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Egypt Irrigation Improvement Project

Technical Progress Report
1 Jan 1987 to 30 Jun 1987

Contract No.
263-0132-C-5060-00

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

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I. REGIONAL IRRIGATION IMPROVEMENT PROJECT

1.0 INTRODUCTION

Progress in the Regional Irrigation Improvement Project (RIIP) during the first half of 1987 is discussed in this section of the report. The Management and Operating Plan for this project was modified on 12 October 1986, and again on 15 March 1987. For the convenience of readers, the goals, objectives, and strategy outlined in the Plan are repeated below.

1.1 Goals

The main goals of the project are to:

1. Develop methods and procedures to rehabilitate and improve irrigation systems on old lands;
2. Develop capabilities of the RIIP staff to undertake a national program to rehabilitate and improve irrigation systems.

1.2 Major Objectives

The major objectives are to:

1. Implement a systematic approach to evaluate existing irrigation systems, identify their problems, and to plan their effective rehabilitation and improvement;
2. Train the staff of RIIP to undertake all phases of investigating, planning, and executing a rehabilitation project in the National Irrigation Improvement Program;
3. Undertake the rehabilitation of unit command areas of the Serry canal command on a prioritized basis over the whole command;
4. Procure state-of-the-art and technologically advanced equipment for data collection and analysis, to make design calculations and drawings, and to inspect and supervise construction;
5. Organize Farmers to operate their water courses, through cooperation among themselves and with officials, and to develop an Irrigation Advisory Service to assist farmer leaders to operate and maintain the system below the distributary channel level.

1.3 Strategy

To accomplish the objectives above, the strategy in this project is to teach RIIP staff the procedures and techniques of investigating the problems of irrigation systems and designing rehabilitation and improvement measures by working with them in a step-by-step fashion through selected Unit Command Areas (UCAs) of the Serry Canal system. The selected procedure, commonly followed in rehabilitating irrigation systems, is as follows:

1. Identify the problems and constraints of the system, including social, agronomic, economic, as well as the physical aspects;
2. Examine alternative improvement measures to alleviate or to mitigate these problems;
3. Develop detailed plans and specifications of the selected plan;
4. Reconstruct and rehabilitate the system according to the detailed plans;
5. Implement system operation with farmer cooperation and participation;
6. Monitor, evaluate, and update the system to avoid major future rehabilitation.

2.0 PROGRESS

2.1 Staff Organization

The staff at RIIP headquarters is being organized to take on the responsibility and authority to accomplish the technical aspects of the rehabilitation work. In the Regional RIIP Office, the Director needs assistants to share responsibilities for various phases of project work and for work in different unit command areas. New engineers have been added to both headquarters and regional RIIP offices.

A sociologist has been added to the headquarters staff. His major responsibility is to formulate a program to organize farmers in all the command areas selected for improvement in the RIIP throughout the country. For this task he will first need to

recruit substantial numbers of sociologists and train them for the rehabilitation work. He is to take part in developing Farmer Organizations in the Serry command and replicate the process or adapt the successful features in other commands as rehabilitation work progresses throughout the country.

2.2 Serry Command

2.2.1 Serry Canal

During this reporting period, excavation and pitching within the first 12 km of the Serry canal was completed. No further earthwork in the Serry canal will be undertaken through contracts. Where excavation is found to be necessary in rehabilitating the system, it will be done by maintenance contractors as a part of their task of cleaning the canal.

Construction of three regulators in the Serry canal was started, with the first (at Balansora) almost completed by the end of June. Considerable assistance was provided by the consultants for the Structural Replacement Project (Harza) in inspecting and supervising the construction activities. In addition, a specialist in maintenance of main canal systems and system controls, Mr. Duane Nelson, was called in to review the planned control scheme of the Serry canal.

The plan for control of the Serry canal is to use radial gates at the regulators which will be at first manually operated (electrically operated if possible). The gates will all be electrically operated as soon as possible. Through electronic water level sensors and telemetry to the operational headquarters in El Minya, the canal levels, (and discharge) can be regulated from Central with the aid of a microcomputer.

After a review of the state-of-the-art in controls and control structures in Egypt, Mr. Nelson recommended that emphasis be placed in manually operated controls. Water level measurements should be read manually for now, and transmitted by radio (voice) communications to operation headquarters where control decisions can be made and transmitted back to the gate operators.

2.2.2 Herz-Numania UCA

Activity in this first UCA included collection of sociologic data in the Maharas village by Dr. Abdulla Saber and two staff sociologists. Analysis of the data is being conducted at the end of the reporting period through the help of subject matter specialist (SMS), Dr. Jim Layton.

Through aerial photography, remote sensing, and field surveys, the Remote Sensing Center of the National Academy of Science, along with SMS Tim Martin, completed mapping the water table and saline areas of this UCA. The final technical report is due in August, 1987. A parallel effort is being conducted in the traditional way by the Soil and Water Research Institute of the Agricultural Research Center (ARC). The SWRI will complete their work in July and the final report and maps will be delivered. The reason for duplication the soil survey work is to compare the results of the "newer" approach using satellite imagery with the traditional method.

The radial gate structures (civil works) were completed for both the Wasselet Herz and Numania canals before January 1987. New bridges across these canals were also constructed in selected locations. The automatic downstream radial gates (Neyrtec types) for these structures have been ordered (through U.S. companies) and delivery is expected late this summer.

Lining of the Numania canal with concrete blocks was started, but was halted due to poor quality concrete blocks and generally poor workmanship. Although a committee of consultants devised solutions to overcome both the technique of construction and poor quality of concrete blocks, work has not resumed.

Feasibility studies of alternative measures to improve 27 mesqas in the first 770 feddans of the Herz-Numania UCA was undertaken during the period. Three basic alternatives were examined, raised concrete-lined mesqas with single point lifting, low level mesqas with, and without lining, and low-pressure pipelines. Standardization of structures for each alternative design and possibilities for pre-casting of these structures were

examined by SMS Mr. Jack Grimsley and Dr. Gary Gosnell from the USA. Cost and benefits of each alternative are being compared, with assistance from Dr. Mel Skold to evaluate the benefits of the alternatives.

Before any alternative can be adopted for construction, they must be discussed with the farmers in the area. Such discussions can best take place with Farmer Organizations (FO) through their leaders. The farmer leaders in the Maharas village will be identified by the end of July through the efforts of Dr. Abdulla Saber and Dr. Jim Layton, and the preferred technical solution for rehabilitating and improving mesqas in their village will be presented to farmers through the FOs. Through farmer reactions and inputs to the plan, an acceptable improvement program will be developed.

2.2.3 Beni Ibeid UCA

Tender offers for construction of structures for the automatic radial gates in the Beni Ibeid canal have been requested and a contractor has been selected. No other work in the Beni Ibeid area was undertaken during the period.

2.2.4 Beni Mazar Area

Through a reconnaissance survey of the Serry command area, the RIIP staff prioritized the order for rehabilitating the major sectors of the command based on the seriousness of problems within their areas. It was concluded that the farmers in the Beni Mazar area are having great difficulty with high water table, salinization of their land, and generally low crop yields, so that this area should receive immediate attention.

A formal problem identification process was initiated in this area to determine the agronomic, sociologic, economic, and engineering problems and constraints. A crop yield survey formed the basis for selecting sub-areas (hods, or basins), within the 4-village area of about 9,000 feddans, to study in greater detail.

The process, developed with the assistance of SMS Dr. Bill Schmehl, involved the following. First, records of crop yields for the past 5 years were collected from cooperatives for the hods in the villages by Dr. Abdulla Saber and his staff. Two crops for the winter season and two for the summer were selected as indicators of trends and averages. The winter crops selected are wheat and broadbeans, and the summer crops are cotton and maize.

The data sets for each village are separated, but for each crop, yields for each hod are averaged, and the averages for each hod in the village are arranged in progressive order. The high and low quartile hods (in terms of yield) are then identified for each village. Indexes are used to average winter and summer crop yields, and subsequently for all the crops. A high quartile hod and a low quartile hod are then selected along a branch or distributary canal within the village area, and then mesqas within these hods are identified for detailed surveys. The purpose in this procedure is to determine why there are differences in the "high" and "low" yielding areas within the village, and subsequently within the command area. By examining the sociologic, economic, agronomic, and physical data sets collected along mesqas in the selected hods, the problems and constraints characteristic of those of the system would become apparent.

The agronomic data have been evaluated by Dr. W. Schmehl. Sociologic data have been collected by Dr. Shafia Sallam and his staff of the Agricultural Extension and Rural Development Research Institute of ARC. The economic data set has been collected by Dr. Mahmoud Monsour and the staff of the Economic Research Institute of ARC, and the physical data have been collected by the RIIP staff. Dr. Layton is assisting in the analysis of the sociologic data, Dr. Skold is assisting with the preparation of a report for the economic data, and Dr. Neil Biggs, a new arrival in Egypt to be stationed in Minya, is assisting the Minya staff in analyzing the physical data. An interdisciplinary meeting to discuss the problems of the Beni Mazar UCA is planned for July.

3.0 Training

3.1 Short Courses

In June, there were 12 engineers who attended an on-farm water management program in 5 different states in the US, which was specially organized by the US Soil Conservation Service. There were 5 engineers of RIIP who attended a special training course at CSU on operating modern surveying equipment and developing computer-assisted drawings by direct data transfer from total stations to computers. A senior engineer attended a special short course on the integration of pipeline systems with open channels in irrigation systems.

Several of the RIIP staff attended short courses conducted in the UK by contractors of a UNDP sponsored project. Another staff member attended a course on remote sensing in Belgium on behalf of RIIP.

3.2 In-Country

A four-week course on rehabilitating and improving irrigation systems was held in Minya under the direction of the Training and Manpower Development Department. The course was organized by RIIP staff and substantial portions were conducted by the staff in Minya as well as Cairo. Special training sessions with computer programs are continuing more-or-less on an individual basis with the staff in both Cairo and Minya.

3.3 On-The-Job

Considerable on-the-job (OTJ) training has taken place during the first half of 1987, and will continue throughout the remainder of the project period. With the assistance of SMSs and resident expatriate staff, engineers in the Cairo office have developed considerable capability and confidence in designing water delivery systems, both for open channels and for pipe systems. Commercially procured computer programs, as well as special computer programs prepared by the RIIP staff are being used to design canals, water courses, pipelines, and structures.

4.0 SUBJECT MATTER SPECIALISTS

The following subject matter specialists served in Egypt during the reporting period:

1. Drs. Dan Sunada and James Warner (CSU) assisted in analyzing the effects of conjunctive use of groundwater in the Beni Mazar area on vertical drainage and the water table. Their work was used to guide a plan to construct three test wells in the Beni Mazar area, and the tail end of the Mantout UCA.

2. Mr. Dave Young (Hardie Irrigation Company) conducted a special OTJ short course on pipeline and sprinkler system designs.

3. Dr. James Ruff (CSU) reviewed the procedure identified for rehabilitating irrigation systems and discussed progress. He also provided advice on soil cement lining of canals constructed in sandy soils.

4. Mr. Duane Nelson (USBR) reviewed canal control structures (intakes and regulators) and recommended control methodology for the Serry canal and major branches.

5. Dr. Bill Schmehl (CSU) reviewed the agronomic situation of the Beni Mazar area and assisted in the development of a methodology to select typical hods (basins) in which mesqas could be selected for detailed study during the problem identification phase.

6. Dr. Peter Ames (Harza) conducted an environmental assessment of the Irrigation Management Systems (IMS) Project and identified the expected effects (mostly beneficial) of RIIP, Structural Replacement, and other projects of IMS with any impact on the environment.

7. Mr. Jack Grimsley (USBR) assisted the design engineers with standardization of irrigation structures and identifying potentials of prefabricating many of the structures as a means on providing quality control in construction.

8. Dr. James Layton (CSU) assisted Dr. Abdulla Saber in starting the organization of farmers in the Herz-Numania UCA. He also assisted Mr. Farouk Abdel Aal in planning his task of organizing sociologists for the Regional Offices of RIIP.

5.0 EQUIPMENT PROCUREMENT

5.1 Facilities

Electrical service for the Shoubra office of RIIP was procured. With inadequate electricity capacity, the additional computers purchased to assist in the design work could not be utilized.

5.2 Vehicles

Ten additional vehicles have been ordered for use in the RIIP. Pickup trucks, carry-alls, and vans comprise the order.

5.3 Engineering Design

Ten additional computers were delivered to RIIP and distributed among the field office and headquarters. One computer is being used by WRC (Dr. Abu Zeid) until his order arrives. Another has been distributed to the Sharkiya RIIP office for use in the UNDP studies.

5.4 Instrumentation

The Marsh Mcburney Flow meters were received and have been deployed for use in the field. Water level recorders have also been received.

5.5 Laboratory Equipment

None of the laboratory equipment will be purchased because they have been ordered on the nation-wide procurement program through Harza Engineering.

5.6 Construction Equipment

None of the construction equipment has yet been ordered.

5.7 Water System Equipment

The distributors for El Gharak canal have been delivered to the job site in Fayoum Governorate and the components have been inventoried as complete. The radial gates for the Boloktor canal, and Herz-Nomaniya canals are expected in the next three months.

5.8 Field Survey Equipment

The special survey equipment have been ordered and delivered to CSU, and a special training course was conducted there on its use and care. All of the equipment will be shipped to Egypt during the next period and additional staff will be trained while making surveys of canals and fields for planning the improvement work.

II. WATER RESEARCH CENTER

1.0 INTRODUCTION

The Work Plan for the Water Research Center (WRC) was approved in December, 1986. Implementation of the plan began in January, 1987. Support was expanded to all 11 Institutes of WRC and the Training and Manpower Development (TMD) Department. This support is provided through:

1. Training of professional staff to further develop their abilities, and special training of other support staff while on-the-job (OTJ), through short courses in the US, and formal degree and non-degree academic programs;
2. Procurement of equipment and commodities necessary to plan, manage, and conduct their research and training responsibilities;
3. Technical assistance using short-term subject matter specialists (SMS) to assist in the formulation and solution of special problems in management, research and training.

1.1 WRC GOAL

The goal of WRC is to determine the most effective and efficient methods for the development, control, and use of Egypt's water resources for its social and economic welfare.

1.2 OBJECTIVES

The objectives, within the framework of this project are to:

1. Conduct research to provide solutions to problems

facing the Ministry of Irrigation (MOI) in its activities to meet its overall goal.

2. Conduct the research necessary to provide answers to key policy issues in the irrigation sector.
3. Develop the long-term capabilities of the WRC and its research institutes to provide the MOI and Egypt with solutions to their irrigation and water resources problems.

2.0 ORGANIZATION

The Water Research Center is organized with the Central Office of the Chairman, and 11 Institutes. The research institutes and their Directors are shown in Fig. 1. The function of the Chairman's Office is to coordinate the overall activities of the institutes within the framework of WRC goals and objectives.

In addition to the research institutions, the Chairman's office has responsibility over the Training and Manpower Development Department. This department is responsible for administering appropriate training programs for upgrading the practical knowledge and technical skills of personnel in the Ministry of Irrigation.

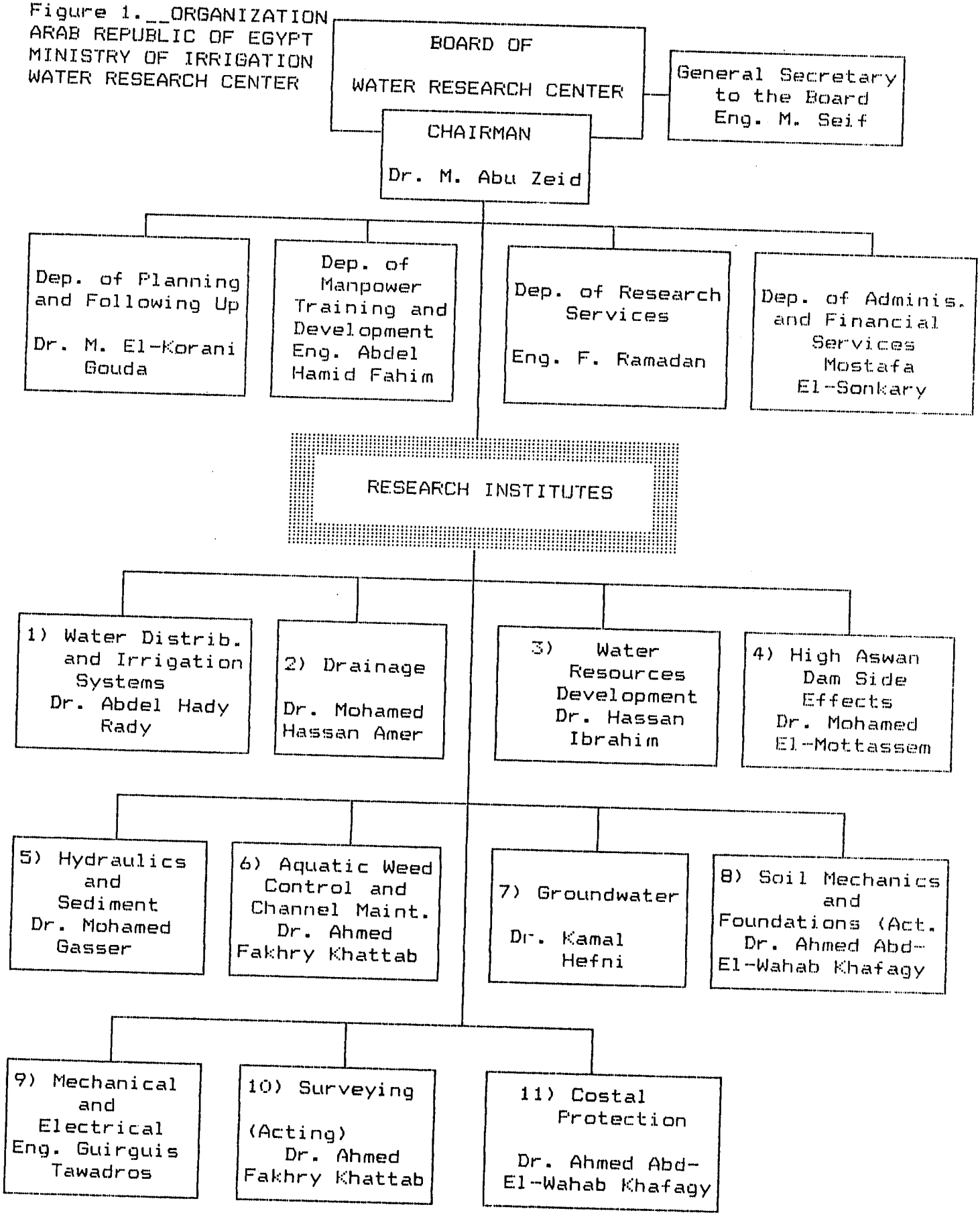
3.0 TRAINING

Training activities during the reporting period involved academic degree, post-doctoral, invitational tours, short courses, and OTJ training.

3.1 Academic Degree

One Ph. D. candidate from Water Master Plan, Eng. Mervat Sidhom Awad started her program for a Ph. D. at Ain Shams University, Egypt, with one year of academic training at Oregon State University. Eng. Mohamed G. Abdel Maksoud of the Soil Mechanics and Foundation Research Institute began a M. Sc. program in soil mechanics, and Agronomist Hoda Deweeb of the Water Distribution and Irrigation Systems Research Institute (WD&ISRI) started a M. Sc. program in Agronomy at CSU during this period.

Figure 1.__ORGANIZATION
ARAB REPUBLIC OF EGYPT
MINISTRY OF IRRIGATION
WATER RESEARCH CENTER



Abdel F. Matawi, M. Ragy Darwish, Farida A. Meguid El Hessy, Tarik A. Tawfik, and Mohamed Naguib, of the WD&ISRI continued their Ph. D. studies at CSU. Ahmed El Attar of the WD&ISRI and Fatma Hassan of the Research Institute for Ground Water (RIGW) continued their M. Sc. studies at CSU.

3.2 Invitational Tours

Eng. Salah Shehab accompanied the US Bureau of Reclamation's inspection tour of Hoover, Davis, Parker, and Glen Canyon dams, visited the Salt River Project (SRP) in Arizona, and the Imperial Valley of California.

Dr. Safinaz A. Soliman of the Survey Research Institute visited the National Geodetic Survey in Washington D.C.

Dr. Ahmed Fakhry Khattab and Eng. Zeinab A. Rahman El Gharably of the Aquatic Weed Control and Channel Maintenance Research Institute (AWC&CMRI) visited research stations in Florida, Colorado, and California.

Dr. Fatma Attia of RIGW began a one month tour at CSU working ground water models with Drs. Sunada and Warner, including a one week tour of Montana.

Eng. Nadia Wahby of the WD&ISRI began a tour of irrigation projects in Colorado, California, and Arizona.

3.3 Short Courses

3.3.1 Chairman's Office

Eng. Nermine Fahmy attended a course titled "Microcomputer Workshop on Irrigation Data and Project Management" at CSU in January. Mrs. Mary Halim began a 4-month training program for technical editing and conference management at CSU in May. Ms. Mervet Hassan Abdel Aal began a 4-month training program for executive secretary and use of computers at CSU in May. Agronomist Anhar Saleh of the Department of Planning and Following Up began a course in June titled "Management of Agricultural Research" in Washington, D.C.

3.3.2 Water Distribution and Irrigation Systems R.I.

Eng. Abdel Ati Allam attended a course titled "On-Farm Irrigation Design and Evaluation" at Logan, Utah and Grand Junction, Colorado, conducted by Utah State University (USU) in May and June. Eng. Mohamed Nabil Naguib and Eng. Talatt Helmy Yowakim attended a course titled "On-Farm Irrigation Training" by the US Soil Conservation Service in June. Eng. Nahla Zaki Abu El Fotouh began a course titled "Techniques of Hydrologic Investigation" at Denver, Colorado. Sociologist Sohair Kamal Yousef began a course titled "On-Farm Irrigation Scheduling" at USU and Alamosa, Colorado. Sociologist Agharid Saleh Rifaat began a course titled "Social and Technical Aspects of Irrigation Organization" in June.

3.3.3 Aquatic Weed Control and Channel Maintenance

Eng. Hemmat Mohamed Hassan began a course on analysis of field irrigation problems and appropriate practices at CSU, Arizona, and California.

3.4 Post-Doctoral

Dr. Mona El-Kady completed her post-doctoral training program at CSU in irrigation water management and studying American management methods using computers.

3.5 In-Country

Support was provided for the International Commission on Irrigation and Drainage (ICID) Sixth Afro-Asian Regional Conference on "Water Management in Arid and Semi-Arid Areas" held 9-16 March, 1987.

The Egyptian National Committee conducted a very successful conference. Twenty-three countries and international organizations participated. Papers describing the studies and results conducted under the current project, and those under EWUP, were highlighted during the conference.

3.6 On-The-Job

Training on the use of computers for solving technical problems continued for engineers and support staff assisting Dr. Gwinn with special problems of the WD&ISRI, and the Water Resources Research Institute (WRRI).

4.0 SUBJECT MATTER SPECIALISTS

1. Dr. Jim Warner completed a one-month assignment on development of ground water models for the El Arous and Minya areas of Middle Egypt with RIGW, and training of staff on the use of the models.
2. Dr. E. V. Richardson reviewed the EIIP program with the Chairman's office and attended the ICID conference in March.
3. Dr. Al Stevens completed a one-month assignment on river hydraulics with the Hydraulics and Sediment Research Institute (HSRI) and visited the High Dam Side Effects Research Institute in April and May.
4. Dr. Rusty Erdman completed a three-week assignment on wave data recording with the Coastal Protection Research Institute.

5.0 PROCUREMENT

Dr. Gwinn, working with the Institute Directors, prepared specifications for procurement of equipment and commodities necessary to plan, manage, and conduct their research and training responsibilities under the current WRC work plan.