EGYPT IRRIGATION IMPROVEMENT PROJECT

TECHNICAL PROGRESS REPORT

1 June 1985 to 31 December 1985

Contract No.
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1. INTRODUCTION

1.1 BACKGROUND

On May 23, 1985 a contract was signed between USAID/Cairo and the Consortium for International Development (CID) to provide technical services to Egypt's Ministry of Irrigation (MOI) for the Regional Irrigation Improvement Program (RIIP) and Water Research Center (WRC) of USAID's Irrigation Management Systems Project (IMS). This report is the first six month technical activities of the project but first a short background on Egypt's irrigation, the goals and objectives of the IMS and this project and the general activities of this Egypt Irrigation Improvement Project (EIIP) will be given.

1.1.1 Irrigation

Irrigation is the backbone of Egypt's agriculture. Rainfall is practically nil. Without the Nile water there would be no agriculture. Consequently, the nation's farmlands are, and have been since time immemorial, entirely dependent upon irrigation from the River Nile. These farmlands include approximately 6,000,000 feddans of alluvial soil along the Nile and in the Delta, the so called "Old Lands." Some additional land has been and is being reclaimed from the bordering desert and the tidelines along the northern coast.

The last century witnessed a radical change in Egypt's irrigation methods. The ancient system of basin irrigation and cultivation of one crop per year which prevailed since the dawn of civilization has been superseded by perennial irrigation. Due to the construction of many control structures and storage reservoirs, including the High Aswan Dam, water is now available for year-round cultivation. However, prior to the completion of the High Aswan Dam, Egypt and her irrigation farmers were at the mercy of the fluctuations that naturally occurred in the Nile River. Flows could be as low as 36×10^6 million acre feet or

as high as 122×10^6 million acre feet. The average annual flow is 67×10^6 million acre feet. With the low flows there would be no flooding and no crop would grow. With the high floods excess flooding would occur. In either case, disasters of major proportions did occur. The construction of the High Aswan Dam with its immense storage capacity of 1.9 x the average annual flow of the Nile River (127,600,000 acre feet) gave the Egyptians complete control of the Nile River flow.

There are those who disparage the accomplishments of the High Aswan Dam saying its side effects are too high a price to pay to obtain a sure water supply. The side effects of the High Aswan Dam have been mostly overstated; for example, the loss of fertility. Recent studies of loss of fertility indicate that the loss of nitrogen, potassium and other nutrients supplied by the flooding Nile waters are insignificant in comparison to the amounts needed in order to take advantage of the potential production that could be provided by Egyptian soil, water and plant resources.

Prior to the High Aswan Dam, the Egyptian irrigation farmer, through 150 years of irrigation practice, had developed a water management system in coordination with the Nile River fluctuations. The construction of the High Aswan Dam provided new opportunities for more intensive crop production but to obtain the maximum benefits of this new resource, the High Aswan Dam, there is a need for on-farm water management and delivery system improvements. The irrigation techniques that the farmers practiced in the "Old Lands" will probably have to change because now the Egyptian farmer has an entirely new system under which to operate. Prior to the High Aswan Dam there were frequent shortages of water. These shortages required careful water management. With an abundant water supply water management has become careless. Water is wasted and crop production is not optimal. Also, modern knowledge of soil, water, fertilizer, plant relationship and irrigation technology require that Egypt's methodology of irrigation and related agronomic practices need to change. Similarly, the operation, management, and maintenance of the irrigation delivery system will need to be improved to take

advantage of this abundant water supply, new irrigated agriculture science and technology in order to maximize the potential of perennial irrigation. This was recognized by the Egyptian Government which started many significant studies, such as the Nile Masterplan Study, the Egypt Water Use and Management Study, and the Irrigation Management Systems Project.

The Egyptian Government has accepted the recommendations of the Egyptian Water Use and Management Project for on-farm water management, associated agronomic practices and delivery system improvement. The United States Government, recognizing the need for on-farm water management and delivery systems improvement and also recognizing there is a need for continued support of the Water Research Center, Ministry of Irrigation agreed to provide technical assistance for Egypt's Regional Irrigation Improvement Project (RIIP) and to the Water Research Center. The Consortium for International Development, with Colorado State University as lead institution, supported by the ten other Western Universities with extensive experience in arid and desert land irrigated agriculture was contracted to provide the technical assistance.

1.1.2 Project Goal

The goal of the Irrigation Management System Project is effective control of Nile waters for all uses and particularly their optimal allocation to and within agriculture.

1.1.3 Project Purpose

To improve the operating efficiency of the total irrigation system and strengthen the Ministry of Irrigation's (MOI) operation, maintenance, research and planning capabilities.

To increase the institutional capacity of the Water Research Center (MOI) to conduct research and development to increase the knowledge base necessary to improve the operating efficiency of the total irrigation system.

To assist the Ministry of Irrigation (MOI) to implement the Egyptian Cabinet approved National Irrigation Improvement Program (NIIP); by developing an implementation process to improve

utilization of water for agriculture on a large scale; and by developing the staff for implementation of this National Irrigation Improvement Program.

Operating efficiency means controlling the flow of irrigation water in a way to assure that water for crop production reaches farmers when it is needed, at the time it is needed and in the amounts required. It means that no water is wasted by unproductive flows from the irrigation systems into the drainage system, that no excess availability encourages farmers to over-irrigate and thus contributes to the deterioration of the land through water logging and salinity associated with rising water tables, and that no fields are short of the water they need.

1.1.4 General Project Activities

CID/CSU will provide the following technical assistance to the MOI in the following broad catagories:

1. Technical assistance to increase the institutional capacity of the Water Research Center (WRC) of the Ministry of Irrigation (MOI) to conduct adaptive research and development to improve the operating efficiency of the total irrigation system. (See purpose for definition of operating efficiency). And to continue the development and evaluation of pilot programs started by EWUP at its three project sites.
2. Technical assistance to the Irrigation Department's Regional Irrigation Improvement Program (RIIP) to help it incorporate the results of formal adaptive research carried out under EWUP into a regional program of irrigation system improvement and renovation. Further that CID/CSU will assist in developing methodologies to adapt the RIIP into a national program.
3. Training of staff of the MOI in the planning, operation, design, management, research and irrigation technology needed to increase the operating efficiency of the total irrigation system.

4. Assist the WRC and RIIP in the selection, purchase and shipping of equipment needed by them to carry on their respective duties.

1.2 THE WATER RESEARCH CENTER

The Water Research Center (WRC) conducts mission oriented research to solve problems related to and in support of the programmatic functions of the Ministry. The Center has eleven research institutes and a manpower and training unit. The eleven research institutes are:

1. Water Distribution and Methods of Irrigation
2. Drainage
3. Water Resources Development
4. Side Effects of the High Aswan Dam
5. Hydraulic and Sediment
6. Weed Control and Maintenance of Waterways
7. Groundwater
8. Soil Mechanics and Foundations
9. The Mechanical and Electrical
10. Survey Research
11. Coastal Research

1.2.1 Technical Assistance To Water Research Center

CID/CSU will provide technical assistance in the following activities:

1. Interdisciplinary field research on branch canals and mesqas (watercourse network) to determine low cost improvements in reconstruction, water scheduling, management, maintenance, water control (outlets and gates), and operation that increase the timely availability of water to the farmers and decrease waste.
2. Interdisciplinary field research for on-farm water application improvements that increase crop production and farmers income.
3. Development of computer assisted procedures for the design of improved watercourse networks.
4. Development of procedures and methods for economic analysis of irrigation improvements. This will continue the use of farm records and the development of methods to determine the cost of improvements and their benefits.

5. Continued development of methods to involve farmers in the maintenance of mesqas, scheduling water use between farmers and on-farm irrigation improvements. This will involve continued field research into farmer organization, MOI irrigation linkages to farmers and existing farmer water management activities.

6. Conjunctive use studies of surface, ground and drainage waters.

7. Develop monitoring and feed-back mechanisms from RIIP so MOI and WRC can determine progress, research needs and constraints affecting progress.

8. Help in the completion of the El-Hammami pipeline, the Abyuha Canal area improvements, and the work on the Hammed and Manshiya mesqas in the Kafr El-Sheikh area.

1.3 THE NATIONAL IRRIGATION IMPROVEMENT

The Government of Egypt, through the Ministry of Irrigation, has recently initiated a National Irrigation Improvement Project to rehabilitate and improve major canals, their distributaries, and on-farm delivery systems throughout the country. The much-needed project has targeted for improvement several major irrigation systems covering 500,000 feddans, in 10 Governorates, during the next five years.

There are many irrigation systems in Egypt that have had little or no improvement since their original construction. Systems designed to operate as basin irrigation with annual flooding of the Nile are now operating with perennial irrigation. While there are many obvious problems with these systems, there are others that need to be investigated and identified so that renovation and improvement of systems include solutions to all the problems of the system. Some of the obvious problems include old control structures that are difficult to operate and are not providing the desired control of water in canals and mesqas. Lack of control results in loss of water from the system to the drain and maldistribution of water within the system. Other problems include unnecessary loss of head in canals that reduces capacity so the system is unable to deliver needed water during the peak irrigation demand months of July and August. There are other obvious problems of high water table and accompanying accumulation of salts that reduce productivity of the land.

There are more subtle problems of maintenance where weed growth during irrigation seasons retards flow and the system is unable to deliver the quantities of water required by the crops. Where maintenance is provided regularly, canal cross-sections have deteriorated through the years because of over-excavation and the channels are not conveying water efficiently. Canals need to be re-aligned and re-filled, and where necessary, lining or bank protection should be applied.

1.4 REGIONAL IRRIGATION IMPROVEMENT PROJECT

The Regional Irrigation Improvement Project (RIIP) was initiated by the Ministry of Irrigation (MOI) to improve selected irrigation systems in 10 Governorates. Specific methods for rehabilitating and improving irrigation systems are to be applied and evaluated for possible adoption in the National program. In the Minya Governorate the Serry canal command has been chosen as the first target system in the program. The goal is to identify the problems in the system, develop solutions, design improvements and rehabilitate the canals and distributaries including the mesqas without interrupting irrigation service to the farms. New and modern control structures need to be constructed while the old ones continue to operate the system. Improved on-farm delivery systems and management practices need to be introduced to prevent water waste and increase crop production and yields.

The Serry canal is one of the oldest major canals in middle Egypt, serving an area of about 125,000 feddans in the Minya Governorate and about 5,600 feddans in the neighboring Beni Suef Governorate. Water is supplied to the Serry from the Ibrahimiya canal and is delivered to farms through numerous distributary canals and mesqas. Although the water supply is generally adequate during the winter growing season, there is shortage of water during the summer season, particularly during July and August. A significant reason for this shortage is the inability to control flows in proper quantities in the canals. Either because there are no structures, or because the existing structures cannot be operated properly, it is estimated (by RIIP engineers) that about 25 percent of the irrigation water that enters the Serry canal flows directly to the drain from its distributaries. Additional amounts are wasted through over-irrigation. In some areas seepage from canals contributes to the loss.

There are 12 control structures along the Serry canal that are used to maintain prescribed downstream water levels for the distributary canals. Flow into the distributaries is by gravity,

as is much of the flow from the distributaries to the mesqas, but farmers generally lift water from the mesqas to the farms.

1.4.1 Goals of RIIP

The project goal is to rehabilitate and improve approximately 40,000 feddans of the Serry canal command during a three-year period beginning 1 June 1985. During this process specific methods of analysis, design, and construction will be developed for wide-scale use in the National program. Developing criteria for selecting areas within the Serry canal system, as well as criteria for rehabilitating canals and improving mesqas, are also goals of the project. The establishment of these criteria will be guided by the results of research previously conducted under the auspices of a predecessor project called the Egypt Water Use and Management Project (EWUP).

1.4.2 Purpose of RIIP

The purpose of the Regional Irrigation Improvement Project is conserve irrigation water by eliminating waste and improving water management practices throughout the delivery system including those on the farms. During the course of this project different approaches to rehabilitation will be examined, equipment will be procured, personnel will be trained to analyze and redesign canal systems, and procedures to accomplish RIIP goals will be demonstrated.

1.4.3 Methodology

Through the adaptive research conducted by EWUP in representative irrigated areas of Egypt, innovative methodologies were developed and tested for rehabilitating and improving selected distributaries and mesqas. The successful methods were systems approaches involving interdisciplinary teams comprised professionals in the most relevant disciplines in irrigated agriculture, namely engineering, agronomy, sociology, and economics. A very effective procedure, labeled Diagnostic Analysis, or DA,

consists of an interdisciplinary team that conducts an investigation of a command to identify problems, proposes solutions, tests those solutions against objectives and revises them when necessary. The process is interative, involving the DA team, officials who operate and control delivery of water, and most importantly the farmers who are directly affected by the problems as well as by their solutions.

Economic assessment of the benefits of rehabilitation, in addition to the more obvious benefits of physical improvements, must be included in any adopted procedure. Data that will enable this economic evaluation must be included in the baseline data set. Because better water management is of major concern, discharge measurements in canals prior to channel rehabilitation and installation of better control gates should be included in the baseline data. Without prior discharge measurements, there can be no definitive assessment of better water management.

Rehabilitation will progress in stages by specific areas served by a distributary network. In the Serry system these areas range from about 3000 to 12,500 feddans in size. Design and construction will proceed from are to area during the 3-year program until a total of about 40,000 feddans has been improved.

Farmer organizations must be created to control and maintain mesqas and develop water delivery schedules so that canals, mesqas, and on-farm delivery systems can be improved, and operated properly when reconstruction has been completed. To accomplish better system management and more efficient system operation, the present plan is to develop field offices, responsibile to the District Engineer, that will be manned by technicians who will operate the headgates and pumps of mesqas as well as turnouts from the mesqas to the farms. Farmers will be responsible for scheduling water and maintaining the mesqas.

2. PROJECT STAFFING

2.1 STAFFING AND ORIENTATION

Emphasis was given to establishing project personnel and acquiring and shipping the initial vehicles and computer equipment during the first six months of the project. Work on the project by team personnel began essentially on 1 September 1985 when all of the team members became available for full time service. Dr. Susumu Karaki, team leader, was on another assignment through the summer, as was Dr. Sritharan. Dr. Wendell R. Gwinn returned to the United States on 8 July 1985 from a two-year assignment in Pakistan, and his wife had major surgery soon after their return. Mr. James Hedrick, project administrator, arrived in Cairo late August to establish offices for team members and set up procedures for the project.

A one-week orientation of Egyptian history and customs was conducted at Colorado State University in August and an intensive two-week course on Arabic language was attended by team members at the Berlitz language school in Denver during the first two weeks in September. This was followed by a one-week technical orientation of the project on the CSU campus. Most of the team members utilized the ten days in September to pack and store house-hold effects and arrange for shipment to Egypt. The first week in October was utilized to prepare for travel, obtain travel documents, arrange for physical examinations and to obtain various medical immunizations. The Gwinns, Karakis, and Martin Farber, arrived in Egypt on 6 October 1985, along with the campus coordinator for the project, Dr. E.V. Richardson.

2.2 STAFF ASSIGNMENTS

The remainder of October was utilized to introduce team members to counterparts at the Water Research Center (WRC) and the Regional Irrigation Improvement Project (RIIP) staff in the Ministry of Irrigation (MOI). Observation and orientation trips were made to the primary Egypt Water Use and Management Project

(EWUP) sites at El Mansuriya, El Minya, and Kafr El Sheikh to provide the expatriate team members with first-hand views of prevalent conditions of irrigation systems and farms and to see the results of improvement efforts by the EWUP team. Meetings were also held with Egyptian counterparts to establish office and work assignments for the expatriate staff.

Assignments were not finalized until Dr. Abu Zeid, Chairman of WRC and Dr. Abdel Hadi Radi, Director of the Water Distribution and Irrigation System Research Institute (WD&SRI) of WRC, returned from a trip abroad at the end of October. It was decided that Dr. Wendell R. Gwinn will devote full time to WD&SRI with Dr. Radi. Dr. Susumu Karaki will devote full time to RIIP as will Dr. Sritharan to provide technical support to the RIIP Project staff working at Shoubra and El Minya. Mr. Martin Farber is stationed in El Minya and will provide technical support to Director General Abdel Raouf and his staff. Mr. James A. Hedrick will administer to the needs of both RIIP and WRC, which will include all of the WRC institutes, in addition to WD&SRI.

2.3 PROJECT STAFF

2.3.1 Expatriate Staff

Dr. Susumu Karaki	Team Leader, Civil and Irrigation Engineer
Dr. Wendell R. Gwinn	Civil and Irrigation Engineer
Dr. S. Sritharan	Civil and Irrigation Engineer
Mr. Martin A. Farber	Civil and Irrigation Engineer
Mr. James A. Hedrick	Project Administrator

2.3.2 Egyptian Staff at WRC

Ms. Mary Halim	Translator / Editor
Ms. Mervat Hassan	Secretary
Moustafa Mahran	Electrician
Habib Aziz	Driver
Mohamad Abdel Zaher	Driver
Ali El Habashi	Driver
Abdel Hamid Orabi	Driver

2.3.3 Egyptian Staff at RIIP

Nawal Abdalla	Accountant
Gamel Kamel	Expeditor
Nairy Kamberian	Secretary
Nermin Hassan	Secretary (El Minya)
Awad Abbass	Driver
Rashad Abou Bakr	Driver
Yehya El Sayed	Driver
Hassan Abdel Rahman	Driver (El Minya)

3. TECHNICAL PROGRESS

3.1 WATER RESEARCH CENTER

3.1.1 Work Plans

A short term work plan was developed in October in conferences with personnel at WRC and the United States Agency for International Development (USAID). An important component of that work plan was the development of a long-term work plan, not only for the Water Distribution and Irrigation System Research Institute (WD&SRI) but for all of the Institutes of WRC. A detailed schedule of tasks for the WD&SRI will be developed, along with identification of additional equipment and manpower training to accomplish the tasks. Dr.Richardson will revisit Cairo to assist Dr. Abu Zeid to formulate the overall work plan.

3.1.2 EWUP Pilot Sites

Field visits were made to each of the pilot project sites of Kafr El Sheikh, El Mansuriya, and El Minya. All of the sites are actively involved in completing the projects started under EWUP. Limited financial resources appears to be a significant impediment to progress at the sites.

Construction of El-Hammami pipeline No 2 is continuing at Mansuriya with approximately 1 km remaining to be completed. The first seven outlets of pipeline No 1 (including the corner stand)

are complete.

A report on design and operation of Daqalt Canal (6300 feddan) has been submitted by the Kafr El Sheikh field team for MOI review. The team will be cooperating with a CIDA supported project (Integrated Soil and Water Improvement) on drainage research in the Kafr El Sheikh area.

The El Minya team has 12 mesqas to renovate in the Abyuha area. They are also providing technical assistance to the Groundwater Institute at El Arouse where tubewells are used for irrigation. The Abyuha staff will be available to train an interdisciplinary team for RIIP and give technical assistance to personnel on the Serry Canal project.

3.1.3 Field Research Stations

A review of ten field research stations under the WD&SRI was begun by visits to all of the operating stations during the first two weeks in December. Accompanied by Engineer Abd El-Ati Allam, visits were made to Bahtim, Shebin El-Kom, Mallawi, and Lake Evaporation Station Shakshouk. A trip report is on file at the project office.

There are presently nine active Field Research Stations, and one inactive Station, where the principal goal is to obtain water requirements for different crops in the different regions of the country in which these stations are located. Data, methodology, reports, and plans for work at the Field Research Stations were reviewed and will be given detailed attention in the near future. Improvements to plans or necessary changes will be worked out with Institute professionals. A visit to the last field station at Kom Ombo will be made when site personnel are available.

3.1.4 Computer Programs

A computer program was prepared during November and part of December to compute gate opening (for a given discharge) for any combination of outlets on the El-Hammami pipeline No. 1.

A computer model for scheduling irrigation times will be

developed for operation of the El-Hammami pipelines. The model will use crop water requirements and the irrigated area (in feddans) to determine the time between irrigation applications with full valve openings.

3.2 REGIONAL IRRIGATION IMPROVEMENT PROJECT

3.2.1 Work Plans

Activities within the Regional Irrigation Improvement Project were underway when the CSU/CID team arrived in October. There were a number of tasks underway and some were completed, but a clear plan of work had not been developed.

A draft work plan for the Serry Canal project has been completed and submitted under separate cover. A copy of the task schedule is appended to this report. There are 92 major tasks and milestones covering a period of three years in the schedule, and the principal tasks are detailed separately. The primary aim of the work plan is to identify manpower and equipment needs, and to identify the functional steps necessary to complete the project within the designated time. Critical tasks are identified and a Pert chart is developed to show the inter-relationships between the tasks. An abbreviated version of the work plan is being assembled for management officials.

Separate areas of the Serry canal, totaling between 40,000 and 50,000 feddans, will be selected for improvement during the three years of the RIIP program. There were several studies for redesign of the Serry canal before the project started, but a final design has not been made. Baseline data which includes hydrologic data of both surface and ground waters, as well as meteorological data, agronomic data which includes crop patterns, water requirements, soil type, and salinity maps, economic data concerning the welfare of farmers, and topographic data including detailed maps of the command area, canal locations with profiles and cross-sections, and contours of surrounding farm lands need to be assembled. Of these, some of the agronomic and topographic

information were assembled before the first (Herz-Numaniya) area of the Serry canal was redesigned.

As this project progresses, the data base must be improved. Feasibility analyses will be conducted for all succeeding areas and different approaches will be examined before implementation. Lessons learned from EWUP will be adopted, with modifications, when appropriate, to suit the goals of this project.

3.2.2 Design Criteria

Early in the project, during May 1985, a committee was formed to develop specific criteria for rehabilitating the Serry canal and its distributaries, and for improving mesqas within the system. The criteria (translated from Arabic) are appended to this report.

In the present condition of the system, water is lifted from mesqas to farmlands by individual farmers. A significant improvement will be the lifting of water at the heads of raised mesqas so that farmers will be able to irrigate their lands by gravity. Because water levels in the canals are generally lower than the surrounding lands, it is not often possible to achieve gravity flow from the Serry canal on to the farms. However, where conditions permit, gravity irrigation should be encouraged.

By realigning the main channel where possible, modernizing structures, and lining key distributary canals, head losses throughout the system will be minimized so that pumping heads and pump operating costs will be minimized. Direct flow of water from the canals to the drain will be prevented by eliminating tail escapes from the distributary canals and introducing self-adjusting radial gates with downstream water level control.

Flows in the canals will be continuous and water will be available on demand. When there is no irrigation demand, for example during night-time hours, the radial gate will close as the downstream water level rises. With no tail escape the downstream water level will continue to rise until the gate is completely closed, and there will be spillage into drains.

Water reuse will be examined and introduced when economically feasible and when water quality permits. Use of ground water to augment surface water will be examined, and conjunctive use will be promoted when benefits of lower water table and additional irrigation water are clearly evident.

Water delivery to farmers from mesqas will be by rotation. Where long furrows or long basins can be created by precision land leveling, turnouts will be sufficiently large to maximize flows onto the farms to improve irrigation efficiency and minimize irrigating time. Distributary canals and mesqas will be managed by technicians under the supervision of the District Engineer. The plan is to assign two technicians for approximately each 7,000 feddans. The technicians will be trained to operate and maintain pumps and check structures, as well as turnouts from the mesqas. On-farm water management training should be an integral part of this project.

Water user associations (WUA) or other suitable farmer organizations are needed to enable rehabilitation of the distributary canals as well as mesqas. Farmers must determine a schedule for irrigation to meet crop demands while permitting time for contractors to reconstruct mesqas and sections of distributary canals. After construction, schedules must be developed for efficient operation of the system. Maintenance of mesqas and distributary canals must be organized to keep the system operating efficiently. Organizations for mesqas, with leaders of those organizations forming distributary canal associations, are needed to communicate effectively with all the farmers in the subsystem or sub-area. Farmers must maintain control over their irrigation schedule and resolve conflicts when they arise.

3.2.3 Serry Canal

The Serry canal system is long and narrow, averaging approximately 1,000 feddans per kilometer. With about 40,000 feddans targeted for improvement, approximately 40 km of the

Serry canal should be improved in the RIIP program. The first 3,400 feddans and the first 8.4 km of the Serry canal has been redesigned, and two contractors have been selected to work on the Serry canal during the winter closure from 5 January to 31 January 1986.

3.2.4 Distributary Canals

Discharges for the distributary canal in the Herz-Numaniya area have been calculated using cropping patterns and consumptive use or water duty. Water duty includes infiltration and water application losses in addition to consumptive use. Redesigned cross-sections and slopes have been determined for the Herz, Numaniya and Wasselit canals. Sections of the canals will be lined with precase concrete blocks. Flow control in the canals will be automatic through use of downstream control radial gates (Avio and Avis gates) developed by Neyrpic Laboratories.

Construction of structures and earthwork for canals will continue during the year between irrigations and between crops. Firm schedules with concurrence by farmers are therefore absolutely necessary for work to progress smoothly.

3.2.5 Mesqas

Mesqa improvements cannot begin until farmers agree with plans for improvement, especially those concerning his mesqa. Teams of sociologists and engineers, with assistance from agronomists and economists, must help farmers organize and inform them of overall plans for improvement and discuss the implications of the improved system with respect to timely applications of water, less time and labor requirements for each irrigation, better management of water on their lands, and greater income from improved crop yields.

The Ministers of Agriculture and Irrigation are discussing transfers or reassignments of personnel, from the Ministry of Agriculture to the RIIP Project. The interdisciplinary teams must be trained to organize farmer groups, and obtain essentially

their full cooperation so that work on mesqas can begin. Progress on canal improvements, as well as mesqa improvements, can be delayed until there is concurrence by the farmers to planned changes and their cooperation is assured.

3.2.6 Second Improvement Area

A second area for rehabilitation and improvement (Beni Abeid) has been selected adjacent to Area 1. The second area comprises approximately 5700 feddans and topographic data, which includes cross-sections of the channels, are now being obtained by survey crews. Cropping pattern data for the area will be obtained and water requirements will be determined. The design method applied to the second area will be similar to the first, and with the experience gained in designing the first area, the work is expected to progress well.

3.2.7 Priority Tasks

There are several high priority tasks that must be started in this project. The first is to finalize the work plan for the entire project, so that the plan can be used as a management tool. Another is to analyze and design the entire Serry canal. A computer model for that task is available from the work done by Dr. Sritharan, and data needed for redesign are now being assembled. Another critical task is collection of baseline data for target areas of the Serry canal system. That activity must be coupled with the organization of an interdisciplinary team, including TDY personnel from the United States, to begin analyzing problems in selected areas of the Serry command and examining alternative solutions for rehabilitation and improvement.

3.3 TRAINING

In September a Management Training Course for senior officials was conducted in Cairo by four professionals of the Salt River Project. The course was attended by 21 participants and conducted at the Manpower Training and Development Center of WRC at Shoubra.

Mr. Abdel Fettah Metawi, Mr. Mohammed Ragy Darwish, and Ms Maha Ismail El-Hakim have been selected for participation in advanced academic degree programs. They will all be candidates for Ph. D. degrees, Mr. Metawi is enrolled in the Civil Engineering Department at Colorado State University, Mr. Darwish has been accepted as a student in the Department of Economics, also at CSU, and Ms. Maha has not yet selected a univeristy but plans to enroll for the fall term in 1986.

A short course was organized for engineers at the MOI offices in several Governorates. The purpose of the course was to orient the engineers to the upcoming task of designing for system improvements. The 5-week course was organized by Project Director Engr. Farouk Shahin and involved 20 engineers from several differenrt Governorates. The course was conducted at the Manpower Training and Development offices of WRC at Shoubra.

3.4 EQUIPMENT PROCUREMENT

Procurement of 10 vehicles and 5 micro-computers as provided in the original plan of the contract was initiated in June. The five micro-computers have been delivered to Cairo and distributed to RIIP and WRC offices. Two of the 10 vehicles have been in Alexandria in custody of the Customs office since 17 November 1985. At the time this report was submitted, we have been able to arrange their delivery to the project.

Efforts are underway to identify needed equipment during the remainder of the contract period in order to properly execute the work identified in the work plans. The equipment being identified with specific tasks in the work plans for both WRC and RIIP. Equipment needs range from locally available office

furniture to equipment procured from the United States for construction and for setting up quality control laboratories for soils and concrete. To minimize the time lapse between contract amendments and procurement of needed equipment, specifications for a number of key items of equipment are being preestablished. The plan is to review the specifications as soon as possible to be ready to issue purchase requisitions when funds are assured.

3.5 Contract Amendment

Dr. E.V. Richardson prepared and submitted, in October, draft proposals for Manpower Training and Equipment Procurement, which are two important components within the scope of this contract. The training proposal provides for in-country training and education in American universities, professional training through short courses both in Egypt and abroad, and on-the-job training in Cairo as well as in the Governorate offices. The proposal for equipment is based on needs identified within WRC and RIIP. Detailed lists of equipment needs in RIIP have been developed along with the work plans. Equipment lists for WRC will follow formulations of their work plans.

A P P E N D I X

SPECIFIC CRITERIA

for

IMPROVING SERRY CANAL COMMAND IRRIGATION AREA

(Established on 21 and 22 May 1985)

THE COMMITTEE

Eng. Artim Halim	Undersecretary for El Minya Governorate
Eng. Farouk Shahin	Undersecretary for RIIP
Eng. Abdel Raouf	Director General for RIIP in El Minya
Eng. Abdel Raouf Abdel Fattah	Director of Irrigation, West Minya

The committee recommends the following criteria for improving the Serry canal, distributary canals, and mesqas:

1. Water levels in distributary canals shall be generally 50 to 75 cm below mesqa level.
2. Water levels in supply canals are to be below land levels. Mesqas shall be raised to permit gravity irrigation but they shall be closed at the end to prevent wasting water to the drains.
3. Use automatic gates and develop water management systems to ensure water distribution according to the actual needs of crops during the year.
4. Supply the intakes to large mesqas with gates similar to those used for the mesqas at Abyuha.
5. Design for reuse of water when feasible.
6. Develop conjunctive use of groundwater when feasible.
7. Provide estimates for canal discharges using cropping patterns and consumptive use, but use approved calculations from the responsible irrigation department in the Ministry for the final design of the canals.
8. Establish trees along the boundaries of the water channels to prevent encroachment into the canal right-of-way.
9. Realign and redesign the initial reach of the Serry canal using maps and data collected by RIIP and modify the canal cross-sections as suggested by the committee.

10. Begin immediately to execute a pilot project consisting of 3410 feddans of the Herz and Numaniya canals at the initial reach of the Serry canal considering the following:

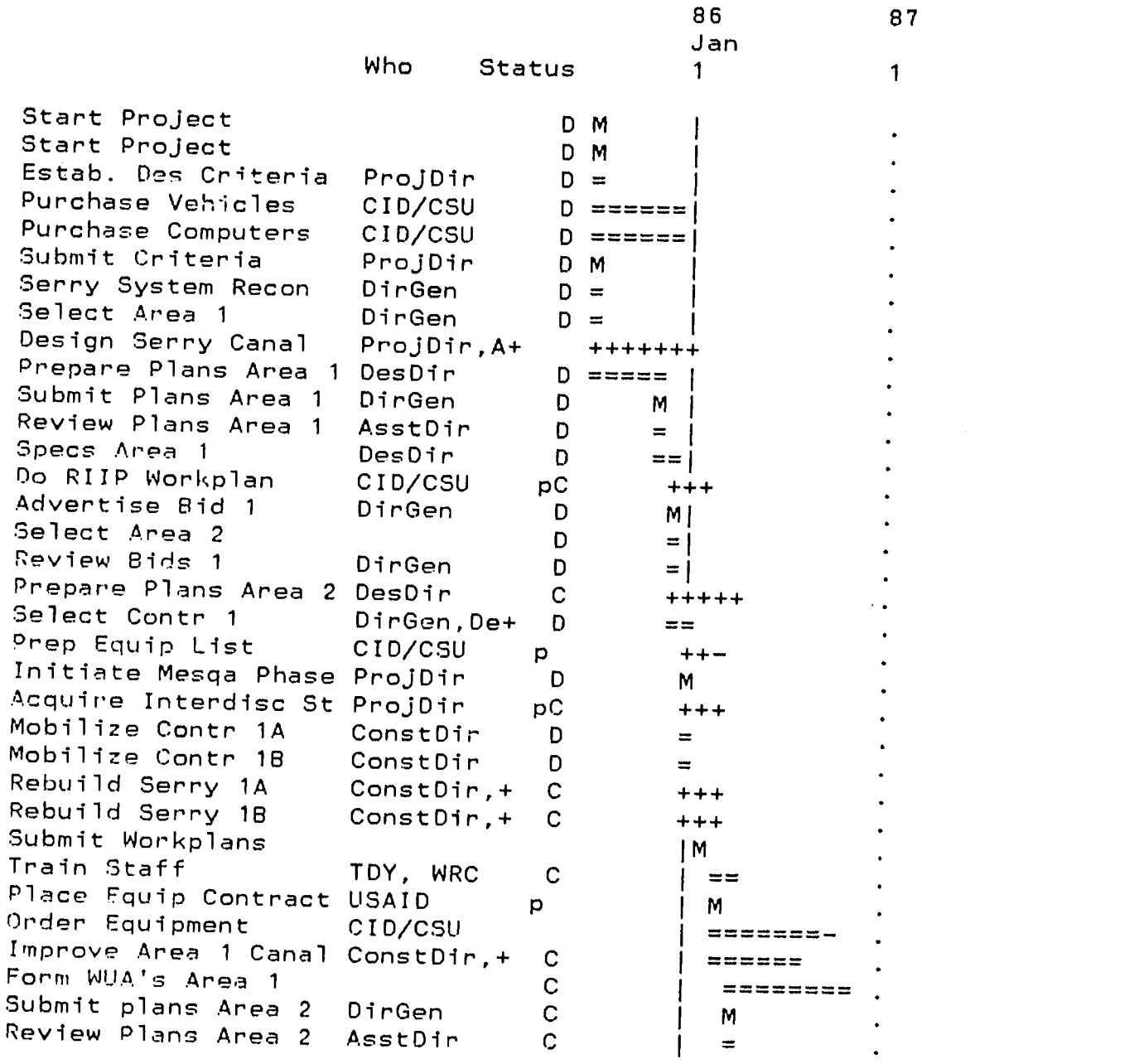
(a) Apply lining to the branch canals taking into consideration the lessons learned in the Abyuha canal.

(b) Provide gates at the intakes to large mesqas, similar to those used at Abyuha.

(c) Establish Water User Associations to convince the farmers to raise mesqas and line them with pre-cast concrete elements. Mesqas shall be raised and water will be lifted only at the head of the mesqas.

Schedule Name: Regional Irrigation Imrovement Project
Project Manager: Farouk Shahin
As of date: 10-Jan-86 4:48pm Schedule File: C:\TL\TLDATA\RIIP

Draft workplan
Version 1.0



D Done
C Critical
R Resource conflict
p Partial dependency
=== Task
+++ Started task
M Milestone
- Slack time (=====), or
Resource delay (-----)
> Conflict
Scale: Each character equals 1 month

TIME LINE Gantt Chart Report Strip 1, Page 1

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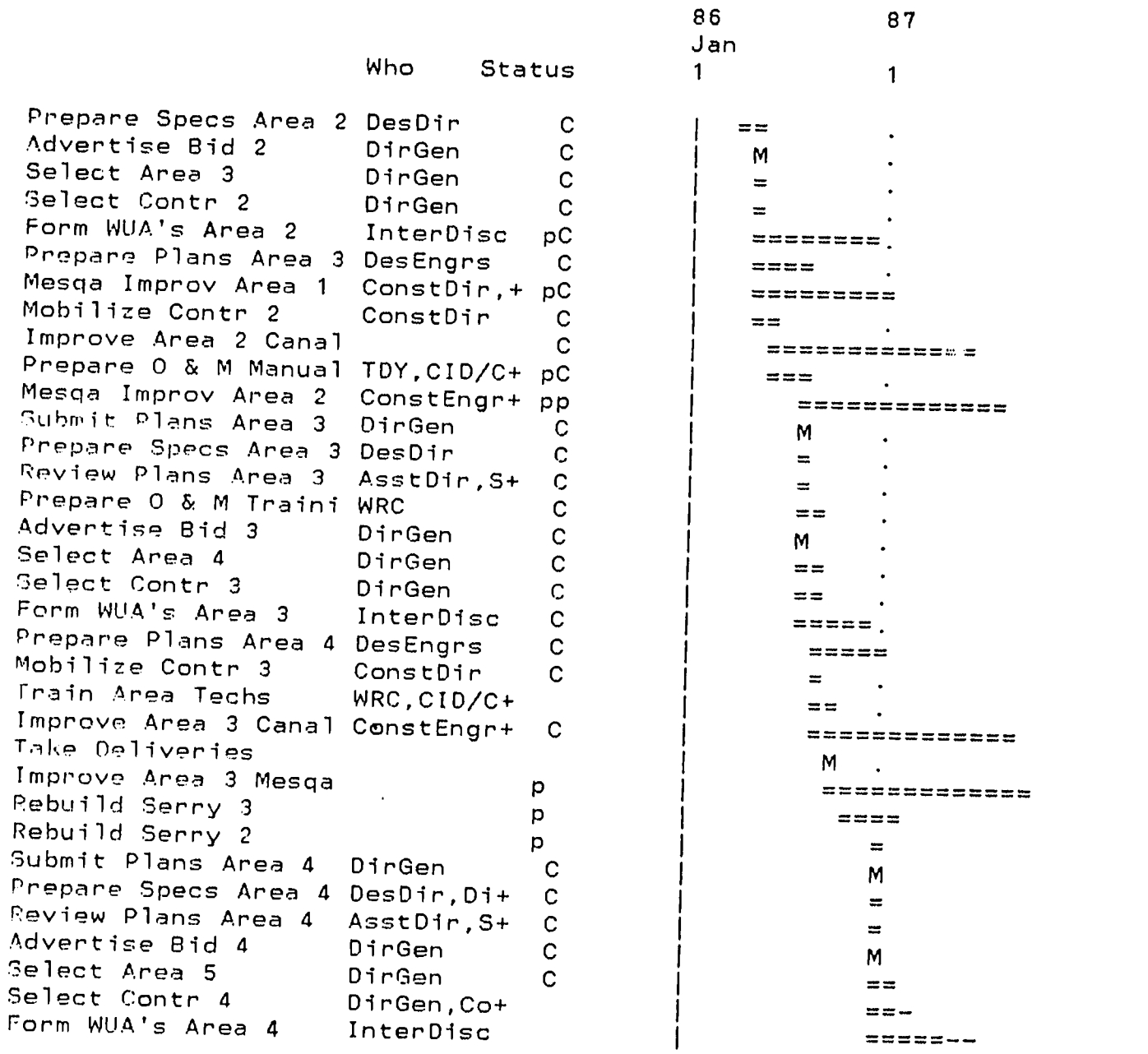
Draft workplan
Version 1.0



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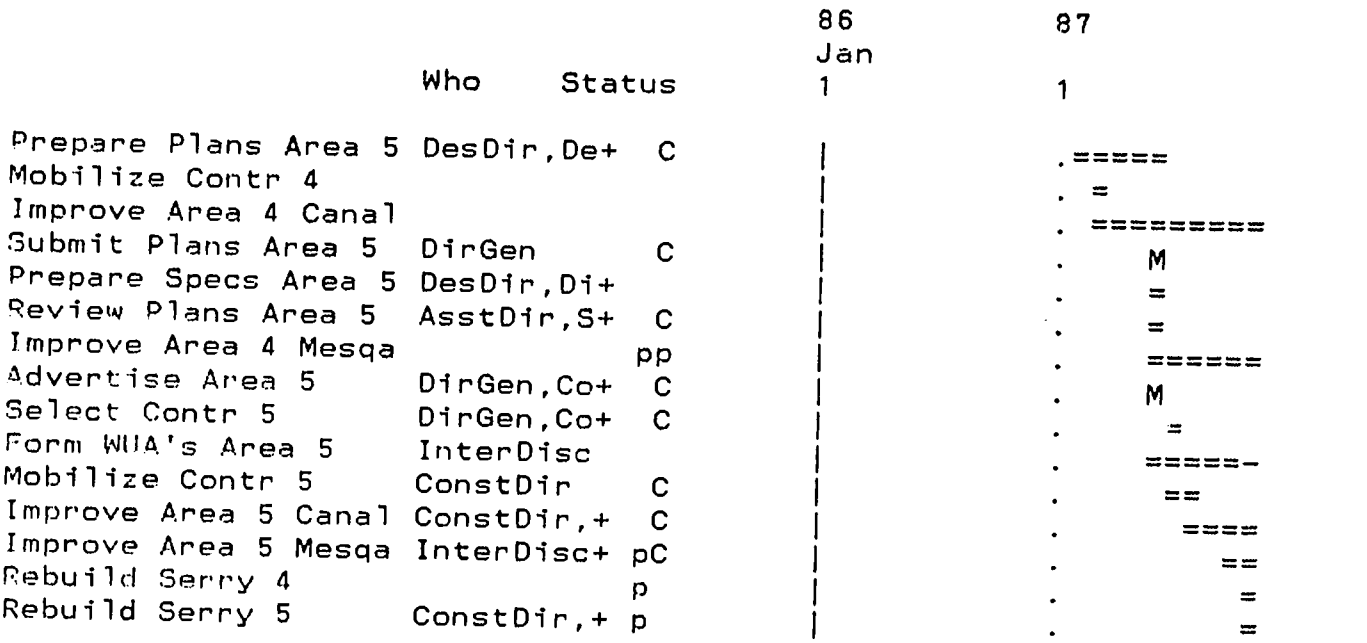
Version 1.0



D Done
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Schedule Name: Regional Irrigation Imrovement Project
Project Manager: Farouk Shahin
As of date: 10-Jan-86 4:50pm Schedule File: C:\TL\TLDATA\RIIP

Draft workplan
Version 1.0

	Who	Status	88 Jan 2	89 1	90 1
Prepare Plans Area 5	DesDir,De+	C		.	.
Mobilize Contr 4				.	.
Improve Area 4 Canal			=====-	.	.
Submit Plans Area 5	DirGen	C		.	.
Prepare Specs Area 5	DesDir,Di+			.	.
Review Plans Area 5	AsstDir,S+	C		.	.
Improve Area 4 Mesqa		pp	=======	.	.
Advertise Area 5	DirGen,Co+	C		.	.
Select Contr 5	DirGen,Co+	C		.	.
Form WUA's Area 5	InterDisc		-	.	.
Mobilize Contr 5	ConstDir	C		.	.
Improve Area 5 Canal	ConstDir,+	C	=========	.	.
Improve Area 5 Mesqa	InterDisc+	pC	==========	.	.
Rebuild Serry 4		p	===	.	.
Rebuild Serry 5	ConstDir,+	p	===	.	.

D Done
C Critical
R Resource conflict
p Partial dependency
=== Task
+++ Started task
M Milestone
- Slack time (=====), or Resource delay (-----)
> Conflict
Scale: Each character equals 1 month