment
  - Irrigation equipment
  - Technical talks
  - Photo voltaic pumping plants.
2. U.S.D.A. Irrigation Research.
3. University Irrigation Scheduling Methods and Operation (HP based)
4. Joe Lord Irrigation scheduling company.
5. Two-three pump manufacturers
6. Defco Irrigation Company
  - Trickle-Sprinkler Manu & Plastic hose

7. U.S.D.A. groundwater recharge research site
8. Westlands Irrigation District.  
Underground pipe delivery -  
Meter based charges  
Farmer demand.
9. California Department of Water Resources.
10. The Swanson Company  
Plastic Pipe (P.V.C.)
11. Superior Farms - Bakersfield  
Irrigation scheduling  
Water costs and irrigation methods
12. Cotton Research Station - Shafter.
13. A. D. Edmonston Pumping Plant  
Wheeler Ridge  
Central Valley Project
14. 1-2 Irrigation Districts operating on demand basis and providing  
scheduling advice to farmers.
15. Research, training, and farm based operations of the Center for  
Irrigation Technology (Fresno).
16. Westside Field Station  
Central Valley Canal and San Luis  
Reservoir (canal buffer).

These activities should provide the information that will be useful to the students.

Transportation will be by rental car (EWUP cost) with Ed or his technician driving.

Trust this covers what you had in mind for the students. Please let me know if you have any suggestions or changes.

STATUS REPORT  
PAPERS OUT FOR REVIEW  
AT FORT COLLINS  
Prepared by Diane Maybon

TITLE

---

PLANNING IRRIGATION IMPROVEMENT: THE IMPACT OF  
POLICIES AND PRICES ON FARM INCOME AND RESOURCE  
USE. - HAIDER'S Ph.D. Fort Collins - Review Incomplete

---

DWP # 101 - ON SUGAR BEET YIELD AND SOIL SALINITY  
CHANGES UNDER LONG AND SHORT FURROW IRRIGATION  
SYSTEMS - EL FALAKY. Fort Collins - Review Completed

---

DWP # 102 - FARM RECORD SUMMARY AND ANALYSIS FOR  
STUDY BASES AT ABYUHA, MANSURIYA AND ABU RAYA SITES  
1981-1982 - EWUP ECONOMICS TEAM. Fort Collins - Review Completed

---

DWP # 107 - ROOT PENETRATION EVALUATION OF 1982  
WINTER CROPS IN ABU RAYA, KAFR EL SHEIKH GOVERNORATE  
- MELEHA. Fort Collins - Review Completed

---

DWP # 110 - KAFR EL SHEIKH ON-FARM PILOT PROGRAM  
1981-1982 WINTER SEASON - EWUP KAFR EL SHEIKH TEAM.  
Fort Collins - Review Incomplete

---

DWP # 112 - A COMPARISON OF THE COST OF PICKING  
COTTON TO THE VALUE OF COTTON - SOBHI/ELEWA/DARWISH  
Fort Collins - Review completed

---

DWP # 115 - EFFECT OF LAND LEVELING ON THE TIME AND  
DEPTH OF IRRIGATION, APPLICATION EFFICIENCY AND WATER  
USE EFFICIENCY OF WHEAT - EL FALAKY. Fort Collins - Review completed

---

PTR # 14 - THE CHALLENGE OF IMPLEMENTING AN  
IRRIGATION PROGRAM IN AN EGYPTIAN VILLAGE - MAYFIELD/NAGUIB.  
Fort Collins - Review completed - Author reviewing comments

STATUS REPORT  
PAPERS OUT FOR REVIEW  
AT FORT COLLINS  
(Continued)

TITLE

---

PTR # 17 - OPTIMAL DESIGN OF BORDER IRRIGATION  
SYSTEMS - REDDY/CLYMA. Fort Collins - Review completed

---

PTR # 38 - PRECISION LAND LEVELING - BY KAFR  
EL SHEIKH TEAM - LEY. Fort Collins - Review completed - Printing

---

Proposed PTR #44 CONJUNCTIVE WATER USE - SCOTT. Fort Collins - Review  
Completed - Author reviewing comments.

---

Proposed PTR #50 FARM SYSTEM ECONOMIC ANALYSIS - LYBECKER. Fort  
Collins - Review Completed

---

Proposed PTR #52 - STATUS OF ZINC IN THE SOILS OF PROJECT  
SITES - NAIM. Fort Collins - Review Completed

---

Proposed PTR #58 - COTTON FIELD TRIALS, SUMMER 1980 - AWAD/  
EL KAYAL. Fort Collins - Review Completed

---

Proposed PTR #72 - DAY/NIGHT IRRIGATION TIMING PREFERENCE  
OF OM SEN FARMERS, KAFR EL SHEIKH - METAWIE/LITWILLER.  
Fort Collins - Review Completed

PAPER NO. 2P15

## INFILTRATION STUDIES ON EGYPTIAN VERTISOLS

by

Kenneth F. Litwiller  
 Research Associate, Civil Engineering Dept.  
 Colorado State University, Fort Collins, CO 80523

Richard L. Tinsley  
 Associate Professor, Agronomy Dept., Colorado State  
 University, Fort Collins, CO 80523

Hoda H. Deweeb  
 Agronomist, Egypt Water Use and Management Project,  
 Kafr El-Sheikh, Egypt

Thomas W. Ley  
 Extension Irrigation Engineer, Irrig. Agric. Res. and  
 Ext. Center, Washington State Univ., Prosser, WA. 99350

Presented at the Poster Session of the National  
 Conference on Advances in Infiltration

Hyatt Regency Illinois Center, Chicago, IL  
 December 12-13, 1983

**SUMMARY:**

Cylinder infiltration tests were conducted during wheat irrigations on shrinking/swelling Vertisol soils. Infiltration proceeded from high initial rates to low long term rates. Infiltration characteristics resulted in large infiltrated depths during the planting irrigation, good water distribution across irrigated basins, and danger of prolonged ponding in field depressions.



**American Society of Agricultural Engineers**

St. Joseph, Michigan 49085

Papers presented before ASAE meetings are considered to be the property of the Society. In general, the Society reserves the right of first publication of such papers, in complete form. However, it has no objection to publication, in condensed form, with credit to the Society and the author. Permission to publish a paper in full may be requested from ASAE, 2950 Niles Road, St. Joseph, Michigan 49085.

The Society is not responsible for statements or opinions advanced in papers or discussions at its meetings. Papers have not been subjected to the review process by ASAE editorial committees; therefore, are not to be considered as refereed.

PAPER NO. 83-2580

## FARM IRRIGATION SYSTEM IMPROVEMENT, ABU RAYA, EGYPT

by

Thomas W. Ley

Extension Irrigation Engineer, IAREC, Washington St. Univ.

Prosser, WA 99350

(formerly Res. Assoc., Ag. & Chem. Engr. Dept., Colo. St. University  
Ft. Collins, CO)

Kenneth E. Litwiller

Research Associate, Civil Engineering Dept.

Colorado State University, Ft. Collins, CO 80523

Abdel Fattah Metawie

Research Assistant, Water Distribution and Irrigation Systems Res.

Institute, Ministry of Irrigation

Cairo, Egypt

For presentation at the 1983 Winter Meeting  
AMERICAN SOCIETY OF AGRICULTURAL ENGINEERS

Hyatt Regency, Chicago, Illinois

December 13-16, 1983

**SUMMARY:**

An on-farm water management improvement project which identified problems with farm irrigation methods and practices is described. Suggested problem solutions were field tested, from which a demonstration program for improving surface irrigation evolved. Precision land leveling and level basin design were major components of the program. Improved efficiencies and water, labor and time savings were consistently demonstrated.



## American Society of Agricultural Engineers

St. Joseph, Michigan 49085

Papers presented before ASAE meetings are considered to be the property of the Society. In general, the Society reserves the right of first publication of such papers, in complete form. However, it has no objection to publication, in condensed form, with credit to the Society and the author. Permission to publish a paper in full may be requested from ASAE, 2950 Niles Road, St. Joseph, Michigan 49085.

The Society is not responsible for statements or opinions advanced in papers or discussions at its meetings. Papers have not been subjected to the review process by ASAE editorial committees; therefore, are not to be considered as refereed.

Evaluation of Irrigation System  
Performance - - Economics

by

Melvin D. Skold, Colorado State University  
and  
Ian Carruthers, Wye College

prepared for

Meeting on Preparation of Guidelines

for the

Evaluation of Irrigation System Performance

Water Resources, Development and Management Service  
Land and Water Development Division  
Food and Agricultural Organization of the United Nations  
ROME.

13-16 December, 1983

## ABSTRACT OF THESIS

## A TECHNICAL AND ECONOMIC ANALYSIS OF LOW LIFT IRRIGATION PUMPING IN EGYPT

The need for small, efficient, low lift pumping devices is being recognized throughout the world. Small efficient pumps lifting irrigation surface water 1/2 to 3 meters are needed in many developing countries. Likewise, the need for similar pumps is increasing in the United States with the introduction of tail water pumpback systems. However, little information is available comparing the technical and economic aspects of such pumps.

The technical and economic characteristics of a variety of low lift pumping devices were analyzed. Water wheels and both portable and fixed axial flow pumps were considered. Animal, electric, and fossil fuel drivers were investigated. The analysis was performed specifically for pumping conditions in Egypt where discharges of 14 to 100 litres/sec (220 to 1585 gpm) are required at static lifts ranging from 1/2 to 3 meters. Both the economic costs of pumping based upon international market prices and the on farm pumping costs in Egypt were determined. A computer model was developed to aid in pump selection and to perform the economic calculations.

A six-inch axial flow pump developed by the International Rice Research Institute (IRRI) was found to be the most efficient low lift pump (efficiencies for this pump as high as 70% have been reported) at heads of 1/2 to 3 meters. Data from field tests indicate that discharges range from 46 litres/sec (729 gpm) at a static lift of 1 meter; to 27 litres/sec (427 gpm) at a static lift of 2.8 meters.

The six-inch IRRI pump driven by a 3 horsepower electric motor provided the lowest pumping costs. Where electricity is unavailable, the animal powered water wheel resulted in the least expensive pumping costs. However, if the opportunity time of the farmer's labor is included and the opportunity cost is greater than three cents an hour, the cost of pumping with a diesel powered IRRI pump was less than with the water wheel.

Henry Ridgely Horsey  
Civil Engineering Department  
Colorado State University  
Fort Collins, Colorado 80523  
Fall, 1983