2630017 (2) NE/M
FILE
PD-AAC-251-B1

JUN 22 1976

ACTION MEMORANDUM FOR THE ADMINISTRATOR

THRU: ES
/s/ Alexander Shakow

THRU: AA/PPC, Philip Birnbaum

78p.

FROM: AA/NE, Robert H. Nooter /s/ R. H. Nooter

SUBJECT: Water Use and Management (0017), Egypt

Problem: The Egyptian Mission has submitted the attached grant funded project for assistance in irrigation management. The project calls for a substantial amount of technical assistance for applied research and demonstrations with respect to improving farm yields through better water management. The six year life of the project is considered necessary to insure adequate time for thoroughly developing and demonstrating the technology. Your approval is needed because of the length of the project (6 years), and the level of funding, $8 million.

Discussion: The food short Egyptian economy is constrained in growth by the performance of the agricultural sector - which in turn is almost wholly dependent on irrigation. The Egyptian irrigation system is quite good relative to most poor nations. But because perennial irrigation is now possible, as contrasted to the pre-high dam intermittent irrigation, new sets of problems (salinization and water logging) have emerged and the system has not yet reached its potential. In fact, tile and open drainage corrective measures are necessary to maintain land productivity. The drainage problems are being addressed through other AID and IBRD projects and this project will work with on-farm and system management to improve farm yields, thus the most serious problems will be addressed.

Since the beginning of AID assistance in 1974 a series of studies have verified the need for this project. First there was the L. Ayres, A. Bishop and G. Corey reconnaissance team study in December, 1974 which identified general problem areas; second, the U. S. D. A. Soil Conservation Specialists further identified specific technological issues in the course of the U. S. D. A. Sector Survey and finally the Consortium for International Development conducted the feasibility study and project design for this project. The project consists of first testing new on-farm irrigation techniques, and in a second phase it will demonstrate those techniques in three pilot irrigation districts. The second phase will also determine what sort of organizational structure is required for a national program. Both U. S. and Egyptian technicians will live in the field and carry out practical farm operations to verify the existing evidence that farmers' yields can still be increased 20 - 50%.

The project will supply some 825 employee months of services of U. S. personnel, and contribute over $1 million worth of commodities and training for the Egyptian water management program. We feel the program is adequately funded because the budget provides an allowance for both inflation and contingencies. Because we exceeded the amounts listed in the Congressional Presentation for FY 76 there is a need for a Congressional Notification. It has been prepared and processed separately from this project approval request and forwarded to Congress on June 11, 1976.

In addition to its promised effect on the Egyptian economy generally, the project is "new directional" in that virtually all farms in Egypt are small, as well as irrigated, but because of their small scale of operation the farmers are also among the poor of Egyptian society.

Recommendation: That you approve this project by signing below and that you also approve the attached Grant Authorization (Tab A).

Approved: /s/ DP

Disapproved: _____

Date: JUN 25 1976

Attachments:
1. Grant Authorization (Tab A)
2. Project Paper (Tab B)

Clearances:
NE/DP:BLangmaid (draft)
for NE/ME:NSweet JRoberts (draft)
NE/CD:STaubenblatt (draft)
NE/TECH:DSteinberg (draft)
GC/NE:WClark
PPC/RC:MJHeyl (draft)
PPC/DPRE:AHandly
PPC/DPRE:JShannon (draft)
SER/ENGR:LMastrofini (phone)
TA/AGR:GCorey (draft)
GC:CLGladson

NE/TECH/AGR:RMorrow

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GRANT AUTHORIZATION

Egypt: Water Use and Management Grant

Provided from: Foreign Assistance Act, Part II, Chapter 4 ("Security Supporting Assistance"), Section 532

Pursuant to the authority vested in me as Administrator, Agency for International Development ("A.I.D.") by the Foreign Assistance Act of 1961, as amended, (the "Act"), and Delegations of Authority issued thereunder, I hereby authorize the furnishing of a grant (the "Grant") pursuant to Part II, Chapter 4 (Security Supporting Assistance), Section 532 of the Act, to the Government of the Arab Republic of Egypt (the "Grantee"), of not to exceed One Million Five Hundred Thousand United States dollars ($1,500,000) to assist in financing certain foreign exchange costs of goods and services for an irrigation water use and management project (the "Project") to develop and demonstrate replicable, improved irrigation water management and associated practices to increase agricultural production, and to increase institutional capacity to develop and sustain an improved on-farm water management program throughout the Nile River Valley and Delta.

I hereby authorize incremental funding for this Project.

The Grant shall be subject to the following terms and conditions, unless A.I.D. otherwise agrees in writing:

(a) Godds and services financed by A.I.D. under the Grant shall have their source and origin in the United States.

(b) Prior to any disbursement under the Grant, Grantee shall furnish in form and substance satisfactory to A.I.D., evidence of budgetary allocation of Grantee's contribution to the Project for its first fiscal year.

(c) Prior to any disbursement under the Grant, Grantee shall furnish in form and substance satisfactory to A.I.D., a time-phased implementation plan for carrying out the Project.

(d) Prior to any disbursement under the Grant to finance consultant services, Grantee shall furnish in form and substance satisfactory to A.I.D. the name(s) of the consultant organization(s) to be contracted with and draft contract(s) for the consultant(s)' services.

(e) Prior to any disbursement under the Grant to finance on-farm pilot programs, the Grantee shall furnish in form and substance satisfactory to A.I.D. a description of the pilot programs proposed to be undertaken.

(f) The Grant shall be subject to such other terms and conditions as A.I.D. may deem advisable.

/s/ Daniel Parker

Daniel Parker

JUN 25 1976

Date

Clearance
NE/TECH:DSteinberg 6/18/76
NE/CD:THLustig
NE/ME:NSweet NSRM 6/18/76
NE/DP:BLangmaid
FM/FCD:JMcColl phone 6/18/76
GC/NE:RMeighan RMeighan by RM 6/18/76
AA/NE:RHNooter
GC:CLGladson
AA/PPC:PBirnbaum
GC/NE:WClark:jab:6/18/76
WDC

2-4

Proj. No-2630017
PN

WATER USE AND MANAGEMENT

EGYPT

(263-0017)

6/25/76 (?)

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AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT PAPER FACESHEET

TO BE COMPLETED BY ORIGINATING OFFICE

1. TRANSACTION CODE (X APPROPRIATE BOX)
[X] ORIGINAL [ ] CHANGE [ ] ADD [ ] DELETE

PP

DOCUMENT CODE 3

2. COUNTRY/REGIONAL ENTITY/GRANTEE
ARAB REPUBLIC OF EGYPT

3. DOCUMENT REVISION NUMBER [redacted]

4. PROJECT NUMBER
26[redacted]7

5. BUREAU
A. SYMBOL: NE
B. CODE: 03

6. ESTIMATED FY OF PROJECT [redacted]PLETION
FY 81

7. PRO[redacted] TITLE - SHORT (STAY WITHIN BRACKETS)
[Irrigation Water Management]

8. ESTIMATED FY OF AUTHORIZATION/OBLIGATION
A. INITIAL MO. 6 YR. 6 B. FINAL FY 80

9. SECONDARY TECHNICAL CODES (MAXIMUM SIX CODES OF THREE POSITIONS EACH)

091	022				

10. ESTIMATED TOTAL COST ($000 OR EQUIVALENT, $1 = 1.8LE)

A. PROGRAM FINANCING	FIRST YEAR B. FX	C. L/C	D. TOTAL	ALL YEARS E. FX	F. L/C	G. TOTAL
AID APPROPRIATED TOTAL						
(GRANT)	(1500)	( )	(1500)	(8036)	( )	(8036)
(LOAN)	( )	( )	( )	( )	( )	( )
OTHER U.S. 1.						
OTHER U.S. 2.						
HOST GOVERNMENT		554	554		4991	4991
OTHER DONOR(S)						
TOTALS	1500	554	2054	8036	4991	13027

11. ESTIMATED COSTS/AID APPROPRIATED FUNDS ($000)

A. APPROPRIATION (ALPHA CODE)	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH. CODE	FY 76 D. GRANT	E. LOAN	FY 77 F. GRANT	G. LOAN	FY 78 H. GRANT	I. LOAN	ALL YEARS J. GRANT	K. LOAN
SA	123B	064	1500		1472		1638		8036	
TOTALS			1500		1472		1638		8036	
12. ESTIMATED EXPENDITURES					1200		1600			

13. PROJECT PURPOSE(S) (STAY WITHIN BRACKETS) [ ] CHECK IF DIFFERENT FROM PID/PRP

1. Develop and demonstrate replicable improved irrigation water management and associated practices that increase agricultural production.
2. Increase institutional capacity to develop and sustain an improved on-farm water management program

14. WERE CHANGES MADE IN THE PID/PRP FACESHEET DATA NOT INCLUDED ABOVE? IF YES, ATTACH CHANGED PID AND/OR PRP FACESHEET.
[ ] YES [X] NO

15. ORIGINATING OFFICE CLEARANCE

SIGNATURE
Wilbert R. Templeton

TITLE
AID Representative/Cairo

DATE SIGNED MO. DAY YR.

16. DATE RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION
MO. DAY YR.

AID 1330-4 (5-75)

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I. SUMMARY AND RECOMMENDATIONS

I.B. Recommendations

Approval of Grant Project - $ 8,036,000.

I.C. Project Description

Through adaptive research/demonstration, the project will develop and test a program of irrigation water management 1* for later implementation throughout the Nile Valley and Delta. The Project will work with small farmers in three pilot areas to adopt water management practices to increase agricultural production and water use efficiencies[2] and decrease drainage problems. The Project will require a contractor to work with the Land and Water Research Institute, Ministry of Agriculture, and the Water Distribution Research Institute, Ministry of Irrigation. Both Ministries have recently been placed under the authority of a single Minister of Agriculture and Irrigation. The Agriculture Sector Report states " A water management program for the irrigation distribution system and, more importantly, on-farms, will be needed to provide a lasting and effective water-use program for increased crop production in Egypt in the years to come". Successful adoption of on-farm water management has significantly increased production in other parts of the world. Average agriculture production in Egypt, although good, is 50% or more below maximum yields obtained in Egyptian Experiment tations. The system appears to use too much water. The overall water efficiencies are low for good crop production. These factors support the proposition that the Project will succeed.

The end product of the project, per se, is an action program ready for implementation in other districts and identification of additional areas which might require further research/demonstration efforts.

I.D. Summary of Findings and Analysis leading to the Project.

A series of teams have concluded that significant improvements in on-farm water management are both possible and desirable. This conclusion came after observations and studies of on-farm water management, water delivery and removal procedures, and agricultural research activities. Alternative approaches to the situation were considered, such as (1) no change in the current approach, (2) reduction in water delivery from high Aswan to improve on-farm water management and reduce drainage problems, (3) selection of research results from existing Egyptian institutions for rapid and widescale implementation, and (4) an initial research program combined with on-farm demonstration and pilot projects. Considering the implications of these possibilities, the team in consultation with Egyptian officials, concluded that the fourth approach would be the best course to follow.

A five-year research and development program has been designed. This program will build upon the research and operating activities within the GOE.

Research methods and operating procedures proposed are intended to be an adaptation of new technology to Egyptian conditions. Officials in the GOE, including the Minister of Agriculture and Irrigation, have placed high priority on this project so that it can be started soon. Three project areas have been selected and a phased program designed to be sufficiently representative of agricultural, irrigation, and drainage conditions in Egypt, so that project results can be extended throughout the country. Application of research results through on-farm demonstrations is expected to begin early in the program. No significant adverse environmental impacts are expected; beneficial impacts are expected to result from (1) less waterlogging and improved salinity control from lowered water tables in certain areas, and (2) improvements in the environmental conditions for combatting Bilharzia, Malaria and other water-vectored diseases through better regulation of drainage water.

Estimates of project costs have been derived. The impact of the Project on the rural poor is expected to be direct and eventually significant, as the results of successful demonstration programs are extended to other areas. Increased agricultural production will eventually contribute to increased government revenues by raising the tax base, to improvements in the balance of trade, and to other national objectives.

An organization suggested for carrying out the Project would include a staff of 25 Egyptians and 8 resident Americans. In addition, TDY and support staff in the United States would be provided. The project organization will be newly created with headquarters in Cairo and field offices in or near Mansouria, Sakha, and Abu Korkas. The Egyptian project leader will be responsible to the minister of Agriculture and Irrigation or his delegate. The project leader from the United States team will be the technical advisor to his Egyptian counterpart. Policy and other advice and assistance will include the Directors of the Water Distribution Research Institute, Soil and Water Research Institute and Agricultural Economics Research Institute, representing the GOE, and the Chief Agricultural Officer for AID/Cairo, or other designate of the AID Mission Director. The GOE will also make the facilities of its central Soils and Water Quality Laboratories and the regional organizations of the Irrigation and Agricultural Departments available as needed.

Periodic reports will be supplied to both the GOE and the US, and review teams will be formed to evaluate Project accomplishments and to recommend improvements. These evaluations by GOE and US staffs will take place at the end of the Project (fifth year). A program formulation meeting will be held after the first six months to discuss and approve the program of work for the remainder of the Project. The Project is scheduled to begin full-scale operation in Egypt by January 1977.

I.E. Project Issues

The Project is not dependent upon changes of major policy issues. It will develop some of the information required if the GOE should need to change any of its policies which affect water management.

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[1]The management of water from the last outl[illegible]f the Irrigation Department through the farmer's [illegible]ds. It includes the delivery and application of [illegible]ter at the optimum frequency and depth to meet crop water requirements for germination, aeration or drainage, salinity control and evapotranspiration for optimum production in combination with other inputs consistent with the management capabilities of the farmer.

[2]The definitions of efficiencies as used in on-farm water management are:

Irrigation efficiency (E_i) - a ratio of the amount of water stored in the root zone during an irrigation plus that to control salinity to the amount of water available at the Irrigation Department outlet ($E_i = E_d \times E_a$).

Delivery efficiency (E_d - a ratio of the amount of water delivered to the field outlet to the amount of water available at the Irrigation Department outlet.

Application efficiency (E_a) - a ratio of the amount of water stored in the root zone during an irrigation plus that to control salinity to the amount of water applied to the field.

Improvement in either delivery or application efficiency improves the irrigation efficiency. More efficient use of water makes more water available for effective use on all the crops under production and increases yields, allows for more intensive cropping with a larger area under crops at a particular time or more crops grown on a particular area during the year. Crops having higher water requirements may also be grown. New lands may be placed under cultivation with water released through improved efficiencies. More efficient use of water may result in more effective use of water with the total volume used increased. Drainage requirements will also be substantially reduced.

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II. Project Background and Detailed Description

II.A. Background

II.A.1. Considerations of A Water Management Project.

Cropping practices followed in the Nile River Basin for many centuries have made this one of the most productive agricultural areas in the world. Recently, however, average agricultural productionhas reached a plateau in certain major crops. (See Table , page .). In some areas, waterlogging and higher salinity levels are increasing and production has decreased.

The waterlogging and salinity have mainly been the results of changes in irrigation practices made possible by construction of barrages and dams for regulating the river's flow. In modern times, the first of these regulatory devices constructed was the Delta Barrage north of Cairo in 1860 The latest has been the Aswan High Dam, from which irrigation service began in 1967.

The resulting total regulation of the river's flow has made possible the complete conversion from a system of basin irrigation to perennial irrigation. Historically, Egyptians had used the system of basins to hold water on the land for a period of 30 to 60 days following the annual floods to increase the residual moisture in the soil. The basins were filled during the high water period of August, September and October, following which the fields were drained and planted to crops. After these were harvested the following spring, the fields lay idle throughout the summer months until the proce s was repeated again at the next flood season.

With the benefits made possible by regulating the river's flow, Egyptians began to practice year-round, or perennial, irrigation in the conventional manner. This has led to a cropping intensity in the entire Nile Valley of 190% at the present time (1975). Increased availability of water has resulted not only in the land being used year-round, but also in significant increases in the growing of high-water-requirement crops, notably sugarcane and rice. Increased availability of water has thus resulted in use

of greater amounts of water, and unfortunately, the rising of water tables and consequent salinity buildup in the soils. The farmer adds what many believe to be excessive amounts of water to leach these salts.

The Government of Egypt recognized early that increased quantities of available irrigation water would require provision of more extensive drainage facilities than had been needed previously, and undertook a program for construction of drains to coincide with deliveries expected to commence in 1967 from the Aswan High Dam. National priorities were altered, however, when the country went under strict mobilization conditions as a result of the 1967 war, with the result that further construction of needed drains was postponed. The tile drainage program at present consists of 950,000 feddans in the Delta and 300,000 feddans in Upper Egypt which was approved by IBRD in 1973 for 62 million U.S. Dollars foreign exchange. Another program now under study consists of 1,000,000 feddans for the Delta, while a Program under negotiation between Egypt and IBRD/AID for 350,000 feddans for Upper Egypt would have an estimated foreign exchange cost of 61 million U.S.Dollars. At the present rate of construction, tile drainge for all of Egypt will be completed by 1995, but the GOE is considering an accelerated program which would complete all installations by 1985. In addition to the tile drain project, the GOE has independently undertaken other soil amelioration projects, particularly constructing open drains and subsoiling in the Delta. All of these measures are having positive effects and are being pursued as vigorously as possible within prevailing constraints.

A number of recent studies, however, have focused on causative factors that have necessitated these measures being taken to ameliorate the consequence resulting from increased use of irrigation water. A visit of a U.S. water management team of Egypt (Corey, Bishop and Ayers, 1974) concluded that "... emphasis needs to be placed on management of the water as it is being applied to the crops to reduce the amount of water which necessarily must be removed by the drainage system. An on-going program of assisting farmers with this important aspect should be seriously considered."

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The recent Egyptian Agricultural Sector Report, based on investigations conducted by a USDA/FAS team in September-October, 1975, placed a high priority on the necessity for steps being taken to improve on-farm irrigation practices. A member of that team, Dr. J. Carl Lee, in a separate report stated "... there are some irrigation practices which might be modified and have the net effect of both saving water and increasing crop yields..."

Impetus for a potential project began with a draft PID being prepared by an AID/W team during a visit to Cairo in December, 1975. This provided the basis for reviewing the concept of a project between AID/Cairo and the Ministries of Agriculture and Irrigation, and ultimate positive indications that consideration of the project was not only desirable, but carried sufficient priority to justify efforts to have it included in the FY 1976 Program.

On the basis of continuing working sessions with MinAg and MinIrrigation officials, the PID underwent revisions more completely delineating a scope of work that might be pursued by a project design/study team. These were forwarded by cable (Cairo 1092) on January 28, 1976, which also suggested the team should be able to proceed directly to preparation of a final PP by the end of April, with final approval and negotiation of this Project Agreement by early June.

The NE Project Advisory Committee met on February 20, 1976, to review documentation for the Project, and reaffirmed the need to move ahead rapidly with further efforts to develop the Project. The Committee identified key problems needing further development for the project team's assessment, and these were subsequently refined and developed into a detailed scope of work in succeeding cable exchanges.

Based on these exchanges appraising and affirming the need for undertaking a study to determine the feasibility of an on-farm water management and delivery project in Egypt as expeditiously as possible, and if found feasible, to develop an appropriate project design, an AID-financed study team was recruited and fielded in Egypt on March 28, 1976.

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II.A.2. Other Donors

A salinity control study supported jointly by UNDP and FAO currently is underway in the area of "new lands" recently having been brought into development west of the Delta. The scope of this project being proposed for A.I.D. support lies only in the areas of the "old lands", the 5.7. million feddans that have been traditionally farmed under irrigation situated in the Delta, Central and Upper Egypt, and thus is outside the scope of inquiry being considered in the UNDP/FAO-supported project in the "new lands".

The Government of the Netherlands is presently evaluating the feasibility of including some surveys of on-farm practices in connection with a drainage study which is also being evaluated for its feasibility. This would be a research project and relate directly to drainage requirements, e.g. determining the best means of installing drain tiles, relative efficacy of asbestos-cement vs. PVC tile, and the best manner of preparing the gravel bed for tile drains.

The Ford Foundation has prepared and presented to the Ministry of Agriculture a proposal for a Comparative Irrigation Systems Study. This would be intended primarily to study the efficacy of sprinkler and drip irrigation methods vs. basin or channel techniques on production of high-value horticultural crops in "new lands" areas. Thus, as in the case of the UNDP/FAO Project mentioned above, this project would be outside the scope of the A.I.D.-supported Project. Other water-related projects being discussed or planned for Egypt include one for study of total control of the Nile River system through telemetering at the Delta Barrage (UNDP), and an overall master water plan for Egypt (IBRD/UNDP), neither of which would have elements relating directly to on-farm water management techniques.

Beyond these, and the IBRD Project for installation of tile drains previously mentioned, no other projects comparable to the one being proposed in this design paper are being carried out or known to be under consideration from other donors.

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II.A.3. Grantee's Request for Assistance

The Government of Egypt's request for assistance (Annex A) to develop and implement a project intended to improve on-farm water management is entirely consistent with the proposals present in this Project Paper.

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D. Project Description

B.1. Logical Framework

This project is designed to contribute critical technological information to the agricultural sector of Egypt and hence provide an input which will increase the productivity of the sector. The project has, what may be termed; two major "internal" objectives; 1) the generation of practical information on the proper use of irrigation water and management of irrigation systems, and 2) the strengthening of institutions which deal with water management research and extension of findings to farmers. The "external" objective of the project is to carry out pilot area operations. This will be done with farmers and irrigation system managers. It will demonstrate to both how to best use the water resource to increase farm production, hence, the project purpose as shown in the log frame.

The project outputs will be achieved through a series of phased actions which cumulatively lead to the achievement of the purpose. These action elements are:

1. a) Initiation of applied research on questions of (a) quantity and timeliness of irrigation water application; (b) quantity of water entering and leaving the district system; (c) influence of the levelness of fields on yields; and (d) agronomic practices vis irrigation efficiencies.

   b) Carrying out of farmer surveys to ascertain information which will help specify additional research areas and to provide better understanding of the farming and irrigation systems.

2. Performance and analysis of the applied research program and design of the pilot program.

3. Carrying out of the pilot program.

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The training of staff and other institutional development efforts are an integral part of project operations. They lead to the "internal" objective of creating the capability to sustain demonstration activities which eventually are to go beyond the pilot areas. The project will have achieved a measure of success when a revised and practical set of irrigation and water management technologies are prepared and implemented in the pilot areas. The final measure of success will be ascertained in terms of changes in farmers' productivity which can be attributed to the project.

The proposed life of the project for five years and costs are set forth for that time frame. The benefit stream is predicted to last much longer as will the Egyptian institutions associated with water resources.

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II.B PROJECT DESCRIPTION

II.B.1. LOGICAL FRAMEWORK

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS
Program Goal: Improve the social and economic conditions of the small farmer.	Measures of Goal Achievement: In project areas, farmers' crop production and real income will have increased.
Project Purposes: 1. Develop and demonstrate replicable improved irrigation water management and associated practices that increase agricultural production. 2. Increase institutional capacity to develop and sustain an improved on-farm water management program.	Conditions that will indicate purpose has been achieved (EOPS): 1.A. Three pilot areas established. B. Farmers are practising recommendations derived from the Project. C. Yields have increased significantly over non-Project areas. 2.A. Government approval exists for program expansion. B. Farm problem feedback mechanism exists. C. An evaluation program exists for the research. D. Interministry and interdisciplinary approach accepted. E. Farmers' views understood and incorporated in planning.
Outputs: 1. Identification of the major constraints to improved on-farm water management and optimal delivery system operation. 2. Established ; optimal water practices available for use at the farm level in Project areas. 3. Improved water control practices for the delivery system in the project areas established. 4. Plans for organization and implementation for future program expansion. 5. Experienced scientists and technicians in place.	Magnitude of outputs: 1. A process of listing and selection of research priorities is being carried out. 2. Farmers have available (in a practical form) the results of applied research. 3. Water budgets and other managerial information available to systems operators, program and policy makers. 4. Expansion plans exist and are based upon cost-effective programs, analysis of pilot area results and farmers' views. 5. Improved job knowledge and staff competence reflected in above outputs and project purpose achievement measures.
Inputs: 1. USG: TA (Scientists, field party personnel, PDI, equipment, training, studies. 2. GOI: Staff officers, local labor costs, local costs of support of research, local materials and equipment, advisory and evaluatory.	Implementation Target (Type and quantity): 1. TA staff in GOI 90 days after contract signed. 2. GOI staff on project 30 days after contract signed. 3. Staff officers equipment and vehicles available 120 days after contract signed.

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II.B.1. LOGICAL FRAMEWORK (Contd)

MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Program Goal:	Assumptions for achieving goal targets:
Comparison of conditions found in initial Project surveys with status found later.	That there continue to be cost/price relationships at least as favorable as at present.
Project Purpose:	Assumptions for achieving purpose:
1. Project monitoring.	1. Adequate supplies of improved seed, fertilizer and other inputs available, as well as reliable markets for crops produced.
2. Annual report.	2. Adequate GOE personnel are available.
3. Sampling of farmers in project areas.	3. That engineers and agriculturists from the two joined ministries will continue to work together to achieve project purpose and that external assistance contributes to this end.
Outputs:	Assumptions for achieving outputs:
1. Project monitoring.	- (Same as for project purpose.)
2. Annual report.	
3. Irrigation and Agricultural Statistics.	
Inputs:	Assumptions for providing inputs:
1. Project monitoring.	1. Inflation within budget estimates
2. Annual report.	2. Timely GOE authorization of budget and staff required.
3. Revised work plan at end of first six months of Project.	3. Contractor with required expertise will be available.

II.B.2. On-Farm Water Management Research Program

II.B.2.1. Program Approach

The focus of the program is on the identification of problems and the testing of solutions with the farmer on the farm. The research is conducted by an interdisciplinary team of U.S. and Egyptian engineers and scientists to develop and test a package of technologies which solve the priority problems of on-farm water management.

II.B.2.2. Summary of Program

There are three basic components in the On-Farm Water Management Research Project. In Component A (B.3.2), the present on-farm water management practices will be researched to identify the primary constraints to increased production and efficient use of water. Outlet studies for a season or a year on representative laterals, and a physical and socio-economic survey of farms will form the basis for problem identification.

Component B (B.3.3) will initiate village programs of soil testing for fertilizer recommendations and improved irrigation practices in the early months of the Project on farmer's fields. As additional problems are identified from Component A, additional testing of solutions will be attempted in continuing experiments during the Project. Problems requiring further research will be given to the Research Institutes to define solutions as part of their on-going programs. In the third year of the Project, pilot programs consisting of solutions to the priority problems will be developed and tested on selected villages within the project areas. The pilot programs will be evaluated and revised during the remainder of the Project and results provided to the Government of Egypt for implementation as a development program within the project area.

Measurement of quantities, qualities and rates of water delivered in the project areas and study laterals, in the drainage outflow, and the ground water (shallow and deep) system will also be measured as part of Component C. Results will be used to evaluate the delivery system for improvement, change of the rotation system for more efficient on-farm water management, development of a water budget for the project area and evaluation of the effects of on-farm water management practices on drainage requirements.

The above programs will be initiated in three different project areas at phased 6-month intervals, beginning in the Mansouria Irrigation District.

II.B.3. Detailed Description

II.B.3.1. Introduction

The three basic components of the On-Farm Water Management Research Project are described below. As new and improved technologies that appear adaptable to the Egyptian farmer surface from project and associated activities, an integrated pilot program will be developed that will include a study of economic benefits. Results of the integrated program will provide solutions to on-farm water management problems, and be the basis for a continuing program of replication in appropriate areas. An expansion of this section is given in the Technical Report, Annex D3.

II.B.3.2. On-Farm Surveys - Component A

The interdisciplinary team will plan to conduct the field surveys as an integrated program. The field surveys will be divided into two phases. The first phase,

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the preliminary field survey, will consist of tabulation of existing data and information about the project area. The second phase will consist of detailed field surveys combined with seasonal or annual studies of selected outlets.

II.B.3.2.1. Preliminary Field Survey

A preliminary survey will be conducted in the field to gain an understanding of how the irrigation delivery system operates and how it governs the use of water by the farmer. The survey will also include an elucidation of agronomic and other farm management practices. Preliminary measurements of delivery losses, irrigation efficiencies and drainage losses will be made. The data will be obtained from a number of laterals in each project and will be used to select laterals for the detailed field survey and possibly for the location of cooperators for on-farm testing. The preliminary survey will be made at Mansouria during the first 6 to 8 weeks of the project, and at succeeding six-month intervals at Sakha and Abu Korkas.

II.B.3.2.2. Detailed Field Survey

The detailed field survey will be conducted in all three districts during the spring and summer of the second project year. The on-farm engineering, agronomic and socio-economic components of on-farm water management practices will be researched to identify the primary constraints to increased production and the efficient use of water.

The farm survey will consist of a questionnaire and the measurements of physical factors. The questionnaire will be used to collect four types of data: 1) general information on farm operations, inputs, yields, personal information, etc; 2) organizational factors such as amount and frequency of water rotations, water costs, relationship to government institutions; 3) farmers' perceptions of problems; and 4) farmers management and decision making awareness. The physical measurements will include the monitoring of outlet discharge,

conveyance efficiency, soil survey, soil testing, and mapping of the entire outlet, and a mapping of cropping patterns, water channels, field branches, etc.

II.B.3.2.3. Seasonal Watercourse Evaluation

A watercourse survey will be carried out to determine farmer practices during a complete year so that water management can be related to cropping pattern, stage of plant growth, soil moisture stress, crop water requirements, agronomic practices and the supply of irrigation water. This will supplement the detailed field survey and will be used to identify seasonal on-farm water management problems in Egypt.

This study will include, primarily, physical measurements of the system such as the amount and time of application of water, water losses, soil moisture stress, water table depth, measurement of crop yields, soil tests, etc. Cropping patterns, stage of growth, past drainage, and other data will be recorded.

The study will be initiated in each project area as soon as an outlet can be identified from the preliminary field survey (B.3.2.1).

II.B.3.2.4. Fertility of Village Soils

A village soil testing program will be initiated during the first six weeks of the Project. Approximately 250 fields will be selected from a village in each District. The surface soil will be sampled and analyzed in the Soil Testing Laboratory for available nitrogen, phosphorus and potassium by analytical procedures developed for Egyptian soils. The results will be summarized to give the general fertility for soils in each village, and will serve as a guide to supplement current fertilizer recommendations for the upcoming crops.

In a second phase of the soil testing program, the cultivated and subsurface soil layers will be sampled for all cropped fields in the seasonal studies (B.3.2.3).

The samples will be used for fertility and salinity analyses. The results will assist in determining fe[illegible]i-lizer practices for the optimal management study (B.[illegible]3)

[illegible].B.3.2.5. Physical Analysis of Soils

Certain soil physical properties may need to be determined in areas where crop yields are poor, yet soil fertility and other management practices appear to be good. Rooting depths will be studied. Possible measurements will include an examination of the soil for deleterious factors such as poor soil structure, the presence of a soil pan caused by cultural operations, chemical deposition or cementation, or by the presence of a high water table. Other physical properties such as bulk density, texture, as well as field capacity and wilting point moisture contents will also be measured on selected fields.

II.B.3.2.6. Determination of Agronomic Practices

An intensive survey and analysis of current farmer practices is needed to determine possible agronomic constraints in the effective use of irrigation water on the farm. The same outlet areas will be used for study as for the seasonal watercourse evaluation. The study will include an assessment of all agronomic practices that effect the efficient use of irrigation water by the small Egyptian farmer. The results will be used to identify agronomic factors for study in the optimal systems experiment (B.3.3.3).

II.B.3.3. On-Farm Testing - Component B

A preliminary analysis of the operation of the on-farm water management system is given in the Feasibility Report (Annex D1). From this analysis a tentative program of testing of solutions to the problems identified is suggested. Revision of the problems defined and solutions proposed should be made after the results of problem identification studies have been completed. As results become available, some problems may be so obvious that practical solutions will be attempted early in the on-farm studies.

II.B.3.3.1. Delivery System Improvement

Since studies by the Irrigation Ministry indica[illegible] that in many instances the rotation system of deliver[illegible] ter does not result in optimum use to meet crop wat[illegible] quirements, on-farm experiments with a demand system of ater delivery will be initiated. The advantages and disadvantages will be evaluated with emphasis on on-farm water use efficiencies and the effects on crop yields. Another policy of the Irrigation Ministry has been to deliver water to the farmer below the land surface. Studies should be conducted to deliver water, possibly on demand, at elevations for gravity flow and at a rate that is efficient for both delivery and field application of water. Redesign of outlets would be a major component of this program. The water delivery system should also be evaluated.

II.B.3.3.2. Application System Improvement

A review of the present system of applying water to fields (Annex D1) suggests that current application efficiencies may be low. Studies should be initiated which will develop an optimum combination of flow rate, furrow length or border length and width, infiltration rate of the soil, surface slope, and precision of levelness which results in the most efficient application of water. Other studies will be initiated to develop simple criteria to improve the effectiveness in application of water with existing systems. In conjunction with these studies would be research to determine the exact amount of water required to replenish the soil water deficit and to control soil salinity and waterlogging.

II.B.3.3.3. Optimal Management Systems

After the major agronomic constraints to improve on-farm management of water are identified (B.3.[illegible].6), optimal management systems will be designed and research will be conducted on the farm to determine the feasibility for adoption by the farmer. Management factors will include field cultural practices, fertilizer application, pest control and irrigation methods. Acceptability of the proposed practices by the farmer will have high

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priority in the identification of improved practices for general recommendations. This research will be initiated during the first year of the Project.

II.B.3.3.4. Salinity Balance Experiments

Experiments will be initiated during the second project year in the Kafr El Sheikh District to determine the influence of water quality, water management practices and the presence or absence of drainage, on the salinity balance for rice and cotton cropping systems. Similar research will be initiated during the third year in the other districts. The results will provide guidelines for recommending optimal management in areas where both soils and ground water are saline.

II.B.3.3.5. Fertility Experiments and Soil Test Correlations

With preliminary soil test data obtained from the field survey, fertilizer experiments will be designed to study the effect of fertilizer material, fertilizer rate, and method of application on crop growth on farmers' fields. The data will be used to correlate the soil test with crop yields and is the basis for developing a soil testing program for Egypt that will optimize fertilizer inputs for small farmers.

In other phases of the soil fertility research, the recovery of applied fertilizer for selected cropping patterns and nitrogen fertilizer systems will be studied. The results will have direct application to the evaluation of efficient methods of farm irrigation.

II.B.3.3.6. Experiment Station Research

Most of the basic data required to outline on-farm adaptive research appears to be available for Egyptian conditions. Where the basic data are not available, experiment station research may be conducted, but it is anticipated that this type of research will be limited to high priority areas.

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II.B.3.3.7 The Pilot Program

At the end of the initial program of solutions to the major problems, a number of high benefit technologies will be defined. With these technologies identified, an integrated package of technologies will be offered as a pilot program on an outlet or lateral basis for adoption by farmers. Such a program would then be initiated on a pilot basis to test its acceptability by farmers and their rate of adoption. In the pilot program phase, the organization and the technical competence of the people required to implement the program would be determined. The pilot program areas would be further studied to obtain costs and benefits before adoption of the program on a project or country wide basis. As problems develop during the pilot program phase, the research program team would be available to identify and provide solutions to these particular problems.

II.B.3.4. Water Irrigation District Delivery and Drainage - Component C.

In each of the three irrigation districts (Mansouria, Sakha, Abu Korkas) the amount and quality of irrigation water entering the district at main canal headworks and also leaving the district by canal will be measured, and the same measurements will be made for all major drain water entering and leaving the district. Similar determinations will be made on the distributories where the on-farm water management research will be conducted. The elevation and quality of the shallow and deep ground water tables will also be determined at 30 or 40 selected points in each district.

These data will provide the information needed to calculate a budget for the hydraulic system, and will be used to determine delivery efficiency of the canal system, water stored in the canal system at any time, the contribution of the main canals and distributaries to the drainage problem, and will supply information needed to design possible changes in water rotation systems.

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Component C will be implemented in the Mansoura District as soon as the project begins, and in the Sakha and Abu Korkas Districts in successive six-month intervals.

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III. PROJECT ANALYSES

The four types of analyses (technical, financial, social and economic) presented in this section are carried out at two levels. One concerns the research program itself and the other anticipates the eventual results to the economy at large. This approach is in response to the lack of specificity in portions of the research program, since part of the research effort is to identify factors deserving study. It is also in recognition that successful completion of the research program is expected to contribute significantly to Egyptian agriculture and ultimately to the whole of society.

III.A. Technical Analysis

The following factors were taken into consideration in preparing the technical aspects of the project: program strategy, appropriateness of design and timing, selection of GOE organizations as executors of the project, possibilities for replication of results, environmental issues, basis for cost estimates and policy issues.

III.A.1. Program Strategy (Alternate approaches).

In the design of this project, the feasibility of alternate strategies was considered. The alternatives considered were:

1) To do nothing with on-farm management.

2) Immediate implementation of an on-farm water management program based on available Egyptian research.

3) Reduce drainage problem and over use of irrigation water by reducing flows from High Aswan Dam.

4) Research on water use coupled with on-farm demonstration and pilot program.

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The analysis was based on the judgement of team members

Details of the information available are given in the Feasibility Report in Annex D.1.

III.A.1.1. Do nothing Strategy

This approach does not provide a solution to the major problems identified in the Feasibility Report. These problems are an agricultural production that although good is 50% less than potential, waterlogging and salinity that is reducing yields in many areas, and inefficient use of water resulting in severe drainage problems, requiring hundreds of millions of dollars to solve.

Preliminary appraisals of the system for delivering water suggest limited knowledge of the actual quantity delivered exists. The calculations of the actual quantities supplied to farmers do not consider the amount of water used by crops from a high water table, which is expected to be significant. Farmers use extra water from unauthorized outlets, outside of authorized turns and from drains. The solution of these problems is imperative to increase yields, increase cropping intensity, decrease waterlogging and salinity, and release water for other uses, including an expansion to new lands. The GOE has an expanding population which must be fed from limited land resources but presently abundant water supplies.

III.A.1.2. Immediate Implementation

A number of improved on-farm water management technologies are known that are not presently being practiced in Egypt (See Annex D.3). An on-farm water management program has been identified for Pakistan and is explained in detail in the references cited in Annex D.1, Section 1. These practices, with variations, are followed in other countries such as the U.S. and Turkey. Experience in the development of the on-farm water management program for Pakistan suggests that these practices will need significant adaptation for widespread adaption in Egypt. Also, present knowledge of the system does not permit an identification of the high priority

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problems for which these known technologies [redacted]uld provide solutions.

There are essential differences in the agriculture, cultural, on-farm irrigation methods and MOA/I water delivery policies that indicate adaptive research is needed. Similar differences exist for the U.S. and irrigation practices in other countries.

For example, one component of the on-farm water management research program in Pakistan is research on developing methods for using furrow irrigation. Little furrow irrigation is practiced in Pakistan. In Egypt, a study of the effectiveness of present furrow irrigation methods must be completed before knowing if improvements are needed or to be able to suggest what improvements are needed.

There is a serious lack of information of all aspects of Egyptian irrigation. Some were mentioned in the previous section. Others are: How much water does the farmer actually apply to his fields in any one irrigation ? How much water is lost in the field ditch, canals and drains ? How does the farmer irrigate ? Is the land in border irrigation precisely level ? What are his tillage, fertilizer, cropping practices, etc. ? What is the quality of water in the drains ?

Without adaptive research and the development of a successful pilot program which depends on adequate measurement of current practice, immediate implementation is a high risk strategy. The potential for introducing counterproductive practices, alienating the farmer and even disrupting the economy is too great. The GOE is very careful to field test new seeds, fertilizer or changes in practices. This careful, strategy has paid off in gaining the confidence of farmers who, although considervative, will adopt new seeds and use recommended fertilizers.

Of course, to the extent known, profitable technologies should be extended without delay. The first, and continuous, phases of the project will seek out such technologies through 1) the search of the literature, 2) contacts with farmers, and 3) from external sources.

III.A.1.3. Reduce the amount of water in the system

The Ministry of Irrigation experimented in this program last year and reduced the amount of water released based on the calculated water requirements by six percent. All releases of water were first reduced by an average percentage. This resulted in excessive farmer complaints. Another policy was initiated where the amount of water, as computed by crop requirements, was reduced relatively more during periods of low demand than during periods of high water demand. The result was the same savings cited above but with fewer farmer complaints.

The problem with the above strategy is that knowledge is lacking, as described in the Feasibility Report, about how much water is needed and how much is actually delivered. A delivery system of rotations and a need to maintain a minimum water elevation in the canal means that a considerable quantity of water is stored in the system or is passing through the system in order to supply water to the farmer. When the amount delivered is reduced by a given amount, this reduction comes completely from the quantity that the farmer uses. For example, if the losses, storage and flow-through percentage equals 50 percent, then the quantity delivered to the farmer is 50 percent. If the system deliveries are reduced by 10 percent, the quantity delivered to the farmer is reduced by 20 percent. At some percent of curtailment, the system will fail. There will not be enough water available to supply the farmer. The strategy is obviously dangerous to the production of food and the farmers' well-being.

If carried out, the on-farm water management program suggested in this report, would provide information on the water delivery system. This information, coupled with data on farm practices, would provide the type of information needed to develop a strategy for limiting releases from High Aswan Dam.

III.A.1.4 Research on-farm water management

This is the program of action for this Project. The existing data and knowledge on water use, water requirements by crops and on-farm water management, plus the collection and analysis of new data on present-day on-farm irrigation and agricultural practices will be used to develop and test an on-farm water management pilot program by working with the small farmer.

III.A.2. Appropriateness of Design

Review of various reports and discussions with a variety of persons in Egypt suggest the absence of extensive and reliable information about water budgets for the various water courses, and about the characteristics of on-farm water use. Thus, the preliminary (and continuing) effort in the research program is to develop such information. The project team will use water data gathering and on-farm interview techniques that incorporate procedures successfully adapted to conditions typically encountered in developing countries. For instance, a rural sociologist with extensive experience working with peasant farmers should take responsibility for developing guidelines for on-farm data collection. Concerning this example, advantage will be taken of work being carried out by the Agricultural Economic Research Institute, Ministry of Agriculture, and the experiences of the Ford Foundation in the farm budget studies to be carried out in Sharkia Governorate. Similarly, potential improvements to water delivery and removal and on-farm management practices to be tested should reflect the researchers' experience in adopting modern technology to peasant agriculture. For example, in land levelling, due consideration would be given to equipment suited to the small sizes of many of the Egyptian fields. On-farm experiments would take account of farmers' customs and their relations with external factors, such as government-managed co-ops production and price regulations, land taxation, and so on.

III.A.3. Timing of the Project

Two aspects of project timing need to be taken into account. The first of these concerns the best time to initiate the project. Considering pressures of a high population increase (2.3%), levelling off of crop yields, worsening balance of trade, increasing costs of government food subsidies, and recently more serious inflation, it has been concluded that action on this Project should be initiated at the earliest possible time. The plan to submit this Project Paper for approval in June (1976), to obtain GOE-USAID implementin agreement shortly thereafter, and to secure a contractor by the end of the year is in response to this urgency.

The second factor regarding project timing has to do with the phasing of project components. The contractor will be asked to devote the first six months to the collection of data on on-farm soil, water and agronomic practices, initiation of [illegible] experiments, and preparation of the detailed research program. Thus, by the end of the Project's six month of operation, the research program will be well under way.

III.A.4. Choice of GOE Organization

A new organization will be created within the Ministry of Agriculture/Irrigation to carry out the proposed research program. The staff for the organization will be drawn primarily from the Water Distribution Research Institute and the Soil and Water Research Institute. A tentative organizational structure and staffing are described in subsequent sections of this report. The Minister of Agriculture/Irrigation has designated these two organizations for carrying out the Project and has orally approved the organization chart.

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The combined Ministries of Agriculture and Irrigation under a single Minister make up the central organization serving the farmer. This organization operates the water delivery system, carries out research, and provides extension services. Its personnel manage the village cooperatives and Ministry policies are coordinated with those of the Agricultural Credit Bank. With the combining of the two Ministries, the integration of water delivery and removal with on-farm water management has been enhanced. The integrative benefits of this merger have already been felt while preparing this Project Paper.

The Water Distribution Research Institute and the Soil and Water Research Institute are concerned with research on soil-water interactions, soil surveys and crop-water requirements, as well as other areas. These institutes have the personnel (agronomists and engineers), the Agricultural Economics Research Institute has staff economists, and the overall Ministries can supply other disciplines to support the Project. Moreover, staff and facilities of the regional offices of the Irrigation and Agricultural Departments will be provided as needed

III.A.5. Replication and Diffusion of Results

The three project areas in the Upper, Middle and Lower Nile Valley have been selected in such a way that each is representative of a particular cropping pattern and unique water management problems. These areas cover the basic conditions encounted in most of the "old lands" which comprise roughly 90 percent of the country's total area under cultivation.

The El-Minya area (Upper Nile) is typical of areas with loamy soils, fragmented holdings, drainage problems, a gravity system and cropping patterns that center on the major crops of maize (corn), cotton and sugar cane. The Mansouria area (Middle Nile) is typical of areas with lighter sandy alluvial soils bordering the Western desert, lesser drainage problems, a lift system, fragmented holdings, and major production of citrus and vegetables. The Sakha area (Lower Nile) contains heavier clay loam soils, larger sized holdings, drainage and salinity problems, a lift system and major crops of paddy rice, cotton, and wheat.

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The deistribution of farm holdings follows in a subsequent part of this Section (III) and additional details on the physical characteristics of the project areas are to be found in the Feasibility Report (Annex D-1).

As results of the pilot projects are obtained, those that are successful will be suggested for implementation by the GOE. Funding could come from separate loan agreements between the GOE and AID, with other bilateral and multilateral donors, or by other means. This approach provides an efficient and timely means of expanding project results on a broad scale to other areas and eventually throughout the country.

III.A.6. Environmental Issues

Improved on-farm water management will reduce the return flow of drainage and excess surface water into open drains, and should dry up some ponds and swamps. To the extent this occurs, control of Bilharzia, Malaria and other water-vectored diseases will be facilitated. However, as long as some water remains in the drains throughout the year, snails will be able to live and act as the intermediate host for S. Mansoni, and the ultimate total effect the Project is expected to have on the Bilharzia problem is indeterminate at the present time.

A reduction in return flows will also reduce weed growth in the drains and loss of nitrogen from the soil by leaching. Both are beneficial environmental effects, although the magnitude probably will be small. However, the water that does appear in the drains will have higher higher concentrations of salt in solution even through the total aggregate salt content probably will be less. When drainage water returns to the supply system, it does increase the salinity of the irrigation water, but the differential effect of improved on-farm water management probably will be small and should have no appreciable positive or negative on the environment.

Reduction of waterlogging will improve conditions in the villages, decrease salinisation of the ground water by reduction in non-beneficial evapotranspiration and increase food production and resulting nutrition though increased yields and cropping intensities.

III.A.7. Project Costs

Total cost of the project, exclusive of inflation, is equivalent to L.E.5.4 million ($ 9.8 million US)* for the five-year program. A summary of the values making up this estimate is shown in Table 1 and itemized estimates are shown in Annex D.2.

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*1 L.E. = $1.8 U.S.

TABLE 1

COST SUMMARY FOR THE PROJECT*

(in thousands)

Item		L.E.	$	Equivalent L.E
Professional Staff:				
GOE	160 Man Yrs.	521		521
US:				
Resident	37.5 "		2,872	1,596
TDY	9.8 "		848	471
Back Stopping	14.0 "		658	366
Supporting personnel:				
GOE	754 Man Years	672		672
US	12.5 "		145	81
Consultants		30	60	63
Equipment Purchases:				
Field		30	331	214
Laboratory			164	91
Office		35	85	82
Vehicles:				
Purchases			294	163
Operating Expenses		160		160
Training			284	158
Per Diem in Egypt		140		140
Office Rent and Utilities		92		92
Others		81	5	84
Sub-Total		1761	5746	4954
Contingencies (10%)		176	575	495
Total		1937	6321	5449

Note:
See Section IV.C.2 for a discussion of staff requirements, and Annex D.2 for details on cost and equipment.

*Does not include an allowance for inflation.

These estimates are approximations at this time and should be used for setting the target levels of activity for approval of this project paper and for subsequent negotiations between the GOE, AID, and the US contractor. Firmer values should come from these negotiations. A contingency allowance of 10 percent has been included to allow for additional staff, equipment, supplies and for unforeseen requirements.

Estimates of these items are based on quantities established in the section on technical analysis. Unit costs reflect the going rates for manpower, equipment, supplies and services of the quality judged appropriate for the project. GOE staff and support personnel have been costed according to standard GOE budgeting procedures. Senior staff from the United States is expected to be of high technical quality, which customarily draws a base salary on the order of $ 35,000 per year. By adding in fringe benefits, organizational overhead, transportation, in-country living allowances and related costs, the annual cost to the project of such an individual is about $ 75,000 (See Annex D.2). Estimates for equipment and vehicles are for standard production-line items, whose value are competitively determined. Few, if any, items will be of unique design requiring special manufacture.

III.A.8. Policy Issues

Egypt's revolution in 1952 resulted in placing the state in charge of many areas of economic activity, except in the agricultural sector. There, private ownership of farm land was retained and even broadened under land reform measures which resulted in approximately one million feddans being distributed to 362,000 beneficiaries. Ownership is now limited to a maximum of 50 feddans per individual, or 100 per family.

Although recent policy decisions have been made to liberalize state control over the economic sector, a number of policy measures prevail which have a direct

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bearing on the relationships of the Egypti[illegible] farmer with his government. Because many of thes[illegible]re quite different from those prevailing in the U.S. [illegible] members of the U.S. project team may find that traditional frames of reference for conducting research and instituting technical changes in farming practices are also different.

Policy matters that could have a bearing on broad-scale implementation of the results of the on-farm water management project are as follows:

- Production quotas. Mandatory quotas (in feddans) are imposed on farmers for production of cotton, rice, wheat, sugar cane and other basic crops. Water delivery rotation schedules are based on water requirements for these crops; water is not available on demand.

- Fixed prices. Quota crops are required to be sold to the government at fixed prices. Profit margins on these crops are generally less than for crops for the free market. Farmers often delay planting quota crops beyond optimum planting dates to prolong use of the land for non-quota crops.

- Water Charges. The Egyptian farmer pays a land tax that is based on the imputed rental value of the land. This value rests on the productivity of the land, which in turn is dependent upon a viable irrigation system. Thus, indirectly, the farmer pays a water charge on the general availability of water, but he does not pay for the quantity of water he actually uses. In this respect he has no economic incentive to reduce water use until yields decline from excessive application of water.

- Pumping required. Although water is deliverd by gravity flow in certain areas, lifting water from the ditch to the field is the rule. Because this is usually achieved by manual or animal effort, this is regarded by Government authorities as a viable means of curtailing use of water.

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Cooperative membership mandatory. Cooperatives in Egypt are not just institutions which provide farmers with requirements for agricultural production, marketing and related services. They are also instruments for implementing many of the social and economic policies of the state in the rural areas. These include determining and enforcing cropping patterns, supplying farm inputs, assisting with credit and accepting delivery of quota crops on behalf of the government. To a certain extent, extension-type services are also channeled to the farmer through his local co-op. As a result, the Egyptian farmer lacks the freedom of action to follow the directions indicated by free market forces in pursuing his economic goals.

The above policy issues are relevant to the successful completion of the Project. Some of the policies may hinder the acceptance or introduction of some of the on-farm water management results in Egypt if profit margins become narrow or changed practices costly in respect to margins. The Project will develop some of the needed information for the GOE to change policies that hinder acceptance of the methods developed by on-farm water management.

The farmer has operated, and increased production, within the existing policy framework for many years. Prices of commodities are set so a modest profit above all costs is possible.

The policy issues will not affect the completion of the internal objective of the project and it is reasonable to assume policies will be favorably maintained to achieve the production objectives to which the project findings will contribute.

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III.B. Financial Analysis and Plan

The financial summary which follows shows the expenditure side of the Project. Other factors to consider include (a) the financial capabilities of the Ministry of Agriculture/Irrigation and of the research organizations responsible for overseeing the program, and (b) the financial effects on participating farmers and the GOE.

III.B.1. Financial Summary

The financial costs of the project given in Table 2, come to $13.0 million (L.E.7.2 million). The GOE would contribute L.E.2.8 million ($5.0 million) and the US $8.0 million. The Egyptian component, amounting to 38 percent of the total would be both in cash and kind. The annual schedule of Egyptian expenditures, including inflation, begins at L.E.0.3 million ($0.6 million) and builds to L.E.0.7 million ($1.3 million) by the fifth year. The schedule for the US averages close to $1.6 million each year. Aside from the inflationary component, the total amount is the same as that shown in Table 1.

Four inflation rates have been assumed, since different rates are anticipated for the two countries and for salaries and the rest of the economy. The rate of inflation in the Egyptian economy from 1970 to 1973 was 2.9 percent. In 1974/75 this rate increased considerably (exact rates have not been published). Considering recent trends, Egyptian economists consider 15 percent as a reasonable assumption for the period of the project. Salary adjustments for installation over the past five years for the relevant Egyptian organizations have been nil. But due to greater inflationary pressure in the economy, a rate of 10% has been assumed. The ten percent rate for the United States economy is somewhat above the present rate, but not out of line with recent rates now with possible future rates. The eight percent rate for salaries is consistent with expectations for state-supported Universities in various parts of the United States.

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TABLE 2

FINANCIAL SUMMARY FOR THE PROJECT (in thousands of equivalent US dollars).

NOTE: Totals may not add due to rounding

ITEM	1st year		2nd year		3rd year		4th year		5th year		Total		TOTAL
	GOE	AID	GOE	AID	GOE	AID	GOE	AID	GOE	AID	GOE	AID	
Professional Staff	113	663	206	868	206	970	206	972	206	905	937	4378	5315
Supporting Staff	146	29	266	29	266	29	266	29	266	29	1210	145	1355
Sub total	259	692	472	897	472	999	472	1001	472	934	2147	4523	6670
Contingencies (10%)	26	69	47	90	47	100	47	100	47	93	215	452	667
Sub total	285	761	519		519	1,099	519	1,101	519	1,027	2362	4975	7337
Inflation (10%, GOE, 8% GOUS)	29	61	109	164	172	285	241	397	317	432	868	1,389	2257
Sub total	314	822	628	1151	691	1,384	760	1,498	836	1,509	3,230	6,364	9594
Consultants	11	12	11	12	11	12	11	12	11	12	55	60	115
Equipment Purchases	55	311	20	137	14	44	14	44	14	44	117	580	697
Vehicle Purchases	0	180	0	34	0	60	0	10	0	10	0	294	294
Vehicle Operation	45	0	51	0	64	0	64	0	64	0	288	0	283
Training	0	56	0	57	0	57	0	57	0	57	0	284	294
Per diem in Egypt	26	0	57	0	57	0	57	0	57	0	254	0	254
Office Rent and Utilities	22	0	36	0	36	0	36	0	36	0	166	0	166
Other	31	1	29	1	29	1	29	1	29	1	147	5	152
Sub total	190	560	204	241	211	174	211	124	211	124	1027	1223	2250
Contingencies (10%)	19	56	20	24	21	17	21	12	21	12	102	122	224
Sub total	209	616	224	265	232	191	232	136	232	136	1129	1345	2474
Inflation (15%, GOE, 10% GOUS)	31	62	72	56	121	63	174	63	234	83	632	227	859
Sub total	240	678	296	321	353	254	406	199	466	219	1761	1572	3433
TOTAL	554	1,500	924	1,472	1044	1,638	1,166	1,697	1,302	1,728	4991	8036	13027

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III.B.2. Financial capabilities of GOE Participants

Recent operating budgets of the Ministries of Agriculture and Irrigation (recently combined) have been about 8 percent of the total operating budget of the GOE (Defense Department expenditures expected). Within the Ministries of Agriculture and Irrigation, roughly L.E.11 mil. have been allocated to the two Research Centers.

As indicated in Table 2, the Egyptian contribution to the project will begin at L.E. 0.6 million during the first year and eventually reach L.E. 1.3 million per year. This represents a 66 percent increase in the combined operating budgets of the two institutes during the first year and 140 percent in the latter years, which is not an unrealistic expansion.

The directors of the two research organizations most directly responsible for this project and from whence research staff will be drawn have demonstrated financial management capabilities. This judgement was reached after field trips to their research centers and areas of activities, a review of the overall research capabilities within the GOE, and by discussions with others konwledgeable of conditions in Egypt.

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TABLE 3

OPERATING BUDGETS* OF SELECTED GOE ORGANIZATIONS

(Million of Egyptian Pounds)

	1971/72	1973	1974	1975	1976
Total National Budget**	421.1	420.0	513.5		
Ministry of Agriculture	19.7	17.4	19.4	20.9	22.5
Ministry of Irrigation	16.7	15.4	20.5	22.9	24.3
Water Research Center					4.0
Agricultural Research Center			6.3	6.4	6.9
Water Distribution Research Inst. (MOI)					0.3
Soil/Water Research Institute (MOA)			0.6	0.6	0.7

* Since this table is used to show order of magnitude values, actual and budgeted amounts have not been distinguished.

** Defense expenditures excluded.

Source:

Ministry of Finance and Ministry of Agriculture.

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III.B.3. Financial Impact on Participating Farmers.

The primary impact of the proposed program on farmers located in the the three project areas is expected to be one of increased output at little additional cost to them. This effect will come about in several ways. For farmers participating in the on-farm trials and demonstrations, higher than average technical assistance and adequate supplies of farm inputs will be made available to them in the interests of carrying out a successful experiment and demonstration program. Even though the farmer would be charged for farm supplies, he can be expected to improve his farming practices and consequently his yields. Of course, some trials may be less efficient than existing practices and some mistakes may occur in applying new techniques. But on the whole, increased output should be the result, in subsequent years if not immediately. Farmers taking part in the pilot projects will benefit in a similar manner but with somewhat more certainty since the experimental work is intended to filter out problems of on-farm implementation. Even those farmers not participating directly may benefit from improved management of the water distribution system. A better understanding of the water budget would make it possible to eventually regulate flows and hopefully reduce waterlogging and salinization problems.

The following table shows present income levels of farmers in the areas designated for the pilot program. Expected yields are shown in annex D.1 , page . Given the present unfortunate evidence of yield plateaus (page) it is difficult to see how the national target yields will be achieved since an array of constraints - including lack of good water management data - impede reaching the goals.

Assuming the achievement of only national percentage goals (about half of what the Consortium for International Development estimated as possible),

TABLE

1974 FARM INCOME AND PROJECTED PROJECT BENEFITS

L.E./FEDDAN

CROP	PRODUCTION EXPENSES	RENTS	GROSS INCOME	NET Y PER ACRE	NET Y/ACRE INCLUDED RENT
Rice					
Kafr El Sheikh	40.9	11	86.4	34.5	45.5
Wheat					
Kafr El Sheikh	26.9	12.4	61.8	21.2	34.7
El Giza	36.3	17	78.8	25.5	42.5
El Menya	31.1	20	72.7	21.6	41.6
	11.4	16.8	71.1	22.7	39.6
Sugarcane					
El Menya	77.7	35	240	127.6	162.6
Corn					
Kafr El Sheikh	28.8	11.7	73.6	33.1	44.8
El Giza	37.2	10.0	77.2	29.9	39.9
El Menya	38.3	12.0	78.71	28.4	40.4
	34.6	11.2	76.5	30.5	41.7

the financial benefits to farmers are still substantial and result in the following income increases:

TABLE

£E - Net Benefits To Participating Farmers/Feddan

	Yield	Production Costs Up		Net Returns Up			
	% Up	Amt.	%	Amt.	%	With Rent to Farmers Amt.	%
Rice	24	3	7	17.5	50	17.5	38
Wheat	29	2.9	9	16.9	75	16.9	42
Corn	20	3.2	9	11.7	38	11.7	28
Sugar cane	26	9.5	12	30	24	30	18

The average income increase illustrated above represents a 36% increase for farms with food crops and a more modest 18% increase for cane farmers (who already appear to have high incomes per feddan - at least for 1974). The average income increase of 19£E/feddan does not include any income gains (or losses prevented) from effects on cotton. Experimental evidence is not available which quantifies likely income on cotton, relative to water management and the associated practices. It is anticipated that one of the major benefits of the project will be in the costs savings and "productivity maintaining" gains to be found in managing the salinity build up problems which now plague the farmer for cotton as well as other crops. Financial and economic gains for cotton can not, however, be estimated. Such findings, whatever they may be, are to be a major output of the project.

III.B.4. Financial Impact on Operating Agencies

The GOE can eventually be expected to benefit substantially from this program. Improved management of productive activities is often a viable alternative to investment in physical works when attempting to increase output, reduce expenditures, or both. In the present case, a possible reduction in the need for tile and open drainage through better water management could save the GOE significant amounts of funds. For example, a ten percent reduction in the tile drainage program presently being implemented by the GOE and the World Bank would alone save about

$12 million. Moreover, better application of water in the root zone can have a several-fold benefit over the alternative of increasing water supplies at the source. A one percent increase in the efficiency of water storage in the root zone of all of Nile irrigated agriculture would be equivalent to 500 million cubic meters of additional water per year at Aswan dam.

Finally, improved water management can be expected to increase agricultural production through:

1) Increased yields to existing crops.
2) Increased cropping intensity
3) Reduction of the amount of land with waterlogging problems.
4) Additional water to irrigated "new" lands
5) Improved options for crop selection and cropping patterns.

Increased agricultural production will in turn lead to:

1) Higher incomes to the small farmer.
2) Less inflationary pressure on food costs.
3) Increased exp[illegible] possibilities.
4) Decreased imports of food stuffs.
5) Greater cash flows to GOE through land taxes (due to higher land values and less subsidies to contain the rise in food prices).

This discussion of the potential financial impacts to the farmer and to the GOE has been illustrative and qualitative rather analytically quantitative. This is due to the research nature of the proposed project. But as research concepts get tested on the farm and extended through the pilot projects, bases will be developed for quantification in the project areas and, through extrapolation, to the rest of the country.

III.C. Social Analysis

The Social Analysis is intended to answer the questions of (1) who the beneficiaries of the project will be, (2) wh[illegible] they were selected, (3) how they will benefit, (4) the nature of their response to project activities, and (5) the role of women.

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III.C.1. Beneficiaries

The primary beneficiaries of the project will be peasant farmers taking part in the on-farm experiments, soil testing and pilot programs. About 800 farmers are expected to be involved in the experiments and soil testing during the first two years, and some 3,000 farmers in the pilot programs. Eventually much larger numbers will be affected as project successes are expanded within project areas and extended into other areas.

The distribution of farm holdings is highly concentrated in the smaller sizes. For El-Giza and El-Menya Governorates approximately 90% are less than 5 feddans, with 60 percent less than 2 feddans. For Kafr El-Sheikh, the distribution is different: only 20 percent of the holdings are less than 2 feddans and 36 percent are over 5 feddans. See below:

	GOVERNORATE		
Size	El-Giza	Kafr El-Sheikh	El-Menya
Less than 2 feddans	62%	20%	59%
2-5 feddans	29%	44%	29%
5-10 feddans	6%	24%	7%
10-20 feddans	2%	8%	3%
More than 20 feddans	1%	4%	2%
	100%	100%	100%

While these values are from the 1961 census**, Egyptian officials feel that little change has occurred,

---

* 1 Feddan = 1.04 acres.

**The 4th. Agr. Census, 1961, GOE

especially among the smaller holdings.

The land reform laws have gradually reduced the maximum allowable size of holdings. In 1952, the law allowed 200 feddans per owner. This was lowered to 100 feddans in 1965 and to 50 feddans in 1969. As a result, the percentages over 20 feddans, shown above, may be slightly reduced. Although average-sized holdings are small (3.7 feddans in 1960), they are intensively cropped--1.9 crops per year according to more recent estimates.

Family size according to the 1966 census was 5.3 members. Annual per capita income for the country as a whole in 1972 was the equivalent of $ 240 and the value added per worker in the agricultural sector was two-thirds the national average. The project is consequently aimed at this poorer segment of society, the small peasant farmer.

III.C.2. Basis for selection

Once the decision was taken to improve on-farm water use, the target group was largely determined. This is the result of the general homogeneity of the peasant groups and the pervasiveness of the land reform movement, which gave widespread ownership rights to these small farmers. The three project areas will effectively be representative of most farm considitions in the country.

III.C.3. How the farmers will benefit

The effects of improved on-farm water use for the peasant farmers was described in the section on finance. However, the magnitude of effect will be dependent upon prices of the major crops (e.g. sugar, rice, corn, wheat and cotton) and principal farm sunplies, as well as the degree to which cropping patterns and production targets are set and enforced by the GOE. To the extent that real income of the farmers improves and more intensive farming takes place, employment opportunities on the farm should increase slightly and the rate of rural to urban

migration might even decrease. Quantification of these effects can be carried out, at least in part, in conjunction with the evaluation of project towards the end of the research program.

III.C.4. Nature of response

The Egyptian farmer is widely judged as being responsive and willing to adopt new farming methods and inputs. Fertilizer use is widespread, pesticides are applied, some irrigation pumps have replaced animal and human power for lifting water, and new varieties of see have been introduced. Farmers strain to get an extra cutting of berseem (Egyptian clover) before planting the required quota of cotton. Shifts into higher yielding vegetables, fruit, and other crops are taking place, and other evidence exists to reveal the farmers' response to the profit motive. These characteristics are also revealed in the high yields obtained in Egyptian agriculture. This acceptance of change can be attributed to a number of factors, such as dependability of water supply, opportunity and to harvest more than one crop per year, financial support from family members to help finance investments and to cover losses, and the regulatory powers of the government to influence decisions concerning seed varieties, fertilizers and other factors.

III.C.5. Role of woman

In preparing this project, the role of women has been considered in several ways. On the professional side, women graduates of Egyptian Universities are abundant and trained in the disciplines relevant for project activities. Egyptian women engineers have taken part in the discussions concerning this project and a target of two, and possibly three, Egyptian women professionals is set for the project team. Particularly appropriate would be an Egyptian women who would take part in the socio-economic surveys of farm families living in the three project areas.

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At the farm level, women living in the project areas would benefit from improved income of the peasant families. To the extent socially feasible, women will conduct and participate in the socio-economic surveys.

III.C.6. Employment

The project will require substantial numbers of engineers, agronomists, laborers and technicians - perhaps several hundred - but the overall impact on the economy from direct employment with the project will be small. There is the potential of generating several small industries, e.g., pump manufacturing from prototypes used in the project. A large number of measuring devices (measuring flumes, soil samplers, etc.) will be required that can be locally made. Country-wide implementation of on-farm water management would require substantial amounts of such equipment and could generate substantial local industry and employment.

III.D. Economic Analysis

The major economic impact of this project will come subsequently to this research effort. The direction of the research program appears appropriate and research activities are considered cost-effective.

III.D.1. Nature of the Benefits

The principal categories of benefits have been noted earlier in the section on financial analysis; namely increased agricultural production, improved balance of trade and a more equitable distribution income. Examples of potential benefits will be noted rather than attempting to quantify benefits and cost of subsequent programs: a) For production, data show that experiment station yields on some of the major crops are substantially above farm yields. (See following table).

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Yields in M.T./Feddans

Crop	Soil and Water Inst. Trials	Ford Found. and Exp. Station trials	National		
			Present	1980 Target	% Increase
Rice	3.5	4.8	2.1	2.6	24
Wheat	2.3	2.3	1.4	1.8	29
Corn	2.2	2.5	1.5	1.8	20
Sugarcane	52	-	34	43	26

Analytical studies carried out in Pakistan indicate that improved on-farm management practices on irrigated lands might reasonably reduce the ratio between yields and average farm yields from about 1.8 to 1.3. This represents about a 40% increase in average farm production, which would be substantial when applied on a national scale. b) Since about 80% of Egyptian exports are agricultural commodities and 40 to 50 percent are agricultural imports, increased farm production will lead to an appreciable improvement in the balance of payments, c) For income distribution an increase in yields of 40 percent could raise the farmer's per capita income by something less than 40 percent due to additional requirements for farm inputs. Nevertheless, the increase to the farmer would be substantial, provided relative price levels in the future do not work seriously against him.

III.D.2. Cost Effectiveness

The magnitude of benefits for this project cannot be predicted accurately, hence the traditional rate of return or "effectiveness" of costs cannot be predicted in quantitative terms. Agricultural research generally has internal rates of returns of around 40% and given the number and nature of [illegible]chable problems listed in Annex D-1 , it would appear that this project has a potential for significantly high returns. Experience with similar projects (U.S., Pakistan, India) have shown the problems can be effectively addressed through applied research techniques and ultimately by farmers.

The overall cost of the program (i.e. L.E. 5.4 million equal to $9.8 million without inflation; L.E.7.2 million equal to $13.0 US million with inflation), does not appear out of line with the potential benefits to Egyptian agriculture. A one percent increase in the output of Egyptian agriculture would amount to about L.E. 15 million. Considering the generally agreed upon significance of on-farm water management, improvements areexpected to be considerably above this amount. The budgets of the Irrigation and Agricultural Research Centers were L.E. 4 million and L.E. 1 million respectively in 1975. The proposed program therefore represents a much needed increase in the combined annual expenditures of these two organizations.

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IV. IMPLEMENTATION

IV.A. Organizations

IV.A.1. Participating GOE Organizations

Administration of project activities will be in the Ministries of Agriculture and Irrigation (MOA/I). The Water Distribution Research Institute (WRDI) in the Water Research Center (WRC), Ministry of Irrigation (MOI), and the Soil and Water Research Institute (SWRI), in the Agriculture Research Center (ARC), Ministry of Agriculture (MOA), are the designated participating organizations. The organizational structure of MOA/I is given in the following chart. The organizational chart for the Water Management Research Project is given in Section IV C.2.

Both Research Institutes have research activities throughout the country with strong central staffs and facilities in Cairo. They have the necessary laboratories in Cairo, although some additional equipment would be needed to meet the testing requirements of the Project.

These organizations are further described below.

IV.A.1.1. MOA/I

The Minister of Agriculture and Irrigation administrates all activities in the fields of water and agriculture. Although MOA/I formerly was headed by two ministers, it now is administered by one individual who is responsible to a Council, which in turn reports directly to the Prime Minister. Working through a single minister having control of both water and agriculture would have definite benefits for the Project. Organizationally, the MOA/I has clear lines of internal responsibility. However, it is a very large and complex dual Ministry with many large semi-autonomous agencies.

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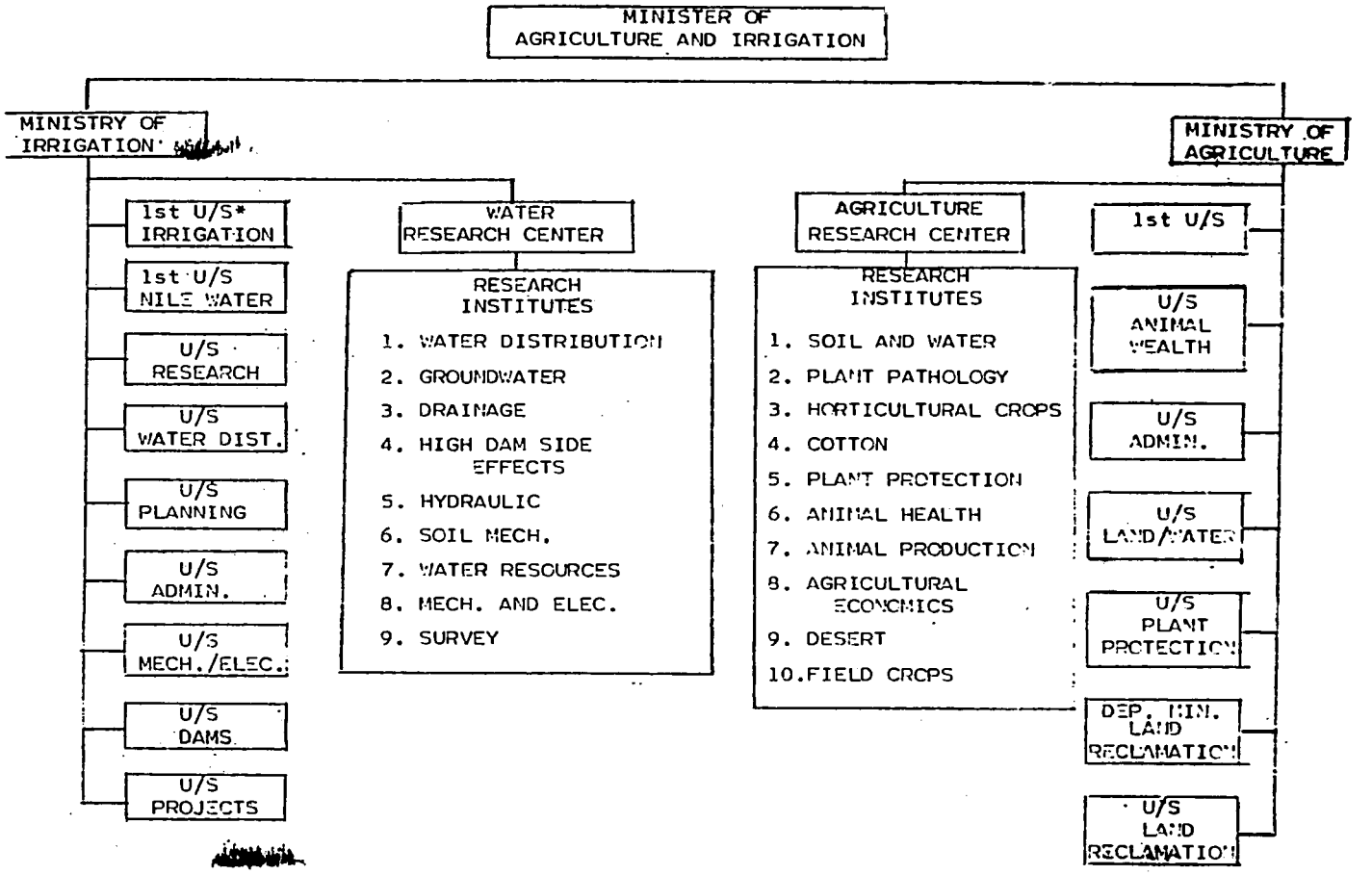
ORGANIZATIONAL CHART, MINISTRIES OF AGRICULTURE AND IRRIGATION



U/S = UNDERSECRETARY

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A.1.2. WDRI

WDRI has a professional staff of 26 irrigation engineers having M.S. and Ph.D. degrees. This Institute has the research responsibility for water distribution and crop water requirements. Five of the staff are women engineers. It has strong leadership and direct lines of administration with MOA/I through the Director, WRC. Its headquarters is in Cairo and has field offices throughout the country. WRDI presently has seven discrete research projects underway. It possesses the professional, technical and equipment resources for the Project but will need additional equipment and additional staff. Budgetary figures are given in Section III.B.2.

A.1.3. SWRI

SWRI has a professional staff of 80 agronomists and agricultural engineers holding M.S. and Ph.D. degrees. The SWRI has research responsibility in soils, salinity, and drainage. It also has strong leadership and direct lines of communication with MOA/I through the Director, ARC. It is quartered in the Giza Governorate, near Cairo, and has staff personnel at all Agriculture Research Centers throughout the country. It is also responsible for the operation of the Salinity Laboratory in Alexandria. The Institute has over six active research activities in progress at the present time, in addition to its on-going soil analysis service. The SWRI also has the manpower and institutional resources for the Project, but some additional equipment will be needed.

A.1.4. Field Support

The Agriculture Experiment Stations and Irrigation Departments in the Menya, Kafr El-Sheikh and Giza Governorates will furnish space and logistical support for experiments in the Abu Korkas and Sakha Districts. The IrrigationDepartment and the Soil and Water Research Institute, both located in Giza, will give logistic support for work in the Mansouria District. The Minister

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of Agriculture and Irrigation has assured that he will allocate space in Ministry of Agriculture facilities at Dokki, Giza Governorate, for operating the Project.

The Governorate Experiment Stations in Menya and Kafr El-Sheikh have laboratories, offices and about 300 and 15,000 feddans of agriculturol lands, respectively. The laboratories at SWRI will serve the Mansouria area. Rest houses providing lodging accommodations, are also available at Menya and Kafr El Sheikh. Laboratory facilities at these locations are good, but some soil analysis equipment will be needed.

A.1.5. Ancillary organization

Ancillary institutional, technical laboratory and administrative support for the projects will be furnished by the Irrigation Departments and Agriculture Experiment Stations in the Menya and Kafr El Sheikh Governorates where project activities will be located, and by central laboratories in Giza for the Mansouria District. SWRI and WDRI have personnel in both of these governorates.

In addition, other Research Institutes in IRC and ARC will furnish help as needed. In particular, the Agricultural Economics, Field Crops, Drainage and Hydraulics Research Institutes will provide additional backstopping as required.

A.2. AID Supporting Group

The AID/Cairo Mission will endeavor to provide some logistical support, FPO and commissary privileges to the American contractor. The logistical support will be on as-available and as-needed basis and will not require additional AID Staff.

The Mission Director will designate an AID project officer for the project and this individual will serve on the Project Review/Advisory Committee, as shown in the project organizational chart.

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B. Contracted Technical Assistance

B.1. Qualifying Organizations

The Project will require the services of a contracting organization well-grounded in irrigation practices and problems prevailing in arid environments. Because of the similarities of Egypt's agriculture with that of many areas of the Western United States, and the broad and reputable experience of many of the institutions of the West, gained both at home and overseas, the technical requirements of the Project could best be filled by a contracting organization from this sector.

IV.C. Implementation Plan

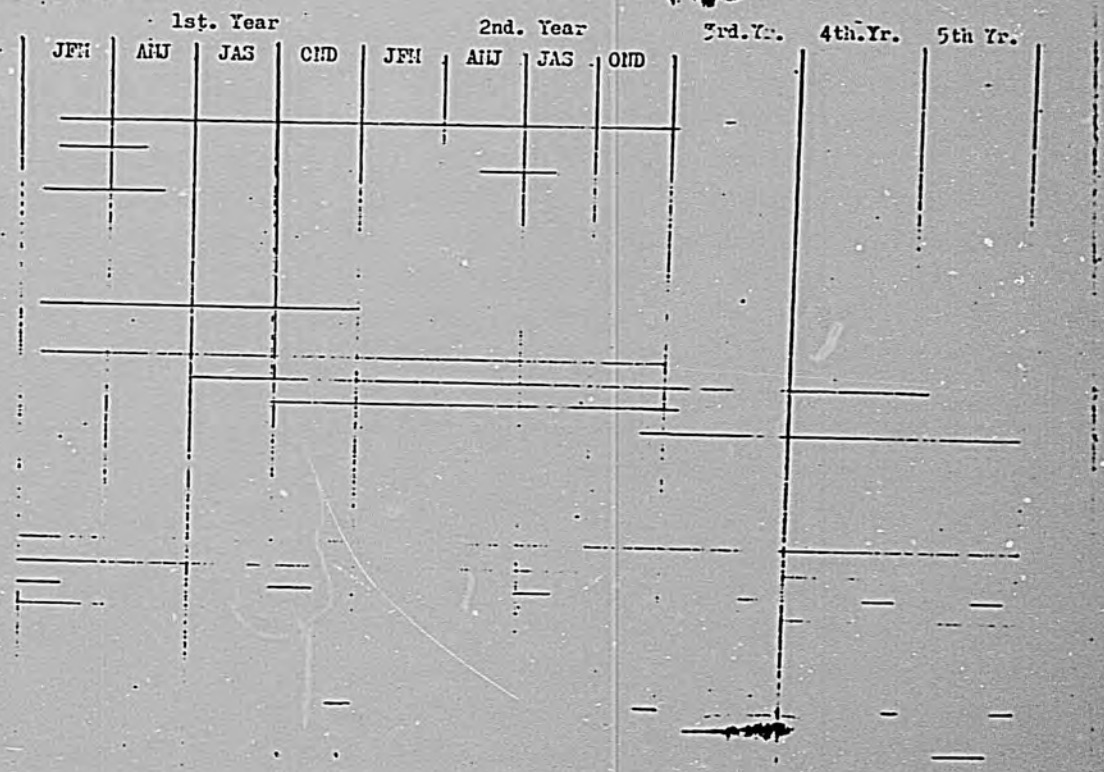
IV.C.1. Schedule of Project activities

The Project will be implemented in three overlapping components. The schedule for the components and stages is given in Table C.1.1. The organization for administration of the Project is shown in Chart C.2. Component A will initiate the Project with research study of on-farm water management practices on representative outlets within the Project area. The village soil testing program would be concurrent with the outlet studies and provide information on farmer practices as well as assistance that is available to the farmer. The data from the outlet studies will be used to develop additional designs of the on-farm experiments in Component B. The on-going WDRI research program will be evaluated and modified to provide maximum data relating to on-farm water management improvements for farmers.

Component B's on-farm experiments on water management improvement practices will be initiated at the beginning of the program. Outlet changes, such as adjustments of the amount and frequency of irrigation, will be initiated as soon as data are obtained which provide the basis for change. After testing various practices in on-farm experiments, a package of practices will be offered as a pilot program to villages on a lateral basis within the project area. The pilot program is expected to be initiated with new improvements on a sequence of villages within the project area during the latter half of the project execution. Monitoring, evaluation and project revision will be a part of the pilot program. The end product will be a developmental program for implementation in the project area as a different project.

Component C is an integral part of the project to be implemented with TDY assistance from the home office. Initiation of measurements on the delivery system will come early in the Project to provide data for later revision of the rotation system and for the water budget studies. The water budget and delivery

TABLE C.1.1. ON-FARM WATER MANAGEMENT SCHEDULE OF EVENTS



Note:
Schedule is shown for Mansouria. Sakha and Abu Korkas will have the same schedule except that they will start 6 and 12 months later, respectively.
However, the Project area on-farm survey will be conducted not later than summer of the 2nd year for the three Project areas.

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system data will be used to select representative outlets and will complement the program to provide data for evaluation of the effect of on-farm water management improvements on drainage requirements.

The studies under Component C will continue with TDY assistance throughout the project.

With the assistance of MOA/I scientists, three project areas were selected by the project feasibility team. The first project area will be at Mansouria, with subsequent initiation of the program at 6-month intervals at Sakha and Abu Korkas. Egyptian personnel will participate in a training program in an on-going project area before initiating a program in a new area.

The organizational and administration chart is given in Chart C.2.1. The project personnel will consist of a U.S. component with counterpart personnel from the Government of Egypt. The Cairo office personnel will direct the program as an interdisciplinary team. Egyptian interdisciplinary teams will also be posted in each area to execute the day-to-day programs in the project area. An American advisor is provided for each project area, but to facilitate interdisciplinary efforts, these may be finally posted at Cairo. Otherwise, they are scheduled for arrival three months before the initiation of each project area except Mansouria where he will arrive with the team.

Project evaluations will be conducted on the basis of annual reports and annual reviews with a comprehensive mid-project review of progress and program direction scheduled near the time of initiation of the pilot program.

A final review will be conducted during the last 9 months before the termination of the project.

IV.C.1.1. Milestones

There are three important milestones in the implementation of this project. They are:

a. The development of a detailed work plan by the end of the first 6 months.

b. The mid-project review at the end of $2\frac{1}{2}$ years when the adaptive research is substantially completed and the Pilot Project is being designed.

c. Implementation of the pilot programs at start of the third year.

IV.C.2. Project organization and Manpower

The management of the Project will be organized as given in Chart C.2. The Project Director will be a GOE Scientist with proven leadership. The Technical Project Director will be a US Scientist with proven leadership ability. Preferably, both men will have a PhD degree in one of the fields of agronomy, agricultural engineering, irrigation engineering, civil engineering or economics.

The Project Director will report to a representative of the GOE appointed by the Minister of Agriculture/Irrigation. The Project Director and Technical Project Director will be advised by a committee which will include the Directors of WDRI, SWRI, AERI and the Agriculture Officer of AID/Cairo. The Minister of MOA/I may change the designated GOE members of this advisory group and the AID Mission Director may change the AID representative.

The Directors will have one or two GOE administrative assistants to take care of routine administrative details of both the GOE and US staffs. The Director and senior staff of agronomists, agriculture engineers, irrigation engineers, economist

CHART 3.2.

ORGANIZATIONAL CHART, ON-FARM WATER MANAGEMENT RESEARCH PROJECT

MINISTER
OF
AGRICULTURE AND IRRIGATION

PROJECT ADVISORY COMMITTEE
Director, NDRI
Director, LWRI
Director, AERI
Agri.Ofcr.AID/CAIRO

Project Director, GOE
Project Technical Director, US
Admin. Assistants, GOE

BACKSTOPPING
Army)
Engineering) 3
Secretary 1
- as required
Third Party Return

CAIRO

	GOE	US
Agronomist	2	1
Ag. Engr.	1	TDY
Irrig. Engr.	2	1
Economist	1	1
Sociologist/ Extension	1	1
Technicians	5	

SOILS LAB. - LWRI
Soils Scientist 1 GOE
Technicians 3 GOE

WATER QUALITY LAB. - NDRI
Chemist 1 GOE
" 1 US TDY
Technicians 2 GOE

NEW MOUNTAIN

	GOE	US
[illegible]	1	
Agr.	1	1
Ag.Engr.	2	
[illegible]	1	
Technicians	9	

Menya Irr.Dept.
Menya Agr.Dept.

HANSOURIA

	GOE	US
Agro.	1	
Ag. Engr.	1	1
Irrig.Engr.	2	
Econ.	1	
Technicians	7	

Giza Irr.Dept.
Giza Agr.Dept.

DAKAHLIA

	GOE	US
Agro.	1	
Agr. Engr.	1	1
Irrig. Engr.	1	
Econ.	1	
Technicians	2	

Dakahlia Irr. Dept.
Dakahlia Agr.Dept.

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IV.C.2.1. Personnel requirements - US:

The on-farm water management research personnel will be senior professionals with extensive experience in research and irrigated agriculture, and will operate as an interdisciplinary team within the following disciplines:

Agricultural/Irrigation Engineering

Agronomy

Sociology/Extension

Economics

The manpower requirements are given in table C.2.1. The team will be supported in the field by an advisor located within each study area. Home base support will be provided by:

1. Civil or Irrigation Engineering (TDY) assistance for surface water and water quality measurements, studies of the canal delivery systems and for systems analysis of canal deliveries.

2. Assistance in agronomy (TDY) in planning applied research projects, on-farm soil testing programs, improved farmer cultural practices, on-farm test demonstrations, data analysis and preparation of reports.

3. Drainage engineering (TDY) assistance for a water budget of the project area and to evaluate the effects of on-farm water management practices on drainage requirements.

4. Additional TDY assistance will be provided to assist the field party, Government of Egypt and the AID Mission on special problems that may arise. Examples include the design and/or improvement of machinery or equipment to solve specific project-oriented problems, preparation of special reports for the Mission or Government of Egypt on related aspects of the program, assistance

TABLE - C.2.1. MANPOWER REQUIREMENTS - US

PROFESSION	Man Months 1st Yr.	2nd Yr.	3rd Yr.	4th Yr.	5th Yr.	TOTAL
Cairo Office and Field Party						
Team Proj. Director	12	12	12	12	12	60
Agronomist	21	24	24	24	24	117
Agricultural Eng.	24	36	36	36	36	168
Sociologist	12	12	-	-	-	24
Extension	-	-	12	12	12	36
Economics	3	6	12	12	12	45
TOTAL	72	90	96	96	96	450
T.D.Y.	18	21	30	27	21	117
Home Office						
Techn. Backstop	18	36	24	12	12	102
Field Party Return	-	-	12	30	24	66
Secretarial	18	18	18	18	18	90
TOTAL	36	54	54	60	54	258

with developing new irrigation methods, such as sprinkler or drip, and with special crops or cropping practices. The home base support in administration shall consist of one full time technical director and secretarial assistance to provide stateside logistic support, such as acting as coordinator with AID/ Washington, ordering special field equipment and literature resources, and the many other tasks required to maintain the Egyptian program. The other man months of home base support is to provide short-term home base backstop. They will help with the preparation of training materials and assist the field party in conducting special training programs for Egyptian counterparts in Egypt, the U.S. and in third countries. They would also conduct special studies, analyze data, assist in writing and publishing reports, etc., so that the field party in Egypt can maximize their efforts in the on-going field aspects of the program.

Time will be provided during the later years for field party members when they return to home base for completion of reports under preparation, including training materials. Returning field party members will also assume the role of technical backstops as much as possible. A portion of the technical backstop time will also be used to assure proper orientation of the field party personnel who join the Project or replace initial members.

Job descriptions for the field party personnel are as follows:

Project Leader: Coordinate the components of the program to insure interdisciplinary interaction of the field party in problem identification, solution and program definition. Direct the members of the field party in their role with the team. Serve as principal contact and coordinator with the Government of Egypt and the AID Mission. Assist in the program of field research of the team.

Agricultural Engineer (Irrigation Engineer): Assist in the problem identification phase by planning on-farm studies, including the data collection, training of personnel, data analysis and report preparation. Based on the results of the on-farm studies, improvements in the delivery and application systems with assistance from agronomy and economics will be planned and tested. He will interact with other members of the team in their areas and assist in planning an irrigation advisory service to farmers.

Agronomist: Accept responsibility for the on-farm studies of cropping practices that enhance or restrict crop yields. Based on results of the surveys, develop cropping practices or services to the farmer that will solve major problems and increase yields. Plan on-farm and search institute experiments with assistance from engineering and economics that will solve major problems or enhance yields.

Sociologist: Conduct on-farm surveys with the assistance of agronomy, economics and engineering to identify major physical, economic, social and institutional constraints to improved crop production and on-farm water management.

Extension: Assist the other team members in developing a practical program of on-farm water management practices and delivering them to the farmers, including the training of an effective organization of water management advisors for on the farm.

Economics: Assist the other members of the team in developing and evaluating the components of an on-farm management program for implementation as a pilot program, and determine the costs and benefits of the pilot program.

Project area advisors (3): Broadly trained agricultural engineers or agronomists will serve as advisors in each project area to assist in the day-to-day implementation of the program. Their background should provide a broad range of experience in irrigated agriculture and research.

IV.C.2.2. Personnel requirements - GOE:

Cairo Main Office:

The Cairo main office will consist of the American and Egyptian interdisciplinary teams. Work will be planned and progress reviewed on a team basis. Training and general supervision of the Project will be carried out from the Cairo office with the field office personnel executing day-to-day work programs in each project area. The disciplines and organization of the Cairo Staff are shwon in Chart C.2.

Full responsibility for the day-to-day field program will be carried out in the Mansouria Project by the Cairo office staff. Field office staff will be given training during this period. At least three months of training will be provided the field office staff for a new area in an ongoing project area before initiation of activities in a new area. Close field supervision will be given project activities in a new area for a minimum of three months after initiation of the Project.

GOE personnel will serve with U.S. personnel in complementary roles as an interdisciplinary team with program definition developed initially for Mansour ia and then to the other project areas. Program planning, monitoring, evaluation and report preparation will be conducted at site and with assistance from the main office.

Project Site Office:

At each site, day-to-day and overall supervision by personnel holding M.S. degrees with the following specialities:

1 Irrigation Engineer for evaluations, land levelling, channel design and outlet modifications.

1 Irrigation Engineer for drainage and ground water evaluations.

1 Agronomist for seasonal outlet evaluations.

1 Agricultural Engineer for on-farm experiments.

1 Economist for cost and return data.

At each site data collection will be conducted or supervised by technicians working daily in the field. The activities are:

2 Five outlets/man on a particular lateral for water

1 Surveying and preparation of maps and construction.

1 Farm and field channel construction and evaluation.

1 Land levelling.

1 Data analysis.

1 Seasonal outlet studies for economic and agronomic measurements.

1 Soil fertility analysis of village area.

1 On-farm experiments.

Manpower requirements per year are given in Table C.2.2.

IV.C.2.3. Training

Training is an essential element of the Project. The Egyptian engineer, agronomist and economist are well trained at the technical or academic levels. However, they have been out of contact with Western Agriculture, lack knowledge of Western systems of on-farm water management and also lack modern managerial experience. Therefore, several types of training will be designed to complement strengths and to improve weaknesses. Training programs will include a) in-service training in Egypt, b) short courses in both U.S. and Egypt, and c) training tours to third countries.

TABLE C.2.2. - MANPOWER REQUIREMENTS - GOE

Cairo/Field Officers

Man Months

Profession	1st. Year	2nd. Year	3rd. Year	4th. Year	5th. Year
Project Director	12	12	12	12	12
Agronomist	48	60	60	60	60
Agric. Eng.	36	48	48	48	48
Irrig. Eng.	72	96	96	96	96
Economist	36	48	48	48	48
Soil Scient.	12	12	12	12	12
Chemist	12	12	12	12	12
Sociologist	12	12	-	-	-
Extention	-	-	12	12	12
TOTAL	240	300	300	300	300
Admin. Asst.	12	24	24	24	24
Techn.	144	420	420	420	420
Drivers	120	216	216	216	216
Translator	24	24	24	24	24
Typist	24	72	72	72	72
TOTAL	324	756	756	756	756

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The in-service training will be given continuously while working on the project. Short courses of one to four months usually will be taught by home base or TDY staff will guidance from the Project staff for course content. These courses will be designed as a concentrated study in technical specialities such as water measurement, modern irrigation practices, crop water requirements, land levelling, project design, farm machinery, pumps, on-farm water management, cross-institutional programming and management, etc. The training tours to third countries will be scheduled after the water-management project is in progress to acquaint the participants with successful projects in third countries.

Advanced degree training will not be part of this program but worthy candidates will be identified and will be encouraged to obtain advanced degrees with the help of other sponsors.

Funds are provided in the budget for expenses to cover approximately 120 months of training.

IV.C.2.4. Consultants

To obtain the services of experts not available from either the contractor or the Ministry of Agriculture/Irrigation, personnel funds are provided in both GOE and US Budgets in Section III.

These are to provide in-country or expatriate experts who have special knowledge or skills on particular problems or programs such as: rural problems in Egypt, sprinkler and drip irrigation, to present special lectures or course materials in an in-country short course, automative water control devices, Egyptian rural sociology, economic analysis, public health, the role of Egyptian farm women, etc. The funds will provide the Project Leader extra flexibility in the design and conduct of the research, and in-training programs.

IV.C.3. Supervision and monitoring

The GOE Project Director will have overall supervision of the project. The US Technical Project Director will advise the GOE Project Director and all staff on technical matters, will supervise all US personnel, and control the expenditure of all US contract funds.

The Project Leader and Technical Project Leader will prepare periodic program reports to be sent to the Minister MOA/I, or his designated representative, to the Director of ARC and IRC, the Director of LWRI and WDRI and to AID/Cairo Mission Director. Other reports and their timing are described in other sections.

Auditable reports on all expenditures will be prepared and distributed as generally required by standard procedures of the GOE and USG.

IV.C.4. Procurement of Equipment and Supplies

The procurement of all equipment and supplies will follow standard procedures of the respective Governments.

Equipment purchased from the U.S. will be ordered through the American Embassy on a duty-free basis.

IV.C.5. Disbursement Procedures

The Project Director will be provided with a cash account by which it will be possible to draw funds for day-to-day expenses, such as per diem, gasoline, and servicing of equipment, without having to obtain repeated higher government approval. Such funds will be allocated annually, or by other regular accounting period. Disbursement of these and other project funds will be subject to the standard auditing procedures of both Governments.

IV.D. Evaluation of Project

The final output of this project is an on-farm water management program, tested and verified as pilot programs, for elimination of the major constraints to increased food production in Egypt. Trained Egyptians operating the program will also be an output. To ensure expeditious progress toward this goal, annual reviews of project progress will be made from reports prepared and submitted by the contractor, as well as an annual review by AID and GOE either at homebase or in Egypt. In addition the Project Technical Director shall submit periodic memoranda of progress and major problems to appropriate U.S. authorities for information and resolution of any major problems. An additional in-depth review shall be made at approximately the midpoint of the Project, or prior to the time of initiations of the first Pilot Program. This review is for the purpose of evaluating the on-farm water management program for completeness and to make recommendations for future emphasis in the program. Accomplishment of the objectives will be judged on the basis of data supplied from test farms, farmer interviews and GOE agency personnel.

IV.E. Conditions and Covenants

See Grant Authorization.