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QUARTERLY REPORT

January 1, 1983 to March 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
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TABLE OF CONTENTS

	<u>Page</u>
I. PROJECT STATUS IN EGYPT	1
II. BACKSTOPPING	58
Planning and Coordinating Committee	
Training	
Equipment	
TDYs	
Work Plans	
III. PERSONNEL	62
Field Staff	
Campus	
IV. APPENDIX	63

ii

I. PROJECT STATUS IN EGYPT

Major emphasis during the past quarter has centered on preparing reports for presentation at a Project workshop to be held May 30 - June 2 in Cairo. It is intended that all Project findings and tentative recommendations developed during the past five years should be presented for critical review by the Project professional staff and invited reviewers. Task groups and field teams are preparing for this event. The agenda is shown in the Appendix.

Following the Workshop it is intended that papers will be prepared for presentation at a national Conference to be held in Cairo in November. This event will be open to the public and it is anticipated that major findings and recommendations will be presented.

Dr. E. V. Richardson, Project Coordinator from the Colorado State University campus, visited Egypt in February and assisted in developing an irrigation improvement plan for consideration by the Egyptian Government as a part of its Five Year Plan. While in Egypt, he consulted with the Minister of Irrigation, the Chairman of the Water Research Center, officials from USAID and EWUP personnel in order to prepare a working draft of a plan which included the major recommendations of EWUP. The draft is presently under review in the Ministry of Irrigation. It is anticipated that it will lead to a proposal to be presented to the President's Cabinet.

During Dr. Richardson's visit technical and financial plans were developed for the last year of the CID - AID contract. Dr. Nielsen and Mr. Braunworth will be returning to the CSU campus at mid-year 1983. At this time the field operations at Mansuriya and Minya will be transferred completely to Egyptian staff. Mr. Litwiller will also move from Kafr El Sheikh to Cairo at that time leaving the Kafr El Sheikh operations in the hands of Egyptian staff. The team leader from Kafr El Sheikh, Engineer Kamal Ezz El Din returns from training at CSU in late May. The staffs at each of the field sites will be under the leadership of Egyptian professionals who are well trained in research and the practical aspects of on-farm water management.

Plans are moving forward to hold an international conference on irrigation management in April 1984. Dr. R.M. McCornen was in Egypt in March to work with the local committee on formalizing final plans. Additional funds will be solicited from the Ford Foundation and UNDP to assist with the cost of bringing foreign experts to the conference. The conference will emphasize the on-farm and branch canal aspects of irrigation management.

Major field work the past quarter consisted of consolidating and refining farmer organizations, land leveling, *mesqa* and open drain cleaning, construction of improved canals and *mesqaas*, construction of a buried pipeline system and experimentation with alternative systems of *marwa* and *mesqa* lining. Routine work continued regarding evaluation of on-farm irrigation systems, collection and analysis of farm record data, collection and analysis of water budget data and collection of sociological data through visits to farmers. Agronomists continued to work on development of crop calendars and the use of crop calendars in analyzing water requirements for specified areas in EWUP field sites.

Assistance was provided to the Irrigation Management Systems (IMS) Project in planning the on-farm water management training this year. EWUP completed its final year of training in 1982. In recognition of the valuable contribution made by this training program to Egypt's irrigated agriculture the Ministry of Irrigation requested that it will be continued through IMS. The Egyptian trainers from last year have been retained to continue this effort and 20 - 30 new trainees will be recruited for this year's training.

Construction of the buried pipeline system at El Hammam progressed adequately early in the quarter but then slowed appreciably. By the end of the quarter progress was discouraging. It is now unlikely the construction will be completed in time to test new irrigation management and scheduling before the CID - AID contract terminates.

Construction of the raised banks of Abyuha Canal is being completed by the Project after the contracting company left the job prematurely. This has not been a serious problem since the construction was far enough along to permit the canal to function according to plan. Unfinished work consists mostly of bank compaction and installation of turn out gates. This work is progressing adequately.

A contract has been let to renovate the 30 *maqaa* served by the Abyuha Canal. Some *maqaa* will be consolidated; roads will be established in place of redundant *maqaa*. During the past quarter considerable emphasis was given to experimenting with locally available equipment, including a road grader, for *maqaa* renovation. Each machine has its limitations and more work needs to be done to improve the process of *maqaa* renovation.

The Egyptian Agricultural Mechanization Project (EAMP) provided four tractors and scrapers equipped with laser controls for land leveling. These units are working on land served by Abyuha Canal as part of the overall improvement plan. This effort promises to greatly accelerate the land leveling at the Minya field site as work continues into the next quarter. EAMP is utilizing this opportunity to train crews and develop an approach to land leveling which is compatible with Egyptian conditions.

In general, task groups and pilot program groups are progressing according to plans. The only major exception is the El Hammami Pilot Program which is delayed due to poor performance by the contractor.

Arbitrary application of regulations by the Egyptian Customs Department have caused continued problems. An air freight shipment containing desk calculators, paper for water level recording instruments and other equipment and supplies has been detained at the airport since March, 1982. Release of recent shipments of other equipment vitally needed to complete Project research reports, has also been held up. Meanwhile, the Customs Department charges storage for these shipments. Recently notice was given by Egypt Airlines Company that two shipments would be sold at auction if not claimed. Continued efforts are being made through USAID and the Government of Egypt to resolve this problem.

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

Task Group

TO	1	On-Farm Water Management
TO	2	Water Distribution Systems
TO	3	Farmer Organization
TO	4	Farm Management and Planning
TO	5	Water Budget
TO	6	Land Leveling
TO	8	Soil Characterization
TO	10	Conjunctive Use of Water
TO	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.

I. Accomplishments and Future Plans for the El-Hammami Pipeline Pilot Program are as follows:

Table 1. Construction progress of the El-Hammami pipeline to March 31, 1983.

	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

1. Work is now proceeding on pumphouse one and two. The pump stands are complete and work is proceeding slowly on the super structures.

Corner stand at the end of Shimmy Branch is complete. The gate stand is nearly complete while work is beginning on the corner stand of line 1.

Approximately 30 'T' connections for alfalfa values have been installed. However, this installation does not include the pipes and alfalfa values as yet.

A test of the Remaily Drain line resulted in a burst pipe which was repaired. The quality of work now being done is better than some of the past work which was rejected. No addition pipe has been laid this quarter.

The dewatering system has greatly helped in the construction process for the stands.

During the closure period in January the contractor constructed the pipe connections between Mansuriya Canal and each of the pump stations.

The work schedule presented in previous quarterly reports has been omitted since the contractor is completely off the schedule.

Problems have occurred in water delivery to farmers during construction. This had had deliterious effects on EWUP-farmers relationships. Weekly meetings are being held with the contractor to push the work and to solve operational problems. Attendance at these meetings by the contractor has been less than satisfactory.

2. On-farm water management data are being collected on several sites. This will continue in the next quarter. This included some conveyance loss tests.
3. The farm record data are being maintained on many sites in the area and will continue. Several new crop enterprise cost studies have been completed as well. Work is being done on farm management surveys.
4. Selected water budget and water quality data are being collected.
5. Further data collection has been done in order to assist in a water management plan for the system.

II. Accomplishments and Future Plans for Beni Magdul, 'aaqa #10, Pilot Programs are as follows:

1. OFWI data continues to be collected.
2. Data collection has included documentation of the farmers' irrigation schedule. This will be continued and be used to evaluate the performance of the new *maaqa*. Data regarding *Maaqa #10* are being prepared for an evaluation report.

III. Special Studies:

- A) The water budget work is being continued in the Beni Magdul area. Full details are reported by the water budget task group.

- B) The cropping sequence studies are continuing in both areas.
- C) The farm record data on numerous sites and the farm management surveys in the Beni Magdul Canal area continue.
- D. On-Farm water management measurements are continuing on *berseem* on *maqa* #6.

We anticipate the following reports to be released in the next quarter:

1. Report on *berseem* irrigation and production on *Maqa* #6, Beni Magdul 1981/82.
2. Report on corn irrigation and production on *Maqa* #6, Beni Magdul Canal 1982.
3. Report of basic engineering data and pipeline construction concepts.

Mansuriya Field Staff

I. Professional

Wadie Fahim	Team Leader	Bill Braunworth	Ass. Team Leader
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 Abel Al	Sociologist	Lotfy Nasr	Economist
Gamal Fawzy*	Economist	Mahmoud Khadr	Agronomist
Tarik Abdel Rahman	Agronomist	Tarif Zeitoun	Engineer

II. Non Professionals

Badry Mahmoud	S. Tech.	Handy El Said	S. Tech.
Ibrahim Hussein	S. Tech.	Gamal Ahmed	S. Tech.
Mervat Mohamed	Secretary	Rokaya Abdel Mawla	Secretary
Ibrahim Abdou	S. Tech.	El Said Kamal	S. Tech.
Ibrahim Zakaria	S. Tech.	Moustafa Mahmoud	S. Tech.
Said Rezk	S. Tech.	Mohamed Abdel Hamid	S. Tech.
Abdalla Abdel Moneim	S. Tech.	El Said Hamed	S. Tech.
Ibrahim Abdel Fatta	S. Tech.	Mohamed Farrag	S. Tech.
Mohamed El-Dash	S. Tech.	Mohamed Shaaban	J. Tech.
Ismail El Shimi	J. Tech.	Abdel Rahman Eid	J. Tech.
Abdel Rahim Mohamed	J. Tech.	Shawky El Awady	J. Tech. Lab.
Abdel Maaboud Ibrahim	J. Tech.	Selim El Tantawy	J. Tech.
Farahat El Ashkar	J. Tech. Lab.	Fathy Abouel Nasr	J. Tech. Lab.
Hamed Aly Tahoun	J. Tech. Lab.	Ahmed Ragab	J. Tech. Lab.
El Shimi Ismail	J. Tech. Lab.		

III. Drivers

Abdel Latif El Tawil
Abu El Ella
Salah Sadek

Mohamed Rezk
Aly Habashy
Nagy Hassan

* Presently in USA for semesters of academic training at CSU.

KAFR EL-SHEIKH

I. Summary of Progress

During the first quarter of 1982, work at the Kafr El-Sheikh EWUP site focused on activities as described below:

1. Routine data collection activities were carried out on all winter season pilot program sites of wheat, sugar beets, and beans. Agronomists assisted farmers in urea and zinc sulfate application. Lifted and applied irrigation water was measured. Observation well and irrometer readings were taken.
2. *Mesqa* cleaning operations were carried out on Manshiya, Hammad and Om Sen *Mesqa*s. Bed level surveys were made to determine the extent of cleaning required. The farmers were organized to carry out the cleaning. Efforts were successful with the exception of Hammad *mesqa* where farmers at the middle of the *mesqa* refused to participate in the cleaning. These farmers are accustomed to irrigate by gravity and are aware that obstructions in the *mesqa* facilitate gravity irrigation.
3. Preparations were made for irrigation one wheat site by using gated pipe. Th site owner has a diesel engine coupled to a centrifugal pump. A local artisan was approached concerning manufacturing an air tight, leak proof connection between the pump and the gated pipe. This was accomplished with a 6 meter flexible hose and several fittings. The fittings, hose, and gated pipe were tested and found to be satisfactory.

Heavy rains during January and February removed the need for irrigation and delayed the used of the gated pipe. After March 22, the test was further delayed by a shortage of water in Hammad Canal.

9. Sociology work included monitoring farmer reactions and opinions concerning the on-farm pilot program work. An evaluation of the 1982 summer season was also prepared.
10. Discussions were held concerning a new emphasis on delivery system work at Dakalt Canal. Estimates were made of manpower needs for surveying all of the *mesqas* on Dakalt Canal. It was suggested that the on-farm work load be reduced to allow the engineers more time to do *mesqa* longitudinal and cross-sectional surveying.

An interdisciplinary proposal for data required for canal improvement was prepared by the main office. The surveying instruments were sent to Cairo for repair. The Kafr El Sheikh team met several times to discuss the role of each discipline in the delivery system improvement process. Collection of socio-economic base survey data from the five cooperatives which serve Dakalt Canal was begun.

11. A 2½ *faddan* cotton site at the tail of On Sen Canal was chosen for summer season 1983 pilot program work. The land was leveled and long furrows were made.
12. Preparations were made for the visit of El Minya farmers and professionals on 6-8 April.

IV. Work Plans for the Next Two Quarters

1. Continue work on Dakalt Canal renovation, including collection of socio-economic data and *mesqa* surveying.
2. Preparations for the summer season 1983 pilot program work will be carried out including site selection and land leveling for cotton, corn and rice crops.

3. Professionals from the various disciplines will determine topics for draft working papers covering the entire EWJP work at Abu Raya.
4. Routine data collection will continue for the water budget.
5. A comprehensive summary report for the summer 1982 on-farm pilot work will be written.
6. Data will be collected and summarized for all disciplines concerning the 1982-83 winter season pilot program.
7. Receive El Minya farmers and professionals. Demonstrate bed making for planting and irrigation cotton and hoeing of cotton furrows between irrigations by donkey plow.
8. Test aluminium gated pipe system on a Hammad wheat site.

II. Personnel Activities

1. Professional Staff

Abdel Fattah Metawie	Team Leader	Ken Litwiler	Ass.Team Leader
Kamal Ezz El-Din <u>4/</u>	Engineer	Amany El-Kayal <u>4/</u>	Engineer
Magdy Awad <u>4/</u>	Agronomist	Ahmed El-Attar <u>4/</u>	Sociologist
Ahmed Ismail	Agronomist	Safaa Fahmy	Engineer
Mohamed I. Meleha <u>1/</u>	Agronomist	Hoda Hussein	Agronomist
Magdi Badawi	Economist	Ragy Darwish	Economist
Sohair Kamal Youssef	Sociologist	Saad H. Zaki	Engineer
Mahmoud Moh. Said <u>3/</u>	Agronomist	Sobhi Elewa <u>4/</u>	Economist

2. Technicians

Hammad Group

Moh. Ahmed Badr
Moh. Omer Abdel Meguid
Kamal Moh. Abu-Omar
Helal Moh. Hussein
Abdou Mostafa Kamel
Abdel Aziz El-Yamany (Oct. only)
Ragab Moh. Shanab (Oct. only)
Gamal Moh. Ali (Oct. & Dec. only)

El-Manshiya Group

El-Said Abdel Hamid
Salah El Sayed Abdel Hafeez
Ahmed Abdel Hamid (Oct. & Nov. only)
Magdy Abdel Hamid (Oct. only)
El-Said El-Said Helal (Oct. only)
Abdel Hamid A. Seif (left in Dec.)
Hamdi Abdel Hady Moh. (Oct. & Nov. only)
Mostafa Moh. Abu-Omar (Dec. only)
Salah Ahmed Badr (Dec. only)
Moheb Abdel Samad EL-Sawy

Water Budget

El-Said Abdel-Salam (Oct. only)
Sabri Mostafa Taha (Oct. only)
Bilal El-Said Metawie (Dec. only)
Ahmed Abdel-Hamid (Nov. & Dec. only)
Ramadan Gazal

Laboratory

Atef Hamed Sayed
Hanaa Ali Said

Equipment & Cars

Alaa Fatouh Ibrahim
Abdel Hamid Sayed

3. Secretary & Administrative

Mohamed Abu Omar	Admin. Assistant
Nadia Mahmoud Arafa	Secretary

4. Drivers

Asel Ahmed A. Aziz
Osama Moh. Sobh
Kamal Saied Talha
Attia Mostafa Abdu
(tractor)

5. Laborers

Saber Ahmed Ismail
Ibrahim Gaid Ahmed
Abdel Raouf Mazal
Mohamed Mostafa Omar
Osman Abdel Rasoul
Ahmed Mostafa Baraka
Ibrahim Moh. El-Besawy
Abdallah Abdel-Hamid
(Nov. & Dec. only)

6. Guards

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

Foot notes (over)

MINYA

I. Summary of Accomplishments

During the first quarter of 1983 work at El-Minya continued to emphasize canal, *mesqa* and road improvement, according to the Master Plan for Unit Area Development, June 1982.

A. Abyuha Canal Pilot Program

1. The contractor terminated his assignment of raising the banks and straightening the Abyuha Canal. Compaction was not adequate and gates were not installed. Unfinished work will be completed by the Project at the contractor's expense.
2. The Irrigation Department installed an iron gate at the Abyuha intake on Ibrahimiya Canal. The gate controls water better than the wooden blocks but there is still considerable leakage during the "off" period.
3. The Chief of The Abu Qorqas Road District was contacted to obtain help in making the road on the left bank of the Abyuha Canal. The Road District will take responsibility for maintaining the road.
4. The irrigation Department used chemicals to control the weeds (horse tail) in the Abyuha Canal.
5. A design for the tail escape of Abyuha Canal was developed. Construction will be done next quarter.

6. According to the team's decision it is intended to operate the Abyuha Canal on a continuous flow basis after installing all the gates and compacting the banks to guard against excessive seepage. The on-off periods will be rotated among the *mesqas* according to the wishes of the farmers and agreement of the Irrigation Department.

Mesqa Improvement

1. A survey and design for renovation of all 30 *mesqas* was completed.
2. A contract was awarded to a company in the MOI for improvement of *mesqas*. It is expected that construction will start in May.
3. The sociologists held meetings with farmers to inform them of plans and to get cooperation for *mesqa* access.
4. Engineers Illsley and Bayoumi conducted experiments on *mesqa* renovation with a road grader. Problems were encountered because the grader is not ideally suited to working in wet conditions with extremely limited right of way.
5. A road was constructed on the border between *Mesqas* #25 and #26. It will be raised further and smoothed during the wheat harvest period.
6. A drain tank for the overflow from a domestic water hydrant was established at Ramadan Village. This provided a good right-of-way for the road.

7. It was agreed by the team to establish turn out gates on *Mesqas* #11 and #14. *Mesqas* #15 and #22 are to be lined. Construction of modified *mesqas* will begin at the first reach of Abyuha Canal where it will be easier to get adequate head at the *mesqa* intake.

C. Land leveling by EAMP equipment

1. Four tractors and scrapers equipped with laser controls have been stationed at the field site.
2. Leveling is in progress under the control of the EWUP staff. It is expected up to 300 *faddans* can be leveled during the wheat harvesting period.

D. Agronomists Activities

1. Farms for cotton and soybean production have been selected on *mesqas* 7 and 26.
2. After leveling the fields long furrows will be established under Project supervision.
3. Exchange of visits between Minya and Kafr El Sheikh farmers has been arranged to promote long furrow irrigation at Minya.

II. Plans for the next quarter

1. Complete installing headgates at the *mesqa* intakes.
2. Complete leveling of units 11 and 13.
3. Contractor should complete *mesqa* modification.
4. Raise the water step by step, in Abyuha Canal.
5. Organize the irrigation rotation by *mesqas*, in consultation with farmers.
6. Install a tail escape on Abyuha Canal.

III. Personnel Assigned to Minya

Professionals

Abdel Raouf Hassan	Team Leader	Erwin Nielsen	Ass. Team Leader
Tim Gates	Eng.half time	Abdalla Saber	Sociologist
Farouk Hassanein	Sociologist	Mohamed Awad*	Agronomist
Ahmed Abdel Naim	Engineer	Nabil Farag	Economist
Esmat Wafik	Engineer	Elia Sorial	Economist

Technicians

Drivers

Laborers

Eman Ebid	Khalaf Moh. Khalaf	Khalaf Saad
Nashat Younis	Farouk Hassan	Kamel Ahmed
Mahmoud Noman	Mohamed Esawy	Hemid Said
Bekhit Nazer		Said Abdel Fattah
Mohy Yehya (resigned Feb.1)		
Mohamed Allah		

* Agronomist Mohamed Awad is at Colorado State University for two semesters of training.

TASK GROUP 1 : ON-FARM WATER MANAGEMENT

Objectives

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

Work Completed During The Quarter

1. The report "The Influence of Land Leveling on Irrigation Efficiency and Management of Irrigation Water" (proposed EWUP Technical Report No. 41) was completed by Tom Ley. The report provides details on the conventional farm irrigation systems at the three project sites and a summary of the problems associated with the irrigation systems identified at each site. a presentation, discussion and analysis of irrigation trials at the three site is included along with a review and analysis of all trials of farm irrigation system improvements.

Precision land leveling and design of long level basins and long level furrows as compared to the conventional systems (small basins) is the focus of the report. Design analyses utilizing the USAID-SCS design models for level basin and level furrow irrigation were performed to illustrate why certain results were obtained.

2. A report "Effect of Land Leveling on the Time and Depth of Irrigation, Application Efficiency and Water Use Efficiency of Wheat" (Draft Working Paper No. 115) was completed by Assia El-Falaky. This report presents the results of the pilot program in Abu Raya, Kafr El-Sheikh Governorate for two successive seasons.

In summary the report concludes that a 32 percent decrease in the irrigation time and a 30 percent decrease in the amount of water applied resulted in fields with EWUP irrigation practices (levelled large basins). The EWUP irrigation practice increased the water use efficiency by 60 percent over that measured for the traditional farmer practices.

3. A section of the report on "Criteria for Determining Desirable Irrigation Frequencies & Requirements and Comparisons with Conventional Frequencies and Amounts Measured in EWUP" was completed by John Wolfe and Mona El Kady. This report presents the current farm practices with respect to intervals between irrigations and amounts applied at each irrigation. A comparison is made of the amounts applied with corresponding measurements of soil moisture depletion or with estimates of consumptive use rates.

A criteria was developed which farmers and farm advisors can use to decide when it is time to irrigate and how much to apply to obtain optimum yields without contributing excessively to the water table. The discussion includes special conditions, such as leaching requirements and winter closure, that may justify irrigating at different times or different amounts than the ideal schedule call for.

Work in Process

1. Seasonal evaluation reports consisting of the farmers' perceptions of the various on-farm practices are being accumulated by the sociologists. These reports will provide the necessary data for the final report focusing on the sociological aspects of introducing on-farm water management practices.
2. A section of the report on the criteria for determining irrigation frequency requirements is being drafted by Moheb Semalka and Dave Redgrave.

Plans for Next Quarter

1. Water use efficiencies and water table positions will continue to be evaluated.
2. A section of the report on the criteria for determining irrigation frequency requirements will be completed by Moheb Semalka and David Redgrave.

3. The farm record summary and analysis reports for each site will be completed by the site economists supported by the main office staff.
4. A report on the impact of on-farm water management on soil properties, water table level and crop production will be drafted by Taher, Assia and Saleh.

Work Cancelled:

Plans for the second phase of the farm management surveys will be by Farouk and Martella.

Future Work Involving TDY Personnel Will Be

1. Final report on the criteria for determining irrigation frequency and requirements.
2. Final report on the evaluation of long furrows and/or basins as compared to small basin irrigation systems.
3. Complete tabulation and reports on farm management surveys, phase one.

Personnel Presently Assigned to the Task Group

Mona El-Kady, Martella, Hanson, Taher, Assia, Semika, Farouk, Layton and Nadia.

TASK GROUP 2 : WATER DISTRIBUTION SYSTEMS

Objectives

1. Prepare and evaluate procedures for designing gravity distribution systems through canals and *masqas*. 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 *mauqas* (lined and/or elevated) and other selected *masqas*. Evaluate the effect of the improvements on seepage losses.
5. Using data obtained in seepage tests, evaluate the aspects of *masqa* maintenance with respect to the efficiency of water delivery.

Activities During the Quarter

Abyuha Area

Tim Gates has completed most of the work on a draft entitled " A Canal System for Gravity Irrigation: Hydraulic Design". This will be presented at the Workshop which commences May 30, 1983.

David Martella, Tim Gates and Jim Layton have completed a report on "Baseline data Requirements for Watercourse Improvement". This report presents the procedures and data that must be considered in developing and evaluating alternative structural and operational designs. The report has been given to Kafr El Sheikh team for use in planning to improve the Dekalt Canal system.

Engineers Bayound and Illsley reconstructed the upper 100 meters of *Manqa* 30 at Abyuha to test the adaptability of an articulated road grader, a "V" ditcher, and project equipment for renovating *Manqas*. From this experience Engineer Illsley reports that *manqa* renovation can be carried out mechanically by use of readily available machinery. No one machine exists that will cope with all the varied problems.

Design information for construction of *manqas* in the Abyuha area has been assembled by Tim Gates and David Martella and presented for preparation for the contract specifications. The award of the contract was made in the latter part of March and construction will commence in April.

El Hammami Area

Construction was almost completed for Pump Stands 1 and 2. Plans have been made to test the parts of the pipelines which have been constructed. Sixty-one percent of pipeline No. 1 and eight percent of pipeline No. 2 remain to be completed.

The hydraulics of the end stand for pipeline #1 was analyzed by W.O. Ree. It is recommended that the stand be constructed according to the original design. When the 0.525 m line for *mesqa* 2 is constructed a reducer will be used to connect it to the 0.35 m pipe emerging from the stand.

Summary of Seepage Tests

Tests were completed this quarter on the original *Mesqa* 10 at Beni Magdul and *Mesqa* 26 at Abyuha. A summary of the test results is presented in the table for comparison with results of tests made earlier on *mesqa* 7 (Abyuha) and El Hammami Canal.

Channel	Seepage Rate lps/sec/100m		Remarks
	Initial	Final	
<i>Mesqa</i> 26 (Abyuha)	2.34 ^{1/}	0.32 ^{1/}	Tests were made by the pond- ing method
<i>Mesqa</i> 7 (Abyuha)	1.28 ^{1/}	0.13 ^{1/}	
<i>Mesqa</i> 10 (Old at Beni Magdul)	0.56 ^{2/}	0.22 ^{2/}	
El Hammami Canal	1.02 ^{3/}	1.00 ^{3/}	

- ^{1/} The estimated depth of the water table was 1 to 1.5 meters below the bottom of the *mesqa*.
- ^{2/} The water was approximately 25 cms below the bottom of the *mesqa*.
- ^{3/} The water table was 10 to 13 cms below the water surface in the canal and approximately 38 cms higher than the bottom of the canal.

Plans for Next Quarter and The Future

Abyuha Area

Construction will continue for the installation of the remaining headgates and the tail escape, after which the water surface in the canal will be raised to the new operating level. The canal will have a continuous flow and rotations will be among *mesqas* according to schedules which will be made to allow for the drying of *mesqas* as they are selected for ongoing construction work.

El-Hammami Area

Work will continue to complete and test the pipelines, and to complete the superstructure for the pumps after which the pumps will be installed and connected to the pipelines.

Kafr El Sheikh

A study of the Dekalt Canal is planned to commence on May 13, 1983 by personnel who have been requested for TDY service as follows:

Tom Ley	May 13 to July 15
Dan Sunada	May 14 to June 10

Their work will be to prepare a report containing design and operational recommendations for improving the timing and water distribution to the *mesqa* and land served.

Personnel Assigned to Task Group #2

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

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* organizations and the canal organization proceeded concurrently with canal-area renovation. There was a

canal organization meeting of *mesqa* leaders in January and plans are made to have such meetings periodically. Each *mesqa* has been visited by the Project sociologists to discuss the progress of the work with the leaders and to plan with the leaders, and hence with the farmers, various activities such as land leveling and experimenting with methods of *mesqa* renovation. The major effort this past quarter has been to work with the leadership of the *mesqa* and the 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: Mesqa #10

The farmers have had an organizational framework established and periodic meetings with the leadership, and others, have been held. This organization is being used for the sharing and scheduling of the irrigations. Discussions with the farmers for the transferring of the operation and maintenance of the *mesqa* from mostly EWUP control to that of the farmers' control have been continuing.

3. Mansuriya: El-Hammami

The work with the farmers is commensurate with the status of the pipeline itself.

4. Kafr El-Sheikh

The farmers on Hammad and Manshiya *mesqa* were organized for cleaning the *mesqas* by the farmers. There were different responses to the work by each *mesqa*. Manshiya's farmers participated completely while some of the Hammad farmers did not cooperate in the program. An evaluation of the reasons for why the difference in the reaction has begun.

B. Documentation of farmer Organization Work

The documentation of the organizational work will follow the six major procedural steps in organizing farmers:

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.

All documentation will result from interviews and observation studies.

1. Accumulated leadership studies (complete for all of the three field sites with continual updating needed).
2. Contacting leadership (same as 1). A questionnaire was developed to find out what are the characteristics of the leaders chosen in the area. The questionnaire will be administered next quarter.
3. Contacting farmers (Same as 1).
4. Establishing the organization.

- Creating the structure of the organization (complete for Kafr El-Sheikh, *Mesqa* #10, and Abyuha).
- Naming the personnel for the organization (same).
- Establishing working procedures for the organization (complete *Mesqa* #10, Kafr El-Sheikh, and developing them in Abyuha).

5. Sustaining the organization.

EWUP interaction (in process for all areas). Documenting how EWUP works with the farmers in the particular organization.

6. Evaluating the organization (to be accomplished in future).

- Performance under the existing structure.
- Performance under the existing procedures.

C. Documentation of the Existing Situation

Efforts for this topic are focused on looking at how the farmers presently work together for particular practices and how other organizations affect the farmers' activities. The major source of this documentation as of now is the system of recording and summarizing farmer's contact records which delineate how the farmers are reacting to various project activities. These records are continually being kept.

Future Tasks For Next Quarter

- A. Developing and Sustaining Farmer Organizations.

1. Minya

Continue with the efforts to make both the *mesqa* and the canal organizations viable entities. Contact with all the leadership group will continue on a periodic basis with special efforts being made in special circumstances. The major concern and emphasis of work will be to involve the farmers in the *mesqa* renovation as much as possible.

2. Mansuriya

Work with the organization on *Mesqa* #10 to take over the new *mesqa*. Develop the El-Hammami organization when the work on the canal deems it appropriate.

3. Kafr El-Sheikh

Evaluate the winter closure cleaning program.

B. Documentation of Farmer Organization Work

Begin to analyze the data which have been collected for inclusion in the final report drafts.

C. Documentation of the Existing Situation

Same as B.

Personnel Assigned

Jime Layton, Farouk Abdel-Al, and Eldon Hanson.

TDY Support this Quarter

Dave Rogers.

TDY Support Next Quarter

Frank Santopolo.

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

- Obtained crop calendar information from El Minya. This completes initial run form each site and allows to continue after the May workshop.
- Kafr El Sheikh crop calendar: finished typing and circulated for review.
- The technical report on accessibility has been submitted to Editor.
- Major effort is being made on irrigation practices for May workshop.
- In conjunction with Task Group #11 and Task Group #5 we started a paper on rotation modification based on farm irrigation practices and collaborated by water budget data and from records.
- Crop Management, Summer 1982. A internal memorandum was completed. This report is a review of the agronomic practices conducted by EWUP in the project sites. It had been submitted for publication.

- Farm record summary and analysis for year 1981/82, study cases for Abyuha, Mansuriya, and Abu Raya Sites was reviewed and published as internal memorandum Draft Working Paper # 102.
- Final technical report on farming system economic analysis, was revised and submitted to be on work processor.
- A farm management survey analysis for El Hammami, *Mesqa* #10 in Mansuriya, and *Mesqa* #26 at Abyuha was initiated during the quarter. This analysis is being carried out by the site economists with assistance of the main office staff. Tabulation of the *Mesqa* #10 data has been completed and the drafting of a working is in process.
- Internal memorandum on enterprise cost studies for summer 1982 is not completed

Plans for Next Quarter

- Complete the project technical report on EWUP crop management studies.
- Complete the internal memorandum on enterprise cost studies for summer 1982.
- Complete tabulation for farm management survey data (1st phase) and run the analysis.
- Continue to keep farm record books with the selected farmers to evaluate the alternative farming systems.
- Continue working on a farm record manual.
- Complete working on a technical report on irrigation practices for years 1979/80 - 1980/81 - 1981/82.

Personnel Presently Assigned to Task Group #4

Farouk, Tinsley, Martella and Naim.

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

Much progress was made toward completing analysis of data for preparation of the report entitled "Water Budgets for Irrigated Regions in Egypt". This report will summarize the following seasonal water budgets:

1. Abyuha - summer 1980, winter 1980-81, summer 1981, winter 1982-82.
2. Beni Magdul - winter 1979-80, summer 1980, winter 1980-81, winter 1981-82, summer 1982.
2. Om Sen - summer 1981, winter 1981-82, summer 1982.

Plans for Next Quarter

Complete preparation of above cited report.

Continue to monitor data collection at each of the Project sites.

Personnel Presently Assigned

Mahmoud Ibrahim, Azza Nasr, Moheb Semaika and Tim Gates

Main Office Support Staff

Iman Saber and Laurette Gouel (P.T.)

Field Professional Staff

A. Abdel Naim (Abyuha), Wadie Fahim (Mansuriya) and Ahmed Ismail (Om Sen).

TDY Staff

W.O. Ree - Engineering, Data analysis.

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 activities this quarter have pertained to objective 3, the assessment of the impact of leveling on on-farm water management. The main effort has been to summarize the data which have been accumulated to date with land leveling in EWUP. Personnel in teams and headquarters have reviewed data with Tom Ley during his TDY service from Jan. 5 to Feb. 18. He has assembled the data and analyses in the following reports:

1. Precision Land Leveling in the Abyuha area, El Minya.
2. The Influence of Farm Irrigation System Design and Precision Land Leveling on Irrigation Efficiency and Water Management (this is to be reviewed and proposed for publication as PTR No. 41).

An earlier report entitled " Precision Land Leveling on Abu Raya Farms, Kafr EL Sheikh Governorate, Egypt" (Dated December 1982) has been reviewed and is being proposed for publications as PTR No. 38.

The trials conducted at the Mansuriya (Beni Magdul) site were of limited success. Special problems were encountered here due to the inadequate size of irrigation streams which were available for the tests.

Generally, the stream size available during irrigation for these trials was too small and variable for the given area to ensure rapid and efficient coverage of the border strips or furrows. Farm size is extremely small and varied in the area. Farmer preference to grow a large variety of crops in small fields has made it difficult to find locations suitable for tests on long borders and furrows.

The ability to perform precision land leveling in the area is limited due to limited access to machinery in these small fields. Measurements from *Mesqa* #6 in Beni Magdul show that farmers do a relatively good job of irrigating using their small basins. In this cases, the effect of unlevel fields is less critical. Thus, it may be that the suggested solutions involving long runs are inadequate for the area due to the numerous constraints. An economic analysis which compares the costs and benefits would assist the decision.

In Minya, irrigation trials on newly leveled land also met with problems, even though there were relatively large irrigation streams available.

The water application efficiency generally declined as the size of stream was increased. This indicates that the time of application was excessive when the larger irrigation streams were used. This demonstrates an important joint that precision land leveling and farm irrigation system design changes are not sufficient in themselves to produce improvements. Management of water is the key factor that must be also considered and farmers must be trained to use the new systems and larger streams.

This is evident on *Mesqa* #26 where improved water delivery provided consistently large available streams. Some farmers using long runs or small basins did equally poorly in managing the large streams.

In Abu Raya, Kafr El Sheikh, the Irrigation trials of precision land leveling and farm irrigation system improvements have been much more successful. Farms are relatively large which has favored the use of large basins. The crop pattern and rotation is relatively orderly, and farm access is not severely constrained. Problems to perform precision leveling have not been so great as in the other team areas. Implementing long runs with level border and level furrow designs in Abu Raya has provided more control in the application of irrigation water than farmers normally have with the large basins of all shapes and sizes.

In this area there was a general increase in water application efficiency with an increase in the size of irrigation streams. The potential benefits of long basins and furrows is realized when efficiency increase with stream size. Large streams per unit area reduce time of irrigation, and high efficiencies reduce volume of water required water.

The benefits of improved efficiency, water savings, labor and time savings have consistently been demonstrated over several seasons. Further improvements to the farm systems such as improvement of *marwan* for better on-farm water delivery and distribution (also significant water savings) and the removal of non-productive open field drains (to increase productive land area) have contributed to the benefits demonstrated. All of these practices have had no adverse effect on water table conditions; and with paddy rice in the two-year crop rotation, improved water management has shown salinity can effectively be controlled.

The results of the trials at each of the three areas indicate that improvement must be based on the local conditions. Where conditions are similar (from farm size to crops to irrigation water delivery characteristics to soils), similar solutions could be feasible over the entire area. In general, practices such as precision leveling and farm irrigation design (level border strips or level long furrows) can save water, time and labor if proper management practices are applied.

With respect to current land leveling activities, plans at Minya have been made with the Egypt Agricultural Mechanization Project (EAMP) to provide laser leveling equipment for an intense program of laser leveling all the land in units 5, 13 and 11 (330 *feddans*). The work will be extended into other areas at time permits. Demonstration leveling with laser equipment was accomplished on approximately three *feddans*. The major effort will be done during the next quarter at which time the harvesting of crops has been completed. At Kafr El Sheikh, two *feddans* have been leveled in March and four more *feddans* will be leveled after the current berseem crop has been harvested.

Plans for Next Quarter

Tom Ley will complete his final TDY report for Minya and Mansuriya. Some revisions will be made to the other reports cited on page 1.

Information will be assembled into a report on "The Role of Land Leveling in Egypt Agriculture". This will be presently at the Workshop during May 30 through June 2, 1983.

On-farm land leveling will be accomplished according to the plans which have been described for Minya and Kafr El Sheikh.

A TDY assignment has been requested for Tom Ley from May 13 to July 15, 1983. Although the major emphasis of this work will be on improving operations and scheduling of the Dakalt Canal, some land leveling considerations will be involved.

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

1. An internal memorandum (DWP) on Water Management of Egyptian Vertisols was submitted to the technical editor.
2. Internal memorandum (DWP) on Problems of Irrigation vertisols in Egypt is finally revised and will be submitted to the technical editor very soon.

Plans for Next Quarter

Following up our task group activities and work on preparing the technical reports for the Final Report. We are also expecting TDY assistance from R. Hill.

Personnel Presently Assigned

Taher, Tinsley, Assia and Somajka.

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 Accomplished During The Quarter

1. Analysis of monthly water samples from canals, drains and wells from the three project sites is going on up to that time.
2. A paper on the Water Quarterly based on a year data is proceeding to be prepared. In this paper the suitability of the different sources of water for irrigation will be classified according to their content of soluble salts, SAR, boron content and residual sodium carbonate. The monthly variation in the compositive of ground and drainage water will be discussed in relation to irrigation water composition, soil properties and the pattern of the growing crop.

Personnel Presently Assigned

Assia, Hansori, Taha and Ikram.

TASK GROUP 11: IRRIGATION ADVISORY SERVICE

The Irrigation Advisory Service (IAS) component of Task Group #4 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 delineated. From these two areas of analysis, the objectives of the task group have been created and the work activities have been designed.

Objectives

1. Make explicit provisions for providing the technical advice and assistance to farmers and farm organizations served by the pilot studies which will at least:

Provide technical advice and assistance to the individual farmer on irrigation practices and systems by cooperating with the existing extension service, village cooperative, and farmer organization. Provide technical advice and assistance to the farmer organizations, which will be needed if the farmer organizations are to be successful, on expected water requirement, irrigation scheduling, maintenance of *mesqas* and drains, etc.

Establish the responsibility for specifying the nature of and the person responsible for providing the technical assistance for each pilot study.

2. Develop criteria and procedures for establishing a country-wide IAS. To define what should be the purpose and parameters IAS. To delineate how an IAS is to be organized in terms of its of an personnel, administrative structure, procedures and progams.

To examine how the IAS is to be integrated into the existing institutional structure, i.e., what role will this service play in terms of other organizations.

To examine the preparatory and training aspects of the staff members for this advisory service.

Tasks Completed

- Evaluation studies of the Kafr El-Sheikh work in terms of interacting with the farmers have been completed and are now starting to be analyzed in terms of the task group objectives.
- 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.
- A questionnaire designed to provide the information to complete objective two has been received from Dr. Ed Knop (TDY) and is now being readied for administering next quarter.
- That questionnaire has been translated into Arabic. It will be pre-tested and then administered in Kafr El Sheikh and Minya.

Future Tasks for Next Quarter

- The questionnaire designed by Dr. Knop is to be administered and analysis of the data will begin in the summer.
- Analysis of the evaluation studies in Kafr El-Sheikh and of the special study on *Mesqa* #10 will be continued next quarter. Completion of these analyses will be done for inclusion in the final report.
- Analysis of the contact records describing the Project's efforts in implementing the various programs will continue.

Personnel Presently Assigned

Jim Layton--Coordinator, Moheb Semalka and Gamal Ayad.

TDY Support this Quarter

None.

TDY Support Next Two Quarters

Ed Knop and Frank Santopolo.

TRAINING

During the past quarter the training component of EWUP was involved in two major activities:

1. Assisting the IMS Project to take over the on-farm water management training course.
2. Completion of the tour to the United States for OFWM trainees.
3. Salt River Project - Ministry of Irrigation Exchange.

At present there are eight professionals training abroad. They are:

Gamal Fawzy, Economist, Colorado State University.
Kamal Ezz El-Din, Engineer, Colorado State University.
Mohamed Awad, Agronomist, Colorado State University.

Amany El-Kayal, Engineer, Utah State University (Peace Fellowship).

Mohamed Nabil Naguib, Bari Institute, Italy (Italian Government Fellowship).

Magdi Awad, Agronomist, Colorado State University.
Ahmed El-Said El-Attar, Sociologist, Colorado State University.

Two Egyptian engineers returned from eight weeks of training with the Salt River Project at Phoenix, Arizona. They are :

Eng. Ibrahim Ismail Mohamed GAD.
Eng. Esam Menoufy Mohamed.

Two American engineers from the Salt River Project returned to the United States from six weeks in Egypt. They worked with irrigation engineers at Giza Irrigation District from Oct. 13 to Nov. 24, 1982. These Americans are :

Don Womack.
Sid Friar.

In addition to the above activities an English class was conducted by Laura Litwiller for eight Egyptian staff members by EWUP. The training officer, Dr. Layton, arrange for English classes and examinations for 19 EWUP staff members during the quarter.

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 March 31, 1982.

Hassan Wahby	Project Director
Gene Quenemoen	Technical Project Director
Farouk Abdel Al	Economics Discipline Leader
David Martella	Economics Disc. Counterpart
Ahmed Maher	Deputy Institute Director
Gamal Ayad	Senior Economist
Ahmed Taher	Agronomy Disc. Leader
Richard Tinsley	Agronomy Disc. Counterpart
Mohamed Abdel Naim	Senior Agronomist
Assia El-Falaky	Senior Agronomist
Hamed Saleh (33% time)	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
Yousria Allam (50% time)	Sociologist
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
Mohamed Ahmed Salem
Mohamed Saïl El-Shatter
Salah El-Din Salem
Sayed Sakr
Zeinab Abdel Ghany
Ekhlas Abdel Ghaffar
Magda Yassin Mahmoud
Ashgan Abdel Zaher
Bamba Shaarawy
Iman Abdel Gaber
Maher Attallah
Abdel Naby Youssef
Ahmed Soliman Abdallah
Ahmed Ibrahim
Saïd El-Saïd Elwi
El-Araby Mansour Shahin
Imam Sayed Washba
Osman Shaker
Shaaban Mohamed Abdou
Ahlam Abdel Rahman
Taha Moustafa
Ikram Mohamed 1/
Ahmed Ghanem
Abdalla Gad
Ahmed
Moustafa Mahmoud Mahran
Saad Mansour
Nawal Abdallah Ahmed
Magda Moh. Mahrous
Mala Mokhtar Awad
Mervat Hassan
Hannan Samuel
Mary Halim
Hamdi Ahmed Hamdi

Engineer - Water Requirements
Senior Adminis. Personnel
Senior Adminis. Expeditor
Junior Adminis. Secretary
Junior Adminis. Storekeeper
Junior Adminis. Inventory
Junior Adminis. Secretary
Junior Adminis. Arabic Typist
Junior Adminis. Photocopier
Junior Adminis. Photocopier
Junior Adminis. Accountant
Junior Tech. Mechanical Work
Techn.-Mechanical, Motor Pool
Techn.-Mechanical, Motor Pool
Junior Administrative, M.P.
Junior Administrative, M.P.
Junior Technician, Electrician.
Technician
Junior Admin.
Telephone Operator
Junior Admin. Accountant
Eng.-Water Laboratory
Eng.-Water Laboratory
Techician-Water Lab.
Techician-Motor Pool
Guard-M.P.
Electrician-M.P.
Management Ass. for Finance
Accountant - Main office
Ex. Secretary - Main Office
Secretary - Main Office
Secretary - Main Office
Secretary - Main Office
Editor - Main Office
Translator- Main Office

1/Leave without pay

PUBLICATIONS REPORT

Publications are being turned out at a rate of 3 Technical Reports (or 4 Draft Working Papers) per month, including their editing, typing, proofreading & corrections, printing and covering. Any delay that happens is mainly attributed to the overcrowding of printshops at certain occasions or seasons of the year.

The reports are now written on the "Word Processor" which is a real help in making all the necessary changes in a very clean and tidy manner. Besides, the right margin is adjusted, the titles are written in black print and the tables are very nicely arranged.

Concerning the covers of the Technical Reports, it was decided to return once more to the original green covers that were previously used. We managed to print them in Egypt and they proved to be less expensive than the "Fabriano" grey covers currently used.

Correspondence with F.C. is now taking place through Mr. Henry Horsey and we finally succeeded to agree upon a standard format to be used in all EWUP papers, whether produced in Cairo or in F.C.

The process of distribution of Technical Reports has also become a very easy job thanks to the Word Processor, where all the distribution letters are recorded on a special disk and can be printed at any time upon request, by changing only the name of the report.

The following publications were put out by the project during the months of October - December: (N.B. An updated list of publications is always available in the Editorial Office upon request).

PROGRESS REPORT

I. Draft Working Papers (DWPs)

No.	Title	Remarks
DWP # 103 DWP # 104 DWP # 105	 To be Assigned. 	Not yet submitted to Editorial Office
DWP # 110	Kafr El-Sheikh On-Farm Pilot Program (1981/82 Winter Season). By EWUP KES Team.	Typed and ready for printing
DWP # 111	El-Hammami Irrig. Delivery System, And Actions for Improvement. By Mona El Kady & Eldon Hanson	Needs Review
DWP # 113	To be assigned	Reserved by Agronomy Discipline. Not yet submitted to Ed. Office
DWP # 114	Water Management of Egyptian Vertisols. By A.Taher, and R. Tinsley	Delivered to Ed. Office on 1.31.83
DWP # 115	Effect of Land Leveling on Time and Depth of Irrig., Application Eff. and Water Use eff. of Wheat. By Assia El-Falaky.	Complete and distributed on 4.7.83

(cont.)

I. Draft Working Papers (DWPs)

No.	Title	Remarks
DWP # 116	Corn Irrig. & Production on #6, Beni Magdul Canal, Mansuriya District Egypt 1982. By Sabah Mahmoud & W.S. Braunworth	Circulated for approval on 3.6.83. Approved by all Discipline on 4.11.83
DWP # 117	Berseem Irrig.& Production #6, Beni Magdul Canal, Mansuriya District Egypt, 1981-82. By M. Khidr, Sabah Mahmoud & W.S. Braunworth	Submitted to Ed. Office on 4.11.83

II. Project Technical Reports (PTRS)

No.	Title	Remarks
PTR # 14	The Challenge of Implementing an Irrig. Program in an Egyptian Village (Organization Development and leadership Training Needs in EWYP). By J. Mayfield, M. Naguib	With Author for making the necessary changes
PTR # 16	Irrigation System Improvement by Simulation and Optimization, I. Theory, II. Application. By J. M. Reddy, W. Clyma	to be processed in F.C.
PTR # 17	Optimal Design of Border Irrig. Systems. By J.M. Reddy & Clyma	To be processed in F.C.
PTR # 18	Population Growth and Development in Egypt: Farmer's and Rural Development Officials' Perspectives. By E. Knop, S.Knop	With author for final review
PTR # 21	El-Hanmami Pipeline Design By Sherith.	To be processed in F.C.
PTR # 25	Problem Identification Report for El-Minya. By Royal Brooks.	With Dr. Nielsen for technical review
PTR # 27	Alternative Approaches in Extension & Rural Development Work: An Analysis of Differing Perspectives. By Salam, E.C. Knop	With author for revision

No.	Title	Remarks
PTR # 31	Analysis of Farm Management Data From The Abyuhia Project Site. By Elia Sorial, M. Skold, R. Rehnberg, Gamal Ayad and P. Abdel Al	Economics Discipline for incorporating comments
PTR # 32 (from DWP # 94)	Accessibility of EWUP Pilot Sites.	With editor for review
PTR # 33	Soil Survey of Abyuhia Area. By Abdel Wahed Selim, M. El-Hamal, M. H. Assal.	Complete
PTR # 34	Soil Survey For Abu Raya Area. By Abdel Wahed Selim, M. A. El-Hamal, and M. H. Assal.	Complete
PTR # 35	Farm Irrig. System Design, Kafr El-Sheikh, Egypt. by EWUP Kafr El-Sheikh Team.	Reviewed and sent to P.C.
PTR # 36	Discharge and Mechanical Efficiency of Egyptian Waterwheels. By Slack, Wahby, Clyna.	Printed in P.C.
PTR # 37	Allocative Efficiency And Equity of Alternative Methods of Charging For Irrig. Water: A Case Study In Egypt. by R. Howen and R. A. Young.	Reviewed & sent to P.C. on 12.19.82

II. Project Technical Reports (PTRS)

No.	Title	Remarks
PTR # 38	Precision Land Leveling on Abu Raya Farms, Kafr El Sheikh , Egypt By T. Ley	Circulated for approval. Appendix B was approved to be a separate manual (#5).
PTR # 39	On-farm Irrigation Practices For Winter Crops at Abu Raya. By A.P.Metawie, N. L. Adams, Tarek Tawfik	Incomplete as a Technical reports. Needs rework by the authors
PTR # 40	A Procedure for Evaluating Crop Growth Environments for Optimal Drain Design. by Durnford, Richardson, Poemore	Opinions are still Contradictory as to its being issued as a PTR.
PTR # 41	The Influence of Farm Irr. System Design and Precision Land Leveling on Irrig. Water Management. By Task Group 1 & others	Circulated for approval on 3.31.83

I. Draft Working Papers (DWP)

None

- DWP # 102. Farm Record Summary and Analysis For Study Cases at Abyuha , Mansuriya and Abu Raya Sites (1981-82). By EWUP Economics Team.
- DWP # 106. Beni Maghul Crop Calendar (1980-81). By Salah Mahmoud & Gamal Fawzy.
- DWP # 107. Root Penetration Evaluation of 1982. Winter Crops in Abu Raya, K.E.S. Governorate. By M. Meleha.
- DWP # 108. Day/Night Irrigation Timing Preference of On Sen Farmers (Summer 1981). By A.F. Metawie, K.E. Litwiller.
- DWP # 109. Farm Machinery : Activity Report. By A. Bayoumi & N. Illsley.
- DWP # 112. A Comparison of the Cost of Picking Cotton to the Value of Cotton. By Sobhi Elewa & Ragy Darwish.

II. Project Technical Reports (PTRs)

- PTR # 33. Soil Survey Report for Abyuha Area, Minya Governorate. By Abdel Wahed A. Selim, M.A. El Nahal, M.H. Assal.
- PTR # 34. Soil Survey Report for Abu Raya Area, Kafr El Sheikh Governorate. By Abdel Wahed A. Selim, M.A. El-Nahal, M.A. Assal, F. Hawala.

III. Manuals

None

III. Manuals

No.	Title	Remarks
Manual # 6	Programs for Calculators HP - 67 and HP-97	Reviewed and ready for printing

II. BACKSTOPPING

Planning and Coordinating Committee

Committee members worked on the training programs for Egyptian professionals who are taking non-degree graduate training, attended weekly meetings to plan project activities, reviewed and worked on reports, discussed work plans with the TDY's, provided orientation to Egyptians taking part in the U.S. training programs and backstopped the discipline needs for the Egyptian and American staff in Egypt. Additionally, the committee members have been helping plan the upcoming workshop, and National and International Conferences on farm water management.

Dr. Mel Skold has been working with Eng. Gamal Fawzy on a report on Egyptian Farming Systems for Task Group 4.

Tom Ley continued his analysis of the impact of precision land leveling on farm water management. He also compared the data collected on the improved farm irrigation methods tested by EWUP (long level basins and furrows) with the conventional methods farmers use. "The Influence of Farm Irrigation Efficiency and Irrigation Water Management," was significantly expanded. "Precision Land Leveling in Abyuha Area, El Minya: A Summary Report" was written and sent to Cairo. PTR #38 "Precision Land Leveling on Abu Raya Farms, Kafr El Sheikh, Egypt" is being revised to incorporate the suggestions of reviewers. PTR #35 "Farm Irrigation System Design, Abu Raya, Kafr El Sheikh" is being printed and distributed.

Henry Horsey continued an investigation of canal lining techniques and costs. He is completing a report on the technical and economic aspects of various low lift pumping devices. Horsey has been directing the Fort Collins publication activities of the project. He has also been involved in developing training programs for the short term trainees.

Training

The following trainees took these courses spring semester:

<u>NAME</u>	<u>COURSES</u>	<u>CREDITS</u>
Agronomy Magdi Awad	AG470 Soil Physics	3
	AG471 Soil Physics Laboratory	1
	AG666 Salinity and Soil-Water Mgmt	3
	AG564A Chemical Analysis-Saline and Sodic Soils	1
	GS670 Inter. Agricultural Development	3
	AG795 Independent Study	4
Agronomy Mohamed Awad	AG470 Soil Physics	3
	AG471 Soil Physics Lab	1
	AG666 Salinity and Soil-Water Mgmt	3
	AG564A Chemical Analysis-Saline and Sodic Soils	1
	GS670 Inter. Agric. Development	3
	AG370 Irrigation	NU

Economics			
Gamal Fawzy	EA505	Agricultural Production Economics	3
	EA510	Agricultural Marketing	3
	GS670	Interdisciplinary Agric. Development	3
	EA695	Independent Study	1
	EA540	Agricultural Finances	AU
	EC542	Econ. Analysis of Water Development	AU
Engineering			
Kamal El Din	CE615	Open Channel Flow	3
	CE544	Water Resources Planning	3
	CE514	Hydraulic Structures	3
	GS670	Interdisciplinary Agric. Dev.	3
	AG370	Irrigation	3
Sociology			
Ahmed El Attar	S 210	Intro. to Social Research	3
	AD629	Program Development	3
	PR600	Research Methods	2
	S 795	Independent Study	
	AD620	Processes and Methods	3

1. Special Program (Short Courses)

Engineer Amany El Kayal, is completing her M.S. degree program at Utah State University under a Peace Fellowship.

2. Salt River Project Exchange

Ibrahim Ismail Mohamed Gad and Essam Monofie Sheikh spent February 20 to April 1, 1983 working and training at the Salt River Project at Phoenix, Arizona. Prior to the time in Phoenix they spent a week in Fort Collins in orientation and participating in a study tour of Colorado irrigated agriculture. They also took a study tour of irrigation districts in Western Arizona and Southern California. The itinerary for the two men at the Salt River Project is in the Appendix.

Engineers Don Womack and Sid Friar from the Salt River Project spent the period March 9 to April 20, 1983, working as exchangees in Egypt for the Ministry of Irrigation.

Equipment

The laboratory equipment for determining soil permeability was shipped on March 24, 1982.

The HP 41 CV calculator system was sent with Tim Gates.

Wind speed and wind direction recorders have been received and checked. They will be sent soon.

The bids for the diesel generator set for El Hammami pumping plant were received. General mode' SD030 was ordered. The unit shall be ready for shipment 8 weeks after the company receives the order.

Two slave drive units for the HP 9825T desktop computer systems have been ordered but not received.

The balance of equipment and supplies for El Hammami pumping plants have been sent. The remaining tools and equipment necessary for installation and checkout will be hand carried.

Repair parts for the C-2 current meter have been ordered.

Spare projection lamps for all of the different types of projectors have been sent with TDY's.

TDY's

The following people were in Egypt TDY this quarter:

Dr. John Wolfe, Enging wanuary 19, 1983 - March 30, 1983) assisted in writing reports for Task Group 1. Reviewed reports of irrigation activities in the three project areas and wrote criteria for determining irrigation frequency and irrigation requirements. Reviewed a semi final report comparing the results of long furrow and border irrigation with the conventional small basin irrigation practices.

Dr. Richard McConnen, Economist (March 1, 1983 - March 25, 1983) to draft the economic criteria for evaluating a computer program to be used in designing and evaluation of watercourse improvements. He will also assist in writing the report of Task Group #2.

Dr. Wendell Gwinn, Engineer (March 9, 1983 - June 4, 1983) to write a report on construction, operation and maintenance of the Abueha Canal System.

Dr. Dave Redgrave, Agronomist (March 3, 1983 - April 29, 1983) to work with Dr. Taher and others on the water depletion report for Kafr El Sheikh.

Mr. Bill Ree, Engineer (March 16, 1983 - May 30, 1983) to assist Task Group 5 analyze and prepare water budget reports.

Mr. Tom Ley, Engineer (January 5, 1983 - February 18, 1983) to write reports pertaining to engineering aspects of the following activities in the task groups indicated a) evaluation of the impact on farm water management of land leveling for 1) modifying the field layout and topography 2) utilizing large irrigation streams to save irrigation time and water 3) eliminate drains and meskas (Task Group 6) b) evaluation of irrigation by long furrows or basins as compared to conventional irrigation of small basins (Task Group 2).

Dr. E. V. Richardson, Project Coordinator (February 7, 1983 - February 28, 1983) to assist with project management including plans for equipment orders, allocation of funds to Egyptian pound account, and the project workshop in May.

Dr. Don Lybecker, Economist (February 3, 1983 - March 10, 1983) to work on a technical report dealing with the economics of farming systems at the three EMUP field sites. In addition he will assist with writing a report on a comparative analysis of EMUP farm records through time.

Dr. David Rogers, Sociologist (January 23, 1983 - February 8, 1983) to assist Task Group 3, Farmer Organizations prepare reports concerning the analysis of the leadership surveys at the three field sites. Produce a draft report on the attitudes of rural leaders in the pilot programs underway at field sites.

Mr. Sid Friar, SRP (March 9, 1983 - April 20, 1983) to increase the professional competence of the participants by an exchange of literature, information and on the job training relative to irrigation problems and practices in Egypt and USA. Exchange between SRP and MOI.

Mr. Don Womack, SRP (March 9, 1983 - April 20, 1983) to increase the professional competence of the participants by an exchange of literature, information and on the job training relative to irrigation problems and practices in Egypt and USA. Exchange between SRP and MOI.

Work Plans

Advisory service will be provided to the Egyptians studying at Colorado State University. Arrangements for a study tour for these students will be completed.

Short courses, and special study programs for the summer Egyptian trainees will be arranged.

Planning will continue on the National and International Farm Water Management conferences. These conferences will be held in Cairo in September 1983 and Spring 1984 respectively. Members of the Planning and Coordinating Committee members will attend the project workshop in Cairo at the end of May. The project workshop will review the project activities to date and help to focus the projects goals in this next year.

The Planning and Coordinating Committee will continue to work on recommendations to the MOI on the National Irrigation Improvement Program.

Project reports will continue to be written, reviewed, finalized, printed, and distributed.

Dr. McConnen will continue to work on water pricing.

The Consortium for International Development will review the project at its board meeting in July. It is hoped that Dr. Wahby will be present during this review.

The Salt River Project exchange will continue with two Egyptians going to Phoenix and two Americans traveling to Cairo next fall. Four members of the Salt River Project will travel to Cairo in May to conduct a Mid Project review. While there they will also consult with the Ministry of Irrigation on the development of a second phase of the exchange program.

III. PERSONNEL

Field Staff

No change

Tim Gates and Eldon Hanson were on home leave during this quarter.

Campus

The following people will be in Egypt TDY next quarter:

Den Sunada	5/16/83 - 6/11/83
Bill Shaner	5/26/83 - 6/11/83
Wayne Clyma	5/24/83 - 6/10/83
George Radosevich	5/24/83 - 6/11/83
John Andrew	5/8/83 - 8/1/83
Ed Kirdar	5/24/83 - 6/2/83
Marcel Boulais	5/24/83 - 6/2/83
Robert Mason	5/24/83 - 6/2/83
Jack Pfister	5/24/83 - 6/2/83

APPENDIX

January 1, 1983 to March 31, 1983

ITINERARY FOR EGYPTIAN EXCHANGE PARTICIPANTS

Mr. Hassan El Attafie

Mr. Essam Monofie Sheikh

February 19 - April 3, 1983

Ahlan Wa Sahlan - Welcome

Guests will be staying at:

**Spanish Oaks
4221 E. McDowell Rd.
Phoenix, Arizona**

Room _____

Saturday, February 19 - Water Staff

10:30 AM	Don Davis	Pick up guests at airport
11:30	"	Check into apartment Remainder of day free

Sunday, February 20

Weekend Free

Monday, February 21 - Water Staff

8:30 AM	Don Davis	Pick up guests
8:45	"	Orientation film
9:30	"	Overview of program Questions and answers
10:00	Jim Gardner	Tour Interactive Drafting & Design
11:15	Don Davis	Tour Administration Building History Center
11:45	Don Davis	Lunch - Cafeteria
12:45 PM	Jim Birt	Tour Files & Reproduction
1:45	Reid Teeples	Welcome to SRP Room 1209
3:00	Milt Rouss	Pera Club
4:00	Don Davis	Familiarization to Valley Questions & Answers
4:45	Don Davis	Return Guests

Tuesday, February 22 - Water Construction & Maintenance

7:30 AM ^{HARRY LEVINGER} Bryan-Brooks Pick up guests. Tour Roosevelt Dam facilities and the typical construction and maintenance activities done by our forces

3:30 PM " Return guests

Wednesday, February 23 - Water Operations

8:30 AM	Bob Hensley	Pick up guests
8:45	Sid Friar	Overview of Water Operations Dept.
10:00	"	Discuss Water Operations mission and functions, amount of water delivered, summer demand, Table of Organization, Budget, Questions and Answers
11:00	"	Lunch
12:00	Bob Hensley	Brief tour of Association Dispatch Center (ADC) - overview of transmission system, supervisory control, communication equipment and responsibilities
1:00 PM	"	Travel to Granite Reef Dam - Discuss river and transmission system
4:30	Bob Hensley	Return guests

Thursday, February 24 - Information Systems

8:30 AM	Will Munsterman	Pick up guests
8:45	Phil Sawyer	Instruction in data processing concepts, including hands-on exercises on CRT. Tour Data Processing.
12:00	Will Munsterman	Lunch
12:30 PM	"	Instructions on how present data processing applications are maintained. Demonstrations and tours of terminals in use.
4:30	"	Return guests.

Friday, February 25 - Water Construction and Maintenance

7:30 AM Dennis Erickson Pick up guests and return to PAB

7:45 Ron Merkley Discuss in detail:
Water C&M mission and function
Operation & Maintenance (O&M) Budget
Key Indicators

9:45 " Discuss in detail:
Storm Control responsibilities
Table of Organization and Manager's
responsibilities, and staff
responsibilities

10:30 Dennis Erickson Take guests to Southside C&M to begin
training program

11:00 Tom Bawden Greet guests and introduce to
Southside staff

Review of Southside C&M's mission and
function regarding maintenance of
canals, laterals, drainage ditches,
etc.

11:30 " Lunch

12:30 PM Eddie Arnold Review manpower and equipment needs for
construction and maintenance
at Southside C&M

2:00 " Return guests

Saturday and Sunday February 26-27

Weekend Free

Monday, February 28 - Water Construction and Maintenance

7:30 AM	Wes Farley	Pick up guests and return to Southside C&M
8:00	"	Review maintenance Areas 4 and 5
9:00	"	Tour equipment and yard and various applications of equipment
		Tour precast yard and observe setup and pouring techniques
10:15	"	Field trip to observe typical irrigation repairs and various cleaning operations
11:30	"	Lunch
12:30 PM	"	Continue maintenance tour
2:00	"	Return guests

Tuesday, March 1 - Water Construction and Maintenance

7:30 AM	Dave Derka	Pick up guests and return to Southside C&M
8:00	"	Field trip to observe typical irrigation construction projects. Exposure to men and equipment used to perform the work
11:30	"	Lunch
12:30 PM	"	Continue field trip to observe typical irrigation construction jobs
2:00	"	Return guests

Wednesday, March 2 - Water Construction and Maintenance

7:30 AM	Winn Winkyaw	Pick up guests and return to Water C&M (Crosscut)
7:45	"	Overview of Weed Control Program (Aquatic and Terrestrial) Review weed spray training program.
9:45	"	Review all chemicals used and method of application
11:30	"	Lunch
12:30 PM	"	Visit field locations where weed problems are evident, and areas where maintenance results can be seen. Observe canal mowing operations
2:15	"	Return guests

Thursday, March 3 - Water Construction and Maintenance

7.00 AM	Winn Winkyaw	Pick up guests and travel to maintenance division (Southside or Western)
7:30	"	Observe the mixing of chemicals in spray trucks. Explain the different mixes, the expected results, and proper storage of chemicals.
10:15	"	Familiarize them with spray trucks and observe spraying operation
11:30	"	Lunch
12:30 PM	"	Visit Acrolein demossing site. Observe setup procedure and equipment requirements.
		Observe results of demossing from previous applications
2:15	"	Return guests

Friday, March 4 - Water Construction & Maintenance

7:30 AM	Winn Winkyaw	Pick up guests
8:00	"	Visit site where fish are being used for moss control in canal system
11:30	"	Lunch
12:30 PM	"	Return to Crosscut Office and tour Chemistry Lab operation and observe testing programs
2:15	"	Return guests

Saturday and Sunday, March 5-6

Weekend Free

Monday, March 7 - Special Studies

8:30 AM	Ed Kirdar	Pick up guests
8:45	"	Overview major functions of Special Studies Group including Central Arizona Project (CAP) and Central Arizona Water Control Study (CAWCS) Plan 6 objectives and operations. This will be accomplished by utilizing video tape, slides and maps.
10:45	"	Visit Salt-Gila Pumping Plant and the CAP Aqueduct construction. Lunch in route
2:30 PM	Tom Sands	Overview of computer applications related to Special Studies that includes HEC-5R and SRPSIM computer programs
4:30	"	Return guests

Tuesday, March 8 - Water Construction and Maintenance

7:30 AM	Tom Frost	Pick up guests and travel to Groundwater/Building C&M
7:45	Paul Peters	Greet guests and introduce to office staff Review Groundwater/Building's mission and function Overview of deep well pump operations
8:30	John Biggs	More detailed review of wellsite maintenance and operation program
10:30	Leon Johnson	Field trip to observe typical wellsite and maintenance and/or construction Review canal structure maintenance program
11:30	"	Lunch
12:30 PM	"	Observe automatic trash rack in operation Visit Filter Plants on SRP canal system
2:15	"	Return guests

Wednesday, March 9 - Civil Engineering

8:30 AM	Alex Richards	Pick up guests - Department Introduction
9:00	"	Overview of Water Civil Division
10:00	Bob Larchick	Transmission Design Bridge Design Canal Lining Design Radial Gates Design Lateral Headgate Design
4:30 PM	Bob Larchick	Return guests

Thursday, March 10 - Navajo Generating Station

6:30 AM	Don Davis	Pick up guests
7:00	SRP Airplane	Leave Sky Harbor Airport
8:40	Jerry Jones	Arrive Page, Arizona
5:10 PM	SRP Airplane	Leave Page, Arizona
6:50	SRP Airplane	Arrive Sky Harbor Airport
7:00	Don Davis	Return Guests

Friday, March 11 - Civil Engineering

8:30 AM	Alex Richards	Pick up guests
9:00	Joe Kissel	Broadcrested Weir Design (Trip to weir site or Water Conservation Lab)
4:30	"	Return guests

Saturday and Sunday, March 12-13

Weekend free

Monday, March 14 - Civil Engineering

8:00 AM	Art Moore	Pick up guests
8:30	" "	Quality Control (Arrange field trip to observe compaction testing, concrete tests, concrete pipe testing, etc., as activities are available)
12:00	"	Lunch
1:00 PM	Jim Reiman	Distribution Design Pipeline Design Criteria Lining Design Criteria Structure Design Criteria
4:00	"	Return guests

Tuesday, March 15 - Water Construction and Maintenance

7:45 AM	Mike Francis	Pick up guests and return to Western C&M
8:30	Phil Gaiser	Greet guests and introduce office staff Review Western's mission and function Provide overview of program at Western
10:15	Bill Bobb	Discuss maintenance Areas 1, 2, and 3 Cover Foreman's responsibilities Cover crew makeup and type of work performed by each Discuss the types of equipment and their uses Storm conditions and duties Tour maintenance yard and shop
11:30	"	Lunch
12:30 PM	Larry Harding	Review, coordination required with irrigation operations Observe vector jet cleaning operation, if possible. If not, observe typical repair and machine cleaning operation
2:00	"	Return guests

Wednesday, March 16 - Water Construction and Maintenance

7:45 AM	Mike Francis	Pick up guests and return to Western C&M
8:30	Jack White	Brief overview of how we get our construction work and coordinate dryups, etc. Visit various construction projects
11:30	"	Lunch
12:30 PM	"	Continue tour of construction activities
2:00	"	Return guests

Thursday, March 17 - Water Construction and Maintenance

7:45 AM Charlie Nelson Pick up guests and continue on to Horseshoe and Bartlett Dams. Tour dam facilities and our typical construction and maintenance programs normally done by our forces.

2:00 PM " Return guests

Friday, March 18 - Water Operations

8:30 AM	Ron Grosch	Pick up guests
9:00	"	Review organization structure and mission
10:00	"	Supervisory system operation
11:00	"	Control room operation
12:00	"	Lunch
1:00 PM	"	Field tour at 2-4.1, 2-0 and 1-3
2:00	"	Field tour at Indian Bend
3:00	"	Review of day - Questions & Answers
4:00	"	Return guests

Saturday & Sunday, March 19-20

Weekend Free

Monday, March 21 - Water Operations

8:00 AM	Watermasters, Paul Carney and Hank Gerlach	Pick up guests
8:30	"	Console operation explained
9:30	"	Hands on operation
10:00	"	Take readings
11:00	"	One hour with ADC operation
12:00	"	Lunch
1:00 PM	"	Scheduling explained/observed
3:00	"	Wrap-up - Questions & Answers
4:00	"	Return guests

Tuesday, March 22 - Water Operations

7:30 AM	Bob Hensley	Pick up guests. Travel to Western Irrigation operations pointing out facilities enroute
8:30		Explain Northside Irrigation, Table of Organization, Responsibility of Superintendent, mission and functions
10:30	Bill Hancock	Responsibilities of Chief Clerk, office procedures, accounting, auditing, water order preparation, direct entry, audit charge cards, etc.
11:30	Bob Hensley	Lunch
12:30 PM	Watermaster	Meet Watermaster and review responsibility of Watermaster. Discuss area audits, construction problems, water orders, etc.
1:30	Zanjero	Meet Zanjero and review scheduling for Area 23
3:00	Bob Hensley	Return guests

Wednesday, March 23 - Water Operations

6:30 AM	Bob Hensley	Pick up guests. Travel to Western Operations
7:15	"	Meet zanjero on Area 23
		Explain schedule which was completed yesterday, gate operation, emphasis on measuring, trouble calls, etc.
11:00	"	Lunch
12:00	"	Ride with zanjero on Area 23, continue to discuss zanjero responsibilities and measuring
2:30 PM	"	Return guests

Thursday, March 24 - Water Resources and Services

8:30 AM	Brian Crouse	Pick up guests
8:45	"	Review Customer Service functions
10:15	Bob Cocks	Review Accounting and Collection functions
11:30	Bruce Mack	Lunch
12:30 PM	"	Groundwater Planning
2:45	Darrell Jordan	Hydrology, Pumps and Special Contract Records
4:30	"	Return guests

Friday, March 25 - Water Resources & Services

8:30 AM	Jim McDade	Pick up guests
8:45	"	Head of Lateral Measurement (HOLM) overview Records of improvement Charts and graphs of results
10:00	"	Lateral Standard Determination (LSD) overview. Records, charts and graphs
10:45	"	Specialized studies, projects and measurements
11:30	Sid Wilson	Agriculture program, watershed management
12:30 PM	"	Lunch
1:00	Cecil Pendergast	Agriculture Program - Field Demonstration
4:30	"	Return guests

Saturday & Sunday, March 26-27

Weekend Free

Monday, March 28 - Water Resources and Services

7:30 AM	Jim McDade	Pick up guests
7:45	Martin Richards	Demonstration of current meter measurement of Arizona Canal at Arizona Falls
12:00	Jim McDade	Lunch
12:30 PM	"	Additional demonstrations of irrigation gate measurement techniques using probe, calipers, weir stick and Hatcher calculator
3:30	"	Return guests

Tuesday, March 29 - Water Resources & Services

7:30 AM	Jim McDade	Pick up guests
7:45	"	Demonstration at Hydraulics Laboratory
11:00	"	Demonstration of Irrigation gate measurement
12:00	"	Lunch
12:30 PM	"	Demonstration of broad-crested weirs and flumes
3:30	"	Return guests

Wednesday, March 30 - Water Operations

7:30 AM	Al Risinger	Pick up guests. Travel to Southside Irrigation
8:00	"	Explain Southside Irrigation, Table of Organization, area of responsibility
10:30	Watermaster	Explain watermaster responsibilities
11:30	Al Risinger	Lunch
12:30 PM	Watermaster	Tour of Southside Irrigation, farm tours, irrigation methods, measuring, different structures
3:30	Al Risinger	Return guests

Thursday, March 31 - Water Operations

7:30 AM	Bob Bahls	Pick up guests
8:15	Zanjero	Meet Zanjero area 30, hands on water measurement, gate operation, trouble calls
11:00	Bob Bahls	Lunch
12:00	Zanjero	Schedule with Zanjero
2:30	Bob Bahls	Review day's activity
3:30	Bob Bahls	Return guests

Friday, April 1 - Water Operations

8:30 AM	Don Davis	Pick up guests
9:00	"	Review program and comments solicited from Egyptians
10:30	Reid Teeple	Meeting for Egyptians to inform Salt River Project management of their experience at SRP, and how they may use the information in their work in Egypt
		Presentation of Zanjero Certificate
11:30	Don Davis	Lunch - Cafeteria
12:30	"	Orientation film (in Arabic language) to reinforce their understanding of SRP
1:00	"	Afternoon free for special requests of Egyptian guests

Saturday, April 2

Free Day

Sunday, April 3

Leave Phoenix - to California

- End Program at Salt River Project -

IBRAHIM GAD
ESSAM MOHAMMED

April 2 - 9, 1983

ITINERARY

Please cancel all hotel reservations by 5:00 p.m. if you decide to stay someplace else. These rooms have been guaranteed and we will be charged for them, whether or not you stay there. Reservations are under Ibrahim Gad's name. I have reserved 1 double room at each motel.

April 2, 1983 (Saturday)

Free Day in Phoenix

April 3, 1983 (Sunday)

EASTER SUNDAY

Travel Phoenix to Yuma by Greyhound bus. (Cost of ticket is \$16.70). Salt River Project will help you purchase the bus ticket. Hotel reservations in Yuma are at the Royal Motor Inn, 2941 South Fourth Avenue (602/344-0550), rate is \$44.00 + tax per night for a double. You will need to take a taxi from the bus station to your motel. You will visit the Wellton Mohawk Project on Monday.

April 4, 1983 (Monday)

Travel to the Bureau of Reclamation, about 1/2 mile from where you are staying. Ken Siddebottom at the Bureau will take you out to the Wellton Mohawk Project. Hotel reservations are at the Royal Motor Inn tonight.

April 5, 1983 (Tuesday)

Visit Wellton Mohawk Project in the morning. You need to go to the airport to catch your flight from Yuma to El Centro, leave Yuma at 2:40 p.m. on Sun Aire 522, arrive El Centro at 2:00 p.m. Your motel reservation in El Centro is at the Airporter Inn (619/355-2411) which can be seen from the airport, rate is \$28.57 for a double, confirmation #DN37015. You will visit the El Centro Water District (Imperial Valley) tomorrow.

April 6, 1983 (Wednesday)

El Centro Water District (Imperial Valley). Richard Taylor/Linda Sanchez contact (619/352-2462) has made arrangements for your tour. Call Richard Taylor El Centro Water District after 8:00 a.m. to come and pick you up at

the motel. You need to go to the airport in the afternoon to catch your flight out of El Centro to Los Angeles. You leave El Centro at 2:55 p.m. on Sun Aire 518 arrive Los Angeles at 3:50 p.m. Your reservations is at the Airport Century Inn, 5546 W. Century (213/649-4000), rate is \$48.38 per night for a double. Use the hotel courtesy telephone at airport to call hotel to pick you up. Check about transportation to Disneyland (Anaheim) tomorrow. You can take a taxi.

April 7, 1983 (Thursday)

Take a taxi to Disneyland today (Disneyland is in Anaheim). Travel back to Los Angeles in the evening. Your reservation is at the Airport Century Inn, 5546 W. Century (213/649-4000). This hotel is near Los Angeles International Airport. The Airport Century Inn has a shuttle bus that runs back and forth between their hotel and the airport. You travel to Cairo, Egypt tomorrow morning. Find out about shuttle service tonight to the airport.

April 8, 1983 (Friday)

Take shuttle service from Airport Century Inn to L. A. International Airport. Your flight is:

April 8, 1983	Lv	Los Angeles	10:00 a.m.	TW736
	Arr	New York (JFK)	6:00 p.m.	
April 9, 1983	Lv	New York (JFK)	7:15 p.m.	TW840
	Arr	Cairo	4:40 p.m.	

If you have any questions or problems please call Pam Hobbs (303/491-8655)

These flights were all booked through Debbie at Edgerton Travel. She will mail tickets to Don Davis at Salt River Project.

April 5, 1983 (\$28.00)	Lv	Yuma	2:40 p.m.	Sun Aire 522
	Arr	El Centro	2:00 p.m.	
April 6, 1983 (\$64.00)	Lv	El Centro	2:55 p.m.	Sun Aire 518
	Arr	Los Angeles	3:50 p.m.	

MAR 30 1983

Egypt Water Use & Management Project

22 El-Galaa St. Bulak, Cairo ARE
Phone 973474, 972674, Cable EWUP, EGYPT

Colorado State University Ft. Collins, Co. 80523
Phone (303) 491 8484, Cable ENECNRU

MEMO

March 30, 1983

TO: E. V. Richardson

FROM: Thomas W. Ley

Thomas W. Ley

SUBJECT: Quarterly Report of Activities -- 1 January - 31 March 1983

REMARKS:

I. Summary of Progress:

A. TDY to Egypt (4 Jan - 18 Feb 83): Focus of the assignment was to collect, analyze and summarize available data at the 3 project sites pertaining to the impact of precision land leveling on farm water management and to compare the improved farm irrigation methods tested by EWUP (long level basins and furrows) vs. the conventional methods farmers use. Data was summarized and draft reports formulated to assist Task Groups 1 and 6. Draft reports and data summaries which were prepared during the assignment and in follow-up work after returning to Fort Collins are:

1. "The Influence of Farm Irrigation System Design and Precision Land Leveling on Irrigation Efficiency and Irrigation Water Management." This was the major output of the TDY assignment. It is an expanded draft of an earlier version written by Eldon Hanson and includes more comprehensive data and analysis formulated by the three teams with assistance from myself. Significant results showed why certain of the irrigation trials of EWUP at the three sites were or were not successful and what modifications were necessary to increase success.
2. A set of irrigation trials data from El Minya (Mesqa 26, 1981-82 winter season), which had not previously been analyzed, was analyzed, and a summary returned to Cairo. Problems with missing data and with data quality render this set to limited usefulness.
3. "Precision Land Leveling in Abyuha Area, El Minya: A Summary Report" was written in Fort Collins and sent to Cairo after the TDY. Data from grid surveys performed during 1981 and 1982 are included. Other aspects of performing land leveling in Abyuha area are reviewed.



Memo Continued

4. Mansuriya grid survey data for land leveling were reviewed and summarized to characterize field levelness in the area. A summary report outline has been formulated for reporting this information.

The above activities in conjunction with previous reports compiled by myself on Kafr El Sheikh irrigation trials data (PTR #35) and land leveling data (proposed PTR # 38) met the objectives of the TDY assignment and contribute to the objectives of Task Groups 1 and 6.

- B. Post-TDY work included followup on data analysis and summary reports (please see above). Also the following work activities were performed during this quarter:
 1. Distribution of proposed PTR #38, "Precision Land Leveling on Abu Raya Farms, Kafr El Sheikh, Egypt," for review by Fort Collins and Cairo Staff. Review comments have been received from several and the report is presently undergoing revision. It should be available next quarter.
 2. Final editing and approval for printing of PTR # 35, "Farm Irrigation System Design, Abu Raya, Kafr El Sheikh" were completed. The report was submitted for printing.
 3. Technical paper proposals were formulated in collaboration with EWUP/Cairo and Kafr El Sheikh Staff. One paper is intended for an ASAE conference on advances in infiltration and is a summary of EWUP experience with infiltration on vertisols. The second proposed is intended for the ASAE 1983 Winter Meeting and is a summary of EWUP/Kafr El Sheikh level irrigation system design improvements with technical analysis of the design model used.
- C. My summary TDY report was recently completed. Please see that report for further information and accounting of the work accomplished.

II. Work Plan for next quarter:

- A. Finalize revisions to proposed PTR #38 on Kafr El Sheikh precision land leveling work. Submit for approval and followup until printed.
- B. Revise TDY report on the impact of farm irrigation design and precision land leveling on improving efficiency and water management. Submit for approval as a PTR.
- C. Work with EWUP/Cairo and Kafr El Sheikh Staff to formulate drafts of the two technical papers: Infiltration on Egyptian Vertisols, and, Improving Surface Irrigation in Kafr El Sheikh Area.
- D. Backstopping in irrigation and agricultural engineering for overseas staff as needed.

Memo Continued

E. Possible TDY to Egypt to work on Dakalt Canal Delivery System Study.

TWL/dm

cc: Gene Quenemoen
Wayne Clyma

SUMMARY TDY REPORT

Thomas W. Ley

4 Jan - 18 Feb 1983

INTRODUCTION

The purpose of the TDY assignment is stated in the attached memo of 20 April 1982 (please see Appendix, Item No. I). The TDY dates were changed after that memo to those given above.

A summary schedule of activities during the assignment is given in the Appendix (Item No. II).

The planning for the assignment conducted with the discipline leaders during the first few days established the following. Review the draft manuscript prepared by Eldon Hanson and supporting materials prepared by others for a proposed technical report on the influence of land leveling on farm water management. Travel to each of the three project areas and work with the existing data sets or new data to further support the above planned report. Focus on summarizing the irrigation trials involving land leveling and/or long runs. Perform further technical analysis on existing summaries and add new information summaries from trials not yet analyzed. Also, try to get further summaries of land leveling data. The plan called for a site visit and work on data for a particular site for approximately 10 days for each site. The remaining time was allocated to time in Cairo spent in writing and further data analysis.

RESULTS

The following discussion summarizes the results of various activities of the assignment in chronological order.

Abstracts for Proposed Reports for EWUP Workshop. An engineering discipline meeting was held 16 January 1983 to discuss paper proposals for the EWUP workshop and national conference (contributions from the engineering discipline). I was requested to work on two abstracts. The first would be a summary of EWUP studies to improve farm water management through land leveling and farm irrigation method modifications. The second was to be a summary of precision land leveling experience of EWUP. Those items were completed and submitted to the engineering discipline leader (see Appendix, Items No. IIIa and IIIb). These paper proposals were formulated as contributions from Task Group 1 and 6, respectively, and essentially followed the objectives of my TDY assignment.

Progress Reports. On 8 February 1983, progress reports of my activities were made to Task Groups 1 and 6 for use at the monthly meeting. Work accomplished is summarized therein. Everything was proceeding smoothly, on schedule and with very good cooperation from the three teams. These progress reports are attached in the Appendix as Items IVa and IVb.

Summary TDY Report - Thomas W. Ley Continued

Progress Report and Draft Manuscript. A memo to the Project Directors on 13 February 1983 gave a TDY progress report and transmitted the draft manuscript entitled: "The Influence of Farm Irrigation System Design and Precision Land Leveling on Irrigation Efficiency and Irrigation Water Management." The memo is included as Item No. V in the Appendix. Because of its length, the draft report is not included. This report is the major output of the TDY assignment and several copies plus the original were left with the engineering discipline leaders.

The major findings of the report illustrated through computer-assisted design analyses why the irrigation trials at Mansuriya and El Minya were of limited success, and why those at Kafr El Sheikh were more successful. Generally, the long runs tested in Minya and Mansuriya were inappropriately designed for the prevailing conditions, in particular, the stream size available and the large temporal effect of the soil intake characteristics in these areas. Improved farmer understanding of the "new" methods and improved water management are necessary elements to ensure success of the trials. This was not always the case.

It was planned at the time of the progress report to finalize other data analyses upon return to Fort Collins. The remaining discussion pertains to that work.

Irrigation Trials, Mesqa 26, 1981-82 Winter, Abyuha. The summary of this data set was originally planned for inclusion in the main report just described. As analysis progressed, however, numerous problems with the data, including missing data, surfaced. A memo to the engineering discipline leaders summarizing the analysis and problems concluded this effort. A summary of the analysis was also sent back to Cairo. Item No. VI in the Appendix is a copy of the memo summarizing this effort.

Precision Land Leveling in Abyuha Area, El Minya: Summary Report. This report was completed upon return to Fort Collins. It is attached in the Appendix as Item No. VII. A copy of the report was sent to Task Group 6 in early March. The summary of the precision land leveling data analyzed showed on the average that:

- 1) Fields in Abyuha have a mean elevation range of 0.11 m (or ± 5.5 cm), which is nearly 4 times the acceptable tolerance for level irrigation systems, and;
- 2) average cut volume for Abyuha farms was measured as 41.0 m³/feddan (based on the initial grid survey only and a cut-fill ratio of 1.00).

Summary Grid Survey Data, Mansuriya Area. Mansuriya grid survey maps were brought to Fort Collins for analysis. Item VIII in the Appendix presents summary information on the levelness of fields in Mansuriya. Some of this data is taken from EWUP PTR# 4. Due to a lack of information such as grid size, field size, etc. on the majority of these maps, estimates of cut and fill volumes have not been made. A summary report outline and these summary data were sent to Task Group 6 on 11 March.

Summary TDY Report - Thomas W. Ley Continued

Proposed PTR # 38. This report summarizes the experience of the Kafr El Sheikh Team in performing precision land leveling in Abu Raya. Technical analysis of the data is also included. The draft report was distributed for review to EWUP staff in Cairo and Fort Collins in January. Review comments were received before departing Egypt. The report is presently being revised.

SUMMARY

The main output of this assignment was a draft technical report summarizing EWUP's work in the three project areas as related to precision land leveling and modified farm irrigation methods and their effect on improving efficiency and farm water management. This report essentially fulfills the objectives of the assignment and contributes to the stated goals of both Task Groups 1 and 6. Additional data analysis and summary reports on precision land leveling in Minya and Mansuriya were completed. This information along with proposed PTR # 38 assist Task Group 6 in the fulfillment of the objectives.

ACKNOWLEDGEMENTS

I would like to extend my warmest thanks to Dr. Mona El Kady and Eldon Hanson for their support and guidance during the assignments. The assistance and cooperation of the team leaders and the 3 teams is appreciated, as well as that of numerous others in the main office. Finally, the support of the Project Directors in helping me to meet the objectives of the assignment are gratefully acknowledged.

ITEM I

Egypt Water Use & Management Project

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Colorado State University Ft. Collins, Co. 80523
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ENG/029-82

April 20, 1982

TO: Project Directors

FROM: Ahmed Maher and E. Hanson

SUBJECT: Employment of Tom Ley for TDY Assignment.

It is requested that Tom Ley be employed for a TDY assignment from October 4 to November 22, 1982 to write semi-final reports pertaining to engineering aspects of the following activities in Task Groups indicated:

1. Evaluation of the impact on on-farm water management of land leveling for : (1) modifying the field layout and topography, (2) utilizing large irrigation streams to save irrigation time and water and (3) eliminating drains and meskas. (Task Group 6).
2. Evaluation of irrigation by long furrows or basins as compared to conventional irrigation of small basins (Task Group 1).

This work will involve the analyses of all engineering data accumulated in these activities to date in the El Minya, Kafr El Sheikh and Mansuriya areas of the project, and to organize the material in a form which will be used as a major part of the engineering contributions to the final reports for the task groups

It is particularly important that we take advantage of Tom Ley's availability to work on this assignment. During his full time employment in Egypt with EWUP, he had intensive in-depth experience in these activities, and his work at Kafr El Sheikh has not been excelled in any other area of the project.

AM/EH/mf



Item II. Schedule of Activities

<u>Date</u>	<u>Location</u>	<u>Activity</u>
4 Jan		Depart Denver
5 Jan		Arrive Cairo
6-8 Jan	Cairo	Cairo Main Office: planning and review of TDY activities and objectives. Meet with Project Directors and Discipline leaders.
9-11 Jan	Kafr El Sheikh	Travel to Kafr El Sheikh with Dick Tinsley. Meet with Team Leaders and team, review of work accomplished by me on Kafr El Sheikh data (PTR's 35 & 38). Review of work activities in Kafr El Sheikh with visit to Abu Raya to see the field work. Spent one day going through Kafr El Sheikh data files to complete missing information for PTR's 35 & 38 and to complete summaries of field trials data in Kafr El Sheikh in which small basins were compared with long level runs.
12 Jan	Cairo	Distribute proposed PTR # 38 on Kafr El Sheikh land leveling data for review. Started review of available Mansuriya irrigation trials data. Much of this work was analysis and expansion of information written by Bill Braunworth in DWP's and as a draft section for Eldon Hanson's report on the influence of land leveling on water management.
13 Jan	Cairo	Monthly meetings.
14-21 Jan	Cairo	Continue review of Mansuriya irrigation trials data. Performed computer model-assisted analysis of the long level systems tested. Met with Main Office Engineers to discuss EWUP workshop paper proposals. Wrote proposals/abstracts for this on reports from Task Groups 1 and 6. Prepared for visit to El Minya. Worked with Ahmed Bayoumi to review available land leveling data in the Main Office files.

Item II. Schedule of Activities Continued

<u>Date</u>	<u>Location</u>	<u>Activity</u>
22 Jan	Cairo	Began review of materials/data on El Minya irrigation trials and on-farm water management.
23-25 Jan	El Minya	Worked with El Minya staff (mainly Eng. Abdel Raouf and Eng. Ahmed) to review, analyze and summarize irrigation trials data for winter season 81-82 on <u>Mesqa 26</u> . Reviewed land leveling data maps and needs. Made plans to work further with Eng. Ahmed to complete land leveling data analysis.
26-28 Jan	Cairo	Continued analysis of El Minya data. Tried to find some missing data. Performed computer-assisted design analysis of long level borders and furrows for Abyuha conditions. Formulated outline for revision and expansion plan for Dr. Hanson's report. Irrigation trials data and analysis for three project areas essentially completed.
29 Jan - 4 Feb	Cairo	Wrote revisions to Dr. Hanson's draft report. Wrote expanded sections on analysis of irrigation trials at Mansuriya and Kafr El Sheikh sites. Worked with Eng. Ahmed/El Minya to perform computer-assisted analysis of El Minya land leveling data. Eng. Ahmed delivered land leveling grid survey maps w/ complete information for 1981 and 1982.
5-7 Feb	Kafr El Sheikh	Visit to Kafr El Sheikh w/Dr. Mona and Dr. Tinsley to review the Dakalt Delivery System problems and plan for study of the system. Field tour of Dakalt and Abu Raya. Field tour of other branch canals in Kafr El Sheikh area to determine similarity of Dakalt problems to entire area. Meeting with Kafr El Sheikh Team Leaders and engineers to discuss data needed in study.
8-11 Feb	Cairo	Completed El Minya section for irrigation trials report. Received missing soil water data for <u>Mesqa 26</u> , 81-82 winter season trials. Completed computer-assisted analysis of El Minya land leveling data.

Item II. Schedule of Activities Continued

<u>Date</u>	<u>Location</u>	<u>Activity</u>
12-17 Feb	Cairo	Reduce and summarize 'El Minya soil water data for 81-82 winter season trials. There were a lot of missing data and problems with the data. Completed report: "The Influence of Farm Irrigation System Design and Precision Land Leveling on Irrigation Efficiency and Irrigation Water Management," and submitted to Project Directors and Discipline Leaders. Develop work plan and study for Dakalt Delivery System in meetings with Engineering Discipline and Kafr El Sheikh Team Leaders. Started work on available Mansuriya land leveling data. Continued summary of Minya land leveling data. Continued summary and analysis of Minya 81-82 winter season irrigation trials on <u>Mesqa 26</u> .
18 Feb		Depart Cairo/arrive Fort Collins.

ITEM IIIa

DESCRIPTION OF PROPOSED REPORT FOR EWUP WORKSHOP AND NAT'L CONFERENCE

TITLE: The Influence of Farm Irrigation System Design and Precision Land Leveling on Irrigation Efficiency and Irrigation Water Management.

CONTRIBUTION OF: Task Groups 1 & 2

AUTHORS:

ABSTRACT: The results of EWUP studies at each of three locations; Mansuriya, Kafr El Sheikh and El Minya to characterize the conventional farm irrigation systems used by farmers are summarized. Typically, the methods used are flooding of small flat basins or sort furrows within small basins. Basin size is a function of many factors such as field levelness, farm size, crop pattern/rotation and water supply. The small basins require high labor input for construction of ditches and bunds and for irrigation, as well as careful water management if irrigation water is to be uniformly and efficiently applied.

Numerous irrigation trials at the three EWUP field locations have been conducted to test the impacts of precision land leveling and farm irrigation system design on improving on-farm water management. Objectives were to increase irrigation efficiency, improve water control on the farm, save water, save irrigation time and labor, improve water table and salinity conditions, and contribute to increased crop production. The results of the trials are reviewed and analyzed with a focus on why they were or were not successful, what conditions are necessary for successful implementation and what further improvements or adaptations are suggested.

SUGGESTED OUTLINE:

- I. Introduction
 - A. EWUP and three work locations
 - B. Statement of paper purpose
 - C. Scope of study - 3 areas of Egypt studied for 1978-1983
 - D. Organization of paper
- II. Description of conventional farm irrigation system and farmer practices and problems
 - A. Mansuriya
 - B. Kafr El Sheikh
 - C. El Minya
- III. Review of farm irrigation concepts/definitions
 - A. Effect of unlevelled land
 - B. Effect of field/furrow dimensions

- C. Effect of stream size
 - D. Effect of infiltration
 - E. Effect of surface roughness
 - F. Management
- IV. Results of irrigation trials and comparison with conventional methods/analysis of factors contributing to successful or unsuccessful results
- A. Mansuriya
 - B. Kafr El Sheikh
 - C. El Minya
- V. Summary
- VI. Conclusions
- VII. Recommendations
- VIII. References
- A. Mansuriya - PTR's: 01, 4, 22
 - SP's: 031
 - IAP's: 087, 91, 98, 99
 - B. Kafr El Sheikh - PTR's: 06, 9, 35, 38
 - SP's: 057, 61
 - IAP's: 074, 75, 86, 89, 110
 - C. El Minya - PTR's: 025
 - IAP's: 081, 02
 - D. Hanson's draft manuscript

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DESCRIPTION OF PROPOSED REPORT FOR EWUP WORKSHOP AND NAT'L. CONFERENCE.

TITLE : Precision Land Leveling for Egyptian Agriculture: The EWUP Experience.

CONSTRUCTION OF: Task Group #6.

AUTHORS:

ABSTRACT: Precision land leveling (PLL) has been performed at each of the three EWUP field locations as part of a package of practices being tested for improving on-farm water management. The impact of PLL on improving on-farm water management is discussed in another report. In this report, summaries of the available leveling data and experience made to provide such information as :

- a. The need for PLL on fields, the variation in elevation in fields, results of grid survey data.
- b. The machinery requirements for PLL and the experience of EWUP in machinery use, the time required for performing PLL operations.
- c. The earthmoving (cut and fill volumes). Performed at the 3 locations.
- d. Personnel and logistic requirements, training needs.
- e. Cost estimates resulting from EWUP PLL work accomplished.
- f. Procedures for performing PLL : From collecting and analyzing grid survey data for design to machinery operations and constraints on implementation.

The reasons for performing PLL and the expected benefits to be obtained are reviewed as an introduction to the subject.

SUGGESTED OUTLINE:

- I. Introduction
 - A. EWUP
 - B. Three field locations.
 - C. Purpose of report
 - D. Organization of report
- II. Precision Land Leveling
 - A. Reasons for performing
 - B. Expected benefits
 - C. Procedures

1. Field/design
2. Machinery operation

D. Requirements

1. Manpower/Training
2. Equipment
3. Machinery
4. Constraints
 - a. Soils/cut depth
 - b. Time of year
 - c. Farm/field/crop

II. EWUP Experience at 3 field locations, cuts, fills, machinery times, cost

- a. Mansuriya
- b. Kafr El-Sheikh
- c. Minya

IV. Economics - basic review and project

V. Summary, Conclusions, Recommendations

VI. References

- A. Mansuriya: Data files, PTR #1,4.
DWP #98
- B. Kafr El-Sheikh: Data files, PTR #6,9,35,38
SP: 61
DWP: 86, 110
- C. Minya: Datafiles, PTR 25
- D. Land leveling Planning Guide, Water Management Synthesis Project.
- E. EWUP Manual #8
- F. Proposal EWUP Manual on PLL data analysis for HP 9825 computer.
- G. Other - accessibility study.

ITEM IVa

8 Feb 83

MEMO

TO: Task Group 1

FROM: Thomas W. Ley

SUBJECT: Report on progress of TDY work plan as related to Task Group 1

REMARKS:

The draft report: "The Influence of Land Leveling on Irrigation Efficiency and Management of Irrigation Water," as compiled by Eldon Hanson has been reviewed, revised and expanded. Emphasis was placed on expanding the introductory material to provide details on the conventional farm irrigation systems at the three work areas and summary of the problems identified. Sections which discuss the effects of unlevel land and stream size on efficiency and water management were expanded to include discussion of other design parameters such as soil characteristics.

Considerable effort (7-10 days for each area) was placed on expanding the discussion and analysis of irrigation trials data from the three areas. Plus additional data was added as it was summarized from investigations of available data from the three areas. Summary sections written by Bill Braunworth (for Mansuriya data) and Ken Litwiller (for K.S. data) were revised and expanded for inclusion in the report. The draft is being typed and should be available for review by 15 Feb.

ITEM IVb

8 Feb 83

MEMO

TO: Task Group 6

FROM: Thomas W. Ley

SUBJECT: Summary of progress of TDY work plan as related to Task Group

REMARKS:

The draft report: "Precision Land Leveling on Abu Raya Farms, Kafr El Sheikh Governorate, Egypt" (proposed PTR No. 38), was distributed to several EWUP staff members. A meeting was conducted on 18 Jan with several of these staff members to review suggested revisions and changes. Other revisions will be considered and the entire draft will be revised and prepared for final editing in Ft. Collins. This report essentially fulfills the objectives of Task Group 6 as far as the precision land leveling data and experience at Kafr El Sheikh are concerned.

Main office files of PLL data (maps of farms, grid surveys) were organized for the three areas. Minya data has been expanded through the efforts of Eng. Ahmed Abdel Naim, who provided a summary of land leveling maps and data from 1982 in El Minya.

Summary reports of these land leveling data (cuts, fills, earthwork volume) Minya and Mansuriya are being prepared. It appears there is only limited data available in these 2 areas on tractor and implement.



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February 13, 1983

ITEM V.

TO : Drs. Hassan Wanby and Gene Quenemoen
Project Directors

FROM : Thomas W. Ley *T.W. Ley*

SUBJ. : TDY Progress Report and attached Draft Manuscript.

REMARKS: I respectfully submit the attached draft manuscript entitled "The Influence of Farm Irrigation System Design and Precision Land Leveling on Irrigation Efficiency and Irrigation Water Management" as partial fulfillment of the requirements of my present TDY assignment.

This report is largely based on the draft report (of approximately the same title) prepared by Dr. Hanson dated 22 Nov., 82. The present report is significantly more comprehensive, however, in following aspects:

- 1) Description of the farm irrigation systems conventionally used by farmers at the 3 project work locations and summaries of the problems identified.
- 2) Presentation, discussion and analysis of irrigation trials at the 3 sites. Review and analysis of all trials of farm irrigation system improvements (precision land leveling and design of long level basins and long level furrows) as compared with the conventional systems (small basins) is the focus of the report.
- 3) Design analyses utilizing the USDA-SCS design models for level basin and level furrow irrigation are performed to illustrate why certain results were obtained. Such analyses provide insight to where modifications and adaptations are necessary to improve upon those designs which proved unsuccessful during the trials.

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This report essentially fulfills the objective of my TDY assignment which concerned "the evaluation of irrigation by long level basins and long level furrows as compared to conventional irrigation of small basins (Task Group 1)". There is also a definite overlap with the second objective in terms of evaluation of the impact of precision land leveling on on-farm water management (Task Group 6). Supporting documents compiled by myself for the K.S. Team, which are proposed PTR No. 35 and No. 38, should also be considered in fulfilling the objectives of Task Groups 1 and 6. I will be making the final revisions and editing of these reports upon my return to Ft. Collins. Directly thereafter they will be returned to Cairo for publishing.

Concerning fulfillment of the second objective of my TDY: evaluation of land leveling data, I have the following progress to report. Grid survey data from 24 farms in Abyuha was compiled by Eng. Ahmed Abdel Haim. These data were taken in 1982. We worked together to log the data on the HP 9825 computer for analysis by an algorithm written by me which follows EWUP Manual No.8. The summary information provided includes cuts, fills, ranges in field elevations, cut volumes and fill volumes, plus hard copy output of the grid survey and summary. Data from El-Minya for 1981 will be summarized in this way, as will selected data from El Mansuriya. I plan to complete most of this analysis before departing on 18 Feb. I propose to complete the analysis and compile a summary report on the El Minya and Mansuriya precision land leveling data immediately upon return to Ft. Collins. Such summary report shall be dispatched back to EWUP/Cairo by 4 Mar. 1983.

As a result of my work during this assignment I also propose to include summary reports on the following topics in my final TDY report (which will be prepared in Ft. Collins):

- 1) Summary reports on farm irrigation system design considerations for
 - a) El Mansuriya, Beni Magdul area.
 - b) El Minya, Abyuha area.
- 2) Summary report of 1981/82 Winter Season irrigation trials: long level basins vs. conventional small basins, wheat crop, Mesqa #26, Abyuha.

I have also compiled a file of summary information on the Dakalt Branch Canal. I will try to summarize this along with other available information and meet with Dan Sunada to assist in preparation for the TDY assignment to write

the technical report on the system. Regardless of whether Dr. Sunada, myself or both of us end up working on this assignment, I feel much can be accomplished between now and then, and I will devote part of my efforts to assist in this.

I would like to extend my warmest thanks to you and all other EWUP staff in Minya, Mansuriya and K.S. who have cooperated to make my present assignment very successful. It has been a pleasure to return to Egypt and assist in the analyses of data for Task Groups 1 and 6. Please inform me if there are any followup needs to make my present work more complete.

TWL/mm

Attach : Draft Manuscript

cc. : Dr. E. Hanson
Dr. Mona El Kady
Dr. E.V. Richardson
Dr. W. Clyma (memo only)



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MEMO

ITEM VI

March 3, 1983

TO: Dr. Mona El-Kady & Dr. Eldon Hanson

FROM: Thomas W. Ley *TLey*

SUBJECT: Analysis of Irrigation Trials Data for 1981-82 Winter Season,
Wheat Crop. Mesqa 26, Abyuha

REMARKS:

One of the objectives of my recently completed TDY assignment in Egypt was to gather and analyze all available data on irrigation trials in which long level borders on furrows are compared with the conventional systems. Such data and analysis would then be compiled in the report on this topic by Task Group 1. Please find enclosed a copy of summary data and primary analyses for irrigation trials in Abyuha during 1981-82 Winter season on the wheat crop. These data were compiled during my assignment (and visit to El-Minya), however, due to delays in obtaining a complete set I was unable to finish the analysis in Egypt.

Unfortunately, the data set is still incomplete (dimensions for 1 farm are missing; primary analysis for this farm could be completed when the dimensions become available). However, I have completed much primary analysis of the available data. There are many problems with the soil-water data, such as after irrigation values being in the range between field capacity and saturation (gravity drainage is still occurring). This resulted in the measured change in soil water content being greater than the irrigation depth applied in nearly 60% of the irrigations measured, and also gave a mean total depletion of about 65 cm, when UNDP Report No. 17 and EWUP DWP No. 81 report values of about 40-48 cm. Soil moisture samples were missed in 27% of the irrigations measured. Flume data are missing in some irrigations also.

I did make estimates of depth applied when flume data were missing, and used UNDP #17 to fill in the gaps where soil samples were missing. The resulting calculated application efficiencies showed a very large degree of variation. Because of the soil-water data problems, several values of E_a over 100% occurs. I feel such results are nonsense.

As an alternative, I did also calculate E_a using UNDP #17 estimates of CU. These results also show a large amount of variation.

Overall, the results can probably be used to show some trends, however, I personally feel that even these are highly questionable. Perhaps you may be able to glean some useful information from these summaries. I strongly recommend, however,



memo - Dr. Mona El-Kady & Dr. Eldon Hanson, Con't.

Page Two

that they do not be used for any meaningful comparison of long and small basins. Although it is not apparent, both the long and small basin strips were probably leveled for these trials (this has been the procedure in other Abyuha trials, see DWP #81, 83), thus no meaningful conclusions may be drawn concerning the impact of land leveling. Finally, I was unable to find any land leveling data (maps, grid surveys, etc.) for these farms.

I will be most interested in any comments or suggestions you may have concerning this data set. I do not plan to pursue any further analyses with it. Thank you again for your support of my TDY assignment efforts and your consideration of this matter.

TWL/dm

Enclosure .

cc: (memo only) E. V. Richardson
Project Directors

ITEM VII. PRECISION LAND LEVELING IN ABYUHA AREA, EL MINYASUMMARY REPORT

by

Thomas W. Ley

Introduction

This report provides a summary of precision land leveling experiences (PLL) of the EWUP El Minya Team in the Abyuha Study area (see Figure 1) during 1981 and 1982. The purposes of this summary are to document the procedures used for PLL in Abyuha, to present summary data which illustrate why PLL should be performed in the area and to present discussion of how PLL must be an integral part of the Abyuha area development plan.

Grid survey data from 37 farms which were leveled in 1981 and 1982 in Abyuha are summarized. These data illustrate the general situation in the area in terms of single field elevation variation and necessary earthwork volumes to be moved to achieve dead level grades in these fields. Unfortunately, farm machinery time of operation data were unavailable for inclusion at the time this report was formulated. These data are available, however, and perhaps can be added at a later date. It is expected that this information will yield summaries on the time required for leveling on a per Feddan basis in Abyuha. Such data should also include summaries of the total time of usage of the various implements.

Description of Abyuha Study Area

The Abyuha Study Area is located in the El Minya Governorate in the Nile Valley of Middle Egypt. The irrigation and drainage system is illustrated in Figure 1. The Abyuha Branch Canal takes water from the Ibrahimiya Canal and distributes it by gravity flow to 31 mesqas. In many of the areas served by these mesqas farmers can irrigate by gravity flow directly from the mesqa to their farms. Poor mesqa maintenance and obstructions to flow often limit these gravity streams to low head and flow rate. Pumping with small diesel pumps or lifting with tambours augments the application of water.

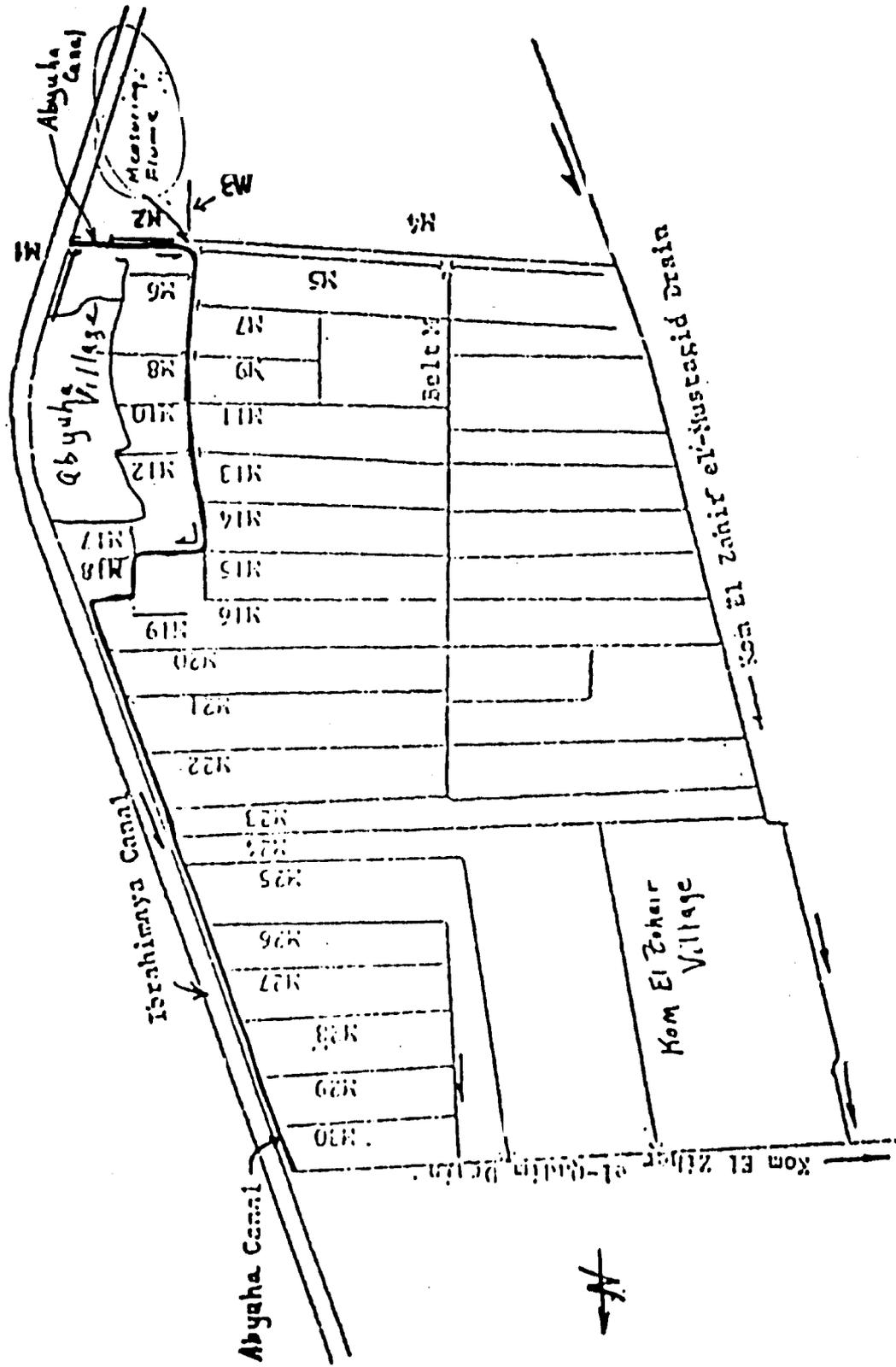


Figure 1. Irrigation and Drainage System for Abyuha Study Area, El Minya.

Because of the small available stream sizes, unlevel fields (to be discussed) and tradition, farmers use small basins for irrigating the crops. The typical farm layout is illustrated in Figure 2. Major summer crops are cotton and corn which are grown on furrow ridges in rows in the small basins. Major winter crops are wheat and birsim which are grown on the flat surface in small basins. Broadbeans, another major winter crop, are grown on the furrow ridges in rows in the small basins. Land preparation is minimal in the area as most is by hand or animal labor. Plowing is done between both the winter and summer seasons at both periods. Large labor input is necessary for forming the furrows/furrow ridges for the row crops of cotton, corn and broadbeans. Such crops may be planted on the flat basin and the furrows formed as the crop matures. Irrigation facilitates this process, as the soil moisture content is higher during the season than when the land is fallow, which means the clay soils are easier to work.

Precision land leveling has been tested in Abyuha as a practice for improving on-farm water management. The hypothesis was that PLL would allow farmers to use longer irrigation runs thereby reducing labor requirements. With proper irrigation design, irrigation efficiency on the leveled fields is expected to be higher. A development scheme to improve the quality of the gravity water delivery (higher heads and flow rates) was designed to also allow the use of long runs. The results of these irrigation trials have been summarized in other EWUP reports.

Process Used for PLL in Abyuha

In general, the following process has been used to perform PLL in Abyuha:

- 1) Chisel plow the area to be leveled.
- 2) Smooth the surface of the field using the field plane so a grid survey could be made on a relatively smoother surface.
- 3) Perform a grid survey to determine cuts and fills necessary to bring field to dead level.
- 4) Use soil scraper or field plane to perform cut/fill operations. Generally, it was indicated the field plane was used more often for this step.
- 5) Perform a grid survey to check the tolerance of grid point elevation variations. The goal was generally to level until ± 2 cm from mean field elevation was achieved at most of the grid points.
- 6) Further smoothing was performed if the check grid survey indicated it was needed.

122

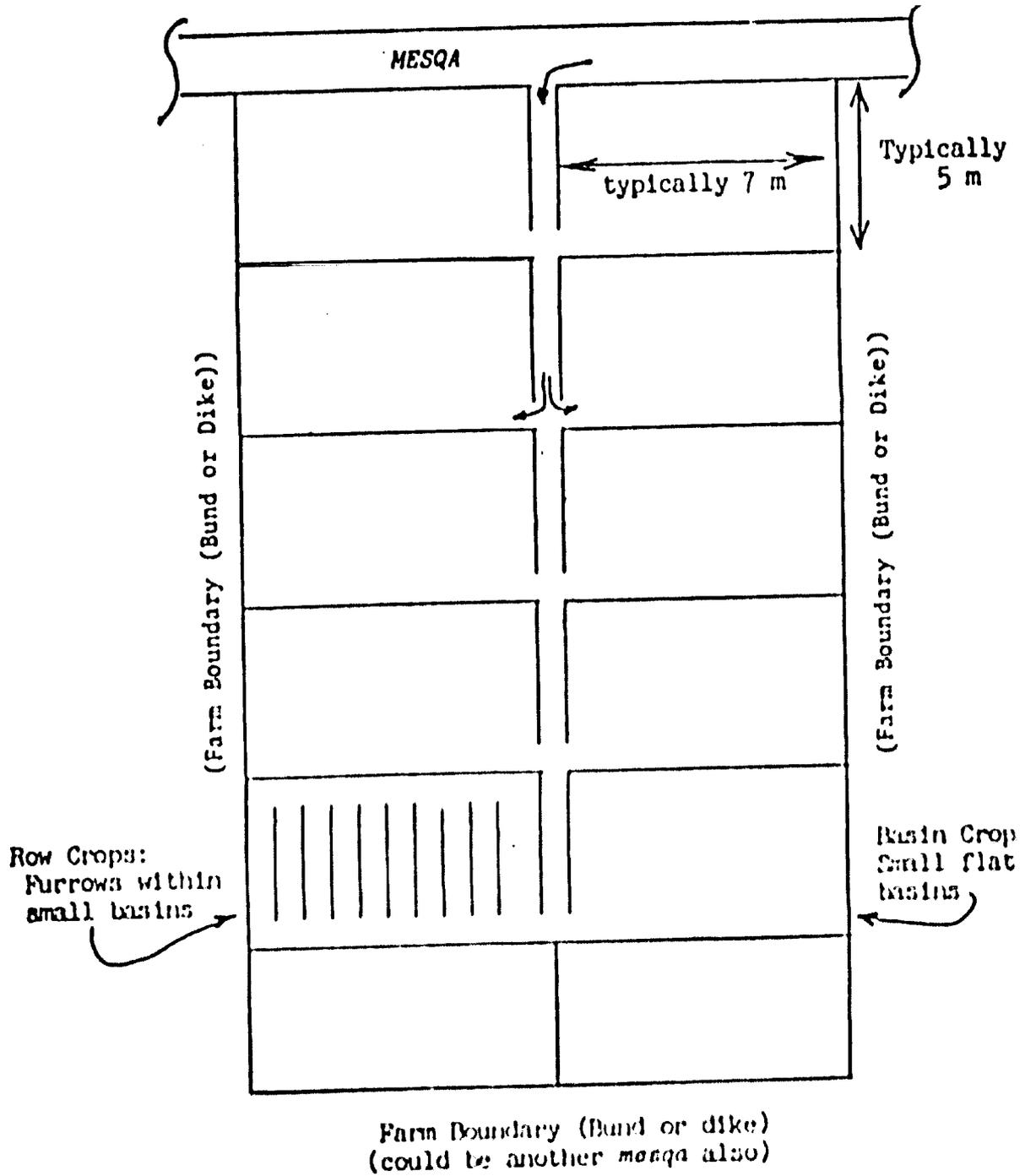


Figure 2. Typical layout of the Farm Irrigation System, Abyula Area, El-Minya.

Grid surveys were generally set up to conform to the dimensions of the field. For instance, it was not always possible to use a standard 10 m x 10 m grid size, because a large number of the farms in the area are long and narrow. Where necessary, the grid interval across a narrow strip was adjusted so that at least two grid points were established. This often meant that grid intervals across a field were from 5 m to 10 m. Lengthwise, a grid interval of 10 m was typically used. The procedure for calculating cuts and fills at the grid points was to first determine the average rod reading for the entire field from the rod readings at each grid point. This value was generally rounded to the nearest centimeter. Comparing this value with the rod reading at each grid point determined if a cut or fill was necessary at that point. In this way, a grid map of cuts and fills (in centimeters) was constructed. This map was used by the operator for performing the leveling, as well as grid stakes established at various grid points and at points along the field boundaries. Cut and fill volumes were determined by summing the product of the cut or fill depth at each grid point and the area it represented.

The calculation procedure described above results in equal cut and fill volumes, i.e., the cut-fill ratio is unity (1.00). Due to rounding of the average rod reading, cut-fill ratios sometimes were less than 1.00 and sometimes greater than 1.00. There was no attempt to lower the average plane to achieve a cut-fill ratio greater than 1.30, the recommended minimum to allow for soil settlement. Further description of calculations for precision land leveling is given in EWUP Manual No. 8.

Constraints

Constraints to performing PLL in Abyuha include the problems of accessibility to farms, the field size and shape, the crop pattern and rotation and the soil type and profile. A study was recently completed in the Abyuha area to characterize the conditions and situations of farm access roads in the area. The major finding was that access to farms in Abyuha is currently very limited. Easily accessible areas (for farm machinery such as needed for PLL) amounts to as small as 10% to 15% of the total study area. Access to interior farms along the mesqas is only possible by driving across neighboring farms (which may already be planted) and then only when these farms have not been recently irrigated.

Field size and shape can severely constrain PLL operations, particularly the field planing operation where most of the precision is achieved. Long,

narrow fields common in the area limit the maneuverability of machinery in the field. Smaller equipment and/or laser leveling systems may be necessary for improving this situation in an effort to maintain precision.

The crop pattern and rotation does not appear to impose any significant constraint on when PLL can be performed. Most farms would appear to be fallow at the same time during two or three periods between crops: a) between birsim and cotton in February or March (3 to 6 weeks), b) between broadbeans or wheat and maize in April to June (2 weeks to 2 months) and c) after maize or cotton and ^{winter} crops in September to November (10 days to 6 weeks).

Soils in the area are clay - clay loams and are classified as Vertisols. This means extensive cracks form as the soil dries. Plowing of the heavily cracked, dry soil causes large aggregates to be pulled up, which subsequently are difficult to work down to an adequate seed bed. Farmers may typically irrigate the rough, cloddy fields before attempting to prepare or improve the seed bed.

Summary of Grid Survey Data

In this section, the results of grid surveys on 37 fields which were leveled in 1981 and 1982 are summarized. The grid survey data were analyzed using a program developed for the HP 9825 computer. Figure 3 is an example of the analysis performed. The calculation procedure of this program was adapted to the method used in Abyaha, i.e., cuts and fills based on the average rod reading so that the cut-fill ratio is 1.00. Summary data were then taken from the 37 computer runs and are tabulated in Table 1 for 1981 farms and Table 2 for 1982 farms. The summary data taken are depicted in Figure 3:

- 1) average, maximum and minimum rod readings (m),
- 2) the range in rod readings (m),
- 3) the maximum cut and fill (cm),
- 4) the field area (Feddans),
- 5) the total cut and fill volumes (m³),
- 6) the cut volume on a one Feddan basis (m³/feddan).

It is to be noted that the calculated cut and fill volumes summarized in Tables 1 and 2 are based on the initial grid survey data only and therefore represent the maximum volumes required to bring the field to exact dead level. This is practically impossible given the machinery used, and the check surveys performed should be used to determine the actual earthwork. These check grid surveys were not made available for analysis and inclusion in this report.

125

LAND LEVELING DATA ANALYSIS

Maska 26
Fauzy Thabet, Abdel Hamid Hady
31 May 82 Survey before scraping

Field dimension(E-W)= 56.50 m Field dimension(N-S)= 66.50 m
Grid interval (E-W) dir.= 10.00 m
Grid interval (N-S) dir.= 10.00 m

Grid point values are rod readings ^{^N}

0.33 CO.02	0.35 FO.00	0.37 FO.02	0.35 FO.00	0.37 FO.02	0.65 CO.01
0.32 FO.01	0.32 CO.03	0.34 CO.01	0.32 CO.03	0.33 CO.02	0.65 CO.03
0.35 FO.00	0.39 FO.03	0.37 FO.02	0.34 CO.01	0.34 CO.01	0.65 FO.00
0.37 FO.02	0.39 FO.03	0.34 FO.01	0.34 CO.01	0.34 CO.01	0.65 CO.03
0.36 FO.01	0.37 FO.02	0.35 FO.00	0.35 FO.00	0.31 CO.04	0.65 CO.02
0.34 CO.01	0.35 FO.00	0.37 FO.02	0.33 CO.02	0.33 CO.05	0.65 CO.01
0.65 FO.04	0.65 FO.00	0.65 FO.01	0.65 CO.01	0.65 FO.01	0.42 CO.02

Rod reading (m)		
ave.	max.	min.
0.35	0.39	0.30

$$\text{range} = 0.09 \text{ m}$$

$$\text{Max. cut} = 5 \text{ cm}$$

$$\text{Max. fill} = 4 \text{ cm}$$

$$\text{Area} = 56.5 \text{ m} \times 66.5 \text{ m} \\ = 0.89 \text{ Fed.}$$

$$\text{Volume of cut} = 30.0 \text{ m}^3$$

$$\text{Volume of fill} = 30.0 \text{ m}^3$$

$$\underline{\underline{V_c = V_f = 33.6 \text{ m}^3/\text{Fed}}}$$

A value of 0.0 means pt. is outside of field bdy.

When no. appears in upper left corner of grid sq. it represents the size of that grid sq. as percentage of the std. grid size

Grid pt. cut/fill values are rounded to nearest (cm).

Adjusted average rod readings = 0.347 m Design value = 0.347 m
Total cut vol. = 30.04 m³ Total fill vol. = 30.04 m³
Extra fill vol. required(drainage) = 0.00 m³
This extra fill vol. was included in the calculations
Cut/fill ratio = 1.00

Figure 3. Example of land leveling data analysis performed using original grid survey data.

Table 1. Summary Grid Survey Data
Precision Land Leveling,
El Minya, Abyuha Area, 1981.

Farmer	Mesqa	Area (Fed.)	Rod reading (m)				Range in Cut & Fill Depths	Volume of Cut (m ³) (m ³ /Fed.)		Volume of Fill (m ³)	C/F Ratio
			Ave.	Max.	Min.	Range					
Ensaf Abdel Malik	5	1.06	0.39	0.44	0.30	0.14	+9 to -5	23.6	22.3	23.	1.00
Foly Soudek	7	0.85	0.38	0.43	0.32	0.11	+6 to -5	33.3	37.9	33.3	1.00
Said Nashed/ M. Yusef	7	1.27	0.21	0.29	0.17	0.12	+4 to -8	56.8	44.9	56.8	1.00
Abdel Mesehe	7	0.61	0.30	0.38	0.25	0.13	+5 to -8	24.7	40.1	24.7	1.00
Fathi Mina	7	0.33	0.26	0.30	0.20	0.10	+6 to -4	13.4	40.6	13.4	1.00
Kamel Shehata	7	0.66	0.23	0.32	0.17	0.15	+6 to -9	38.7	57.0	38.7	1.00
Abdala Eishak	7	0.97	0.41	0.45	0.38	0.07	+3 to -4	25.5	26.2	25.5	1.00
Moh. Fangary	7	0.50	0.23	0.27	0.20	0.07	+3 to -4	17.9	35.7	17.9	1.00
Zoza Tousan	7	0.54	0.28	0.35	0.24	0.11	+4 to -7	22.2	41.4	22.2	1.00
Ali Abdel Rahiem	7	0.91	1.52	1.56	1.46	0.10	+6 to -4	30.5	33.4	30.5	1.00
Saber Khalil	7	0.41	1.50	1.55	1.46	0.09	+4 to -5	11.7	28.7	11.7	1.00
Ragab Madalla	7	0.40	1.50	1.52	1.45	0.07	+5 to -2	7.8	19.5	7.8	1.00
Abdalla Mafaiz	7	0.41	1.50	1.56	1.48	0.08	+2 to -6	11.7	28.7	11.7	1.00
Sheihat Henin	7	0.41	1.51	1.55	1.49	0.06	+2 to -4	12.8	31.2	12.8	1.00
Abdo Meseiad	7	0.42	1.52	1.56	1.48	0.08	+4 to -4	13.7	32.7	13.7	1.00
Fawzy Thabet	26	1.13	0.56	<u>0.62</u>	<u>0.50</u>	<u>0.12</u>	+6 to -6	<u>44.1</u>	<u>39.0</u>	44.1	1.00

Mean (+ Std. dev.) 0.10
(+0.03)

Mean (+ Std. dev.) 34.96
(+9.26)

Table 2. Summary Grid Survey Data
Precision Land Leveling,
El Minya, Abyuha Area, 1982.

Farmer	Mesqa	Area (Fed.)	Rod reading (m)				Range in Cut & Fill Depths	Volume of Cut		Volume of Fill (m ³)	C/F Ratio
			Ave.	Max.	Min.	Range		(m ³)	(m ³ /Fed.)		
Abdo Ismail & F. Abdel Rahman	11	0.98	0.39	0.46	0.33	0.13	+6 to -7	52.7	53.7	52.7	1.00
Ibrahim Amin	11	0.91	0.44	0.49	0.35	0.14	+9 to -5	64.9	71.3	64.9	1.00
Kiser Fana	11	0.95	0.44	0.53	0.39	0.14	+5 to -9	50.4	53.1	50.4	1.00
T. Abdel Rasik, et. al.	11	1.76	0.41	0.49	0.36	0.13	+5 to -8	65.0	36.9	65.0	1.00
K. Abdel Moneim	11	0.90	0.34	0.39	0.30	0.09	+4 to -5	30.3	33.5	30.3	1.00
El Omda	20	9.2	0.53	0.60	0.40	0.20	+13 to -7	684.5	74.4	684.5	1.00
Abdalla Abo Takeia	22	3.17	0.60	0.65	0.55	0.10	+5 to -5	107.7	34.0	107.7	1.00
Abdalla Abo Takeia	22	3.19	0.60	0.64	0.53	0.11	+7 to -4	101.5	31.8	101.5	1.00
M. Selawy/Abdel Waly Khalid	22	1.41	0.40	0.47	0.33	0.14	+7 to -7	66.0	46.6	66.0	1.00
Fawzy Thabet/ Abdel Hamid Hady	26	0.89	0.35	0.39	0.30	0.09	+5 to -4	30.0	33.6	30.0	1.00
Abdel Hamid Hady	26	0.71	0.43	0.49	0.39	0.10	+4 to -6	32.2	45.1	32.2	1.00
Fathy Awad	28	1.68	0.41	0.49	0.34	0.15	+7 to -8	110.6	65.7	110.6	1.00
Aziz Mikhail, et. al.	28	3.56	0.38	0.45	0.32	0.13	+6 to -7	198.0	55.6	198.00	1.00
Hameda Mosa, et. al.	28	2.11	0.39	0.44	0.34	0.10	+5 to -5	88.2	41.8	88.2	1.00

128

Table 2. Summary Grid Survey Data (Continued)
Precision Land Leveling,
El Minya, Abyuha Area, 1982.

Farmer	Mesqa	Area (Fed.)	Rod reading (m)				Range in Cut & Fill Depths	Volume of Cut (m ³) (m ³ /Fed.)		Volume of Fill (m ³)	C/F Ratio
			Ave.	Max.	Min.	Range					
Abdel Rahman Shehata, et. al.	28	2.28	0.38	0.45	0.30	0.15	+8 to -7	128.3	56.3	128.3	1.00
Said Abdel Ghani	28	1.01	0.36	0.40	0.29	0.11	+7 to -4	44.3	43.8	44.3	1.00
Said Abdel Ghani	28	0.77	0.35	0.40	0.28	0.12	+7 to -5	30.7	39.9	30.7	1.00
M. Abdel Hakim	28	0.95	0.36	0.41	0.30	0.11	+6 to -5	35.0	36.8	35.0	1.00
Khaire Younes	25	0.64	0.64	0.65	0.62	0.03	+2 to -1	11.2	17.4	11.2	1.00
Al. Mohamed	25	0.56	0.40	0.44	0.36	0.08	+4 to -4	22.8	40.7	22.8	1.00
Gania Nazien	27	0.96	0.39	<u>0.42</u>	<u>0.36</u>	<u>0.06</u>	+3 to -3	<u>28.1</u>	<u>29.2</u>	28.1	1.00
Mean (<u>+</u> Std. dev.)						0.11	Mean (<u>+</u> Std. dev.)		44.8		
						(<u>+</u> 0.04)			(<u>+</u> 14.4)		

Table 1 shows that the average range in field elevation variation for the 16 farms of 1981 (mostly on Mesqa 7) is 0.10 m. This implies the average field has high and low spots which are ± 5 cm from the average elevation. Maximum cut found on the 1981 fields was 9 cm, while maximum fill was also 9 cm. The mean cut volume was about 35 m^3 per feddan with a standard deviation of about $9 \text{ m}^3/\text{feddan}$.

Table 2 shows that the average range in field elevation variation for the 21 farms of 1982 was 0.11 m. The average field then has high and low spots which are ± 5.5 cm from the mean elevation. Maximum cut found was 13 cm, while maximum fill was 9 cm. The mean cut volume was 44.8 m^3 per feddan with a standard deviation of about 14 m^3 per feddan.

For all 37 farms together, the average range in field elevation variation is 0.11 m, or ± 5.5 cm. This range is nearly four times greater than the recommended tolerance of ± 1.5 cm for efficient level basin irrigation. 75% of the fields measured show that the elevation variation is at least three times the acceptable tolerance. The ranges in cuts and fills in Abyuha given in Tables 1 and 2 (with a maximum of 13 cm) are not considered as limiting in terms of the characteristics of the soil profile or soil fertility.

The average cut volume for the 37 farms was found to be about $41 \text{ m}^3/\text{feddan}$ with a standard deviation of 13 m^3 per feddan. For reasons explained above, the actual cut volume will be less. The cut volume would also have been somewhat greater had the land leveling design been for a cut/fill ratio of 1.30 or greater, rather than the 1.00 value used. Measurements made on fields in Abu Raya area in Kafr El Sheikh showed that the initial estimate of cut volume was $61 \text{ m}^3/\text{feddan}$ (average from 39 fields). Using post-construction surveys available at that site, the actual earthwork cut volume was determined to be about $36 \text{ m}^3/\text{feddan}$ or only 60% of the amount determined when only the initial grid survey is used. Assuming this can be extrapolated to El Minya (since in both areas the goal was to achieve ± 2 cm on most of the field), then the estimated actual cut volume in Abyuha could be on the order of 60% of $41 \text{ m}^3/\text{feddan}$, or 24 to $25 \text{ m}^3/\text{feddan}$. It is noted, at any rate, that the earthwork volumes involved are relatively very small compared to typically reported volumes (on the order of $240 - 320 \text{ m}^3/\text{feddan}$ for areas in the U.S.).

Data on machinery operation times for performing the PLL work in Abyuha are presently not available for inclusion in this report. For purposes of comparison, data from Kafr El Sheikh showed that an average of 6.3 hrs./feddan was necessary for the chisel plowing, soil scraping and field plane operations. This average is based on 4 seasons of data during which 7 sets of PLL observations were recorded. Since the earthwork volume is less in El Minya it is likely the machinery time is also less.

Abyuha Area Development Plan and PLL

A major intervention plan has been developed for Abyuha area which entails improving the delivery system to provide for better quality (higher head and flow rate) gravity flow distribution in the system. This should provide for large available stream sizes at farm turnouts. Concurrently, plans include the elimination of almost every alternate mesqa and replacement with a farm access road. This is only possible where farm ownership pattern will allow farmers to obtain irrigation water from a different mesqa; apparently this includes a large portion of the area. This modification practically mandates the need for PLL in Abyuha as some farms will now have to depend on a different source of water and in most cases only one source. PLL to dead level on these farms will be necessary to ensure that adequate water distribution can be accomplished.

The addition of numerous farm access roads, where previously there was a mesqa, will allow for easier field access for PLL farm machinery. Better gravity delivery of water, implying consistently large available streams of adequate heads will be produced given proper system management, indicates that long runs can be used effectively. PLL to dead level will allow for implementation of properly designed long level basins and long level furrows. These systems should consequently reduce farm labor requirements. The entire scheme should eventually pave the way for farm mechanization in the area, which will be necessary as farm labor becomes scarce and costs increase.

Summary, Conclusions and Recommendations

This report summarizes briefly the experiences of EWUP in performing PLL on farms in Abyuha area, El Minya. The present situation of irrigated farms in the area is described to give the reader an introduction to how and why PLL can become a significant improvement practice in the area. Constraints to performing PLL in area presently include poor farm roads or lack of roads

which limit farm machinery movement to the field and small fields which limit maneuverability of conventional leveling machinery in the field.

Summaries of grid survey data from 37 farms which were leveled in 1981 and 1982 show that the average field elevation variation is 0.11 m. This translates to an ± 5.5 cm deviation from the mean, which is nearly four times the acceptable tolerance for dead level irrigation systems. Average earthwork volume was found to be relatively small: 41 m³/feddan cut volume was determined based on initial grid surveys.

Results of irrigation trials to test the influence of precision leveling and long irrigation runs on improved farm water management are summarized in other EWUP reports. Precision leveling does allow for efficient irrigation using long basins or furrows given that other design factors are appropriately accounted for. Precision land leveling and use of long level runs are integral components of a development scheme in Abyuha which is focused on improved gravity delivery of water and improved farm access.

In conclusion, it is noted that although the amount of earthwork and the field elevation variations are relatively small, PLL is still going to be a necessary practice to improve on-farm water management in Abyuha area. As farmers realize increased costs for their small basin methods, they will turn to longer runs on which PLL is necessary for efficient irrigation. In this regard, PLL is a recommended practice and it along with proper farm irrigation system design should continue to be demonstrated to farmers in the area as larger streams become available. This will allow farmers to develop the necessary management expertise for the new systems.

Acknowledgement

Special thanks are extended to Eng. Ahmed Abdel Naim for compiling grid survey data into a computer ready format for analysis and inclusion in this report. The assistance of Eng. Ahmed Bayoumi, Dr. Erwin Nielsen, and Dr. Eldon Hanson in the compilation of data and information for this report is gratefully acknowledged.

ITEM VIII

Summary Grid Survey Data/Mansuriya/El Hammami Area

Canal	Mesqa	Farm(er)	Survey Date	Grid Point Rod Reading/Elevation (m)			Range	Range in Cut Fill Depths (cm)
				Mean	Max.	Min.		
E.H.	-	A. Khalil	16/2/81	1.53	1.57	1.44	0.13	+9 to -4
E.H.	-	Saad	14/2/81	1.92	1.99	1.85	0.14	+7 to -7
E.H.	-	-	14/10/79	1.76	1.85	1.70	0.15	+6 to -9
E.H.	-	A. Khalil	25/2/81	1.55	1.57	1.53	0.05	+3 to -2
E.H.	-	-	11/10/79	1.50	1.59	1.42	0.17	+8 to -9
E.H.	-	Barror	-	1.39	1.45	1.30	0.15	+9 to -6
E.H.	-	1	13/8/79	1.475	1.51	1.41	0.10	+6.5 to -3.5
E.H.	1	Barror	20/4/79	1.54	1.60	1.47	0.13	+7 to -6

- Note: 1) There are several other grid survey maps in the Mansuriya file/El Hammami area which accompany the above. Those were omitted due to lack of information. The above surveys were for land leveling to dead level. Several maps (sites) were done in E.H. for a 0.1% design slope. These sites are also omitted in this summary. There is too much missing information on all the maps (especially grid size and field size) to determine cut and fill volumes. It is not clear that all surveys were done on a standard grid size; none of the surveys are so marked.
- 2) There are no machinery data in the file for El Hammami farms where leveling was done (unless it is in Arabic).

133

Canal	Mesqa	Farm(er)	Survey Date	GRID POINT Rod Reading/Elevation (m)				Range in Cut Fill Depths (cm)
				Mean	Max.	Min.	Range	
B.M.	-	6/Mahmoud	22/5/80	1.52	1.57	1.42	0.15	+10 to -5
B.M.	6	Bash	29/9/81	1.52	1.53	1.50	0.03	+2 to -1
B.M.	6	Abdel Saber	5/2/83	1.19	1.38	1.01	0.37	+18 to -19
B.M.	Site 6	Farm 6	8/10/80	1.48	1.56	1.38	0.18	+10 to -8
B.M.	-	-	7/1/80	1.56	1.59	1.53	0.06	+3 to -3
B.M.	-	-	-	1.49	1.54	1.44	0.10	+5 to -5
B.M.	5	-	14/4/79	1.75	1.80	1.70	0.10	+5 to -5
B.M.	-	-	12/4/82	1.77	1.84	1.68	0.16	+9 to -7
B.M.	Farm	No. 1	10 May	1.50	1.55	1.45	0.10	+5 to -5
B.M.	5	No. 6	3/6/79	1.52	1.56	1.48	0.08	+4 to -4
B.M.	5	No. 3	3/6/79	1.54	1.65	1.46	0.19	+8 to -11
B.M.	5	No. 2	3/6/79	1.50	1.57	1.44	0.13	+6 to -7
B.M.	10	No. 5	8/4/82					
		(14 small basins)		best case	1.87	1.83	0.04	
				worst case	1.90	1.83	0.07	
			(18 k)	total area	1.90	1.80	1.10	
B.M.	10	No. 1	6/4/82					
		(19 - 4m x 3m ² basins)		best case	1.91	1.90	0.01	
		228 m ²		worst case	1.88	1.84	0.04	
				total area	1.93	1.84	0.09	
B.M.	10	-	6/3/82					
	(5 small basins)				1.955	1.90	0.055	
		total area = 964 m ²						
B.M.	10	-	21/9/81	1.62	1.73	1.55	0.18	+7 to -11
B.M.	10	-	15/9/81	1.49	1.55	1.44	0.11	+5 to -6

Note: Several maps were omitted due to too much missing data. Cut and fill volumes not calculated due to missing data (grid size and field size). Machinery data available for 1 farm on M-6 only.

Table 2. Range in Elevation of Bunded Units for Selected Fields.

Location	Field Variation		Unit to Unit							
	Mean Field Elevation (m)	Range (cm)	Max.	Min.	Standard Deviation					
<u>Level Basin without Furrows - Field Variation</u>										
B.M. Site 2, Field 2	16.59	.9	16.64	16.55	0.02					
Field 4	16.58	20	16.67	16.47	0.07					
Field 5	16.58	21	16.69	16.48	0.07					
B.M. Site 6	16.40	13	16.46	16.33	0.03					
B.M. Site 7	16.64	13	16.71	16.58	0.03					
B.M. Site 1	16.70	17.5	16.795	16.62	0.05					
B.M. Site 4	16.49	20	16.60	16.40	0.07					
B.M. Site 5	16.43	12.5	16.485	16.36	0.03					
<u>Level Basin Without Furrows - Bunded Unit Variation</u>										
B.M. Site 3	16.43	10	16.48	16.38	0.03					
	16.43	10.5	16.485	16.38	0.026					
	16.43	12.5	16.485	16.36	0.026					
B.M. Site 2	16.59	9	16.54	16.55	0.019					
Field (2)	16.59	6	16.61	16.55	0.014					
B.M. Site 2	16.59	8	16.62	16.54	0.0199					
Field (4)	16.59	8	16.62	16.59	0.0199					
	16.60	6	16.61	16.55	0.0166					
	16.60	10	16.67	16.57	0.029					
	16.59	5	16.62	16.57	0.017					
	16.57	7	16.60	16.53	0.018					
	16.56	7	16.60	16.53	0.033					
	16.52	9	16.56	16.47	0.026					
B.M. Site 2	16.61	9	16.66	16.57	0.022					
Field (5)	16.61	8	16.66	16.58	0.019					
B.M. Site 6	16.40	5	16.43	16.37	0.021					
	16.42	10	16.46	16.36	0.024					
	16.41	7	16.44	16.37	0.015					
	16.37	9	16.42	16.33	0.02					
B.M. Site 7	16.63	5	16.65	16.60	0.014					
	16.62	6	16.64	16.58	0.015					
	16.67	8	16.71	16.63	0.016					
B.M. Site (1)	16.75	9.5	16.795	16.70	0.03					
	16.72	8	16.76	16.68	0.025					
	16.71	8	16.75	16.67	0.026					
	16.69	10	16.72	16.62	0.030					
	16.68	5	16.70	16.65	0.018					
	16.68	10	16.74	16.64	0.021					
E.H. Site (8)	17.04	20	17.15	16.95	0.07					
	16.93	11	17.00	16.89	0.029					
<u>Level Basin with Furrows - Bunded Unit Variation</u>										
	Ridge	Furrow	R	F	R	F	R	F	R	F
E.H. Site 6	17.70	17.62	8	7	17.73	17.65	17.65	17.58	0.026	0.022
E.H. Site 6	17.72	17.63	4	5	17.75	17.65	17.71	17.60	0.016	0.016
E.H. Site 8(X)	16.96	16.86	9	6	17.01	16.88	16.92	16.82	0.026	0.017
-- --	16.92	16.78	8	23	16.95	16.93	16.87	16.70	0.023	0.071
-- --	17.66	17.54	10	8	17.705	17.575	17.61	17.51	0.0226	0.0196