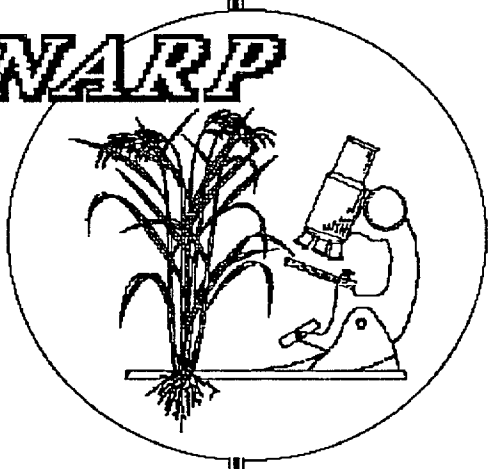
PN-ACF-357

1990 UPDATE

AGRICULTURAL

NARP



BRIEFING

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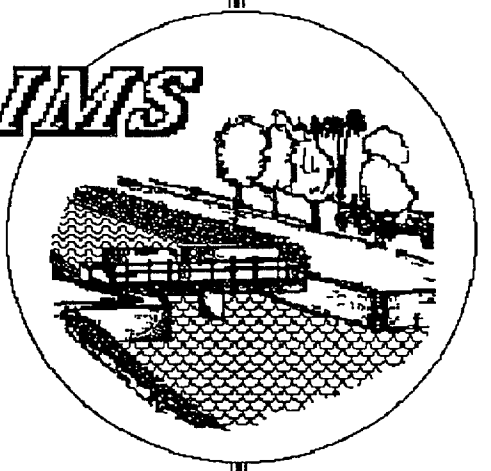

PAPER

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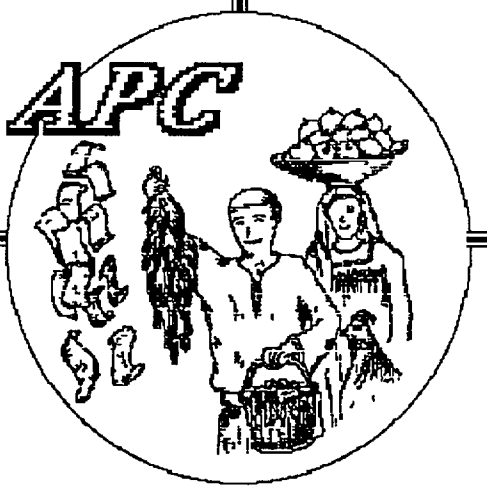

USAID

Cairo - Egypt

Revised February 1990

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AGRICULTURAL BRIEFING PAPER

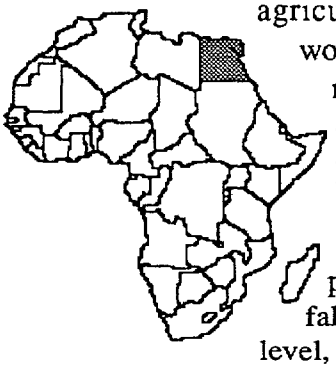
This paper is an overview of the agricultural sector in Egypt It defines the major constraints to agricultural production and outlines USAID's activities which are designed to assist the Government of Egypt (GOE) in improving its overall agricultural output The primary objective is to ultimately reduce the existing gap between supply and demand in the agriculture sector through policy, institutional, and technological changes

Attached are Annexes A through D Annexes A through C define in more detail the elements of each of the three ongoing USAID projects Annex D outlines the availability and limitations of water resources to Egypt

The Agricultural Resources Directorate, USAID/Cairo, may be contacted for more details on the various programs and projects described herein

SETTING

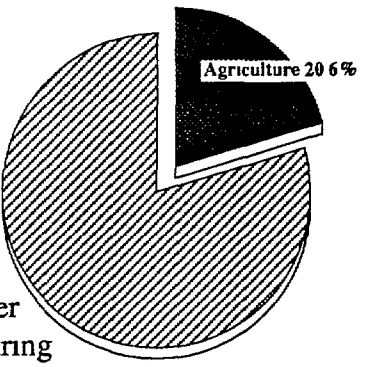
Having a year-round favorable climate with three cropping seasons, fertile soils, and a dependable—although finite—high-quality supply of fresh water for irrigation, Egypt has one of the richest endowments of agricultural resources in the world These fertile areas, most of which produce two crops a year, can be compared to one large controlled environment or greenhouse where temperatures seldom, if ever, fall to the freezing or frost level, there is almost continuous sunlight, photoperiods are sufficiently variable so that virtually all high value and staple crop varieties can be grown, and where practically 100 percent of the crop land is irrigated During the summer the main crops are cotton, rice, maize, tomatoes, and sorghum During the winter wheat, clover, beans, barley and vegetables are grown Sugarcane, oranges, and grapes are the major perennial crops



The Nile Delta (north of Cairo) and Nile River Valley (south of Cairo) are among the world's oldest agricultural areas having been under continuous cultivation for at least 5,000 years Except for a few oases and some arable land in the Sinai, most of Egypt's seven million cultivated feddans are confined to this river area Historically, agriculture, providing the bulk of employment and output crucial to foreign exchange earnings, has been the dominant sector in the Egyptian economy Two millennia ago, Egypt was the Mediterranean breadbasket, producing much of the wheat needed to feed the cities of the Roman Empire

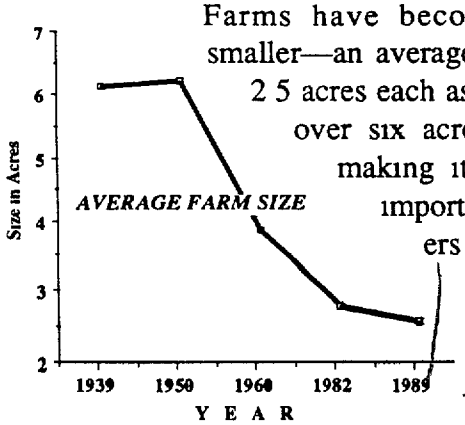
In the late 1950s and early 1960s, growth of the Egyptian economy was based more upon expansion of the industrial sector Agriculture's share of the GDP fell from 34 percent in 1955 to 21 percent in 1987/88, while its share of employment fell from 56 percent to 30 percent over the same period Nevertheless agriculture remains the most important sector of the economy

GROSS DOMESTIC PRODUCT

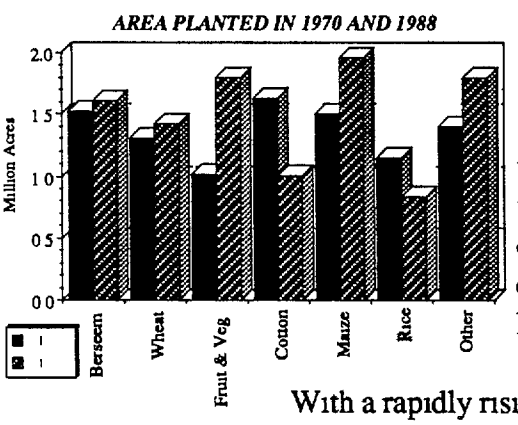


Egypt's agricultural production grew at over three percent annually during the 1960s and early 1970s as a result of improved yields and controlled water supplies made possible by the newly built Aswan High Dam From the mid-1970s to mid-1980s, however, the pace of growth in production declined to less than two percent Several factors contributed to this slowdown first, a system of controls over production and marketing of cotton, rice, and other major crops had an adverse impact on incentives for farm production, second, agricultural labor costs rose as alternative employment opportunities in urban areas and abroad rose dramatically, third,

prime agricultural land was lost to urbanization at the average rate of 50,000 acres per year; and fourth, year-round irrigation led to a rising water table, drainage problems, and declining yields



Farms have become steadily smaller—an average of less than 2 5 acres each as compared to over six acres in 1939—making it increasingly important for farmers to shift to production of high-value crops or to seek off-farm employment Fortunately, farmers have been able to shift to vegetables, fruits, or even flowers to increase income from their small plots in order to meet emerging export markets and demands from a more prosperous population of urban consumers Unfortunately though, farmers have also had strong personal financial incentive to expand the acreage devoted to fodder crops (berseem clover, corn, and beans/wheat grown as feed) See the section on Policies, below



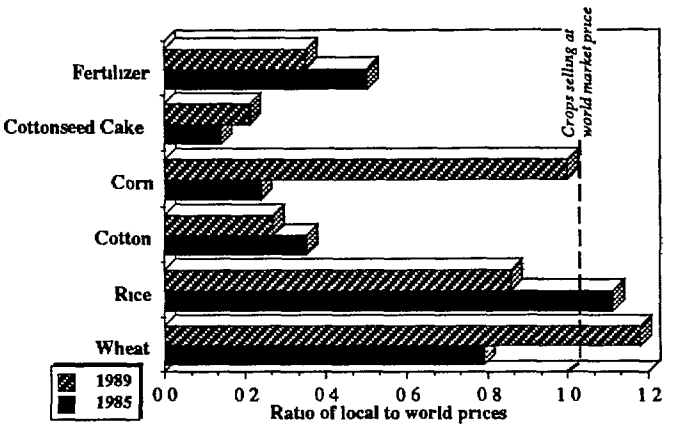
With a rapidly rising population (over 2 8 percent per year, more than doubling from 26 million in 1960 to 54 million in 1989), a dramatic increase in per capita consumption, a very limited agricultural land area, and the shift toward animal feed and horticultural crops, Egypt has had to import a greater share of its basic grain needs Agricultural imports have now reached approximately $4 billion per year, $800 million of which is from the United States Egypt is currently importing over two-thirds of its wheat and vegetable oil and about one-third of its corn Such an evolution of trade is merited but requires that Egypt earn foreign exchange to finance these imports, either from export of higher value agricultural crops or from the export of industrial goods

Egypt's agriculture sector is unique in that over 95 percent of its production is derived from irrigated agricultural land and its irrigation waters originate outside its borders The prolonged 1976-87 drought in Africa caused low water levels in the High Aswan Dam, the resultant lack of water in 1988 effected cutbacks of areas allocated for rice farming Major problems were averted by heavy rains in the Nile watershed during June-August 1988, but the experience of the drought has left the GOE more aware of the necessity to conserve water Additional details on the water resource trends and the current situation may be found in Annex D

CONSTRAINTS

There are four broad categories of constraints impeding agricultural development in Egypt These include inappropriate policies, overlapping institutional and organizational responsibilities, resource limitations (water and non-water), and lack of modern technology

Policies A conglomeration of policies and controls over the agricultural sector has sent economically inefficient production signals to farmers These controls have misdirected and seriously constrained the growth of Egyptian agriculture The result is too much land being put into low value crops and not enough land being used for the production of crops which would produce higher returns for the nation This land allocation makes financial sense to the farmer, but does not contribute to Egypt's economic growth For cotton, where production and marketing is controlled by the state, farmers receive less than a third of the export-value of their crop For poultry and red meat, restrictions over imports and private marketing inflate prices for similar, locally produced items Therefore, scarce and costly land is being allocated to the



production of long season berseem (clover) to provide fodder for the protected meat industry and highly subsidized fertilizer is being applied in excessive quantities

Institutional Reflective of the prevalence of state intervention that once characterized Egyptian agriculture is the number of ministries with key overlapping responsibilities Over-regulation, institutional territorial disputes, and conflicting policies have resulted in abnormally slow development In addition, planning and managerial limitations of these ministries do not permit the development of needed information and incentive structures Full consideration is not given to the farmers' needs during the planning and designing of the agricultural program and irrigation system Moreover, many regulations restrict private sector competition and lower overall efficiency

Resources Fertile arable land and irrigation water are key constraints to increased agricultural production in Egypt The fertile land base (old lands) is being reduced and degraded by water logging, salinity, and urbanization Droughts, such as that experienced over the past decade, have emphasized the limited water supplies available to Egypt. Conveyance water losses in on-farm channels are often high because of improper design and inadequate maintenance Poor land-leveling causes uneven water distribution and water applications that greatly exceed crop needs, especially on desert soils These inadequacies result in reduced yields and impede efforts to intensify cropping via more timely seedbed preparation, transplanting, etc Ineffective on-farm drainage often occurs from the lack of drains or from inferior maintenance of field drains and/or main drains

Labor shortages at the farm level occur seasonally but are in some measure artificially induced by the ineffectual prices paid for certain crops—especially cotton which, in Egypt, is highly labor-intensive

Technology Highly productive agriculture depends on reliable flow of advanced technology Because of the relatively high levels of productivity already achieved in Egypt, the technological constraints on Egyptian agriculture are greater and more sophisticated than those operating on other countries in the region While much improved technology is already available, it is also likely that other technologies developed elsewhere and not yet evaluated in Egypt could be adapted to Egyptian conditions

Limited attention to the marketing system as the production shifted to more perishable crops such as vegetables, fruits, and livestock products has resulted in a marketing infrastructure that has not had a commensurate investment and development As a result, the quality and quantity of produce available for consumption and export are seriously constrained

USAID AGRICULTURAL PROGRAM

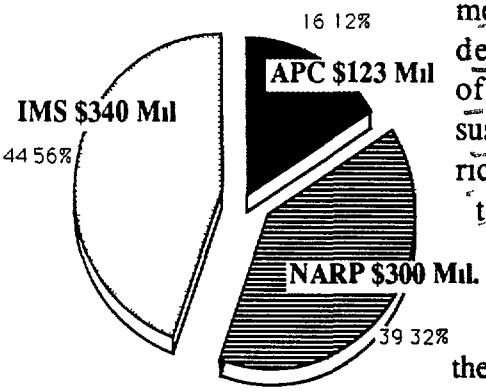
USAID has made a long-term commitment to assist the GOE in developing and improving its agricultural sector Since its return to Egypt in the mid-1970s, USAID's authorized funding for the agriculture sector has been more than $990 million Agricultural and credit programs are with the Ministry of Agriculture and Land Reclamation (MALR) and irrigation with the Ministry of Public Works and Water Resources (PWWR)

The first agricultural USAID portfolio, developed in the late 1970s, contained 14 projects with a total USAID contribution of $230 million

These projects were primarily targeted at the promotion of productivity gains, and included emphasis in such areas as poultry, cereal grains, farm and agricultural machinery, horticulture, aquaculture, water management, small farmer credit programs, and data collection and analysis programs Several hundred Egyptians received graduate degrees under these projects and literally thousands received non-academic and in-country training Seven major research and experimental centers were built and a host of Egyptian government facilities were renovated More than $20 million of agricultural equipment was procured and more than a dozen laboratories were equipped The research carried out under these "first generation projects," which were phased out by 1987, have benefitted roughly 1 4 million farmers who are now producing high-yielding crops

Based on the relationships developed and the lessons learned from the first generation projects, the current portfolio of three major projects has been developed with a total USAID contribution of $763 million The major objective underlying these three projects is the improvement of the policy environment and the development of the basic sustainable agricultural system which would enable farmers to generate the highest possible return from their small farms Three offices within the Agricultural Resources Directorate monitor these projects In addition, there are 20 contracts (several over $20 million) in place with 70 resident staff providing the GOE technical assistance and commodity procurement assistance in implementing the projects The three projects (National Agricultural Research, Agricultural Production and Credit, and Irrigation Management Systems) are summarized on the following pages

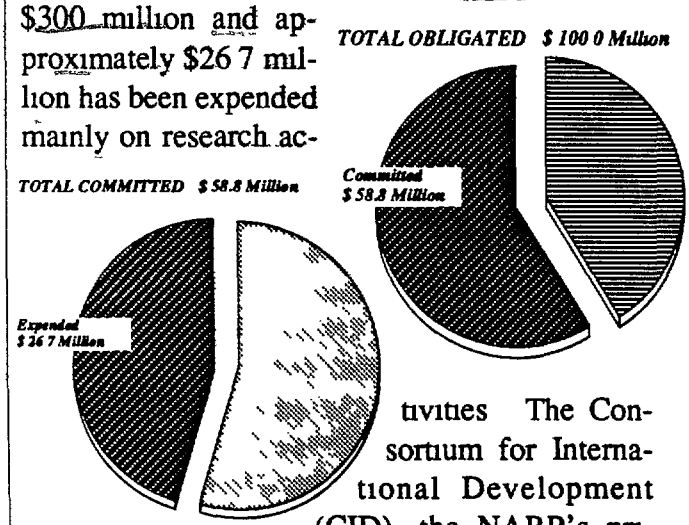
AGRICULTURE PORTFOLIO



National Agricultural Research Project

The Office of Agriculture within the USAID Agricultural Resources Directorate is monitoring the $300 million National Agricultural Research Project (NARP) The design of this project emphasizes increasing crop and livestock yields by the creation and transfer of appropriate technologies, and by facilitating a policy environment which encourages their generation/use and removes constraints to agricultural production and marketing

The project's strategy calls for enhancing the effectiveness and extent of a broad range of public and private institutions involved in Egypt's agricultural development The NARP has been supporting agricultural research since 1985 and was amended in 1988 to expand its scope to include five areas of concern The project's five components focus on (1) agricultural research, (2) agricultural policy analysis, (3) seed technology, (4) technology transfer, and (5) project management/ new initiatives Annex A provides a more comprehensive description of the NARP program To date, $100 million has been obligated out of the $300 million and approximately $26 7 million has been expended mainly on research activities The Consortium for International Development (CID), the NARP's primary technical assistance contractor will have a 12 person resident team (eight in place as of January



1990) providing guidance and advice for improving management systems and research practices

In addition, there are contracts with San Diego State University Foundation (training placement), International Rice Research Institute (rice research), CIMMYT/ICARDA (maize and wheat research), Social Science Consultants (technical assistance), USDA (technical assistance and training), and Oceanic Institute (mullet fish research/production) to provide the necessary support to implement the project Additional contracts are planned to provide technical assistance to policy and management/new initiatives, construction planning, design, and supervision services, and commodity procurement services The NARP is scheduled to be completed in 1994 Accomplishments currently include

IFRRI ?

ACCOMPLISHMENTS

- The first phase of $9 million of research grants to Egyptian universities has been started with 101 proposals approved
- 325 research proposals from the ARC institutes have been approved and funded at LE 4,777,000
- One improved threshing machine—which will thresh both wheat and rice—has been developed and released to the private sector for production, and three other machines are being tested
- Over 1,900 researchers and extension agents have been trained in Egypt in on-farm research methodology
- Architectural design work for $8 million in renovations to research and library facilities has commenced, eleven contracts have been let, and work is underway
- A new rice variety which is "blast" disease resistant, high yielding, and has desirable cooking and eating qualities has been released
- 133 participants have received short-term training and/or started their academic degree training
- A study of the seed sector is underway to identify the constraints preventing private sector participation in the seed industry The study will recommend remedies to the constraints and will develop an implementation plan
- Commodity contracts are nearly complete to procure $7 million in laboratory equipment, farm machinery, and library materials
- A mullet fish breeding and production effort is underway
- 25,000 person days of in-country training have been completed

Agricultural Production & Credit Project

The Office of Agriculture and Economics is monitoring the $123 million Agricultural Production and Credit (APC) Project This is a unique complementary approach to the NARP activities concentrating on support for agricultural policy reforms and strengthening farmer credit systems The project's two elements grew out of the lessons learned under the USAID-supported Small Farmer Production Project (SFPP) The first element is a capital transfer component in which cash transfers are made to provide capital for the Principal Bank for Development and Agricultural Credit (PBDAC) These credit transfers are phased and releases are tied to successful implementation of previously negotiated relaxations of state intervention in the agriculture sector Through 1989, three releases totaling $100 million have been made following GOE implementation of agreed policy changes As a result of these negotiations, Egyptian farmers now receive world market level prices for several key crops, most crop delivery quotas have been relaxed or eliminated, and wasteful subsidies for imported animal feed have been phased out This activity is considered very successful by both the GOE and USAID and is expected to be extended to other policy areas in the agriculture sector

The second element of the project, which has expended $8 5 million out of a planned amount of $23 million, is an institutional strengthening component designed to assist the PBDAC in enhancing its ability to provide credit for Egypt's farmers and agro-businesses An initial five year contract has been signed with Chemonics International to provide a team of eleven banking experts to work with PBDAC in restructuring its lending and management processes This technical assistance, along with procedural improvements, will enhance the financial viability and effectiveness of PBDAC in supplying the credit needs of the rural sector

The APC Project was approved on November 20, 1986, and is scheduled to be completed on September 30, 1993 Due to the excellent progress to date ($123 million obligated, $109 million expended), an amendment is in process to expand and extend the APC Project to 1995 Annex B provides a full description of the APC Project

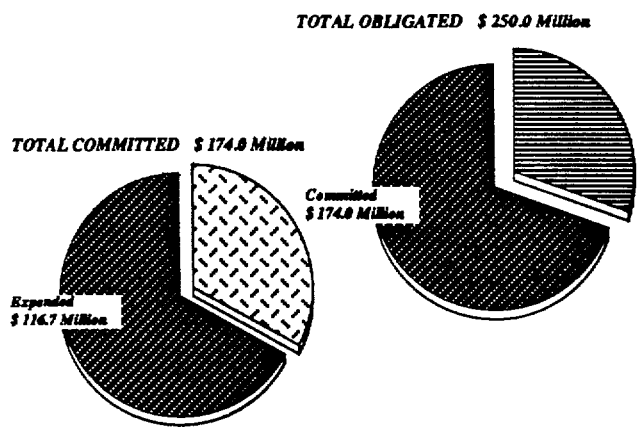
Accomplishments to date under the APC Project and its predecessor include

ACCOMPLISHMENTS

- $18 4 million contract with Chemonics International signed and the resident team in place
- Major policy changes have been made by the GOE, freeing up many constraints to increased production (see Annex B for details)
- Small farmer loan concepts and procedures developed under SFPP have been extended to a total of 12 governorates and 334 of the 350 targeted villages under the project Over 1,060,000 small farmers have received unsubsidized loans of LE 10,000 or less
- Over 9,000 individuals were trained in various courses (loan management, accounting, computer operations, etc)
- A draft APC Project Credit Manual and a proposed General Ledger System and Computerized Accounting System have been prepared and are being institutionalized

Irrigation Management Systems Project

The Office of Irrigation and Land Development is monitoring the Irrigation Management Systems (IMS) Project The IMS is a complex umbrella project authorized for $340 million and is scheduled for completion in September 1995 Objectives are to increase agriculture production and to utilize water resources more efficiently The project, comprised of ten components administered by eight Public Works and Water Resources (PWWR) project directors, has activities in all 19 irrigation directorates and focuses on the six million feddans of irrigated old lands in Egypt. The various components are designed to improve the institutional capabilities of PWWR, address social issues associated with irrigated agriculture, and upgrade the irrigation infrastructure Major consultancy contracts have been concluded with Harza Engineering Company (two contracts), Consortium for International Development, Sheladia Associates, Morrison-Knudsen (two contracts), Geonix Corporation, and the U S Bureau of Reclamation, all of which support the implementation of the IMS Project (refer to Annex C for more details regarding the IMS Project and its components) Out of the $250 million obligated thus far, $174 million has been committed and $117 expended.



To date, the project has accomplished the following

ACCOMPLISHMENTS

- Consultancy and procurement contracts in the amount of $165 million have been put in place and are operational The consultants currently have over 50 resident staff in place
- Under the Structural Replacement component, 11,000 irrigation concrete structures have been replaced, providing benefits to 1 4 million farmers During the past three years, structures have been replaced at the rate of five to six per day or over 2,000 a year
- More than 5,000 PWWR employees have been trained in 25 major disciplines
- Eleven initial studies for rehabilitating approximately 400,000 acres of irrigation systems have been conducted under the Regional Irrigation Improvement component.
- A model Irrigation Advisory Service has been created in Minya where 100 percent of the farmers in the area have been contacted by the outreach team and have been consulted on irrigation delivery problems The Irrigation Advisory Service is currently being replicated in the five other RIIP directorates
- The Project Preparation Department has developed and analyzed a number of studies for potential funding by other donors

OTHER A.I.D. AGRICULTURAL PROJECTS

In addition to the three major projects described above, USAID has several activities outside the Agricultural Resources Directorate that have a positive effect on the Egyptian agricultural sector

Commodity Import Program:

The USAID Commodity Import Program is investing $200 million in Egypt's public and private sector annually Recipients of the private sector apply for loans for issuance of letters of credit which are used toward the purchase of U S commodities

Since 1975, $284 million has been invested in public sector agriculture for such items as well digging machinery, pumps, canal lining machines, feed grains, and irrigation equipment Private sector agriculture has also received $43 million worth of commodities since the program began and its share is rising rapidly

Farmer-to-Farmer Program:

This A I D /Washington activity has brought American volunteer farmers to Egypt to work directly with and share their expertise with more than 1,500 Egyptian farmers in areas of dairy herd health management, dairy and livestock production, fruits, vegetables, honey production and plant pathology USAID/Egypt is currently funding a six-month extension of this program and has approved, in principle, funding an expanded three-year effort. The goal of this program is to increase food production and farmer income and to improve the overall efficiency of Egyptian farmers through the introduction of new technologies and better farm management practices via assistance at the grassroots level The technical approach to the second phase will be to accomplish three tasks

- Optimize the use and impact of the U S volunteers' time in Egypt by focusing farm visits on 600 medium-to-large core group farms and reaching

1.

the Egyptian small farmer through village meetings, farm demonstrations, and evening video presentations organized by Farmer-to-Farmer local project staff and American Research Center extension agents,

•More clearly quantify the socio-economic impact of the program by tracking progress on individual farms via the Farmer-to-Farmer management information system,

•Institutionalize the program by mobilizing Egyptian farmers, research personnel, and extension agents as active participants in the Farmer-to-Farmer technology transfer program

The total cost of this proposed three-year effort is $6 million and LE 4 7 million

Tri-National Program:

A tri-national U S , Israeli, Egyptian program funded by A I D /W provides a variety of technical and research projects in both Egypt and Israel The program began in 1979 and currently supports arid lands research, aquaculture development, establishment of horticultural and vegetable nurseries, technology exchange and cooperation, epidemiology and control of vector-borne diseases, and scholarships A total of $39 8 million has thus far been allocated to the program Technical assistance and coordination is being provided by the U S Department of Agriculture, San Diego State University Foundation, New Jersey Marine Sciences Consortium, National Academy of Sciences-Institute of Medicine, and U S Department of Health and Human Services-National Institute of Health

OTHER DONORS

There are numerous donors providing assistance to Egypt in the agriculture sector With the exception of the World Bank, all have relatively small programs in relation to USAID, but these donor activities are important to the overall development of the agriculture sector, and the individual donor projects are coordinated with the larger USAID activities As part of our overall effort to assure coordinations USAID has proposed the development of two pilot areas (one in middle Egypt and one in the Delta) where the efforts of several projects and donors can be demonstrated PWWR and MOA are in the process of approving the proposed pilot areas

The **World Bank** is heavily involved in Egypt's agricultural sector Its activities include a $246 million large field drainage project covering most of the irrigated area (4 4 million acres) of the country and a small integrated agricultural development project in the Minya governorate Currently the World Bank is designing a reclamation project covering over 150,000 acres and has completed negotiations for a $40 million fertilizer storage project

The **United Nations Development Program** (UNDP) and the World Bank have assisted the PWWR in developing a Water Master Plan Project UNDP also supported strengthening the cotton arbitration and testing capability of the government as well as agricultural development and settlements in West Nubarya, assisted with coastal protection activities, provided technical assistance to plan the rehabilitation and improvement of water delivery systems in old lands, carried out remote sensing, supplied technical assistance for maintenance and management of irrigation pumping stations, and supported the Water Research Center

In addition, other donors are providing over $250 million in the water management and agricultural projects The **Food and Agriculture Organization** (FAO) has the Fayoum project including farm mechanization and animal diseases research, **Canada** is supporting the Integrated Soil and Water Improvement Project in Daqahliya aimed at remedying salinity and water logging problems, **The Netherlands** has three projects in the Fayoum (70,000 acre horticultural development project, water management and drainage project, and an aquatic weed control project), the **African Development Bank** is helping with con-

struction of the Esna barrage, the **Ford Foundation** is assisting with a ground water utilization project, and the **European Investment Bank** is helping the government to develop sprinkler and drip irrigation of 30,000 hectares in the Nubarya area

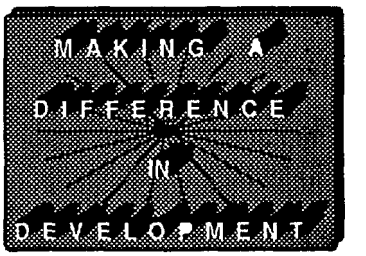
The **Japanese** are funding two irrigation and land reclamation projects The Katara project is reclaiming 15,000 feddans by using sprinkler and drip irrigation methods In the Adleya land reclamation project, 6,000 feddans of desert will be reclaimed In addition, other areas such as agricultural machinery and sugarcane production are being financed by the Japanese

Holland has supported an integrated rural development project (credit, extension, on-farm water management, horticulture and mechanization) in Fayoum governorate, the **Finnish Government** is funding a milk collection and cooling project with the Misr Food and Milk Company and a tree seedling and an applied agricultural research project, and **West Germany** (GTZ) has supplied long-term support to Egypt's agricultural sector in the areas of rodent control, agricultural research, mechanization and social development in rural areas

The **United Kingdom** is providing training, irrigation development, disease control, and technical assistance The **European Economic Community** (EEC) provides both loans and grants for agricultural credit, agricultural warehouses, fodder based by-products, and water resources development in the Sinai

FUTURE USAID ACTIVITIES

In addition to implementing the current portfolio activities, USAID is finalizing a major amendment to the APC project which will encourage the GOE to make further policy changes in the agriculture sector and to privatize the input responsibilities of PBDAC This addition should result in liberating the rest of the agricultural sector



over the next few years and allowing the private sector to expand rapidly

USAID is also considering ways to assist the GOE in its development of the new lands There are approximately 1 3 million feddans of new lands that have been developed using Nile River waters Some additional new lands will be developed over the next 20 years utilizing water made available from improved overall irrigation and water use efficiencies Past studies have indicated that most new lands development projects have been marginal, however, a recent assessment by the World Bank suggests that land reclamation can be feasible USAID is planning a study to determine how to improve the new lands already developed, define the policies that are impeding development, and help define a possible strategy for future involvement in new lands This study will also identify specific areas for possible A I D involvement USAID could play an important role in development of groundwater resources in the New Valley and Sinai

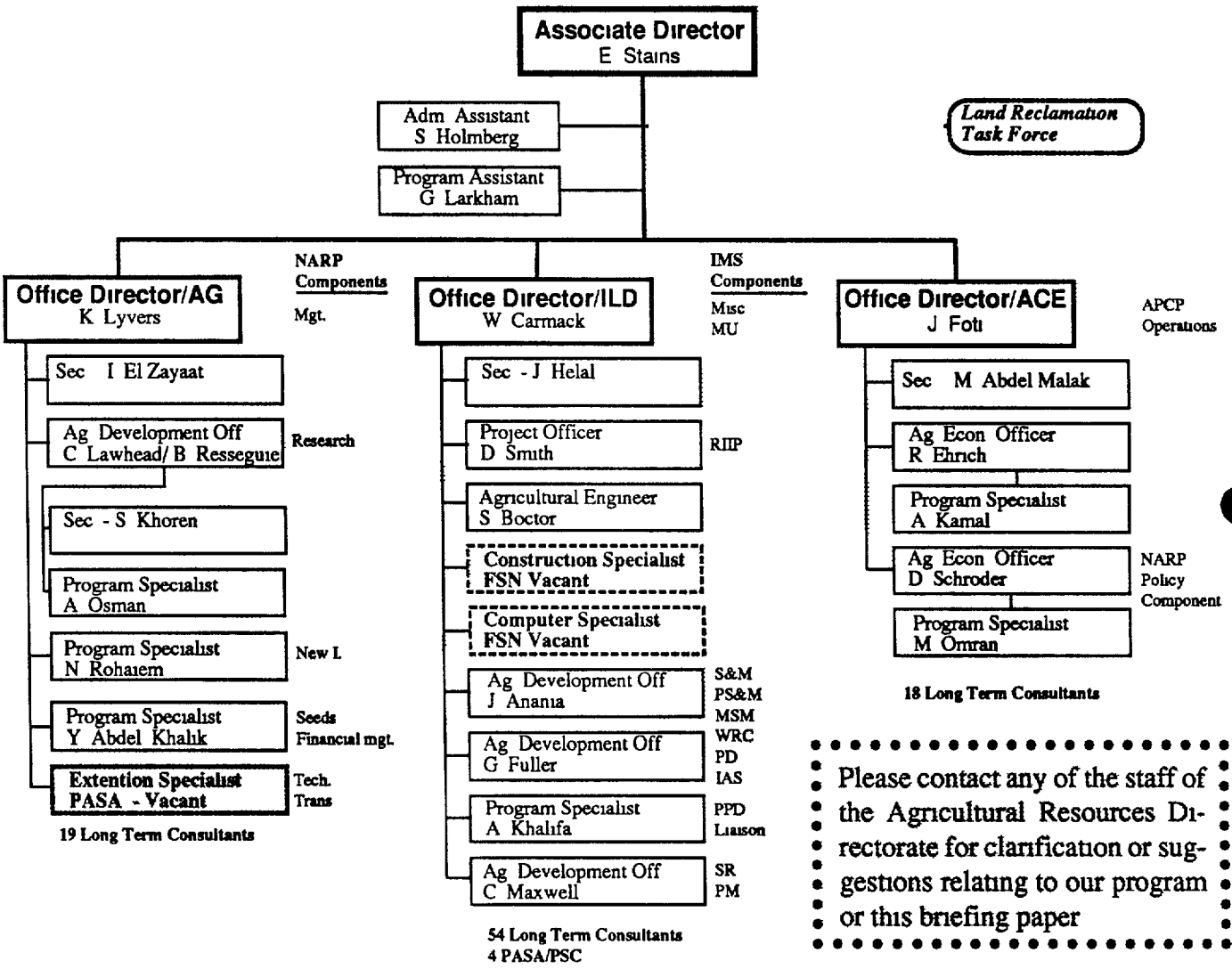
USAID has been approached unofficially concerning additional activities in coordination with the World Bank. Current discussions include funding of technical assistance and training for a second project to renovate part of the approximately 1,000 pump plants that form an integral part of the delivery and drainage systems

Several activities of the current IMS project could be expanded into a sector support activity or result in follow-on projects In a recent analysis of the Structural Replacement project, a need has been identified to include replacement of intermediate size structures in addition to the small structures replaced by the current program The Monitoring Forecast and Simulation activity which is being implemented through a FAO grant

will fund Phase I of a II phase activity The second phase could be the subject of additional A I D funding Communication linkages could be established with other Nile basin countries to share metrological data The Main Systems Management component will establish 300 of 500 data collection stations that are needed to monitor and manage water movement in Egypt The additional stations could be part of a follow-on project The Preventive Maintenance component will establish a maintenance program in six governorates Funding will be needed to extend this activity to the remainder of the country The Regional Irrigation Improvement component will result in the renovation of about 360,000 acres Once methodologies are proven and needed policies are in place, similar improvements could be expanded to the remainder of the country

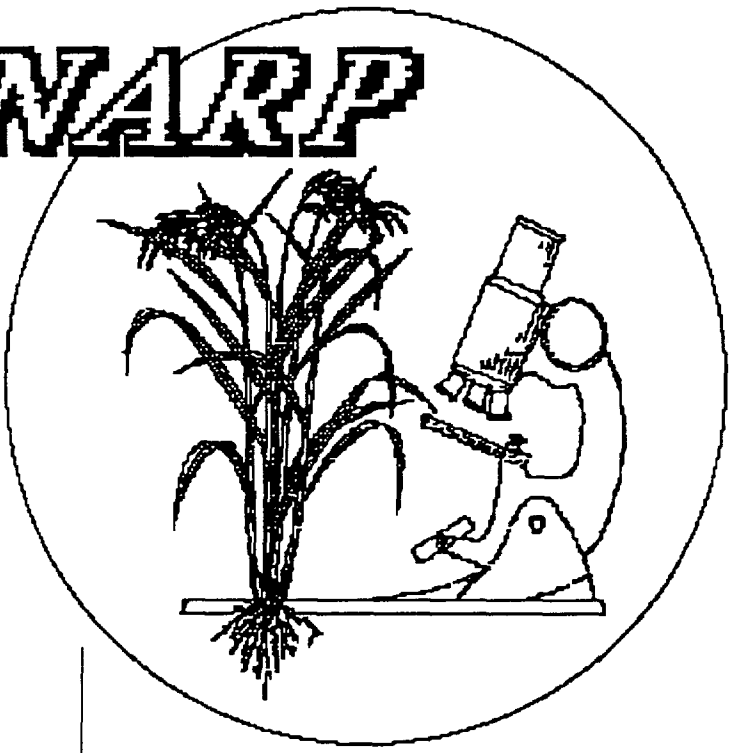
Other projects or programs that may be undertaken by USAID are assist the MOA in increasing private sector participation in marketing both agricultural inputs and outputs with special emphasis on farmer owned and managed co-ops, increase involvement in the animal and dairy science areas, investigate means to develop multi-channel agricultural input distribution, and assist in developing computer linkages between the MOA and PWWR

AGRICULTURAL RESOURCES DIRECTORATE



Please contact any of the staff of the Agricultural Resources Directorate for clarification or suggestions relating to our program or this briefing paper

NATIONAL AGRICULTURAL RESEARCH PROJECT



Project Number: 263-0152
Start Date: Sept. 12, 1985
Completion Date: Sept. 30, 1994
Authorized Amount: $300 million
Obligated 31 Dec. 89: $100 million
Expended 31 Dec 89: $27 million
Implementing Agency: Ministry of Agriculture and Land Reclamation (MOA)

Project Summary

Nearly all of the time and energy of the staff of the Agriculture Office is applied to developing, implementing, monitoring, and evaluating the National Agricultural Research Project (NARP) USAID is contributing $300 million and the GOE is contributing LE 219 million to the project. The project's goal is to increase agricultural productivity with the purpose of improving Egypt's capability to provide farmers with productivity-increasing technologies in a supportive policy environment The design of this project emphasizes increasing crop and livestock yields by the creation and transfer of appropriate technologies, and by facilitating a policy environment which encourages their generation/use and removes constraints to agricultural production and marketing

The NARP was originated in 1985 with the major focus being improved research with an initial funding level of $130 million over a seven-year period In 1988 the project was evaluated, revised, and expanded into the current nine-year program ending in 1994

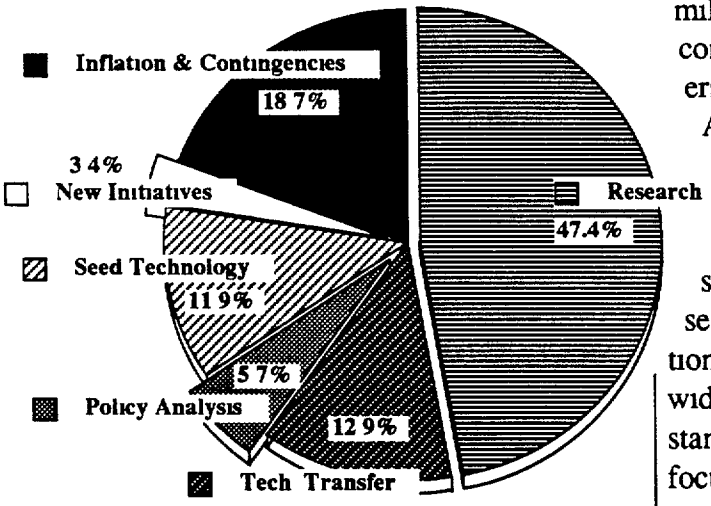
The expanded project's strategy calls for enhancing the effectiveness and extent of a broad range of public and private institutions involved in Egypt's agricultural development The project's five components focus on (1) agricultural research, (2) agricultural policy analysis, (3) seed technology, (4) technology transfer; and (5) management/new initiatives The following summarizes these components

Components Description

Agricultural Research

The $143 million (plus contingency and inflation) USAID contribution to this component is intended to significantly improve and expand agricultural research in Egypt It focuses primarily on strengthening the Agricultural Research Center (ARC), Egypt's most important agricultural research institution The two major thrusts are the institutional strengthening of ARC's research

NARP RESOURCE ALLOCATION BY COMPONENT



management capability and the expansion of an agricultural research orientation to increase the production of relevant, practical technologies

The institutional improvement of ARC involves a comprehensive program of human resources development, management improvements, and upgrading of physical facilities A technical assistance contractor, Consortium for International Development (CID), with a 12 person interdisciplinary team (eight in place as of January 1990), is providing guidance and assistance to ARC for improving management systems and research practices A separate contract is in place with IRRI which is providing technical assistance for rice research and recently with CIMMYT/ ICARDA for maize and wheat research

An extensive training program in support of both management improvements and research methodologies has been designed in response to a training needs assessment It provides for 276 graduate and post-doctoral participants, observational and invitational travel, and in-country training for over 40,000 participants in 164 different types of programs Facility improvements include a renovation program for existing buildings, a maintenance program, and land improvements Commodities include lab equipment, farm machinery, library books and periodicals, office equipment and vehicles

The research component also provides financial support for agricultural research activities A research support program allocates $12 6 million to fund in-house ARC research to allow a continuous flow of improved technology to farmers and to develop farmer feedback mechanisms A research grant program will earmark $15 8 million to support university research and strengthen linkages with the university community An international collaborative research program will fund $16 million for research in Egypt in collaboration with international experts This will facilitate access to worldwide technology and its adaptation to local circumstances All three research support programs will focus on national development priorities and assure relevant, problem-oriented research

Agricultural Policy Analysis

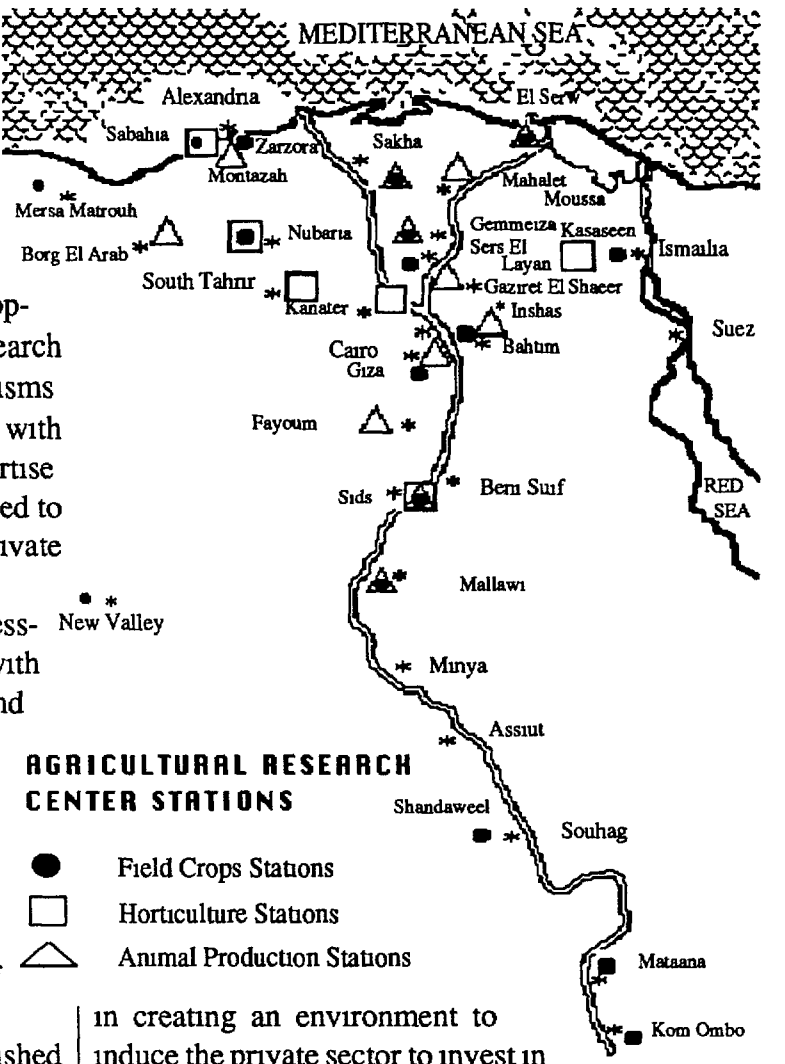
The $17 6 million (plus contingency and inflation) USAID contribution to this component is designed to strengthen the policy analysis capability of the MOA's Undersecretariat of Agricultural Economics and Statistics (U/AES) and the Agricultural Economic Research Institute (AERI) The two together will be known as the Ministry's Agricultural Statistics and Economics Group (ASEG) This merger is intended to result in an enhanced Ministerial ability to monitor the agriculture sector and analyze the impact of policy decisions, facilitating more effective policy reform, liberalization of agriculture, and increased productivity

This project component will assign $9 5 million for five long-term technical advisors and 240 person months of short-term experts USDA will be providing one of the long-term advisors, and technical proposals are currently being requested for the balance of long- and short-term expertise needed The Policy Analysis Component will also allocate $3 1 million for training, including U S long-term training for 16 high level technicians and managers, U S short-term training for 67 other staff, and in-country training for 573 persons Commodities include $2 7 million for office equipment and vehicles Support services will include $2 7 million for technical studies and minor renovation of office space

The technical assistance and training will be supplied to the ASEG to improve its ability to conduct and manage priority analyses, interpret and utilize results of these analyses, and address economic policy issues The technical assistance contractor will assist in improving management practices and research methodologies, developing a quick response capability for urgent research topics, and establishing feedback mechanisms The training program will provide the staff with advanced analytical and subject area expertise Policy workshops and seminars will be utilized to strengthen linkages with the public and private sectors, universities, and other groups

The statistical analysis and data processing capability of the ASEG will be upgraded with emphasis on improving the quality, scope, and accessibility of information Technical assistance will be provided to systematize reporting formats and develop a data base information system for policy and statistical analysis A total of 76 personal computers will be allotted for the ASEG and its 38 field offices Internal training programs will instruct staff in the use of PC and mainframe computers

An Information Center will be established to support the policy analysis operations of the ASEG Technical assistance will be provided for planning and developing this Center Long-term U S training for three staff and short-term U S technical training for six persons will be included Equipment for archive management, printing, microfiche, and office equipment also will be provided



Seed Technology

The $36 9 million (plus contingency and inflation) USAID contribution to this component emphasizes development and installation of up-to-date cost efficient research and processing facilities and equipment, combined with in-depth technology training for staff This component is the key to providing farmers with quality seeds which can have a quick, relatively low cost impact on increased productivity Major steps will be taken in creating an environment to induce the private sector to invest in the seed sector by increasing urgently needed support services This component provides $1 6 million for one seed technology advisor and seven person-months of short-term experts (being provided under the CID Contract mentioned under the Agriculture Research Component description) It includes $2 5 million for U S long-term training for 66 persons and short-term training for 17 persons Due to the lack of qualified candidates, however, less long-term and more "hands-on" short-term training is planned The component provides $30 6 million for instituting improved testing, standardization, quality control, and certification procedures of the seed sector, enhancing inventory control of germ plasm, breeder seed, and foundation seed, replacing antiquated equipment in eight existing plants and a cotton research and ginning facility, and upgrading the efficiency of the five seed cleaning and processing plants which

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A I D financed under earlier projects One million dollars is also provided for the purchase of vehicles, and $1 2 million is allocated for the operating expenses of seed activities

Technology Transfer

The $41 million (plus contingency and inflation) USAID contribution to the Technology Transfer component is designed to improve communication between research organizations and the farmer This includes the diffusion of new technologies to the field and feedback on the conditions and needs of farmers Linkages between farmer and scientist must be strengthened so research can be oriented toward solving practical problems by generating relevant technology Coordination of extension services must be achieved in order to package the technology properly and deliver it when and where appropriate

The component includes $4 8 million in technical assistance under the CID contract for two long-term technical advisors and 182 person months of short-term experts In addition, $23 8 million is provided for a major training effort and for commodities, including office equipment, vehicles, and media processing equipment The component also includes $12 4 million in support services for extension demonstrations, office renovations, and technology transfer grants

Support will be provided to strengthen the planning and management capabilities of the ARC Extension Affairs Division (EAD) which is responsible for monitoring and guiding the planning and operations of the 20 governorate extension services EAD senior staff will receive short-term training in planning and management The staff of EAD's applications-oriented centers and institutes will be upgraded with U S long-term training for a total of 14 technicians, trainers, and communications experts

Decentralization of technology transfer institutions will be encouraged by strengthening governorate level extension services and improving coordination between the national and governorate levels Technical assistance will be provided to assist local government councils in developing, reviewing, and approving yearly extension plans Technical assistance and U S short-term training will be provided for up to 10 senior extension officials in each governorate to improve their administrative skills Approximately 350 extension workers in each governorate will receive in-country training to enhance their communications skills for working with farmers Funding is provided for renovation, office equipment, and communications Transportation equipment will be furnished to improve service delivery The funding also supports the development of technology packages tailored for each governorate, and the costs of technology delivery, such as media, demonstration plots, and farmer training

Support for non-public extension service agencies will be provided in the form of a $3 5 million grant fund Organizations and activities which are problem oriented, cater to farmer needs, involve farmer participants, and increase agricultural productivity will be supported Examples include indigenous PVOs, private sector companies, farmer groups and cooperatives, and agricultural faculties at Egyptian universities

The component will also strengthen the research community's technology transfer capability at the governorate level It support training of subject matter specialists from a wide variety of public and private institutions and provides funds for the preparation of technology packages identified in governorate extension plans or requested by non-public extension groups The agricultural extension training currently being conducted by the Principal Bank for Development and Agricultural Credit (PBDAC) will be taken over by NARP in early 1990/91 Conversion of 10 ARC experimental stations into research and extension centers is also granted in order to improve outreach to farmers in their service area

Project Management/New Initiatives

The $9 3 million (plus contingency and inflation) component is divided into two major aspects with the overall Director General of the

project in charge of the Executive Office and a Component Director in charge of the New Initiatives Temporary technical assistance and other support is being supplied to the NARP's Executive Office which monitors the project This office will install a management monitoring and financial control systems and develop project support services such as implementation planning, monitoring, evaluation, procurement, rehabilitation/construction, maintenance, and communications The New Initiatives Component has a separate office which will be provided with technical and financial resources to enable it to deal quickly with emerging agricultural development problems and to detect new opportunities by preparing studies and developing new projects or other initiatives The component includes funding for three long-term consultants (two for the Executive Office and one for New Initiatives) and 99 person-months of short-term experts The request for proposals is currently being prepared to provide the long- and short-term experts Funding will be provided for 110 person-months of short-term training including money for support and administration of both offices, pilot or test areas, numerous studies, evaluations and audits

Cost Estimates

NARP's summary cost estimate and financial plan by component and expenditure category are noted below For budgeting and planning purposes all contingencies and inflation funding have been deleted from respective project components In the future these two line items will be budgeted and planned each year and thus added to respective components as work progresses and funding is needed

	AID		GOE	Total
By Component	$FX	$LC	$LC	$
Research	86,474	56,819	34,220	177,513
Technology Transfer	16,202	24,754	7,425	48,381
Policy Analysis	12,604	4,951	3,745	21,300
Seed Technology	31,470	5,467	7,607	44,544
New Initiatives	6,675	2,660	3,714	13,049
Contingencies	7,466	4,276	2,683	14,425
Inflation	20,527	19,655	15,606	55,788
Total	184,418	118,582	75,000	375,000
Project Total	**$300,000**		**$75,000**	**$375,000**
By Expenditure Category				
Technical Assistance	33,036	5,232	720	38,988
Training	22,104	18,225	2,321	42,650
Commodities	67,716	4,108	3,250	75,074
Services	30,569	67,086	50,420	148,075
Contingencies	7,466	4,276	2,683	14,425
Inflation	20,527	19,655	15,606	55,788
Total	181,418	118,582	75,000	375,000
Project Total	**$300,000**		**$75,000**	**$375,000**

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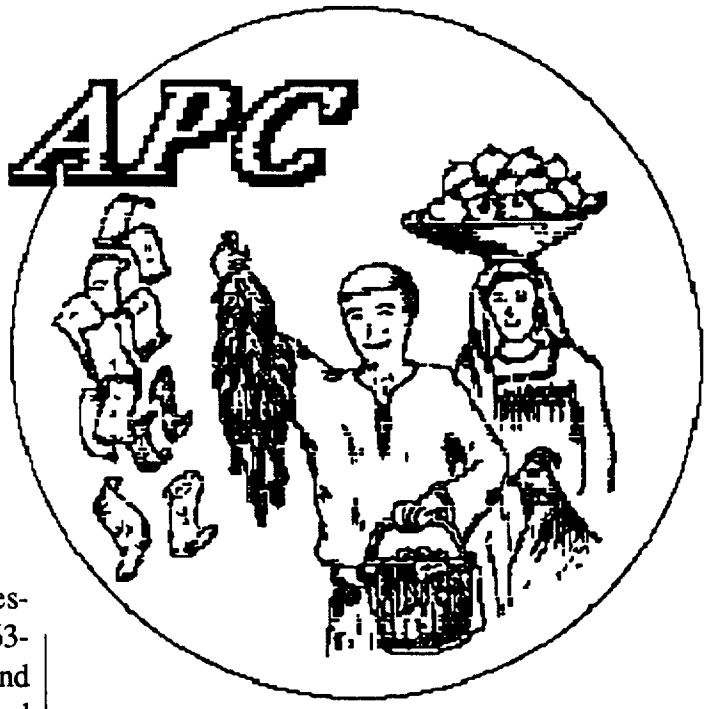
AGRICULTURAL PRODUCTION AND CREDIT PROJECT

Project Number: 263-0202
Start Date: Sept 30, 1986
Completion Date: Sept. 30, 1993
Authorized Amount: $123 million
Obligated Dec. 1989: $123 million
Expended Dec. 1989: $109 million
Implementing Agency: Principal Bank for Development and Agricultural Credit (PBDAC)



Background

The project evolved from (1) the predecessor, Small Farmer Production Project (SFPP 263-0079), (2) a series of studies analyzing the role and needs of the Principal Bank for Development and Agricultural Credit (PBDAC) and its role as a provider of agricultural inputs, (3) several analyses and high level dialogues regarding the policy reforms required to increase agricultural production, and (4) the 1985 PBDAC decision to expand the SFPP concept from three to eight additional governorates

Goal and Purpose

The project is financed by a grant to the Government of Egypt (GOE) The goal of the project is to support reforms in the agricultural sector and strengthen market-based incentives, thus encouraging investment in agriculture and increasing overall productivity and farm income This major USAID and GOE effort will entail significant reforms in sectoral policies

The purpose of the project is to provide farmers with new technology, improved financial services and a competitive, expanded input supply system The project will achieve this purpose by increasing the capitalization of the PBDAC to enable it to meet the demand for increased credit resulting from the policy reforms, by strengthening the institutional capacity of the PBDAC to obtain adequate funds, provide access to credit, and provide financial services, by opening the input supply market to the private sector; and by improving technology diffusion systems

The bulk of USAID project funds are dollar denominated performance payments to support the GOE measures to reform the agricultural sector and will be transferred in tranches based on implementation of planned changes The Grantee will make funds available to expand the capital base of the PBDAC The amount of performance funds released will be determined by the Bank's need for additional capital to meet the demand for credit resulting from policy reform. Prior to or simultaneously with each performance disbursement, the GOE shall increase the capitalization of PBDAC by at least an equivalent amount of Egyptian pounds These funds will ensure that small farmers and entrepreneurs have necessary financing available to realize opportunities created by policy reform The parties will monitor the lending

activity attributable to the increased capitalization of PBDAC All interest on the capitalization funds shall belong to PBDAC At a minimum the amount of loans to small farmers at the highest allowable interest rate will be equal to or exceed the amount of the performance disbursements For these purposes, a small farmer loan shall be the Egyptian pound equivalent of $5,000 or less This expanded credit activity and technical assistance to modernize banking activities in over 350 of the PBDAC's 750 village banks will reorient the Bank as a primarily financial institution and allow it to diminish its role in controlling input supply and marketing

While the GOE is developing its agricultural reform program, the project will begin to institutionalize PBDAC systems to transfer new technology and make credit accessible to small farmers and rural entrepreneurs providing farm-related services USAID funds are being used for technical assistance, services, training, and commodities to accomplish these project objectives

The PBDAC assists the private sector by financing expansion of services and infrastructure investments needed for agricultural development The Bank is also improving its banking services to businesses supporting agriculture, e g , improved analysis of loan and investment opportunities, techniques of evaluating client performance, and methods of loan management will enable the Bank to play a dynamic role in supporting the private sector These private sector enterprises are expected to become major sources of information on new machinery, proper maintenance, new products, and agricultural technologies

To ensure the long run availability of these services, the financial viability and management capacity of the Bank is also being strengthened At the end of the project, the PBDAC will have

- A sound capital structure and capital management system,
- Effective management controls (budgeting, auditing, and financial analysis of Bank performance),
- A dynamic personnel management and training program, and
- A modern management information/accounting system

Implementation

The policy reform caucus with the Ministry of Agriculture is the most successful part of A I D 's overall policy dialogue with the GOE The details of the policy dialogue process and the capitalization of PBDAC have been the subject of GOE/USAID meetings These details include the establishment of policy benchmarks, determination of PBDAC's need for additional capitalization, and progress made by the GOE on its previously announced agenda of policy reforms

The technical side of the project is being implemented by the PBDAC The Bank will cooperate with others, i e , the National Extension Service, private enterprises, and the MOA to ensure that the project meets its objectives

The Chairman of the PBDAC is the Project Director The day-to-day activities are managed by a Project Manager who reports to the Chairman and has responsibility for coordination with the extension service, preparation of reports to PBDAC and A I D , management of administrative support, and leadership of the total project team with the help of the technical assistance contractor

Project Technical Activities

Project activities are designed to enable farmers and private sector businesses to take advantage of policy reform to create a dynamic, expanding agricultural sector The three primary technical activity outputs are

- Financial services which allow small farmers to take advantage of opportunities created by policy reform
- Development of private sector businesses in distribution and marketing
- Increased transfer of new technology to farmers by these private sector enterprises and the National Extension Service (NES)

Project Amendment

PBDAC and USAID are currently finalizing a major amendment to this project A proposed increase in funding, approximately $160 million, will be used to support implementation of a program of agricultural sector reforms during 1990-92 which have been set as targets by senior officials within the Ministry of Agriculture and PBDAC Moreover, the amendment provides financial resources to enable PBDAC to increase the number of governorate banks (BDACs) served by the project from the current 12 to 14 and the number of village banks from 350 to 450 Lastly, funds will be provided for the study/analysis of emerging problems associated with PBDAC divestiture plans and to accommodate a two-year extension of the project's PACD through September 1995 The project outputs will remain essentially unchanged as a result of this amendment They include agricultural policy reform, the expansion of rural credit, and strengthening of rural credit institutions Deregulation of the agriculture sector will allow a market-driven economy where farmers are free to respond to price incentives The availability of credit will allow farmers to cope with the higher costs of unsubsidized credit and production inputs By the end of the project, the following conditions are anticipated

- The fiscal burden of exchange rates and direct budgetary subsidies for fertilizer, credit, and most other farm inputs will have been eliminated
- Farmers will have easier access to all inputs, including credit, as market prices As a result, farmers will be using better combinations of inputs in response to market signals
- Private dealers will have increased their share of the input supply operations, with PBDAC decreasing its operations
- Farmer incentives for production of major crops (especially cotton and rice) will have been moved into alignment with world market conditions, in response, farmers will voluntarily adjust their cropping patterns to better suit international comparative advantage
- Controls over private processing and marketing of selected major crops (notably rice) will have been eliminated
- Farmers will be using improved technologies disseminated by village teams and private sector input supply firms
- The number and share of loans to small farmers will have increased

These conditions will allow farmers and farm-related businesses to respond to price incentives with a more diversified array of inputs, contributing to the project goal of increasing agricultural investment, agricultural productivity, and farm incomes

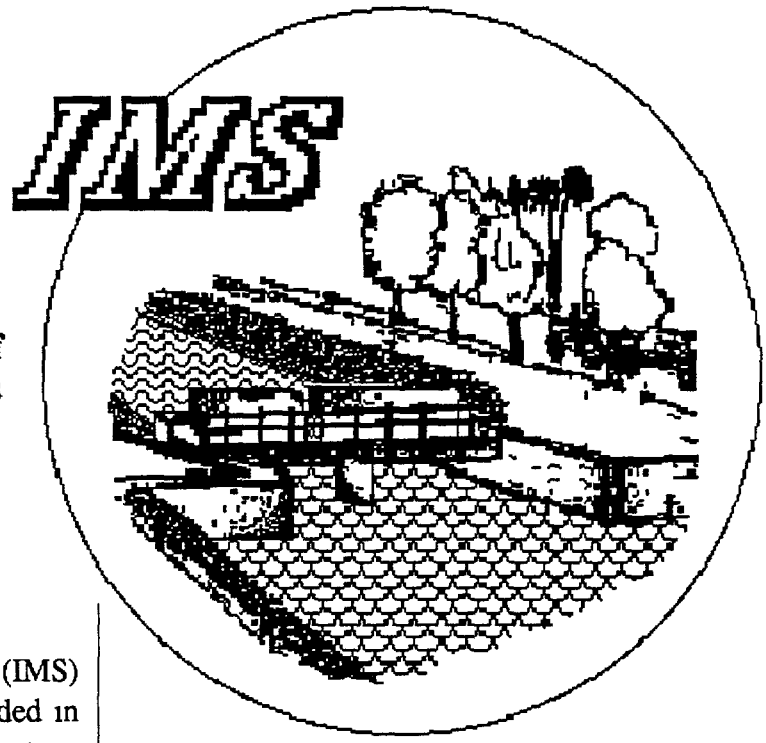
Illustrative Financial Plan

The following table provides a summary cost estimate for the project The total A I D contribution to the project will be $123 million LE 42,000,000 of a total GOE contribution of LE 150,240,000 will be extended to the first phase of the project.

	U S A I D			G O E		TOTAL
	Dollar	LE $ Equiv	Total $	L E	Dollar Equivalent	USAID&GOE $ Equivalent
Technical Assistance	7,900	1,700	9,600	720	533	10,133
Training	800	2,500	3,300	4,060	3,007	6,307
Commodities	5,065	1,135	6,200	2,526	1,871	8,071
Services	700	200	900	4,694	3,477	4,377
Project Subtotal	14,465	5,535	20,000	12,000	8,889	28,889
Inflation & Contingency			3,000	3,240	2,400	5,400
Project Total			23,000	15,240	11,289	34,289
PBDAC Capitalization				135,000	100,000	100,000
Policy Performance			100,000			100,000
Grand Total			123,000	150,240	111,289	234,289

IRRIGATION MANAGEMENT SYSTEMS PROJECT

Project Number: 263-0132
Start Date: Sept. 22, 1981
Completion Date: Sept. 21, 1995
Authorized Amount: $340 million
Obligated 31 Dec 89: $250 million
Expended 31 Dec 89: $177 million
Implementing Agency: Ministry of Public Works and Water Resources (PWWR)



Project Summary

The Irrigation Management Systems (IMS) Project was originated in 1981 and amended in 1984 to improve its impact and to take advantage of the lessons learned from six years of research carried out under the USAID Egyptian Water Use and Management Project (263-0017) The project was expanded in 1987 and now consists of 10 components Some are designed to remove specific constraints to agricultural production by improving the effectiveness of the current irrigation and drainage system Others are to support the Ministry of Public Works and Water Resources (PWWR) through continued research, training, and improved data base

The project consists of technical and capital assistance for the planning, design, construction (rehabilitation), and management of Egypt's irrigation system The diagram on page 2 shows the 10 project components, the PWWR project directors, USAID funding levels, current contractors, and duration of activities The overall management of this complex project is provided by the PWWR Coordinating Committe which is composed of all of the project directors, officers from all key departments within PWWR, and a USAID observer

Project Rationale and Description

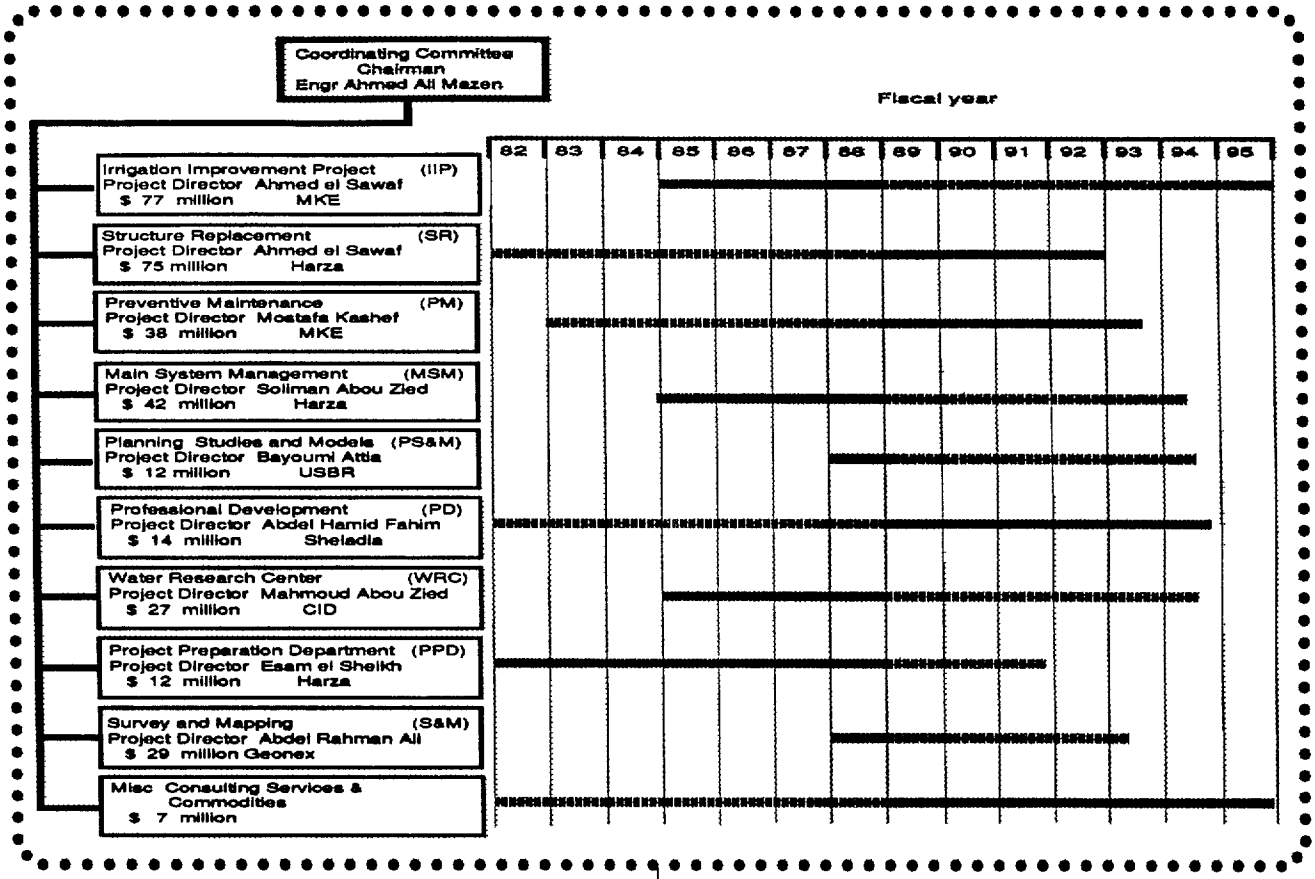
Project Rationale

1 Goal

Considering the problems specific to the irrigation sub-sector as well as the overall agricultural sector problem of inadequate agricultural production of the old lands, the goal of this project has been specified as

"Effective control of Nile waters for all uses and particularly for their optimal allocation to and within agriculture as a means of helping to increase agricultural production and productivity "

Control over water and its proper management for agricultural and other purposes is required at all levels in the irrigation system so that water can be efficiently delivered to the crop root zone without waste, when required, and in the quantities needed Therefore, a sub-goal has also been specified



"To improve the operating efficiency of the water distribution system for agricultural irrigation and for other water uses "

2. Purpose

The purpose is to strengthen the capability and capacity of the PWWR to plan, design, operate, and maintain the water distribution system

To achieve this purpose the project is in the process of

a Planning, designing, and constructing an improved, operationally efficient irrigation system in selected canal commands throughout the country This includes establishment of formal organizations of farmers to communicate with representatives of the PWWR as well as the Ministry of Agriculture and Land Reclamation (MALR), and the involvement of the PWWR and MALR officials in on-farm water management

b Strengthening PWWR maintenance capability through the following activities (1) completion of the Structural Replacement (SR) component which is replacing obsolete or otherwise non-functional structures, (2) the implementation of a Preventive Maintenance (PM) Program in six of the19 irrigation directorates, and (3) support of an International Bank for Reconstruction and Development (IBRD) assisted project on earthen channel maintenance, with particular emphasis on development of integrated channel maintenance cycles and the use of private contractors

c Further developing and adding to the set of computer models and computer programs that are designed for planning, operation, and management of the irrigation system, and bringing the Project Preparation Department to a state of preparedness where it can analyze the feasibility of most PWWR developmental options with minimal expatriate assistance

d Developing and implementing the computer models designed for operation of the irrigation system and further development of the telemetry data collection and analysis system, including pilot investigations of system automation Developing and implementing a River Nile Basin Monitoring, Forecasting, and Simulation unit for coordi-

nation of water use with supply Developing a management information system to improve overall management of PWWR and to permit maximum utilization of computer models

The above activities are being supported by extensive research operations that cover all aspects of irrigation development and management, a PWWR-wide training program developing a new National Irrigation Training Institute, the preparation of contour maps utilizing aerial photography, and the provision of essential miscellaneous technical and commodity assistance

Setting

The Overall Irrigation and Drainage System

The irrigation delivery system with its single source of supply (Nile River) running the full length of the country appears deceptively simple However, with its two dams at Aswan, seven Nile River barrages, 31,000 km of public canals (some discharge up to 1,000 m^3 sec), approximately 80,000 km of mesqas[1/] and farm drains, 560 large public pumping stations, over 17,000 km of public drains, 450,000 saqias,[2/] small pumps, and over 22,000 water control structures, the system is extremely complex It provides water for over 6 million feddans,[3/] approximately 5 0 million of which are the alluvial lands along the Nile Valley and in the Delta (old lands) and 0 8 million for recently (1952-80) irrigated desert lands (old new lands)

The main characteristics of the irrigation system are (1) operation and control of the water is based on the elevation of the water upstream or downstream of the off-take structures, (2) water is supplied to farmers on a rotational system that alternates on-off periods that vary by season and cropping pattern, and (3) most farmers have to lift water onto their fields rather than have it delivered by gravity flow

The drainage system for removing excess water from cultivated lands consists of open drains, tile drains, and pump stations The open drain system, built mainly between early 1900's-1965, serves almost 5 5 million feddans (mostly old lands) Since the late 1960's, the GOE, with the assistance of the IBRD, has initiated a series of tile drainage projects to relieve Egypt's water logging and salinity problems Currently, some three million feddans have been provided with subsurface drainage and improved open drain systems

The PWWR is responsible for all aspects of the irrigation and drainage systems—planning, design, construction, operation, maintenance, and management. The Ministry has four Departments (Irrigation, Finance, Planning, and Mechanical), four Authorities (Drainage, High Dam, Coastal Protection, and Survey), six public companies, and the Water Research Center To administer the irrigation system the Irrigation Department has 19 directorates (essentially the same area coverage as governorates), 48 inspectorates, and 167 districts

The PWWR regulates water supplies to and within each of the 50 canal commands, normally based on monthly water needs prepared jointly by the regional offices of PWWR and MALR In general, since the High Dam was completed in 1968, the supply of water has been sufficient to enable the farmers to achieve close to 200 percent cropping intensities

On-Farm Irrigation and Delivery System

Farm sizes in the 5 0 million feddans of old lands are small, 95 percent of the farms consist of 5 feddans or less and approximately 70 percent consist of one feddan or less The traditional method of irrigation is for the farmer to divide the land into small basins of a size not greater than 10m x 10m These basins enable the farmer to control the on-farm irrigation systems, and permit a fairly uniform application of water even on unleveled fields The farmer is required to lift water from 50 to 75 cm because Government policy favors lift irrigation on the assumption that gravity flow re-

1/ A mesqa is a private ditch serving from 10 to 300 feddans and 10 to 200 farmers

2/ A saqia is a water wheel to lift water

3/ One feddan equals 1 038 acres or 0 420 hectares

sults in excess water application However, some areas in Upper Egypt and in Fayoum have gravity systems

Water delivered to the farmer is not based on precise plant needs but on rotation with on and off periods These periods depend on the type of soil, the cropping pattern, and the season There are two-turn and three-turn rotations For example, a two-turn rotation could be four days on and four days off (rice), while a three-turn system would be four days on and eight days off (general crops in the summer) Under rotation, farmers at the upper end of a mesqa often irrigate twice in a turn and the farmer at the lower end might not get a turn

Project Components: Brief Description

Irrigation Improvement Project (IIP)

The IIP is planning, designing, and implementing a rehabilitation/modernization program in selected canal commands covering an area of more than 300,000 feddans during the life of the project

The IIP is being carried out in the following four phases within each area to be enriched (1) constraints to improved agricultural production are identified, (2) a feasibility study of potential solutions is carried out, (3) the appropriate alternatives (which must be technically sound, economically viable, and socially acceptable) are designed and implemented, and (4) the implemented solutions are then monitored and evaluated to enhance the effectiveness of future improvements Several feasibility studies have already been prepared by the Ministry and are currently being reviewed by A I D

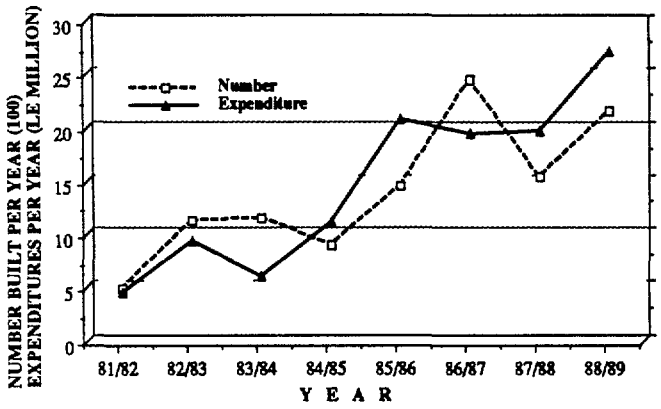
USAID is helping finance improvements such as water control structures, monitoring systems, canal lining, crossings, excavation and/or realignment, land leveling, farmer organizational efforts, a grass-roots irrigation advisory service, commodities, training, and technical assistance

The total A I D contribution to IIP will be $77 million including approximately 500 person months of technical assistance, 300 person months of non-degree training, and two persons receiving degree training, commodities, and construction Consultant services are currently being provided by Morrison-Knudsen Engineers which has a 17 person resident team in country, seven of whom are located outside Cairo on the various job sites

Structural Replacement

The SR component is aimed at improving or replacing over 12,000 of the initial 1981 baseline of 20,500 small to medium structures in the irrigation system These 12,000 structures had deteriorated or were no longer functionally appropriate The structures include intake regulators, head regulators, weirs, tail escapes, spillways, bridges, and crossing structures The component is also aimed at improving quality of construction by assuring that the building conforms to PWWR specifications, and reducing the backlog of structures that are unrepairable to enable the PWWR to have a manageable amount of structures that can be maintained

STRUCTURAL REPLACEMENT PROGRESS



The total USAID contribution to the SR component will be $75 million, including approximately 80 person months of technical assistance, 25 person months of non-degree training, commodities, and 80 percent of the cost of the structures A full time advisor is being provided through Harza Engineering Company Eleven thousand five hundred of the 12,000 structures have been completed

Preventive Maintenance

The Preventive Maintenance component will provide six directorates with the equipment and staff training necessary to perform routine first echelon maintenance It is also installing the procedures to plan for, manage, and control higher levels of maintenance, including replacements that are contracted out PWWR has committed to reorganize staff and provide funds needed to assure proper and reliable maintenance of the system The product of this effort will be a preventive maintenance program tested, accepted, functional, and fully staffed in six directorates

The initial phase of the Preventive Maintenance component began with the establishment of a pilot preventive maintenance organization in the Gharbia Directorate

Associated with this program is an International Bank for Reconstruction and Development (IBRD) assistance package to strengthen the channel maintenance work throughout the country The main focus of the IBRD program is on improving the capabilities of the PWWR public excavation companies which carry out most of the channel maintenance work on the larger channels The IBRD program also includes a component to encourage small private sector firms to take over the maintenance of all small channels

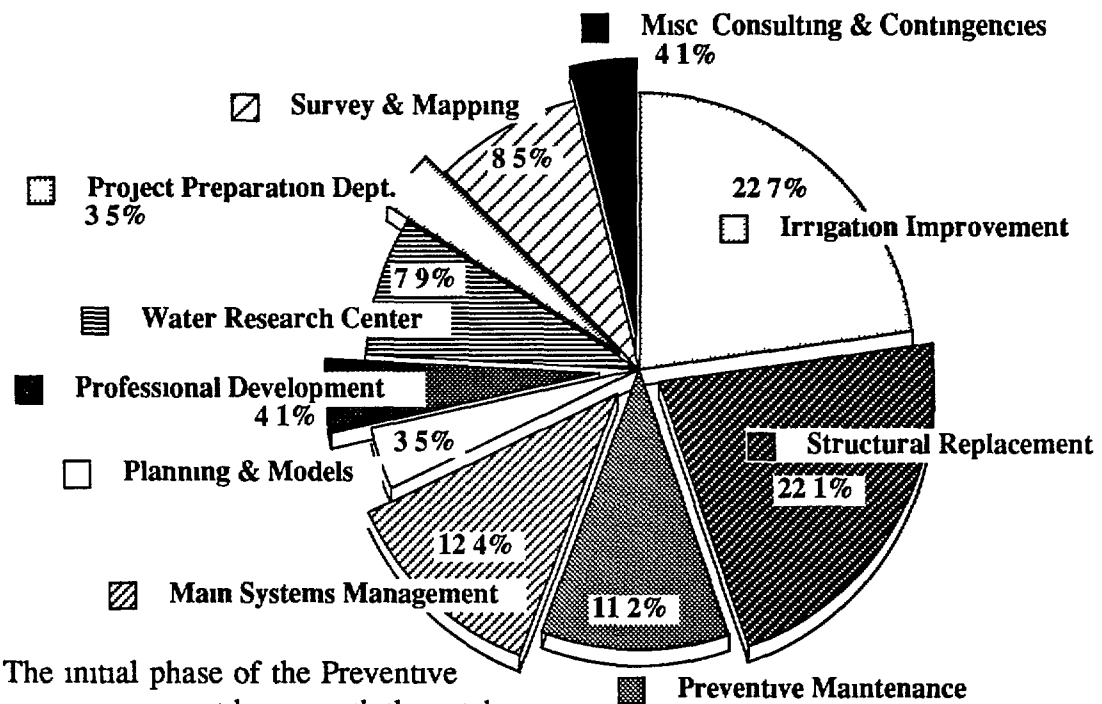
Under this component USAID will provide $38 million including about 290 person months of technical assistance, 80 person months of non-degree training, and commodities Consultant services and seven resident specialists are being provided by Morrison-Knudsen Engineers

Main Systems Management

Management decisions to increase or diminish water flow at key points throughout the irrigation delivery system will be improved by a telemetry data collection system This system is being developed to provide real-time data to the managers of the water distribution system in order to improve management of resources, including water waste reduction and irrigation shortages

The initial phase of the telemetry system is designed to provide detailed data on the hydrology and other characteristics at 60 key points in the irrigation system After gaining experience during the initial phase, the system will be expanded to increase the kinds of data to include flow rates, water quality, communications, as well as the number of data collection points in the system

IMS RESOURCE ALLOCATION BY COMPONENT



This component will also assist PWWR in experimenting with automation of control gates in a pilot area of the irrigation system The pilot effort should result in decreased operation losses and improved irrigation efficiencies Communications network and canal feasibility studies for determining the economic extent of automation will also be financed

The total USAID contribution to this component will be $42 million, including approximately 200 person months of technical assistance, 60 person months of non-degree training, 10 persons receiving degree training, and commodities Consultant services are being provided by Harza Engineering Company which currently has six of their planned nine member resident team in country

Planning Studies and Models

Through the Water Planning Group (WPG), the Ministry has developed a number of computer models that are designed to increase the operating efficiency of the whole system These models fall into two groups One group concerns inflow simulation to predict flows into Lake Nasser from the area above the lake, and the other group of models are concerned with the service area between the High Aswan Dam and the Mediterranean Sea This set of models is used to analyze the impact of the water delivery system on agricultural policies and programs, to plan the distribution of water through the system, and to provide detailed operating parameters such as gate movement schedules for operating the system within a specified set of constraints

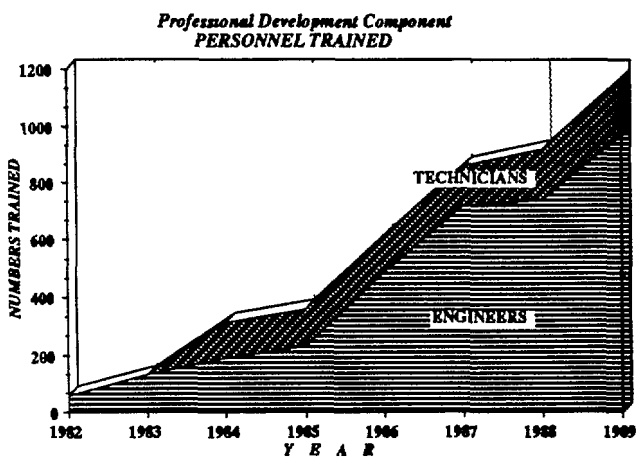
The development of these two groups of models has been assisted by UNDP starting in 1977 During the past three years, IBRD and UNDP, with USAID participation, have carried out a number of review missions and found the project as having a positive and beneficial impact on developing the models needed to properly plan and operate the irrigation and drainage system Due to funding constraints, the UNDP assistance will be phased down, and USAID is providing support to further refine the two groups of models and the addition of several new models to the two groups

A program for improving monitoring, forecasting, and simulation (MFS) of the precipitation and run off in the Nile Basin is being established The plans are for a grant to be made to the FAO to execute Phase I of a MFS program

The total USAID contribution to the component will be $12 million for commodities and approximately 130 person months of technical assistance and 70 person months of non-degree training Technical assistance is being provided by the U S Bureau of Reclamation which has two resident staff in Cairo

Professional Development

Through this unit, the Ministry is providing structured in-service training programs for the 5,000 to 7,000 professional and 70,000 to 80,000 nonprofessional staff of PWWR, plus some from the MALR Training is being expanded to more than 60 subject matter areas The component goal is to develop a National Irrigation Training Institute having the capability to provide high quality training to 2,500 students per year, focusing mainly on the professional staff This unit is currently offering courses in 25 subject areas and has trained 4,200 Ministry staff



USAID will provide a total of $14 5 million including approximately 230 person months of technical assistance, 150 person months of non-

degree training, five persons receiving degree training, and commodities Consultant services, including a three person resident team, are being provided by Sheladia Associates, a minority owned firm

Water Research Center

The scope and complexity of PWWR responsibilities for the irrigation system involve an extensive range of scientific disciplines and widely varying subject matter areas The Water Research Center was created in 1975 by PWWR to do the basic research and to be the reservoir of knowledge on all aspects of the irrigation system To serve this purpose, 11 separate research institutes were created The project is helping the institutes improve their research capabilities, information dissemination, and use of local private contractors, universities, and other research organizations to carry out special research projects rather than increase core staffing

The total USAID contribution to the WRC will be $27 million, including approximately 420 person months of technical assistance The existing staff of all 11 institutes will be strengthened with a significant amount of degree training (44 PhD and 62 MSc), non-degree training (470 person months), and commodities Consultant services, including a four person resident team, are being provided by a university group (Consortium of International Development) with Colorado State University serving as the lead university

Project Preparation Department

The Project Preparation Department (PPD) was created by PWWR under the IMS Project to provide international quality economic and technical feasibility analyses of investment options The PPD also serves in a staff capacity for PWWR to provide economic and technical analysis of various developmental options as assigned by the Minister These analyses help the PWWR and foreign donors determine which programs are viable and worth pursuing

The total USAID contribution to the PPD component will be $12 million, including approximately 400 person months of technical assistance, 25 person months of non-degree training, and commodities Consultant services are being provided by Harza Engineering Company

Survey and Mapping

Part of the normal planning/design apparatus for irrigation systems is high quality aerial photography and detailed topographic maps

Most of the cadastral and topographic maps currently in use for planning and designing irrigation improvements were prepared between 1900 and 1945 The majority of these maps are not adequate for preparation of feasibility studies or detailed project planning In addition, accurately scaled aerial photography is not available for the irrigated areas of Egypt

This component will arrange for aerial photography, new cadastral maps for about five million feddans of the irrigated lands, and large scale contour maps of the agricultural land It will also provide training and equipment to the Egyptian General Survey Authority to upgrade its capability to provide mapping services

The total USAID contribution to the Survey and Mapping component will be $29 million, including approximately 400 person months of technical assistance, 50 person months of non-degree training and commodities In December 1989 a contract was signed with the Geonex Corporation to provide the required technical assistance

Miscellaneous Technical Assistance and Commodity Procurement

This component provides for a residual supply of technical, commodity, and training assistance to cope with problems not addressed by the other components

To date, $1 8 million has been utilized for special studies carried out in conjunction with other donor agencies, included are non-degree training for PWWR officials outside the normal IMS components, establishment of a project-wide monitoring office, project evaluations, invitational travel, and miscellaneous procurement

EGYPT'S WATER RESOURCES

Introduction

The multi-year water regulatory capacity provided by the High Aswan Dam has given stability to Egypt's water resources by providing a reserve storage capacity during years in excess of requirements and providing supplemental resources during lean years The recent African drought from 1976-87, while being devastating to many parts of Africa, has had limited impact on Egypt The High Aswan Dam's water reserves were diminished, but the high inflows during 1988 have restored reserves to approximately the 1983/84 level However, as a result of the drought, Egypt is now focusing more effort on water management and forecasting This effort will improve the utilization of its water resource to meet future demands and to improve preparedness should drought threaten the availability of water resources in the future

This Annex has been prepared to provide an overview for those interested in understanding Egypt's water resources and its importance in sustaining food and fiber production to meet the demand of a growing population Water inflow and usage trends and the future water requirements are discussed The Annex also outlines water policy issues and the necessity for Egypt to complete plans and implement a long range program to better manage the limited water resources based on needs and conditions in the Nile watershed This requirement stems from (1) the significant draw down in water reserves behind the High Aswan Dam during the recent African drought, and (2) estimates that show there will be insufficient water to sustain Egypt's projected requirements by the Year 2000 unless progressive conservation measures and management improvements are put into place during the next few years

Water Resources

The renewable water resources available to Egypt are derived from the Nile River and its watershed The Nile River, with a main channel 6,700 kilometers (km) long, is one of the longest rivers in the world and drains an area of 2,900,000 square kilometers The river has two main branches (Blue and White) with headwaters in Ethiopia and Tanzania and drains parts of nine countries Approximately 80 percent of the runoff into Egypt's Lake Nasser, which is formed behind the High Aswan Dam, is derived primarily from rain water runoff originating in the Ethiopian watershed The other 20 percent is generated through the White Nile system which begins at Lake Victoria in Tanzania

Over the years, numerous agreements have been reached between the countries involved in the watershed with regard to sharing the water resources of the Nile basin These agreements have culminated in an arrangement whereby Egypt would be allocated a net of 55 5 billion cubic meters of water annually at the High Aswan Dam, based on an average annual runoff from the watershed of 84 billion cubic meters The agreements specify procedures for sharing excesses during high runoff years and sharing deficits during low runoff years In addition, Egypt and Sudan have agreed to share the cost and the additional runoff generated by reducing evaporation losses in the swamps in southern Sudan via the construction of the Jonglei canal and other civil works Realistically these improvements could increase Egypt's net share of the Nile River water to approximately 58 billion cubic meters by the turn of the century and ultimately to approximately 65 billion cubic meters if all the planned construction activities are undertaken However, it must be noted that Ethiopia is not in full concurrence with the above-mentioned agreement and the construction sites in Sudan are currently closed

In addition to the surface water resources, usable groundwater is available in several areas within Egypt However, the groundwater in the Nile Valley and the Delta of Egypt is not a resource in itself It can only be looked upon as a storage reservoir that is supplied by the Nile waters through

the irrigation distribution system It is currently estimated that 2 3 billion cubic meters are being extracted from the Nile Valley and Delta and that this amount could be increased to 5 0 billion cubic meters to balance the current recharge available from the irrigation system

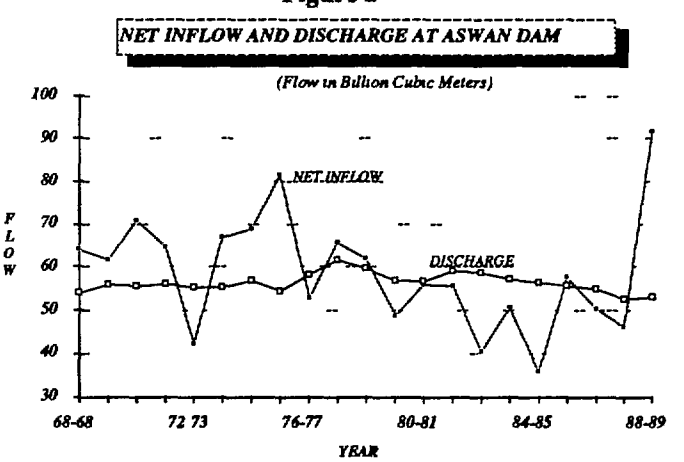
There are also two significant pockets of ancient nonrenewable groundwater under the Western Desert and the Sinai Estimates of the amount under the Sinai have varied widely and have been as high as 25 billion cubic meters The groundwater resources under the Western Desert have been studied in some detail The studies indicate that the groundwater is 20,000 to 30,000 years old and is being recharged by water moving in from the southwest at the rate of 14 to 27 meters per year There is no recharge to this area from the Nile River Current developments are removing 460 million cubic meters per year which is 145 million cubic meters more than the annual recharge capabilities Studies have indicated that it may be economical to increase development to irrigate an additional 100,000 feddans by increasing withdrawals to 730+ million cubic meters per year At this rate of withdrawal the water table would drop less than 100 meters in 50 years Additional economic studies should be carried out before any further development proceeds

The only other source of renewable water resources to Egypt is a very small amount of rainfall (10 to 20 cm annually) along the northwestern coast A small amount of rain-fed agriculture is supported by this limited precipitation

Water Inflow and Use Trends

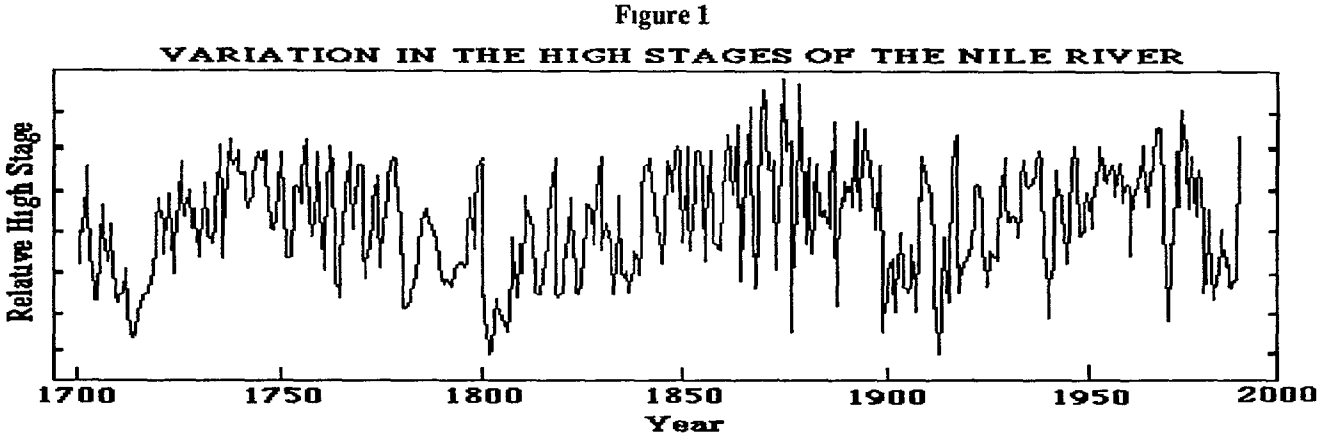
It appears, based on long-term stage (high water) records of the Nile River, that the runoff pattern has a hundred year cycle Figure 1 indicates that there were low flow periods at the beginning of each century, high flow periods in the mid-century, and wide annual fluctuations Based on this observation, it might be assumed that we are currently entering a low flow period for the next 10 or 20 years However, the long-term weather patterns and water yields to Egypt could very well be changed because of man's influence through various development and usage activities in the countries within the watershed Figure 2 shows the net

Figure 2



water inflows to Egypt at the High Aswan Dam during the past 20 years and shows that the inflows for the past few years, excluding last year, have

Figure 1



been significantly below the average of 55 5 billion cubic meters The figure is based on the total annual inflows for the Egyptian water year which runs from August through July The 1984-85 total inflow was less than 38 billion cubic meters surpassing the previously record low of 42 billion cubic meters in 1913-14 Although 1985-86 inflows were back to normal, 1986-87 and 1987-88 were below average However, 1988-89 demonstrated the possibility of wide fluctuations as this was the record high inflow year since construction of the High Aswan Dam As shown by the constant or slightly decreased discharge rate from the High Aswan Dam (Figure 2), Egypt was not adversely affected by the recent African drought, with the 1988-89 inflow, the storage reserve has returned to approximately water year 1983/84 levels Still, the African drought has had an impact by reducing reserves and several more good years are required before full storage capacity can be reached The 1989-90 inflow appears to be sufficient to replenish the previous year's withdrawal but insufficient to bring the reservoir up to its full level

The High Aswan Dam was constructed in the mid-60s with a gross storage of 165 billion cubic meters Egypt benefited from a series of high inflow years between 1968 and 1975 which allowed the reservoir to be completely filled The live storage capacity is 135 billion cubic meters and the dead storage is 30 billion cubic meters Figure 3 shows the net additions to storage in the early years and net withdrawals from storage during the past twelve years These withdrawals to meet the water requirements of Egypt resulted in lowering the gross storage content to only 40 4 billion cubic meters in July 1988 Fortunately, the current record inflow year increased gross storage to 92 billion cubic meters as of December 1, 1989 The multi-year regulatory capacity of the High Aswan Dam has given Egypt a reprieve from the severe scenarios that were being predicted during early 1988 and demonstrated the major benefit of the reservoir to protect Egypt from five to seven year droughts Under the worst case scenario, approximately 20 billion cubic meters can be withdrawn from the Dam's dead storage and used productively

Figure 4 presents the mean water inflows over the past 20 years, a low flow year (1984-85),

Figure 3

ADDITION AND REMOVAL FROM STORAGE

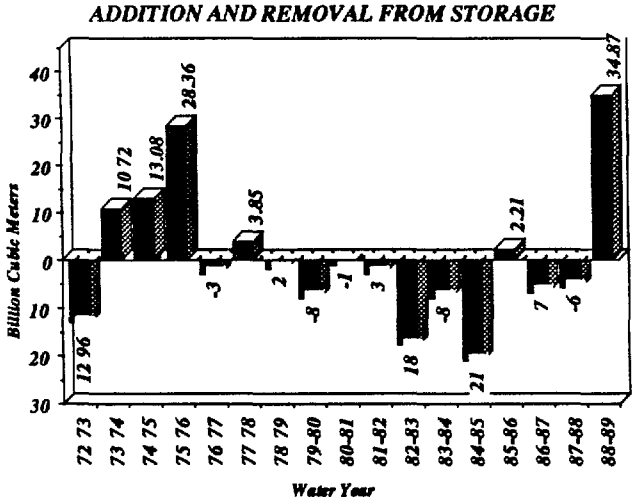
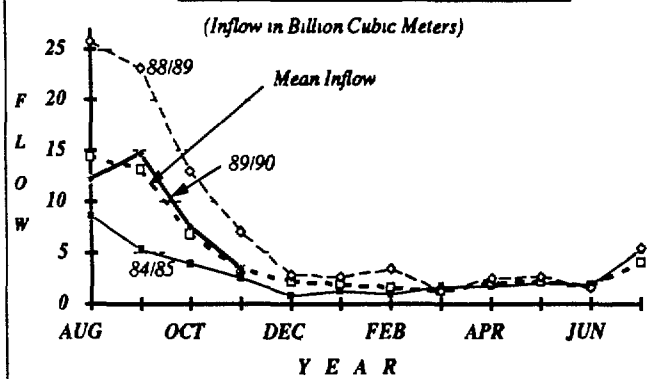


Figure 4

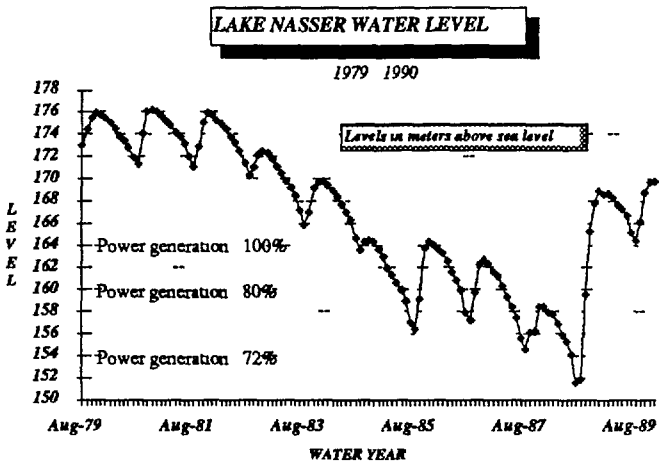
NET INFLOW TO LAKE NASSER



and the high flows of 1988-89 (clearly a record high year) There is very little difference in inflows for the various years between November and July, in August the difference between the wet and dry years becomes apparent. The current year's inflows appear to be approximately equal to the mean

Figure 5 (next page) provides the annual high and low water levels in Lake Nasser for the past 10 years showing that the overall levels have declined as a result of the recent drought The drop in water level behind the Dam resulted in hydroelectric power production diminishing to 70 percent of rated capacity during July 1988 However,

Figure 5



1988-89 inflows have restored power production levels to 100 percent of the rated capacity

Figure 6 provides a table showing the Nile River water balance for the calendar year 1982 With releases from Aswan of 58 70 billion cubic meters, approximately 32 billion cubic meters were beneficially used, including 27 cubic meters for agricultural production The consolidated overall water use efficiency of 54 percent and the irrigation water use efficiency of 45 percent are misleading in that much of the losses from the operation of the system and from the agricultural lands are recaptured and reused several times throughout the length of the system In many cases this requires large energy consumption in pumping water from drains back into the irrigation system, pumping water from drains into the farmers' fields, and pumping from wells The actual seasonal irrigation efficiencies at the farm level have been shown to range from 26 (inefficient system) to as high as 76 percent (efficient system) To maximize output per unit of water, the efficiency of delivery and application must be increased

Figure 6

NILE RIVER WATER BALANCE - 1982
(Billion Cubic Meters)

Releases From Aswan Dam	**58 70**
Productive Uses	**31.82**
Municipal	1 84
Industry	0 34
Old Lands Consumptive Use	27 01
New Lands Consumptive Use	0 03
Power and Navigation	2 60
Losses	**26.88**
Sea and Terminal Lakes	24 77
Evaporation and Seepage	2 11
Nile Water Use Efficiency	54%
Irrigation Efficiency	45%

Water Quality

The overall quality of water in the Nile system is good for most purposes and very good for irrigation There are particular locations where local pollution loads temporarily exceed the ability of the Nile River to assimilate or dilute But, for the most part, the quality of water of the Nile system from the Sudan border to Cairo can be described as "good " Downstream from Cairo, in both the Rosetta and Damietta branches, some deterioration does occur The water quality in the irrigation canal system is also good, although there is more variation both spatially and temporarily The water quality in the drainage system varies from good to severely polluted

There have been no comprehensive water quality studies in Egypt that are in sufficient detail for determining the full impact of multipurpose development However, based on individual studies carried out in different areas of Egypt, the following general water quality information is available

- The total dissolved solids at Aswan range from 175 to 180 miligrams per liter during the year, increasing to 200 to 210 at the Delta Barrage (Cairo), and further increasing to 312 to 460 at Damietta and 296 to 392 at Rosetta near the Mediterranean Sea Concentrations below 1,500 miligrams per liter are considered suitable for irrigation at today's level of management knowledge
- The return flows from agricultural drains south of Cairo are of generally good quality with 95 percent being below 800 miligrams per liter while the drains in the middle Delta have flows generally below 1,000 miligrams per liter However, the

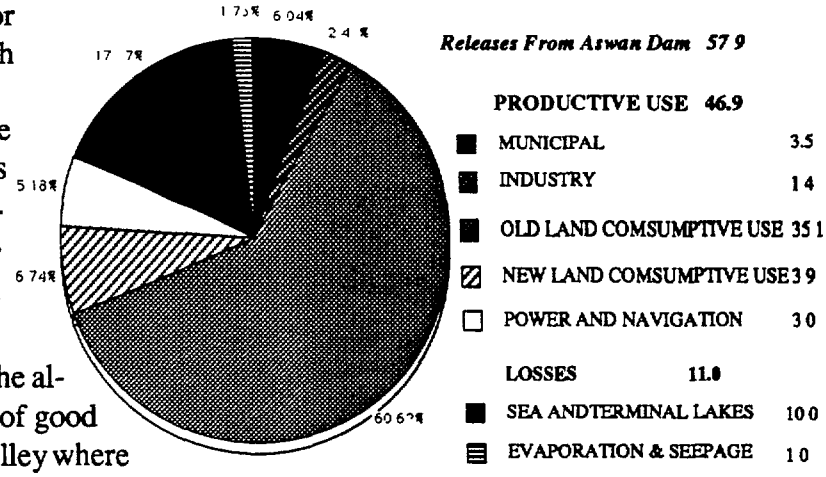
drains in the western and eastern Delta generally have high values of totally dissolved solids greater than 1,500 milligrams per liter and are not suitable for irrigation unless they are diluted with good quality river water

- There are many exceptions to the above statements near the larger towns and cities where industrial and municipal waters discharge into the canal or drainage system causing localized pollution problems
- The groundwater drawn from the alluvium in the Nile Valley is generally of good quality except along the edges of the Valley where irrigation causes some leaching of desert soils Wells in the southern half of the Delta produce good water but in the northern half of the Delta, salinity increases toward the coast. The total dissolved solids in the Nile Valley, Western Desert, and south of Tanta in the Delta are generally less than 1,000 milligrams per liter As one moves toward the coast from Tanta, the level of total dissolved solids rise rapidly to 4,000 at Kafr El Sheikh and 40,000 milligrams per liter near the coast

Figure 7

NILE RIVER WATER BALANCE 2000

(Billion Cubic Meters)



Future Water Requirements

Egypt's Water Balance

Figure 7 shows the estimated Nile River water balance for the Year 2000 It has been estimated that to increase agricultural production sufficiently to eliminate the food deficit over the next 15 years, approximately 39 billion cubic meters of water will need to be available for consumptive use of crops compared to the current level of 27 billion cubic meters In addition, industrial and municipal water requirements will rise from the current level of 2 2 (Figure 6) to 4 9 billion cubic meters Current available information indicates that Egypt cannot rely on much more than 58 billion cubic meters of net water supplies being available per year during the next 15 years, assuming average inflows As such, the only way to increase the amount of usable water supplies for consumptive, municipal, and industrial use is to increase the water use efficiency within Egypt Since the main water user is irrigation, the overall irrigation efficiency will have to be increased from the current level of approximately 45 percent to 67 percent, or 22 percent over the next 15 years Under the current management conditions and physical systems available to Egypt, including the pumping network for water reuse, this is not an unrealistic goal In addition to improving the irrigation efficiencies, PWWR is investigating ways of reducing losses to the sea As was done during 1987-88, approximately four billion cubic meters of water can be saved annually by better management of the hydroelectric and navigation release in the winter when they exceed the irrigation demands

Irrigation Management

A key to increasing irrigation system efficiency is through improved irrigation management

The term "irrigation management" has come into its importance during the last decade and is an outgrowth of the evolution of on-farm water management and irrigation water management work carried out since the 1960s Irrigation management is a mixture of science and art and is not fully understood There are no formal degrees offered in irrigation management

Irrigation management can be defined as the process by which water is manipulated and used for the production of food and fiber This is a comprehensive definition in that it includes water resources, dams, reservoirs, codes, laws, canals, institutions, farmers, soils, crop inputs, and cropping systems Irrigation management has to do with how these physical, biological, chemical, technical, legal and social resources are combined and orchestrated along with the essential knowledge, skills and motivations required to achieve improved food and fiber production in terms of a stated set of performance goals

In Egypt and elsewhere, most of the engineering principles to improve irrigation management have been known for years What is not known is how to devise an irrigation management program based on the physical and cultural interfaces in each location One of the most underrated and misunderstood dimensions of irrigation management today is that of the individual and collective irrigation behavior of farmers

Government officials and donors are slowly realizing the high economic, social, and political costs involved when farmers and users play only a passive role in irrigation projects What is still not well understood is how to match technologies and management modes with different physical and social environments Likewise, we need to learn how to diagnose and reform key social organizations and institutions, discover better ways to utilize farmer clients more effectively by giving them a sense of ownership in irrigation systems designed to serve them, and find the proper set or mix of policies which provide incentives that will really motivate farmers This is hardly possible until all professionals and agencies concerned provide the adequate incentives, institutional support, and services which will in fact make improved production possibilities a reality

Egypt is beginning to adopt an interdisciplinary approach of using a team of engineers, sociologists, economists, and agronomists to identify irrigation management problems and develop and implement solutions to those problems

Policy Issues

As Egypt progresses toward improving the water use efficiency of the river and canal system, numerous existing policies will have to be reviewed and modified and additional policies established An Inter-Ministerial Water Planning Committee has been established, headed by the Ministry of Public Works and Water Resources and having representatives from eight other ministries This body is responsible to review the impact of all proposed projects involving the use of water and has the authority to set policies as required As the ministries' existing computer modelling capacity improves, their capacity to test the impacts of alternative policy reforms will increase many fold

The following is a list of some of the possible policy improvements being discussed with GOE as they relate to irrigation management

- Proportion of funds allocated for improvement of existing projects versus new schemes
- Incentives required to improve the management capability of the PWWR
- Cost recovery for water from the beneficiaries, taking into account the present and planned price controls and subsidies
- Benefit package (monetary and merit advancement) required to retain qualified professional staff within the PWWR
- Public versus private groundwater development to help control water tables and supplement the surface distribution system
- Responsibility of PWWR and the farmers at the mesqa level and for the operation of the canal system
- Diagnostic multidisciplinary "bottom up" planning and design approach versus the engineering "top down" approach
- Coordination responsibilities of the MALR and PWWR
- Organization and staffing policies of the PWWR as it begins to utilize more advanced technology

IMS APCP NARP

MAKING A DIFFERENCE IN DEVELOPMENT

AGRICULTURAL RESOURCES DIRECTORATE

USAID, Agricultural Resources Directorate Cairo, Egypt February 1990

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