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QUARTERLY REPORT

April 1 to June 30, 1984

EGYPT WATER USE AND MANAGEMENT PROJECT

Contract No.

AID/NE-C-1351 (Egypt)

Project No. 263-017

0

Consortium for International Development
Executive Office
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I. PROJECT STATUS IN EGYPT

During the second quarter of 1984 emphasis was given to completing Project reports, moving the expatriate staff back to the United States and closing out contractor inventories and facilities. Late in the quarter, at the request of the Government of Egypt, a six-months no-cost extension was provided to the Project and to the contract between the Consortium for International Development and AID/Washington.

The extension permitted use of the Egyptian Pound account balance at the end of June to be used by the Water Management and Irrigation Systems Research Institute in furtherance of Project objectives. It also provided for the transfer of \$ 90,000 from funds left in the U.S. dollar account, to AID/Cairo for use by the Institute.

The primary effect of the extension will be to permit the Institute to use the limited funds for employing Project support staff and Drivers and for general operating expenses until secure funding is received under pending new project arrangements. A monthly budget of approximately LE 14,000 has been arranged for the period July 1 to Dec. 31, 1984.

The extension did not alter the actions in progress to terminate positions and residential facilities for expatriate staff who were living in Egypt. The schedule for preparing project technical reports was also maintained.

Residences were closed and household effects were shipped for Timothy Gates, Kenneth Litwiller, Eldon Hanson, Gene Quenemoen, James Layton and Richard Tinsley. Arrangements were also made for the personal travel of these persons and their families to the U.S.

The guest house at Maadi was closed late in June. All equipment and furniture was transported to storage facilities of the Ministry of Irrigation. It was received and signed for by MOI representatives.

The main office staff continued to assist field teams to extend their work outside the original field sites. The team at El-Minya is completing *mesqa* renovation on the Abyuha canal and providing preliminary surveys for the Serri canal which serves 126,000 *feddans* south of Minya. The Kafr El-Sheikh team is developing a water delivery improvement program for the Daqalt canal while the Mansuriya team has

extended its activities to the Nahia canal. The teams are working productively on interdisciplinary problems, utilizing training obtained through EWUP during the past six years.

The request for bids to complete construction of the El-Hammami buried pipeline has been readvertized. It is anticipated now that a contractor will be selected in July and that construction should be resumed shortly thereafter.

The contractor working on *mesqa* renovation at Minya has experienced many problems working with farmers and conducting construction operations on private land. It is clear that *mesqa* renovation requires a coordinated effort that involves working closely with farmers and farm leaders. The contractor did not have the qualifications or staff to provide such coordination and had to rely on EWUP professionals. Arrangements were made to have tractors and laser leveling units on hand during the time land is fallow, between winter and summer crops, to level land and at the same time obtained soil for rebuilding *mesqas*. The Egyptian Agricultural Mechanization Project (EAMP) has been providing land leveling services which is required after soil is scraped from adjacent fields for rebuilding the *mesqas*. It is becoming more evident each day that other management arrangements must be made in order to properly coordinate the *mesqa* improvement operations. EWUP and EAMP personnel answer to different supervisors and different ministries. Even with the memorandum of understanding, signed in April by the directors of both projects, difficulties arise in the field which cause work stoppages. Two alternatives for consideration in the future are apparent; (1) Establish an "authority" which is given funds, control and responsibility over resources and work plans or (2) Provide EWUP with needed land leveling equipment to be used in the *mesqa* modification process.

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

The IBM personal computers have proven to be extremely valuable for planning and evaluating improved irrigation management systems. An additional computer was purchased. We now have one IBM personal computer at each of the three field sites and two in the Cairo Main Office. TDY personnel from Colorado State University have assisted in translating computer programs from the previously used language for the Hewlett Pakard 9825A system to BASIC which is used by the IBM personal computers.

The Professional Employees Exchange Program (PEEP) operated jointly by the Ministry of Irrigation and the Salt River Project (SRP) through EWUP has sponsored two Egyptian engineers who worked for eight weeks at SRP headquarters in Phoenix, Arizona. The SRP also conducted a Senior Administrative Management Seminar at Phoenix, June 3-6. It was attended by Drs. Hassan Wahby and Mona El-Kady from the Project as well as other key personnel from the Ministry of Irrigation and Egyptian universities.

Drs. Wahby and El-Kady and Eng. Ahmed Bayoumi presented a paper at the International Congress on Irrigation and Drainage held late in May at Colorado State University. Engineer Bayoumi went on to observe canal renovation equipment and machinery management methods at R. O. Hanson Company in Spokane, Washington and at the SRP in Phoenix, Arizona. Dr. Moheb Semaika travelled to the U.S. for training in irrigation scheduling.

Tarif Zeitoun and Sabah Mahmoud returned to the Project from two semesters of training at CSU. Ragy Darwish was given permission to remain in CSU under sponsorship of the Ford Foundation until January 1985. He has enrolled in a graduate degree program. Farouk Abdel Al Omar was granted permission to remain at CSU until July 15 in order to complete some course work vital to his EWUP professional interests.

GOE permission was obtained to sell the six private owned vehicles belonging to the six American staff members who returned to the U.S. This saved the Project considerable shipping costs.

Project work is organized among six pilot program groups and nine active task groups. The pilot programs are continuing. The planned work of the Task Groups is now completed. These groups will be reorganized for the next phase of the work of the Research Institute.

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

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

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

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

MANSURIYA

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

The objectives of these structures are basically to:

1. Deliver proper quantities of water to all farmers served by the system.

2. Reduce the conveyance losses which now occur.
 3. Deliver water to farmers with sufficient head to allow for faster irrigations by gravity.
 4. Eliminate the need for lifting water on an individual basis by providing centralized lifting.
- A. Accomplishments and Future Plans for the El-Hammami Pipeline Pilot-Program:

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

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

2. Advertisements have been made to secure new contractors. Bids will be evaluated in July.
3. No on-farm water management data were collected due to the complaints of the El-Hammami farmers with respect to the pipeline problems.
4. The farm record data are being maintained and will continue. Several new crop enterprise cost studies have been completed as well. Work is being done on farm management surveys.
5. Collection of selected water budget and water quality data will continue.

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

Problems have been encountered in operating the *mesqa* according to plans:

- . Water levels in the Mansuriya canal during trun "B" became very low after closure period in January as mentioned in the last report.
- . The main pump for *Mesqa* 10 has been maintained.
- . The weeds increased in Beni Magdul as happens every year this time. Trials have been made to overcome this problem.
- . There is no pump on the well near the branch canal to provide water for *Mesqa* 10 through Beni Magdul canal, therefore, we started to build a room at the well site to install a diesel pump which can be used to feed Beni Magdul during shortage of water.

Because of water shortage the old *Mesqa* 10 has been opened. This gives the farmers a chance to compare the new *Mesqa* 10 with old *Mesqa* 10. We are recording and comparing data.

C. Special Studies:

1. Lining by using rubber sheets has been tested in Nahia Canal and also lining by concrete slabs and concrete cast-in-place has been tested in *Mesqa* # 3 and 6 in Beni Magdul.
2. The water budget work is being continued in the Beni Magdul area. Full details are reported by the water budget task group.
3. The cropping sequence studies are continuing.
4. The farm record data on numerous sites and the farm management surveys in the Beni Magdul Canal area continue.
5. The soil testing program that was started by Dr. Warner has continued by the team. It consists of obtaining soil samples

in the field and making consolidation and permeability tests in the laboratory. The soil samples from Kafr El-Sheikh and El-Minya have been tested in the field lab of Mansouriya area.

6. Special study for the water budget on *Mesqa #5* has been started to find out the contribution of ground water on the plant growth.

D. Training:

Agronomist Sabah Mahmoud, Engineer Tarif Zeitoun, and Sociologist Farouk Abdel-Al were in the U.S. for nine months of training. The first two named returned to the work at the Project field site in June. Farouk is expected to return July 15, 1984. Ahmed Tahoun has gone to Italy for 5 months training.

Mansuriya Field Staff

I. Professional

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

II. Non Professionalsal

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

III. Drivers

Abdel Latif El Tawil	El-Shimi Ismail
Salah Sadek	Aly Habashy
Nagy Hassan	

KAFR EL SHEIKHI. Summary of Progress

During the first quarter of 1984, work at the Kafr El-Sheikh EWUP site focused on activities as described below:

1. Routine data collection and analysis activities were carried out on summer pilot program sites of cotton and Rice. Applied irrigation water was measured. Observation well and irrrometer readings in the sites were taken. Soil moisture samples were taken before and after irrigation and weekly.
2. Routine sociological contact records and economic farm records work continued. Additional work was done on the crop calendar study and water requirement study. Climatological measurements were taken at Karada station.
3. Routine data collection was carried out for the water budget including water levels and quality for surface and subsurface water. Meterological data and crop surveys were taken.
4. Daqalt Canal data collection and analysis continued.
5. Analysis of the sociological questionnaire of Daqalt canal continued.
6. Discharge measurements by current meter in Daqalt Canal continued.
7. Work in previous seasons report for Kafr El-Sheikh.

II. Training Status and Changes

2. Econ. Ragy Darwish is at CSU for two semesters of academic training (since August 20, 1983).

III. Work Plans for the Next Quarter

1. On-farm work will continue, new.

2. Water budget work will continue.
3. Work in Daqalt report will continue including hydraulic and constructure design.
4. Seasonal reports will be written.
5. Computer training will continue.

IV. Personnel Assignments

1. Professional Staff

Kamal Ezz El-Din	Team Leader	Ahmed A.Monsef	Engineer
Abdel Fattah Metawie	Asst. T.L.	Esam Ezz El Din	Sociologist
Magdy Awad	Agronomist	Safaa Fahmy	Engineer
Ahmed Ismail	Agronomist	Hoda Hussein	Sociologist
Mohamed I. Meleha	Agronomist	Ragy Darwish ^{3/}	Economist
Magdi Badawi	Economist	Saad H. Zaki	Engineer
Mahmoud Moh. Said ^{2/}	Agronomist	Sobhi Elewa ^{1/}	Economist

2. Technicians

Hammad Group

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

El-Manshiya Group

El-Said Abdel Hamid
 Salah El Sayed Abdel Hafeez
 Moheb Abdel Sama El-Sawy
 Hassan El-Rafaey

Water Budget

Farag El-Masry
 Hassan El-Rafaey

Laboratory

Atef Hamed Sayed Ahmed

Equipment & Cars

Abdel Hamid Sayed

^{1/} Vehicles

^{2/} Laboratory and Karda station manager

^{3/} On training Leave

3. Secretary & Administrative

Mohamed Ahmed Abu Omar	Admin. Assistant
Nadia Mahmoud Arafa Ali	Secretary
Esmat Mostafa	Secretary

4. Drivers

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

5. Laborers

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

6. Guards

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

MINYA

I. Summary of Accomplishments

During the second quarter of 1984 work at El-Minya continued to emphasize canal, *mesqa* and road improvement, according to the Master Plan for Unit Area Development.

A. Abyuha Canal Pilot Program

Routine work continued on the Abyuha canal network of *mesqas*. Construction has fallen behind due to delays of the contractor and because of work stoppages by EAMP. It is very difficult

to get land leveling done at the time farmers have the land dry and clear between cropping seasons. EAMP is not sufficiently flexible in work schedules to meet the needs of farmers and consequently opportunities for land leveling are missed. It is doubtful whether this problem can be corrected without having the land leveling equipment completely under the control of EWJP.

B. Other Activities

1. We cleaned all the observation wells and recorded water levels from these wells every day during the winter closure.
2. We installed four peziometric wells inside the area and recorded the water level in these wells.
3. We continue the water budget work in the Abyuha area.
4. The economics discipline continues to:
 - a) Maintain up-to-date farm record books both in Arabic and English.
 - b) Measure the water applied to the selected farm on *Mesqa* 13.
 - c) Review the farm record books and prepare farm record surveys with personnel from the main office.

II. Plans for Next Quarter

1. Complete improving the *mesqas* during this summer harvesting time.
2. Level all lands adjacent to these *mesqas* from which we will take the soil to fill these *mesqas* during improvement.
3. Complete construction of the check structures on all *mesqas* which are improved.

4. Continue making water rotation schedules on the *mesqas* and raise the water in the canal to cover the area in the last reach by good gravity.

III. Personnel Assigned to Minya

Professionals

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

Technicians

Abdel Kany Hafiz
Nashat Younis
Mahmoud Noman
Bekhit Nazer
Mohamed Allah

Drivers

Khalaf Moh. Khalaf
Farouk Hassan
Mohamed Esawy

Laborers

Khalaf Saad
Kamel Ahmed
Hemid Said
Said Abdel Fattah

TRAINING

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

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

Arrangements were made for Engineer Saweres and Engineer El-Kashef to visit CSU and SRP as part of the Professional Engineers Exchange Program. They departed Cairo on May 5.

Engineer Ahmed Bayoumi participated in a one-month training program on machinery management and Dr. Moheb Semaika participated in a 5-week training program on water scheduling. Both training programs were coordinated through CSU.

Publications Report

During the past quarter, technical reports were produced with a quicker dispatch, both in Cairo and Fort Collins, to meet the June 30th deadline.

The following reports were published in Cairo. Photoready copies were (or will be) sent to FC for reproducing there.

TR # 41. The Influence of Farm Irrigation System Design and Precision Land Leveling on Irrigation Efficiency and Irrigation Water Management.

TR # 46. Hydraulic Design of a Canal System for Gravity Irrigation.

TR # 47. Water Budgets for Irrigated Regions in Egypt.

TR # 50. Farming System Economic Analysis of EWUP Study Cases.

TR # 51. Structural Specifications and Construction of a Canal System for Gravity Irrigation.

TR # 57. Infiltration Studies on Egyptian Vertisols.

DWP # 105. Farm Income Increases and Water Savings from the K.E.S EWUP On-Farm Pilot Program, Summer 1982.

DWP # 120. Kafr El-Sheikh On-Farm Pilot Program, Summer 1982.

The following report has been sent to the printer in Cairo:

TR # 45. Irrigation Practices of EWUP Study Cases - Abyuha and Abu Raya Sites for 1979/80, 1980/81 and 1981/82.

As of May 22, 1984, the following reports have been sent to the printer in Fort Collins.

TR # 27. Alternative Approaches in Extension and Rural Development Work: An Analysis of Differing Perspectives.

TR # 31. Analysis of Farm Management Data from Abyuha Project Site.

TR # 56. Egyptian Canal Lining Techniques and Economic Analysis.

TR # 76. Kafr El-Sheikh Farm Record Summary.

Manual # 10. EWUP Farm Record System.

Copies of the following reports were sent from F.C. to Cairo and are available in the Editorial Office.

TR # 21. El-Hammami Pipeline Design.

TR # 37. Allocative Efficiency and Equity of Alternative Methods of Charging for Irrigation Water: A Case Study in Egypt.

The remaining technical reports are in the final stages, whether in Cairo or in F.C., and will be completed very soon (Status Report attached).

Moreover, there are six Draft Working Papers and two Manuals that are still in Progress in the Editorial Office.

LIST OF PROPOSED EWUP TECHNICAL REPORTS

(Titles are preliminary)

Proposed TR No.	Title	Author	Status	
14	Administering an Interdisciplinary Project: Some Fundamental Assumptions upon which to Build	J.B. Mayfield & M. Naguib	With J. Layton for review. To be typed in F.C.	Layton
16	Irrigation System Improvement by Simulation & Optimization, I. Theory II. Application	J.M. Reddy & W. Clyma	To be printed in F.C. 50 copies are requested for dist. in Cairo.	E.V.R.
17	Optimal Design of Border Irrigation System	J.M. Reddy & W. Clyma	To be printed in F.C. 50 copies are requested for dist. in Cairo	E.V.R.
25	Problem Identification Report for El-Minya	R. Brooks & W. Schmehl	With Dr. Schmehl for final review To be typed and printed in F.C.	E.V.R.
32	Accessibility of EWUP Pilot Sites	A. El-Kayal, S. Saleh, A. Bayoumi & R.L. Tinsley	Approved as a DWP	E.V.R.
39	On-Farm Irrigation Practices for Winter Crops at Abu Raya	A.F. Metawie N.L. Adams & T.A. Tawfic	Needs approval for Project Directors & re-typing	G.Q.
40	A Procedure for Evaluating Crop Growth Environments for Optimal Drain Design	D.S. Durnford E.V. Richardson & T.H. Podmore	To be printed in FC 50 copies are requested for dist. in Cairo.	E.V.R.
42	Meeqa Renovation Report	N. Illsley & A. Bayoumi	Needs retyping & Directors' decision (TR OR DWP)	Hanson
44	Conjunctive Water Use - The State of the Art and Potential for Egypt	V. H. Scott & A. El-Falaky	Approved to be Published as a Manual. Sent to Dr. Scott for review.	G.Q.

Proposed TR No.	Title	Author	Status	
48	A Method for Evaluating and Revising Irrigation Rotations	R. L. Tinsley, A. Ismail & M. El-Kady	Needs minor editing	Tinsley
49	Farming System of Egypt: With Special Reference to EWUP Project Sites	G. Fawzy, M. Skold, F. Abdel Al & R. L. Tinsley	With Dr Tinsley for finalizing.	G.O.
52	Zinc Fertility Status of the Soils in Project Sites.	M. Abdel Naim	Needs retyping and P.O. approval	Tinsley
53	Crop Management Studies by the Egypt Water Use & Management Project	M. Abdel Naim	With Dr. Schmehl for review. To be retyped in F. C. 50 copies are requested for dist. in Cairo.	E.V.R.
54	Criteria for Determining Desirable Irrigation Frequencies & Requirements, and Comparisons with Conventional Frequencies and Amounts Measured in EWUP	M. El-Kady, J. Wolfe & M. Semaika	Needs minor editing and P. O. approval	Hanson
55	Design and Evaluation of Water Delivery System Improvement Alternatives	T. K. Gates, J. Andrew, J.Ruff D. Martella, J. Layton, M. Helal & A.Nasr	With T.K. Gates for Review. Not yet submitted to Ed. Office.	Gates
58	Cotton Field Trials, Summer 1980, Abu Raya	Kafr El-Sheikh Team as compiled by M. Awad & A. El-Kayal	Approved as DWP	Tinsley
59	Management Plan of a Distributary Canal System	A. Early, E. Wafik, T.K. Gates & J. Layton	With Dr. Early for completion	Gates

Project No.	Title	Author	Status	
60	Hydraulic Conductivity and Vertical Leakage in the Clay-Silt Layer of the Nile Alluvium in Egypt	J.W. Warner, T.K. Gates, W. Fahim, M. Ibrahim M. Awad & T.W. Ley	With Tim Gates for completion	Gates
61	The Effect of Irrigation Water Management on High Water Tables in Egypt	K. Litwiller M. El-Kady, T.K. Gates & E. Hanson	With Hala for corrections. Copy with Ken for review.	K.L.
62	The Water Quality of Irrigation Canals, Drains and Groundwater in Mansuriya, Kafr El-Sheikh & El-Minya Project Sites	A. El-Falaky, V.H. Scott, T. Hussein, I. El-Anwar, K. Khallaf & A. Nasr	With Hala for corrections. Needs Dr. Quenenoon's approval	G.Q.
63	Watercourse Improvement Evaluation (Mesqa # 26 & Mesqa # 10)	R. McConnen, F. Abdel Al, G. Ayad, D. Martellan E. Sourial & G. Fawzy.	With John Andrew for review	E.V.R.
64	Influence of Soil Properties on Irrigation Management in Egypt	A.T. Moustafa & R.L. Tinsley	With R.L. Tinsley for completion	Tinsley
65	Experiences in Developing Water Users' Associations	J. Layton and Sociology Team	With Jim Layton for completion	Layton
66	The Irrigation Advisory Service: A Proposed Organization for Improving On-Farm Irrigation Management in Egypt	J. Layton and Sociology Team	Not yet submitted to Editorial Office. To be typed in F. C.	Layton
67	Sociological Evaluation of the On-Farm Irrigation Practices Introduced in Kafr El-Sheikh	J. Layton, A. El-Attar, H. Hussein, S. Kamal & A. El-Masry	Not yet submitted to Ed. Office. To be typed in F.C.	Layton
68	Developing Local Farmer Organizations: A Theoretical Procedure	J. B. Mayfield & M. Naguib	Not yet submitted to Editorial Office. To be typed in F. C.	Layton

Proposed No.	Title	Author	Status	
69	The Administrative and Social Environment of the Farmers in an Egyptian Village	J. B. Mayfield & M. Naguib	Not yet submitted to Editorial Office To be typed in F. C.	Layton
71	Impact of Mesqa Intake Size and Condition on Water Management on Farms	E. Hanson, M. El-Kady & K. Litwiller	With Hala for typing. Not yet submitted to Editorial Office.	Hanson
72	Baseline Data for Improvement of a Distribution Canal System.	K. Ezz El-Din K. Litwiller & Kafr El-Sheikh Team	Not yet submitted to ED. Office . Draft with Ken Litwiller	K.L.
73	Considerations of Various Soil Properties for the Irrigation Management of Vertisols.	C. W. Honeycutt & R. D. Heil.	In final stages of review in F.C.	E.V.R.
74	Farmers' Irrigation Practices in El-Hammami Sands.	T. A. Tawfic R. L. Tinsley	Needs editing & P.D. approval	Tinsley
75	Abyuha Farm Record Summary and Analysis over years (1979/1983).	D. W. Lybecker, F. Abdel Al, E. Sorial & N. Farag	To be reviewed & retyped in F.C.	E.V.R.
77	El-Hammami Farm Record Summary & Analysis.	M. Haider, M. Skold E. Abdel Ali, H. El-Naggar & G. Ayad.	to be typed in F.C. (C/o M. Haider)	
78	Beni Magdul Farm Record Summary & Analysis.	M. Haider, G. Fawzy, L. Nasr & F. Abdel Al	To be typed in F.C. (C/o M. Haider).	
79	A Technical and Economic Analysis of Low Lift Irrigation Pumping in Egypt	Henry Horsey	To be reviewed & printed in F.C.	

MAIN OFFICE

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

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

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

 * On leave without pay.

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

* On leave without pay.

II. BACKSTOPPING

Planning and Coordinating Committee

The second quarter of 1984 the Project Planning and Coordinating Committee (P & C) concentrated on reviewing and rewriting where needed the technical reports summarizing the Project findings. The committee continued to meet on a biweekly basis to discuss the final details of the transfer of the Project to the Egyptian Ministry of Irrigation. As part of the committee's oversight function, work plans were developed and TDY assignments were approved in areas where delays in the completion of the Project's work had occurred. Specifically, Dave Molden, a CSU micro-computer specialist in water resources, spent 7 weeks in Cairo this last quarter aiding in the transfer and rewriting of computer codes. Dr. Alan Early, a specialist in delivery systems planning and management spent 11 weeks in Cairo reviewing, and critiquing project reports, and completing the development of Project planning and management tools.

The P & C Committee members continued to advise the Egyptian Project personnel who were completing training programs at Colorado State University. The P & Committee during the 6 month unfunded project extension will continue to meet to review Project activities and provide technical and management support when needed.

Fort Collins Staff

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

22.

The publishing activities of the Fort Collins Staff increased due to a reorganization of the publishing responsibilities within the Project. The publishing activities of the Fort Collins Office include editing and minor rewriting, typing, proofing, printing and distributing the Project reports to over 100 individuals and institutions in North America and Europe. The publishing activities are expected to be completed prior to October 30th. A schedule detailing the reports published by the Fort Collins office and the status of the unpublished reports is in the appendix. Additionally, over 10 Conference presentations and several Journal articles were prepared this quarter.

Travel arrangements for the TDY's and the returning American Staff and families continue to be handled by the Fort Collins staff. Airline and hotel reservations, insurance arrangements, visa requirements, per diem checks and orientation were all handled by the Fort Collins staff along with the engendered administrative and accounting tasks. Travel and shipping arrangements were completed for the return of the American staff, their dependents and personal effects from Cairo.

Long term Training

Three trainees completed their long term training at Colorado State University this quarter. A fourth trainee returned to Egypt prior to the completion of his coursework. A list of the trainees and the courses they took follows.

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<u>NAME</u>	<u>COURSE</u>	<u>COURSE #</u>	<u>CREDITS</u>	<u>GRADES</u>
<u>Economics - (Young)</u>				
Ragy Darwish	Economics of Water Resource Planning	EC542	3	B
	Micro Economic Analysis I	EC506	3	B
	Agricultural Production Economics	EC505	3	B

Ragy Darwish continued his excellent work this quarter. He completed all Colorado State University English requirements and was cited by his instructors for his excellent written and oral skills. Ragy received a Ford Foundation Fellowship to complete a Master's degree at Colorado State University.

<u>Sociology - (Knop)</u>				
Farouk Abdel Al Omar	Introduction to Social Research	S210	3	C
	Quantitative Social Analysis	S310	3	Audit
	Independent Study with Dr. Knop	S695V	3	S*

*Satisfactory

Dr. Knop reported that Farouk worked diligently this quarter. Farouk's work continued to improve as he became more accustomed to the American educational process and culture.

<u>Agronomy - (Schmehl)</u>				
Sabah El-Sayed	Irrigation	AG370	3	D
	Soil Physics	AG470	3	C

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Agronomy - (Schmehl) (Continued)

Sabah El-Sayed

Soil Physics Lab	AG471	1	A
Salinity and Soil Water Management	AG666	4	C
Advanced Soil Microbiology	AG755	3	I

Dr. Schmehl reported that Sabah worked diligently throughout the quarter.

Short-Term Training

Ahmed Bayoumi, Management of Motor Pools, (May 25 - June 24, 1984)

1. Attended the International Congress on Irrigation and Drainage, Fort Collins, Colorado.
2. Maintenance of heavy equipment, operation of irrigation machinery pools and land leveling, Colorado State University and the Salt River Project. He also visited the Hanson Company in Spokane, Washington to observe the production of irrigation equipment.

Moheb Semaika, Project Engineer (April 24 - June 9, 1984)

1. An in-field study of irrigation system scheduling, operations, design and maintenance. Prosser, Washington, Fresno, California, Fort Collins, Colorado.
2. Attended the International Congress on Irrigation and Drainage, Fort Collins, Colorado.

American TDY's

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

Alan Early, (April 6 - June 20, 1984) Reviewed and completed irrigation delivery system planning and operation reports. Developed management plans for the Abyuha distribution system. Helped develop preliminary workplans for the National Irrigation Improvement Project. Provided computer workshops.

Mohamed Haider, Economist, (March 10, 1984 - April 21, 1984) Review and revision of the studies on crop production functions, determination of the value of irrigation water in Egypt and revision of the economic reports for the three Project sites.

David Molden, Micro-Computer Specialist and Hydraulic Engineer (February 6, 1984 - April 5, 1984) Conversion and enhancement of computer programs on the Hewlett Packard 9825 to an IBM PC. Assisted in the design of a computer aided canal design model and provided software support for the Lotus 1-2-3 program.

E. V. Richardson, Project Coordinator (June 7 - June 25, 1984) Complete Contract termination details.

Bill Ree, Irrigation Expert (March 31 - May 9, 1984) To complete reports on delivery system design and operation and to teach a short-course on hydraulic design of irrigation canals.

Rex Rehnberg, Economist (January 30, 1984 - March 30, 1984) to help Task Group 4 complete a technical report evaluating the economic aspects of Mesqa #10. To review and edit reports on the farm management surveys of El-Hammami and the farming systems analyses of Project sites.

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Bill Schmehl, Agronomist (March 10, 1984 - April 10, 1984) - a member of the P & C Committee, to work with the EWUP long term staff, review and edit PTR's 25 & 53 and attend the EWUP National Conference (March 18 - 24, 1984).

Mel Skold, Economist, (March 16, 1984 - April 2, 1984) to work with EWUP long-term staff, review and edit PTR's #49 and 76 and attend EWUP National Conference (March 18 - 20, 1984).

Egyptian TDYs

Dr. Mamhoud Abu Zeid, Chairman of the Water Research Institute MOI (May 19 - June 14, 1984) Attended the International Congress on Irrigation and Drainage, Fort Collins, Colorado. Also attended the Executive Management Seminar - Salt River Project - Scottsdale, Arizona.

Dr. Mona El-Kady, Senior Research Engineer, EWUP, (May 19 - June 14, 1984) Attended the International Congress on Irrigation and Drainage, Fort Collins, Colorado. Visited California State University - Fresno - Advances in Irrigation Technology and Irrigated Soil Problems. Also attended the Executive Management Seminar - Salt River Project - Scottsdale, Arizona.

Dr. Hassan Wahby, Director of EWUP, (May 19 - June 14, 1984) Attended the International Congress on Irrigation and Drainage, Fort Collins, Colorado. Attended the Executive Management Seminar - Salt River Project - Scottsdale, Arizona. Also helped complete contract termination details.

Dr. Wafai Abdel Sallam, General Director, Project Preparation Department, Horizontal Expansion Projects, (May 26 - June 13, 1984) Attended the International Congress on Irrigation and Drainage, Fort Collins, Colorado, and the Executive Management Seminar - Salt River Project - Scottsdale, Arizona.

Farouk Abdel Al - Economist, (May 5 - May 22, 1984) Worked with Dr. Skold on the farm record summaries for EWUP technical reports.

Salt River Project Exchange Program (SRP)

Kamal Zaky and Fathi El-Shaer completed their training at the Salt River Project (SRP) this quarter (February 20 - April 20, 1984). The 8-week training tour was designed to increase the professional competence of the participants. A one week orientation program at Colorado State University preceeded the SRP training program. Specific subject areas included water operations, construction and maintenance of irrigation delivery systems and water resources and services.

F. Saweres and A. El-Kashaf (May 5 - June 30, 1984) Began their eight week training program at SRP this quarter. Their training program is similar to that of K. Zaky's and F. El-Shaer outlined above.

Equipment

1. The Hewlett-Packard HP-41CX calculator systems have been purchased and received. They have been packed and will be hand carried by the next TDY going to Cairo.

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2. The main housing of the diesel generator for El Hammami was crated on its trailer for additional protection. The unit left CSU on a flat bed trailer, July 2, 1984, for the port at Houston, Texas where it was enclosed in a dedicated container for shipment to Egypt on the Brinton Lykes vessel. It left Houston on August 1, 1984 for arrival at Alexandria approximately September 1, 1984.
3. Parts and accessories for the Hewlett-Packard HP-67 and HP-97 calculators were purchased and sent with E. V. Richardson in June of 1984.
4. All other parts and supplies that were requested have been sent with personnel traveling to Egypt during May and June of 1984.

Work Plans

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

The Planning and Coordinating Committee will continue to provide technical and management advice when requested. A limited number of TDY's may be authorized this next quarter should a need be identified and the funds available.

The publication and distribution of the majority of the project technical reports will be completed next quarter.

III. PERSONNEL

Field Staff

All American field staff returned to the United States by June 30, 1984.

Campus

The following people will be in Egypt TDY next quarter:

James Layton

September 15, 1984 - October 31, 1984

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 8655, Cable ENGRCSU

STATUS OF EWUP TR PUBLICATIONS August 10, 1984

As of August 10, 1984, the following reports have been printed and are ready for distribution:

1. Manual #10 - EWUP Farm Record System*
2. PTR#14 - Administering an Interdisciplinary Project: Some Fundamental Assumptions Upon Which to Build*
3. PTR #27 - Alternative Approaches in Extension and Rural Development Work: An Analysis of Differing Perspectives*
4. PTR #31 - Analysis of Farm Management Data From Abyuha Project Site*
5. PTR #40 - A procedure for Evaluating Crop Growth Environments for Optimal Drain Design*
6. PTR #46 - Hydraulic Design of a Canal System for Gravity Irrigation
7. PTR #47 - Water Budgets for Irrigated Regions in Egypt.
8. PTR # 56 - Egyptian Canal Lining Techniques and Economic Analysis*
9. PTR #63 - Watercourse Improvement Evaluation*
10. PTR #73 - Considerations of Various Soil Properties for the Irrigation Management of Vertisols*
11. PTR #75 - Abyuha Farm Record Summary and Analysis Over Years 1979-1983*
12. PTR #76 - Kafr El-Sheikh Farm Record Summary*
13. PTR #78 - Beni Magdul Farm Record Summary and Analysis*
14. PTR #79 - A Technical and Economic Analysis of Low Lift Irrigation Pumping in Egypt*

* 50 copies of these reports have been shipped to Egypt by air freight with a photoready copy for additional printing.



The following reports have been sent to the printers:

1. PTR#41 - The Influence of Farm Irrigation System Design and Precision Land Leveling on Irrigation Efficiency and Irrigation Water Management
2. PTR#50 - Farming System Economic Analysis of EWUP Study Cases
3. PTR#51 - Structural Specifications and Construction of a Canal System for Gravity Irrigation
4. PTR#57 - Infiltration Studies on Egyptian Vertisols
5. PTR #60 - Hydraulic Conductivity and Vertical Leakage in the Clay-Silt Layer of the Nile Alluvium in Egypt
6. PTR #61 - The Effect of Irrigation Water Management on High Water Tables in Egypt
7. PTR#65 - Engineering in Developing Water Users' Associations

The following reports are going through final editing procedures and should be ready for printing within two weeks:

1. PTR#25 - Problem Identification Report for El Minya
2. PTR#67 - Sociological Evaluation of the On-Farm Irrigation practices Introduced in Fakr El-Sheikh
3. PTR#68 - Developing Local Farmer Organizations: A Theoretical Procedure
4. PTR#69 - The Administrative and Social Environment of the Farmers in an Egyptian Village
5. PTR #77 - El-Hammami Farm Record Summary and Analysis

The following reports have been turned into our office and must be retyped and edited:

1. PTR #44/(Manual #3) - Conjunctive Water Use - The State of the Art and Potential for Egypt
2. PTR#55 - Design and Evaluation of Water Delivery System Improvement Alternatives, Dr. Early, Tim Gates and Dr. McConnen are working on this report.
3. PTR#64 - Influence of Soil Properties on Irrigation Management in Egypt.
4. PTR #72 - Baseline Data for Improvement of a Distribution Canal System.

The following reports are in the process of being rewritten by the authors:

1. PTR#49 - Farming System of Egypt: With Special Reference to EWUP Project Sites. Dr. Tinsley is working on this report.
2. PTR#53 - Crop Management Studies by the Egypt Water Use and Management Project, Dr. Schmehl is working on this report.
3. PTR#59 - Management Plan of a Distributary Canal System, Dr. Early is working on this report.
4. PTR#66 - The Irrigation Advisory Service: A Proposed Organization for Improving On-Farm Irrigation Management in Egypt, Dr. Layton is working on this report.
5. PTR#71 - Impact of Mesqa Intake Size and Condition of Water Management on Farms, Dr. Early is working on this report.

The following reports are to be printed and rewritten in Cairo.

1. PTR#32 - Accessibility of EWUP Pilot Sites
2. PTR#39 - On-Farm Irrigation practices For Winter Crops at Abu Raya.
3. PTR#42 - Renovation Report.
4. PTR#45 - Irrigation Practices of EWUP Study Cases - Abyuha and Abu Raya Sites for 1979-1981 and 1981-1982.
5. PTR#48 - A Method for Evaluating and Revising Irrigation Rotations.
6. PTR#52 - Zinc Fertility Status of the Soils in Project Sites.
7. PTR#54 - Criteria for Determining Desirable Irrigation Frequencies and Requirements, and Comparisons with Conventional Frequencies and Amounts Measured in EWUP.
8. PTR#58 - Cotton Field Trials, Summer, 1980, Abu Raya.
9. PTR#62 - The Water Quality of irrigation Canals, Drains and Groundwater in Mansuriya, Kafr El-Sheikh and El-Minya Project Sites.
10. PTR#74 - Farmers' Irrigation Practices in El-Hammami Sands.

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MESQA RENOVATION

by

NORMAN ILLSLEY

EGYPT WATER UTILIZATION PROJECT

! CAIRO, MARCH 1983

INTRODUCTION

This paper suggests a method of rebuilding Egyptian irrigation mesqas using heavy machinery, based on research done near the Abyuha Canal, El Minya, in 1983.

The machinery used for this trial was borrowed, and the operators were not familiar with this type of work. Nevertheless, we found that an articulated motorgrader, an Eversman "V" ditcher, and a 65-hp agricultural tractor with dual wheels were able to handle the job satisfactorily. With freedom to modify the equipment, based on additional experience, the effectiveness of the method could be improved.

There are two additional pieces of equipment which would do the work better and more easily. Instead of a wheel tractor, a crawler tractor would operate more effectively in wet conditions. A sheepsfoot roller attached to the front of the motorgrader would do a better job of compaction than was possible with the equipment used in this trial.

PROCEDURES

The process of mesqa renovation involves the following operations.

1. Development of a design for the new mesqa.
2. Removal of standing water.
3. Removal of organic matter and other debris.
4. Backfilling and building up a pad.
5. Cutting a new channel and installing check structures and turnouts.

1. Design.

Farmers whose lands are irrigated by the mesqa must be involved in the planning and design of the renovation. This will ensure their cooperation and minimize the possibility of oversights of farmers' needs. After the plans have been agreed upon, the mesqa should be staked, indicating the centerline and elevations.

2. Standing water.

Removal of standing water is essential because excess moisture will prevent proper compaction. Standing water is caused by an uneven channel bed, causing pools after the

ditch has been drained, and by seepage through the banks, aggravated by a high water table and organic matter in the banks.

Various techniques were tried to solve these problems. A furrow down the bed, either dug by hand or made by dragging a log behind a tractor, helps the natural drainage. Remaining pools can be pumped out with a small engine-drive pump. A much better mesqa will result if time permits allowing the ditch to dry out in the sun after drainage and after the organic matter has been removed.

Fill dirt should also be as dry as possible to aid compaction.

3. Organic matter.

All organic matter and debris, including trees, bushes, grass, sticks, and trash such as rocks and concrete, must be removed from the mesqa. The area from which fill dirt will be taken must also be cleared. Clearing will remove organic matter and expose the soil to the sun to help dry it out.

Trees and other large obstructions can most easily be removed with a small bulldozer. Stumps or heavy pieces of concrete can be extracted with a tractor-mounted winch.

Weeds and bushes are cut out with the blade of an articulated motorgrader. With careful operation, this machine can remove a thin slice of the bank, taking the organic matter and leaving most of the soil. The undesirable material can be graded off to the edge of the work area, leaving it free of organic matter.

4. Backfilling and building up a pad.

Backfilling and compacting can begin when the old mesqa bed and the fill dirt are sufficiently dry. Centerline stakes should be flagged to mark the final bed elevation.

The best technique found for backfilling was to use the motorgrader blade as a plow to turn a slice out of the old bank into the channel. One of the virtues of the articulated motor grader is that the front wheels pack the soil while the back wheels remain safely on the firm ground above. Each succeeding pass cuts another slice and adds it to the accumulation in the mesqa. Each cut is made at a flatter slope until the blade is level and the old channel is filled and packed.

To obtain good compaction, the fill material should be uniform in texture and moisture content. Non-uniform layers will separate when the ditch is being dug. A sheepsfoot roller is the best implement for compaction because the

spikes on the roller penetrate and mix the soil being compacted. This implement can be mounted on the front of the motorgrader, in place of the scarifier. The roller will pack the layer of fill from the previous pass of the motorgrader. Compaction of soil in a watercourse does not have to be as dense as for roadbed construction (see Kemper 1979).

5. Cutting a new channel.

A "V" type ditcher pulled by a crawler tractor is the best combination for cutting the new mesqa. The tread of the tractor must be wide enough to span the width of the trench being cut. If the ditcher is mounted on a 3-point hitch, this will give it greater stability. A crawler tractor is preferred because it has a natural tendency to go in a straight line, and the tracks spread the excavated soil. Normally three to four passes with this machine should cut a satisfactory ditch in the mesqa. The excavated material can either remain on the mesqa bank or be scraped-off into adjoining fields

After the channel has been cut, basic water control structures must be installed in accordance with the engineering design and based on the anticipated distribution of water to the farmers' fields. These should include drop

structures if the slope of the mesqa is sufficient to require them. Check structures can be used to raise the level of water in that section of the mesqa where farmers are irrigating.

Turnouts should be installed frequently enough so that there will be no need for cutting the mesqa bank to get delivery of water to the fields. Where the watercourse passes through villages where the water is used for domestic washing or bathing cattle, special masonry structures should be installed to limit the erosion of the mesqa from these activities.

CONCLUSION

The magnitude of the task of mesqa renovation in Egypt is such that hand labor cannot cope with the problem. The use of mechanized equipment will make renovation possible. All the machinery discussed in this paper is conventional equipment, readily available. However, some of the techniques are different from those used in road construction. With training and practice, a good operator can learn these new skills quickly.

Table 1. Mechanized *Mesqa* Renovation Team

Team Leader	: Agricultural Engineer
Survey	: 3 person\$
Dozer Operator	
Motor Grader Operator	
Mechanic	

Table 2. Mechanized *Mesqa* Renovation Rate of Work.

Survey	5 Km per day 5 Km per day	Initial Final layout before cutting
Dozer	1.5 Km per day	
Motor Grader	1.5 Km per day 1.5 Km per day	Remaining Organic Matter Backfilling
Ditcher	5 Km per day	

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Table 3. Mechanized *Mesqa* Renovation
Time per 1.5 Km *Mesqa*.

Surveying	1/3 day
Dozing	1 day
Organic Matter Removal	1 day
Drying Out	3 days
Backfilling	1 day
Surveying	1/3 day
Ditching	1/3 day
TOTAL	1 Week 4 Work days

} Concurrent

Table 4. Mechanized Mesqa Renovation Operational Plan.

Item	Planning	Draining Water	Organic Matter Removal	Trash Removal	Back- filling	Cutting
1. Farmers	X	X		X		
2. Transit & Rod	X				X	X
3. Crawler						
with dozer		X	X	X	X	
with winch				X		
with 3-pt. hitch & ditcher						X
4. Motor Grader		X	X		X	
with sheep foot roller					X	
5. Pump	X	X	X			

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Figure 1. The old mesqa has been filled with the spoil from the first pass of the motor grader.

Figure 2. Rear view of the motor grader, showing the rear drive wheels on firm ground, and the front wheels articulated to the left, running on the new mesqa pad.

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- 14 -

Figure 3. The new mesqa cut by the V-ditcher.

3. Excess water in the mesqa must be drained off either by establishing a small channel in the bottom of the mesqa feeding into a sump at one end of the mesqa and then pumping the water from the sump or by pumping at intervals along the mesqa.

Land adjoining the mesqa and needed for machine operation should be drained at the same time.

4. Organic matter should be removed:
 - a. First from the top of the mesqa bank so that there is a relatively smooth surface for machinery to operate from. This can be done with a road grader.
 - b. Second, from the mesqa side wall, again using the road grader with the blade swung to the side and cutting at a grade, or if conditions require, with a bull dozer.
 - c. Third, the area alongside the mesqa should be graded off to remove all the original matter from the area where soil will be taken from for refilling the mesqa. This can also be done with a road grader. The total organic matter will be left in a windrow at the outer edge of the mesqa right of way.
5. Backfilling will be done with either a bull dozer, or road grader, depending on what proves most appropriate for the conditions which prevail.

Where along runs can be made, the road grader can move a windrow of fill. This would be the fastest method of filling in the old mesqa.

6. Compaction should be done at about 20 cm lifts to assure sufficient density to the mesqa bed. This should be done with a sheeps foot roller.

If a bull dozer is used for the filling, some implement such as a road grader or back blade will be needed to spread out the fill to the desired 20 cm depth prior to compacting.

7. The new mesqa can be cut in several ways. A road grader with the blade angled and sloped under the center of the machine; or a machine similar to the DANDI ditcher can be used to cut the original ditch and follow this with a grader to widen the ditch to the desired profile; or an EVERSMAH type ditcher can cut the ditch to the desired depth, are possibilities.

A road grader can be hired for about L.E.100/day. Presumably crawler tractors with dozer blades should be available for similar costs.

In the event that irrigation water must be pumped to an area where the mesqa renovation activity has cut off the normal supply of water, the cost of pump and pipe must be considered.

Appendix A Recommendations for carrying out the work of mechanical mesqa renovation.

Mesqa Renovation

(Please add your comments or criticism)

REQUIREMENTS:

- 1. Uniform cross section.
- 2. Proper grade.
- 3. Adequate banks
- 4. Adequate compaction.
- 5. Elimination of organic matter.
- 6. In a condition that will allow easy periodic maintenance.

ANTICIPATED STEPS TO ACCOMPLISH RENOVATION:

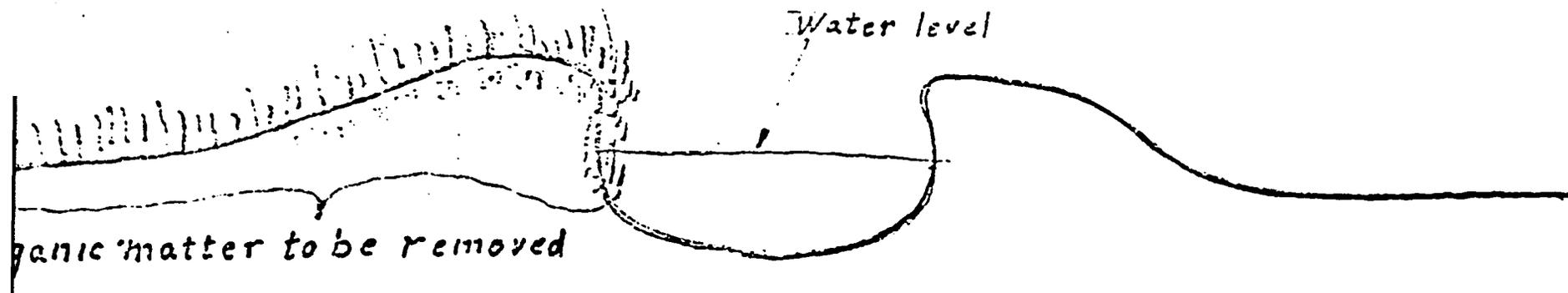
- 1. Survey and mark (with flags or stakes) the mesqa.
- 2. Remove physical obstructions.
- 3. Drain off excess water and dry the area sufficiently for machine work.
- 4. Remove organic matter:
 - a. From the top of the mesqa bank
 - b. From the mesqa side wall.
 - c. From the area where fill dirt will be barrowed.
- 5/6. Backfill and compact the mesqa with clean material
- 7. Recut the mesqa to the desired cross section.

ANTICIPATED PROCEDURE FOR THE ABOVE STEPS:

Step

- 1. The survey should establish the centerline, one edge, and the grade of the mesqa. These should be flagged or staked at 10 meter intervals. The survey should also include notes on any other unusual features of the existing mesqa that will affect the renovation such as trees, cattle baths, obstructions, etc.
- 2. Trees, where possible should be cut and their stumps removed. Where this is not possible, the new mesqa must be routed around the tree.

TYPICAL MESQA CROSS SECTION



The objective is to remove all organic matter from the mesqa walls and banks that may cause problems in construction or operation of the mesqa. (Principally leakage and weak spots.)

The organic matter consists of both the plant material such as grass above the ground and the dense, matted root system immediately beneath the surface. Loose roots deeper than about ten centimeters should not cause problems.

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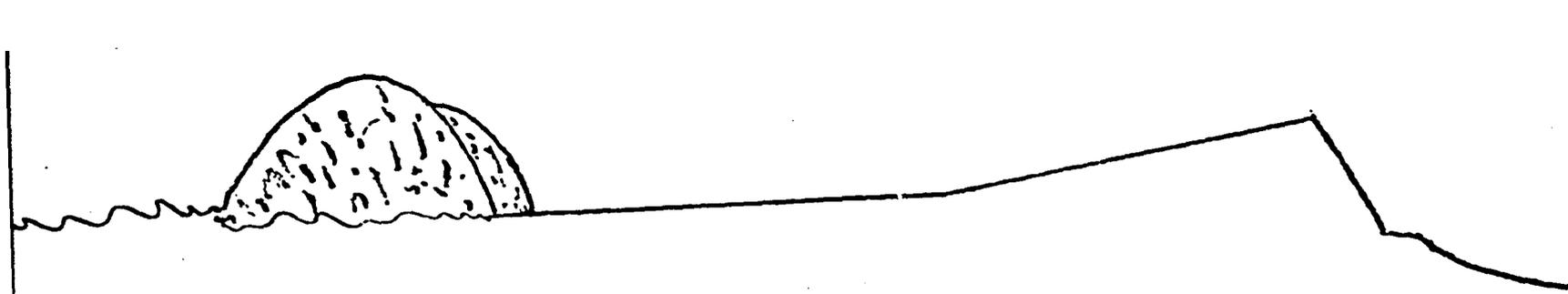


As much of the excess water as possible should be drained out of the area, either out into a field or further down stream from the work area. Some of this can be drained by cutting a small ditch in the bottom of the mesqa from which the collected water can be pumped.

The first cut of organic matter should include the top of the mesqa bank as well as the area along side of the mesqa from which fill dirt will be dug. A road grader or other blade type implement should be used for this. The organic matter can be windrowed along the edge of the cleared area.

By making the first cut on the top of the mesqa a smooth, level area will be left for the following machine operations.

STEP 2.



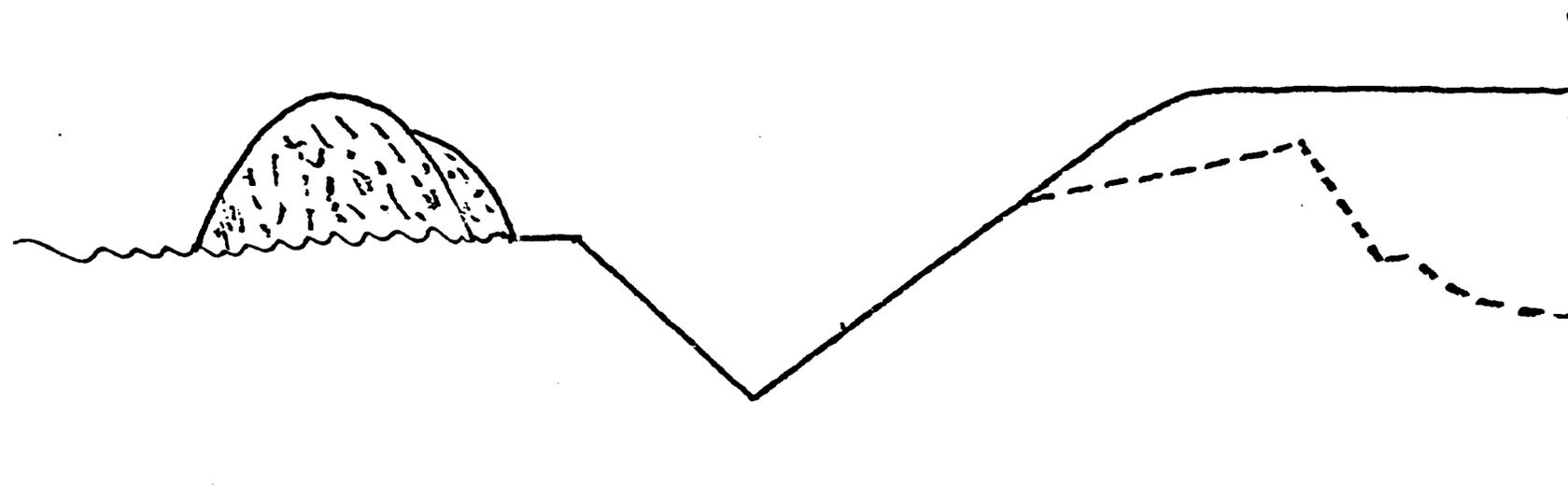
Organic matter within the mesca, ie. on the inside bank, must also be removed. This can be added to the windrow of material from the top of the work area.

This material can be left at the side until the renovation is completed and then re-spread over the area from which clean fill material has been dug.

This windrow will also act as a dam to keep field water from running into the work area.

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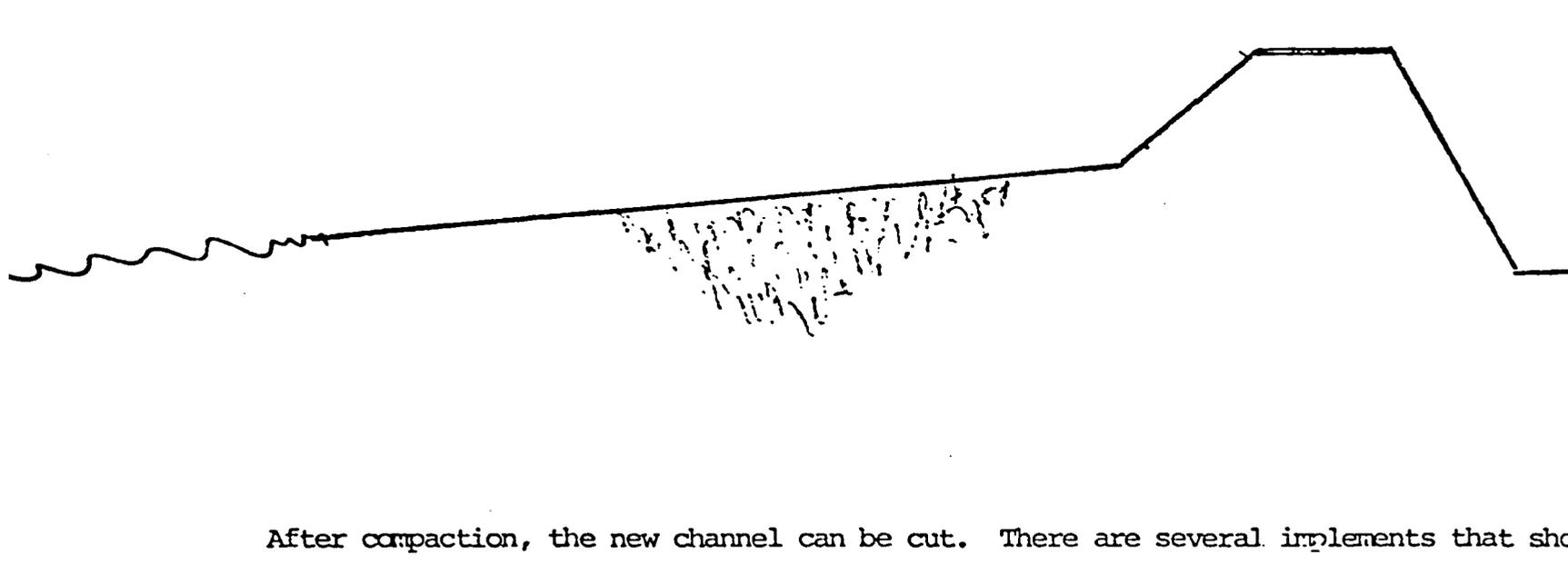
STEP 3.



After all organic matter has been cleared from both the mesq̄a and work area, the mesq̄a can be back filled with clean material and compacted in preparation for re-cutting the channel.

Compaction can be done with rollers, tractor wheels, depending on what the soil and moisture conditions are.

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After compaction, the new channel can be cut. There are several implements that should be suitable for this: the Eversman ditcher followed by a blade for leveling the bank top; a roadgrader for both cutting the channel and smoothing the bank top; the Dandi ditcher followed by a blade to cut the banks to a shallower slope.

When the mesqa is finished, the organic matter can be used to fill the area from which the fill material was dug.