PD HAD 340

NATIONAL RESEARCH COUNCIL

OFFICE OF INTERNATIONAL AFFAIRS

2101 Constitution Avenue Washington, D C 20418

BOARD ON SCIENCE AND TECHNOLOGY
FOR INTERNATIONAL DEVELOPMENT
CABLE ADDRESS NARECO
TWX# 710-822-9589 OR RCA# 248664 NASW UR

TELEPHONE 202/334-2633

OFFICE LOCATION
JOSEPH HENRY BUILDING
21ST STREET AND
PENNSYLVANIA AVENUE, N W
WASHINGTON, D C

October 27, 1983

Ms. Carolyn Coleman
NE/TECH/HRST, Room 6750
Agency for International Development
Washington, D.C. 20523

Dear Carolyn:

Ms. Nena Vreeland, PPC/Office of Evaluation, telephoned on October 27, 1983, requesting an appointment to discuss the Applied Science and Technology Research project prior to her departure for Cairo. We have agreed to meet at 9:00 a.m., Monday, October 31, in my office; Mr. Robert Zimmerman from AID/NE will also join us.

While I was preparing the July - September 1983 quarterly report I made an informal inventory of evaluation reports which have been prepared for the Applied Science and Technology Research program. The list is a rather formidable one. I am enclosing a notebook with copies of the reports for your reference. May I ask that you give or loan this copy to Ms. Vreeland in the hope that it may help her assemble the necessary background materials. I also ask that you check the table of contents to see if I have overlooked any reports.

Thank you for your help.

Sincerely yours,

Jay

Jay Davenport
Professional Associate

Enclosure

1

APPLIED SCIENCE AND TECHNOLOGY PROGRAM IN EGYPT

Evaluation: Compilation of Reports 1980-1983

Reports Prepared by
Board on Science and Technology for International Development
Office of International Affairs
National Academy of Sciences
Washington, D. C.

October 1983

2

CONTENTS

	TAB
Meeting V, Joint Consultative Committee, Program Evaluation Report, ASRT & NAS/NRC, March 1980	1
Overview and Inputs for Evaluation, ASRT, December 1979	2
Staff Summary Report: Evaluation Inputs, NAS/NRC, February 1980	3
Overview and Inputs for Evaluation, NSF, February 1980	4
Evaluation of Project 263-0016 (Applied S&T Research), AID/Cairo, April 1980	5
U.S. Cooperation with Egypt in Science and Technology, Princeton Lyman, et. al., April 1980	6
Evaluation Report: Applied Science and Technology Research, Clinton Stone, et.al., May 1980	7
The National STI System of Egypt: Report of an Evaluation Team, K. Willenbrock, et. al., March 1982	8
Evaluation and Recommendations for Continued Support of the Repair and Maintenance Centers for Scientific Equipment at 5 Egyptian Universities, ASRT/NIH, Autumn 1982	9
The Egyptian More and Better Food Project: Nutrition in Integrated Rural Development (Master of Arts in Regional Planning, Cornell University), Doan, Rebecca M., May 1983	10
A Review of BOSTID's Participation in the Applied Science and Technology Research Program, Egypt, BOSTID: NAS/NRC, Krebs, William; Smuckler, Ralph; September 1983	11

2

APPLIED SCIENCE AND TECHNOLOGY PROGRAM IN EGYPT

Joint Consultative Committee

Program Evaluation Report

March 1980

Academy of Scientific Research and Technology, Cairo

National Research Centre, Cairo

U.S. National Academy of Sciences/National Research Council, Washington

U.S. National Science Foundation, Washington

4

FOREWORD

This Program Evaluation Report is submitted to the U.S. AID Mission in Cairo as a background document for Mission consideration in extending the Applied Science and Technology Program (Project 263-0016) for an additional three years (Phase II). The report includes inputs prepared for the 5th Meeting of the Joint Consultative Committee (February 25-27, 1980) by the Academy of Scientific Research and Technology (ASRT), the U.S. National Academy of Sciences/National Research Council (NAS/NRC), and the U.S. National Science Foundation (NSF) together with summary material prepared by the Committee's staff.

C O N T E N T S

I. SUMMARY and CONCLUSIONS 1

II. INTRODUCTION 5

III. PROGRAM REVIEW HIGHLIGHTS 14

IV. BACKGROUND DOCUMENTS

- ASRT Overview and Inputs for Evaluation
- NAS/NRC Evaluation Inputs
- NSF Overview and Inputs for Evaluation

I

SUMMARY AND CONCLUSIONS

The Applied Science and Technology Program is a cooperative effort by the Arab Republic of Egypt, through its Academy of Scientific Research and Technology (ASRT), and the United States of America, through its Agency for International Development (AID), to:

-- Demonstrate how scientific and technical manpower resources and research institutions can solve Egyptian priority problems of economic and social development;

-- Reorient Egyptian research and development management systems to address problems requiring a multi-disciplinary and multi-institutional approach; and

-- Strengthen the ASRT, its associated research institutes, and Egyptian universities by providing technical assistance, instrumentation, and access to scientific information resources.

The Program enlisted the U.S. National Science Foundation (NSF) and the U.S. National Academy of Sciences/National Research Council (NAS/NRC) to assist the ASRT in the complex process of program design, implementation, management and evaluation. This document briefly describes the origin and development of the Applied Science and Technology Program since the two governments signed a Program Agreement in March 1977. It also outlines the conclusions of the Joint Consultative Committee (JCC), a continuing group of Egyptian and American scientists and responsible for overseeing the Program, who met in Washington in late February 1980 to assess progress, evaluate program goals and objectives,

7X

and make recommendations to AID for a three-year program continuation from October 1980 through September 1983 (Phase II).

The consensus of the Egyptian and American members of the JCC was that Phase I (March 1977 - September 1980) of this program was highly successful as the initial catalyst to help Egypt in its desire to strengthen its national research and development management capabilities and to use its R&D resources to solve critical economic and social problems. In particular, there was good illumination of the problems that surfaced throughout Phase I and that should be addressed during Phase II of the program.

The JCC members considered the four documents submitted by the ASRT, NSF, NAS/NRC, and AID as basic inputs for the self-evaluation at the February 1980 meeting, and stated the following:

1.1 Demonstration Projects

-- More and Better Food.

Overall progress is evident. Plans to reorient and extend this project to include other representative villages are considered for Phase II of project implementation. The ASRT Council of Food and Agricultural Research will work out details to be submitted to the JCC at its sixth meeting (November 1980).

-- Biogas Technology.

Social aspects of introducing biogas technology in rural areas should be the major thrust during Phase II.

-- New Crops for Arid and Semi-Arid Zones.

The project, still at an early stage of development, should emphasize: (a) marginal lands as primary sites for implementation; (b) salt tolerant, drought resistant plants; and (c) optimum utilization of water resources.

1.2 R&D Projects

-- The phosphate ore, corrosion and wool wax projects have developed good linkages between the R&D sector and industry.

-- Economic impact will continue to be stressed in selecting new projects for Phase II.

-- The Red Sea fisheries project, redesigned to focus upon definite goals, shows good prospects for implementation and should be pursued.

1.3 S&T Information

-- Although the start-up time for this project was long, implementation of the survey and design study and in-service training is proceeding intensively.

1.4 Instrumentation Technology

-- There has been success in establishing maintenance and repair (M&R) centers, in training associated personnel, and in procuring equipment. However, the JCC has noted excessive delay in certain aspects of equipment procurement which has been a major constraint in overall program execution. Continued work to improve procurement procedures is essential.

9X

1.5 Policy, Planning and Management

-- Seminars and workshops should continue to take place in Egypt, in order to increase participation of Egyptian personnel.

-- Recognition was given to the need to institutionalize R&D management training in Egypt.

-- Follow-up activities might include greater involvement of Egyptian trainees in S&T management aspects of their institutes.

II

INTRODUCTION

A. Program Origin and Purpose

The Applied Science and Technology Program is a joint endeavor of the United States and Egypt to help orient Egyptian scientific and technical research activities toward solving high priority national development problems. The two countries have long cooperated in research efforts under the PL-480 program; this activity began in 1975, when the Egyptian Academy of Scientific Research and Technology (ASRT), the U.S. National Science Foundation (NSF), and the U.S. National Academy of Sciences/ National Research Council (NAS/NRC) jointly held a workshop on science and technology policy, research management, and planning in Egypt. From that workshop and subsequent studies came a formal agreement in March 1977 between the ASRT and the U.S. Agency for International Development (AID) to enter into a five-year cooperative program for strengthening management and institutional capabilities of Egypt's science and technology community. Both the ASRT and AID invited the NAS/NRC and the NSF to join them in the activity which became known as the "Applied Science and Technology Program" and is designated as Project 263-0016 by the AID Mission in Cairo.

The formal program agreement between the two governments includes six basic elements:

1. Policy planning and management of research and development (R&D);

2. Demonstration projects, multidisciplinary in scope, directed to high priority areas of economic and social development;

3. R&D projects, also directed to specific priority problems faced by "end-users" in agriculture or industry;

11X

4. Scientific and technical information systems;

5. Procurement of scientific instruments and equipment, including improvement of maintenance and repair capabilities; and

6. Planning for years 3, 4, and 5 (Phase II).

A contract between AID and NAS/NRC was signed in December 1977 for implementation of elements 1, 2, and 3. An inter-agency agreement between AID and NSF for elements 4 and 5 was completed in September 1978. All Egyptian and American parties share the responsibility for element 6, Phase II planning. The schedule for Phase I (years 1 and 2) has been continued until October 1, 1980, with U.S.$8.1 million and Egyptian pounds 895,000 allocated by AID for those activities.

B. Program Elements

1. Policy Planning and Management of R&D

A Joint Consultative Committee (JCC), composed of six members from Egypt and five from the United States, provides policy planning and management oversight for the Program. The JCC has advisory authority rather than direct operational responsibility. Meetings are held twice a year, alternately in Egypt and in the United States, under the permanent chairmanship of the ASRT President.

NAS/NRC advisory panels are appointed to work with each of the specific R&D and demonstration projects described below. An NAS/NRC staff member (Dr. Helmut Weldes) in Cairo serves as a senior resident advisor at the National Research Centre (NRC/Cairo). He works with the NRC/Cairo Director and senior staff in program planning and implementation. As an *ex officio* member of the JCC, he is the local NAS/NRC representative for all projects

in both technical and administrative matters.

In order to provide specific management training opportunities to the ASRT and NRC/Cairo staff, an R&D management training program was initiated in 1979-1980 under an NAS/NRC subcontract to the Denver Research Institute. The training program consisted of a series of courses in the United States and Egypt emphasizing the following areas: R&D management methods, technology assessment, technical economics, and marketing methods for R&D.

2. Research and Development (R&D) Projects

There are four applied research projects which are included in the Program and receive support in the form of technical assistance, staff training opportunities, and scientific equipment. They are:

-- Evaluation of Egyptian Phosphate Ores: (a) R&D on the utilization of extensive low-grade phosphate ore reserves in Egypt for fertilizer manufacture, and (b) engineering design through the pilot plant stage for phosphate fertilizer production.

-- Corrosion Causes and Control: Investigation of means to inhibit corrosion of Egyptian steels, particularly with reference to the Egyptian petroleum refining industry by using and adapting existing knowledge of corrosion control.

-- Wool Scouring and Utilization of Wool Wax: (a) Adaptation of techniques for scouring raw wool to improve the market acceptability of fibers (wool tops) and, (b) recovery of wool wax, lanolin, and its derivatives from raw wool for use in pharmaceuticals, textiles, and other consumer products.

-- Development of Red Sea Fisheries: Survey of the fisheries areas near Foul Bay of the Red Sea, to assess the potential for commercial development and, depending upon the results, to assist in marketing techniques for the catch as a contribution of increasing Egypt's food supply.

3. Demonstration Projects

Demonstration projects are broader in objective and complexity than R&D projects; are multidisciplinary in design; and multi-institutional in scope. Demonstration projects address high priority problems identified in the Egyptian national development plan and normally require longer time periods to achieve acceptable solutions.

-- More and Better Food: The first of the demonstration projects to be implemented has the following objectives: (a) to improve farm production methods and output of foods produced for local consumption in two selected villages, (b) to assess the nutritional status of the most vulnerable population group (primary school children and nursing mothers) of the two villages, (c) to demonstrate a plan to solve the nutritional deficiences by using local resources and methods, and (d) to assist Egyptian food industries in solving production and product quality-control problems.

-- Development and Application of Biogas Technology in Rural Areas of Egypt: The objective of this project is production and use of methane as a renewable energy source for Egyptian villages by utilizing human, animal, and agricultural wastes.

-- New Crops for Arid and Semiarid Zones: This project investigates agricultural practices and possibilities for nonconventional crops in areas where traditional irrigation practices are not possible. Particular effort is to be directed toward increasing salt tolerance in plants and use of low-quality water.

4. Provision of Scientific Equipment

Equipment for the R&D and Demonstration projects is procured by AID after consultation with the ASRT. Under an AID Participating Agency Service Agreement (PASA) NSF is assisting: (a) AID and ASRT in the specification and procurement of this scientific equipment; and (b) the NRC/SIC, and Universities of Alexandria, Assiut, Cairo, El-Minia, and Tanta in improving their scientific instrumentation maintenance and repair capability. Under contracts with NSF, technical services of a methodological, consultative, and guidance nature are provided by the University of Wisconsin-Madison, Instrumentation Systems Center for (a) and for (b) for the NRC/SIC only; and by the National Institutes of Health-Biomedical Engineering and Instrumentation Branch for (b) for the universities.

5. Scientific and Technical Information

The development of scientific and technical information services to meet information needs of the Egyptian scientific and engineering community is being undertaken through the National Information and Documentation Center (NIDOC) of the ASRT. Under an AID Participating Agency Service Agreement (PASA) the National Science Foundation (NSF) is assisting NIDOC in (a) planning and designing a national information system capable of providing S&T information services to universities, research centers,

and research institutions of various ministries and the private sector, and (b) training key personnel to handle the various functions and operations of such a system. Technical services of a methodological, consultative and guidance nature are provided to NIDOC by the Georgia Institute of Technology for (a) and by the Catholic University of America for (b) under contracts with the NSF.

C. Criteria for Project Selection

The Program Agreement between AID and ASRT provided a framework for selecting specific "demonstration" and "R&D" projects. Problem areas from which R&D projects were to be chosen included: (a) plant production and protection, (b) animal research and fisheries, (c) soil and water resources, (d) medical research, (e) building technology, (f) industrial research, (g) petroleum and mineral resources, (h) energy research, (i) transportation research, and (j) physical and electronics applications. Perhaps the main characteristic of the R&D projects is their emphasis upon "end-users" in the design of the project and their participation in the research.

Demonstration projects were recognized to be of a more comprehensive nature than R&D projects and were to involve multidisciplinary and multi-institutional activities as well as field trials (demonstrations) of experimental results from universities or applied research institutions. One demonstration project, More and Better Food, identified in the original Program Agreement, was assigned to NRC/Cairo as the management agency. The project was to include activities such as food production, harvesting,

preservation, and marketing as well as a nutrition and feeding component focused upon primary school children from two selected Egyptian villages. Another component of More and Better Food consists of NRC/Cairo technical assistance to Egyptian food industries.

A second demonstration project was also to be selected with the assistance of the JCC with the ASRT assigned as its management agency.

The Joint Consultative Committee, during its first meeting (Cairo, May 6-9, 1978), approved the following general criteria for R&D and demonstration projects:

1. Each project must be relevant to critical Egyptian national development priorities (agriculture and rural development, promotion of Egyptian industries, land reclamation, health care, housing, etc.)

2. Project design must be geared toward solving critical development problems.

3. Projects must involve substantial interdisciplinary effort and the mobilization of a variety of scientific specialties and institutions (multidisciplinary participation and cooperation between different research institutions.)

4. Projects must provide an explicit framework within which managerial and technical training and experience can take place, and through which the ASRT can develop recognition of its role as coordinator and stimulator among research and user communities.

5. User participation must be provided for in the process so that practical end-use applications are built into the objectives.

17X

6. Appropriateness of technology must be considered; e.g., labor-intensive adaptation to local materials, applicability to existing skills, etc.

D. JCC Evaluation Process

The Applied Science and Technology Program Agreement between the Government of Egypt and the U.S. AID provides for two evaluations of the Phase I (January 1978 - October 1980) activities prior to initiation of Phase II (October 1980 - October 1983). One was conducted by AID/Cairo in April 1979; a second, external evaluation is being conducted by AID/Cairo through a 5-person contract team visiting Egypt in April 1980. This latter evaluation is designed to assess:

- the ability of the Egyptian organizations participating in the projects to conceptualize, select, and manage goal-oriented research;
- the improved institutional capabilities of the Egyptian scientific and technical community to engage in priority projects related to social-economic development; and
- the validity of recommendations of the Egyptian and U.S. participating groups for continuation of the Applied Science and Technology Program into Phase II.

The Joint Consultative Committee at its Third Meeting agreed to conduct its own "self-evaluation" to: (a) discuss and measure (where feasible) the validity of the overall program concept and approaches taken by the individual project elements, (b) identify changes or actions that could improve efficiency, (c) identify needs outside the program that have not been addressed but should be undertaken to in-

sure that longer-term goals can be reached, and (d) examine both the technical and nontechnical content of the projects in light of the resources made available.

Written reports from the ASRT, the NAS/NRC, NSF, and U.S. AID/Cairo were prepared for the JCC self-evaluation sessions at its February 25-27, 1980 meeting. The reports, discussions, and other background documents, such as the Project Agreement, all constituted the inputs to this JCC Program Evaluation Report.

III

PROGRAM REVIEW HIGHLIGHTS

A. Participants in the JCC Program Review

The Program Review (JCC self-evaluation) was held on February 25, 1980, during the 5th Meeting of the Joint Consultative Committee with the following members present:

EGYPTIAN JCC MEMBERS

Dr. Hassan Ismail
President, Academy of Scientific Research and Technology (ASRT)

Dr. Mostafa Al-Gabaly
Counsellor, Ministry of Agriculture

Dr. Osama Al-Kholy
Director, Industrial Development Center for the Arab States

Dr. Ibrahim Helmy Abd El-Rahman
Counsellor, Office of the Prime Minister

U.S. JCC MEMBERS

Dr. H. Guyford Stever
Consultant
Member, National Academy of Sciences and National Academy of Engineering

Dr. George Bugliarello
President, New York Polytechnic Institute

Dr. Mary E. Carter
Director, Southern Regional Research Laboratory
U.S. Department of Agriculture

Dr. James Hillier
Consultant
Vice President (retired), RCA Corporation
Member, National Academy of Engineering

Dr. Gilbert F. White
Chairman, Commission on National Resources
National Academy of Sciences

Dr. Helmut Weldes (Ex Officio)
Senior Staff Officer, Board on Science & Technology for International Development (BOSTID)

Others present who were invited to comment on various program elements and join with the JCC members in the evaluation discussions were:

EGYPTIAN ADVISORS

Dr. Mohamed Kamel
Director, National Research Centre (NCR)

Dr. M. Darwish
Cultural and Scientific Counsellor
Embassy of the Arab Republic of Egypt, Washington

Dr. A. S. El-Nockrashy
Director, Applied Science and Technology Project
Academy of Scientific Research and Technology

Dr. Osman Galal
Head, Technical Office, National Research Centre

NATIONAL SCIENCE FOUNDATION

Mr. Roger Doyon
Section Head, Africa and Asia Section, INT

Dr. Lawrence Edwards
Program Manager, Africa and Asia Section, INT

Mr. Eugene Pronko
Senior Program Manager, Africa and Asia Section, INT

NATIONAL ACADEMY OF SCIENCES

Mr. David Williams, Comptroller

Mr. Thomas Gikas
Office of Contracts and Grants

Dr. Victor Rabinowitch
Director, Board on Science & Technology for International Development (BOSTID)

Mr. Jay Davenport
Staff Officer, BOSTID

Mr. Augustus Nasmith
Staff Officer, BOSTID

INTERNATIONAL DEVELOPMENT COOPERATION AGENCY

Mr. Princeton Lyman
Special Assistant to the Director

AGENCY FOR INTERNATIONAL DEVELOPMENT

Mr. James Riley
Director, Industry, Science, and Technology Division
U.S. AID Mission, Cairo

Mr. Edgar Pike
Office of Technical Support, Bureau for Near East
Washington

NATIONAL BUREAU OF STANDARDS

Dr. Kurt Heinrich
Chief, Office of International Relations

Dr. Sam Chappell
Senior Standards Specialist, Office of Domestic and International Measurement Standards

NATIONAL INSTITUTES OF HEALTH

Mr. Howard Metz
Biomedical Engineering and Instrumentation Branch

CATHOLIC UNIVERSITY OF AMERICA

Dr. Bahaa El-Hadidy
Graduate Department of Library and Information Sciences

GEORGIA INSTITUTE OF TECHNOLOGY

Dr. Vladimir Slamecka
School of Information and Computer Science

UNIVERSITY OF WISCONSIN

Dr. Norman Huston
Director, Instrumentation Systems Center
College of Engineering

Mr. Edward Falk
Instrumentation Systems Center
College of Engineering

B. General Discussion Highlights

Mr. James Riley, program officer for technical and administrative direction of the Applied Science and Technology Program for the AID Mission in Cairo, was specifically invited by Dr. Hassan Ismail to comment on the program for the Mission. Mr. Riley first outlined the Mission evaluation process to be as follows:

- specific evaluation of the Applied Science and Technology Program (Project 263-0016) following the guidelines given in the original Program Agreement, and
- a broader evaluation of science policy in Egypt looking at institutional structures and R&D linkages to end-users. This latter review would examine the impact of current science and technology policy on Egyptian economic and social development.

Looking specifically at Phase I, the project identification and initiation aspects as well as the training activities in R&D management and in equipment maintenance and repair, Mr. Riley was asked by the Mission Director, Mr. Donald Brown, to report that:

- U.S. personnel inputs in Phase I seemed "high," and therefore costly. The AID Mission asked the JCC to reduce U.S. personnel inputs in Phase II.
- greater emphasis during Phase II should be directed to economic and social returns of the projects
- greater emphasis should be placed upon science policy formation during Phase II.

The President of the ASRT, Dr. Hassan Ismail, replying to Mr. Riley's remarks, agreed that Phase II should demonstrate a greater degree of

Egyptian management of the projects. One change in the ASRT that Dr. Ismail has already set in motion is a reorganization of Academy Councils as advisory groups to the ASRT President. The Councils will set overall policy guidelines in their respective areas of R&D (agriculture, health, industrial development, manpower and training, etc.) and assist in monitoring projects which are supported by the ASRT grants system. Already, the trend of support is toward applied R&D linked with priority national goals (food production, housing, etc.)

Several JCC members commented upon the AID reference to "high" U.S. (and Egyptian) personnel inputs and stated that:

- it is the diversity of the Applied Science and Technology Program that requires experienced, highly skilled, and broadly representative manpower inputs.
- if one goal is to encourage both multidisciplinary and multi-institutional projects under 263-0016, those activities will naturally require extensive technical and managerial inputs.
- nearly 100 percent of the U.S. manpower inputs on advisory panels, study missions, and on the JCC itself have been given on a pro bono basis.
- the large number of U.S. institutions that have been involved as sites for Egyptian observation and study visits do translate into specific (and heavy) personnel involvement, but these inputs have also been provided on a pro bono basis.

Dr. H. Guyford Stever (U.S. panel) and Drs. Al-Gabaly and Al-Rahman (Egyptian panel) underlined their understanding that the Applied Science

and Technology Program was intended to shift leadership and involvement from U.S. to Egyptian scientists and engineers as the program progressed from Year 1 to Year 5.

The Policy formation emphasis referred to by Mr. Riley was viewed by JCC participants as a "new" concern which could be added during Phase II but would require new resources beyond those which the JCC had already contemplated for the more limited, program-related policy and management functions (Element 1). To differentiate the larger science and technology policy questions from "management policy" issues of the program, the JCC members suggested that an additional program element, hereafter referred to as National Policy Measures for Science and Technology, be added to the Phase II program planning.

C. Evaluation of Demonstration Projects

1. More and Better Food

JCC members remarked that the More and Better Food project is extremely diverse, involving plant and animal production; nutrition studies; medical observation of food-nutrition patterns and their effects upon growth in village children; design, operation, and monitoring a nutrition intervention experiment; and conducting food technology advisory activities for industry. In support of this multifaceted program, Dr. M. Kamel (Director, NRC/Cairo) observed that the More and Better Food Program "demonstrates" exactly the type of activity needed in Egypt--it addresses real problems, it involves villagers as well as a variety of researchers and administrators, it gathers together the experience and skills in many disciplines, it proceeds from "known" information to clearly outlined goals, and it challenges the skills (management as well as technical) of

all involved. Best of all, the More and Better Food Program was "on schedule" in its laboratory support aspects, field data gathering, and advisory services to industry. The major time delaying factor, common to nearly all of the projects, is lengthy equipment procurement procedures and deliveries.

One JCC member observed that the ASRT Agricultural Council was reviewing the More and Better Food Program and might suggest some reorientation to the JCC at its November 1980 meeting. The reorientation might, for example, take the form of recommending a separation of the food technology program aspects (which could then become a "new" R&D project) from the village "demonstration" program activities.

Dr. Stever summarized the consensus of the JCC members by stating that progress is evident and that resources should continue to be made available to the More and Better Food project.

2. Biogas Technology for Rural Areas

This demonstration project is managed directly by the ASRT and assigned to the National Research Centre (Pilot Plant Division) for implementation. Dr. Kamal characterized progress during Phase I to be "excellent." The operational philosophy has been to build upon extensive biogas technology and experience by taking advantage of a United Nations training course offered in the People's Republic of China, by visiting operating biogas demonstration projects in Thailand and India, and by utilizing previous experience both in Egypt and in the U.S.A. Testing of a locally constructed digester has begun at the NRC; village selection for field studies is completed; and key persons from the villages are already participating in the technical and social aspects of the Egyptian

program. As in the case of More and Better Food, the biogas project suffers from delays in receiving equipment and instrumentation but the experimental team has been diligent to improvise and move ahead in both the laboratory design and preliminary village implementation stages of the program.

JCC members commended NRC/Cairo and ASRT program management for incorporating social acceptance of biogas technology into the project at its earliest design stage and underlined the importance of good village-level participation in the implementation of biogas digester operation at NRC/Cairo to ease the transition to village testing during Phase II.

3. New Crops for Arid Zones

Among some JCC members, the early design emphasis on nonfood crops in this demonstration project continues to be a subject of discussion. Other JCC members observed that the demonstration project should be viewed in the context of overall activities of the Ministry of Agriculture and the National Agricultural Centre; therefore, a modest effort on new "cash" crops for arid zones seems eminently reasonable.

Field activities have not yet begun. Phase I has consisted of bringing together three Egyptian resource groups -- from Ain Shams and Al Ahzar universities and from the Plant Production Department of NRC/Cairo. The project design provides for the use of nonirrigated lands which are not currently thought to be suitable for food production; nevertheless, Dr. Al-Gabaly suggested that the project management committee carefully evaluate: (a) marginal lands as primary sites for implementation and at the same time consider food crops as a part of the overall plan, (b) salt tolerant, drought resistant plants in the choice of crops for the project

D. Evaluation of R&D Projects

During the JCC members' general discussion on R&D projects, attention was directed toward the question of priorities and potential economic/social returns from the individual projects.

With respect to priorities, Dr. Kamel and others reminded the group that the Program Agreement gave a very broad framework of problem areas for project selection (i.e., plant production and protection, animal research and fisheries, soil and water resources, medical research, building technology, industrial research, petroleum and mineral resources, energy research, transportation and physical-electronics applications). The NRC's three R&D projects (phosphate ore beneficiation and fertilizer production, corrosion causes and control, and wool scouring and wool wax utilization) fit well into these guidelines. Furthermore, the R&D methodology is one which emphasizes the participation of end-users at each stage of project design and implementation.

The original idea for many of the R&D projects arose from a joint Egyptian Chemical Society-American Chemical Society symposium held in December 1977 which had an applied problem orientation; moreover, participation in the symposium included significant industrial representation. In the design of the three NRC/Cairo R&D projects, joint NRC/Cairo-industry teams were formed, written agreements of participation were made with the three respective industry sectors (fertilizers, petroleum and textiles) and the work is proceeding both at the Centre and in the industries. This partnership in research with industry is somewhat new in Egypt and is a step in the direction of contract research common to the industrial sector in the USA.

Dr. Gilbert White of the US panel raised a different point. He stated that the coupling of R&D to practical end-use is not easily accomplished, nor are there "sure" mechanisms that work consistently. For example, demonstration projects and R&D projects, when conscientiously conducted often have such intense personnel inputs in the pilot village, or the counterpart industrial laboratory, that it is often difficult to "generalize" the results and adapt them on a broad basis.

Dr. Al Gabaly emphasized a similar theme by stating that the U.S. experience with extension services, particularly in rural areas, is not applicable to Egypt, where agricultural land holdings are small, typically are non-contiguous, and where the education process for the average farm worker is far less formal than in the USA. For all of these reasons, extension services based on the U.S. model have not been effective in Egypt.

Dr. Carter (U.S. panel) added that the ability to grow a crop or produce a manufactured product is far different from the demonstration that the new goods have markets. She recommended that market development studies and promotion activities be incorporated into demonstration and R&D programs.

Assessment of the wool scouring and wool wax project raised questions regarding its priority for Egypt. Drs. Kamel and Weldes replied that (a) the wool processing industry is an export earner for Egypt, (b) the project represents a class of applied research for which there is a good potential market in Egypt <u>if</u> NRC proves its ability to respond promptly and successfully, and (c) the project has particularly good industry-NRC

24X

linkages. Thus, it is an example of an R&D problem and R&D management method which the Applied Science and Technology Program is designed to promote.

Dr. Hassan Ismail presented a newly revised R&D concept for the Red Sea Fisheries project of the Institute of Oceanography and Fisheries. Four specific activities have been identified: (a) determination of the pelagic (open sea) commercial fisheries potential in the Foul Bay area of the Red Sea; (b) determination of the relative abundance of deep-water shrimp from the Gulf of Suez to the Sudan frontier; (c) identification of the relative abundance of reef fishes in the Foul Bay area; and (d) determination of commercially available spiny lobsters in the coastal reefs. If any or all of the above assessments prove commercially feasible then the questions of fleet size and preservation of catch will be addressed. Results of these surveys could be completed within approximately 18 months if a suitably equipped vessel can be provided for the work. It is believed that a small rented vessel with rather standard fisheries survey equipment can be obtained in 1980. Project principal investigators will be appointed in Egypt and further joint R&D design work will be undertaken prior to the November 1980 JCC meeting.

E. Evaluation of the Science and Technology Information Project (STI)

The STI Project was developed jointly by NSF and the Egyptian National Information and Documentation Centre (NIDOC) and consists of a design study (including a computer accessed information experiment as well

as a current information resources planning inventory) plus an in-service training activity. NSF, with the cooperation and assistance of the ASRT, has selected the Georgia Institute of Technology as contractor for the design study; Catholic University of America was selected for development and direction of an in-service training program for Egyptian information specialists.

The JCC members' consensus was that although the STI Project's start-up time was long, implementation of the design study and in-service training was proceeding intensively by February 1980.

F. Evaluation of Instrumentation Technology (IT)

The IT component is aimed at developing institutional capability to maintain and repair (M&R) scientific instruments for use in ASRT sponsored applied research. The activity is multi-institutional in character with the following organizations actively participating: National Research Centre (NRC/Cairo); Scientific Instruments Centre (SIC); Universities of Alexandria, Assiut, Cairo, El-Minia, and Tanta; University of Wisconsin Instrumentation Systems Center (UW/ISC); and National Institutes of Health Biomedical Engineering and Instrumentation Branch (NIH/BEIB).

M&R facilities are operational at all institutions. Scientific instruments are being repaired by returned trainees at the NRC, Tanta, & El-Minia Universities. Administrative procedures at the M&R facilities are still being developed. Project execution was on schedule until October 1979 when a problem occurred with the second group of trainees. This group of 16 trainees was delayed in order to satisfy USAID English language proficiency requirements. This has now been completed, and

departure scheduled for March 1980. M&R training schedule has therefore been delayed five months.

Alexandria University was added to the original four universities in late 1979. The first trainee from Alexandria was to travel to NIH/BEIB in March, 1980. Planning for the M&R facility at Alexandria has been initiated.

The consensus of the JCC membership is that there has been success and notable progress in establishing M&R centers, in training the associated personnel and in procuring equipment. However, certain aspects of equipment procurement have experienced excessive delays which have been a major constraint in the overall program. Continued work to improve procurement is essential.

G. Evaluation of Policy Planning and Management

(The JCC has defined this to involve only policy planning and management at the level of the Applied Science and Technology Program).

A management problem affecting this program and nearly all Egyptian S&T programs is one of personnel loss to countries outside Egypt. This situation arises because Egyptian salaries at all levels in the universities, research institutes and the government are far below the real market value for the services of well-trained persons. The effect is a brain-drain within the region to the oil producing countries, Western Europe and the USA, where salaries are much higher. In addressing this problem, Dr. Hassan Ismail stated it to be "an Egyptian problem" independent of science and technology. The consequences of the brain

drain are such that the government is now addressing the situation and action is expected by 1981.

Dr. Al-Kholy addressed two aspects of the R&D management training component of this program element. He stressed the need to institutionalize management training within Egyptian institutions. Furthermore, he suggested that case studies based upon Egyptian R&D experience need to be prepared as a tool in local management training institutions.

At the level of the specific R&D mamangement workshops conducted by the Denver Research Institute (DRI) there was a discussion of the goal, or objectives of the four programs held in Denver. Dr. Kamel (NRC/Cairo Director) stated that the workshops were originally considered to be broad, in-service type training for high-level, carefully selected Egyptian scientists and engineers who are now involved in R&D management. The courses would examine current methods, information tools and philosophies of management stype practiced in the USA and other industrialized countries. There was no thought that short-courses would be able to offer in-depth management training. Courses could be primarily a catalyst for change; one element in a series of management reforms.

Some JCC members approach R&D training from a different point of view. First, they believe that in-depth training is required and that such in-depth training on R&D management must be given in Egypt if it is to be relevant to Egyptian conditions. Further, Egyptian-experience must be the focus of the curriculum rather than experience of the USA, Europe and Japan. These persons also place heavy emphasis upon the creation of an Egyptian institutional base for R&D management training. Thus, one philosophy is

that R&D management skills are acquired by "in-service" experiences supplemented by short-term management-oriented training; the second is a more formal process approach which considers "managers" to be specifically trained for their roles. A definitive resolution of these differing points of view was not made by the JCC members but there was general agreement that the forthcoming DRI workshops in Cairo would be introductory in scope, designed primarily for "in-service" scientists and engineers who have not had extensive or formal management education.

3

Ref. No. JCC 5-1

December 1979

APPLIED SCIENCE AND TECHNOLOGY PROGRAM

IN EGYPT

OVERVIEW AND INPUTS FOR EVALUATION

PROJECT 263-0016

Prepared by

ACADEMY OF SCIENTIFIC RESEARCH AND TECHNOLOGY

CAIRO, EGYPT

F O R W A R D

This report was prepared by the Egyptian Academy of Scientific Research and Technology to evaluate the progress of the Applied Science and Technology Program, specifically, all its Phase I activities, from the program's inception in 1977 through December 1979.

This report also provided guidelines, objectives, and possible recommendations for Phase II planning, which had been identified during previous meetings of the Joint Consultative Committee (JCC).

This document served as an input for the JCC "self-evaluation" which took place during their Fifth Meeting in Washington, D.C., February 25 - 27, 1980.

CONTENTS

		Page
I.	SUMMARY	i
II.	INTRODUCTION	1
III.	REVIEW OF ACTIVITIES	2
	A. GENERAL	2
	B. POLICY PLANNING AND MANAGEMENT	4
	C. DEMONSTRATION PROJECTS	7
	1. More and Better Food	7
	2. Bio-Gas Technology	10
	3. New Crops for Arid Zones	11
	D. R & D PROJECTS	12
	1. Phosphate Ore Beneficiation	13
	2. Wool Scouring and Wax Recovery	13
	3. Corrosion Monitoring and Control	15
	4. Red Sea Fisheries	16
	E. SCIENTIFIC AND TECHNICAL INFORMATION SYSTEMS	16
	F. INSTRUMENTATION TECHNOLOGY	17
IV.	INPUTS FOR PROGRAM EVALUATION	19
V.	PLANNING FOR PHASE II	38

I. SUMMARY

The Joint Consultative Committee of the Applied Science and Technology Program held its Fourth Meeting on November 6 - 8, 1979, at the ASRT Headquarters in Cairo to review progress in the program and to recommend initiatives for the future.

The Fourth JCC Meeting marked approximately 18 months of activities in the Program, with 11 months away for completion of Phase I, scheduled October 1, 1980. Before Phase II activities can begin, AID plans to evaluate the accomplishments of Phase I, and to formulate a detailed plan for Phase II (October 1980 - October 1983). Therefore, the JCC discussed at its fourth meeting a methodology for an evaluation program activities during Phase I and the content of activities for Phase II.

The fifth JCC Meeting planned for February 25-27, 1980, will be addressed to two major items

1. Final Recommendations to AID for the Phase II Plan.
2. A JCC-self evaluation report on progress made during Phase I.

This document is a status report that gives an overview on the progress made during Phase I (as to Dec. 1979), and speculations for continuity of on-going projects during Phase II. Two additional documents are submitted with this status report as inputs for JCC-5:

1. A Summary Progress Report "Technical Reports prepared by Team Leaders".
2. A Phase II - Planning Document "Prepared Jointly by all Parties Involved in the Project.

II. INTRODUCTION

The Applied Science & Technology Program emerged as a result of intensive planning efforts by the Academy of Scientific Research and Technology (ASRT) and representatives of the United States scientific community, together with officials of the U.S. Agency for International Development (AID). The Program addresses Egypt's desire to strengthen its national research and development (R&D) management capabilities and to utilize its R&D resources in solving critical economic and social problems. The activity is covered under AID Project Number 263-0016, a project grant agreement signed by the two governments on March 29, 1977.

The Agreement includes six basic Elements:

1. Policy Planning and Management of R&D;
2. Demonstration projects, multidisciplinary in scope, directed to priority areas of development;
3. R&D projects also directed to priority areas;
4. Scientific and technical information systems;
5. Procurement of scientific instruments and equipment; as well as training in their maintenance and repair; and
6. Planning for years 3, 4, and 5 (Phase II).

A contract between AID and NAS/NRC was signed in December 1977 for the implementation of elements 1, 2, and 3. An interagency agreement between AID and NSF for elements 4 and 5 was completed in September 1978. All Egyptian and American parties are jointly responsible for element 6, Phase II planning. The time period for Phase I has been continued until October 1, 1980, with US$8.1 million and Egyptian Pounds 895,000 allocated by AID for those activities. This report summarizes the activities as to

39X

December 1979; more complete accounts of the individual projects are given in separate reports prepared by Team-leaders, NAS/NRC, and NSF.

III. REVIEW OF ACTIVITIES

A. GENERAL

The purpose of this report is to give an overview on the past, present and future activities of the Applied Science and Technology Program.

Coordination of program planning necessarily involves at least five main groups: AID, NAS, NSF, ASRT, and NRC. In the course of implementation three American Institutes are being involved: Denver Research Institute, Georgia Tech., Catholic University. Also, a total of 22 American panelists joined in the processes of planning, monitoring and assessment of Demonstration and R. & D. Projects.

At present, the program is extending its activities in a total of about 30 Egyptian sectors. The number of personnel involved in program activities exceeds a total of 679. The following gives estimates of personnel and their sectorial belonging; as destributed among program components:

	ASRT/NRC and Affiliated	Universities	Ministries	Industry	Total
I. S.&T. Management Training:					
1. Denver Workshops	42	1			43
2. Cairo I */	24	48	6		78
3. Cairo II */	30	120	30		180
II. Demonstration Projects					
1. More and Better Food.	143	3	29	8	183
2. Bio-Gas	21		6		27
3. New Crops	1	2	2		5
III. R.&D. Projects					
1. Phosphate	18			1	19
2. Wool Wax	8			8	16
3. Corrosion	28			15	43
4. Red Sea Fisheries	3				3
IV. S.&T. Information					
1. Training	5				5
2. Steering Committee	2	2	3		7
3. Task forces	13	20	15		48
V. Instrumentation					
1. M.&R. Training	10	4			14
2. Steering Committee	3	5			8
TOTAL	351	205	91	32	679

*/ Based on requests for participation.

A summary bar chart for the whole "Applied Science and Technology Program is included for easy reference (covering both Phase I and Phase II).

B. POLICY PLANNING AND MANAGEMENT

1. The Joint Committee (5 U.S. members, 5 Egyptian members, and the President of ASRT "Chairman") was established early in 1978, and held four meetings during the last two years.

JCC-1	May 1978	Cairo
JCC-2	November 1978	Washington
JCC-3	March 1979	Cairo
JCC-4	November 1979	Cairo

JCC-5 is scheduled to be held in Washington on February 25-27, 1980.

2. The NRC senior resident advisor (Dr. Helmut Weldes) was hired by NAS in November 1978, posted to Cairo early January 1979, and is expected to remain in Egypt throughout Phase I.

3. The ASRT senior resident advisor has been deleted for Phase I for various significant reasons.

4. Phase II Planning is closely following a time table set at JCC-2

JCC 3- * Approval of criteria for project selection;

* General overview on Phase II Plan

JCC 4- * Document on Phase II Planning Jointly prepared by ASRT, NRC, NAS, NSF and AID.

* Discussion on Phase II Plan-format and Method of Presentation to AID.

JCC 5- * Approval of format and content of Phase II Planning Document.

* Final approval of projects for Phase II.

April 1980 : Presentation of Phase II - Plan to USAID-Cairo.

May/Sept. 1980: USAID-Cairo in-house operations

* Project Paper (PP)
* Project Agreement (Pro Ag)
* Project Implementation Orders (PIOS)
* Host Country Agreement with ASRT

October 1, 1980: Start of Phase II (3 years)

5. JCC - Self Evaluation of Project Progress (Phase I):

JCC 3 * recommendation to submit a document on self evaluation process.

JCC 4 * ASRT, NAS prepared the document

* Plan approved

JCC 5 * JCC self evaluation report prepared immediately after JCC-5, and submitted to AID as an input in AID-In-House evaluation.

6. Management Education Workshops:

6.1. Completion of four workshops at Denver Research Institute (June - September 1979).

* Workshops covered:
  - R&D management of projects and institutes
  - Techno-economics of Projects
  - R&D marketing
  - Technology assessment

43A

* Forty three Egyptian scientists, engineers, economists and other specialists participated in workshop.

* Participating bodies include management officials from: ASRT, NRC, Petroleum Research Institute, National Institute of Standards, Scientific Instrumentation Centre, Institute of Oceanography and Fisheries, Institute of Astronomy and Geophysics, Institute of Metallurgy and Cairo University.

6.2 NRC and ASRT started a plan of action to involve DRI-Trainees in process of S&T management in both institutes.

6.3 Plans for a second series of R&D managment workshops has been terminated to take place in Cairo early in 1980. This will include:

- 5 Day Survey Course for Senior Staff of the following sectors (February 6 - 11, 1980)

Sector	Level	Participants
ASRT & Affiliated	* Directors of Institutes * Heads of Department	24
12 Universities	* Vice - Deans of Faculties (Post-Graduate, and Research)	48
Ministries	* Vice - Ministers of - Industry, Agriculture, Health, Electricity, Energy, Transportation, and land reclamation	6
	Total	78

- Specialized workshops (March 15 - May 7, 1980)

	Duration (W)
- R & D Management	
- Proposal Preparation and Report Writing	1
- R & D Marketing	1
- Techno-economics	2
- Technology Assessment	2

* Participants in each workshop come from sectors given before, and are personnel involved in R&D programs and projects in their sectors. Numbers vs. sector (Given as total for the 5 workshops)

Univ.	ASRT/Affiliated	Ministries & Industry	Total
120	30	30	180

* Participants at the Denver Workshop will be involved in the Cairo programs.

C. DEMONSTRATION PROJECTS

1. More and Better Food

This is a multidisciplinary project coordinated through the NRC/Cairo had its program design essentially completed by the first meeting of the JCC. Original work plan was put by NRC-Staff, reviewed and approved by an Advisory Committee that had as members (2 former-Ministers of Agriculture, a former-Minister of Land Reclamation, a former-Minister of Commodities, advisor to present Minister of Agriculture, present Dean of Faculty of Agriculture, Alexandria University, and a Professor of Nutrition). Final

project document was reviewed by a 3-membered U.S. Panel (Agronomist, Nutritionist, and Food Technologist). A Steering Committee for the Project was established on May 1978, and helds 3 monthly meeting (on average) to follow-up progress.

The project consists of three major elements:

- Agricultural and animal resources studies involving two Egyptian villages, Kafr Al-Khadra (old lands), and Omar Makram (new lands), designed to improved the productivity and quality of food produced;
- Nutrition studies of the traditional diet in the two villages, designed to improve the diet of nursing mothers and primary school children through a comprehensive education and supplemental feeding program; and
- A parallel endeavor by NRC/Cairo and participating food industry scientists to solve problems in cottonseed oil manufacturing and production of Damietta cheese.

The project involves 183 scientists and support personnel from: NRC 143, ministries 29, industry 8, universitier 3.

Base-line information on agricultural and animal resources is collected and analyzed for the two-above mentioned villages. This information includes data on cropping systems, soil types and fertility, irrigation and drainage systems, fertilizer practices, agricultural and animal pests, and pesticides used. In order to develop a model for increasing crop production, the project team, using small-scale technology transfer, introduced the support-and-wire method for intermediate tomato production to the Kafr El Khadra area. Preliminary results demonstrated the feasibility of increasing tomato production four-fold by this simple change in cultivation practices. Other projects include parallel cultivation of 2 crops "faba beans/trigonella,

onion/soya bean". Identification of insect pests in the village areas indicates that greater attention should be focused on pest control and monitoring, if food productivity is to be increased. Finally, milk production and processing studies are underway to assist the Egyptian farmers in increasing productivity by simple interventions within their economic means.

The nutrition studies in the villages have been greatly aided by local doctors who provide village clinical data. This data, although limited, reveals a considerable degree of malnutrition and parasitism, resulting in retarded growth among children. The mortality rate of infants under one year of age is relatively high, with diarrhea and malnutrition identified as the main causes of death.

The NRC/Cairo, working with the El Nil Pharmaceutical Company, producers of "Supramine" (the only Egyptian manufactured high protein food supplement) have identified the major problems in this product's market acceptance, storage life, and nutritional value. Studies are underway at NRC/Cairo to improve taste, quality, and general acceptability (ease of formulation, texture, odor, etc.) of supramine.

In the food technology area, NRC/Cairo studies on the refining of color-fixed cotton seed oil have moved to a semi-pilot stage (50 kg batch) with the design, manufacture, assembly and testing of the semi-pilot plan apparatus. Similarly, testing of various manufacturing methods for the production of soft white cheese (Damietta type) from whole and skim milk powder continue in the NRC/Cairo laboratories with the participation of Misr Milk and Food Company technical staff.

A summary document on progress made in the Project during Phase I is submitted separately, and enclosed is a bar chart for Project (covering

47 X

both Phase I and Phase II).

2. Development and Application of Bio-Gas Technology in Rural Areas of Egypt

This project, approved by the JCC in Nov. 1978, explores methods of converting agricultural, human, and animal wastes, into methans for small scale energy use. The project has been assigned to the Pilot Plant Division of NRC/Cairo. A management Committee meets biweekly to coordinate all inputs into the work, recommend necessary actions, and serves as information/communication forum.

The project involves 27 scientists and support personnel from NRC 21, ministries 6.

Management Committee members visited biogas projects in Thiland, China, India; and the engineering group leader attended a four-week U.N. Environment Program financed training seminar in China.

The five multidisciplinary sub-groups comprising the biogas technology project are: laboratory and bench scale research, fertilizer evaluation, engineering, fundamental microbiology, and sociological aspects. Each of the five groups has been active since the last project report to the JCC in March 1979. The laboratory and bench scale group is measuring methane production from various mictures of cow dung, maize and sewage typical to the demonstration villages. The fertilizer evaluation group is assessing the nitrogen and phosphorus value of the digester effluents as well as bacteriological and other side effects which can occur from the use of these effluents on crop producing lands. The engineering group is constructing and testing a proto-type biogas digester at the NRC; delay in obtaining local currency funds resulted

in a two-month time loss and further delays are anticipated if equipment and instrumentation procurement from the United States is also delayed. The sociological group is collecting data among families in five villages chosen as test sites for the project.

A summary document on progress made in Phase I is submitted separately, and a bar chart for the project is enclosed (covering Phase I, and Phase II).

3. New Crops for Arid and Semi-Arid Zones

In JCC - 2 (Nov. 1978) a preliminary proposal for the project was considered by the Committee, in view of the project's potential for agricultural production, and it was recommended that further design be undertaken through a joint committee.

The joint committee met in January 1979, when a 4 membered U.S. Panel arrived to discuss plans for the project.

In JCC-3 (March 1979) it was recommeded that the project be restricted to unconventional crops, the program design be modified accordingly, and a sum of $ 300 thousand be allocated for Phase I initiation studies.

In April 1979 a steering committee was established, modified the plan and specified needs of equpment, materials and supplies, which were passed to University of Wisconson for procurement. A committee member visited specialized arid land research institutes in U.S. for consultation on project plan and needed training.

In JCC-4 (Nov. 1979) A modified program was presented, but further modification was requested. A final program was prepared and is ready to be discussed with a 3-membered U.S. Panel who are due to

visit Cairo on Jan. 19 - 22, 1979. The final plan is to be submitted to JCC-5 (February 1980).

It is expected that initiation of implementation of the project will be during the last six months of Phase I. This will include area selection, site/Laboratory preparation, equipment/seed selection and procurement, and training. Full project implementation and execution is expected during Phase II.

A bar chart diagram is enclosed for easy reference on expected project implementation schedule.

C. RESEARCH AND DEVELOPMENT PROJECTS

R. & D. projects according to the criteria that were approved by the JCC are:

* Projects must be directly related to national development priorities.
* Projects must be geared to the solution of critical development problems.
* Projects must demonstrate end-user participation.

The JCC approved the following R. & D. Projects:

1. Phosphate Ore Beneficiation
2. Improving the Processing of Wool Scouring and Wool Was Recovery.
3. Corrosion Monitoring and Control in the Petroleum Industry.
4. Development of Red Sea Fisheries.

The first three project are in progress, and summary reports are given in separate document. The fourth project is still in the planning stage.

Bar charts for the projects are given (covering both Phase I and Phase II).

1. Phosphate Ore Beneficiation

The goal of the project is to conduct laboratory and pilot plant studies of Egyptian phosphate ores, their conversion to phosphoric acid and phosphate fertilizers, and utilization of process waste products. The technological and economic studies are conducted at NRC/Cairo in collaboration with the Egytian industrial sector.

One element of the project entails NRC staff training. Two senior chemists visited the U.S.A. for one month in October 1979 on a study and observation tour of phosphate fertilizer mining (Utah and Florida) beneficiation and mining equipment manufacturers (Colorado) and phosphate fertilizer R&D (International Fertilizer Development Center and Tennessee Valley Authority in Alabama). Two NRC engineers also spent two and one half months each at the international Fertilizer Development Center working in the ore beneficiation and wet chemical processing pilot plants.

Another project component involves ore beneficiation studies. While equipment orders remain undelivered, the NRC group has been conducting bench-scale beneficiation studies (both wet and dry) on ore samples from Abu Tartour and the Western desert regions of Egypt. An ore beneficiation pilot plant is also being equipped and should become operational in 1980.

2. Improving of the Processing of Wool Scouring and Wool Wax Recovery

The objective of this project is to determine from known technology how the recovery of wool wax may be significantly improved without harming the primary end-product (wool fibre) and at the same time to

decrease the volume of effluents discharged as wastes. The project requires both technological and economic optimization.

The NRC's Textiles Research Laboratory works jointly with the Misr Beida Dyers Company, near Alexandria, on this project. The Misr Beida Dyers Company is the only industrial plant in Egypt (public sector) which does wool scouring (cleaning of raw wool to remove dirt, natural waxes and extraneous materials). The total quality processed is 8,000 metric tons annually with a recovery of approximately 200 metric tons/year of a wool wax product. Because the scouring process is inefficient, another 200 etric tons/year is lost as waste.

There are two processes currently under investigation to improve the wool scouring and wax recovery operation. One process, the "Lo-Flo", developed in Australia, has a number of attractive features, is used commercially in the United Kingdom, and its available at minimum licencing costs. An additional advantage of Lo-Flo is that existing equipment at Misr Beida Dyers Company could be adapted without major building modifications. A second process, developed by the Wool Research Organization of New Zealand and known by the actonym WRONZ, is also being investigated. The Director of Misr Beida Dyers observed pilot plant operation of the Lo-Flo process in Australia. A technical team went last January to the United Kingdom to study the commercial scale process and discuss licencing arrangements with the International Wool Secretariat. Project team members will also visit the United States to observe and discuss conversion of wool waxes to lanolin and other high-quality products for the pharmaceutical and cosmetics industries.

Detailed data-gathering of the current wool scouring process and operational parameters are presently underway at the Misr Beida Dyers Company plant. Laboratory and pilot plant testing of variations on the Lo-Flo and WRONZ wool scouring techniques must await delivery of continuous centrifuge equipment on order in the United States.

3. Corrosion Monitoring and Control in the Petroleum Industry

Recognizing the economic losses in Egyptian industry due to metal corrosion, the National Research Centre has formed a multidisciplinary team of chemists, physicists, metallurgists, and engineers to study the problems of corrosion, prepare inhibitors for various corrosion situations, and work with industry in minimizing the adverse effects of corrosion. The NRC's corrosion project has a two-fold purpose: (a) to collaborate with the Suez Oil Refining Company to combat the unusual corrosion problems resulting from the refinery's idleness during the 1976-75 war years, and (b) to strengthen the corrosion laboratory at the NRC/Cairo to undertake a broad spectrum of applied corrosion R&D problems.

The NRC/Cairo and the Suez Oil Refining Company have signed a formal cooperative agreement which assigns a joint technical team specific responsibilities for investigating major corrosion problems at the refinery. The co-principal investigator for NRC/Cairo, Dr. A.A. Abdul Azim, has consulted with Dr. E. Snavely, a corrosion specialist at the Mobil Research Laboratory in Dallas, Texas, on the R&D plan. Equipment for the NRC/Cairo corrosion laboratory has been orderd; basic data are being collected at the Suez refinery: and a literature survey of industrial corrosion problems is underway. Another team has begun its preparation and testing of corrosion inhibitors, while samples of corrosion damage (pitting, galvanic and stress) are being collected from the

refinery.

4. Red Sea Fisheries

The goal of this project is to determine fisheries resources in the area south of the Gulf of Suez and assess their commercial potential.

In September ASRT President Hassan Ismail appointed a new Egyptian steering committee to conduct an in-depth review of the project. The committee includes Dr. H.A.F. Gohar (a former director of the Institute of Oceanography and Fisheries), Dr. R. Baycumy (current director of the Institute), and Dr. A. El-Fetouh Abdel Latif (Secretary General of the ASRT). Since the project review was not completed by early November 1979, a report will be presented at the next JCC meeting. In February 1980, a U.S. technical group of fisheries specialists is expected to visit Egypt to assist the Egyptians in this task. The U.S. specialists will include persons with extensive experience in fisheries research management, in boat and gear design for fisheries research, and in remote sensing and instrumentation.

D. Scientific and Technical Information Systems (STI)

The STI Project is managed by the ASRT with the assistance of the U.S. National Science Foundation (NSF). Phase I project components include: (a) a planning and design activity to determine the current status and assess the priority needs for an operational scientific and technical information pro ram at the National Information and Documentation Centre (NIDOC), and (b) an in-service training project to prepare a core group of information specialists for the Egyptian institutions associated with the project.

Between the third and fourth JCC meetings all procedures were completed in the NSF competitive bidding process to select contractor organizations for the planning and design activity and the in-service training activity. Contracts were awarded in October 1979 to the Georgia Institute of Technology (Prof. Vladmir Slamecka as project director) for the STI design study, and in November 1979 to the Catholic University of America (Dr. Bahaa El-Haddidy as project director) for the in-service training project. The principals involved in both activities visited Cairo during November for detailed planning in order that an STI design assistance team may begin work in January 1980 in Egypt. The first group of Egyptian trainees begin their training in the United States last January.

E. Instrumentation Technology

The Instrumentation Technology (IT) project has developed from a jointly recognized need that maintenance and repair personnel for scientific instrumentation and equipment are in critically short supply in Egyptian universities and in all ASRT-affiliated institutions. The IT project goals are to: (a) train a cadre of maintenance and repair (M&R) specialists for the Scientific Instruments Centre (SIC), the National Research Centre (NRC) and five Egyptian Universities (Assiut, Cairo, El-Minia, Tanta and Alexandria), and (b) to assist those institutions in strengthening their M&R capabilities by providing core equipment and advisory services.

The IT project is managed by the ASRT with the assistance of the NSF and two principal U.S. contractors, the University of Wisconson (Instrumentation Systems Center) and the National Institutes of Health (Biomedical Engineering and Instrumentation Branch). The University of

Wisconsin contract, effective as of April 1979, is designed to assist the NRC and SIC both in the training of personnel and the organization of the M&R facilities at the two institutions. Wisconsin also assists the ASRT and USAID in a technical advisory capacity in the procurement of instrumentation and scientific equipment under the Applied Science and Technology Project. Since April, six staff members of NRC and SIC have been training for three and six month periods at the Instrumentation Systems Center (ISC) of the University of Wisconsin. An employee from the ISC is expected to take up residence at the NRC/Cairo in January 1980 for one year to assist in establishing the new M&R facility and to aid in local training of additional maintenance and repair specialists.

Four staff members from the Egyptian universities have completed six months of M&R training at the National Institutes of Health. M&R facilities are now being assembled at these universities. A second group will be sent to U.W. and NIH for training, that will start on February 1980.

Am.N.

IV. INPUTS FOR PROGRAM EVALUATION

The Applied Science and Technology Program Agreement between the Government of Egypt and the US AID provides for two evaluations of Phase I (January 1978 - October 1980) activities prior to initiation of Phase II (October 1980 - October 1983). One evaluation was conducted by AID/Cairo in April 1979 but the report was not available by the November 1979 JCC meeting. A second, external evaluation is to be assembled by AID/Cairo prior to April 1980 to assess:

- the ability of the Egyptian organizations participating in the projects to conceptualize, select, and manage goal-oriented research;
- the improved institutional capabilities of the Egyptian scientific and technical community to engage in priority projects related to social-economic development; and
- the recommendations of the Egyptian and U.S. participating groups for continuation of the Applied Science and Technology Program into Phase II.

The Joint Consultative Committee at its Third Meeting agreed to conduct its own "self-evaluation" to: (a) discuss and measure (where feasible) the validity of the overall program concept and approaches taken by the individual sub-project elements, (b) identify changes or actions that could improve efficiency, (c) identify needs outside the program that have not been addressed by must be undertaken before longer term goals can be reached, and (d) examine both the technical and non-technical content of the sub-projects in light of the resources made available.

Written reports from the ASRT and NRC/Cairo, the NAS/NRC and its senior advisor at the NRC/Cairo, the NSF, and US AID/Cairo will provide inputs to

the JCC self-evaluation. At the February 1980 JCC meeting in Washington the JCC will examine all data from the groups, discuss the validity and implications of information, and prepare a report to the ASRT President giving an assessment of Phase I. This report will guide the Phase II plan to be submitted to US AID in Cairo.

All reports and data will be available to the JCC members for study by February 10, 1980.

The following inputs can be considered by the Joint Consultative Committee in the evaluation process:

A. Status of Program Components and Elements

The following gives a resume on the status as to Dec. 30, 1979, with reference to the plan of action as has been described in the program document.

1. Policy Planning and Management

1.1. Establishment of JCC: early 1978, held 4 meetings during 1978-1979, JCC has been functioning as planned as body responsible for reviewing program activities and making recommendations on future course of action.

1.2. Senior Advisors to NRC, ASRT; NRC - Advisor was hired by NAS Nov. 1979, posted in Cairo Jan. 1979. Advisor has been actively participating in program management at NRC. ASRT-Advisor has been deleted for Phase 1 for significant reasons. ASRT and AID-Cairo mutually agreed to this respect.

1.3. Phase II-Planning closely follow time table set by JCC

1.4. Management Education Workshops:

Four workshops were completed at DRI (June-Sept. 1979) with 43 senior level participants. Groups trained are at present actively participating in programming of NRC and ASRT - R&D and S&T management activities.

A 5-day survey course, scheduled to take place in Cairo (Feb. 6 - 11, 1980) with a total of 78 senior level participants - Directors of Res. Institutes, Vice-deans of S.T. Faculties, Vice Ministers of production.

2. Demonstration Projects

Agreement document calls for 2 D.P. one for NRC (More and and Better Food) and one for ASRT (to be identified in 1 / Y time from program initiation).

2.1. More and Better Food:

Execution follow the timing of the plan. Base line data collection going according schedule, implementation of projects in villages progressing successfully beyond the schedule. Positive signs of interaction with village administrators and community. Problem; Equipment availability.

2.2. Bio-Gas Technology:

(ASRT) Approved Nov. 1978, execution started same time. Work going as planned. Problems of equipment and delay of local funding for materials and supplies. U.S. Panel reports reflect satisfaction on progress made.

2.3. New crops for Arid and Semi-Arid (ASRT).

Endorsed by JCC as a potential area for Agric. Production (Nov. 1978). Project at a stage of planning.

3. R&D Projects

Agreement Document calls for identification of 3-5 R D projects. Three projects were selected and approved by JCC (Nov. 1978 - March 1979) Phosphate Ore, Wool wax, corrosion. Work carried by NRC in collaboration with industry. Progress going satisfactorily according plan put by team. All 3 projects will continue in Phase II because of delay in equipment delivery (still being procured). A fourth R&D project still in a stage of planning.

4. S&T Information

4.1. This component experienced significant delay because of delay in

- contracting between AID and NSF (April 1978)
- subcontracting between NSF and Georgia Tech. (July 1979)
- subcontracting between NSF and Catholic Univ. (Nov. 1979).

4.2. Precontracting activities has been carried by Task forces as planned. Training at Catholic University (5 trainees) started Jan. 1980. Phase I plan anticipated to terminate October'81.

5. Instrumentation & M.&R.

5.1. Delay in AID-NSF contracting affected initial stages of component execution. A total of 10 trainees completed their program at U. Wisconson and NIH (3-6 months). Workshops for M.&R. of Equipment been delivered and will be installed Feb. 1980.

5.2. Procurement of Equipment for D. and R.&D. Projects:

- Equipment for More and Better Food (% of items procured been delivered). Feb. 1980 installation of equipment.

- Core Equipment (% of items procured been delivered)

  Feb. 1980 installation of equipment.

- Equipment for all other D.P. and R&D projects and in process of procurement.

6. Phase II Planning

   As scheduled.

B. Probable Outcome of Components and Projects

1. Policy Planning and Management

   1.1. The JCC has been actively participating in the selection of implemented projects according to criteria that meets the goal of the program. Their recommendations paved the way to more effective management control systems.

   1.2. The NRC-Advisor has been working harmonously with NRC-senior staff, principal investigators and ASRT management office. His contribution to the process of program management and follow-up is undeniable.

   1.3. Active participation of senior staff that attended DRI-workshops has been initiated both at NRC and ASRT in the management control system of the 2 institutes.

   1.4. Participants in DRI workshops will collaborate with DRI-staff in the Cairo Intensive S&T management training program.

   1.5. NRC introduced S&T management as part of their training program.

2. Demonstration Projects

   To the ASRT and NRC demonstration projects are considered a new era of practicing multidisciplinary programs directed towards

solving national development priority problems. It is also meant to learn through these programs appropriate methods of planning, management, monitoring, and end user participation. The More and Better Food involves 9 sectors, the Bio-Gas Technology so far involves 3 sectors, the New Crops Project is planned to involve 4 sectors. Management Plans for these projects are going satisfactorily according to a previous document submitted to JCC-3.

2.1. More and Better Food

- Effective involvement of researches in village problems is at present demonstrated with positive interaction from villages community and incoordination with Governments and village authorities.
- Mutual cooperation of food industry sector would open the doors for more future involvement.

2.2. Bio-Gas For Rural Development

- Laboratory demonstration of the feasibility of anaerobic digestion of waste material. Design and construction of a bio-gas digester (10 m^3) and system, from local materials, simple to operate and maintain.
- Careful selection of test village, and investigation of process parameters (engineering, microbiological, hygenic, agricultural, social and economic).

2.3. New Crops for Arid and Semi-Arid

- Selection of demonstration site (Kom-Osheim) as a pilot area for introducing selected crops (Jojoba, Guayule and non-conventional legumes). Seed Propagation and study of water

requirement, salinity, drought resistance, management techniques, and other factors for arid crops.

- Initiation of a training program that serves the goal of the project.

3. R&D Projects

Actual involvement of researchers in production problems, and collaboration of the industrial sector in the projects would certainly open the doors for more effective cooperation.

3.1. Phosphate project developing a process through the pilot plant for upgrading of low-graded Egyptian phosphate ores and their economic conversion to phosphoric acid and fertilizer.

3.2. Wool wax recovery and scouring, development and commercial implementation, and economics of process.

3.3. Corrosion in Petroleum Refining, development of corrosion inhibitors for the industry from local raw materials, and monitoring of corrosion and R&D services to the sector.

3.4. Red Sea Fisheries Development, Assessment of Fisheries resources and implementation of appropriate exploitation in Red Sea.

4. S&T Information

By end of Phase I the following activities will be terminated

4.1. First group of trainees (5) finish their training on STI and second group (10) start their program, and local training programs initiated.

4.2. Collection and analysis of data relevant to system design.

4.3. Outlines on national information policy, NIDOC design, current services, national information system structure, R&D inventory manpower development, and information needs.

4.4. Organization of Egyptian design team, and initiation of design phase.

5. Instrumentation and M&R

By end of Phase I the following is anticipated

5.1. Instalation and operation of M&R workshops at NRC, Universities of Cairo, Tanta, Assuit and El-Menia.

5.2. Second group training terminated (March - September)

5.3. More and Better Food and Core Equipment installed and operates. Procurement and partial delivery of other equipment needed for demonstration and R.&D. projects.

C. Performance of Contractors and Subcontractors

1. NAS/NRC

The NAS has been carrying their role in the project with highest effectiveness. NAS officers and management offered atmost cooperation to ASRT and NRC in program planning, implementation and management. Help offered in carrying the program activities according to schedule, selection of highly comptent U.S. panels and successful planning for managerial and technical training can not be denied.

2. NSF

Though the program experienced delay in its initiation, specially in the SAT information component, yet at present activities are going according to the final plan.

3. University of Wisconson, NIH

- M&R Training is going satisfactorily according to plans.
- Procurement of scientific equipment experienced delay-due to the tedious procedure it has to go by.

4. Georgia Tech. and Catholic Univ.

- Though it is premature to comment on the performance (sub-contracting July-Nov., 1979), yet reponsibles from both institutes are doing good efforts to start STI programs according to plan.

D. INPUTS

1. Training

	Egyptians to US		Americans to Egypt	
	Individuals	days	Individuals	days
1. Program Management	9	157	13	201
2. Management Training	43	903	1	16
3. Demonstration Projects				
a. More & Better Food	3	31	5	26
b. Bio-Gas	8	136	8	54
c. Arid Crops	—	—	7	37
4. R&D Projects				
a. Corrosion	1	3	3	15
b. Wool Wax	2	42	1	5.5
c. Phosphate	4	210	4	20
d. Fisheries	—	—	3	19
e. Nile Water	—	—	2	6.5
Total Demonstration & R&D Projects	18	281	33	183

65X

3. Equipment Delivery

Status (% based on Units)

3.1. More and Better Food

3.2. Core Equipment

3.3. Other Demonstration and R&D Projects

E. MAJOR CONSTRAINTS AND PROBLEM AREAS

1. Delay in equipment procurement and supply

- % of More and Better Food Equipment and % of Core equipment being supplied.

Equipment for other projects are in process of procurement.

2. Delay in Contracting and Subcontracting

Project agreement March 1977

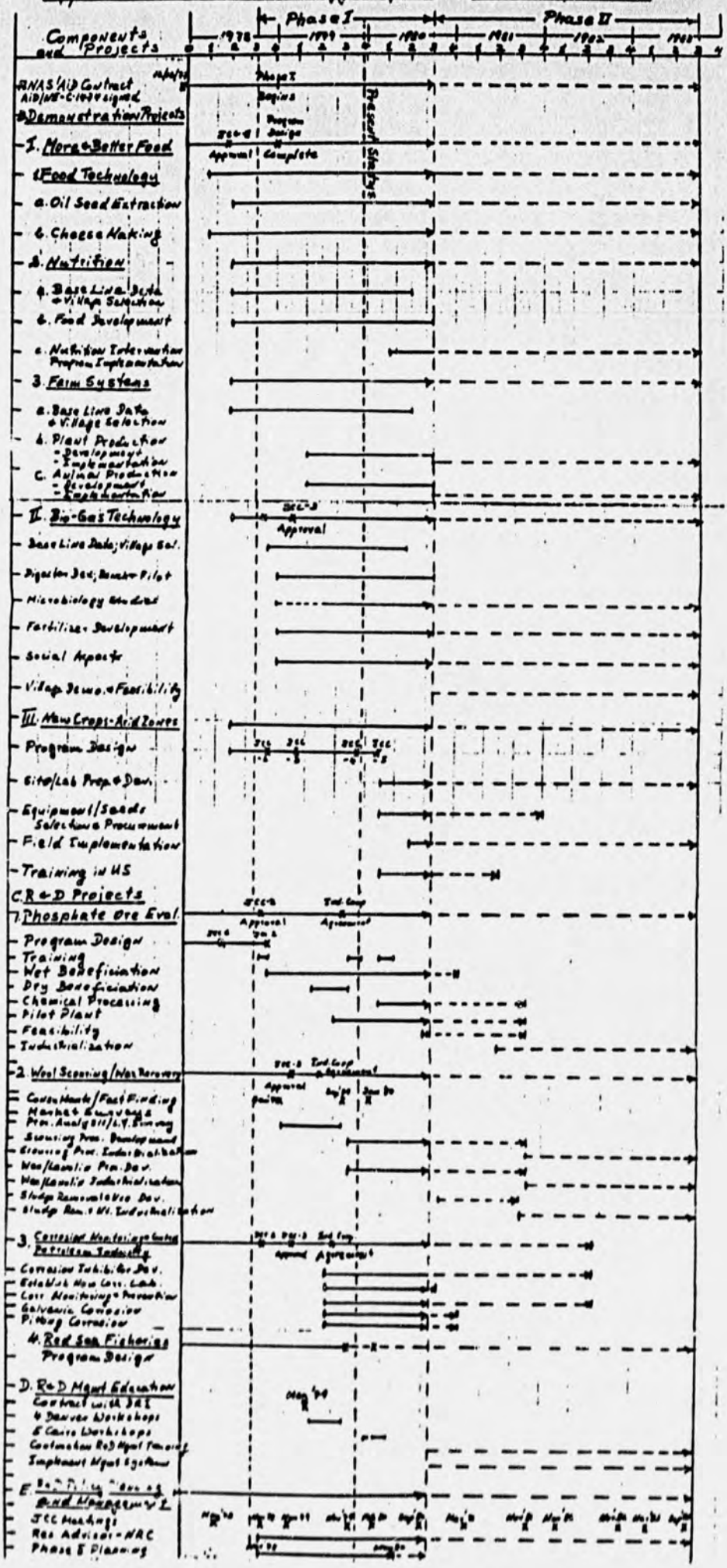
- AID-NAS (Dec. 1977)
- AID-NSF (April 1978)
- NSF - Georgia Tech. (July 1979)
- NSF - Catholic Univ. (Nov. 1979)

3. Inavailability of a source to purchase locally needed materials and supplies for projects.

4. Limitation of budget allocated for incentive payment (L.E. 350 thousand for Phase I) specially after deducting L.E. 70 thousand form it for purchase locally needed materials and supplies.

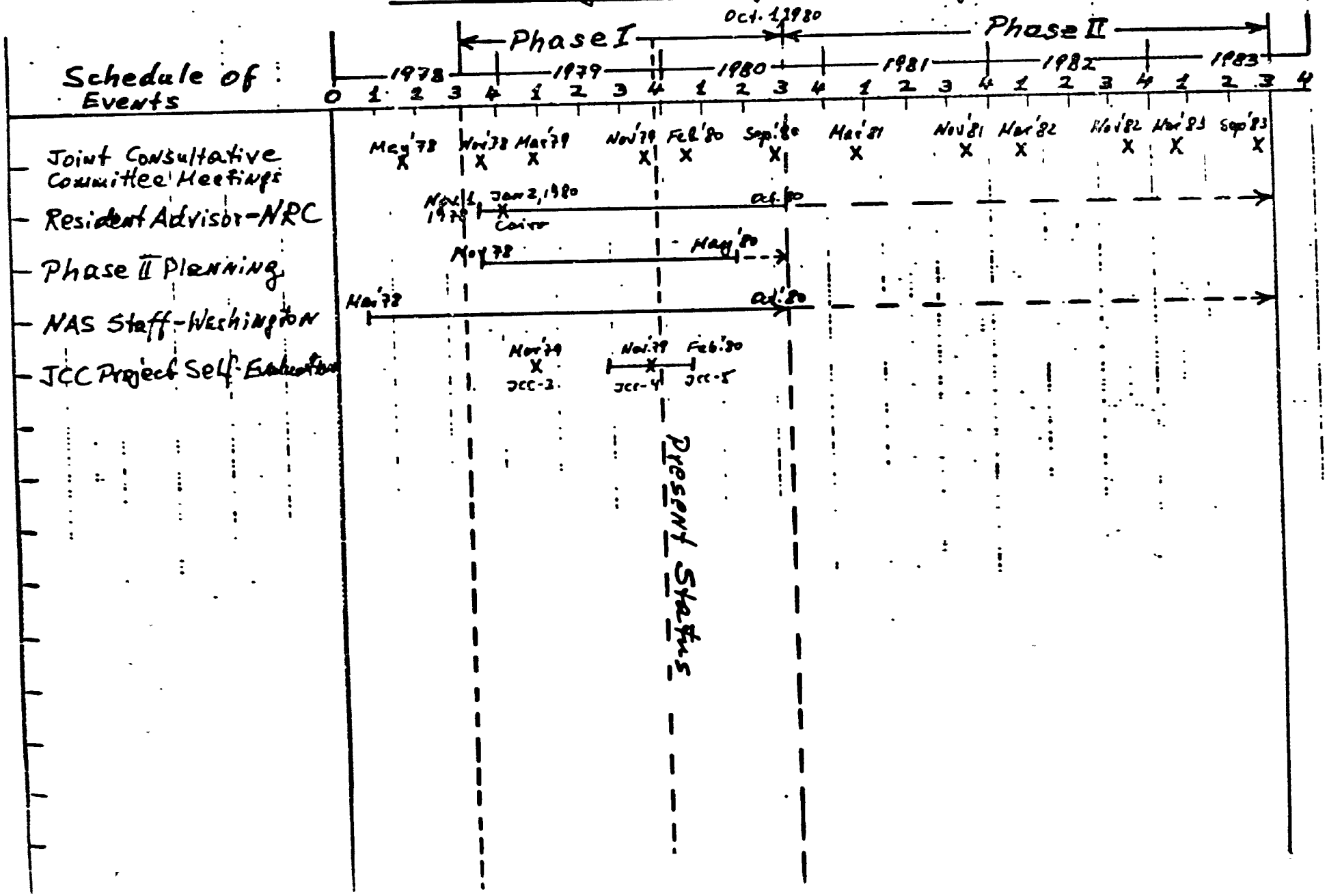
Am.N.

Applied Science and Technology Program — NAS Components

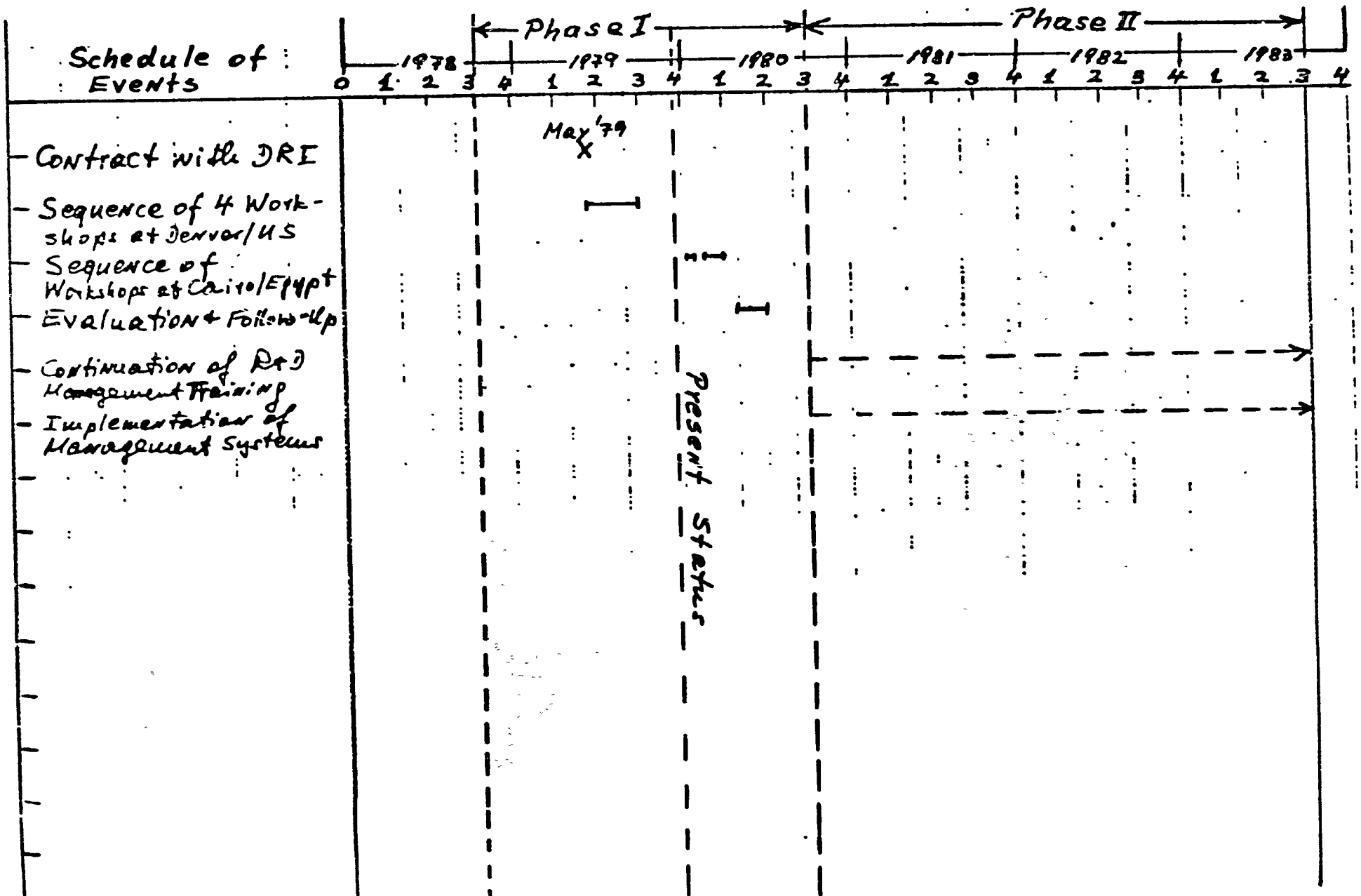


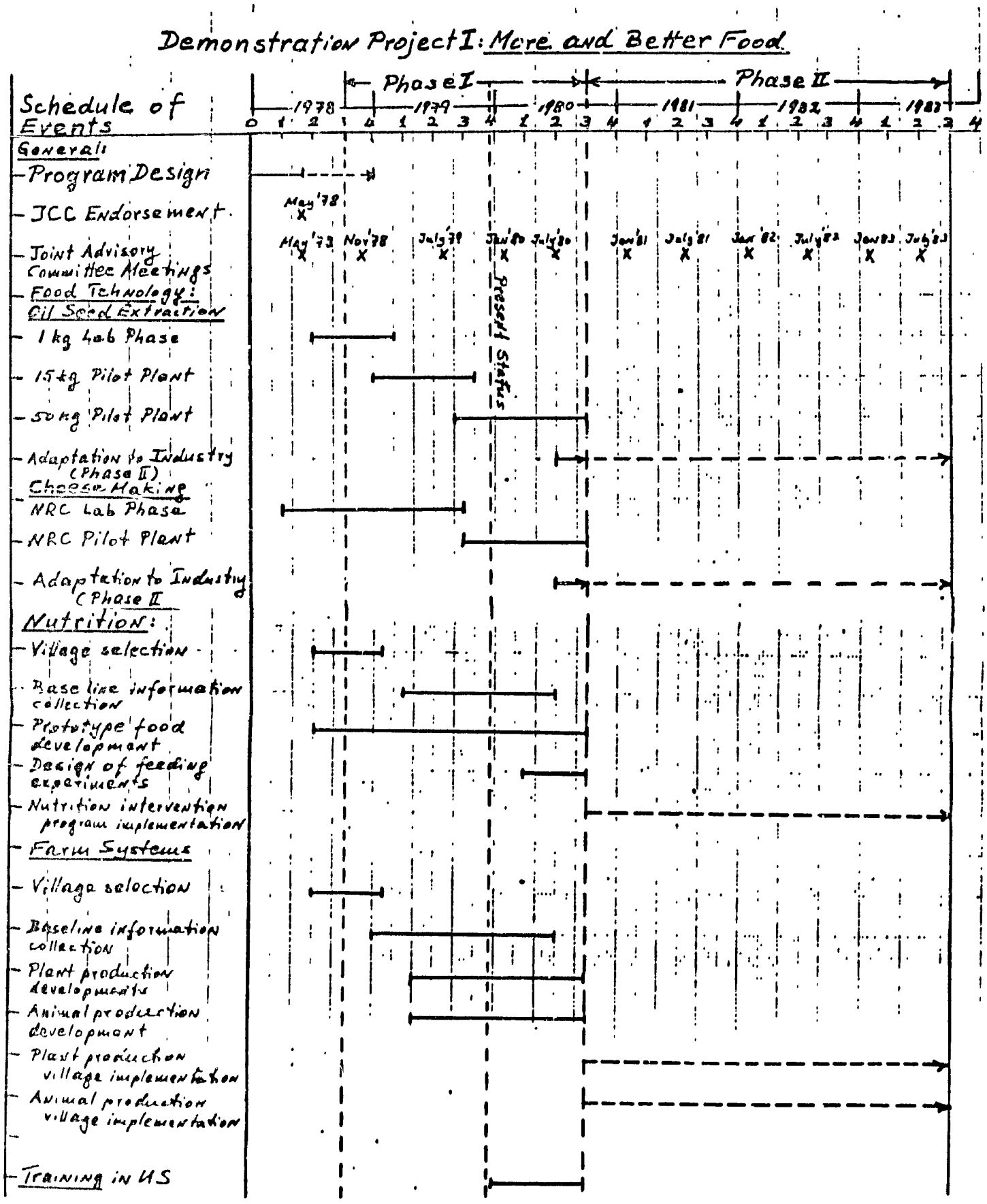
67X

R&D Policy Planning and Management



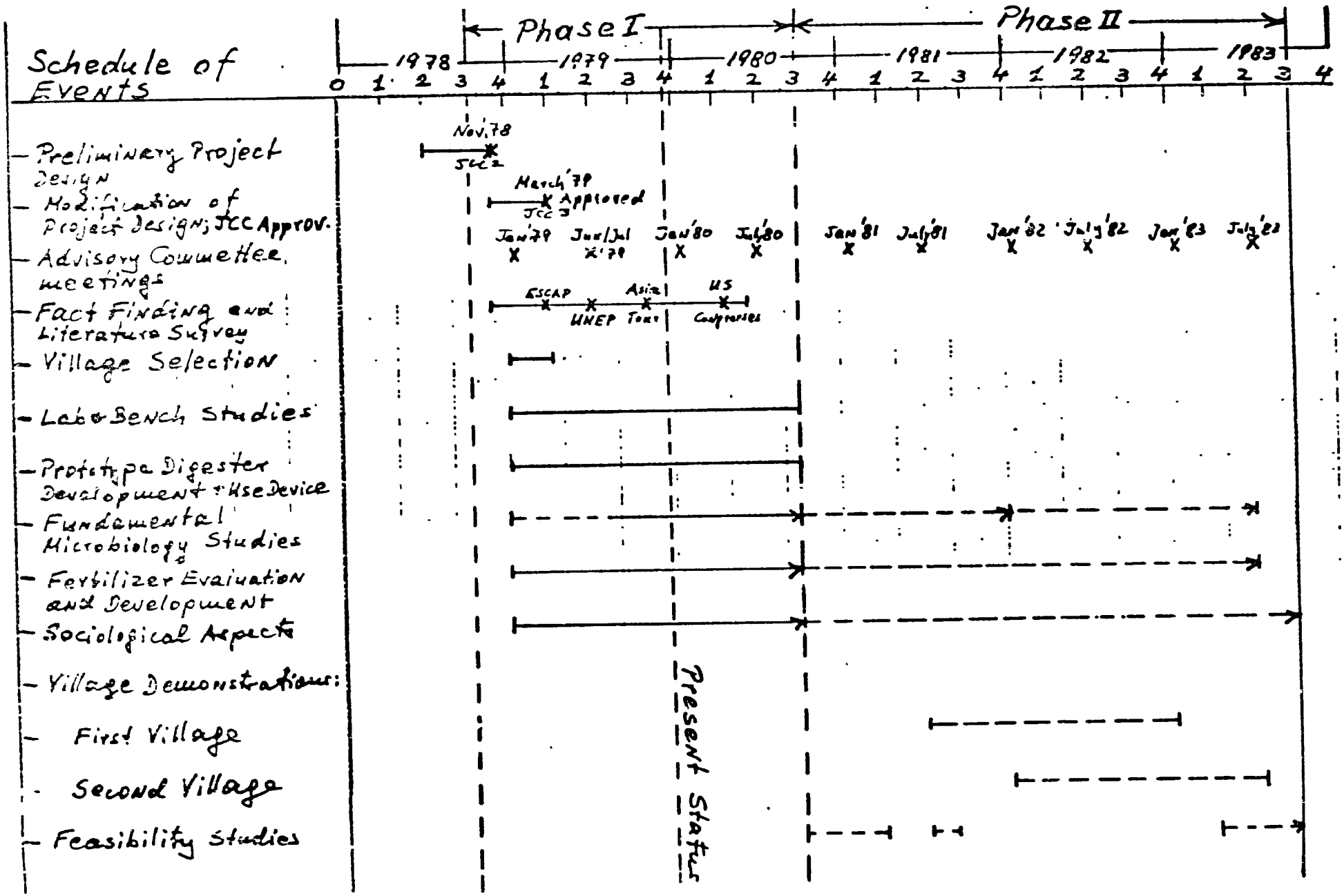
R&D Management Education



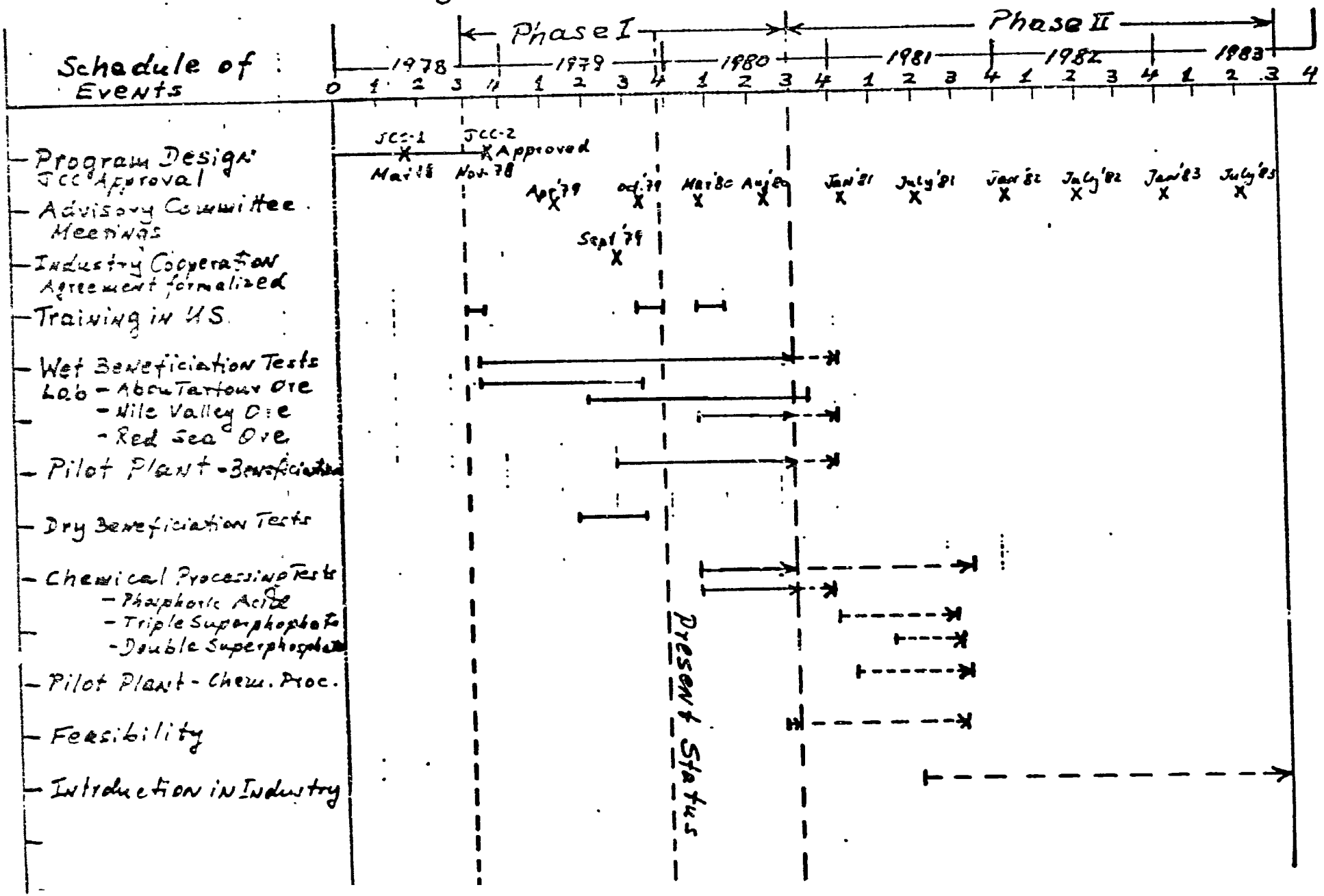

Demonstration Project I: More and Better Food
Schedule of Events
Phase I
Phase II
1978
1979
1980
1981
1982
1983
0 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4
General
Program Design
JCC Endorsement
May '78
Joint Advisory Committee Meetings
May '78
Nov '78
July '79
Jan '80
July '80
Jan '81
July '81
Jan '82
July '82
Jan '83
July '83
Food Technology: Oil Seed Extraction
1 kg Lab Phase
15 kg Pilot Plant
50 kg Pilot Plant
Adaptation to Industry (Phase II)
Cheese Making
NRC Lab Phase
NRC Pilot Plant
Adaptation to Industry (Phase II
Nutrition:
Village selection
Base line information collection
Prototype food development
Design of feeding experiments
Nutrition intervention program implementation
Farm Systems
Village selection
Baseline information collection
Plant production developments
Animal production development
Plant production village implementation
Animal production village implementation
Training in US
Present Status

70

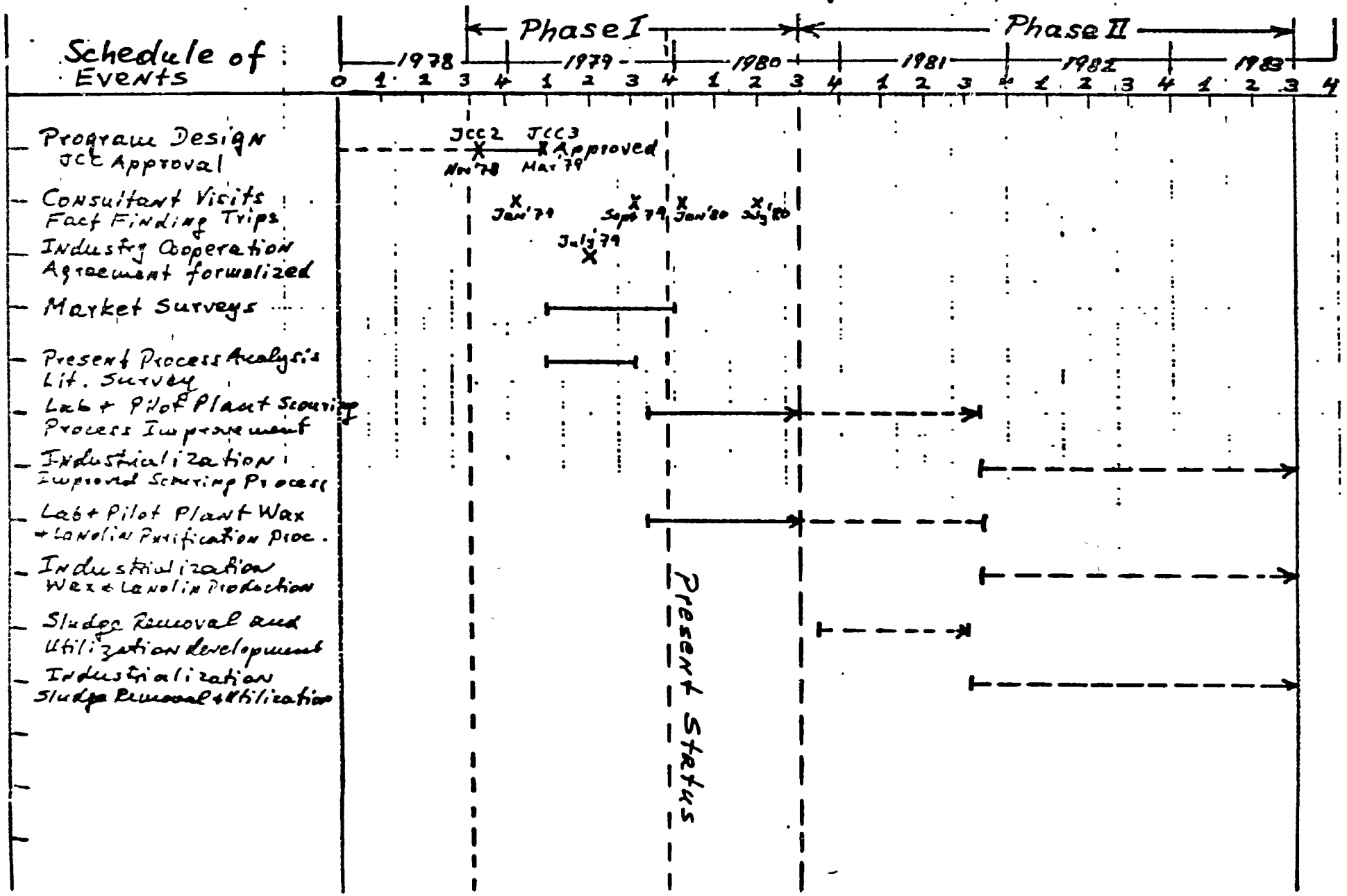
Demonstration Project II: Bio-Gas Technology



R&D Project: 1. Phosphate Ore Evaluation

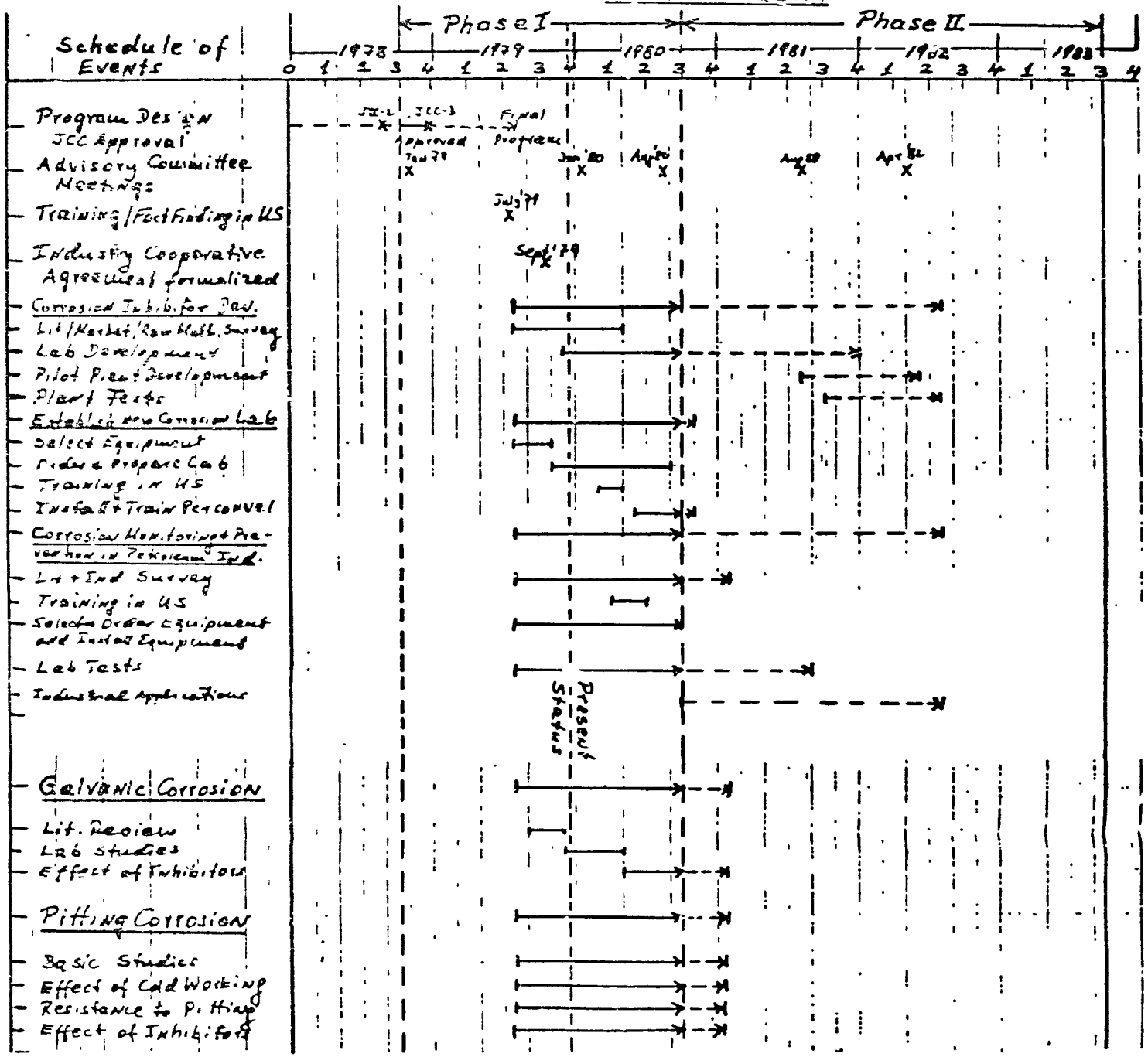


R+D Project: 2. Wool Scouring and Wax Recovery



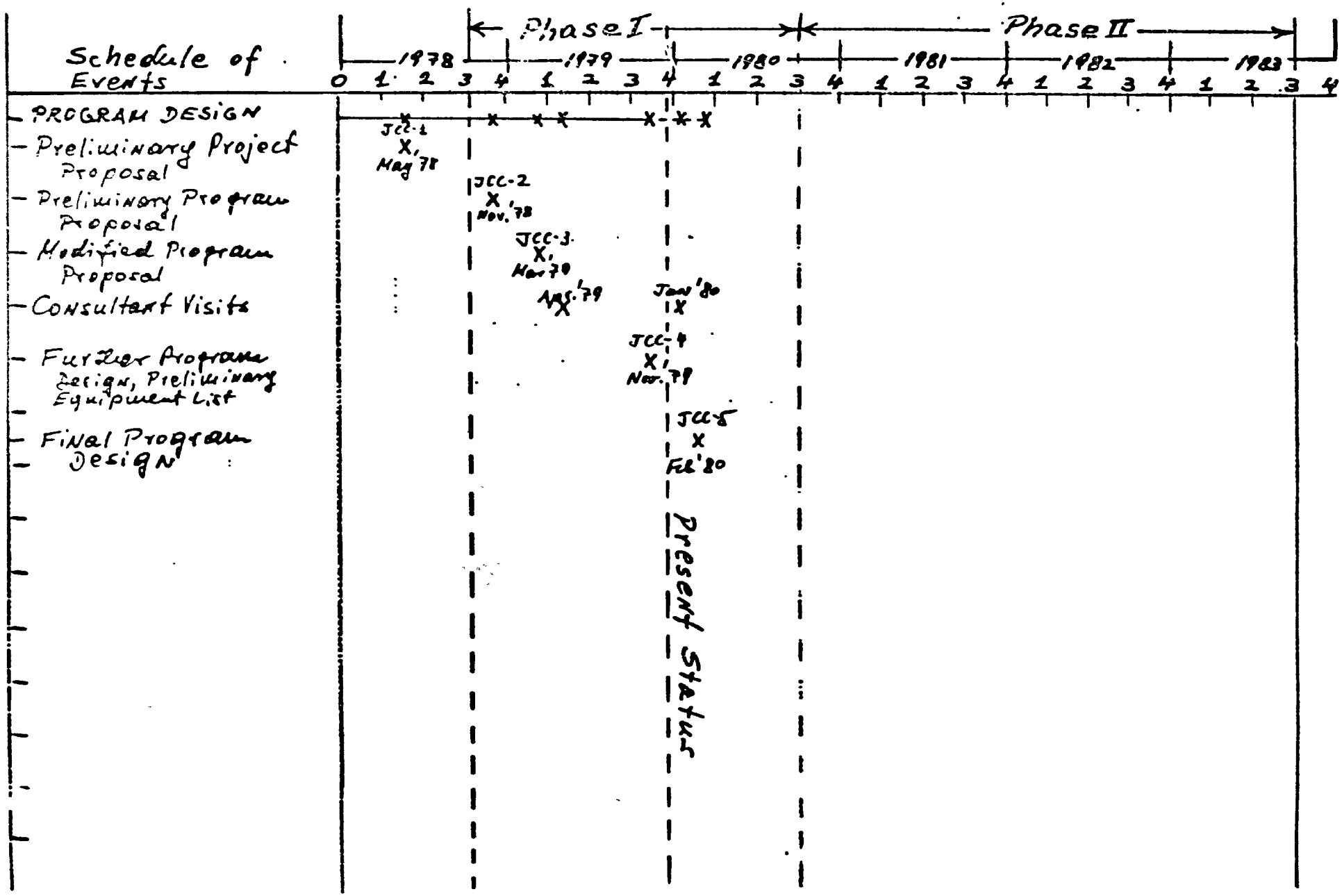
R+D Project: 3. Corrosion Monitoring and Control

Petroleum Industry



74

R&D Project: 4. Red Sea Fisheries



V. PLANNING FOR PHASE II

The project agreement between the Government of Egypt and the Government of the United States requires all principal parties engaged in the Applied Science and Technology Activities to participate in the Phase II planning process.

During its Third Meeting in March 1979, the JCC set the following guidelines to be considered for Phase II planning. Proposed projects must:

1. Meet the general criteria established by the JCC for Phase I:
   - Each project must be directly related to critical Egyptian national develoment priorities.
   - Each project must be geared to the solution of critical development problems.
   - Each project must have an explicit framework within which managerial and technical training experience can take place.
2. Assure integration and coordination of the Applied Science and Technology Program with other US AID projects.
3. Continue Phase I projects of R&D management education, equipment repair and maintenance and S&T information systems.
4. Establish an Egyptian national scientific and technical information network which will serve efficiently a broad base of universities and research institutes.
5. Continue strengthening the infrastructure of national research institutes through upgrading of equipment, facilities, training and access to consultant services.

In many respects Phase I is a design, data-gathering, and training

phase preparatory to more intensive, execution and implementation type activities. Thus Phase II can serve as a period for perfecting the previous phase elements, for integrating those elements into standard management systems of the participating Egyptian institutions, and for facilitating interaction and involvement between these newly strengthened institutions and the wider community of "end-users".

Keeping this philosophy of implementation and perfection in mind, a Phase II plan presented to the Fourth Meeting of the JCC recommended the following objectives:

- Continuation of ongoing activities in policy planning and management (i.e., resident advisor at the NRC/Cairo, strengthening management control and service functions of the ASRT and its associated research institutes, and institutionalizing R&D management training activities);
- Completing the on-going demonstration projects;
- Completing the on-going R&D projects;
- Implementing the S&T Information Services System;
- Strengthening the capacities of the participating institutions in the maintenance and repair of scientific equipment and instruments;
- Providing continuing technical services in scientific equipment and instrumentation selection and procurement; and
- Taking decisions on new projects for Phase II within the framework of the guidlines and selection criteria.

The ensuing discussion by the JCC members led to the following recommendations:

1. The Phase II planning document prepared for the Fifth JCC Meeting shall include as its major components: (a) policy, planning, management and control; (b) infrastructure development; (c) demonstration projects; and (d) R&D projects.

2. Infrastructure development shall include: (a) S&T information; (b) maintenance and repair of equipment; (c) standards and measurements; and (d) manpower development.

3. Instrumentation and equipment components of Phase II shall include advisory services in design characteristics, procurement and management of scientific equipment utilization.

4. Continued R&D management training during Phase II shall focus on institutionalizing training in Egypt and on increasing end-user involvement in design and participation in training activities.

5. New proposals for R&D projects, emphasizing end-user participation, shall be presented for JCC review and consideration during the Fifth Meeting.

6. Instrumentation and information projects shall be planned to facilitate their continuation as strong, on-going Egyptian projects after conclusion of U.S. assistance under the Applied Science & Technology Program.

7. Avenues shall be explored to permit fiscal and managerial flexibility under JCC guidelines so that on-going projects can be adapted to meet needs and contingencies during the three-year period of Phase II and

that small new projects can be initiated without major delays from review and analysis within the sponsoring organizations.

Finally, the JCC members took into consideration the process AID must follow in approving Phase II. Therefore the Fifth Meeting will include recommendations for a Phase II Plan to AID/Cairo for its consideration for the period October 1980-October 1983.

Am.N.

4

Ref. No. JCC 5-4

February 1980

APPLIED SCIENCE AND TECHNOLOGY PROGRAM IN EGYPT

OVERVIEW AND INPUTS FOR EVALUATION

PROJECT 263-0016

Prepared by

BOARD ON SCIENCE AND TECHNOLOGY FOR

INTERNATIONAL DEVELOPMENT

COMMISSION ON INTERNATIONAL RELATIONS

NATIONAL ACADEMY OF SCIENCES/NATIONAL RESEARCH COUNCIL

WASHINGTON, D.C.

80

FORWARD

This report was prepared by the U.S. National Academy of Sciences/National Research Council to examine development impacts of its on-going projects in Phase I, specifically, the R&D, demonstration, and S&T planning/management projects of the Applied Science and Technology Program.

This report addresses each project's progress in the context of overall program goals and objectives and identifies achievements, unexpected benefits, problems, constraints, and possible solutions to problems.

The document served as an input for the Joint Consultative Committee's "self-evaluation" which was conducted during their Fifth Meeting in Washington, D.C., February 25 - 27, 1980.

CONTENTS

	Page
INTRODUCTION	1
I. Background	1
II. Evaluation	2
EVALUATION FOR DEMONSTRATION PROJECTS	5
I. More and Better Food	5
II. Development and Application of Biogas Technology in Rural Areas of Egypt	9
III. New Crops for Arid & Semi-Arid Zones	13
EVALUATION OF RESEARCH AND DEVELOPMENT (R&D) PROJECTS	
I. Background	17
II. Phosphate Ore Beneficiation and Phosphate Fertilizer Production	18
III. Wool Scouring and Wool Wax Recovery	22
IV. Corrosion Monitoring and Control in the Petroleum Industry	25
V. Red Sea Fisheries Development	29
EVALUATION OF POLICY PLANNING AND MANAGEMENT CONTROL	32
I. Background	32
II. R&D Management Education	32

INTRODUCTION

I. Background

The goal enunciated in the project grant agreement for the Applied Science and Technology Program in Egypt (AID Project 263-0016) signed in March 1977 between the governments of the Arab Republic of Egypt and the United States of America is "to re-orient the Egyptian scientific and technical community toward those types of research which are of priority importance and are applicable to solving (Egyptian) national development problems." Given the limitations of funds and human resources that are available during the projected five-year time frame for the Program, the goal is one which can be met only partially. Individual projects, therefore, must be viewed as examples, or demonstrations of science and technology resource planning and management for socio-economic development.

To help achieve the objectives, the project agreement provides activities in the following areas:

1. Science and technology(S.& T) policy planning, coordination and management;

2. Demonstration projects which are multidisciplinary in scope and directed to priority areas of Egyptian development;

3. Research and development (R&D) projects as examples of cooperation on applied problems between research workers and end-user organizations;

4. Provision of scientific equipment to organizations and universities assisting in the demonstration projects and R & D projects. A corollary to this is the strengthening of maintenance and repair (M&R) capabilities for scientific instruments and equipment;

5. Creation of a strengthened S&T information system in Egypt; and

6. Recommendations to the AID Mission in Cairo for a three-year follow-up period (Phase II) with activities based upon experience gained during the two initial years (Phase I) of the Applied Science and Technology Program.

The Egyptian government assigned responsibility for the Applied Science and Technology Program to the Academy of Scientific Research and Technology (ASRT); the U.S. government, through the Agency for International Development in December 1977 contracted the U.S. National Academy of Sciences/National Research Council (NAS/NRC) for the program components involving S&T planning and management, R&D projects and demonstration projects. In May 1978, AID entered into a participating agency agreement with the National Science Foundation (NSF) for the projects which assist ASRT in science information systems and strengthening M&R capabilities. AID retained within its Cairo Mission procurement authority for scientific and technical instrumentation and equipment and, at the same time, made arrangments with NSF for advisory services in procurement. NAS/NRC, and NSF share with the ASRT the responsibility to recommend a series of follow-on activities for Phase II.

II. Evaluation

The Applied Science and Technology Research project grant agreement provides a general framework within which AID, in consultation with the participating groups, will conduct a formal evaluation during the second year of Phase I program activities. That evaluation is to include:

--- An assessment of progress toward attainment of program objectives;

--- Identification of problem areas or constraints which may inhibit program progress;

---An assessment of how the information gathered may be used to help overcome problems; and

--- Conclusions, to the degree feasible, of the overall development impact of the Applied Science and Technology Program.

In order to contribute to the AID evaluation process and to provide the Joint Consultative Committee (JCC) with an additional management input for preparing Phase II planning recommendations, the JCC decided to utilize a major portion of its 5th meeting in Washington, D.C. (February 25-27, 1980) to conduct a "self-evaluation" of the Applied Science and Technology Program.

For the purposes of this "self-evaluation", evaluation is defined as "a management process for gathering information about specific program activities, comparing that information with goals set forth in program plans, and assessing progress in order that the lessons learned may be applied to current and future JCC activities." The evaluation process may be both quantitative and qualitative in its form. It necessarily assumes that those interpreting and judging the information are experienced in the subject matter under study and in applying their knowledge of S&T to the development process.

This document represents an NAS/NRC staff input to the JCC for consideration in the "self-evaluation." It is but <u>one</u> input; others include status reports from the project leaders and technical management reports from ASRT, the National Research Centre (Cairo), the NSF, AID/Washington and AID/Cairo.

Since the NAS/NRC is primarily responsible for (a) Demonstration projects, (b) R&D projects, and (c) Policy planning, coordination and managment, only those three program elements are examined. The format includes asking a series of "key questions" which are applicable to each project. The "key questions" are intended to examine development impacts of the projects rather than strictly scientific and technological progress or achievements. They are:

*** How does the project meet the overall goals and objectives of the Applied Science and Technology Program?

*** Has an appropriate management structure been established and is it functioning?

*** Does the project strengthen direct linkages between the management organization and end-users?

*** Has a detailed project plan been developed and is it being implemented?

*** Are expected achievements being realized qualitatively and quantitatively? Are there additional economic, social and environmental benefits?

*** What major problems and constraints have been encountered? Have solutions been found?

*** Are goals realizeable in PhaseI, and in Phase II?

*** What additional inputs are needed beyond Phase II to assure continuity of the project and its adoption by end-users?

EVALUATION OF DEMONSTRATION PROJECTS

I. More and Better Food

A. Background

For a concise summary of project goals/objectives and of project status see the Executive Summary Document prepared by ASRT for the 5th JCC meeting.

B. Key Questions

1. How does More and Better Food meet the overall goals/objectives of the Applied Science and Technology Program?

--- More and Better Food addresses food production (animal and plant wealth), food processing (edible vegetable oils, cheese making and a high-protein weaning food) and nutrition.

--- More and Better Food is multidisciplinary in nature. Within the National Research Centre (the management organization for the project) it enlists help from animal and plant production laboratories, the nutrition laboratory, the soils laboratory, fats and oils laboratory, dairy technology, child development and the pilot plant division (applied technology and engineering.)

--- More and Better Food is multi-institutional in character with the following organizations actively participating:

National Research Centre (Management Institution)

Ministries of Education, Agriculture, Irrigation Land Reform, health, social affairs, and the Governorates.

Cairo University, Faculty of Medicine

Organization for the Development of the Villages

Industries (El Nil Pharmaceutical Company, Al-Badrachin Oil Factory, Misr Food Company.)

87 X

2. Has an appropriate management structure been established and is it functioning?

--- An Executive Committee (9 members) has been formed which is representative of the NRC/Cairo laboratories and the other groups involved in the project. Since May 1978, the Executive Committee has met approximately monthly.

--- A three member U.S. advisory panel made up of an agronomist, food scientist and a nutritionist has met once in Egypt and twice in the USA with representatives of the Executive Committee.

3. In what ways does the project strengthen direct linkages between the management organization and end-users?

--- In the demonstration villages the More and Better Food project team works through the medical clinics (for nutrition studies), the agricultural extension service (for farm systems activities), and with village leaders.

--- In the food technology projects, management and technical representatives from the food industries involved work directly with NRC/Cairo scientists and engineers from the dairy science laboratory, fats and oils laboratory, nutrition laboratory and child development laboratory.

--- NRC/Cairo has been serving as a consultant on development planning to the Governorate of the New Valley as a result of the field activities of the More and Better Food project.

4. Has a detailed project plan been developed and is it being implemented for More and Better Food?

For a copy of the More and Better Food project plan in PhaseI and Phase II, see the document "Overview and Inputs for Evaluation."

5. Are expected achievements being realized quantitatively and qualitatively? Are there additional economic, social and environmental benefits?

--- In the three food technology projects, the goals of the laboratory (bench scale) investigations have been achieved. All are moving as in the program plan to pilot scale testing.

--- The demonstration villages have been chosen, Kafr Al-Khadra in the old lands and Omar Makram in the new lands. Base line studies concerning the farming systems employed and the dietary-nutritional status of the school age children are proceeding.

--- Economic goals are prominent for Phase II. They include the demonstration at the production level of a more acceptable oil product from cotton seed and a significantly increased yield (up to 50%) from the same quantity of cotton seed as now being processed. The cheese making project is designed to increase the output of Damietta cheese using locally produced fluid milk and extending it with low-fat powdered milk imported at market prices.

6. What major problems and constraints have been encountered? Have solutions been found?

--- Equipment procurement has delayed some activities, especially as scale-up to pilot plant operations is undertaken.

--- Transport to the demonstration villages remains a problem that is unsolved. A special vehicle and driver are needed for the field work, especially during Phase II.

--- Lack of local funding for purchase of materials, fabrication of specialized pilot plant scale equipment, and for payment of project personnel also remains as a major constraint.

7. Are goals for the More and Better Food project realizeable in Phase I, and in Phase II?

--- Phase one is largely one of program design, training, laboratory (bench scale) investigations. As of February 1980, More and Better Food is on schedule for Phase I goals.

--- Phase II is the applications aspect, including the need for field work in the two villages and in-plant testing for the food technology projects. good manage ent structure is in place, functioning and gaining experience in multi-institutional, multi- disciplinary research and development. There is every reason to believe More and Better Food can achieve Phase II goals <u>if</u> the constraints of equipment/instrumentation procurement, transport, and local funding requirements are met.

8. What additional inputs are needed beyond Phase II to assure continuity of the project and its adoption by end-users?

Note: This is a topic for JCC discussion.

II. Development and Application of Biogas Technology in Rural Areas of Egypt

A. Background

Project goals/objectives and current status are fully covered in the Third Progress Report (January 1980) submitted for the 5th meeting of the JCC.

B. Key Questions

1. How does Development and Application of Biogas Technology in Rural Areas of Egypt meet the overall goals/objectives of the Applied Science and Technology Program?

--The biogas project will assess the feasibility of converting agricultural, human and animal wastes into methane for small-scale energy use.

--In addition to energy production, the project has implications for waste recycling, pollution control, health benefits and upgrading soil fertility.

--Research is being conducted in a multidisciplinary approach under the leadership of the Pilot Plant Division of the National Research Center involving subgroups of the NRC in laboratory and bench-scale research, fertilizer evaluation, engineering, and fundamental microbiology, and a sociological subgroup of the National Center for Social and Criminological Research. In addition, participants from Ain Shams University and the Ministry of Public Health are involved.

2. Has an appropriate management structure been established and is it functioning?

--The project proposal and progress reports reflect the excellent management approach pursued, with a management committee representing all subgroups meeting biweekly.

--Coordination with the three-person NAS advisory committee is close. The NAS panel has met with the project team twice in Egypt and members are visited when project leaders travel to the U.S.

--The Egyptian management committee, accompanied by the NAS panel chairman, conducted a valuable study tour of biogas facilities in China, India, and Thailand in November 1979.

3. In what ways does the project strengthen direct linkages between the management organization and end-users?

--The sociological subgroup, thus far concerned with village surveys in connection with implementing the demonstration stage, has major responsibility for communicating with the eventual end-users.

--The experimental digester and related facilities being constructed at the NRC will be open to interested ministry, university, and rural development groups and to village leaders and representatives.

--An open seminar on the Asian study mission held at the NRC January 15, 1980, drew attendance from universities, research organizations, and government ministries and established links for further coordination and exchange of information between those interested in biogas technology.

4. Has a detailed project plan been developed and is it being implemented for Development and Application of Biogas Technology in Rural Areas of Egypt?

--The project proposal and progress reports reflect the project leaders' utilization of detailed planning for project direction and periodic assessment.

5. Are expected achievements being realized quantitatively and qualitatively? Are there additional economic, social and environmental benefits?

--Accomplishments in Phase I have followed the anticipated course in this fundamental research, technology assessment and village survey stage in spite of the constraints noted below.

--The actual demonstration stage in Phase II will focus not only on the benefits of energy production, but the potential economic, social, and environmental benefits from waste recycling, pollution control and fertilization.

--The village demonstrations may prove to have additional benefits resulting from village organization, and the educational and self-help components necessary for implementation, utilization and maintenance of the new technology.

6. What major problems and constraints have been encountered? Have solutions been found?

--Delay in equipment procurement has been and continues to be a major impediment to maintaining the project schedule. Nevertheless, improvised laboratory efforts have provided significant data.

--The lack of budget allocations (in the overall program) for purchase of local materials further compounded the equipment situation and caused delay in construction of the experimental digester at the NRC. The perserverance of the team leadership and in some cases personal contributions for necessary purchases enabled initial activities to proceed.

--Initial utilization of local contractors for construction of the pilot digester proved costly and the results were flawed. Subsequent supervision and construction by the engineering and development group itself have saved the day.

--While the enthusiasm and contribution of team leaders have helped overcome problems, the lack of funds for incentive payment for project personnel is a problem which may have serious ramifications in the upcoming demonstration phase, when transportation and other expenses of participants and village workers will be more significant.

7. Are goals for the Development and Application of Biogas Technology in Rural Areas of Egypt project realizeable in Phase I and in Phase II?

--Given the constraints, the biogas project has proceeded remarkably well in Phase I laboratory, technology assessment, and village survey work, and is on course to realizing Phase I goals/objectives.

--In Phase II the actual village demonstrations and assessment of the implication for energy, agriculture (soil upgrading), and environment for rural Egypt are to be made. The project goals should be met in Phase II if the problems of equipment procurement and local transportation, materials and personnel costs are resolved.

8. What additional inputs are needed beyond Phase II to assure continuity of the project and its adoption by end-users?

--If results of the demonstration stage prove the desirability and feasibility of introducing biogas technology more broadly to the rural areas of Egypt (as preliminary studies would indicate) decisions must be made by the government regarding extension of the technology and the necessary training, financing and community development approaches to such a program. The current project team and its experience will be a valuable resource, but the NRC is not the institution to be responsible for a national or regional program. The project leaders plan to prepare the groundwork by encouraging continued participation by appropriate government ministries and governorates in Phase II activities.

III. New Crops for Arid and Semi-Arid Zones

A. Background

In view of the potential importance for Egypt for developing agricultural production through nonconventional techniques in arid and semi-arid zones, the JCC (JCC II, November 1978) requested a joint Egyptian-American committee explore the possibility of a project in this area to comprise a third demonstration project under the program. A joint panel meeting in January 1979 and numerous meetings on the Egyptian side resulted in a preliminary proposal which the JCC endorsed in March 1979, with the understanding that the project focus would be restricted to nonconventional crops and that a more detailed project implementation plan be drawn up.

The Egyptian steering committee determined that the initial experiment site be in Kom Osheim in Fayoum governate, with attention to be given to jojoba, guayule, milkweed, buffalo gourd, and nonconventional legumes. An Egyptian team member visited the U.S. in July 1979 for contacts with U.S. individuals and institutions, and some seed acquisitions were made. Equipment has been requested.

A U.S. panel visited Egypt in January 1980 for further discussions on the project plan and preparation of the experiment site, including technology assessment and equipment needs. Special attention was given to training-personnel development needs. Preparation of the site, initial plantings, and initiation of the training program are the objectives for Phase I.

B. Key Questions

1. **How does the New Crops for Arid and Semi-Arid Zones Project meet the overall goals/objectives of the Applied Science and Technology Program?**

--Successful development of new crops in arid regions of the country has the potential for providing foreign exchange earnings, increasing food supply and alleviating population pressures.

--The project achieves a multidisciplinary and multi-insitutional approach to research on a problem of significance to development through the joint endeavors of groups in two universities (Ain Shams, Azhar), the National Research Centre, the Ministry of Agriculture, and the Governate of Fayoum. Other institutions will be involved in Phase II.

2. Has an appropriate management structure been establisned and is it functioning?

--The Egyptian steering/management committee is comprised of representatives of the participating institutions.

--U.S. panels have met twice in Egypt and an Egyptian team member has visited the U.S.

--The U.S. panel meeting in Cairo in January 1980 noted considerable progress in the development of the project concept, work plan, and the structure for management and coordination.

3. In what ways does the project strengthen direct linkages between the management organization and end-users?

--While the project is in its initial stages, the close cooperation with the Ministry of Agriculture and governate will facilitate linkages to farmers and extension activities once the experiment site(s) is ongoing.

4. Has a detailed project plan been developed and is it being implemented for New Crops for Arid and Semi-Arid Zones?

--As noted, significant effort has gone into refining a project plan with guidelines for its implementation.

5. Are expected achievements being realized quantitatively and qualitatively? Are there additional economic, social and environmental benefits?

--The project's late start as a third demonstration activity means that assessment of expected achievements must await Phase II.

--The numerous contacts and exchange of views on development of the project have already provided an achievement in that joint planning activities among the institutions involved are not common undertakings.

--In addition to the economic and social benefits (foreign exchange, food production, population movement) aimed for, new technologies and new techniques for water and salinity management may result in additional benefits for agriculture and community development and environmental stability.

--Results of the Egyptian experiment should be of interest for all arid land regions and may prove a link to comparative efforts in neighboring countries in the region.

6. What major problems and constraints have been encountered? Have solutions been found?

--Late inclusion in the program and the time for project and workplan delineation have precluded results in Phase I. Continued discussions between representatives of the institutions involved have resulted in agreement on emphasis and division of responsibility.

--Delays in equipment procurement will hinder development of the experimental site.

--Funding for purchase of local materials, transportation to the site, and personnel salaries needs to be resolved.

7. Are goals for the New Crops for Arid and Semi-Arid Zones project realizeable in Phase I and in Phase II?

--Phase I has really been a period of project design.

--The intended addition of sites in the Sinai and northern coastal zones in Phase II will depend upon progress at the first site, equipment procurement, training and resolution of the local costs problem.

8. What additional inputs are needed beyond Phase II to assure continuity of the project and its adoption by end-users?

--Since the project is late in starting, Phase II can illustrate the potential of some new crops, but extension and commitment to larger scale planting most probably will be a post-Phase II emphasis with key roles by the Ministry of Agriculture and governates, with research and feasibility evaluation provided by the project team.

EVALUATION OF RESEARCH AND

DEVELOPMENT (R&D) PROJECTS

I. Background

The general purpose of the R&D projects is: (a) to strengthen applied research in priority areas directly related to Egyptian development needs, and (b) to improve the management of R&D in Egyptian institutions by demonstrating the application of sound management priciples in applied areas.

The AID - ASRT project grant agreement made specific provisions for applied R&D during Phase I of the Applied Science and Technology Program with support for the selection of three to five projects to be chosen from and of the following areas:

- Plant production and protection
- Animal research and fisheries
- Soil and water resources
- Medical research
- Building technology
- Industrial research
- Transportation research
- Physical and electronics applications.

Using criteria adopted during its first meeting in May 1978, the JCC selected four R&D projects for support during Phase I:

--- Phosphate Ore Beneficiation and Phosphate Fertilizer Production

--- Improving Wool Scouring and Wool Wax Recovery

--- Corrosion Monitoring and Control in the Petroleum Industry

--- Development of Red Sea Fisheries

99 X

For a concise summary of each project goals/objectives and of project status see Executive Summary Document prepared by ASRT for the 5th JCC meeting.

II. Phosphate Ore Beneficiation and Phosphate Fertilizer Production

Key Questions

1. How does the Phosphate Ore Beneficiation R&D project meet the overall goals/objectives of the Applied Science and Technology Program?

With the loss of the alluvial deposits from the annual flooding of the Nile Valley after the construction of the Aswan High Dam, the necessity to increase the use of nitrogen, phosphorus and potassium fertilizers assumed immediate importance for Egyptian agriculture so that the growing population could be adequately fed. Moreover, because of the need for multiple cropping on the small amount of arable land (6 million feddans, 3.9% of Egypt's land area) the demand for phosphate fertilizers has increased dramatically. Phosphate ore raw materials are abundantly found in Egypt with the Abou Tartour region of the Western Desert estimated to contain 900 billion tons of low-grade ore. In addition the Egyptian ores have unique properties requiring special mining, beneficiation and conversion techniques.

A serious problem for Egyptian industry and agriculture is the lack of the applied R&D capability in utilizing local raw materials for conversion to fertilizers. Within the Central Metallurgical Research Institute of the National Research Centre, the Ore Beneficiation and Processing Laboratory, therefore, proposed to ASRT that there be

established a new capability to analyze, treat, and convert Egyptian phosphate materials into end-products for the domestic market and for export. At present, the Egyptian phosphate fertilizer producers manufacture only single super-phosphate; all triple superphosphate and phosphate/potassium fertilizers must be imported. The goal of this project is to create a strong group within NRC/Cairo with the equipment and expertise to solve problems of converting Egyptian phosphate ores into fertilizers that are economically viable for domestic agriculture and for export.

2. Has an appropriate management structure been established and is it functioning?

--- Within the National Research Centre is the Central Metallurgical Research and Development Institute (CMRDI) that has formed a steering committee for the phosphate ore project. The steering committee includes representatives of the Ore Beneficiation and Processing Laboratory of CMRDI, the analytical section of the NRC Inorganic Chemistry Laboratory, and the NRC Pilot Plant Division. This steering committee also has links with the R&D laboratory of the phosphate fertilizer manufacturing plant at Kafr El-Zayat.

3. In what ways does the project strengthen direct linkages between the management organization and end-users.

--- The project includes a formal agreement between the NRC/Cairo and the Societe Financière et Industrielle d'Egypte, the parent company for the phosphate manufacturing plant at Kafr El-Zayat.

4. Has a detailed project plan been developed and is it being implemented?

--- For a copy of the project plan see the document Overview and Inputs for Evaluation submitted by ASRT. The plan, especially at the levels of laboratory bench testing and of technical training, is being implemented.

5. Are expected achievements being realized quantitatively and qualitatively? Are there additional economic, social and environmental benefits?

--- Laboratory scale beneficiation tests have demonstrated the ability to up-grade the Abou Tartour phosphate ore to concentrations suitable for economic conversion to fertilizer materials. The effect of iron pyrite (principal impurity) has been negligible but the impurity does affect the color of the end product. Market and field testing are scheduled to determine if the color is acceptable to the farmers. Pilot plant testing, however, has not begun either for beneficiation or wet process chemical conversion to fertilizers. These tests await the completion of a CMRDI pilot plant in 1980.

--- Testing of beneficiation by dry methods is also being undertaken. If this proves feasible considerable sums can be saved because the amount of ore transported from mine site (Western desert of Egypt) to the Nile River will be reduced. Dry beneficiation would have the added advantage of reducing effluent discharge into the Nile River.

--- One major additional benefit to be derived from the Phosphate R&D project is the establishment in Egypt at the CMRDI of NRC/Cairo of a modern, well equipped and well staffed/trained laboratory for

applied development in the area of phosphate minerals characterization, ore beneficiation, processing and conversion to fertilizer materials.

6. What major problems and constraints have been encountered? Have solutions been found?

--- The major constraint in this project is the delay in specification and procurement of pilot-scale beneficiation and chemical processing equipment. Thus major parts of the project, the pilot plant scale beneficiation and wet processing development as well as introduction to industry of the new processes developed, cannot be carried out until Phase II. It is expected, however, that all planned activities can be completed, including the transfer of the newly developed technology to industry, by the end of Phase II.

7. Are the goals for the Phosphate Ore R&D project realizable in Phase I, and in Phase II?

--- Phase I is a period of program design, training, laboratory and pilot plant construction, and upgrading of equipment. During Phase I the experimental work is largely bench-scale while larger, more applications-oriented pilot plant facilities are designed and built. Particular care is being given to the choice of equipment for wet-acid chemical processing and conversion to fertilizer materials. With the exception of equipment/instrumentation procurement, the project is proceeding on a reasonable time schedule to accomplish Phase I goals.

--- Phase II goals are realizable if procurement is not further delayed and funds are authorized for Phase II implementation by October 1980.

8. What additional inputs are needed beyond Phase II to assure continuity of the project and its adoption by end-users?

--- After Phase II, Egypt must maintain the high standards of the Ore Beneficiation and Chemical Processing Laboratory by continuing to supply equipment, maintain and periodically upgrade physical facilities (buildings, field testing laboratories at mine sites, etc) and by providing continuing opportunities for the in-service training of the staff.

III. Wool Scouring and Wool Wax Recovery

Key Questions

1. How does the Wool Scouring/Wool Wax Recovery R&D project meet the overall goals/objectives of the Applied Science and Technology Program?

The Wool Scouring/Wool Wax Recovery R&D project addresses several of the Egyptian development objectives including the broadening and diversification of Egyptian export capabilities, upgrading of industrial technology to recover a valuable product now largely wasted in wool processing, and reduction of industrial pollution by the elimination of a noxious waste.

2. Has an appropriate management structure been established and is it functioning?

3. In what ways does the project strengthen direct linkages between the management organization and end-users.

In the Wool Scouring/Wool Wax Recovery R&D project the management structure is a joint NRC/Cairo-Misr Beida Dyers Company steering committee which provides a direct linkage between the R&D organization and the end-user organization. Furthermore, the link is a true collaborative effort with the General Manager of Beida Dyers serving as the project manager and the Director of the NRC/Cairo Textile Laboratory serving as the principal investigator.

4. Has a detailed project plan been developed and is it being implemented?

For a copy of the Wool Scouring/Wool Wax Recovery project plan in Phase I and Phase II, see the document Overview and Inputs for Evaluation.

5. Are expected achievements being realized quantitatively and qualitatively? Are there additional economic, social and environmental benefits?

The economic returns from an improved wool scouring and wool wax recovery facility at Misr Beida Dyers fully justifies the estimated U.S. $250,000 cost for the R&D project (Phase I and II totals).

Beida Dyers currently processes about 7,000 to 8,000 metric tons per year of imported, top quality wool containing 10 to 15% wool wax and waste material. Present technology is out-dated and can produce a low quality wool wax product with about 50% recovery efficiency. Actually only about 200 metric tons/year of low grade wool wax is currently recovered and brings an international price of about U.S. $350/metric ton. After process improvement using

largely known technologies, the recovery is expected to be 400 - 600 metric tons/year of high grade material valued at up to $850/ metric ton. Furthermore, the effluent from the scouring/recovery process will no longer constitute a large volume liquid waste discharged into Nile canals near the factory. Additional benefits will accrue from a reduced use of chemicals in scouring and an improved quality wool for the export market.

6. What major problems and constraints have been encountered? Have solutions been found?

Again the principle constraints have been in the procurement of pilot plant and laboratory equipment and instruments. Of crucial importance is the procurement and delivery of a continuous flow centrifuge for in-plant testing by late 1980. A means to expedite this item of equipment has not yet been found.

7. Are goals for the Wool Scouring/Wool Wax R&D project realizable in Phase I and Phase II?

Phase I is largely one of problem definition and assessment of alternative solutions. This includes an extensive comparison of wool scouring practices in Australia, New Zealand, the U.K. the United States and Western Europe. The studies must include plant observation and visits in addition to surveying the literature. Many of the study visits (i.e., Australia and New Zealand) were made <u>without</u> cost to the project by the General Manager of the Misr Beida Dyers Company. These studies are completed; detailed monitoring of current scouring within the plant is well advanced and an in-plant testing laboratory at the Misr Beida Dyers factory has been constructed (also at no expense to the R&D project). However, delivery of key items

of equipment and instrumentation from project funds is now crucial to maintaining the Phase I schedule. Goals for Phase II appear realistic but are also dependent upon delivery of equipment.

8. What additional inputs are needed beyond Phase II to assure continuity of the project and its adoption by end-users?

The Wool Scouring/Wool Wax recovery R&D project can terminate during the final (third year) of Phase II. It is an example of targeted and discrete industrial research.

Adoption of an improved scouring/recovery process seems assured by the Misr Beida Dyers Company if results continue to be as promising as currently indicated. The factory investment will be done by the Company from its own capital resources. One encouraging factor is that no additional factory space requirements will be needed thereby eliminating a time consuming and expensive construction program.

IV. Corrosion Monitoring and Control in the Petroleum Industry

Key Questions

1. How does the Corrosion Monitoring and Control R&D project meet the overall goals/objectives of the Applied Science and Technology Program?

The Corrosion Monitoring and Control R&D project has the following objectives, all of which are important for Egypt and for the Applied Science and Technology Program:

--- Strengthening indigenous R&D for problem solving in Egyptian industry;

--- Use of locally produced materials as substitutes for costly imported corrosion inhibitors;

--- Upgrading capabilities in the NRC/Cairo and in the Suez Oil Refining Company on a critical industrial problem.

2. Has an appropriate management structure been established and is it functioning?

3. In what ways does the Corrosion R&D project strengthen direct linkages between the management organization and the end-users?

The Corrosion R&D project involves the CMRDI and other laboratories of NRC/Cairo, and the Suez Oil Refining Company. A joint project team has been established to work on specific corrosion problems in the Suez facility. Links have also been established with a major corrosion R&D facility in the USA and an external "resource" team (advisory committee) will assist the project during Phase II.

4. Has a detailed project plan been developed and is it being implemented?

A project plan for strengthening analytical and testing aspects of industrial corrosion at the NRC has been prepared and is being implemented.

The preparation and testing of specific corrosion inhibitors for use in the Suez Oil Refining facility in Suez is necessarily dependent upon upgrading of the NRC corrosion laboratory.

5. Are expected achievements being realized quantitatively and qualitatively? Are there additional economic, social and environmental benefits?

The project suffered an unavoidable delay of approximately six months very early in Phase I but is now proceeding according to plan.

See the program plan in the document Overview and Inputs for Evaluation.

Economically, the corrosion project is important because Egypt currently imports nearly 100% of its needs for corrosion inhibitors. It is estimated that well over LE 1 million annually is spent on these corrosion inhibiting substances. The petroleum industry alone uses about U.S. $300,000 of imported inhibitors.

6. What major problems and constraints have been encountered? Have solutions been found?

First, the project manager was unexpectedly taken ill and an associate was not immediately designated. This situation, together with delays in procurement have caused the project to fall behind about six months in Phase I.

An associate project manager was appointed with full authority to direct activities in mid 1979. Since that time, activities in training, characterization of equipment needs, and forging of a joint NRC/Cairo-Suez Oil Refining Company management team have moved ahead.

7. Are goals for the Corrosion R&D project realizable in Phase I and Phase II?

If procurement can now proceed expeditiously, the Phase I and Phase II goals are realizable.

8. What additional inputs are needed beyond Phase II to assure continuity of the project and its adoption by end-users?

A corrosion monitoring and applied research laboratory in the NRC/Cairo can be a major asset for Egypt. In time (5-10 years) it could become fully sustainable from contract R&D.

V. Red Sea Fisheries Development

A. Background

In addition to the background information in the Executive Summary document, a revised project proposal (February 1980) has been submitted.

B. Key Questions

1. How does Red Sea Fisheries Development meet the overall goals/ objectives of the Applied Science and Technology Program?

--Knowledge of fisheries and their exploitation in the Red Sea is limited compared with development of the Mediterranean, northern lagoons, and inland lakes fishing industries.

--The project will initially assess specific fisheries resources and the feasibility for an industry which will augment protein for Egyptian consumption (pelagic schooled fish and reef fishes), and valuable export earnings (spiny lobster and deepwater shrimp).

--If subproject investigations point to viable commercialization, that process will create new population centers in sparsely populated desert coastal zones.

--The applied research under the aegis of the Institute of Oceanography and Fisheries will involve fishermen, commercial fishing companies and the Red Sea governate from the outset. Successful findings should lead to immediate response by industry, including provision of necessary storage, processing, and transport facilities.

2. Has an appropriate management structure been established and is it functioning?

--A high level project team from the ASRT and its Institute of Oceanography and Fisheries has worked with NAS advisory panelists

(April 1979 and January 1980) in refinement of the project proposal. Principal investigators for the subproject areas now proposed need to be appointed and the management structure established.

3. In what ways does the project strengthen direct linkages between the management organization and end-users?

--As outlined in 1., the project will involve fishermen and commercial interests from the outset. The management structure should insure that such links will enable results to stimulate well planned commercial development as soon as results warrant.

4. Has a detailed project plan been developed and is it being implemented for Red Sea Fisheries Development?

--The project is in preliminary developmental stages and a detailed plan and implementation procedure should be elaborated following JCC endorsement of the current proposal.

5. Are expected achievements being realized quantitatively and qualitatively? Are there additional economic, social and environmental benefits?

--Since implementation has not begun, achievements cannot be measured.

--If the surveys prove the suspected resources, the economic (food and export earnings) and social (employment, industrial and population attraction) benefits are the major aim.

--Exploitation at a commercial level will involve ecological considerations and a role for the Institute of Oceanography and Fisheries in this area is envisaged, as part of its continuing role in fisheries research.

6. What major problems and constrairts have been encountered? Have solutions been found?

--Clarification and refinement of the initial proposal has taken more time than anticipated, but the initial undertakings now proposed will probably allow for a more focussed and better managed project than if work had begun earlier under a general mandate.

--Delays (or the customary lead time) in equipment procurement will impede the attainment of "first year" results. It is hoped that some way will be found to expedite purchase of equipment so that the exploratory fishing and sampling can get underway.

7. Are goals for Red Sea Fisheries Development realizeable in Phase I and in Phase II?

--Phase I achievements are confined to the project design, equipment definition and order and training components.

--Project goals for assessing potential commercialization can be achieved in Phase II, if equipment is procured in time.

--Initial commercialization, including pilot storage, processing and transportation facilities can be developed in Phase II.

--Assuming positive results, the needs for a basic multipurpose research vessel will be apparent early in Phase II.

8. What additional inputs are needed beyond Phase II to assure continuity of the project and its adoption by end-users?

--If a basic multipurpose research vessel is not operational in Phase II, it will be essential thereafter for continuing research on the initial species to be surveyed, investigation of other species, and to expand such research to include fish population, ecological and related oceanographic research. Successful increase in commercialization will underscore the need for a research vessel.

EVALUATION OF POLICY PLANNING, MANAGEMENT AND CONTROL

I. Background

The more immediate objectives of the Applied Science and Technology Program element identified as "Policy Planning, Management and Control" are:

- Assist in establishing operational, effective R&D management structure and systems at ASRT and NRC/Cairo;

- Assist in the NRC/Cairo reorientation towards end-user R&D.

The long-term goal is to strengthen the ASRT as the key science policy planning and management agency of the Egyptian government.

Both the more immediate objectives and the long-term goal are implemented by the individual and the inter-active functioning of the principal organizations involved in the Applied Science and Technology program - the Egyptian Academy of Scientific Research and Technology (ASRT) and the Egyptian National Research Centre (NRC/Cairo); the U.S. National Science Foundation (NSF) and the U.S. National Academy of Sciences/National Research Council (NAS/NRC).

II. Research & Development Management Education

(Sub-contract of the Denver Research Institute)

Key Questions

1. How does the R&D Management Education project meet the overall goals/objectives of the Applied Science and Technology Program?

The R&D Management Education project was designed to stimulate wide awareness within Egyptian R&D institutions on the needs for, and methods of, organizational structures that promote effective management. The catalysis provided by the courses offered by the Denver Research Institute (DRI) in the USA and in Cairo was considered to be one effective input for bringing about change in the Egyptian R&D management system.

2. Has an appropriate management structure been established and is it functioning?

Initially the DRI courses were designed by representatives of the Institute experienced in holding management seminars and workshops in many countries of the world. The course outlines and plans were critically reviewed in Egypt by the President of the ASRT, the Director of NRC/Cairo and others. After the first activities took place in Denver, an Egyptian steering committee was appointed by the ASRT President to work with DRI management in all aspects of program planning and implementation.

3. In what ways does the project strengthen direct linkages between the management organization and end-users?

The project is designed with ASRT, NRC/Cairo, Egyptian universities and Egyptian R&D institutions as the 'end-users'. ASRT serves as the Egyptian management organization. Linkages have been strengthened among this group through their involvement in all planning steps for the project.

4. Has a detailed project plan been developed and is it being implemented?

Detailed subproject plans were developed, (a) for the USA portion of the project, and (b) for the Cairo portion of the project. In each case the general criteria and plans were implemented. See also Overview and Inputs for Evaluation document.

5. Are expected achievements being realized quantitatively and qualitatively? Are there additional economic, social and environmental benefits?

In the DRI Workshops held in Denver, 43 persons, rather than the 32 originally targeted, were selected and participated. In the first Cairo workshop (Overview of modern R&D management methods for senior officials), 59 participants (out of 70) completed the course.

Qualitatively, the DRI workshop content and presentation has been good. Each workshop to date has "benefited" from the previous one in the series. This shows adaptability and conscientiousness on the part of both DRI and ASRT.

6. What major problems and constraints have been encountered? Have solutions been found?

The workshops have been highly intensive, requiring dedication by both participants and staff. This factor has led to some rescheduling.

The contracting procedure has been cumbersome and time-consuming because NAS/NRC has had to seek AID/Washington endorsement of the contracting process and the contract content. There is no known remedy for these delays.

7. Are goals for the R&D management workshops realizable in Phase I and Phase II?

The series of DRI R&D management workshops will be completed prior to the end of Phase I. Planning for Phase II awaits action of JCC-6.

8. What additional inputs are needed beyond Phase II to assure continuity and adoption by end-users?

Note: This is a topic for JCC discussion.

5

Ref. No. JCC 5-6

February 1980

APPLIED SCIENCE AND TECHNOLOGY PROGRAM IN EGYPT

OVERVIEW AND INPUTS FOR EVALUATION

PROJECT 263-0016

Prepared by

NATIONAL SCIENCE FOUNDATION

WASHINGTON, D.C.

FORWARD

This report was prepared by the U.S. National Science Foundation to assess development impacts of its program activities, specifically, the Science and Technology Information Component and Instrumentation Technology Component of the Applied Science and Technology Program.

This report, which covers Phase I activities from the program's inception in 1977 through February 1980, addresses project progress in terms of overall program goals and objectives and identifies achievements, unexpected benefits, problems, constraints, and possible solutions to problems.

This document served as an input for the Joint Consultative Committee's "self-evaluation" which took place during the Fifth Meeting in Washington, D.C., February 25 - 27, 1980.

CONTENTS

	Page
EVALUATION OF S&T INFORMATION COMPONENT	1
I. Background	1
II. Key Questions	1
A. Goals and Objectives	1
B. Plan	2
C. Accomplishments to date	2
D. Project Management	4
E. Problems/Constraints and Solutions	7
EVALUATION OF INSTRUMENTATION TECHNOLOGY COMPONENT	9
I. Background	9
II. Key Questions	9
A. Goals and Objectives	9
B. Plan	10
C. Accomplishments to date	10
D. Project Management	11
E. Problems/Constraints and Solutions	11

EVALUATION OF S & T INFORMATION COMPONENT

I. BACKGROUND

For a concise summary of project goals/objectives and of project status, see the Executive Summary Document prepared for the fifth JCC meeting.

II. KEY QUESTIONS

A. Goals/Objectives

How does the S&T Information Component meet the overall goals/objectives of the Applied Science and Technology Program?

---Scientific and technical information increasingly is recognized as an essential factor in addition to human, economic, technical and physical factors in the organic process of development. As such, a country's S&T information resources, and access to and use thereof, are critical to both scientists and policy and decision-makers. The STI component, proposing to develop a national S&T information system which will improve access and use of S&T information resources, is therefore directly relevant to , inherent in, and supportive of the overall goals/objectives of the Applied Science and Technology Program and figures as a major element in the infrastructure not only of Science and Technology but also social and economic development.

121

B. Plan

Has a detailed project plan been developed and is it being implemented?

---A Project Management Plan, developed jointly by NSF and ASRT/NIDOC, contained a detailed outline of a general plan for the overall design study, computer-accessed information delivery service experiment, current information resources planning study, and the in-service training project. This detailed outline was refined subsequently into detail specifications in the Requests For Proposals (RFPs) for technical advisory and assistance services. Based on the foregoing, a final detailed work plan and schedule for implementing the projects was developed by the Egyptian STI Steering Committee and the two U.S. contractors (Georgia Tech and Catholic University) in November 1979.

---The work in both the Design Study (including the computer-accessed information experiment and the currrent information resources plannning study) and the In-Service Training Project is proceeding on schedule according to the November 1979 detailed work plan.

C. Accomplishments to Date

1. Are expected achievements being realized qualitatively and/or quantitatively?

---With NSF cooperation with ASRT antedating (April 1976) its formal involvement in the AID/ASRT S&T Program (September 1978), a number of accomplishments resulting from NSF advisory or technical assistance may be cited in three major areas:

* Improved Access to S&T Information

  -- 1 million NTIS R&D reports

  -- 2,500 new reports every two weeks

  -- Special announcement bulletins in food, chemistry, energy, and library and information science

  -- Bibliographic (microfiche) Index to 175,000 reports

  -- 500 NSF-supported technology transfer reports; printed index to 2500 TT reports

* Provision of Microfiche Readers and Telex

  -- User preference evaluation program

  -- Six microfiche readers, including a reader/printer

  -- Telex installed in ASRT introducing potential for access to world's S&T bibliographic databases (over 50 million citations)

* Training of Information Specialists

  -- Orientation training tour of U.S. information centers and facilities

  -- NTIS Information Systems Workshop

  -- Planning for abstracting and indexing workshop

---NSF contract with Georgia Tech providing methodological guidance and technical assistance in the Planning and Design Study for the S&T Information System/Services in Egypt (Oct 1979)

---NSF contract with Catholic University for development and direction of an in-service training program for Egyptian information specialists (November 1979)

---First group of five trainees begin in-service training at Catholic University in January 1980

123X

---Georgia Tech Design Study Team Consultants launch system analysis phase of Design Study in Cairo in January 1980

--- Design Study and In-Service Training are on schedule

2. Are there foreseen economic, social and environmental benefits?

---Insofar as information, and especially S&T information, is an infrastructure element in the economy and society of the country, there can be no question of information's significance to economic, social and environmental development over the long-term (once an effectively operating system is in place).

D. Project Management

1. Has an appropriate management structure been established and is it functioning? Does the project involve a good base of the S&T community?

---In August 1979 an Egyptian STI Steering Committee (STISC) was established consisting of representatives of NIDOC, research institutions, universities, ministries, the private and information sectors. Chaired by NIDOC, the Committee accomplishes the work of the project through four major task groups (surveys, NIDOC system/national services, information manpower, information policy and plan) and a liaison secretary. NIDOC, as Egyptian focal point (executive agency), and the STISC interact directly with the Georgia Tech contractor in receiving methodological advice and technical assistance in carrying out the various project tasks. Having completed its pre-contract-phase responsibilities for

project design, development of a project management plan and detailed RFP specifications, and contract procurement, NSF has receded to the role of program monitorship and management of the U.S. technical resources involved in assisting Egyptian implementation of the project, and securing appropriate external evaluation of project programs in their achievement of stated goals/objectives. Communications between principals in the management structure continues to be problematic and is discussed in Section II.D.3.

2. Does the project strengthen direct linkages between the management organization and end-users?

---Although most, if not all, members of the Egyptian STISC are active members of the "end-user" community, it is too early in the proejct life cycle to determine how effective this linkage will be. Each of the STISC members, however, is encouraged and expected to play a leadership role in promoting access to and use of the new information resources about to be made available through the national system/services being designed. The Phase II Plan more explicitly recognizes the need for "intensive sensitizing of key user constituencies to information products and services" by making this one of its key objectives. Avhievement of this objective envisions development and operation of various kinds of user training programs.

3. <u>Has the reporting system been operating satisfactorily?</u>

--- U.S. contractor-reporting to NSF is real time and satisfactory in the form of monthly letter reports and site visit reports. NSF reports semiannually to AID on project progress. Copies of such reports are available to the principal parties. To avoid bureaucratically induced reporting delays created by too many channels through which reports may be submitted (e.g., NIDOC-to-ASRT-to-AID Mission-to-AID Washington-to-NSF-to- NSF contractors and vice versa), communication or transmittal of reports/documents takes place directly between NIDOC and the NSF contractors with information copies being sent simultaneously to all other parties. Nevertheless, reports generated in Egypt to be sent to NSF and its contractors and vice versa are still subject to delays in transmittal over great geographic distrances. The Georgia Tech contractor and NIDOC are now experimenting with the possibility of conveying documents and information via computer communications over a digital data communications (voice-grade) line.

E. Problems/Constraints and Solutions

What major problems and constraints have been encountered? Have solutions been found?

1. Problem: Unusually long project start-up time -- 18 months (March 1977 - September 1978) to develop project design, project management plan, and RFP specifications; and 11 months (January 1979 - November 1979) for procurement of technical contract services.

   Solution: This matter is now behind us. Contracts for both the Design Study and Training were awarded in Fall 1979 and are now proceeding on schedule.

2. Problem: Transmittal of communications between Egypt and the United States.

   Solution: A possible solution is discussed in Section II.D.3.

3. Problem: Since its inception, the Egyptian STI Steering Committee (STISC) has assumed an operational role ("building a camel by committee") rather than one that is advisory/supervisory (steering) in nature.

   Solution: The Task Groups under STISC will now be staffed with a more stable core of Egyptian project professionals, thus freeing the STISC members from operational participation and allowing them to exercise their advisory/supervisory role.

4. Problem: Technical/Operational Management Responsibility.

With four task groups operating under STISC there is a pressing need for providing centralized, daily, technical direction for operational performance aspects of project execution.

Solution: A full-time Egyptian Technical Project Manager is being hired to inegrate and coordinate project task activities.

5. Problem: Need to assure that the new skills and expertise of professionals formally trained under this project will be effectively utilized on the trainees' return to his employing institution in Egypt.

Solution: Problem and possible solution discussed in Section II.E.b of "Evaluation of Instrumentation Technology Component" (page 12).

EVALUATION OF INSTRUMENTATION TECHNOLOGY COMPONENT

I. BACKGROUND

For a concise summary of the Instrumentation Technology (IT) component goals/objectives and of project status see the Excutive Summary Document prepared for the fifth JCC meeting.

II. KEY QUESTIONS

A. Goals/Objectives

How does the IT component meet the overall goals/objectives of the Applied Science & Technology Program?

---The IT component is aimed at developing institutional capability in maintaining and repairing (M&R) scientific instruments for use in ASRT sponsored applied research.

---The IT component is multi-institutional in character with the following organizations actively participating: National Research Centre (NRC); Scientific Instruments Centre (SIC); Universities of Alexandria, Assiut, Cairo, El-Minia, and Tanta; University of Wisconsin Instrumentation Systems Center (UW/ISC); and National Institutes of Health Biomedical Engineering and Instrumentation Branch (NIH/BEIB).

127

B. **Plan**

Has a detailed project plan been developed and is it being implemented?

---An NSF project management plan was developed in January, 1978. This plan was revised by NIH/BEIB and UW/ISC in their subcontracts with NSF (effective Dec. 78 and April 79, respectively). These plans are being implemented.

C. Accomplishments to Date

Are expected achievements being realized?

---M&R facilities are operational at all institutions. Scientific instruments are being repaired by returned trainees at the NRC, Assiut, Tanta, & El-Minia Universities. Administrative procedures at the M&R facilities are still being developed. Project execution was on schedule until Oct, 79 when a problem occurred with the second group of trainees. This group of 16 trainees was delayed in order to first satisfy USAID English language proficiency requirements. This has now been completed and departure is scheduled for March. M&R training schedule has thus slipped five months.

---Alexandria University was added to the original four universities in late 79. The first trainee from Alexandria is to travel to NIH/BEIB in March, 80. Planning for the M&R facility at Alexandria has just recently been initiated.

D. Project Management

1. Has an appropriate management structure been established and is it functioning?

---On paper the management structure seems appropriate, but, in fact, has not functioned well. A major problem has been in the Egypt-U.S. communication linkages. This is discussed in section E (Problems/constraints, and solutions).

2. Has the reporting system been operating satisfactorily?

---Subcontractor reporting is accomplished through monthly reports from UW/ISC & NIH/BEIB to NSF, which sends the reports to USAID/Cairo. In addition NSF writes semi-annual reports for USAID. Status reports have been prepared for the JCC meetings.

E. Problems/constraints, and solutions

What major problems/constraints have been encountered and what solutions have been found/proposed?

---There are two major problems in the IT component.

a. The first is the difficulty of Egypt-U.S. communications as well as communication within Egypt. This problem will be greatly alleviated by the establishment of a proposed NSF Egyptian coordinator (Professor Muhammed Shaltoot). He will serve as central focal point for communication/coordination in Egypt for both Egyptian and U.S. participating institutions. In this capacity he will act as clearing house for all NSF-Egypt communications, arrange and assist in logistics

131

of NSF & contractors' visits to Egypt, and represent NSF at Program meetings in Egypt. In addition, Professor Shaltoot will also be the IT Egyptian technical project director.

b. The second is the problem of the low salaries paid to Egyptian engineers. An engineer trained at UW/ISC will earn at most $100/month at the NRC. In the private sector in Cairo he could make three times that (and much more if he went to the Gulf). This is a fundamental problem in Egypt, in no way unique to this program. Outside Cairo the problem is less serious because the private sector is not as well developed, yet. The problem of salaries has made Phase I implementation tedious, at best, and poses a serious threat to the success of the IT component. One manifestation of this problem is the reluctance of trainees to return from the U.S. The trainee from Cairo U has, in fact, remained illegally in the U.S. (The U.S. Immigration Service has been notified and will take necessary action.) As a result of his failure to return, Cairo U has not benefited yet from M&R training program.

6

JCC 5- 1

February 1980

APPLIED SCIENCE AND TECHNOLOGY PROGRAM in EGYPT

EVALUATION OF PROJECT 263-0016

(Applied Science and Technology Program)

5th Meeting

Joint Consultative Committee

Washington, D.C. U.S.A.

February 25-27, 1980

Prepared by: U.S.AID Mission
Cairo, Egypt

PROJECT EVALUATION SUMMARY (PES) – PART II

The following topics are to be covered in a brief narrative statement (averaging about 200 words or half a page per item) and attached to the printed PES facesheet. Each topic should have an underlined heading. If a topic is not pertinent to a particular evaluation, list the topic and state: "Not pertinent at this time". The Summary (Item 13) should always be included, and should not exceed 200 words.

13. **SUMMARY** - Summarize the current project situation, mentioning progress in relation to design, prospects of achieving the purpose and goal, major problems encountered, etc.

14. **EVALUATION METHODOLOGY** - What was the reason for the evaluation, e.g., clarify project design, measure progress, verify program/project hypotheses, improve implementation, assess a pilot phase, prepare budget, etc? Where appropriate, refer to the Evaluation Plan in the Project Paper. Describe the methods used for this evaluation, including the study design, scope, cost, techniques of data collection, analysis and data sources. Identify agencies and key individuals (host, other donor, public, AID) participating and contributing.

15. **EXTERNAL FACTORS** - Identify and discuss major changes in project setting, including socio-economic conditions and host government priorities, which have an impact on the project. Examine continuing validity of assumptions.

16. **INPUTS** - Are there any problems with commodities, technical services, training or other inputs as to quality, quantity, timeliness, etc? Any changes needed in the type or amount of inputs to produce outputs?

17. **OUTPUTS** - Measure actual progress against projected output targets in current project design or implementation plan. Use tabular format if desired. Comment on significant management experiences. If outputs are not on target, discuss causes (e.g., problems with inputs, implementation assumptions). Are any changes needed in the outputs to achieve purpose?

18. **PURPOSE** - Quote approved project purpose. Cite progress toward each End of Project Status (EOPS) condition. When can achievement be expected? Is the set of EOPS conditions still considered a good description of what will exist when the purpose is achieved? Discuss the causes of any shortfalls in terms of the causal linkage between outputs and purpose or external factors.

19. **GOAL/SUBGOAL** - Quote approved goal, and subgoal, where relevant, to which the project contributes. Describe status by citing evidence available to date from specified indicators, and by mentioning the progress of other contributory projects. To what extent can progress toward goal/subgoal be attributed to purpose achievement, to other projects, to other causal factors? If progress is less than satisfactory, explore the reasons, e.g., purpose inadequate for hypothesized impact, new external factors affect purpose-subgoal/goal linkage.

20. **BENEFICIARIES** - Identify the direct and indirect beneficiaries of this project in terms of criteria in Sec. 102(d) of the FAA (e.g., a. increase small-farm, labor-intensive agricultural productivity; b. reduce infant mortality; c. control population growth; d. promote greater equality in income; e. reduce rates of unemployment and underemployment). Summarize data on the nature of benefits and the identity and number of those benefitting, even if some aspects were reported in preceding questions on output, purpose, or subgoal/goal. For AID/W projects, assess likelihood that results of projects will be used in LDC's.

21. **UNPLANNED EFFECTS** - Has the project had any unexpected results or impact, such as changes in social structure, environment, health, technical or economic situation? Are these effects advantageous or not? Do they require any change in project design or execution?

22. **LESSONS LEARNED** - What advice can you give a colleague about development strategy, e.g., how to tackle a similar development problem or to manage a similar project in another country? What can be suggested for follow-on in this country? Similarly, do you have any suggestions about evaluation methodology?

23. **SPECIAL COMMENTS OR REMARKS** - Include any significant policy or program management implications. Also list titles of attachments and number of pages.

Part II

13. Summary:

The Grant Agreement was signed on March 29, 1977, with the Egyptian Academy of Scientific Research and Technology (ASRT). Although project implementation was considerably hampered by lengthy negotiations with both U.S. prime contractors, the National Academy of Sciences (NAS) and the National Science Foundation (NSF), the project is now progressing at a satisfactory rate. Since this project represents a departure for NAS from its normal project relationships, finalization of contractual responsibilities moved forward more slowly than anticipated, reflecting its desire to fully consider the extent to which it could mobilize NAS resources and determine its subcontracting needs. In addition, other internal NAS issues concerned the organization of workshops; setting up of panels; and the assumption of broad science policy formulation, rather than its accustomed administration of specific projects. Taken together, these factors delayed NAS entering into contractual relationship with AID. Ultimately, the contract was signed on December 17, 1977.

The NSF had indicated a willingness to participate in the scientific and technical information component of this project from its inception but, due to a series of administrative hurdles (including NSF administrative and policy changes which threatened to undermine its participation for a time), the PASA was not signed until September 25, 1978. The period from September 1978 through September of 1979 was spent in development of RFP's, receipt of proposal reviews, and contracting negotiations. NSF sub-contractors, Catholic University and Georgia Institute of Technology, began work in Egypt in October, 1979.

Despite the initial delays in implementation, significant progress in achieving the project purpose has occured. Considerable work has been done on the research and demonstration projects as well as other components cited in sections 16-19. Other steps taken, such as sizeable core equipment purchases, short-term visits of key Egyptian and American scientific leaders and specialized training in the U.S. and Egypt, have equally contributed to achievement of the project purpose. However, in view of the above mentioned delays, this two-year project has been extended one year and a revised implementation schedule has been developed.

14. Evaluation Methodology:

This evaluation is the first annual evaluation which is taking place two years into the project due to the initial implementation delays. The evaluation was undertaken in order to measure implementation progress in relation to achievement of project purpose. Through this evaluation it is hoped that any implementation problems not previously identified can be brought to the fore and resolved. This analysis represents a joint effort by USAID and participating GOE entities with the assistance of

135

both primary U.S. contractors.

15. External Factors:

Internal changes in the management of ASRT have resulted in renewed enthusiasm in the Academy's upper ranks for this project. The Egyptian project manager is now working full-time on 263-0016.

As a result of the move of the ALESCO (Arab League Education, Scientific and Cultural Organization) headquarters from Cairo to Tunis, IDCAS (Industrial Development Center for the Arab States) is devoting its efforts to Egyptian information needs only. The director of IDCAS has agreed to allow his staff to work with NIDOC (National Information and Documentation Center) on the preparatory work for the arrival of the contractor for the Science and Technology Information component. This additional expertise should prove invaluable to NIDOC in the initial implementation phase.

16 and 17. Inputs and Outputs:

In view of the project implementation delays experienced thus far, introduction of inputs and achievement of outputs have necessarily fallen behind schedule. Revised implementation schedules have been submitted by the contractors and, with the time extension of one year, all project inputs and outputs should be achieved by end of project.

In order to present the project accomplishments to date in the most understandable form, the inputs and outputs have been integrated into one section.

Technical Assistance:

The National Academy of Science (NAS) has provided the link for the ASRT and the National Research Center (NRC) to the American science community in policy planning and management. The National Science Foundation (NSF) is responsible for the information and instrumentation technology components of the project with the National Information and Documentation Center (NIDOC) and the NRC.

1. The National Academy (NAS) contract is to assist the GOE to implement Policy Planning and Management; Research Project Support; Demonstration Project Support; and Planning for Phase II.

A. In the implementation of its Policy Planning and Management segment, NAS was instrumental in organizing the Joint Consultative Committee (JCC) composed of five members each from Egypt and from the U.S. who advise the President of ASRT on program planning, selection of projects and evaluation of results. The NAS/NRC was responsible for selecting the U.S.

136

members (See Annex A) and for the panel's logistic support.

Four meetings of the JCC have been held since it was founded in April, 1978: Cairo, May 1978; Washington, November 1978; Cairo, March 1979 and Cairo, November 1979. The JCC facilitate senior level joint articulation of program policies, sets goals, and periodically reviews project results. Its ability to function in a high level advisory capacity to the President of ASRT has been effectively demonstrated. The JCC has, for example, made recommendations on the selection and modification of projects proposed during its sessions. The JCC has been instrumental in keeping the project orientation to applied research and development problems, which is witnessed by the research and demonstration projects selected.

The NAS contract calls for two Senior Resident Advisors in policy planning and management, one for the NRC and one for ASRT. One position, Advisor to the NRC, has been filled by Dr. Helmut Weldes. He brings to his position at the National Research Center direct experience in R&D, R&D management, R&D marketing, venture formation and senior corporate management.

Dr. Weldes arrived in January, 1979 and has been working to the complete satisfaction of the Director of the NRC. He has been instrumental in establishing linkages with private industry for the NRC, especially in relation to the R&D sub-projects. Among his other accomplishments, Dr. Weldes has assisted in the drafting of the new by-laws of the NRC, designed a management by objectives system for the Center, and managed the Research and Development component of 263-0016. In addition, he has worked closely with the Center's Program Office in organizing all NRC data concerning its ongoing projects with domestic organizations and international donors.

The second position, Advisor to the President of ASRT, remains unfilled. One modification that may be required in the Project Grant Agreement and the NAS contract concerns the assignment of this position. The set of qualifications for the advisory position requires a special degree of personal/cultural sensitivity and, although several high-level persons were nominated for this position, the former President of the ASRT was not fully satisfied with any of the candidates interviewed. Recently the new ASRT president, Hassan Ismail, asked NAS that the Senior Advisor position be deferred to until Phase II. This will require a change in Annex I of the grant agreement and the NAS contract once USAID is officially informed.

B. NAS Sub Contract:

Denver Research Institute (DRI) signed May 1, 1979 for P&D management training. The signing of this sub-contract took

137

an inordinate period of time. Discussions between the contract division of NAS and the AID Contract Office in Washington began in mid-January with formal documentation submitted to the AID Contract Office in mid-February. Approximately eight weeks passed with no indication of a date when the AID Contract Office would approve or deny NAS the authority to subcontract with DRI; however, these contracting problems are now resolved and training is underway.

The following is the schedule for the DRI training:

June 1979 (6/18 - 7/26)	First workshop in Denver, R&D Management Methods, 3 weeks, 12 Egyptian participants
July 1979 (7/9 - 7/26)	Second Workshop in Denver, Technical Economics in R&D, 3 weeks, 10 Egyptian participants
August 1979 (8/20 - 9/7)	Third Workshop in Denver, R&D, R&D Marketing, 3 weeks, 9 Egyptian participants
Sept. 1979 (9/10 - 9/28)	Fourth workshop in Denver, Technology Assessment, 3 weeks, 11 Egyptian participants
Jan. 1980	First workshop to be held in Cairo, R&D Management Methods, 2 weeks, 40 to 50 Egyptian participants
Feb. 1980	Second workshop to be held in Cairo, Technical Economics in R&D, 2 weeks, 40 to 50 participants
March 1980	Third workshop to be held in Cairo, Technology Assessment and Systems Analysis, 2 weeks, 40 to 50 Egyptian participants
April 1980	Fourth workshop to be held in Cairo, Marketing, 2 weeks, 30-40 Egyptian participants

Total trained in Denver: 43
Total to be trained in Cairo: 150-200

Trainees have been and will be representatives from ASRT, NRC, universities, ministries and related industries in the public sector. The original project paper envisioned training 15 program monitors, 12 policy planners, 5 trainees in marketing (management policies) and 60 workshop participants, so that we will have already trained more people than originally envisioned by the end of this CY.

The technical assistance portion for the demonstration projects has consisted of:
U.S. panels for More and Better Food, New Crops for Arid Lands, and Bio-Gas Technology. Assistance has been given in design conceptualization, selection, implementation, monitoring of

progress and evaluation of results to varying degrees in the following R&D projects:

a. Red Sea Fisheries;
b. Wood Wax Utilization;
c. Corrosion Control; and
d. Phosphate Ore Evaluation

U.S. technical assistance has sought to help orient all R&D and demonstration projects toward Egyptian development needs and has stressed the importance of linkages with end-users in the private and public sectors.

C. Demonstration and R&D projects:

Demonstration Project I: More and Better Food
Program design was essentially completed by the first meeting of the Joint Consultative Committee (JCC) May 1978. JCC endorsement was given at its first meeting, May 1978. Advisory Committee meetings were held in May 1978 (Cairo), November 1978 (Washington), July 1979 (Washington) November 1979 and are projected for March 1980 and September 1980.

The More and Better Food project has three components: Food Technology, Nutrition and Farm System. The food technology aspect was chosen as a result of discussions with food industry people who identified cottonseed oil and cheese manufacturing problems on which the NRC might be able to do significant research.

Food Technology: Oilseed Extraction. The laboratory bench-work (1kg.) work was essentially completed by February 1979; scale-up equipment design to 15 kg. based upon factory specifications at Al Badrachin completed by March 1979 and pilot plant testing begun. Following this work, a further scale-up to 50 kg. equipment will be undertaken.

Food Technology: Cheese making. A consultant visited NRC/Cairo in September 1978 and, in collaboration with the Egyptian staff in the NRC dairy laboratory, suggested a series of pilot plant scale steps to investigate production of Damietta cheese using mixtures of fluid milk and imported dry fat milk concentrate. Laboratory (bench-scale) R&D is being performed but must be evaluated at a pilot-plant scale prior to adaptation at Misr Dairy (Damietta). A key piece of equipment (stainless steel homogenizer) has been specified for the pilot-plant but has not yet been ordered. Because of delivery schedules and time required for building the pilot plant at the NRC/Cairo, the process adaptation to Misr Dairy will occur during Phase II (October 1980).

139X

Nutrition Research

The nutrition - related component assesses the target population's nutritional status. There is currently a protein - rich food Supramin, manufactured in Egypt by a pharmaceutical company, which has the potential for meeting some of the nutritional requirements for pre-school and older children. Work in this component began in January of 1979, with a food scientist, food biologist and food nutritionist working on problems ranging from inacceptable food consistency to short shelf life. It will probably take up to twelve months to get results from the current research, but it is hoped that experiments introducing this cereal-based food in combination with some traditional foods into villages will take place by October of 1980.

Farm System

The farm system-related component deals with the problems of nutrition and the developmental process in general and aims to show that science and technology can have an impact on these problems. In order to further investigate what impact could be achieved, the NRC enlisted the assistance of ORDEV, the Organization for Reconstruction and Development of Egyptian villages, which worked on the selection of villages. Ten villages were selected initially and were interviewed using questionnaires. These ten were then narrowed to three, one village in a valley, one outside of a valley and one a new settlement. The six criteria for selection of the villages were: agriculturally-based; availability of health and agriculture services; accessibility by road; farm size of five feddans or less; representation of villagers to participate in the process of data collection and data interpretation.

An executive committee and village committees have been established, with the Secretaries General of the respective Governorates as members. Recently two villages were selected of the three, Kal Khadra in Mounoufia Governorate and Omar Makram in the Mouderiyat El Tahrir (El Tahrir province) Governorate.

Coordination among all the components of the More and Better Food is essential and is proceeding as planned. The farm system component has a significant constraint in that testing of new technologies is dependent both upon data collection for the villages chosen, (i.e. soil analyses, water management practices, seed and fertilizer availabilities, etc.), and upon the actual growing season. Thus, component coordination during implementation has time-dependent aspects (e.g. natural growing seasons) which can be accommodated in the plans to a degree, but not controlled absolutely. Training thus far under this project has consisted of four orientation visits to appropriate facilities in the U.S.

Demonstration Project II. Biogas Technology:

The preliminary program design was presented to the November 1978 JCC meeting; the project was approved with the request

that a) refinement of the plan be made and b) a joint advisory committee be created to review technical details. The advisory committee met in January 1979, and its recommendations were incorporated into the final project proposal submitted to and approved by the JCC at its March 1979 meeting. The fact finding phase included a literature survey (core effort was completed in June 1979) and valuable information gathering trip to the Economic and Social Commission for Asia and the Pacific (ESCAP) in Bangkok by one team member (April 1979). The biogas demonstration project will take place in a village not yet selected in Giza Governorate and a new village, Omar Makram in Mudiriayat, El Tahrir Governorate.

The NAS advisory committee met in the U.S. with the project coordinator (June 1979) and the principal investigator (July 1979). An NAS committee member Dr. Philip Goodrich joined five key Egyptian team members on their visit to India, China, and Thailand in November 1979 to gain experience from ongoing biogas research and rural applications in those countries. A joint committee meeting is anticipated in early 1980 and at the conclusion of Phase I to evaluate results to date and make recommendations for continuing activity in this area.

The biogas technology demonstration project seeks to prove the economic feasibility of establishing biogas units in rural areas for the production of gas. This technology would allow the farmer to put back into his fields organic wastes which he now burns for energy. A digester fed with raw wastes produces methane for energy, as well as a rich organic fertilizer.

Sociological surveys and analyses of the two selected test villages continued through August 1979, with the continuing areas of focus for the sociological group to be determined thereafter. Laboratory and bench scale work commenced early in 1979 and will continue through Phase I. Construction of a prototype Chinese digester at the NRC is completed and is in working order.

Fundamental microbiological work is concentrating on the study of the selective inhibition of the viability of Ascaris Egg in biogas digesters and will continue through Phase I. In addition, fertilizer evaluation activities are being undertaken in conjunction with the other studies throughout Phase I.

Proposed Demonstration Project: <u>New Crops for Arid and Semi Arid Zones</u>

The JCC considered a preliminary proposal at its November, 1978 meeting and recommended, in view of the project's potential for agricultural production, that further design be undertaken through a joint committee. The joint committee met in January 1979 and in March 1979 and the JCC recommended that the project be undertaken with an orientation to non-conventional crops.

The Egyptian Executive Committee for the project has selected two sites (El Fayoum Governorate and the New Valley Governorate)

14 LX

where forty acre experimental sites will be developed in Phase I. An Egyptian Executive Committee member visited NAS committee members and other U.S. scientists for consultation in July 1979. Initial activities will include acquisition and installation of equipment and laboratory facilities at the sites, NRC, and Al Azhar universities; seed procurement; and planting and training for key personnel. Two joint committee meetings are anticipated before the conclusion of Phase I.

Approved R&D Project: Phosphate Ore Evaluation

A preliminary R&D design was presented to the first JCC meeting in May 1978 but additional information was requested. After preparation of the requested background data, a visit to U.S. laboratories and industries engaged in phosphate ore beneficiation and phosphate fertilizer production by an NRC/Cairo chemical engineer, and an oral presentation to JCC at its November 1978 meeting, the phosphate ore evaluation project was approved for implementation. The purpose of this project is to upgrade the ore beneficiations of the phosphate ores for their utilization as fertilizers.

Three members of an NAC/NRC advisory panel on phosphate ore beneficiation and chemical processing met in Cairo early in April 1979 to assist NRC/Cairo scientists and engineers in reviewing the project design, equipment needs and staff training requirements. Additional interaction among the joint groups took place in January and are planned again for March 1980.

NRC/Cairo bench scale ore beneficiation tests, particularly on the Abu Tartour Phosphate materials, have been conducted during 1979 with promising indications that high concentration iron impurities such as pyrite are not detrimental to benefication. Results, however, must be checked at the pilot plant scale in order to verify the findings under continuous flow sheet operation.

During October and November 1979, four Egyptian scientists/engineers from NRC/Cairo participated in training courses at the International Fertilizer Development Center (IFDC) and the Tennessee Valley Authority (TVA) phosphate fertilizer research facilities, both at Muscle Shoals, Alabama. Pilot plant scale beneficiation and chemical processing tests await completion of facilities at NRC/Cairo. (Note: A chemical processing pilot plant may not be available in Egypt until Phase II. In that event, samples may have to be run at the IFDC in the U.S.A.) Adaptation of flow sheet design, originally projected for mid 1980, will be delayed until Phase II when pilot plant scale testing is completed.

Approved R&D Project: Wool Wax Utilization

The Wool Wax Utilization project is one that arose from discussions during an NRC/Cairo American Chemical Society (ACS)

142

workshop in 1977. It was originally proposed within a group of projects for direct collaboration between the ACS and NRC/Cairo as an Egypt-U.S. applied chemistry program. When funding was not available, the wool wax utilization project was one of two proposed by NRC/Cairo, the ASRT requesting a project design for review at its March 1979 meeting.

The ACS sent Mr. Louis Mizell of the International Wool Secretariat, Wool Bureau Technical Center, New York, to Cairo in January 1979 to assist NRC/Cairo and the Misr Beida Dyers Company in the final project design. The project design was approved by the JCC in March 1979 and incorporated into the program as an R&D Project.

In order to proceed with this work at NRC/Cairo, additional equipment is required. Specifications have been made; the University of Wisconsin is assisting AID and the Afro-American Purchasing Company (AAPC) in procurement. Delivery of all equipment, however, may require until March 1980. Pending arrival of equipment at NRC/Cairo, Misr Beida Dyers is proceeding with bench scale determinations and market surveys for wool wax products. Actual application in the Misr Beida Dyers plant will be delayed until Phase II.

Approved R&D Project; <u>Corrosion Causes and Control</u>

The project Corrosion Causes and Control is the second applied R&D activity arising from the 1977 NRC/Cairo-ACS workshop. In January 1979, a two person advisory team visited NRC/Cairo with the assistance of the ACS. The team members were Dr. Henry Leidheiser, Director, Center Surface and Coatings Research, Lehigh University, Bethelehem, Pennsylvania, and Earl Snavely, Mobil Research and Development Corporation, Dallas, Texas. Their consultation with NRC/Cairo scientists resulted in a project proposal for the JCC in March 1979. The proposal was approved by the JCC with the suggestion that sub-elements on pitting and galvanic corrosion be deferred until the more applied aspects of developing petroleum industry corrosion inhabitors are emphasized.

Industrial field studies have proceeded during 1979 to identify and characterize the more serious corrosion problems. Laboratory work at NRC/Cairo will be conducted on the industry problems; however, the laboratories require additional equipment for this work. As in the case of the wool wax utilization project, most of the equipment is not expected to arrive prior to March 1980. Training of NRC/Cairo scientists in the USA on new techniques in industrial corrosion control will occur early in 1980 (approximately 3 months). Application and monitoring of corrosion control methods in industry should begin by September 1980 and continued into Phase II for 18 months.

143x

Approved R&D Project: Red Sea Fisheries

The project was initially proposed at the May 1978 JCC meeting. A revised proposal was approved at the November 1978 meeting and an NAS panelist visited Egypt in April 1979 for consultation. In view of the complexities of the project in initiating surveys in the remote Foul Bay area such as chartering a vessel, procuring equipment, etc., the degree to which goals can be reached in Phase I is unclear. The development of this project will be further clarified following the November 1979 JCC meeting.

The original Project Paper called for five applied research and development and two large scale demonstration projects to be underway by the end of Phase I. With the continued success of the above mentioned projects, all seven of these will be producing preliminary results as originally envisioned. The implementation delay experienced in initiating these R&D projects has caused training activities to be delayed. While the project paper specifies 150 trainees in this area, this number is likely to be reduced to 40 during Phase I.

D. Phase II Planning:

The Applied Science and Technology project has been viewed from its inception as a two-phase project in which Phase II, if aproved, would seek to intensify implementation of activities begun in Phase I and initiate other activities which would further achievement of the project's goal. As the project agreement requires that all principal entities involved in Phase I collaborate in the Phase II planning process, USAID/C, the ASRT, the NRC, the NSF and the NAS/NRC have been the relevant entities.

At the November 1978 JCC meeting a schedule for planning of Phase II was approved. That schedule called for the approval of criteria for Phase II planning and a preliminary review and ranking of proposed projects during the March 1979 JCC meeting, the third JCC meeting. At that meeting, it was recommended that a Phase II planning document be presented for discussion at the Fourth meeting to be held in Cairo in November 1979. The Fourth meeting is to also review achievements of Phase I, evaluate the On-going research projects; establish priorities for Phase II; and funding estimates for new and ongoing projects.

In June of 1979 in Washington, joint elaboration of the aforementioned planning document was begun. The Egyptian counterparts brought to those sessions a document reflecting their decisions outlining on the course which the project might take during a Phase II. In general, the participants decided that those activities begun during Phase I which were found to be successful and which had not come to their conclusions should be continued during Phase II. These include: activities in policy planning and management and demonstration and R&D

activities; implementing the STI system; strengthening the system for instrumentation and maintenance and repair of core scientific equipment facilities; planning for follow up beyond Phase II; and, recommendations for new projects in Phase II.

In addition, all the activities under Phase I were considered individually in order to determine optimum, maintenance and improved (combination of maintenance and optimum) funding level requirements for Phase II activity continuation.

The fifth JCC meeting will be held in February 1980. At that time the JCC will approve the list of projects for Phase II and approve the format and contents of the Phase II planning document.

2. National Science Foundation:

A. Science and Technology Information Service (STI):

Following the signing of the PASA between AID and NSF in August of 1978, it was determined that one of the objectives of Phase I of the project would be to establish a basis for longer term development of a national system of STI services. This could best be accomplished through four inter-related activities:

a. Design study - to develop an overall scheme for a projected nationwide system of STI services (focussing on NIDOC).

b. Supplying of current information materials - to provide current journals and reports essential to basic and applied research and technology.

c. Computer accessed information delivery service - to demonstrate the "selective dissemination of information" mode of providing information.

d. Training of information specialists - to assist in mastery of certain basic skills, techniques and procedures for information processing.

The search for and selection of the two major sub-contractors continued from the signing of the PASA until September 1979. Georgia Institute of Technology and Catholic University were selected for the design study and training components, respectively. The contractor selection process was very lengthy as separate technical evaluation panels were established for each RFP. These panels were composed of NSF and other USG personnel, U.S. university and private industry representatives, as well as the Egyptian Academy. To resolve a final selection, best and final offers were solicited, again with technical evaluation by US and Egyptian members of those offers.

In January and in September, 1979, Mr. Eugene Pronko, NSF Project Officer, visited Cairo to confer with ASRT and NIDOC on,

145

among other things, preparation on the Egyptian side for contractor assistance. An organizational model for Egyptian implementation of project efforts and interaction with contractor technical assistance was developed. The model consists of a Steering Committee of five to seven members drawn from the interested communities or sectors (ASRT, NRC, NIDOC, universities, government agencies, industry, etc.). The Committee is chaired by NIDOC and an Egyptian liaison officer who will be nominated by the Committee and appointed by ASRT, and serve as secretary.

The work of the Steering Committee and the implementation of project tasks currently underway, is being performed initially through four Task Groups: (1) Surveys; (2) NIDOC Systems Study; (3) Information Manpower; and (4) National Information Policy and Plan. Each Task Group is led by a member from the Steering Committee or other qualified persons appointed by the Committee. Working members of the Task Groups are drawn from among the interested communities or sectors plus IDCAS. Contractor assistance and guidance was supplied in October with the arrival of Georgia Institute of Technology consultant.

The need for a full time Project Manager on the Egyptian side has been recognized. NSF and ASRT are giving the matter their fullest consideration and it is expected that a qualified individual to work with and provide liaison with the contractors will be appointed in 1980.

During CY 1980, it is also planned that at least 12 of the 20 originally planned information specialists will be sent to the U.S. for short term training individually tailored to their needs. NIDOC is identifying these people now so that their English language capabilities can be ascertained and upgraded as necessary.

To date, three orientation and training visits have been made by NIDOC personnel to American STI institutions and an NTIS (US National Technical Information Service) training session. A telex system has been installed at ASRT, providing rapid access to STI date bases. In addition, five microfiche readers have been purchased and installed at NIDOC and a $10,000 account at NTIS established for purchase of a core collection of microfiche in agriculture and food, chemistry and energy. Initial NTIS accounting problems have been resolved and approximately 2000 documents in microfiche and printed documents have been received to date.

NSF has also provided a printed index to 2,500 NSF sponsored reports in a specialized collection dealing with applications of research findings. A microfiche set of these documents has been provided. To support the training development of information specialists, a core collection of 30 basic reference works in the fields of information science and technology was selected and purchased for NIDOC.

146

At the request of ASRT and USAID, NSF recommended a U.S. expert consultant in building design for libraries and information centers to consult with ASRT on its building plan and program for a new NIDOC in Nasr City.

A three week intensive workshop is planned to be held in Cairo in 1980 to provide basic training in mastering the skills of abstracting and indexing. NIDOC has had discussions with the National Federation of Abstracting and Indexing Services (NFAID) which has submitted a preliminary plan and design for this workshop. Included in the workshop design will be a component dealing with abstracting and indexing matters relevant to Arabic speaking countries. The exact date of the workshop, a final plan, and budget are yet to be finalized.

B. Instrumentation Technology

The National Science Foundation sub-contracted with the University of Wisconsin (UW), Instrumentation Systems Center (ISC) to assist in development of specifications for equipment procurement and training activities in instrumentation maintenance and repair (M&R). To initiate the training in Egypt, 141 students from five Egyptian universities (Minia, Assiut, Tanta, Alexandria, Cairo) plus the NRC and the Egyptian Instrumentation Center (SIC) have had short term training in basic electronics at the American University in Cairo. Four university students have been sent for M&R training in electronic equipment at the National Institute of Health and six National Research Center (NRC) and SIC students have been trained at the University of Wisconsin in same discipline, thus reaching the goal of 10 trained technicians specified in the project paper. NIH and University of Wisconsin plan to train another 40 Egyptian technicians in maintenance and repair of scientific equipment.

Approximately half of the $2.1 million in core scientific equipment has arrived in Egypt. During the July-August period 1979, two consultants from the University of Wisconsin spent one month at the NRC inspecting the equipment which has arrived. The ISC advisors who assisted NRC encountered some problems in storage of the equipment at the NRC, as alterations in the basement of that facility are not as yet completed and access to stored equipment required lengthy procedures. NRC management has assured USAID that this problem will be resolved before the consultants' return inspection visit in the beginning of CY 1980.

It was also determined in August by the NRC, USAID and UW that a senior U.S. instrumentation specialist resident in Cairo would greatly improve transfer of on-the-job training skills, as well as handle technical management problems as they arose. The NSF is now considering approving such a position.

147

BEST AVAILABLE DOCUMENT

18. Purpose

"To improve the institutional capability of the Egyptian S/T community to develop and manage research programs to solve priority development problems."

This evaluation reviews and examines the first two years of phase one of a two phase project term effort whose objective is to improve the effectiveness of Egyptian scientific and technological resources in applied research directed toward national development goals. The first phase , under review, is aimed at improving the management of applied research, and is preparatory to a more comprehensive follow-on to be designed during the implementaiton of this project. Because the current phase involved new methods of R&D management planning, coordination and execution for Egyptian institutions, only limited developmental/economic impacts can be expected to appear as quantifiable outputs during Phase I (ending October 30, 1980). For this reason, Phase I EOPS focuses on design of Phase II follow-on activity. (See #17 above for progress towards improved management capabilities.) A special evaluation to determine whether or not sufficient justification exists for a Phase I follow-on is scheduled for April 1980.

As evidence of the projects' success in strengthening R&D management at the ASRT, one may cite the overall management plan for the Applied Science and Technology Project which was submitted to the JCC at its third meeting (March 1979). The management plan, prepared by the Academy with the advice of the U.S. advisor to NRC, formally outlines ways in which inputs into the overall program are to be coordinated, monitored and evaluated.

The R&D Division submitted this plan to the Academy Council. (The Council acts as senior advisory board to the ASRT and includes among its members all directors of institutes, presidents of universities, and minister level officials). The Council approved the plan and the ASRT started on January 1979 to apply this new system of management.

Special Linkages

There are several linkages with industry as a direct result of this project as noted above. Oneof particular significance involves NAS/Senior Advisor assistance to the NRC in negotiating a Survey Agreement with an Arabian Company for solar hot water plant technology developed by NRC. This will be the first technology package sale in which the NRO has been involved.

Reports Monitoring

Implementation reports on technical aspects of the project are furnished by ASRT and NRC/Cairo for each of the semi-annual meetings. In addition,NAS furnishes AID/Cairo with a report of each panel or technical visit, a semi annual report, and periodic fiscal reports (through the AID contract management office in Washington). These are on file in HSTD.

19. Goal/Subgoal

" To reorient the scientific and technical research community towards those types of research which are of priority importance and are applicable to solving national development problems." This Phase I project consists of six components:

- Policy Planning and Management
- Research Project Support
- Demonstration Project Support
- Provision of Scientific Equipment
- Science and Technical Information
- Planning for Phase II

Rationale of the Project

The Government of the Arab Republic of Egypt is fully aware of the important role that science and technology can play in the development of its economy, and in the solution of major social, environmental, and other problems. A number of constraints limit the effective utilization of the scientific and technological community's considerable institutional and personnel resources to solve such problems. These constraints include:

(1) shortage of executive skills to formulate policy and to plan, select, staff and monitor projects;

(2) limited experience in the management of large scale interdisciplinary research projects;

(3) a dearth of essential equipment needed for research;

(4) weak incentives for scientists and technicians to concentrate on applied research; and

(5) a paucity of scientific and technological information.

Receptivity to Project Implementation

From the standpoint of the NAS, there has been excellent and sustained interest on the part of the groups involved, and receptivity to U.S. inputs is high. Both in ASRT and in NRC/Cairo the leadership is very competent, dedicated to the project goals, highly motivated, hard working, and open to suggestions coming from U.S. panelists and/or NAS staff. Working relationships are close and the spirit of joint participation in projects is high. This is further highlighted by the activity under the Demonstration Project More and Better Food . The demonstration project was approved for implementation at the First JCC Meeting in May 1978. Two extensive progress reports have been presented (Second JCC Meeting, November 1978 and Third JCC Meeting March 1979).

At the most recent project review by the U.S. Panel (Washington, November 1979) the Egyptian team for More and Better Food was commended for:

(1) on schedule progress;
(2) successful efforts to incorporate groups outside NRC/Cairo in the planning of the village demonstration and field test;
(3) the excellence in technical reporting; and
(4) management plan.

The U.S. Panel felt that the management of the More and Better Food project illustrates the type of result which the overall Applied Science and Technology Project is striving to achieve.

20. Beneficiaries

Research and demonstration projects are designed for applied use and to deal with problems of national interest. Various segments of Egyptian society will benefit directly from the research and technology depending upon the specific area of the sub project. Since there will be a wide range of sub project aimed at industrial, agricultural and social improvements, there will be a concommitant wide spectrum of the population directly benefited.

21. Unplanned Effects

None

22. Lessons Learned

The Science and Technology Project represents an extremely complex set of inter connecting elements-- encompassing broad policy formulation as well as discrete project management (e.g. the Demonstration and R&D Projects). Among the original assumptions either explicitly stated or implied in the project paper and the Project Grant Agreement are:

- Egypt has a reservoir of highly qualified technical and scientific manpower available for applied R&D.
- Egypt has a variety of institutional arrangements that can be mobilized to do applied R&D.
- Egypt, through the ASRT and the NRC/Cairo, has leaders who can plan, manage, direct, monitor and evaluate a new effort in applied R&D.
- Projects can be undertaken relatively quickly and managed to give desirable results in the medium term (3 years).
- U.S. inputs can be matched to Egyptian needs and made available through such organizations as the NAS/NRC and NSF in Washington.
- Training inputs as well as equipment, technical information and technical assistance can be jointly managed by Egyptian

150

and U.S. specialists to catalyze desirable results.
- Difference in management techniques among institutions in Egypt and the U.S. can be overcome, so that joint activities may proceed.
- Efforts by both the Egyptian and U.S. groups responsible for the Applied Science and Technology Project can be sustained, even in the face of the large geographic distance between the two countries and the lack of consistent, reliable electronic communication facilities.

All the above assumptions have proved to be valid, although the project was slow in gearing up because of planning requirements, administrative delays in the U.S. and in Egypt, and time required to mobilize manpower skilled in research and development management.

151X

The United States JCC panelists are:

Dr. H. Guyford Stever, currently an international consultant to the Government of Saudi Arabia (science and technology manpower, university training, R&D programs) and consultant to several major U.S. science-oriented corporations such as TRW and Hewlett Packard. Dr. Stever was science advisor to President Ford, served five years as director of the National Science Foundation, was twelve years president of Carnegie-Mellon University (Pittsburgh) and a long term professor/department chairman at MIT. He is a member of the National Academies of Science and Engineering, serves on the Governing Board of the National Research Council and is chairman of the Council's Assembly (equivalent to "Division") of Engineering.

Dr. George Bugliarello is President of the New York Polytechnic Institute, an institution formed in 1979 by the merger of the Brooklyn Polytechnic Institute and the College of Engineering, New York University. New York Polytechnic Institute is a major, private science and technology education and research institute ranking in quality with such universities as MIT, Caltech, Michigan and California/Berkeley (based upon the quantity of R&D contracts supported by NSF, Defense, NIH and other U.S. Government funding institutions). Dr. Bugliarello was Dean of Engineering at the Chicago/Circle Campus, University of Illinois, and a Professor of Biomedical Engineering prior to becoming President of New York Polytechnic. He has served the NAS/NRC as Chairman of the Committee on the Innovative Uses of Technology, a member of the Board on Science and Technology for International Development and many workshop/seminar activities in Venezuela, the Philippines and the U.S.

Dr. Mary Carter, is a biochemist and currently the Director, Southern Regional Laboratory, U.S. Department of Agriculture. The Southern Regional Laboratory is responsible for R&D work in cotton, cottonseed oil, textiles, peanuts, adaptation of soy beans to semi tropical environments and other projects related to conditions that exist in Egypt. She has served NAS/NRC on other panels and committees and was a participant in a workshop on R&D management planning and evaluation in Peru.

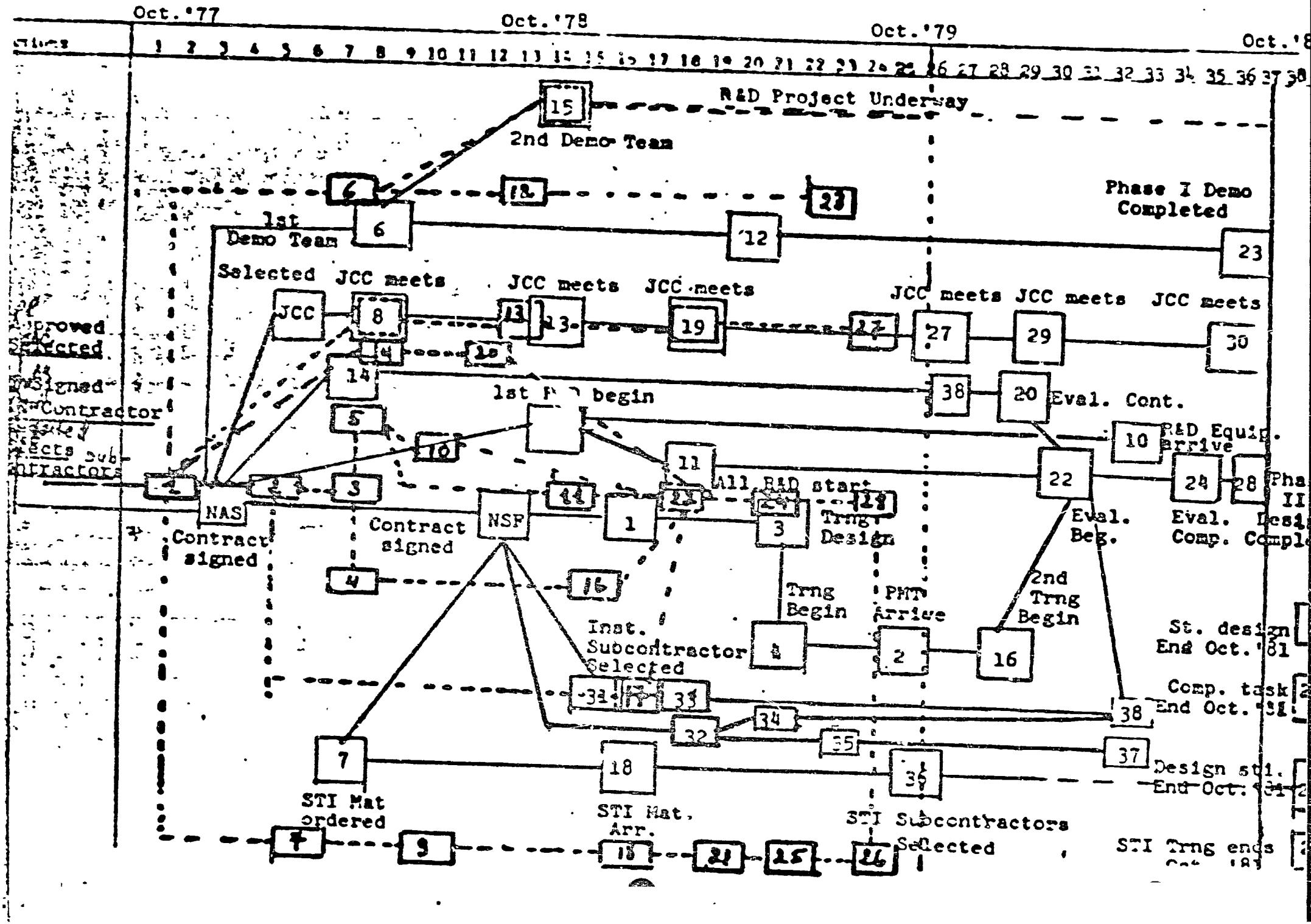
Dr. James Hillier is a physicist who spent his entire professional career at the RCA laboratories in Princeton, New Jersey. Prior to his retirement in January 1978 he was director of the laboratory. He brings to the U.S. JCC panel the kind of critical R&D management experience which comes from the necessity to review constantly cost-benefit analyses of R&D. Dr. Hillier is a member of the National Academy of Engineering as well as the Board of Overseers for the College of Engineering, Cornell University.

Dr. Gilbert White was formerly director and now a senior professor at the Institute for Behavioral Science, University of

Colorado. He is a geographer by profession with long experience in water use planning, river basin development, and environmental effects of large irrigation projects. For several years he has served the Ford Foundation as a consultant on water management and international development. He travels to Egypt an average of twice yearly on Ford Foundation activities. He is a member of the NAS and chairman of its Environmental Studies Board.

CURRENT PERT & Original pert

1. NRC advisor arrives (Current), NRC and ASRT advisors arrive
2. NRC and ASRT policy, management teams arrive (original pert)
3. ASRT, NRC, policy management training plan designed
4. Training management policy program begins
5. First R&D projects approved
6. Demonstration I project team arrives
7. Information team (materials) identifies needs
8. First meeting JCC
9. STI design team completes work
10. First R&D project equipment arrives
11. Remainder R&D projects (ASRT) underway
12. Equipment for demonstration project (I) arrives
13. Second meeting JCC
14. 1st Pro Ag Amendment signed
15. Demonstration project (II) designed, approved, including training, equipment plan
16. Second tranche training begins
17. Second ASRT, NRC policy, management teams arrive
18. STI materials delivery begins
19. Third meeting JCC
20. Evaluation contract signed
21. STI training completed
22. Evaluation begins, S&T, STI
23. Demonstration project (I), first phase completed, data available, Phase II designed
24. Evaluation completed
25. Computer access task completed
26. Design STI (II) completed
27. Fourth meeting JCC
28. Design phase II completed
29. Fifth JCC meeting
30. Sixth JCC meeting
31. Inst. Tech (IT) 1st subcontractor (NIH) selected
32. Inst. Tech (IT) 2nd subcontractor (Wisconsin U.) selected
33. IT training begin at NIH
34. IT training begin at Wisconsin
35. Core equipment arrives
36. STI subcontractors (Catholic U. and Georgia Tech) selected
37. Core equipment completed
38. IT training ends both at NIH and Wisconsin
39. Second Pro Ag Amendmend signed


Oct.'77
Oct.'78
Oct.'79
R&D Project Underway
2nd Demo Team
1st Demo Team
Selected
JCC meets
JCC meets
JCC meets
JCC meets
JCC meets
JCC meets
Phase I Demo Completed
Eval. Cont.
R&D Equip. Arrive
All R&D start
Contract signed
Contract signed
Trng Design
Trng Begin
PMT Arrive
2nd Trng Begin
Eval. Beg.
Eval. Comp.
Inst. Subcontractor Selected
STI Mat ordered
STI Mat. Arr.
STI Subcontractors Selected
NAS
NSP

7

U.S. Cooperation with Egypt in Science and Technology

Princeton Lyman
Herman Pollack
Courtney Nelson
Carl Gotsch

April 1980

156

U. S. COOPERATION WITH EGYPT IN SCIENCE AND TECHNOLOGY

Table of Contents

Part I: Background and Summary of Findings

Background 1

Objectives 2

Findings 2

Conclusion 6

Part II: Discussion

The Science and Technology Scene 8

Policy Directions 13

The Economy and the Society 18

A Strategy for S&T Cooperation 21

U.S. Cooperation with Egypt in Science and Technology

PART I: Background and Summary of Findings

Background

In January 1980, USAID/Cairo requested a broad assessment of the present role of science and technology in Egypt and the degree to which the Government of Egypt's science policy strengthens that role. USAID noted that AID's S & T activities in Egypt were one of the few relatively large such activities in AID. It recommended a broad assessment of such activities, which went beyond project operations to issues of broad science policy and the linkages of S & T to economic and social development. Such assessment was believed to be important not only for USAID/Cairo but of programmatic benefit to AID and sister agencies worldwide in examining issues of S & T in developing countries. (Cairo 01765, January 24, 1980)

In February, the proposed assessment was discussed with the Joint Consultative Committee, a body of Egyptian and American scientists formed to guide activities under AID's Project No. 263-0016, "Applied Science and Technology Research". The JCC includes the President of the Egyptian Academy of Scientific Research and Technology and a number of other leading figures in science in Egypt from the university and other research communities. The JCC recommended that such an assessment be carefully planned in order to avoid simply repeating the efforts of previous assessment. A preliminary visit to Egypt was proposed during which the key issues would be delineated, and the terms of reference for such an assessment -- along with a work plan -- would be developed. The assessment itself was expected to take place in June. (State 059163, March 5, 1980)

A team was assembled for this preliminary visit, consisting of the following:

Princeton Lyman, Special Assistant to the Director of the International Development Cooperation Agency. Team Leader. Dr. Lyman's experience included background in AID program planning and direction, and the role of Deputy Director, later Director, of the Planning Office for the Institute for Scientific and Technological Cooperation.

Herman Pollack, Professor of International Affairs at George Washington University. Professor Pollack's experience included ten years as Director of the Bureau for Scientific Affairs in the Department of State, and previous analyses for AID of science and technology issues in the Middle East.

Courtney Nelson, Consultant to the Office of Science and Technology Policy, Executive Office of the President. Mr. Nelson had been for several years Director of the Ford Foundation's regional office for the Middle East, and the author of several studies on the role of science and technology in foreign assistance programs.

Carl Gotsch, Food Research Institute of Stanford University. Dr. Gotsch's experience included several years work of agricultural economics analyses in the Middle East, and most recently analysis for USAID/Cairo of the potential for new lands development in Egypt.

The team assembled in Washington on March 25 and over the next two weeks held meetings with: AID; other U.S. Departments such as Agriculture, Health and Welfare, State, the Office of Science and Technology Policy, and NSF; members of the National Academy of Sciences; specialists on Egyptian culture and economics; experts on science and technology policy; and members of the MIT faculty working with the University of Cairo.

The following is the report of the team which visited Egypt from April 12 - 29.

Objectives

The team intended, as noted above, to delineate the key issues for a broad S & T assessment and to develop a specific work plan and terms of reference for such an assessment. More specifically, the team examined:

-- The process by which S & T policies are formulated and implemented in Egypt.

-- Priority problems in S & T and opportunities for remedial action through U.S.-Egyptian cooperation.

-- Specific program implications for AID.

-- Alternatives for financing and managing U.S.-Egyptian collaboration in science and technology which has heretofore been supported from non-AID resources.

Findings

-- The Government of Egypt has undertaken several important assessments of the role and the problems of science and technology. These assessment, taken together, provide a perceptive and candid analysis of the major overall issues relevant to future U.S.-Egyptian cooperation in science and technology.

-- Egypt has a very high regard for science, and a very sizeable and well-trained science community. Two-thirds of all graduate degrees are in the pure and applied sciences. There are over 22,500 holders of M.Sc. and Ph.D degrees and more than 260 research institutes. There are gaps in expertise, and problems in institutional orientation which inhibit the organized and systematic application of knowledge to development problems. There are, however, examples of institutional as well as individual research excellence.

-- There is a strong desire and perceptible movement on the part of Egyptian scientific leadership to enhance the contribution of Egyptian scientific capacities to development, specifically to bridge the gap that exists between academic research, on the one hand, and the needs of industry, agriculture, health and other sectors of the economy on the other. Projects and innovative management styles to this effect can be found in the ASRT, the National Research Center, several universities, and in a few industries. Private consulting firms are also starting to play this role.

-- Serious constraints exist to the achievement of this goal, some of which go well beyond the S & T community, per se. These "external" constraints include economic policies which fail to offer incentives for R & D and more cost-effective operations in both the agricultural and industrial sectors; social policies on education and employment which swell the roles of productive enterprises and research establishments and limit the introduction of managerial practices that could help improve effectiveness; low salaries in the public sector which promote the need for second (and third) jobs, individual consultancies rather than institutional S & T support to the productive sectors, and a constant flow of trained persons to wealthier Arab countries; and attitudinal problems which lead to greater reliance on foreign technology and R & D expertise than necessary or appropriate.

-- Other constraints exist within the S & T community itself. These include high concentration on academic values and rewards; lack of organized focus of S & T capacity on economic service; low motivation and incentives, particularly for high quality applied research and problem-solving; weak linkages with the potential users of S & T; skill limitations for some types of problem-solving; quite limited cooperation in exchange of data, joint or multi-disciplinary research efforts, or inter-institutional collaboration.

-- These constraints are all the more serious because the effective use of science and technology is of absolutely critical importance to Egypt at this point in its history. Growing population and the limited prospects for further major gains from the traditional sources of production -- i.e., agriculture along the Nile -- mean that Egypt must develop specific new directions for its economic growth, some of which will demand intensive R & D work before their potential is realized. These new directions include new sectors of industrial production, more and different use of arid and semi-arid lands, and changes in cropping patterns in favor of higher value crops. Adequate knowledge on which to base policies promoting these changes is often lacking. The seriousness of this need is not widely recognized. There is still a belief that the demonstration or application of known science in established areas of production is the principal task. This is only partly true. The finding of new sources of growth is an equally if not more important task for the S & T community.

160

-- Science and technology are also critically important in Egypt because of the very great current expectations being placed by Egyptian political leadership on the role of imported technology. Many of Egypt's current political and economic policies are predicated on the belief that a major infusion of Western technology and know-how will produce rapid growth, modernization, and widespread benefits to the population. Unquestionably, the opening of Egypt to foreign experience, technology, and management expertise can have a revitalizing effect on what had become a sluggish Egyptian economy -- there is already evidence of this. However, without a strong internal scientific and technological capability, applied to critical policy and technical problems, and able to adapt imported technology to Egyptian needs, the results of these open-door policies could be much less than hoped for. Investments based heavily on imported technology, and absent clear policy direction, could skew income sharply and visibly; favor capital-intensive modes of manufacturing to the detriment of employment; increase the services sector (banking, tourism, etc.) more rapidly than the productive sectors; and increase the sense (and reality) of dependence on external technological expertise. If these trends develop and thus belie the present high hopes of Egyptian leaders, they could have very serious political consequences.

-- The scientific and technological community is important from another perspective. Science is very prestigious in Egypt, and the scientific community has great social and political influence. Failure of this community to participate more fully in the modernization process, as active and effective contributors to policy analyses and as developers of technological adaptations and innovations, would create a source of alienation and social discontent among an important and articulate group in Egyptian society. It is a waste of a great resource. This group of people also is responsible for the education of the restless youth crowding Egyptian universities.

-- The next steps in this S & T assessment need not be a broad assessment of policies, institutions and cultural factors in S & T, as originally planned, because the Government of Egypt has largely done this. Rather, there should now be a selective exploration of specific ways in which the U.S. can cooperate with Egypt to help address the above problems, and support Egyptian movement in the direction of more effective use of its S & T capabilities. These steps should take place within a strategy of S & T cooperation which focuses on key objectives and addresses certain of the major constraints.

-- A strategy for S & T cooperation has been developed in this report which emphasizes the following:

1. Improve Egyptian policy-making processes related to science and technology, particularly those concerned with significant investment decisions. While there have been good overall assessments to date, there has been little systematic data collection and analyses to refine the conclusions and support specific recommendations. Staff support for such work has been extremely limited.

2. Strengthen demand from productive sectors for R & D through: analyzing and encouraging replication of the management successes achieved in a few Egyptian industries such as EGPC; increasing funds in the hands of the "users" to be used for R & D commissioned from outside their own ministries or industries; assistance to "users" in appreciating, planning and programming R & D on new economic and productive alternatives so that R & D work on these can be organized, carefully coordinated and focused on problem-solving, and sustained financially for a sufficient length of time.

3. Improve the problem-solving capability of the Egyptian S & T community. Better linkages between the users and the S & T community are critical to this objective for they sharpen the focus of S & T work on problems, improve the formulation of tasks by both users and researchers, and identify more clearly the technical gaps in the Egyptian S & T community which can be assisted in part through the selective use of foreign experts. Improved research planning and management should also be emphasized.

4. Increase attention to the role of science in society. This includes the popularization of science, and more interdisciplinary work to help define the social effects of modernization and the socio-economic implications of various technological alternatives.

5. Provide recognition of and support for the positive and influential role of the Academy of Scientific Research and Technology in promoting the application of S & T to development objectives. This role includes addressing policy issues; seeking to bring together the several relevant communities that produce and employ science and technology; and facilitating linkages between the consumer and supplier of S & T.

6. Increase the role of the university community in applying S & T to development. This could include selective institutional arrangements which allow faculty to participate in problem-solving activities and to involve their students in practical "hands-on" learning environments.

-- There are a number of steps USAID can take, within its present program and beyond its "science and technology" projects per se, to support the above strategy. Individual projects in agriculture, industry and other sectors can include provision of funds specifically for use of Egyptian R & D capacity. These projects can also be used to support linkages being promoted between users and the S & T community, e.g., in specific problem-solving activities or through support for innovative institutional arrangements which link the consumer and producer of S & T more effectively.

-- USAID should consider additional programs to link Egyptian S & T institutions with American ones that can help in developing problem-solving capacities. Such linkages may involve universities, but could also involve industrial R & D institutions in both Egypt and the U.S.

162X

--USAID should plan to develop additional support for ASRT, under Phase II of the "Applied Science and Technology Research" project, for ASRT's role in policy and sectoral analysis related to S&T, and its role as an umbrella for establishing linkages between the S&T community and the potential users of their services. These activities could be planned in more detail during the writing of the Project Paper in May - June.

--USAID should have regular access to policy-oriented S&T expertise for assistance in internal program analysis and interaction with the Egyptian science community on major policy and institutional questions. The skill needed is unlikely to be available, nor perhaps needed, on a full-time basis. The most effective means for this may be to arrange for a consultancy of a senior S&T analyst, who would visit Egypt regularly and would become a knowledgeable and valued advisor to both the USAID and the Egyptian S&T community.

--U.S. interests in S&T cooperation with Egypt extend beyond the AID program. These interests, and a strategy for achieving them, have so far been poorly articulated in Washington. Egyptian priorities have also not been clearly established. In the past, the availability of P.L. 480 funds made possible the establishment of many linkages and the development of many strong research programs, involving on the U.S. side several departments and agencies and many individual scholars. Much experience has been gained. The end of the P.L. 480 resource creates an urgent need for articulating the purposes, priorities and possible mechanisms for continuing such cooperation. These forms of cooperation should be structured to support the Egyptian emphasis on more effective use of its S&T capability for internal development, as well as U.S. scientific interests. They should complement the strategy for S&T cooperation outlined above. AID can play a very useful role in linking these forms of U.S. cooperation to this strategy.

Conclusion

In the FY 82 AID Country Development Strategy Statement for Egypt, science and technology activities are described as not central to the strategy of the AID program; they are supported as useful but peripheral contributions to productivity, etc. If the recommendations of this report are accepted, that would change. Science and technology policies and programs would become an integral part of AID's program strategy.

The reasons for moving it to this position of importance go to the heart of what is hoped for in Egyptian development. Unless Egypt, through its own people and institutions, can absorb and adapt the technological innovations being rushed into Egypt, there is serious concern for the prospects of either stability or growth. If Egypt stagnates after several years of intensive U.S.

aid because it lacks internal dynamism in the management of technology, if Egyptians begin to feel less rather than more control over the uses and societal benefits of technological change, if the newly educated generation of scientists and engineers feel alienated from participation in their own economy, then our endeavors in Egypt could lead to frustration and to reversals in the present character of U.S.-Egyptian cooperation.

AID strategy is understandably built on the needs of the next few years, but the conditions and character of growth in these years could have an effect on U.S. policy in the Middle East for years afterward. Without changing the present AID focus, but by sharpening its attention to the role of the Egyptian S&T community in economic development, a much firmer base for growth and stability can be built.

PART II: Discussion

The Science and Technology Scene

Egypt's science and technology policy, and institutional arrangements for policy implementation, have been examined several times in recent years. This activity in itself is a reflection of the concern in Egypt about the role of science and technology in development and the desire to utilize indigenous scientific capacity more effectively for development purposes.

Two of the most recent analyses are:

Science and Technology Policy Instruments, General Report. Academy of Scientific Research and Technology, 1979; and

The National Paper of the Arab Republic of Egypt, submitted to the United Nations Conference on Science, Technology and Development. Government of the Arab Republic of Egypt, 1979.

Earlier reports, specifically with American involvement, include:

Science and Technology Policy, Research Management and Planning in the Arab Republic of Egypt. Report of a Symposium sponsored by the Academy of Scientific Research and Technology, A.R.E.; The National Science Foundation, USA; and the National Academy of Sciences, USA, 1975; and

Egypt Development and the Role of Science and Technology. Report by Research Triangle Institute, USA, 1976.

A number of papers have been written by Egyptian scholars on science, technology and development in Egypt which add historical insight, cultural perspective and added information on institutional development. For example, Osman El-Kholy's paper, "Some Reflections on Egyptian Experiences in Technological Development", reminds us that Mohammed Aly, in the 19th century, sought to modernize Egypt's scientific and technological capacity through the bringing in of foreign experts, the sending of persons for training abroad, and the importation of technology -- and failed in all but a few cases.

In all these studies, there are some themes in common. But beyond these are the impressions we also gained from our conversations with scientists, officials, research administrators, and -- albeit fewer -- businessmen and industrialists. These add dimension to the formal studies, and give us impressionistically a sense of trends and of the seriousness of some problems over others.

The formal papers agree on several matters. Egypt has a rather formidable S & T infrastructure. There are more than 22,500 holders of M.Sc. or Ph.D. degrees covering practically all fields of science and technology. The majority of these work in more than 260 research institutions, many of which are attached to Ministries and are organized, ostensibly, around specific major problem areas, e.g., the Corn Institute, the Soil and Water Research Institute, the Water Distribution and Irrigation Methods Research Institute. Universities are less significant a source of research for development, partly because of heavy teaching responsibilities, partly due to low research budgets, and partly because of the role accorded to the full-time research institutes elsewhere in the government. Approximately 70 percent of the government's research expenditures go to the full-time institutes.

This infrastructure does not produce the degree of technological support for development that either Egypt desires or that its size suggests. The reasons usually, and nearly unanimously, cited are these.

The structure of employment, promotion and earnings is of considerable influence. Since the late 1960's, the Egyptian Government has guaranteed a job to every college graduate. Coming at a time of increased nationalizations and the growth of socialism, this has led to the Government being a primary source of employment, filling government agencies, institutes, and industries beyond their needs. Pay is low, work is limited, and promotional opportunity often geared to measures of individual rather than institutional achievement. Within the research community, a premium has been placed on promotion through the earning of higher degrees. Research institutes, whether in the Ministries or elsewhere, thus operate very much like graduate schools where employees earn M.Sc. and Ph.D. degrees through individual research projects and publication in scientific (often foreign) journals. This atmosphere discourages interdisciplinary group work, applied research of only limited academic recognition, or attention to problems defined outside the research community itself.

A second problem rooted in government employment practices is the low salary paid to government workers. Second jobs become a necessity, and -- because the government job is a secure base -- often more important in terms of commitment of time and energy. In practice, this has come to mean that any concentrated research effort requires additional "incentives", i.e., additional salary or bonuses in order to engage the researcher's full or even primary attention. Donors, and indeed the GOE, have engaged in this practice as a means of establishing priorities and achieving specific program results. However, the paying of incentives to some workers and not others sometimes creates problems within organizations. The USAID, moreover, feels that the paying of incentives in each and every development effort places an undue burden on donors to re-orient priorities within government. There is no easy answer to this dilemma for it goes beyond research to the whole government establishment.

Finally, in terms of employment, there is the attraction of the wealthier Arab states. Scientists, technicians, and skilled administrators are actively recruited in Egypt for work in these countries, where they reportedly can earn 8 - 10 times their salaries in Egypt. The Egyptian Government, in fact, encourages such migration, for it is a source of considerable FX earnings (nearly as much as oil) and probably a safe outlet for the frustrations that may build up over low salaries and slow upward mobility within Egypt. Since most Egyptians return, or plan to, the loss would not seem so great. But scientific administrators in Egypt claim that there is a loss of more than years and continuity. Persons going abroad in this way, it is claimed, do not maintain the same scientific discipline and return less able to devote themselves to quality work in Egypt.

A broader set of problems involves the attitudes toward science itself. Science is prestigious, but valued for its academic excellence and international recognition rather than its place in technological innovation and adaptation. Science in both the universities and the research institutes is thus "academic". In the National Research Institute, and other institutes formed precisely to serve the country's development needs, senior scientists are entitled "professor" and the staff works for professors very much like graduate students in a university: participating with their professor in a project of academic significance, with an eye on their own dissertations and publications; and giving loyalty to a senior professor who looks out for them in this regard.

The Academy of Scientific Research and Technology, formed in 1971, appeared to have originally this same emphasis rather than a developmental one. Its original organization and functioning remind one of the French Academy: its mission apparently to put Egyptian science on a par with that of the most advanced countries of the world.

The universities have a special institutional problem. Under President Nasser, higher education was made free and greatly expanded. University enrollments have expanded rapidly, and new universities have come into being in just the last few years. Today, the University of Cairo has 130,000 students crammed into auditoriums built for a fraction that many. In this milieu, professors tend toward three types of activity for supplementing their basic teaching salary: (a) teaching at two or three universities -- the so-called "taxi professors"; (b) tutoring students far into the night; and/or (c) undertaking consultancies either directly or through firms. Research activities have a hard time competing. Moreover, research or consultancy support rarely involves funds for graduate students so that the link between even these research-oriented activities and the training of young scientists for research is not strong.

Side by side with this picture of the science community is that of the productive sectors. In industry, much of the manufacturing sector is under public control. Social and economic policies, initiated under President Nasser, have led to emphasis on production targets in

these industries over cost efficiency, and have placed large bureaucracies both over and within these enterprises with a stake in the present public-ownership system. Industries have also come to depend heavily on imported technology, and the access to technological expertise that comes with a foreign license (or donor). There appears to be little incentive for instituting a strong, internal R & D capacity, for enlisting the help (and even less for budgeting for the use) of Egyptian research institutes, or for making a special effort to develop or adapt Egyptian technology in place of imported.

In agriculture, there are also economic distortions in the system that discourage development and application of innovation. Several major crops are price-controlled, and the prices are too low to induce farmers to draw very heavily on research results that may come out of the several institutes created for this purpose. In other cases, where prices are attractive, farmers have been quite innovative. But, in one of the most celebrated cases, farmers responded to an imported corn seed -- actively promoted by the foreign company -- not to innovations coming out of Egypt's Corn Institute or other research institution. In other words, the indigenous research system and the farmer do not appear to be linked dynamically in a system of research, adaptation, marketing, usage and feed-back.

The overall picture one has, therefore, is of the science community and the productive sectors rising side by side in fairly splendid isolation of each other. Neither is greatly dependent upon the other for its support. Even within operating Ministries, research institutes become insular. Good examples of research management, such as in the Quaylub Center for Field and Applied Research or the Biological Serum and Vaccine Laboratory, stand as isolated examples of good organization -- but as dependent and determined upon their isolation as any other institution less well managed.

This leads to the larger, and trickier, matter of cultural constraints. Some would argue that the pattern of S & T usage, even where well-managed, reflects the traditional and heirarchial character of Egyptian society generally. Exclusiveness in pursuing one's own career or activity, limited cooperation across "boundaries" (of discipline, class, institution), emphasis on status, dependence on outsiders for problem-solving -- these are characteristics that one can find in history and in many facets of Egypt's social life. Transferred to S & T, they find their expression in the academic, degree-oriented character of scientific research; the weakness of linkages either among research institutions or between producers and consumers of scientific knowledge; the attention to status in both science (advanced diagnostic equipment) and industry (iron and steel); pride in scientific achievement (leading supplier of skilled persons to other Arab countries); and equal willingness to be heavily reliant on outside technology (Soviet or U.S.) for economic development, i.e., for outside "solutions" to current blockages in economic progress.

At a minimum, one can see the results of recent history. Building on, or exacerbating, these traits, Nasser's Egypt made information-seeking a suspect activity while raising science to a place of national pride. In a situation where, in one celebrated case, a man was arrested for seeking information on the manufacturing process for tomato paste, researchers did not rush to collaborate in the exchange of data or on research plans and progress. People did not work together. Scientists were prized for individual, and by reflection national, achievement in international fora, not for organizing systematic investigations into complex issues of policy, technology, or production. Policy and science, just as producers and science, were kept at a distance from each other.

In the worldwide IDRC-sponsored study of Science and Technology Policy Instruments, the conclusion reached was that economic policy and economic policy institutions had more influence on technological choices in the Third World than science policy or scientific institutions. In Egypt (one of the countries included in the study), this has certainly been true and, at least until recently, intentionally so.

But how far does one go with such analysis? Clearly, cultural generalizations -- especially when applied to factors as distinctively "modern" and change-oriented as science and technology -- can be as dangerous as they are relevant. Moreover, how does one identify and measure change? For every generalization cited above about the Egyptian S & T scene, there are exceptions: industrial complexes with the autonomy, management savvy, and enthusiasm both to support indigenous R & D and make sound use of imported technology and know-how, e.g., the petroleum group; dynamic industrial managers in less-well celebrated parts of the public sector who have simply refused to accept over-employment and economic inefficiency and have made their views stick; research consortia forged across departmental and even university lines to address specific problems; scientists eager to get involved with farmers, into clinics, near the blast furnace, etc., in order to get the feel of a problem; research managers and scientific leaders cajoling, wheedling, urging, seducing institutions and individuals into cooperative arrangements that will address concrete development problems. Are these signs of perceptible movement, or are these the exceptions one finds in any situation where special circumstances or special individuals are involved? We heard both explanations. There is no hard data.

In the end, the outside agent -- the U.S. in this case -- is best advised to heed the warning of one Egyptian professor, a veteran of one of the best research efforts to have received U.S. help: "Don't try to reform all of Egyptian science". For the U.S., it is best to focus on the policies desired by the Egyptians, supported by a significant part of the leadership, and relevant to critical issues of development. In that alone, there is much for the U.S. to do and grounds for optimism about having an effect.

Policy Directions

The Egyptian Government, under President Sadat, has made several specific pronouncements since 1974 on the use of science and techology for development. Equally important, the Government has adopted measures designed to open up Egypt to foreign private investment with the specific aim of introducing new technology and more efficient management in the productive sectors. This opening, primarily to the West, goes beyond investment and has made possible a reopening of the lines of communication between the Egyptian and Western science communities largely closed off during the Nasser regime, especially after the 1967 war.

The combination of policy statements and actions have not been entirely consistent. But they do clearly present the Egyptian S&T community with a major challenge and a major opportunity.

As part of these new policies, there has been specific call for closer links between the Egyptian universities and scientific institutions, on the one hand, and the production sectors, on the other. Included in these pronouncements have been emphasis on research, avoidance of over-dependence on imported S&T, and the adaptation of imported technologies to suit the Egyptian environment (STPI, pp. 10-12).

These pronouncements have come at the same time that the opening to imported technology -- the "Open Door" policy -- has also been elaborated. Several inducements to foreign investment have been offered, and public companies in Egypt have been given encouragement to participate in joint ventures, in which case they become largely private enterprises, free from the employment requirements and other practices that surround the public sector. The "Open Door" policy has great advantages for Egypt after a period in the late 1960's and early 1970's of sluggish growth and limited innovation. The private sector, with foreign participation, has surged forward particularly in banking, tourism and construction. The competition from private business has whetted the appetite of public managers anxious to shake off some of the inhibiting restrictions on cost-effective management in the public sector. Opportunities for entrepreneurship in consulting, engineering, construction and other activities have attracted talented Egyptians from out of the public sector and the universities.

But the "Open Door" policy poses a challenge to Egypt's S&T community. Imported technology, backed by investment, licenses, and R&D establishments in the "home" company, can overwhelm the role and significance of the Egyptian R&D community unless there

are clear steps taken to avoid that happening. There is, however, little clear direction on this point from the Government.

The "Open Door" policy, moreover, has only so far touched a few sectors. Despite favorable official policy at the top, and some attractive inducements in new legislation, the obstacles to negotiating new joint ventures remain considerable, sometimes aggravated by a bureaucracy not wholly sympathetic to the new policy. Even discounting that influence, the rules on employment and the various economic distortions in the economy such as price controls on consumption items, have not been altered, making it still difficult for better management practices to take hold and efficient industry to blossom. There is also concern among foreign investors about the potential for export from Egypt, particularly to other Arab countries, while Egypt remains politically isolated in the Arab world. All these influences have contributed to the fact that, so far, there have been few joint ventures in the manufacturing sector where much of Egypt's economic future must lie.

If this is the case for the near future, then the policy emphasis on greater research activity and relevance to the productive sectors on the part of the Egyptian S&T community becomes even more important. Foreign investment and technology can add modernization, new management techniques, and capital, but it is selective and cannot substitute for an internal Egyptian R&D capacity. That capacity can improve Egypt's selection, adaptation and use of imported technology and provide innovation in areas where foreign investors are reluctant to commit themselves.

The priorities to be followed by the Egyptian S&T community, however, have not been clearly established. In some Government declarations, the priority sectors are stated as food security, housing and "going to the desert." Relevant statements on S&T priorities have also been issued by two of the several National Specialized Councils, formed since 1974, to advise the President on various issues. We were not able in the time available to us to determine the full role or impact of these Councils. The National Council for Production and Economic Affairs has called explicitly for more emphasis on agriculture rather than industry, with only selective emphasis on new technologies for industry. The National Council on Education, Scientific Research and Technology has adopted a somewhat different, apparently broader, agenda. Despite the emphasis elsewhere on agriculture, the STPI document states:

> The present broad industrial policy is based on the belief that, without forgetting the role of agriculture, the future of Egypt is in the continued concentrated efforts to change our national economy into an industrial one, capable of creating more jobs, meeting the needs of the people, and with a surplus for exportation.

With these somewhat conflicting views at the top, real policy is often made at the sector level. Here, the Ministries are most influential, having the budget resources, often their own productive enterprises, and in most cases their own research institutes. Across-the-board science institutions, like the ASRT and perhaps even the National Councils, cannot compete very well in terms of setting priorities that would significantly alter the allocation of resources that Ministries now control. At best, one finds ASRT trying to influence Ministries by supplementing their research resources rather than influencing Ministry resources directly, and by trying to link scientific resources outside the Ministries to those within.

An illustration of the problems created by this rather unclear overall prioritization for the S&T community's activities can be seen in the recent proposals of the ASRT's Agriculture Council. ASRT councils are designed to provide a source of sectoral policy guidance and to give direct promotional support to S&T activities needed for development (See STPP, p. 21-22). In the case of agriculture, the Council followed the national priorities of food security, and called for additional involvement of the science community in programs of intensified production of major crops such as corn, rice and cotton. This, however, put ASRT's proposed activities -- planned largely for the non-Ministerial research community -- directly in competition with those of the Ministry, and created a political as well as bureaucratic problem. In the end, the Minister of Agriculture informed the ASRT that he accepted the latter's research and demonstration proposals -- but would welcome ASRT giving the Ministry any funds it had for the Ministry to carry them out.

The answer to these problems, however, is probably not an overall science and technology policy. We heard much about the need for such a policy, but it is doubtful that a pronouncement at the national level can go far beyond generalization. Few countries, if any, have a science policy which establishes clear and enforceable priorities for the entire science community. Moreover, the relationship between science and technology policy is a rather complex one. Egypt, like most Third World countries, needs to focus very carefully on the criteria to be used in technological choice, particularly in relying heavily on imported technology. Technological choice is not, however, altogether, perhaps not even primarily, a scientific problem, but one involving economic, financial, social and political considerations.

Like science policy, moreover, technology policy is not easy to articulate in the aggregate. While overall guidelines may be helpful, technological choices must come down to sectoral and sub-sectoral goals and in the end to individual firm or farm decisions where national and particularistic objectives have to be melded.

Beyond the establishment of general national guidelines, therefore, the most important policy requirements may lie in disaggregating the task and addressing critical questions at a sector or sub-sector level, or in terms of specific problems such as pricing, salaries or market incentives. Changing policies and practices at this level will nevertheless be the most difficult and time-consuming effort. It is a massive task and can only proceed gradually. To succeed, such changes must be preceded by the systematic analysis of policy options and their direct and indirect consequences, a process too frequently glossed over in Egypt. The creation of the requisite analytical capacity in the institutions involved will itself be time-consuming, and support will have to be found for the hard, long, sometimes painstaking work involved.

The reorientation of the S&T professions toward greater involvement in applied research and more direct collaboration with the production sectors is itself a complex process, involving social change, economic issues, and institutional structure. These matters need greater study in detail. There are distinctions between the Ministerial and non-Ministerial S&T communities, moreover, and more attention needs to be given to their respective roles.

There are clear advantages to addressing these issues at the sector or sub-sector level. For one thing, the problems, choices and skills needed can all be more clearly identified at this level and the benefits more easily recognized. Here, too, the S&T community can acquire the experience it needs to make a greater contribution to national policy decisions; at present, its contributions are in danger of being "academic" and even ill-advised.

The Chairman of ASRT's policy committee has suggested, for example, that along these lines a next step could be to examine the technological factors and trends within key sectors, and branches of sectors, e.g., construction, to determine how choices are being made, the alternatives being considered, and the adequacy of Egyptian S&T input into these choices. This would help determine just how serious are the problems of dependencey, appropriateness, and efficiency in the present situation.

Two other lines of activity seem valuable. It would seem useful if analyses were done of those economic and production needs of significant future importance -- but for which adequate knowledge and technological skills are lacking -- which are not now being addressed through either Ministry or other R&D efforts. These are likely to be the "next generation" of production alternatives in Egypt, not the present ones. In Egypt, as discussed in the next section, the need for such alternatives is quite urgent. These R&D tasks might provide appropriate focus for the

non-Ministerial S&T community, allowing them to complement rather than compete with the research activities of the Ministries, which are generally more attuned to improving existing production patterns.

Finally at a very practical level, it would be useful to begin work in key branches of production to foster more effective linkages between the producers and consumers of S&T. This is being suggested within ASRT's Industry Council and by members of the business community. There are clearly plenty of institutes and organizations in Egypt; one should be chary of starting new ones. But there is room for reorganizing S&T resources, both Ministerial and other, to serve different ends. In a few branches of the economy that are almost sure to be vital -- e.g., construction, food processing, petrochemicals -- concentrated efforts could be begun to structure a stronger and more effective role for the Egyptian S&T community. This would require work with industry, Ministries, research institutes, universities perhaps, and others. It would require inter-institutional cooperation and enormous amounts of commitment to the task. If this type of cooperation is one of the critical weaknesses in the use of Egyptian S&T, it might well be addressed around problems of such importance that they can command the attention of both industrialists and political leaders in backing the effort.

Out of these lines of endeavor, national policies may be able to emerge on a sounder footing. Only as major alternative production possibilities are examined in more depth, as problems of technology importation and adaptation are more clearly understood, and as the Egyptian S&T community begins to restructure itself into a more service-oriented mode, will Egypt be able to enunciate with confidence policies on research priorities and technological choice and development. Ideally, it will be an iterative process with each stage of more specific national guidance taking note of the experiences gained from earlier efforts at the sectoral level. The National Councils, ASRT Councils and other mechanisms already established in the Government can serve this function, provided that the data and information flow to them in usable form.

In summary, it may not be altogether wrong for Egyptian S&T policy at the national level to be somewhat ambivalent today. The relative benefits from imported versus domestic technology, from investments in research and adaptation, from new sectors versus old are indeed unclear. For the moment, letting "a hundred flowers bloom" can be a useful challenge, provided it is taken up effectively by the Egyptian S&T community, the production managers, and the Government.

The Economy and the Society

Science and technology are of special importance to Egypt because of the major economic and social changes it must face. This report cannot provide a definitive analysis of Egypt's economic prospects. But there is evidence that both agriculture and industry will need to be changed radically in the coming decade.

Historically, Egypt was a breadbasket, a natural greenhouse in the belt of land along the Nile, which attracted conquerors from the region and as far away as Napoleon's France. Despite successive waves of conquest that left the primary producers, the peasants, without political power and later without ownership of their land, the Egyptian farmers perfected crop agriculture over the centuries. They adapted extremely well to the introduction of modern and highly systematized irrigation systems. With the revolution in 1952, an Egyptian President came to power. There was land reform, and considerable social investment particularly in education. The Aswan High Dam introduced even more controlled system of irrigation, and there was an expansion of agricultural research activities. Ironically, at this same period of history, Egypt has been gradually moving from a food surplus to a food deficit country. Despite the fact that food crop yields per acre are among the highest in the world, food imports have become a necessity and seem destined to remain so as a result of population growth and the inevitable physical limits on the land along the Nile.

Egypt's government has become concerned about the dependence on food imports. Food security is thus a major slogan of current policy statements. But it may make doubtful economic sense for Egypt to use more of its fertile irrigated soils for cereal grain production. Other crops need to be examined carefully and economic and technological trade-offs evaluated. Moving beyond the Nile to reclaim or develop the large amounts of arid or desert lands in Egypt is enticing but entails high risks. Recent studies of new land developments have indicated that rising energy costs alone will demand very high yields and/or very high-value crops, to make the investments pay. Technological choices in irrigation methods -- drip irrigation, for example -- create possible new opportunities for lowering cost, but pose problems of technological management and training.

In summary, a profound change in the role of agriculture is taking place with possibly accelerating shifts required in patterns of production. Such shifts should draw heavily on research and experimentation if catastrophic mistakes are to be avoided. Unfortunately, the Egyptian S&T community is not in the forefront of this role. Despite years of research on desert lands and irrigation, Egyptian scientists are not playing the lead role in

defining the alternatives, suggesting new departures or outlining feasible alternatives for use of the arid and desert lands. Tahal of Israel and Pacific Consultants of the U.S. are doing the analyses and posing the choices.

In industry, an equally important if different historical turning point is being reached. Industrialization, beyond textiles, began in a serious way only in the 1950's. For ideological and political reasons, President Nasser later nationalized most private industry (all with 25 or more employees), so that industrial expansion took place almost wholly thereafter in the public sector. Government's interest in industrial expansion was tempered, however, by concern with stability. Public industry, like the civil service, was required to provide jobs to the rapidly increasing number of college graduates, leading to overemployment and inefficiency. As in the civil service, moreover, wages were low and incentives minimal. Other policies distorted prices and undervalued output, discouraging efficient management or cost-effective improvements. As a result, exports declined and domestic sales had to be protected by tariffs and exchange controls. Overall growth stagnated, especially after the 1967 war when defense needs began to command a major share of Egyptian resources and attention.

The industrial base in Egypt today is considerable, by Third World standards, but as the AID Country Development Strategy Statement points out, it does not function as a "lead sector". It does not "induce or transmit growth elsewhere in the economy, develop new and strong backward and forward linkages, generate technical progress and thus benefit sectors that purchase the manufactured inputs". While the overall economy has once again begun growing impressively -- due largely to oil exports, remittances, Suez Canal proceeds, rising foreign investment and U.S. aid -- industrial exports have fallen 20 percent in real terms in the last five years, and there is a slow-down in value-added growth in manufacturing since 1978. Because the public sector accounts for such a large share of industrial investment, about 90 percent, revitalization of the private sector cannot alone meet Egypt's needs, and indeed, as noted earlier, little foreign investment has so far gone into manufacturing under the "Open Door" program. A general overhaul of pricing, management, marketing, employment and investment practices is needed, as well as significant technological improvement, if industry is to grow significantly.

Egypt may indeed need not only modernization of industry, but to develop significant new lines of productive enterprise, to maintain growth and stability, and meet its future employment needs. This is especially true in the export field. Those new enterprises will almost surely require significant technological innovation, based on careful experimentation and drawing on a

dynamic internal S&T system. Such a system is sadly lacking. In Egyptian industry, generally if not totally, technological development stagnates unless there is injection from abroad. In refrigerators, Egypt held firm for over 20 years with the technology of its 1959 Kelvinator license, and now is forced to go to Kelvinator for more recent adaptations. After 15 years of solar energy research, Egypt's scientists watched the Government buy solar heaters from Germany; there was no commercially viable design in Egypt.

Outside input -- in the form of expertise, technology and investment -- can obviously help. But it is not a substitute for an internal dynamism. That perhaps is one chief lesson from Mohammed Aly's efforts in the 19th century when 10,000 foreign experts were brought to Egypt. There is also a social problem in too much dependence on foreign involvement, already surfacing in the current opening to the West. The importance of this problem is hard to gauge but obviously it must be watched.

The "social" problem is in fact economic, social and psychological. In the opinion of some, the spectre of a dual society faces Egypt: one being the foreign-connected, entrepreneurial, Westernized groups that succeed well under the "Open Door" policy. Through joint ventures, consultancies scholarships, grants, etc., or through being in a profitable sector related to foreign investment -- hotels, tourist services, construction, etc., -- these persons prosper. This relatively small group becomes the high status part of society, its values replacing those which previously elevated other elites. The "other society" is made up of those who cannot succeed in this regard, or who simply do not participate in those same sectors of the economy. It includes the sectors of production which fail to attract investment or which otherwise stagnate -- sections of agriculture, public industries, businesses attuned more to the Arab than the Western market. It could also include the bureaucrats who have no ability or flair for private sector work, the not-so-well trained college graduates expecting nevertheless a guaranteed job as promised under the more socialist regime of Nasser, the many employees of Ministries and public industries who are threatened by cost/effective approaches to management and the denationalization of industry.

The psychological effects of this economic and social stratification can be great. One Egyptian psychiatrist believes that among the young it is the more educated groups -- those with high school and perhaps college education -- who often feel most threatened by Western influence and values. To "keep up" with the new consumerism, modern social practices, and entrepreneurship requires money, and the taking of risks both economic and social. It is among this group, he believes, that one finds the appeal of Islamic fundamentalism, a retreat into easier, stricter, and not incidentally cheaper, patterns of social behavior, which can

confer status and a position of moral superiority. In summary, if "Open Door" does not lead to continued dynamic growth, greater employment and participation, and fulfilling opportunities for the young educated, it could result in an ugly backlash. Here is where economic and social concerns converge, and where the Egyptian S&T community has a vital role to play.

If this community becomes actively and effectively involved in the productive sectors, Egypt can develop an internal technological dynamism that can lead to self-generating growth. This community can and should begin to define more accurately Egypt's technological alternatives, and enable Egypt to control more of its own technological choices. Then Egypt will appear to its youth to be making use of science and technology for its own ends, not being wholly dependent on others' analysis, values and technology. Finally, this community has a major role in helping to bridge the gap between outside science and technology and that which is inherently and proudly Egyptian. Only if this gap is bridged, only if Egyptians grasp the potential of science and technology for their own needs and so apply them, will the tension between Western technology and Egyptian social values be reduced.

These changes require, however, more than scientific and technological skills. They require an S&T community alive to issues of equity, employment, and social participation and the impact on these factors of technological developments. They require in sum, an S&T community able and willing to participate in the making of national and sectoral economic policies through giving the nation knowledge of its real technological alternatives and their implications for achieving national goals.

A Stragegy for S&T Cooperation

The strategy outlined on pp. 4-6 of this report does not require much elaboration, except as to AID's specific role. The key point is that S&T cooperation must become an integral part of our relationship with Egypt, for that would help both countries achieve their mutual goals. The appropriate steps, moreover, cannot all be separated out into discrete "S&T" activities. Some of the most important objectives must be achieved through sectoral USAID programs in industry, agriculture, energy, etc.

The theme of the strategy is to build Egyptian S&T capacity for economic development. Funds which promote Egyptian research of relevance to national needs, which promote cooperation between production managers and the Egyptian science and technology community, which improve technological decisions and foster adaptations, and which help the Egyptian S&T community concentrate on key technological problems affecting the country's future -- all of these are critical. Foreign, U.S., involvement should be keyed as much as possible to supporting these processes, not supplanting them. That will take discipline, because this type of program is time consuming. Finally, the U.S. can probably organize and mobilize its resources more effectively, AID and

non-AID, for these purposes when our own interests in such co-operation — scientific, economic, political, developmental--- are more clearly defined.

Some comments on the strategy follow:

1. Improve Egyptian policy-making processes.

It was our impression that many Egyptian policy decisions related to S&T are carried out judgmentally, with little research or staff analysis. We did not look closely at the National Councils, but the Councils of the ASRT clearly function this way. Without well-organized and led staff support, the Councils tend to be quite subjective in their conclusions, and their work schedule sporadic owing to the other obligations of their members who are Ministers, Vice-Ministers, professors, etc.

Support for policy analyses should be selective, geared to significant sectoral issues and issues of technological choice, rather than to global pronouncements. Good case studies of science and/or technology policy issues -- with facts, figures and well-posed alternatives -- would sharpen the whole policy-making process. Support should also be given to efforts which differentiate the respective roles of the several parts of the S&T community, e.g., universities, consulting firms, national institutes, ministry institutes, etc., and make manifest the need for cooperation among them. In #5 below, it is suggested that this process can begin with support to ASRT.

2. Strengthen demand from the productive sectors for R&D

An accurate systems view of the innovation process would show a complex set of actors, intermediaries, feedback loops, etc. "Supply" and "demand" are only simplified expressions to indicate some of the forces at work in a dynamic system in which innovation takes place. In a society like Egypt, where the private sector is not well developed, and some of the major users of technology -- for example, farmers -- are not organized into groups whose demands are forcefully expressed, there are limitations on the articulation of demand. Ministries and bureaucracies play a substitute role in these cases but they are likely to represent administratively-determined priorities as much or more than the needs of the users. Outside influences, such as an aid program, can stimulate different parts of the system, but the outside agency too is in a difficult position in trying to represent the "real" needs or demands of the users. In our recommendations, we are suggesting that AID stimulate the articulation of demand, particularly in the industrial sector, and stimulate the suppliers of innovation (see #3 below) to seek out themselves the needs of users in order to be able better to respond to them, recognizing that these are selective interventions in a complex

system in which many other variables (economic policies, employment practices) are at work.

In doing this, there must be careful differentiation by sectors. In industry, for example, the manufacturing unit is the "user" of S&T. By providing funds, training and better modes of cooperation with the S&T community to the chief executives of industry, AID could improve industry's appreciation for and use of Egyptian S&T skills. In agriculture or health, the "user" is the farmer or patient, and the relevant Ministry may not be an adequate spokesman for their needs though a major actor in the choice and promotion of technological investments. Recognizing this, it may be well in these fields to promote better cooperation between Ministry policy-makers and the S&T community, and also some direct cooperation between the S&T community and the real users, e.g., farmers. This may create some friction and competition but it can also help sharpen the debate over the real needs of the population and the most relevant priorities for S&T work. The problem of competition might be lessened if there were agreement with the Ministries on certain problem areas which need S&T study without the Ministry's intermediary role, e.g., the development of new plant varieties or the measurement of specific health treatment efficiencies.

Here is where AID can play a much more active role than in the past. AID programs in industry should set aside funds specifically for indigenous R&D work, and AID should provide technical assistance to industries in the planning and use of R&D. Many industries should be building their internal R&D capability, and AID should help selectively those industries which are prepared to undertake, and can justify such development. In some cases, existing public research institutes may be converted to "wholly-owned" or quasi-private industry components, a proposal put forth by one Egyptian business consultant.

In agriculture, the USAID's research program is already largely with the Ministry. USAID could in addition help in the identification of critical agricultural, or agriculturally related, problems best addressed outside the Ministry and make funds available for such research.

In both agriculture and industry AID must also be sensitive to unintended negative effects of its program on the role of Egyptian S&T. The availability of aid funds for foreign experts, but tight limitations on the use of AID funds for Egyptian salaries, etc., may have the effect of making foreign expertise cheaper or "free" to the individual Ministry or industry relative to Egyptian expertise. AID programs for industrial modernization or management improvement may be similarly structured to favor the use of foreign expertise rather than provide incentives to greater use of Egyptian talent, especially when the emphasis is

on developing specifications for imported equipment, etc. rather than equally on analysis of technological choices in which Egyptian specialists actively participate. This is where the "discipline" in AID programming and implementation, referred to above, must take place.

3. Improve the problem-solving capacility of the Egyptian S&T community.

This is a case-by-case job. It can be promoted from the "supply" side, i.e., by working with the potential technological innovators , by improving researchers' ability to identify problems, market their skills, and become directly involved with interested "consumers". The AID-supported projects with ASRT and the University of Cairo take this approach with considerable success. The support to the "demand" side, emphasized in #2 above, also will draw in the supply side and provide it experience. It can be promoted through selective cooperative arrangements involving both sides, e.g., the organization of R&D support to the food processing or other such branch of industry.

The important point here is that the S&T community needs more direct experience in problem-solving, not only to change its values and mode of operations, but to identify more clearly the skills lacking in Egypt. It would be preferable to focus such activities on "key problems of major significance", but even experience gained from problem-solving in "secondary" matters would be very valuable. USAID support to a wide variety of mechanisms for this purpose is therefore justified, e.g., the present ASRT and University of Cairo projects and additional ones recommended below (#5 and #6).

4. Increase attention to the role of science in society.

The attitudes of the youth toward science and its place in Egyptian society will be very influential in how the population addresses and/or reacts to the technological changes and challenges facing it. Science programs for youth are now being carried on in publications, and, less well, through radio and television. This is an area deserving of more attention. While USAID does not now profess an interest in this area, it is an important one for Egypt.

Understanding more of the effects of technological change upon society is another area of importance which needs much more attention. The ASRT's social science work seems weak in relation to its other activities. Interdisciplinary work is the official norm, but the structure and management of such research appears deficient. Even the problems do not seem very well defined. For the non-Ministerial S&T community, such research is an exceptionally appropriate task, because it can draw on a wide range of resources and focus on problems beyond individual Ministries' concern.

5. Provide recognition of and support for the role of the Academy of Scientific Research and Technology.

The ASRT is in a transitional stage, reflecting new leadership. It is reaching out to the universities and Ministries as well as its own affiliated institutes. It is seeking to develop policy alternatives as well as to broker individual S&T arrangements of a more immediate nature. And it is a direct supporter of research. The various roles stretch its management capacities and, if it continues to play these several roles, new internal management procedures -- which decentralize operational authority -- seem warranted.

In supporting ASRT in these several roles, USAID should not endorse ASRT as the one vehicle for its S&T strategy. Moreover, the ASRT role in policy formulation, research support, and project management will likely be redefined within the GOE over time. There are several roles, however, ASRT plays well and can play better if given adequate support.

a. Policy issues. Whether ASRT should be making policy, or contributing to national policy decision-making of higher fora, is a question deserving more attention, but need not hold up support for ASRT's role in policy analyses. As noted earlier, the next step in policy analysis should be focussed on concrete analysis of sectoral problems and greater knowledge of the issues in technological choice.

The ASRT is in a position to do studies of this kind. The Chairman of ASRT's Council on policy has suggested three lines of inquiry by ASRT: (i) state-of-the-art papers on key technological sectors, with emphasis on Egyptian research and experience; (ii) study of the technological trends in key branches such as construction; and (iii) study of the actual processes of technological decision-making (who are the actors, what problems do they face, etc.) in order to develop a clearer idea of the services needed by decision-makers. These are to be elaborated by the ASRT during May and June. They provide an agenda for discussion of support to ASRT's role in policy analysis under Phase II of AID's project, "Applied Technological Research". USAID support might consist of selective technical support from the U.S. on relevant state-of-the-art work outside Egypt and on research methodology, and of financial and technical assistance for staff support which has not been well organized for any of ASRT's Councils so far.

b. Seeking to bring together the relevant communities that produce and employ science and technology. This is a role often performed on an individual basis by the President of the Academy rather than on an institutional basis. USAID made good use of this role in the design of its new project in petroleum,

ground-water and minerals. That project is designed to make use of Ministry, university and ASRT institutions which the President of the Academy was able to bring together for the purpose. Other opportunities may arise and should be exploited.

c. Facilitating linkages between the consumer and supplier of S&T. The ASRT has undertaken to promote such linkages in a variety of ways. The time seems ripe to pursue linkages in industry in a more concerted, systematic way. Industry is badly in need of a more dynamic internal R&D system. The role of the Ministry of Industry and its research institutes is also different from that in agriculture: there is closer cooperation with ASRT; there is a more clearly defined "user" community (industries) in a position to state its own needs; and there is at least general recognition that the present linkages are weak. The ASRT's Industry Council is beginning to explore proposals for prototype R&D arrangements to service a few important industrial branches more effectively. This will require very careful planning. We recommend USAID provide technical assistance to the ASRT's Industry Council as part of Phase II of the Applied Technological Research project, drawing expertise from U.S. industry R&D experts rather than from U.S. universities. If one or more promising prototypes are organized, we commend that USAID provide long-term assistance to these prototypes under a new project, utilizing U.S. industrial R&D institutions as the source of expertise and long-term training, on a sister-institution basis. The prototypes could well be spun off entirely from ASRT auspices, but in any case the support for them should be organized separately from the present AID project with ASRT because it involves a different process and a different set of objectives.

6. <u>Increase the role of the university community in applying S&T.</u>

Several universities in Egypt have expressed interest in reorganizing their research and service capabilities such as the University of Cairo has done, and some have sought U.S. assistance. The University of Alexandria recently sought support from U.S. industry as well as USAID. USAID is currently reviewing several suggestions for "university linkage" programs with the U.S. There is need to be selective, and to avoid setting up competing, insular R&D activities in Egypt rather than cooperative ones. Also, USAID should consider carefully whether the linkage of the Egyptian university should be with a U.S. university, or with an industry-oriented research institute. We should not reenforce tendencies toward academic research. With these caveats, USAID might well consider one or two projects with additional Egyptian universities which have developed a special regional or sectoral focus and where there is a commitment to a mode of applied research.

In all the above activities, USAID will face the problem of incentive payments. Recognizing the broad problem in such payments, we commend nevertheless that USAID remain willing to provide some such support as part of its S&T strategy. The public salary problem is an across-the-board one; but just as USAID cannot solve it alone, neither can the Egyptian S&T community. Resources in Egypt for the use of Egyptian S&T experts are scarce, and the Egyptian S&T community is not really at an advantage against other claimants. Moreover, the system is not as unusual as it seems in principle: university (including state-supported) faculty in the U.S. get additional salary for some of their research; AID pays that price itself to get U.S. university talent it needs. In other words, the U.S. university system assumes some supplementary earnings. In Egypt we are dealing with government employees, but the assumption of supplementary earnings is still inherent to the system and part of budget realities.

More important, U.S. support for only U.S. technical assistance and materiel reenforces the dependency on outside expertise and weakens the level of real U.S. support to the Egyptian S&T community. It is a source of irritation in Egypt, defensible or not, that U.S. aid in many projects goes overwhelmingly for U.S. experts and for material, with no direct support for Egyptian participation. In the S&T field, this is especially of concern because building up the Egyptian S&T role is at the heart of the recommended strategy. For these reasons, we strongly recommend a flexible USAID position that permits incentive payments to demonstrate the real pay-off to Egypt of better use of its own experts.

Beyond AID

The U.S. has a variety of interests in S&T cooperation with Third World countries. But even in the case of Egypt, where our interests are so great, we found these interests poorly articulated within the U.S. Government. U. S. interests in such cooperation are scientific, economic, political and developmental. Scientifically, the U.S. gains in knowledge of food problems (new plants, soil characteristics, genetic possibilities for the U.S.), environmental matters of international concern, health problems relevant to the U.S. (e.g., NAMRU), and renewable energy possibilities, to name but a few. Economically, we further cooperation in the development and marketing of natural resources important for our needs, e.g., minerals and petroleum. Politically, we gain from cooperation with a body influential throughout the Middle East that shares many of our values and which prizes its link to the international scientific community. Developmentally, we build the capacity of a community vital to self-sustaining growth. These are interests which need to be spelled out more completely.

184 X

Lacking this articulation, the U.S. is uncertain about how to respond to the ending of P.L. 480 currency support for scientific research and cooperation in Egypt. Indeed, without clear policy direction in the past, much of these proceeds went for research of limited practical value. Now we face the prospect of letting such ties disappear altogether, or be supported only on a catch-as-can-basis, e.g., where AID finds the research directly relevant to its current program concerns, where a U.S. Department has some funds (and where another does not). This is a poor substitute for a strategy of S&T cooperation with a country so important to the U.S. Scientific cooperation should be supported for all four of the above reasons and, therefore, directed not by AID (or USDA or HHS) criteria alone.

There are currently plans for a possible request to Congress for a bi-national foundation to support such research. Failing that, we recommend that a small portion of the AID budget be set aside for this type of cooperation, under a separate inter-agency management structure. Aid levels for Egypt, though appropriated to AID, are politically determined, and they should serve a broad spectrum of U.S.objectives within the general development guidelines for Economic Support Funds. It is in fact anomalous to have other agencies request funds for S&T cooperation with Egypt when that is the one country where AID resources are ample to meet that objective. Science and technology cooperation with other Third World countries, where AID funds are limited or non-existent, is more deserving of such domestic agency effort and extra Congressional appropriation.

Guidelines and priorities for such a program should be established by both the U.S. and the Egyptian representatives. Such guidelines should not depart too far from the strategy proposed above. Even though additional U.S. interests are involved, a new mechanism should not reenforce tendencies toward overly academic, or overly individualistic research in Egypt as happened with the P.L. 480 program. Adhering to the objectives of that strategy also reenforces the legitimacy of using AID funds. AID can play an important role within such a structure in articulating the developmental significance of enhancing the Egyptian S&T contribution to development. The State Department should surely be sensitive to the political benefits of a more involved and productive S&T community in Egypt.

Finally, of course, Egypt should see in such cooperation a reenforcement of its own concern with relevance, better linkages, and productive results from its science and technology community. It should insist that resources for U.S.-Egyptian S&T cooperation from whatever source, contribute to this goal.

8

EVALUATION REPORT*

APPLIED SCIENCE AND TECHNOLOGY RESEARCH

AID/Cairo Project 263-0016

May 6, 1980

by

Clinton A. Stone, Panel Chairman, International Program Division, Georgia Institute of Technology

August Kehr, Agriculture specialist (genetics), U.S. Department of Agriculture (retired)

Nicolaas Luykx, Agricultural economist and consultant

James Marion, (Nutrition/biochemistry), Director of Research, Gold Kist, Inc.

* This report arises from a study during March and April 1980 by the four-member panel appointed to review the Applied Science and Technology Research Program funded by the Government of Egypt and the U.S. Agency for International Development. Inputs were received from the four principal operating groups: (a) Academy of Scientific Research and Technology (Cairo), (b) National Research Centre (Cairo), (c) U.S. National Science Foundation, and (d) U.S. National Academy of Sciences/ National Research Council.

APPLIED SCIENCE AND TECHNOLOGY RESEARCH

PREFACE

The Applied Science and Technology Research Program* has a broad and ambitious purpose -- "To improve the institutional capability of the Egyptian science and technology community to develop and manage research programs to solve priority development problems." The program seeks to achieve that purpose largely through a set of research, development and demonstration projects each a learning device with specific goals and objectives. Overlying these projects is a management structure which views both the broad program purpose and the components which comprise the program.

The evaluation team (Attachment [illegible]) wishes to acknowledge with deep thanks the many Egyptians who responded openly and patiently to the numerous questions posed by the team. We would like especially to recognize the time made available by Dr Hassan Ismail, Dr. Mohamed Kamel, Dr. A. S. El-Nockrashy and Dr. Osman Galal Project personnel participating in our discussions are noted in the project reviews Our task would have been impossible without their support and contributions. The USAID/Cairo Science and Technology Office has generously provided information and assistance for which the team is duly grateful.

---

* The organizational descriptors program, project and sub-project, as used herein, are not consistent with AID terminology but provide a useful hierarchy for this report. Attachment A provides definitions and a glossary of acronyms.

157

TABLE OF CONTENTS

	Page
Preface	i
Introduction	1
Issues	2
Recommendations	3
Evaluative Observations	4
Instrumentation Technology	8
Science and Technology Information	12
Management Training	15
Phosphate Ore Utilization	17
Wool Scouring and Wax Recovery	19
Corrosion in the Petroleum Industry	22
Red Sea Fisheries	24
Biogas Technology	26
More and Better Foods	28
New Crops for Arid and Semi-arid Lands	42

FIGURES AND ATTACHMENTS

Table 1. Structure of the Applied Science and Technology Research Program	6
A. Definitions and Acronyms	43
B. The Evaluation Team	44
C. Phase II Budgeting	45

198

APPLIED SCIENCE AND TECHNOLOGY RESEARCH

EVALUATION REPORT

Introduction

This report is addressed to five audiences, each having a particular frame of reference and set of interests in the program; USAID/Cairo and AID/W, the Joint Consultative Committee which has had a key role in shaping the program, the Academy for Scientific Research and Technology and the Egyptian program managers, the National Research Center, and finally the project directors and staff from whom the research results must flow. This introduction points up some important features of applied science and technology, the institutional setting for applied research and development, program goals, factors and criteria used in this evaluation and the relationship of program phasing to the evaluation. The report then discusses, in turn, issues, recommendations for Phase II and major observations. A final section discusses each project and sub-project including points emerging from the review. Attachment C is an overview of Phase II budgets.

Science and technology (S&T) share characteristics with other development sectors. The societal and economic impact of S&T, both basic and applied, results largely from incremental and often interconnected advances in knowledge and practice. The cumulative, longer term effects, either good or bad, of S&T programs are not easily forecast quantitatively. This is due, in great measure, to the unpredictable nature of the interchange and use of knowledge and of the applications which may result. The choice of and support for specific research and development (R&D) sectors, provision for an active interchange of knowledge, ideas and experience, objective evaluations of progress, and a setting which encourages and rewards success are tools available to manage investments in S&T. Steps can also be taken to enhance the likelihood for adoption of applied research results. Careful selection and definition of the problem to be solved, analysis of the constraints and economic/social returns accompanying successful implementation and design of projects to minimize user risk are among the steps which, done in concert with the intended user, are very important to research utilization.

16

The Project Paper states that Phase I is intended to provide measurable impact on the solution of key development problems and to design a long-term project aimed at improving the institutional capability to develop and manage research on priority development problems. Project documents suggest that participants did not always share this view. An implicit objective was an evaluation of the effectiveness of the Academy for Scientific Research and Technology (ASRT) and the National Research Center (NRC) in organizing, managing and implementing an applied research program. Delays in the development and approval of project plans and in the delivery of supporting materials and services have restricted program progress. This evaluation attempts to view the achievements to date in the context of those restrictions.

The major factors/criteria used to judge both program and project progress were the;

- Clarity of concept, sense of purpose and relevance to Egyptian development.
- Effectiveness of organization and the management of resources and problems.
- Appropriateness of the institutional settings to applied science and technology.
- Technical quality of the human and material resources employed.
- Degree of interaction with the intended users and beneficiaries of research as well as among research colleagues.
- Quantitative and qualitative progress to date.

Phase I and Phase II are useful distinctions for AID programming but they do not coincide with decision points in the progress of individual projects or sub-projects. The team has assumed that the commitment implied by the approval of three and five year project plans will be honored unless project performance falls below acceptable standards.

Issues

Issues which should be addressed in the design of Phase II and in consideration of the relationship of this program to national science and technology policy are:

- Is the proper focus for Phase II a continuation of the program as presently implemented with emphasis on one institution and two broad sectors or should the program broaden the institutional base and/or the sectoral coverage?

170

- Should the AID/S&T strategy be to support a larger, more diffuse and widespread effort to introduce effective applied research or to limit support to a more narrowly targeted demonstration?

- What should be the role of the S&T projects and institutions in large scale implementation of successful research? The relationship between projects and anticipated users has evolved satisfactorily in the early stages of research. The transition to implementation on a larger scale is a major task and the program should seek to better define the role(s) it intends to play in this transition.

- Do mechanisms exists for the support of projects with planned duration beyond Phase II? Project starts make little sense if there is no prospect for completion. New crops for Arid and Semi-Arid Lands is an illustrative example.

- Do project leaders have sufficient knowledge and control of project resources (tangible equipment, facilities, personnel and finances; and intangible concepts and ideas, relationships with ASRT, and relationships with outside organizations) to fulfill their responsibilities under the project?

- Is the present AID position on incentive payments consistent with its expectations for end of program status? Mechanisms for multiple sources of compensation are an integral part of Egyptian society and the S&T community in particular and unlikely to change within program time frames. Transfer of the salary incentive burden to Egypt without compensatory adjustments in the fraction of resources which flow to ASRT should be regarded as a negative input.

Recommendations

The evaluation team wishes to make the following recommendations to AID and to ASRT:

- The program has established a pattern of progress and should be extended with the addition of adequate resources for the future expansion of successful projects. Wool scouring, cottonseed oil, cheese manufacture and biogas are examples of projects which show promise of early positive returns.

- The program continues its focus on the sectors and institutions presently involved with the judicious addition within these sectors and institutions of projects with prospect either for completion within the program time frame or continued support beyond the life of program.

- Program and project management be strengthened by: clarifying individual responsibilities for project performance, supervision, reporting and resource management; increasing opportunities for professional interchange and the cross fertilization of ideas among individual project leaders; and increasing the awareness and use of relevant management principles and practices, perhaps by appropriate and carefully focused training.

191

- Greater attention be given to the inclusion of social science analyses in projects which now have a predominantly technological orientation.

Evaluation Observations

Increased Egyptian capability to develop and manage applied research programs is already observable and this program has the potential for continued and greater contributions to that goal. Program progress is commendable. Ten projects (Including seven sub-projects) have been identified and all but two have been underway for some time. The effort expended in clarifying and improving the project designs has been an educational investment important to the program purpose. The evidence is that applied research is increasingly understood and is gaining acceptance as an institutional and personal goal. Project and sub-project performance, although variable, must be considered excellent given the delays both in project initiation and in the provision of certain inputs. There has been active interaction with the users and potential benficiaries of research. However, the truly difficult challenges lie ahead for all projects.

The technical competence and commitment of the project staff is generally high and has contributed greatly to the rate of progress. The number of experienced and highly trained scientists or engineers may, in some cases be larger than necessary with the potential for underutilization and decreased job satisfaction, however. Most projects are making good use of existing equipment and facilities in the absence of the new items to be provided by the program.

Presently approved projects have often been the subject of prior Egyptian research and/or some form of Egyptian/U.S. collaboration. The current investigations can be broadly classified as industrial or food related. The selection appears to have been based upon probable success as well as developmental significance; wisely so since early project success is important to institutional and attitudinal change. The mechanism for soliciting and choosing future (Phase II) projects needs a more directed approach which recognizes the goals and objectives of Phase II. The role of this program and of ASRT in addressing development problems which effect multiple sectors and which cross organizational lines deserves continued attention and emphasis.

192

The majority of Phase I projects and inputs were designed to involve primarily the NRC. Ain Shams University, the National Information and Documentation Center (NIDOC), Cairo University and the Institute of Oceans and Fisheries each lead a project or sub-project activity. In addition, as shown in Table 1, there are 21 cooperating institutions ranging from villages to industries and include associated organizations such as the Scientific Instrumentation Center (SIC). The concentration of activities at NRC provides an institutional recognition and focus for applied research which may initially facilitate the spread of the philosophy of relevant research. The applied projects at NRC have also benefited from strong, top management support which seems to be reflected in staff attitudes toward applied research. By the same token, emphasis on NRC has served to limit the number of institutions influenced by the program.

The U.S. advisors to the program have consistently been of high quality and their contributions to Egyptian awareness of current technical practice, to project design and to equipment selection is judged valuable by the Egyptians and the evaluation team. The timely availability of advisors and the continuity of their participation could have been improved in a number of cases. The National Academy of Sciences (NAS) may wish to consider rejuvenating some advisory groups and assessing group composition as projects enter the implementation or technology transfer phase. A few projects could benefit from skills and experience not resident in the U.S. Access to this expertise through travel of Egyptian scientists and in-country visits by third country experts on a selected basis is encouraged.

The ability of AID, NAS and NSF to deal with the contractual, procurement and decision processes has been disappointing in the short term. Steps have been taken to remedy some of these shortcomings but a much closer examination of both U.S. and Egyptian decision and approval chains is in order. A more effective system with maximum delegation should be possible within the procedural and legal constraints and is an opportunity to teach management by example. It is unfortunate that this program, a major S&T effort, has had to be an educational experience for the assisting agencies and institutions.

TABLE 1

STRUCTURE OF THE APPLIED SCIENCE AND TECHNOLOGY RESEARCH PROGRAM

(SUB)PROJECT	LEAD INSTITUTION/PROJECT LEADER	COOPERATORS
Instrumentation	NRC/M. Kassem; SIC/Eng. El-Alaily	Cairo, Assiut, Tanta, El-Minya and Alexandria Universities
S&T Information	NIDOC/A. Gad	
Management Training	ASRT/A. El-Nockrashy	
Phosphate Ore Utilization	NRC/A. Yousef	Societe Financere et Industrielle d'Egypte; Kafr El-Zayat Fertilizer Company
Wool Scouring	NRC/A. Kantouch	Misr Beida Dyers
Corrosion	NRC/A. El-Azim	Petroleum Institute; C.M.R.D.I.; Suez Petroleum Company
Red Seas Fisheries	Inst. Ocean.&Fisheries/A. Bayoumi	
Biogas Technology	NRC/M. El-Halwagi	Soc.&Criminological R&D Center
More & Better Foods-Exec.Comm.	Cairo University/B. Ahmed	
Cottonseed Oil	NRC/A. El-Nockrashy, F. Osman	Al-Badrasheen Company
Cheese Making	NRC/M. Husseiny	Misr Milk & Food Company
Supramine	NRC/S. Hegazi	El-Nil Pharmaceutical Company
Nutritional Monitoring	NRC/O. Galal	Villages of Kafr Al-Khadra & Omar Makram; Org. for Recon. & Devel. of Egyptian Villages; Ministries of Land Reclamation, Agriculture & Social Affairs; Local Health Boards
Food Processing, Villages	NRC/I. Rifaat	
Livestock & Poultry	NRC/M. Nawato, H. Ali	
Plant Production, Protect.	NRC/H.S. Abdel Rahman	
New Crops	Ain Shams University/A. El-Beltagy	Al-Azhar University

Linkages among the projects are weak. The team often observed a vague understanding of the other projects by staff members. While the projects differ in topic and scope there are many opportunities for useful interchange. For example, commonalities exist in pilot plant problems, in problems of effluent reduction, in industrial interactions and in techno-economic analysis. Technical seminars, problem discussion groups and other interactive mechanisms could help to stimulate the flow of ideas and expand the use of available information from other research and demonstration organizations.

The inclusion of the cottonseed oil, cheese making and Supramine subprojects in More and Better Foods is puzzling. These activities do not have the diffuse user groups which characterize the village efforts, rather the interface is with industries. The work being carried out seems nearer to R&D than demonstration. Management may wish to review this organization.

Additional efforts should be devoted to "marketing" the information coming out of project activities through farmers' associations, industrial associations, professional societies, local government councils, rural and commercial banks, cooperatives, and formal extension services as appropriate. Brochures, periodical documents summarizing program achievements, popular articles, seminars and short training courses are mechanisms that come to mind. Program funds should be made available to assist these activities.

If a portion of the science and technology community is to engage in applied research programs for development, the personal and institutional rewards both psychic and monetary must compete with alternative career choices. One stimulus which this program can provide is the reward of success in achieving project goals and objectives. Recognition, project expansion, and greater responsibility should accrue to groups and individuals which perform above standard. Younger staff members should be encouraged to actively participate and be given outlets for their opinions and creative ideas. The change which this program seeks to accomplish must involve all levels within an institution or societal group if it is to become widespread and lasting.

INSTRUMENTATION TECHNOLOGY

Introduction

The Instrumentation Technology project is an infrastructure activity aimed at 1) building up the capacity within Egyptian institutions for the repair and maintenance (R&M) of scientific equipment; and 2) providing advisory services for the procurement of equipment under the overall Applied Science and Technology Program.

The National Science Foundation (NSF) in under a Participating Agency Service Agreement (PASA) with the Agency for International Development (AID) for the management and implementation of the Instrumentation Technology project. NSF has sub-contracted with the University of Wisconsin and the U.S. National Institutes of Health within this project. The Scientific Instrumentation Center (SIC), the NRC and other units of ASRT, the universities of Alexandria, Assiut, Cairo, El-Minya, and Tanta; and several participating industrial corporations are involved in either the repair and maintenance aspects or the equipment procurement aspects of this project.

Representatives of the evaluation team met with Engineer M. El-Alaily and Dr. M. Ghobashy of the SIC, with Dr. S. El-Sobky of Cairo University, with Drs. F. Hanna, M. Kassim and N. Saleh of the NRC, for specific discussions on this project. Additional general discussions were held with Eugene Pronko, NSF, with Drs. M. Kamel and O. Galal of NRC, and with Dr. S. Arif of USAID/Cairo. Project files and documents were made availability by all participating parties. In addition, the analyses of other project instrumentation requests provided a further base of information.

Project Summary

On the Egyptian side, SIC was established as a national level organization for the repair and maintenance of scientific equipment. Its emphasis is on major repairs, calibration and standardization. It is said that SIC is the only Egyptian institution with capabilities for R&M in optics, and one of the few in glass blowing and fine mechanics. So-called "satellite" R&M centers (R&MCs) are being established and/or developed at NRC and at the universities of Alexandria, Assiut, Cairo,

El-Minya and Tanta. These satellite R&MCs are intended to deal with (all but major repairs in) the electronic aspects of scientific instruments, although Alexandria and Cairo Universities are said to have a capacity in fine mechanics, and some are said also to have a capacity in glass blowing.

On the U.S. side, NSF manages the Instrumentation Technology project. Under sub-contract with NSF, the University of Wisconsin's Instrumentation Systems Center trains the R&M personnel of SIC and NRC, and also helps develop the R&M capability of these organizations. Under its sub-contract with NSF, the Biomedical Engineering and Instrumentation Branch of the National Institutes of Health performs comparable services for the five universities. The University of Wisconsin participates in the procurement of R&M equipment for SIC and the satellite R&MCs, although initial emphasis in procurement was on units at NRC and Assiut, Cairo, EL-Minya and Tanta universities.

A several-stage procedure has been established and justified for the procurement of scientific instruments and equipment under all projects (research and development, demonstration, and infrastructure) of the overall Applied Science and Technology Program. It typically goes as follows (quoted from an AID document entitled "Mechanism for the Selection and Procurement of Equipment for Projects in 263-0016 Applied Science and Technology Project" dated June 27, 1979):

1. Egyptian project scientists prepare a list of equipment to accomplish the objectives of a particular research project.
2. Equipment list sent to the University of Wisconsin/ISC, after approval by ASRT/NRC/Cairo and a copy of the same sent to NAS, NSF and AID/Cairo.
3. University of Wisconsin prepares specifications and estimated prices and sends to ASRT/NRC/Cairo, AID/Cairo and AID/Washington.
4. ASRT/NRC approves and contacts AID/Cairo for concurrence.
5. AID/Cairo authorizes AID/Washington to amend or issue new PIO/C for procurement of equipment making AAPC the authorized agent for procurement. A copy of procurement order sent to University of Wisconsin/ISC.
6. AAPC contacts University of Wisconsin when needed during procurement process."

Because of the warranty terms of much, if not most of the equipment procured, it is project practice that the items received in Egypt be

197

unpacked, examined and tested under the supervision of a University of Wisconsin staff member. Occasionally, a manufacturer's representative performs this function. Damages and deficiencies are reported and corrected under pre-negotiated terms of the procurements, in most cases.

The ASRT has established an Instrumentation Committee chaired by the head of SIC and made up of nine other personnel, two others from SIC, three from NRC, and four from universities. There is an effort to strengthen the role of the committee. Under this effort, the committee may hold monthly meetings, add a fifth university to its membership, and possibly play a part in instrument specification for the procurement process. In the past, U.S. advisors often assisted in the initial specification of requested project instruments.

The NRC has established a Core Equipment Laboratory which exists, organizationally, in addition to its R&MC. This laboratory is comprised of materials testing equipment for pharmaceuticals, textiles, paper and pulp, ceramics and polymers. It is said that the Core Equipment Laboratory will become the principal medium for the NRC's services to industry, and possibly universities, in instrumentation training, materials testing, and the like. NRC's interest in up-grading the equipment of its physics laboratory is tied to this orientation towards industrial service.

Following a relatively long period of discussion, negotiation and deliberation, the NSF and other interested parties apparently have agreed to place a resident expatriate specialist, with an Egyptian technical counterpart, in Cairo to serve as a focal point for this project.

Conclusions and Points for Consideration

- Initially, there seem to have been problems in the selection and preparation of candidates for training as repair and maintenance technicians, but this appears to have been improved.
- Apparently there is difficulty in getting trainees to follow through over the long term on the objectives of the training program. Once trained, viable employment alternatives exist and may be taken advantage of by trainees following their return to Egypt.
- One result of the lengthy equipment procurement process is a distinct time lag in the arrival of necessary equipment for the start-up of individual projects. Many projects are now

well into Phase I without the tools with which to work.

- It is evident that the general procurement process can be shortened. The project files contain some examples. Further, the proposal that the Instrumentation Committee play an early positive role in assisting Egyptian scientists to be more precise and specific in their equipment requests does not appear to have been seriously considered and evaluated.

- It would appear to be a valuable step to combine the NRC physics laboratory directly with the NRC Core Equipment Laboratory, rather than to upgrade it is an semi-detached unit.

- Egyptian authorities appear to be responding actively and positively to earlier questions raised about the means by which procured equipment and trained personnel are to be placed and used within the organizations participating in the Applied Science and Technology Program.

- The U.S. side of the Instrumentation Technology project, after some delays, appears to have made significant progress in organizing improved communication and coordination of the project, particularly through the placement of personnel on site. The communication between the sub-contractors and the Egyptian participating organizations in the two separate areas of responsibility is improving, it seems, but could be improved further.

199 x

SCIENCE AND TECHNOLOGY INFORMATION

Introduction

The Science and Technology Information Project is an infrastructure component of the Applied Science and Technology program. It has two major components: 1) a design study for a national system of science and technology information services (which is envisioned to include a computer-accessed information delivery service and a more traditional service for the supply of journals, reports and other documents); and 2) the training of information specialists in a selection of skills important to the process of information handling.

NSF is under a PASA with AID for the management and implementation of the Science and Technology Information Project. NSF has sub-contracted with the Georgia Institute of Technology for the design study and with Catholic University for the training of information specialists. On the Egyptian side, NIDOC of the ASRT is the principal organization involved.

Representatives of the evaluation team met with Dr. B. El-Hadidy at Catholic University; with Dr. A.M. Gad and Mr. A. El-Dewany at NIDOC; and with Dr. M. Madkour at the Microfilming and Documentation Center at Al-Ahram for specific discussions on this project. Additional general discussions were held with Eugene Pronko of NSF. NSF and USAID/Cairo documentation and project files were made available to the evaluation team.

Project Summary

An eight-person steering committee, chaired by the NIDOC Director has been organized, including membership from NRC, Cairo University and other external organizations. Four task groups have been organized 1) to collect information on pertinent past surveys; 2) to compile a descriptive assessment of NIDOC itself; 3) to inventory personnel resources; and 4) to begin identifying issues in need of resolution before a national information policy and plan can be formulated. Informal indications are that several other similar preparatory studies are also under way. Three of the four identified studies were said to be in draft form at the time of the evaluation team's visit.

A major survey of 1) on-going research on the topic of "information"; 2) the available information resources and services; and 3) the information requirements of Egyptian specialists in all scientific and technical fields had just gotten under way during the period of the evaluation team's visit. Some 400 organizations and 1,200 professionals (academic, scientific, governmental, and industrial) are being involved in the second and third parts of the survey (being conducted on contract by an experienced Egyptian organization). The survey should be completed within approximately three months. NIDOC with the help of additional statistical resources is conducting the inventory of on-going research. Two NIDOC staff members have beeen sent to the U.S. for a four-week program focused on the preparation of profiles of information user needs. They will train some 150 others in the technique following their return to Egypt.

Twelve specialists were to have received a specialized training program in indexing and abstracting, duplication and reproduction, and other related information skills. Five were screened initially and sent to Catholic University. Skpticism on the Egyptian side led to a delay in selecting, preparing and sending the remaining seven until the first five had returned and their experience could be evaluated. Language ability, the complexities of arrangements for specially designed programs conducted partly in different locations, and costs per trainee (approximately U.S. $30,000 each for nine months) all seem to have entered the decision to hold back on the group of seven.

Initially, technical and coordinative inputs stemmed from what appears to have been a careful program plan prepared by the U.S. sub-contractor in the design study components. The in-service training aspect was a single free-standing component that was not programmatically coordinated with the design study. The steering committee's role was adjudged by project personnel to be fairly well completed by early 1980 when the work plan had won approval, the identified reports were being prepared, the major survey of resources and needs was negotiated, and electronic processing of the data had been arranged. However, a need for an on-site coordinator was generally perceived. Negotiations were conducted to recruit a qualified Egyptian specialist for that role.

Conclusions and Points for Consideration

- Active, positive steps are being taken to fulfill sub-project objectives even though there have been a number of problems and delays during the initial stages.
- Project personnel mention a lack of sensitivity to information among Egyptian scientists and other specialists, and attribute this to deficiencies in the educational system, or in the system of motivations and rewards for scientific and technical personnel. While this may be true, project leaders may also want to examine the accuracy, rigor, relevance and utility of information being put into the system.
- As a national information policy is developed, it will be important to take into account the non-information factors that will help promote the implementation of the policy.
- A number of the delays in the early phases of this project and some of its continuing problems may be attributable to the inexperience of some U.S. institutions in overseas operations in developing countries.

MANAGEMENT TRAINING

Introduction

The management training courses conducted by Denver Research Institute (DRI) under a subcontract from the National Academy of Sciences (NAS) were particularly difficult to evaluate. No training was in progress during the evaluation period nor was there adequate time to survey participants in the four courses given at Denver and the survey course presented in Cairo.

The evaluation team reviewed prior monitoring and assessment reports by John Hurley (NAS Memorandum 2/25/80) and Dr. A. S. El-Nockrashy (ASRT Report 2/6/80), considered the background and responsibilities of the 111 attendees, discussed the utility of the training with a small number of participants, and assessed the management needs of ongoing research and demonstration projects. The following discussion should be read with these limitations in mind.

Project Summary

The management of science, technology, applied research and development is a matter of importance to industrial and developing countries alike. As with other forms of management, the practice is a mixture of art and science not easily conveyed through written materials alone. Applied R&D has special management considerations which distinguish it from more basic science. Economic concerns, shorter time horizons, linkages with users, the interdependence between project elements, and often the scale of activities require systems of organization, information flow, direction and dynamic response designed to meet individual project needs. The DRI in-service courses covered topics important to institutions engaged in or making the transition to applied research. Case studies using developing country information and settings were an important but under-utilized tool. The participants expressed a desire for greater use of cases relevant to their situations. Problems of scheduling, support facilities and time for interaction which were encountered have been noted in the reports referenced above.

Careful definition of the research problem and a work plan calculated to maximize success probabilities within constraints of time and money are key to effective applied research. Flexible response to new information and

203

to unpredicted opportunities is also important. The evaluation team believes that increased emphasis on technoeconomics and project feasibility analysis would be of benefit to staff members of ongoing and future projects. The team recognizes the desire to introduce management principles to NRC broadly and to the larger Egyptian S&T community. However, success of the initial projects is vital to the program goals and the team feels that a larger number of project persons should have attended the courses given in Denver. The translation of management principles into practice is not always easy for technically trained people and the team suggests that mechanisms are needed to assist this process until effective R&D management is well established both in the program and its projects.

The plans to establish management courses within NRC merit program support. The intent regarding additional DRI inputs is not clear. However, careful coordination between the NRC and DRI would be beneficial to both if a DRI continuation is implemented. Short term improvement in project management should be a priority objective of all subsequent management training and a subject included in project monitoring.

Summation

The evaluation team believes that:

- The Applied Science and Technology Program has recognized the value of effective R&D management and taken steps to introduce and implement appropriate management techniques.
- The important role of management in the success of initial and future projects warrants additional training inputs.

Program leadership may wish to consider:

- Additional management training for several levels of personnel within the existing program and projects. Greater emphasis should be placed on feasibility and economic analyses as guides to project design, evaluating tradeoffs and decision making.
- Expanding use of case studies and practical excercises with consideration given to use of ongoing projects as the basis for some case material and group study.
- Including relevant practical experience from Egypt and other countries in the Egyptian course being developed.
- Providing project and sub-project managers with guidance and assistance, as required, to help implement management principles and techniques in their R&D activities.

PHOSPHATE ORE UTILIZATION

Introduction

Egypt possesses large reserves of low-grade phosphate ores containing types and forms of impurities not easily removed. These are used to produce marketable phosphate for fertilizers and industrial chemicals. A project was initiated in November 1978 with three sub-topics; pilot plant studies of ore beneficiation, laboratory and pilot scale studies on the chemical processing of phosphoconcentrates to produce fertilizers and chemicals, and agronomic assessments of fertilizers. Phase I of the project is a three-year effort. A letter offering industrial cooperation was received from Societe Financiere et Industrielle d'Egypte in late September 1979.

Interviews were held with Dr. A. Yousef, Dr. S. El-Nizahi and Eng. R. Salama. A visit was made to the beneficiation pilot plant at El-Tibbeen, not yet in operation due to construction delays. As with all projects, the NRC/NAS and AID files were examined.

Project Summary

The International Fertilizer Development Center and the Tennessee Valley Authority have provided extended training on chemical processing for two NRC staff members and have assisted in formulating equipment lists for bench scale processing. The final list was submitted in March, 1980. Substantive further progress in this area awaits receipt of the equipment.

Ore beneficiation studies have been carried out by NRC for some time and equipment is available to devote to phosphate beneficiation work. The pilot plant equipment is located in a new facility still under construction and has been arranged to accommodate process flow schemes for the three ore types prevalent in Egypt. Startup awaits completion of electrical service to the pilot plant bay. Testing should be able to begin no later than May 1980.

Agronomic studies are planned using small test plots but data from these studies are not yet available. Similar studies are being carried out as part of the biogas project and both activities might benefit from the sharing of methodologies, data and conclusions.

205 X

The project has proceeded through the early formative stage but an additional 12-18 months of effort seems necessary to see whether substantial progress toward better utilization of Egyptian phosphate ores can take place.

Summary

The evaluation team feels that:

- The project addresses an important subject and is proceeding well at this early point in the research plan.
- More attention should be given to the water and energy costs of process schemes under study as well as the costs of environmentally sound handling of effluents. In addition, there is an expressed need for increased capabilities in technoeconomics, agronomy, and marketing.
- A review of progress, future plans and resource requirements will be needed in 1981.

WOOL SCOURING AND WAX RECOVERY

Introduction

Misr Beida Dyers Company, Alexandria is the only Egyptian firm currently processing raw wool for domestic and export markets. The company scours, cards and strands imported wool into tops for sale to textile firms. The value added is in the range LE 5-7 million per year. The objective of the joint NRC/Beida Dyers R&D project is the improvement of the classical scouring and wool wax (lanolin) recovery processes now employed. This is likely to lead to increased economic return to the company.

Members of the evaluation team reviewed NRC/NAS and AID project files, discussed the project with Drs. M. Kantouch and A. Bendak, toured the NRC textile laboratories and visited the Beida Dyers plant in Alexandria. More general discussions with Drs. N. Saleh, M. Kassem and S. Harif included equipment and instrumentation for this project.

Project Summary

The wool project had its genesis in the December 1977 American Chemical Society meeting with Egyptian scientists and engineers in Cairo and was one of two projects selected by the JCC in March 1979 from a larger list of Society suggestions. Work began April 1 on a three-year project plan. Dr. A. Borai, Chairman of Beida Dyers, was officially requested, in a June 2 letter, to approve company participation in the R&D project and to head a project steering committee. His acceptance is dated July 5, 1979.

The first project year just ended has resulted in measurable progress. A literature search was conducted as preparation for a subsequent trip to the U.S. and the U.K. The two-person trip provided a general view of modern, commercial wool processing and, importantly, knowledge of specific processes which could be incorporated in the Beida Dyers scouring system with nominal investment:

A small laboratory performing routine production line measurements has been established at the Alexandria plant. The result has been better understanding of the existing scouring process which already has led to improved process control, reduced chemical consumption and increased wool

20/A

quality. Simultaneously, laboratory work at NRC has provided evidence that centrifugation can be a practical approach to improving both the fraction and quality of wax recovered. This appears to be superior to the alternative process of solvent extraction. Work at NRC continues on wax extraction and purification methods to obtain the high quality which is in international demand according to the market survey carried out by the project. The evaluation team noted the close working relationship between the NRC and Beida Dyers in the execution of this project.

The original project plan called for pilot tests of centrifugal wax separation of a scale larger than possible with existing laboratory equipment but smaller than production quantities. It has become evident that the requested centrifuge would have to be specially manufactured with an inherent delay and added expense. The decision has been made to order a larger, standard unit which can be incorporated in one of the four Beida Dyer production lines. This entails a programmed shutdown of the line, alteration of the system piping and installation of the new equipment; clearly a major input on the part of the company. These changes could be initiated after the equipment has arrived to ensure minimum downtime and lost production but this would add measurably to the delay in pilot testing.

The order for this equipment is being held by USAID/Cairo pending resolution of legitimate questions about a major instrument included in the same total order but for another project. The scheduling of equipment delivery apparently cannot be made with sufficient reliable, prior notice to permit the start of plant modifications in advance of centrifuge availability. The unavoidable delays already incurred are likely to be extended with probable loss of project momemtum.

The original economic justification for this project was based upon an increase in the amount and the quality of wool wax recovered from the scouring process. It appears that the prospects for reasonable return on investment through wool wax recovery remain good. However, it has become evident that incremental gains in wool quality, decreases in inputs of process chemicals and de-ionized water, reductions in effluent pollution factors, dryer efficiencies and other as yet unspecified areas may yield economic returns in excess of those forecast for wax recovery alone. The project staff is aware of these possibilities and expressed a willingness to

pursue them over time. The team did not see evidence that alternative project plans were being considered on the basis of a technoeconomic analysis of the tradeoffs among the opportunities which accompany a broader view of wool scouring economics.

Summation

The evaluation team concludes that:

- The wool scouring and wax recovery project has established an effective working relationship between NRC and Beida Dyers Company and that measurable progress toward the project goals has been made.
- Opportunities for unforeseen benefits exist which could greatly increase the resultant economic return and foreign exchange earnings.

It is suggested that:

- AID and NSF make a special effort to facilitate equipment procurement and delivery for this project.
- Provisions be made for the appropriate use of third country advisors to take advantage of expertise not available in the U.S.
- Application of return on investment, present cash value of future benefits, least cost and/or similar project evaluation technique could be very useful in guiding both shorter term and long range project activities.

207

CORROSION IN THE PETROLEUM INDUSTRY

Introduction

Corrosion research was one of the topics suggested for implementation during the 1977 American Chemical Society meeting and approved by the JCC in November 1978. There had been a prior collaborative program between NRC and Ohio State University supported by NSF. A preliminary NRC proposal on corrosion was reviewed by a U.S. advisory panel January 1979 and after further discussions with the NAS/NRC advisor, the three-year project was initiated in August 1979. A letter had been sent to the Suez Petroleum Company in May of that year requesting company participation and cooperation. This resulted in an affirmative response dated September 6, 1979.

In reviewing the corrosion project, member of the evaluation team met with Drs. A. Azim, V. Gouda, F. Saad, T. Saber, F. El-Wahab, M. Khedr, T. Hanna, S. Mustafa, M. Badran, A. El-Hosary, and R. Saleh. The project files, including Dr. Snavely's report on his February 1980 visit to Cairo, were also of assistance to the team.

Project Summary

The Egyptian petroleum refining industry, along with other industrial sectors, continues to have serious corrosion problems with frequent shutdowns from corrosion-induced failures. The Suez Refinery, refurbished in 1977 after a ten-year shutdown, has been selected as the site for cooperative activities. Other petroleum companies were to be invited to observe project progress and results. Travel time to the Suez facility (1.5 hours) has led to a 2 day bi-weekly interaction schedule.

The project has six elements. Corrosion monitoring and corrosion protection are directed to shorter term solutions of industry problems. Research on corrosion inhibitors derived from indigenous plants and materials might produce results in the 2-5 year time frame. Studies of galvanic and pitting corrosion, problems common to industry, are more fundamental efforts to increase understanding of the phenomena. Establishing a well-equipped corrosion laboratory is the final element of the project. This stratified approach provides a solid foundation for continued corrosion research but the team wonders if the resource allocation to the individual elements is consistent with the program goals.

Progress on corrosion monitoring is inhibited by lack of instrumentation and the need for staff training in techniques for in-plant monitoring. Procurement procedures and unbudgeted training expense issues appear likely to delay monitoring activities by six or more months. Timely corrosion monitoring is important to the NRC linkage with the Suez Petroleum Company.

Conclusions

The evaluation team believes that:

- Staff capability and interest are high and, as the February 1980 advisory report points out, progress has been made toward project objectives. The return of the original project leader may further stimulate the rate of progress.
- Some combination of NAS, NSF and AID should act to shortcut procurement procedures for the few items of monitoring equipment requested.
- Action should also be taken to select a training mechanism and provide timely funding.
- A review of the emphasis on and support for the project elements should be made in the fall of 1980.

RED SEA FISHERIES

Introduction

In 1976 the total fisheries production of Egypt was 158 thousand metric tons. Fish consumption in Egypt is said to average about half of world levels on a per person basis. The major aquatic food sources in Egypt include the northern delta lakes (34 percent), the inland lakes (11 percent), the Nile River (17 percent), the Mediterranean coastal zone (13 per-cent), the high seas (10 percent), fish farming (7 percent) and the Red Sea (8 percent). Specialists in the subject feel that the Red Sea fisheries resources need to be better understood, and that their output on a sustained basis could be more than doubled over the next several years. Other significant efforts, such as in aquaculture and mariculture are being made in Egypt to develop the other aquatic food resources.

Members of the evaluation team reviewed NRC/NAS and USAID/Cairo files, and discussed the details of the Red Sea Fisheries R&D project principally with Dr. A. R. Bayoumi of the Institute of Oceanography and Fisheries of ASRT. More general discussions were conducted with other staff.

Project Summary

Project documents indicate that the Red Sea Fisheries project was originally proposed in May 1978 and tentatively approved (in revised form) in November of that year. As of April 1980, the project was still in a state of planning, consultation and review, although the deliberations at the fifth meeting of the JCC seem to have resolved many of the previously unsettled points that had held up implementation. These points appeared to relate mostly to the need for greater specificity in the project's four components.

The Red Sea Fisheries R&D project has four components: 1) pelagic schooled fish; 2) deep water shrimp; 3) reef fishes; and 4) lobster. Six months of preparation time is envisioned for the first year of research work for a total of 18 months. Emphasis is on the collection of statistics on species' availability and distribution; and on the development of improved equipment and techniques for commercial exploitation.

A proposal has been made for the use of remote sensing to prepare topographic charts of the coastal area south of the Gulf of Suez, and to test and demonstrate low light level fish detection. This is under active discussion with the Remote Sensing Center of the ASRT.

Conclusions and Points for Consideration

- Because the Red Sea fisheries R&D project's first phase is on the threshhold of being carried out and has been the subject of extended review by Egyptian and U.S. specialists, the evaluation team supports the launching of this work. The first phase is projected for an 18 month period, and the second phase for 2-3 years (for a total of 3.5 - 4.5 years from the point of initiation). The evaluation team believes that the impact of this R&D project on the availability of total food supplies from aquatic resources may be quite modest, although positive.

- The project documents indicate that numerous questions and issues have been raised and responses seem adequate at the planning level.

- There seems to be little attention given to studying the institutional aspects of fisheries exploitation. This includes the organization, functioning and management of harvesting enterprises; the storage, processing, transportation and other aspects of output distribution; and the economic management of such inputs as labor force, production equipment and supplies.

- Project documents seem to make assumptions or assertions about the probable impact of the R&D work in areas such as the growth of the fishing industry in the Red Sea area, the growth in employment, and the improvement in individual levels of fish consumption that are apparently not being monitored or tested by project activities. The importance of responsibilities for organization, leadership, communication, and coordination are recognized in the project documents but it is not clear to whom they are eventually to be allocated.

- In addition to the scientific and technical emphasis being given to varying aspects of the Red Sea Fisheries R&D project, the evaluation team feels the project leadership may wish to consider further attention be given to the population dynamics of aquatic species, the technology and economics of production enterprise management (especially where sizeable units of equipment are involved), and market institutions and economics. Although commendable attention is given to the need for data, careful attention will have to be given to the accuracy and relevance of the information collected.

213

BIOGAS TECHNOLOGY

Introduction

Early Egyptian interest in energy from biomass was further stimulated in 1978 by a Canadian sponsored workshop. NRC proposed a five-year biogas project in late 1978 and a revised proposal was the basis for project initiation in March 1979. Comments by U.S. advisors emphasized the need for sociological analyses and careful planning for village demonstrations.

Members of the evaluation team met with Drs. M. El-Helwagi, A. El-Dayem, and H. Megahed for project discussions and visited the prototype biogas digester facility on the NRC campus. The project files were reviewed and, during village visits to Omar Makram and Kafr Al-Khadra, impressions were formed on some factors pertinent to biogas implementation.

Report Summary

The project has made substantial progress in the first year and is organized for information exchange among the many staff members. A notable achievement has been the successful transfer of Chinese technology for the construction of domed, underground biogas digesters. The supportive laboratory studies underway and planned appear to be carefully thought out and will be essential to successful demonstration and large scale implementation of biogas technology in Egypt. Similarly, the engineering studies and prototype construction of various system designs should provide valuable input to the project.

Preliminary surveys of physical conditions in four villages have been completed but the report was not available for review. The project staff indicated an awareness of the many factors impinging on village biogas demonstrations and the complex interactions among these factors. Social and economic considerations are thought to underlie the limited acceptance of biogas technology to date. Economics, waste availability, digester siting, gas utilization appliances, ownership, and manure/slurry handling problems are a few of the numerous topics which should be understood and incorporated into the demonstration design.

Biogas demonstrations have often failed to document carefully the setting and the externalities which accompanied the project. Understanding of the biogas role in energy generation for Egypt and elsewhere could benefit from carefully designed and documented pre-demonstration activities, data acquisition, analysis and evaluation that have not characterized biogas programs elsewhere.

Conclusions

Our review has led to the conclusions that:

- There is reasonable prospect for the application of biogas technology in Egypt.
- The project has made substantial progress to date and has a sound technical plan.
- Successful demonstration of biogas technology in Egypt could be jeopardized without early attention to, analysis of and planning for all aspects of the demonstration.

The evaluation team suggests that the project staff evaluate the desirability of:

- Convening with an advisory group of U.S. and third country experts to develop a detailed schedule of pre-demonstration activities and demonstration plan. The project might wish to accelerate the acquisition of background data to better support such an advisory group.
- Increasing the number of demonstration villages (presuming the existence of an adequate plan) to three or four of those identified, adding to the key variables to be tested and the confidence level of results.
- Holding seminars and discussions with interested community groups not directly involved in the demonstration to increase interest in biogas and to obtain an understanding of attitudes toward the technology.

215

MORE AND BETTER FOODS

Project Overview

The More and Better Foods Project is made up of three components: food technology, nutrition and farm systems. The components include application of research data to food plants and village level activities. The village level activities (touching on food processing, livestock productivity and crop management, and nutritional monitoring) are led by a coordinated team of NRC specialists. They apparently have maintained effective communications with each other, with participating farmers and with members of the village council as well as other local leaders. There was some evidence of interaction with other activities being carried out in the villages by the governate and the Ministry of Agriculture. The NRC team generally makes weekly visits to Kafr al-Khadra and Omar Makram, the two villages involved in this work. Additional workers are brought in as needed.

The provision of economic incentives in the form of materials, equipment or seed, for example, combined with reasonably consistent repayment or cost sharing by the villagers from realized profits seems to have been useful in achieving effective participation. A portion of increased profits are returned to the village council to be used in stimulating broader participation. Efforts to engage a larger fraction of the local population merit close attention since they bear heavily on questions of larger scale implementation.

In many respects, the various village activities (sub-projects) are sufficiently well coordinated that they, in fact, constitute a definable, single sub-project. More formal recognition of this de facto organization might assist linkages with village socio-economic data gathering, the documentation of successes and failures with their causes, the improved targeting of new interventions and the planning of similar projects at new locations.

The industrial demonstrations (Cottonseed Oil Refining, Industrial Cheese Making and Supramine) are undertaken separately from the village demonstrations and from each other. These are discussed one-by-one in the following sub-project analyses.

The evaluation team spent considerable time with the More and Better Foods Project because of the extensive network of sub-projects, personnel and cooperators. Files were reviewed at USAID/Cairo and NAS/NRC. Visits were made to the old village, Kafr al-Khadra and the new village, Omar Makram, which were chosen for this demonstration. Local personnel cooperating with this program were interviewed and farmer meetings attended in both villages. Work underway in each village was inspected.

Interviews were held with Drs. M. Kamal, A. El-Nockrashy, and N. Saleh, and the following investigators: Drs. O. Galal, F. Osman, N. Ahmed, M. Abd El-Salam, I. Rifat, A. Abdel-Dayem, H. Salama, H. Al-Nomany, H. Ali, M. Effat, A. El-Nimr, M. El-Beltagy and B. Ahmed. An evaluation report on More and Better Foods by Dr. C. O. Chichester dated 2/27/80 was noted by the evaluation team.

Cottonseed Oil Refining

Introduction

Cotton is the most important agricultural crop for export in Egypt. By-products of cotton production are edible oil and cottonseed cake or meal. Of the 950,000 tons of cotton seed produced annually, 700,000 tons are expelled or extracted, producing about 90,000 tons of edible oil.

The extraction process by which oil is separated from gossypol-containing seed results in a crude oil that is highly colored and difficult to process or refine.

This food technology sub-project has been designed to prevent color fixation of cottonseed oil and to improve refinement procedures for oil already color-fixed. The sub-project goal is to produce high quality refined oil with minimum oil loss and a low processing costs.

Researchers at NRC have joined with personnel from the Al-Badrasheen Oil and Soap Factory to design and conduct laboratory and pilot scale studies on processing treatments to accomplish the above objectives. Pilot scale kettles were designed, built, installed at NRC, and used for the study. Research started June 1978.

Sub-Project Review

A number of experimental treatments have been tried in order to improve oil quality and yield. Some of these are applicable as improved processing steps for industrial use. It is apparent that both NRC and industry have provided inputs to planning, research, sample and data analysis, and establishing a scenario to apply results at a factory level. Pilot scale studies were done on oil from the factory in quantities from 1 to 50 kilograms. Remaining steps are to finish in exact detail all process changes and transfer the technology to a plant scale with batch quantities of 16 tons.

The prospect of industry adapting process treatments developed under this project appear to be good. The treatments reduce costs and improve product quality, possibly to the extent of eliminating an oil bleaching step which is now routine in edible oil refineries. It is important that NRC personnel adhere to present plans of making process changes in Al-Badrasheen factory within 3-6 months.

The sub-project leader attended a marketing seminar under the training program and one team member visited plants in the U.S. Team work with industry representatives is evident among NRC workers. Also encouraging is associated research on other problems in edible oils not directly supported by this project. Work is being done on the quality of hexane (used for solvent extraction), the quality of soybean cake for feeding purposes, stabilization of rice bran oil, and deodorization of soybean oil.

This sub-project has the capability of contributing to the expansion of edible oil processing within Egypt so that an increasing percentage of the 400,000 tons of edible oil imported annually might be refined domestically. If so, added product value, along with equipment, personnel and supply costs, could accrue to Egypt.

Conclusions and Recommendations

The evaluation team concludes that:

- Researchers at NRC have made measurable progress in improving cottonseed oil quality by changes in processing steps at laboratory and pilot scale levels.

- Participation by industry personnel is evident and indications are that process improvements will be incorporated into industry practice.
- This sub-project has potential for providing a data base needed for expansion of refining capacity of crude edible oil.

We recommend that:

- Full support of this sub-project continue and that results be applied at an industry level very soon.
- Processing studies related to refining such as extraction, expelling, and quality of hexane be kept as a part of this study.
- Personnel widen industry contacts, particularly in other countries.

Industrial Cheese Making

Introduction

The production of soft white cheese, Domiati, consumes over one-third of the milk produced in Egypt. Domiati cheese is produced by a number of dairy plants. Only the production of butter oil (ghee) consumes more milk than the cheese process. As milk production and demand change, fluid milk is either less available or more expensive for use in the production of cheese. Milk costs, as a percent of cheese production costs, have been increasing for the past few years and now constitute 75-80 percent of the cost of producing cheese.

The volume of dairy products imported into Egypt is increasing each year, including both white cheese and dried skim milk (DSM). A study was approved, as part of the More and Better Foods Project, on the use of DSM as a partial replacement for milk in cheese production. This has been expanded to study a number of ingredients that could decrease production costs by reducing whole milk requirements.

Sub-Project Review and Evaluation

Work conducted under this sub-project includes an extensive literature review, laboratory-scale formulations and analysis at NRC, pilot-scale production at Misr Milk and Food Company in Domiati, and evaluation of formulation changes by research and industry personnel.

217

Product formulation changes included substitution of DSM for whole milk, adding lipase enzyme for flavor development, and adding butter milk poweder and milk fat. After assessing the acceptability of these formula changes, data were subjected to economic evaluation to determine the effect of formula changes on product cost. Although cheese produced by substitution of DSM for whole milk altered product quality, ethods were studied to correct any quality problems and the final product was fairly similar to that produced by whole milk.

Apparently a working relationship exists between NRC and personnel in the cheese industry in preparing and evaluating alternate formulations. The continued cooperation of companies such as Misr Milk and Food Company will ensure both technicsal input by industry and acceptqnce of research results.

Since DSM and butter oil are products of the dairy industry, world prices on these items eventually follow milk prices and these products may not remain as viable substitutes for milk in soft cheese manufacture. If other items such as vegetable proteins could be used that are native to Egypt, or could be produced domestically, cash flow for inputs could be reduced.

Of particular interest to the evaluation team was reference to studies being started on growing single cell proteins (SCP) from high-salt whey which is a by-product of soft cheese manufacture. SCP will then be dried and used as an ingredient in poultry feeds. About one million tons of high-salt whey is presently produced each year in Egypt, and the SCP produced has a ready market in poultry and livestock feeds.

Conclusions and Recommendations

The evaluation team concludes and recommends that:

- Considerable progress has been made on studying alternate formulas for making Domiati cheese and that savings could be affected by instituting these formula changes.
- Adequate attention has been given to economic impact of cheese formula changes but attention could be directed toward market acceptability of products with different formulas.
- Further work is warranted on this sub-project particularly in view of village level milk processing studies that could conceivably reduce milk available for Domiati cheese production.

- Market acceptability tests shold be conducted on new cheese formulations so that results are readily applicable in industry.
- Continued research on formulation for soft cheese is desirable, possibly looking toward the use of vegetable proteins that possess the needed nutritional and functional properties.

Supramine

Introduction

Supramine, a weaning food for infants, is produced by the El-Nil Pharmaceutical Company in Cairo. Ingredients used are chick peas (38 percent), hard wheat (28 percent), lentils (18 perent), skim milk (10 perent), sucrose (5 percent), and a mixture of calcium carbonate and vitamins A, E and B (1 percent).

This food was developed about 18 years ago for use in Algeria and was based on fairly cheap ingredients. It has been used in Egypt for about ten years but with limited success. Ingredients are now more expensive, acceptability is poor even though price is cheap, equipment to produce the product is fairly old and worn, and problems exist with shelf life, package quality and insect infestation. Research is aimed at improving formulation, processing, and packaging in order to obtain a cheaper and more acceptable product.

Sub-Project Review and Evaluation

Reports covered, and interviews with sub-project leaders, confirmed that different formulations have been made on a laboratory scale, and that a cheaper and more acceptable product will be produced in pilot scale quantities. Part of the acceptability and quality related problems have been solved by use of enzymes and pre-cooking some of the major ingredients such as chick peas and lentils, and them mixing the final product in dry form. One cause for alarm in adapting this process was that microbial analysis of ingredients showed some dried milk samples to be contaminated with Salmonella. Perhaps closer attention to overall packaging methodology and ingredient quality will need to be considered if dry mixing is adapted as a commercial practice.

Products sold in competition with Supramine are apparently well accepted even at much higher prices and with much less nutrition. Perhaps a study of these formulas would be useful in order to determine their overall acceptability.

The distribution and utilization of foods for weaning infants and growing children is of concern particularly with families in outlying villages. Maybe a marketing specialist would be of benefit in determining the best methods for distributing and utilizing Supramine.

The possibility was mentioned of producing products for infants and young children from locally grown items incorporated into foods acceptable to particular rural populations. If this idea is pursued further, an important goal of researchers is to ensure that adequate nutrition, safety, and quality are built into the products.

Nutritional data indicate the need for more effective nutritional programs from the time of weaning to at least six year of age. Considerable technical progress has been made to improve Supramine for this purpose. If these improvements can be incorporated into a weaning and child food that can be distributed and utilized successfully, this technical progress will be worthwhile and should serve as a base for improving overall nutritional levels. Certainly the interface for adopting new ideas and practices has been established in the two villages. Hopefully this can be expanded to other villages and used as a base for effective distribution of Supramine type products.

Conclusions and Recommendations

The evaluation team concludes that:

- There is a definite need for improvements in weaning and child foods in Egypt in order to obtain acceptability, quality and nutrition, and definite progress has been made in improving Supramine for this purpose.
- Research and development efforts should continue on infant and child foods, and more attention needs to be given to marketing and other aspects of product distribution systems and training methods to obtain product acceptance.
- Production on pilot scale levels be instituted with improved formulations, and data on acceptability collected from mothers purchasing the product.

- Data from other countries on similar products be reviewed, related to Egyptian conditions, and additional related sociological data gathered as needed.

Nutritional Monitoring

Introduction

Nutritional Monitoring is associated with the village demonstration activities of the More and Better Foods Project. It is a straight-forward attempt to obtain inexpensive, easy-to-administer measures of trends in nutritional status. It is the belief of the sub-project leaders that body weight (in relation to age) is a logically dependable index of about 80 percent of the information needed by the project regarding the status of individual health with respect to protein-energy nutrition. The reasoning is that the food and agriculture demonstration activities in the village are likely to have an impact on the nutritional status of its population. It is expected that the year-to-year trends in average body weight for different age groups will reflect this impact.

Sub-Project Summary

Birth weights of children born in the village are taken by the official health worker attending the delivery. An information sheet with the identification of the child, its weight and its date of birth (among other information) is prepared and kept on file at the village health unit. Sub-project personnel indicated that a duplicate of this information was prepared and retained at NRC. The "Gomez Classification" is used which separates weight/age ratios into categories of first, second and third degree malnutrition. If shifts occur over time in the distribution of new born children among these categories, sub-project leaders believe that this will be (at least to some significant degree) due to changes induced in the village by the sub-project.

Weight measures are also taken of children at other ages (predominantly in the pre-school years). These occur as opportunities permit (such as a visit to the village health center for other reasons) and records are maintained on each.

Anemia is another nutritional status index which is the subject of testing and development at the village level. A simple color comparison method is used in which a drop of blood drawn from a subject's finger is compared with a standardized color chart.

Additional measures such as breast feeding time, infant mortality rates, and height are also being explored for use as inexpensive and effective indicators of physical quality of life with a demonstrable connection to nutrition.

Conclusions and Points for Consideration

- The measures being used and tested are admittedly rough approximations. However, this is in keeping with the diffuse nature of the sub-project's intervention in the two villages. The sub-project is not targeted on any defined segment of the village population, nor is it calibrated for a specific nutritional impact.
- Village-level nutritional monitoring is still in the development stages and should be further refined. Some of the problems appear to include winning the support and commitment of village level staff, and maintaining the continuity and intensity of personnel application.
- Possibly at a later stage, when and if the sub-projects of the More and Better Foods Project become more finely tuned to the needs of specific segments within the populations of the two villages, it might become important to refine the sensitivity of measures of nutritional status to these differences.

Village Food Processing

Introduction

The objective of this sub-project is to extend and improve preservation, processing, packaging and marketing methodology for agricultural products at the village level.

Review and Evaluation

Products mentioned for preservation studies include vegetables such as turnips, carrots, peppers, tomatoes, and cucumbers, apricots, citrus, fish and peanuts. Solar drying and pickling were mentioned as preservation methods as well as expelling oil from peanuts to produce a cocoa butter

substitute. The expeller cake would be used for feed purposes. To our knowledge, only pickling has been done thus far but with success at the village level.

Two associated studies were mentioned under this topic, one on producing butter and low fat cheese (qareesh) from locally produced milk, and the other on the culture of fish in a lake formed from canals. The cheese and butter study was underway, and plans were being made for the fish production study in the old village.

This sub-project has potential for helping villages to utilize foods more efficiently, waste less food, extend the food supply over more months of the year, and to generate extra income. However, close attention must be given to the safety of preservation methods, and full consideration must be given to processes and products that are familiar and acceptable to villagers. In the case of peanuts, establishing an orderly marketing system to existing industries expelling and extracting oil might be preferable to small-scale processing at the village level.

Conclusions and Recommendations

The evaluation team feels that:

- This sub-project is fairly broad and too general in nature, but progress is being made in specific areas such as pickling and cheese making. Considerable feedback from villagers on product ideas would be desirable.
- Oportunity exists for local processing of agricultural products, but payback, improved nutrition, and better utilization of local products must be realized.
- Adequate attention be given to safety and acceptability of products and processes, and more consideration be given to centralized processing facilities at the village level where villagers could process their own products under the direction of trained technicians.

Livestock and Poultry

Introduction

The purpose of this sub-project is to demonstrate the production of meat, poultry, milk and eggs; to conduct studies where necessary to provide

solutions to relevant problems; and most importantly, to help apply existing knowledge in poultry and livestock production at the village level in order to increase productivity.

Sub-Project Review and Evaluation

Recognition of the problems facing expanded numbers and/or productivity of livestock seems to be apparent among all personnel contributing to this sub-project. Sub-project leaders listed the following problems that exist at the village level: drain on feedstuffs to sustain livestock, unevenness of feed supply and imbalance of nutrition during each year, low productivity of meat and milk by native breeds, use of animals for draught purposes, and problems with disease, parasites and reproduction. Also, the lack of a solid data base on actual production of meat and milk, the economy of this production, and composition of products being produced are recognized as problems and are being addressed. These data are useful in this sub-project as well as in contributing to a nutritional data base for villages.

Research reported on prevalent diseases and parasites affecting livestock seems to be complete and thorough. The information should be used as quickly as possible to correct problems and increase productivity. Progress is being made on detection, condemnation and destruction of animals affected with tuberculosis and brucellosis. However, in the treatment of controllable diseases, storage of vaccines requiring refrigeration is a problem in villages as interruption of electrical service is frequent and unpredictable.

A number of ideas for improvement of animal nutrition were discussed, part of which are already being implemented. Examples are extending protein available during the winter from berseem clover by interplanting winter annuals such as ryegrass and elephant grass, and weaning and fattening of young calves on a cooperative basis. Also, the use of artificial insemination is being practiced and superior meat and milk breeds are being introduced in cooperation with an existing breed evaluation program of the Ministry of Agriculture and Cairo University.

Programs to improve and expand production of poultry meat and eggs are underway. Villagers have been selected for demonstration programs in

chicken broiler growing with the program supplying baby chicks, feed, equipment, medication and technical advice. Cost will generally be borne by the grower and marketing will be locally in the villages. Expertise is available to ensure success of the first stages of this program but expansion will require coordination through an extension service, cooperative or commercial company

An overriding problem common to livestock and poultry production is the availability to farmers of better balanced feeds, particularly concentrates for use with locally grown feed ingredients, and the maintenance of an analysis and feed formulation program to allow preparation of balanced diets throughout the year. Consideration should be given to provide grinding, chopping and mixing equipment to both villages for the purpose of providing feeds or concentrates for demonstration projects in livestock and poultry. If provided by outside funds, repayment should be required, as is done with the poultry program.

Conclusions and Recommendations

The evaluation team feels that:

- This sub-project has the potential of improving livestock, poultry and associated cropping practices in the demonstration villages, and should be continued.
- Considerable "extension-type" effort and service work by vetenarians, researchers and technicians is required to improve livestock and poultry productivity.
- Attention be directed toward specifying and purchasing equipment for village use to grind, chop and mix locally produced feed ingredients.
- Special attention be given to effective storage and use of vaccine and medicines for disease and parasite control of livestock and poultry.
- Maximum use be made of existing genetic stock at the village level.

Plant Production, Protection and Soil Analysis

Introduction

The purpose of this sub-project is the demonstration in the two villages of new technology aimed at increasing food production, and evaluating

its success by the degree of farmer acceptance, increased farm income, increased food supply, and improved human and animal nutrition. These objectives would be reached by new crop variety introduction, new cropping practices, improved control of pests and improved soil fertility management.

Sub-Project Summary

The adoption of a system of growing tomatoes on wires gave a yield increase up to 15 tons per acre in the villages, with a low cost investment. Nearby markets are said to be able to absorb up to ten times the present production if it were available, especially if a redder tomato variety was used.

A start has been made in the introduction of improved crop varieties. Examples include a new export onion variety, Giza 20, and two new varieties of wheat (Giza 155 and Giza 157) which show promise of superior yields. We believe there is need to introduce or develop still more improved crops.

A new practice introduced was the intercropping of onions with soybeans, thus saving land preparation costs. Other new cropping practices initiated in the villages include: 1) innoculation of clover seed with nitrogen-fixing bacteria; 2) planting a mixture of berseem clover and ryegrass thus giving an improved balance of protein and carbohydrates for livestock feeding; 3) increasing the planting of potatoes, a crop which gives the highest yields of food calories per acre among all agricultural crops; and 4) foliar feeding of wheat. The team noted the acceptance by the villagers of these new and improved methods and techniques. As inducements to the farmers, NRC supplied the necessary seed, plants, wire and chemicals with the understanding that repayment would be made from increased profits. In addition, the village council retains a small amount of the profits to be used for adding more farmers to the program.

Progress has been made in the identification and characterization of an unusually large number of plant pests. Personnel in the sub-project are now planning to add new methods of practical pest and disease control, especially by non-chemical means.

It was found that Oronbanche, a plant parasitic on broad beans, did not grow near fennugreek plants. Using this observation, the project has introduced

the practice of mixed plantings of broad beans and fennugreek. When this is done, Oronbanche is controlled and both plants mature normal crops. Research is planned to isolate, characterize, and eventually synthesize the root exudate which inhibits germination of Oronbanche seed as a means of control. Evidence was seen of losses of crops to plant pathogens.

Soil samples have been taken, and analyzed. The initial findings should now be used to develop useful fertilizer recommendations in the village. Consideration has already been given to plant tissue analysis which provides even more specific information on plant nutrient needs. Some of the soils in the village are becoming water logged because of improper water management.

Honey production and silk production are being introduced as auxiliary programs to augment income, making use of more or less spare time and otherwise unused land.

Conclusions

The evaluation team concludes and suggests that:

- This sub-project appears to be making a start in providing a valuable link in agricultural extension. Therefore, the team believes the project should continue along these same lines, but should increase the number of farmers involved.
- That an evaluation be made for expanded research opportunities to develop research programs in non-chemical methods of pest control, especially in control of soil-borne pests. Crop improvement and crop nutrition efforts shold be expanded, and that steps be taken to transfer presently-known technology to correct improper irrigation practices now being used.
- Soil test results and other findings should be reported to the villagers as soon as practicable.

NEW CROPS FOR ARID AND SEMI-ARID LANDS

Introduction

Members of the evaluation team reviewed the NAS files on this project and discussed the project with Dr. El-Beltagy the principal investigator. No site visit was made because the site has not been developed.

Project Summary

Although this project was given favorable consideration by the JCC in November 1978, it has been slow in developing since that time. The delay came as a result of a disagreement on the nature and scope of the project. We understand the problem has now been resolved. However, as a result of this problem progress was slowed. A final project plan was approved in January 1980.

Soil and water surveys have been done on the site for the project at Kom Oshein in Fayoum Governorate. Site preparation has been delayed because of the lack of field equipment. Another constraint on progress in the project has been the lack of seed in sufficient quantity to start initial nursery plantings.

Some progress has been made in growing about 400 seedlings of jojoba at Al-Azhar University (seed sent by a cooperator in the U.S.) and a start was made on determining cultural needs of lima beans and winged bean at Ain Shams University. The principal investigator on a trip to the U.S. has developed the possibility of future cooperation with the Firestone Rubber Company.

Observations

- The present plan has been carefully worked out and the project has made a start in its implementation. However, given current progress, it is unlikely the planned objectives can be reached by 1983. The team believes the mid-range (5-years) and long range (10-years) objectives of the project are valid, but special consideration must be given to the means by which this project could be continued beyond Phase II.
- Steps should be taken to speed up procurement of the critical equipment needed to start work on site preparation and crop establishment on the site. Specifically, arrangements should be made to provide a system of seed procurement which would ensure delivery at the earliest possible time.
- An economic feasibility study should be made of this propject to estimate its potential for bringing desert land into profitable agricultural use and in developing new industrial enterprises.

ATTACHMENT A

Definitions and Acronyms

Program - The totality of activities under Applied Science and Technology Research - AID Project No. 263-0016.

Project - An infrastructure, research or demonstration effort approved and funded under the program.

Sub-Project - A separately managed activity within a project.

AID	Agency for International Development
AID/W	Agency for International Development - Washington
ASRT	Academy of Scientific Research and Technology
DRI	Denver Research Institute
DSM	Dried Skim Milk
JCC	Joint Consulative Committee
NAS	National Academy of Sciences
NIDOC	National Information Documentation Center
NSF	National Science Foundation
NRC	National Research Center
PASA	Participating Agency Service Agreement
R&D	Research and Development
R&M	Repair and Maintenance
R&MC	Repair and Maintenance Center
SIC	Scientific Information Center
USAID	AID Field Mission

231X

ATTACHMENT B

EVALUATION TEAM

August E. Kehr

Received doctorate at Cornell University of Genetics, plant pathology and cytology. Formerly in charge of a national program in crops research in the U.S. Department of Agriculture. Participated in 1975 U.S.D.A. Ministry of Agriculture study of Constraints to Agriculture Production in Egypt. Presently retired.

Nicolaas Luykx

Ph.D. agricultural economics (Cornell 1962). Served since July 1978 as the senior specialist for agriculture, food and rural development in the planning of the Institute for Scientific and Technological Cooperation (ISTC). Served previously in AID's Washington-based Bureau for Development Support as Deputy Director for Title XII and University Coordination, and as Director of the Office of Development Administration. Was previously (1970-76) founding Director of the Food Institute at the East-West Center in Hawaii, and (1966-68) Senior Advisor to the Academy for Rural Development in Comilla (Bangladesh). Has served on the faculties at the University of Hawaii (1970-76), Michigan State University (1966-70) and Cornell (1961-66).

James E. Marion

Ph.D. in Nutrition and Biochemistry, Director of Research, Gold Kist Inc., Atlanta, Georgia. Formerly Head of Food Sience Department, Georgia Agricultural Experiment Station at Griffin. Background in research administration and research studies related to the food technology aspects of agricultural comodities produced in the southeast section of the United States.

Clinton A. Stone

M.S. in Engineering Physics, Senior Scientist, International Programs Division, Georgia Institute of Technology. Senior specialist to the Planning Office, Institute for Scientific and Technological Cooperation (1978-79), AID Office of Science and Technology (1974-77) and Director, Physics Research, IIT Research Institute (1974-).

ATTACHMENT C

Phase II Budgeting

The evaluation team was not able to make a detailed review of each line item in the maintenance and optimum phase II budgets considered by JCC-5. There are several general observations which can be made, however.

This evaluation report recommends that the demonstration projects devote more effort to data acquisition, sociological studies, economics and planning for new demonstrations as well as for the transition to wider scale implementation. If implemented, the recommendation would require added project funding. We estimate that $0.5 million would provide the necessary supplies, services and technical assistance.

Neither budget allows for the expansion of successful ongoing projects. This perhaps could be achieved by adjustments between line items which reflect the progress and potential for each project. Project evaluations over the coming nine to 18 months could provide the basis for such adjustments. Another alternative is the setting of more modest goals for the Scientific and Technical Information Project. Parenthetically, the team was not able to rationalize the proposed Scientific and Technical Information expenditures for consultants/educators given the suggested training investment. Further discussions on this point seem advisable.

The suggested $4 million increase in equipment expenditures in an optimum budget seems out of proportion. New projects, including Standards and Measurements, total only $3.3 million which includes some provisions for equipment. The nature of the new projects will, to some degree, determine the necessary equipment. However, one would hope that Phase II maintenance budget for instrumentation could support more new project activity than envisioned.

In summary, the maintenance budget seems barely adequate with the proviso that line item adjustments are possible. An additional $0.5 million should be made available for sociological, economic and planning inputs to demonstration projects either through item adjustments or added funding. The distribution of funds in the optimum budget merits further discussion and justification.

233

9

THE NATIONAL STI SYSTEM OF EGYPT

Report of an Evaluation Team

F. Karl Willenbrock
Chairman

March 31, 1982

NSF - 82-SP-0648
USAID PASA NF/EGY 0016-7-77

231

CONTENT OF REPORT

		Page
EXECUTIVE SUMMARY		ii
PREFACE		iv
I.	INTRODUCTION	1
	REFERENCES	4
II.	INFORMATION RESOURCES & SERVICES	5
III.	TECHNOLOGICAL ASPECTS	10
IV.	MANPOWER DEVELOPMENT	15
V.	TRAINING PROGRAM	19
VI.	MANAGEMENT & GOVERNANCE	21
VII.	NATIONAL INFORMATION POLICY	25
VIII.	GENERAL CONCLUSIONS	28

APPENDICES

A. List of Personnel involved with the Evaluation Effort A-1

B. Detailed Breakdown of Criteria from Technological Standpoint B-1

C. Summary of International Experience C-1
A paper by A. Neelameghan

EXECUTIVE SUMMARY

This Report gives the results of the study by an Evaluation Team of four Egyptian and three international experts of the proposed design of an information system to provide information services of importance in science, technology and national development (STI). The plan has been developed over a period of two years under the technical direction of Dr. V. Slamecka of the Georgia Institute of Technology with U.S. Agency for International Development funding under a contract administered by the U.S. National Science Foundation and with the guidance of professional personnel from the Egyptian Academy of Scientific Research and Technology and related Egyptian institutions.

The proposed national STI System for Egypt is primarily described in four reports (listed in reference 2) which were issued during the past several months. These reports cover a national policy for STI, the design of the proposed system, an implementation plan, and a manpower development plan. These reports were preceded by several documents reporting the results of extensive, nationwide surveys of the information resources of Egypt. The Evaluation Team examined the reports, was briefed by the contractor, deliberated during an intensive six-day meeting in Cairo, and produced this unanimous report.

The report is structured into a series of general and specific findings and recommendations. The major general findings are that:

+ Egypt could increase its rate of national development with the proposed national STI System.

+ The proposed design, implementation, and manpower development plans are sound and are compatible with the Egyptian environment.

The major specific findings are that the proposed information resources and services systems should be an open-ended network of six nodes devoted to specific technical areas, that an active clientele development program should be initiated, and that a document delivery service be offered as proposed in the four reports. Technologically, the proposed system architecture, the plan to maintain hardware and software compatability at all the nodes, and the proposed tie to international packet-switching networks are appropriate. The proposed crash training program for professional and paraprofessional information specialists is the most cost-effective approach in the manpower development. In the management and governance area, there is a need for a strong central project directorate which carries out a number of technological tasks such as monitoring of activity at the nodes, technical support, and the development of hardware and software standards, and other functions associated with a national focal point for STI.

The major general recommendations are that the results of the initial phase of the project should be accepted by the Egyptian and USAID authorities and that the detailed design and implementation phase scheduled to take three years should start as soon as possible. Also systematic effort should be made to identify the most

important user communities and have their representatives participate actively in the detailed design and implementation phases. In addition a responsive project leadership and an effective decision-making mechanism should be developed.

The major specific recommendations made by the Team include greater emphasis being given to the use of the Arabic language in software development and that greater use be made of the experiences of other developing countries in the STI area. In addition to the crash training program which should be an integral part of the responsibility of the project directorate, efforts should be made to strengthen the information science-related academic progress in Egyptian universities. In most cases training should be accomplished in Egypt to reduce costs. A national policy statement with respect to STI should be formulated and an effort be made to include this statement in the Egyptian National Plan for Socioeconomic Development.

The Evaluation Team also reviewed a separate but simultaneous training program for Egyptian librarians and information specialists carried out by the Catholic University of America in Washington, D.C. which trained fifteen Egyptians who are part of the available human resources in Egypt.

The estimated cost of the implementation phase, if funded by the Egyptian government and the USAID according to present plans appears to be adequate to launch an effective national STI System for Egypt in three years.

PREFACE

It is a pleasure to acknowledge on behalf of the Evaluation Team (members listed in Appendix A) the many courtesies and substantial assistance provided the team during the six-day working period from March 15 to 21, 1982 in Cairo.

Dr. I. Badran, President of Egyptian Academy of Scientific Research and Technology, met with the external members of the team and graciously hosted a luncheon for the entire group. Unfortunately, his busy schedule precluded his taking a more active role in the Team's work.

Dr. Eng. M. Hallouda provided the Team excellent logistical support and participated in the Team meetings on several occasions. He provided active guidance to the Team and made several crucial contributions to the team's developing understanding of the Egyptian environment. His hospitality and innumerable courtesies gave the Team a feeling that they were valued as individuals as well as a group.

Dr. Mohamad Madkour served in a dual role. He was a gracious host for a Team luncheon and also participated as an active Team member. Through his role as Egyptian project manager during the first phase (Phase I) of the project, he had a detailed background of the project's history and development which he shared with the group.

The Team is grateful also to Dr. Vladimir Slamecka, the principal initiator of the STI System Design and Implementation Plan and the main author of the documents which the Team studied and examined. He briefed the Team on the project, worked with the Team's Task Forces at their request, and responded to innumerable questions. His availability whenever needed during the first five days of the working period facilitated the Team's understanding of the project's detailed structure.

The Team also benefited from a briefing by Dr. Bahaa El-Hadidy, the principal investigator of a training program undertaken at Catholic University in Washington, D.C. simultaneously with the STI System project. Dr. Hadidy participated in the roundtable meeting on the 4th day of the working period when the Team presented its preliminary results to the Executive Committee for the Project whose members are also listed in Appendix A.

The role and assistance of the U.S. National Science Foundation's (NSF) program manager, Mr. Eugene Pronko, is also gratefully acknowledged. He provided the Team's international members with valuable information and much travel assistance which greatly facilitated their work. The Evaluation Team operated under NSF project NSF - 82 - SP - 0648.

Also of great help to the Evaluation Team, particularly the international members, were Ms. Janice Weber and Mr. James Riley of U.S. Agency for International Development (AID) Mission in Cairo. Their efficient administrative help saved the Team much time and effort.

238X

As chairman I should like to thank the individual members of the Team for their willingness to put in long hours of effort during six consecutive working days. Not only did they work hard, but they worked together so effectively that this final report has their unanimous concurrence. In view of the wide diversity of backgrounds of the team members, it is a tribute to their intellectual capabilities and spirit of cooperation that such a major undertaking was completed in such a short time.

F. Karl Willenbrock, Chairman
Evaluation Team

I. INTRODUCTION

In November 1976, a proposal for an Egyptian National Scientific and Technical Information (STI) System[1] was put forth. This proposal was followed by a series of agreements between the Government of Egypt and the United States Agency for International Development (AID) which resulted in the development of a plan for a National STI System. This plan is documented in a series of reports[2] by a United States contractor, the Georgia Institute of Technology, with Dr. Vladimir Slamecka as the principal author.

An Evaluation Team whose members are listed in Appendix A was organized in early 1982 to evaluate this proposed STI System. It was composed of Egyptian and international STI experts who met in Cairo from March 15-21, 1982. This report is the result of the Team's work and includes its findings and recommendations. It is directed to both the Egyptian authorities responsible for the project as well as the USAID which funded a major part of the work done on this project.

In addition to the four Egyptian members and three international members of the Team, there were four Egyptian observers listed in Appendix A who served as members of the four task forces into which the Team was divided. These task forces, whose titles and members are also given in Appendix A, examined specific components of the plan and wrote reports which constitute a major part of the Evaluation Team's report.

The Team started its work by generating a series of general criteria to serve as a common basis for the task forces' examination of the proposed System. These criteria were:

+ compatibility with the Egyptian environment
+ completeness
+ continuity beyond the 3-year implementation stage
+ utilization of international experience and resources
+ system adaptability and robustness
+ operational feasibility

These criteria were applied in a variety of ways by the task forces. The criterion, compatability with the Egyptian environment, is meant to designate to what extent the proposed system meets well the present circumstances, which prevail in Egypt both physical and organizational and to likely future developments. The criterion, system adaptability and robustness, refers to how the system can adapt to changes and in particular how fragile the system is. The term, robustness, is used to designate whether the system is overly dependent on a particular element which if it fails could result in making the entire system inoperable. There was a daily interaction between the task forces and the entire Team so that each Team member had an opportunity to participate in the work of all the task forces. However, the task force members who were the principal authors of the sections are listed in each section.

The report uses a findings and recommendations format. The findings are essentially the conclusions reached by the Evaluation Team and the recommendations are the actions which the Team proposes on the basis of its findings. An additional breakdown used by several task forces is to subdivide their findings into 3 categories:

A. Indicating the Team concurs with the contractor's proposal.

B. Indicating that the Team does not concur with the contractor's proposal and has a specific modification to recommend.

C. Indicating that the Team does not concur with the contractor's proposal and recommends a joint effort to resolve the differences in the future.

Not all the task forces used exactly the same format because of the different content of the components under examination and the different approaches to their tasks taken by different task forces.

The Team operated as a single group to develop its position on national STI policies and also to determine the general findings and recommendations which are summarized in the Conclusions section.

An additional ad hoc task force examined the Training Program undertaken by the Catholic University of America and summarized the reports[3] by Dr. Bahaa El-Hadidy. This program which was separate from the STI System Design effort was carried out simultaneously with USAID support.

The Team also hosted a roundtable on the fourth working day to present its preliminary results to the Project Executive Committee whose members are listed in Appendix A. The Team received recommendations and suggestions from this Committee.

The final (sixth) working day was devoted to revising the task force reports and all the sections and their appendices, except for the introduction and preface which were written by the Team Chairman after the completion of the working period. Each Team member approved the content of all the other sections of the report and the associated appendices. It is, therefore, appropriate to state that this report represents the unanimous position of the Team members.

In addition to the description of the history of the project and to the composition and procedure of the Evaluation Team, it is desirable to address one substantive issue in this introduction. The Team devoted considerable time to the question of who would be the potential users of the STI System. It was quickly agreed that if STI were taken in its literal sense of scientific and technical information, it could be inferred that only scientists and engineers would be users. This clientele is certainly too narrow a group for the System's potential services. Dr. Slamecka defined the System's potential clientele to be all problem - solvers active in national socio-economic development. While this term is much broader, it also allows room for ambiguity.

Thus, an effort to describe the System's users is worth undertaking.

The users of the proposed National STI System can be categorized into three major groups:

1. decision makers, policy makers, planners and managers and staff support personnel.

2. research and development personnel, and the academic community.

3. people at the "grass roots" levels, such as professionals and para-professionals in business, education, manufacturing, agriculture, public service, etc.

Traditionally, an STI System addressed itself largely to group 2. But increasingly it is found to be essential to provide information support to the activities of groups 1 and 3. However, the fundamental orientation is to be directed towards socio-economic development.

Finally, it is worthwhile to indicate the extent of the information support that the System would provide its users. In its Implementation plan, scheduled to occur over a 3-year period, the System would initially supply information in the form of numerical data, bibliographic data, documents, and provide referral services, etc. Information analysis services would be developed in a subsequent stage of development. However, it could supply the individual who performs information analysis services much of the information he needs; however, it would not supply him with simulation models.

While it is too early to predict all the services that the System might provide as it gains maturity, it should be kept in mind that in its initial phases, it is directed toward the more traditional information services through the application of state-of-the-art methodologies and technologies.

The next five sections of this report are devoted to the finding and recommendations of the task forces. The final two sections on national information policy and general conclusions were written by all Team members acting as an enlarged task force.

REFERENCES

1. Badran, I.G. and Slamecka, V.
Proposal for the Development of National (Vernacular) Information Services in Egypt: Definiton and Design (Phase I), System Implementation (Phase II), November, 1976

2. Slamecka, V.
The Egyptian National System for Scientific and Technical Information: Design Study, November, 1981 - referred to as the Design study in this report.

The National STI System of Egypt: Implementation, November 1981 - referred to as the Implementation study in this report.

Manpower Development for Egyptian STI Services, January 1982 - referred to as the Manpower Development study in this report.

Adams, S., Madkour, M.A.K., Slamecka, V.
A Proposed National Information Policy of Egypt, September 1981 - referred to as the Policy study in this report.

All these reports published by the School of Information and Library Science, Georgia Institute of Technology, Atlanta, Georgia, U.S.A. and the National Information and Documentation Centre, Academy of Scientific Research and Technology, Cairo, Egypt.

3. El-Hadidy, Bahaa
Training of Egyptian Information Specialists: A Multifaceted Approach, January, 1982

School of Library and Information Science, The Catholic University of America, Washington, D.C.

II. INFORMATION RESOURCES AND SERVICES

Task Force Members - Dr. Jacques Michael, Chairman
Ms. Nagah Habit
Mr. Osama El-Sayed

INTRODUCTION

The task force evaluated the design study report having in mind that the objective of the STI System is to serve the information needs of many users. The evaluation work was segmented in two parts: information resources and information services.

The task force considered the general concept proposed by the contractor for maintaining on Egyptian territory a non-trivial portion of the world's high quality scientific and technical literature. It also considered the general concept an proposed structure of an open-ended network of information services. Included in the activities of the System are clientele development, data development, generation of different types of data bases, access to domestic and foreign data bases, document delivery, and publications. For each of those components, the generic criteria were used as a basis for the analytical evaluation.

INFORMATION RESOURCES

1. General Comments

A. Findings

The task force fully endorses the strategies for the national development of STI resources in Egypt as outlined by the contractor including:

+ a common resource-sharing methodology
+ the systematic supplementation of national STI holdings
+ the central acquisition and processing of purchased materials
+ the maintenance of a union list of STI holdings.

B. Recommendations

1. During the implementation phase, it will be necessary to determine the number and the locations of document repositories having specialized collections. For this purpose a new survey should be made of all the major Egyptian STI libraries, especially those which could be document repositories in the STI System. In particular, surveys and comparisons with the core lists should be made at the American University in Cairo, Military Technical College, and U.S. Navy Medical Research Unit 3. In these surveys, the 1000 new titles of periodicals which have been already delivered to the Egyptian university libraries by USAID should be analyzed. The possibility of obtaining 5-year back-file collections on microfilm should be considered.

2. Consideration should be given to include the social sciences in establishing the core journals list.

INFORMATION SERVICES

1. General Comments

A. Findings

The creation of a geographically distributed open-ended network of information services is an excellent concept and is fully endorsed by the task force. Such a network has the following desirable characteristics:

+ a flexibility which permits progressive implementation
+ an adaptability to the Egyptian environment
+ technical feasibility
+ low risk of service discontinuity since most components fail soft
+ fully adaptable to international cooperation because a similar sectoral approach is followed in most countries and by many international organizations.

The functions of the information services which have appropriately been taken into account are:

+ the systematic development of user clientele
+ the compilation of data bases of indigenous information
+ the provision for foreign and domestic sources of data information.

The special attention given in the Design study to the marketing activities of the information services is noteworthy and is endorsed by the task force.

The progressive operation of sectoral information services will serve the socioeconomic development of Egypt and reinforce its scientific, technical, and cultural leadership in the Arab world.

B. Recommendations

Although the implementation of the information analysis function is proposed for a later phase due to the time needed to train manpower, this function should be initiated as soon as possible via existing extension programs and extension officers.

Information services should be strongly committed to serve the information needs of professional people engaged in science, technology, and development activities, including decision makers and practioners and not only researchers. For this reason information services should be managed by individuals who have both adequate professional experience in specialized fields and detailed knowledge of information operations.

2. Clientele Development

A. Findings

It is essential in an environment which is not information-oriented and does not make adequate use of information, to have a strong clientele development program. The success of the whole national STI System depends on the energy put into the marketing of services. The role of the project director in influencing educational programs to make students more information-minded is crucial. Students who are the future engineers, scientists, and professionals should learn that the first thing to do when facing a problem is to determine if a solution already exists and is available.

B. Recommendations

The marketing effort should cover the evaluation of local and sectoral needs, the study of markets, the promotion of products and services, through advertising and mailings. Appropriate information products should be designed iteractively by using evaluation and feedback techniques.

Present user education programs should be surveyed and evaluated. For example, the user training program for managers in Ain-Shams University should be used and, if necessary, it should be assisted to gain greater strength.

Special training sessions for students on new information technology should be encouraged and if possible integrated in existing curricula. Information resources should be made available to the faculty members involved including special incentives. Continuing education programs regardless of topics under consideration should be encouraged to pay some attention to available information services.

3. Bibliographic and Referral Data Bases

A. Findings

The compiling of electronic data bases of indigenous information is most desirable. The estimate that the number of Egyptian documents to be put into bibliographic data bases to be about 3000 per year is reasonable for the present. The proposed access to data bases is fully satisfactory and the proposal of decentralized data-base searching is endorsed.

B. Recommendations

Two problems are raised:

1) For building an indigenous bibliographic data base of 3000 documents per year, it is not economical to have it built on a decentralized basis. The burden of coordinating such activities will be heavy; as many people will be used for coordination as for doing the work. A centralized input and processing activity is recommended.

2) Bibliographic data bases are raw information materials; they cannot be used directly by many users. Usually only researchers are able to use them without repackaging. Decision makers and practitioners are much more interested in obtaining practical information which is contained in referral data bases such as product information, standards, and ways of identifying exports. Therefore, the task force strongly recommends that:

   a) The data base activity in the information services should be focused on referral information as mentioned in Table 13 of the Design study. Developing referral-type information services should help the marketing of information product and services by their direct appeal to end users and in this way contribute strongly to the success of the overall program.

   b) One node in the STI System should be given major responsibility for building the Egyptian bibliographic data base.

   c) The Implementation study should define in more detail the content of referral data bases and determine:

      + the type of information to be collected
      + the volume of such information
      + the cost involved .

4. Document Delivery

A. Findings

The Design study proposals are very appropriate.

B. Recommendations

Three recommendations are made:

+ a strong coordination with existing document repositories is necessary,
+ a standardized and simple document order procedure based on coupons use (in order to avoid heavy accounting work) is needed,
+ the mail delay should be reduced by making the connection between copy production facilities and users as direct as possible.

5. Publications

A. Findings

The task force concurs with the Design study's recognition of the need for publishing printed products as data base outputs.

B. Recommendations

Publishing only abstracts or STI profiles does not fully serve users. It is recommended that regular publications be made of:

+ Directories from referral data bases as specified in the Design study
+ State-of-the-art summaries in different fields of science and technology
+ Newsletters for managers and decision-makers to provide them with technological trends and news of innovations and newly available technology.

III. TECHNOLOGICAL ASPECTS

Task Force Members - Dr. Nabil Aly, Chairman
Dr. Aly Fahmy

The technological aspects of the STI System project were broken down into the following main evaluation areas:

+ Overall system architecture
+ Hardware and administrative software
+ User interface with databases
+ Data Communication
+ Arabization
+ Applications development considerations

The generic evaluation criteria were broken down into specific set of design-related issues. Appendix B includes a detailed list of these issues as an indication of how the task force viewed the overall evaluation criteria in its own specific perspective.

The Design and Implementation studies were cross-examined against the exploded list of evaluation criteria. The outcome of this exercise is presented below for each of the evaluation aspects using A,B,C, categories:

A - Areas where the task force concurs with the Design study and endorses the design decisions

B - Areas in which the task force recommends a specific modification

C - Issues which need joint future study to resolve.

1. Overall System Architecture

A. Findings: The task force endorses:

+ the overall structure with its minimum reliance on intercomputer links,
+ the analysis of how the STI System will interface with an international packet switching network, and the resource sharing principle to avoid duplication.
+ the ring configuration of the network in light of the experience of STI networks in other countries.
+ the six nodes proposed since these represent a reasonable sectoral coverage and provide an achievable project scope in the implementation phase.
+ the major design criterion that the national STI system will continue to evolve over a long period. It is important to avoid system rigidities since there has been a high rate of failure of national information projects in less developed countries due to discontinuities, political decisions and/or organizational changes.

B. Recommendations

1.1 - Beside the sectoral coverage of the nodes, technical consideration should be given to ensure wide geographical access to the sectoral nodes.

1.2 - Extension of the resource sharing concept beyond the information resources to include also central technical support, research and development activities and system-wide network functions.

1.3 - The design should include a clearer concept of the functional hierarchy of the STI System as a whole and the relation of central staff to the nodes.

1.4 - The STI System project directorate should have its own facilities or gain access to computerized facilities to support its coordinating, monitoring and common development functions, such as

+ monitoring of overall system performance
+ development of common applications
+ assessment of the utilization of service
+ interfacing with local and foreign networks
+ research and development on standards.

2. Hardware and Administrative Software:

A. Findings; The task force endorses:

+ the gross sizing estimation technique adopted
+ the guidelines developed to specify the hardware
+ the recommendations for a single operating system.

B. Recommendations

2.1 - More guidelines are needed to help in selecting the administrative software to include word-processing capabilities, editing and on-line data entry functions, automatic monitoring features, and data communication drivers.

2.2 - While "problem solvers" are the major clientele of the STI System, the search volume upon which design estimates were based included only scientific and research usage. In view of the unpredictability of the workload and storage requirements, more attention should be directed towards how the STI System can cope with such uncertainties.

2.3 - Maintenance responsibility of hardware and basic software should be assigned to the supplier, at least in the first 3 years of the equipment life. The 2% figure for maintenance cost should be revised to meet the local market costs.

2.4 - The statement in the Design study (page 57) regarding asynchronous ports should be clarified or corrected.

250

2.5 - The Design study should spell out clearly and document the pitfalls to be anticipated in the subsequent detailed design and implementation phases.

2.6 - The distributed database (DDB) approach adopted in the system design was investigated thoroughly. It is understood that the DDB is restricted to that of sectoral specialization of the nodes rather than the integration of the dispersed data bases as a single logical system. Such a clarification should be formally stated in the detailed design specifications to avoid any future misinterpretations.

C. Joint Future Efforts

+ Since the STI System is to serve problem-solvers, the reliance on locally produced information will be significant. The design should explore the technicalities involved in providing interfacing of existing data bases as well as those that are currently under development. Difficult problems are encountered when diverse hardware and software are involved.

+ The design should emphasize the criteria governing the choice of a node location especially in relation to proximity to users and physical repositories as well as the possibility of connection to the network.

+ A set of guidelines to direct the procurement process has to be developed such as those related to vendor selection, second sourcing, and compatability matters.

3. User Interfaces with Databases

A. Findings; The task force endorses:

+ the relational database concept.
+ the use of unified query language.

B. Recommendations

3.1 - The use of relational databases should be coupled with the software that suits local conditions. The importance of a single updating entry to all relevant files should be stressed.

3.2 - The aggregated database at the central project directorate has to be outlined to interrelations between the specific data sets included in Appendix D-1 of the Design study. Incorporation of a log file on problems faced by users seems desirable.

4. Data Communication

A. Findings; The task force endorses the decision to interface with an international packet switching network.

B. Recommendations

4.1 - Technical specifications of the required local network as well as the link to the packet switching network needed for the STI System have

to be defined such that proper requests can be made to the Egyptian Telecommunication Agency. A primary objective of this coordination should be the establishment in Egypt of a node of the international telecommunication networks and record carriers. The Agency should be invited to participate in the detailed design phase, and the time-consuming task of coordinating should be taken into consideration in the implementation plan. Recommendation should be made in the detailed design regarding TELETEXT and the linkage of terminals to the nodes.

4.2 - Though the need for interfacing the nodes with each other and with foreign databases was stressed in the Policy and Design studies, the interfacing needs to be properly phased in the implementation plan.

5. Arabization

A. Findings; The task force endorses the short-term solution for the Arabization requirements which is based on the mechanical English to Arabic replacement of query commands and dictionaries.

C. Joint Future Efforts

The design should explore the efforts done in Egypt and other countries in Arabic informatics such as the Industrial Development Center of Arab States (IDCAS), the Central Agency for Public Mobilization and Statistics (CAPMAS), and other groups to avoid duplication and wrong decisons such as using last names for Egyptian authors. However, to guarantee a long-term evolution, a genuine Arabization development program should be planned.

The international experience of other countries such as India, Japan, and Mexico on how they handle native languages in STI systems should be assessed and analyzed. Also translation activities need more emphasis. Organizational and manning requirements should be specified. Although automatic/semi-automatic translation of English to Arabic is available, its use is not anticipated in the early stages of the implementation phase. Further information on this matter should be developed.

6. Applications Development Considerations

A. Findings; The task force endorses the adoption of ready-made software packages to make the implementation phase as smooth and free of major trouble as possible.

B. Recommendations

6.1 - The detailed design should define the types of applications in adequate detail to phase in the recruitment of professional and paraprofessional technical personnel and their training in the implementation stage.

6.2 - A set of guidelines should be specified to govern the applications package selections process such as modifiability and customization.

C. Joint Future Efforts

+ The development of user manuals in both English and Arabic for both the local system and the foreign-based databases should be undertaken.

+ The Egyptian group responsible for implementation should be complemented by competent members from the user communities. User groups should explicitly participate in developing the organizational structure.

IV. MANPOWER DEVELOPMENT

Task Force Members - Dr. A. Neelamegan, Chairman
Dr. Mohamad Madkour
Dr. Farag Sedky
Dr. Samir Rashad

A. Findings

The contractor's analysis of the manpower needs of the proposed STI System and the proposals for the development of the required professionals and paraprofessionals through a crash program of short training courses are generally sound and acceptable.

It is also noteworthy that the STI policy proposals rightly recognized manpower development, in adequate number and of the appropriate quality in the different specialties, as of crucial importance in the practical realization of the STI System.

The objectives of the crash program for manpower development are well defined in relation to the STI System implementation in the next three-year period.

The proposed strategies to develop the required information personnel to implement the STI System are well conceived and feasible in the Egyptian environment.

The facilities, resources, and finances needed to implement the crash program of a series of short courses as identified in the manpower report are reasonable and necessary.

The centralized management of the crash training program through an Information Career Training Center (ICTC) is a sound proposition and should prove effective.

The proposed syllabus for the short courses, the manner of conducting the courses, etc. are appropriate for the purpose.

B. Recommendations

The following comments and recommendations relate to the practical realization of a manpower development program for supporting the national STI System development in Egypt.

1. Although the manpower development proposals address themselves mainly to the immediate needs of the STI System Implementation phase and gives a brief chapter regarding strategies, after the three-year Implementation phase, it is desirable that more definitive guidelines be provided on the actions to be taken now in parallel with the crash program for the long term institutionalization of the education and training for information personnel development in Egypt. The development of a good complement of resource persons (faculty), defining appropriate curricula and teaching levels, building up the necessary teaching aids and facilities, etc. for graduate and postgraduate level courses in Egypt could take two to three years of preparatory work.

2. Development of a core faculty/trainers in information science/informatics is a critical factor in the manpower development effort. Some guidelines in this regard would be helpful, for example:

a) the use of the Egyptian resource persons involved in teaching/training in the crash courses in the faculty development program,

b) formulating and implementing a carefully prepared long term plan for training selected Egyptians in other countries (e.g. USA, UK, France) for teaching information science/informatics subjects at the graduate and postgraduate levels.

c) the identification of existing informatic centers, programs and facilities in Egypt for use in the training of teachers of information science/informatics.

3. The availability and provision of local facilities especially computer hardware and software for use in the training programs, for demonstration and hands-on experience are important. A survey and compilation of the resources of such facilities is a worthwhile project to be undertaken. It would then be possible to formulate appropriate assistance schemes for upgrading the facilities to an adequate level wherever necessary.

4. The selection of persons for the training is an important function. The proposals do contain some guidelines on the criteria or qualifications for the selection. However, more detailed procedures have to be formulated and adhered to. In most cases the administration of a pre-admission test including foreign language competence (especially English), professional/technical knowledge and experience, motivation, and attitude would be necessary for the selection of the right type of candidates.

5. Although the contractor's manpower report does not deal with the training of the fifteen Egyptian library/information personnel in the program at The Catholic University of America in Washington, D.C., the experiences gained from that program in the selection of candidates, language competence requirements, types of courses to be provided, and the depth of training, could be useful in preparing guidelines and in planning future training programs. Also, the candidates trained under the Catholic University program should be considered as potential human resources in the STI System implementation phase.

6. It appears that there is a high degree to turnover of trained and qualified informatics personnel in Egypt and that this undesirable characteristic is likely to continue. This factor could become a serious problem in ensuring the availability of an adequate number of competent persons for the implementation and continued operation of the STI System. Although this is a matter for resolution by Egyptian authorities, nevertheless hints at some possible approaches might be helpful. For example, the provision of adequate career opportunities and financial incentives in the STI System and the formation of a separate cadre of information specialists with appropriate status for its members could be useful motivation to information professionals. Also establishing some types of reasonable contractual obligations for those selected and trained for the STI System may serve as a deterrent to a large turnover. It is also desirable that the number of persons trained be at least 50% more than the estimated requirements so as to constitute a buffer of back-up expertise for the loss due to attrition of various kinds.

7. Experience in other developing countries shows that persons trained under a crash program of non-degree courses face problems of recognition of their certificates vis-a -vis those obtaining a degree or diploma from local universities in library/ information science. The severity of the problem varies from one country to another. Nevertheless, it is desirable that the STI System project directorate initiate early action with the appropriate agencies including universities, the Ministry of Education, the body concerned with establishing equivalence of degrees and diplomas, to mitigate, if not solve, the problem. The documents and guidelines generated by UNESCO in this regard are useful.

8. The Information Career Training Center (ICTC) that manages the training program should be affiliated with the STI System project directorate.

9. The link between the information personnel training and user-education program should be brought out more explicitly so that helpful arrangements for resource sharing between the two programs can be made.

10. Continuing education programs for information professionals must be developed now. The experiences in this matter in other countries should be studied and utilized. The financial resources required should be found outside the current US AID allocation for the implementation of the STI System.

11. As the STI System is implemented, a considerable amount of documentation such as manuals and guidelines, especially for the computerized systems will be prepared and kept updated. These documents should be produced in sufficient volume for use in the training programs.

12. In formulating the curricula for the graduate and postgraduate training courses in information science/informatics in the institutions of higher learning in Egypt, the recent development and proposed programs in the Egyptian universities and the guidelines for an informatics course for developing countries recently proposed by the UNESCO/Science Sector/Informatics Unit should be studied and taken into account. Account should be taken of the recent changes in the existing training facilities in the Department of Electronics and Computer Engineering at Ain-Shams University, the Department of Library and Information Sciences at Alexandria University, and also the courses in library automation, application of computers in library operations, library administration, psychology and behavioral sciences introduced recently at Cairo University.

13. While the initiation of action for instituting fullfledged graduate courses in information science/informatics in Egypt even now is important for the continued operation and development of the national STI System after the implementation phase, it must be stressed that the financial resources required for the purpose should be found outside the current USAID allocation of the implementation of the STI System. The Universities Linkage Program could provide the necessary resources for the purpose.

C. Joint Future Efforts

For the purpose of formulating uniform guidelines on incentives and contractual obligations for those trained under the STI System project, further studies on the existing situation, rules and regulations and labor laws in Egypt should be examined as soon as possible. What has been done in other countries may also prove to be helpful.

V. TRAINING PROGRAM

Ad Hoc Task Force Members - Dr. F.K. Willenbrock, Chairman
Dr. Nabil Ali
Dr. Mohamad Madkour
Dr. Nadia Hegazi

Introduction

The ad hoc task force which considered the training program at the Catholic University of America used three major sources of information in reviewing the training program. These were the briefing by the principal investigator, Dr. Haddy, the final report on the program[3], and contacts with a number of the trainees in the program. The ad hoc task force noted the following:

1. The program was initially designed for five library-oriented training tracks, which were later modified to accommodate nine additional tracks which were information science-oriented. These latter tracks involved a substantial amount of sophistication in computer-based information handling,

2. The training program even after modification was completed prior to the completion of the STI System design,

3. The trainees completed their training much earlier than the determination of the functions they might perform in the STI System and the possible jobs or positions they might hold.

A. Findings

1. For each trainee, the program succeeded in

   a. organizing the training paths to meet individual needs,
   b. dividing the training program into modules,
   c. packaging the overall training of the individuals appropriately.

2. The Principal Investigator showed great flexibility in accommodating the additional requirements of nine new training tracks. He also redistributed the training time among fifteen trainees instead of the twelve trainees originally specified in the contract.

3. The Principal Investigator, through his direct involvement and strong personal commitment, assisted the trainees through the difficult period involved in their individual adaptation to a foreign country and its customs.

4. The present working affiliations of the fifteen trainees are presently as follows:

258*

Seven trainees are staff members at the National Information and Documentation Centre, one is on the staff of the Academy of Scientific Research and Technology, and seven are attached to Cairo University. Three are lecturers in the Department of Librarianship at the Faculty of Arts, one is a lecturer in the Faculty of Engineering, and two are programmers at the Scientific Computation Center. One of the fifteen trainees has resigned from her original job at the Industrial Development Centre for the Arab States (IDCAS) and is employed by a private computer software company. However, her employer has made a firm commitment to make her available to the STI System project on a part-time basis of two to three days a week.

B. Recommendations

1. In view of the prohibitive cost per trainee incurred in this program, future training should be performed in Egypt whenever possible.

2. Training abroad should be confined to the acquisition of specific operational skills or the education of trainers. The attendance of Egyptian personnel at a particularly important technical gatherings relevant to the overall STI System development and performance will also require time overseas.

3. Training should be carried on as an intrinsic part and subcomponent of the STI System development and not as a separate activity.

4. More strict criteria and testing procedures should be applied in the selection of trainees in the forthcoming phases of the STI System project. The criteria should include technical background, personal capabilities, personal commitment, and foreign language proficiency.

5. The fifteen trainees involved in the Catholic University Training Program should be considered as a significant asset when forming the STI System project staff. However, they should meet the criteria specified for the job under consideration.

VI. MANAGEMENT AND GOVERNANCE

Task Force Members - Dr. A. Neelameghan, Co-chairman
Dr. Mohamad Madkour - Co-chairman
Dr. Farag Sedky
Dr. Samir Rashad

The dual title of this section indicates that two distinct phases will be considered. They are:

1) the interim project management for the 3 years implementation phase,
2) the establishment of a permanent governance body for the ensuing period.

A basic function of the interim project management is to seek the establishment of the permanent governance body.

In Figure 1 of the Implementation study, a possible project organization is outlined and in Figure 10 of the Design study, a Council on Information Services and Resources is proposed as a possible permanent governance body. While the configurations proposed are certainly feasible, the task force concluded that the determination of the most appropriate location for the STI System in the Egyptian governmental structure is clearly a decision to be made in Egypt. However, by drawing on organizational experience from 14 other nations as indicated in a paper by A. Neelameghan (Appendix C), there are a number of comments which may help determine the best organizational structure for Egypt.

A structure for the interim project management is shown in Figure 1. The project directorate should operate with two major committees whose membership and functions are distinctly different. The Steering Committee should serve as the link between the project and the political structure of the government. It should be comprised of high-level representatives from the Egyptian ministries of Industry, Agriculture, Health, Housing and Human Settlements, Petroleum and Mineral Resources, Electricity and Power, Telecommunications, Education and Scientific Research, Planning, and the Supreme Council of Universities. Other organizations Central Agency for Public Mobilization and Statistics (CAPMAS), the Academy for Scientific Research and Technology (ASRT), the Egyptian Organization for Standardization and Quality Control, Al Ahram and the Chamber of Commerce should also be included. The Steering Committee should provide policy guidance to the project director; it should also facilitate making decisions which will maximize the benefit of the STI System to these organizations.

In contrast, the Advisory Committee should consist of persons who are selected solely on the basis of their individual expertise. They are not organizational representatives but, rather, serve as sources of information and knowledge important to the effective operation and management of the project.

It is difficult to overemphasize the importance of the selection of a highly-capable project director who has high technical and managerial expertise. The success of the project is directly dependent on the quality of the director. He must be

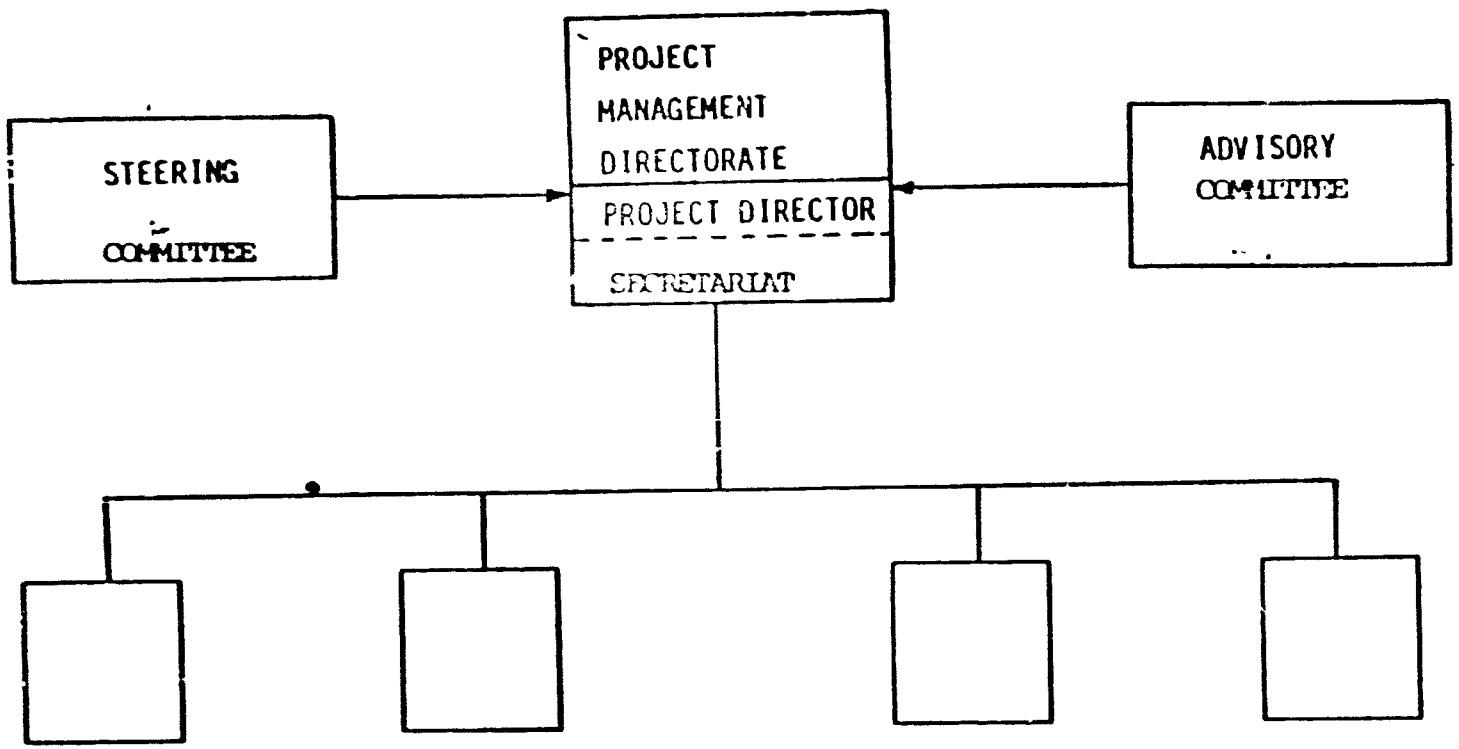

STEERING
COMMITTEE
PROJECT
MANAGEMENT
DIRECTORATE
PROJECT DIRECTOR
SECRETARIAT
ADVISORY
COMMITTEE

FIG 1

energetic and be dedicated full-time to the project. The same applies to all members of the Technical Implementation Group (TIG) as described in the Design and Implementation studies.

The organizational structure of the directorate is the prerogative of the project director. However, the functions to be performed include, but are not limited, to the following:

System promotion
Manpower development
System and network development
Central technical support
Policy and planning

The directorate should not have operational responsibility, which is the role of the nodes, but should operate as the National Focal Point (NFP), a concept which is extensively developed in many of the UNESCO documents related to STI. Appendix C summarizes some of the functions associated with the NFP.

A. Findings

The task force found that:

1. the determination of the appropriate permanent governance structure is best done by Egyptian authorities;

2. the interim project management can be described in general terms on the basis of experience gained from other countries; and

3. there are specific functions that the project directorate of the interim project management should perform.

B. Recommendations

The task force recommends that:

1. a project directorate of the general format shown in Figure 1 be established;

2. a Steering Committee of representatives of the Ministries and other appropriate organizations as listed should be appointed;

3. a capable full-time project director be appointed;

4. the project director be authorized to appoint an Advisory Committee of experts whose knowledge would be of value to the project;

5. the project directorate shall have as a major responsibility seeking to establish the permanent governance body to have responsibility for the project upon the completion of the Implementation phase; and

6. during the early stages of the implementation phase, it is desirable that the core Egyptian group involved be exposed to the experiences gained in other both developed and developing countries in the establishment of national STI Systems.

VII. NATIONAL STI POLICY

Task Force Members - Entire Evaluation Team

The Policy report presents seven broad policy statements which provide a general framework for a national STI policy for Egypt. However, the Evaluation Team concluded that a more specific list of policy objectives should be formulated to provide more specific policy objectives. Drawing on experience gained from other countries, a series of sixteen policy objectives have been identified which can serve as a basis for both a broad and specific policy statement. These sixteen objectives which follow are not in conflict with the seven broad statements presented in the Policy report but rather amplify and complement it.

1. The national STI System when fully established should endeavor to provide access to timely and reliable information and data to all sectors of the Egyptian community, supporting research and development, problem solving, educational and other development activities. In the earlier stages of its development the System should be initially oriented to meet the information needs of problem-solvers in the production and service sectors as well as users involved in research and development, research management, and education in science and technology.

2. Responsibility for building up appropriate information resources and for providing information services appropriate to different user clientele should be allocated to different Egyptian organizations so as to maximize resource utilization.

3. Appropriate codes, guidelines and standards should be formulated and adopted so as to facilitate system interconnections, resource sharing, networking and collaborative and cooperative activities in the System.

4. A national referral facility supported by appropriate tools and mechanisms such as union catalogues, directories, clearing houses, and switching centers should be established.

5. Suitable information personnel development programs should be established to meet the immediate as well as future manpower requirements of the STI System. Procedures for a periodic survey and forecasting of manpower needs of the system should be formulated.

6. Differentiated user education, user orientation, user sensitization programs should be developed, supported, and organized so as to promote the effective utilization of the information resources and services.

7. Periodic surveys or other appropriate mechanisms shall be organized for assessing the changes in the composition of information user groups, their information use patterns, information needs, and the impact of STI services.

8. The national STI System and its components should collaborate with regional and international information systems, services and programs so as to augment the resources and services to the Egyptian user clientele.

9. The national STI System and its components should cooperate with and draw upon existing information systems, services and programs in other sectors and agencies.

10. The national STI System should utilize bilateral and multilateral exchanges and collaborative arrangements with other countries.

11. The STI System should promote and develop adequate translation facilities to augment information use domestically and facilitate the use and recognition of indigenous sources internationally.

12. The development of adequate information technology facilities such as computer hardware and software, telecommunications, micrographics, and audiovisual technology management should be promoted and supported.

13. The STI System should endeavor to secure adequate service conditions, status, job opportunities, incentives, for information personnel.

14. Research projects in the information area, especially relevant to the development of the national STI System should be promoted and supported.

15. The nation's science and technology publications capability should be augmented and improved so as to maximize the capture of the national science and technology research information and its dissemination to the widest extent possible.

16. A national focal point (NFP) placed high in the government structure, with a management directorate and function similar to those recommended by UNESCO for such purposes should be established to facilitate the effective management of the national STI System in its implementation, and operational phases.

A. Findings

The Evaluation Team finds the seven policy statements in the Policy report are acceptable. However, these statements are not specific enough to provide an adequate base for a national statement on STI policy.

B. Recommendations

The Evaluation Team recommends that the seven statements in the Policy study be augmented by the two following two policy statements:

1. In the design and development of the national STI System, the experience of other developing countries in the planning, implementation, and operation of such systems should be taken into account.

2. The STI System should give due consideration to the need for research and development in Arabic informatics to consolidate local and regional efforts and to restore Egypt's regional leadership in informatics.

C. Future Joint Efforts

The Evaluation Team urges that an appropriately definitive policy statement be developed for promulgation by Presidential decree, by legislative enactment, or through incorporation in the Egyptian National Socioeconomic Development Plan. Such a promulgation should have the two-fold effect of raising public consciousness to the importance of STI and also focussing the responsibility for STI System development in the appropriate agencies and defining the location of the System in the governmental structure of Egypt.

VIII. CONCLUSIONS

These conclusions were developed by the entire Evaluation Team.

A. General Findings

1. The Evaluation Team

+ appreciates the significant initiative taken by Egypt to formulate a plan for a national information system for science technology and development;

+ strongly endorses the concept of an integrated network to constitute a national STI System;

+ is convinced that such a System can play a major role in accelerating Egypt's development efforts.

2. The Evaluation Team commends the efforts of the Georgia Institute of Technology contractor and finds the overall design of the national STI System presented in the series of reports is

+ basically sound,

+ compatible with the Egyptian environment,

+ properly reflective of the experience in other countries involved in similar STI System development efforts.

However, with a view to strengthening the System design and to facilitating its implementation, the Evaluation Team has developed a number of general as well as specific suggestions and recommendations in this report.

3. The Evaluation Team concluded that the community for whom the STI System is being developed has not been adequately identified and apprised of the characteristics of the proposed System.

4. The Evaluation Team found that the response to the interim recommendations and actions proposed during the first phase of the proposed STI System were slow and in some respects final decisions are still lacking. As a result, progress towards design consolidation has been substantially delayed.

B. General Recommendations

These general recommendations are to be considered as supplementing the specific recommendations made in Sections II, III, IV, V, VI, and VII of this report. Both the specific and general recommendations should be systematically reviewed and appropriate resolutions should be made.

1. Since the overall design is acceptable and the specific modifications recommended by the Evaluation Team can be completed in the next three months, the actions needed to make the general design more concrete can become the first stage of the coming implementation phase. However, the completion of these actions should be subject to review and endorsement by the Egyptian Executive Committee. This procedure permits the formal approval of the STI System, Design, Implementation, and Manpower development plans (Phase I) to be accomplished immediately and the detailed design and implementation plan (Phase II) to be started at once.

2. The Egyptian user community for whom the System is being developed should be systematically identified and given adequate opportunities for active participation in the detailed design and implementation of the STI System.

3. During the next stages (Phase II) a workable arrangement should be developed to secure more rapid progress in implementing the STI System. Hence,

a) Egypt should provide a highly responsive project leadership and decision-making mechanism;

b) the detailed design, the actual implementation, and the monitoring of the subsequent stages should be performed in Egypt whenever possible;

c) there should be continuous interaction between the US contractor and the Egyptian decision-making and implementation groups; and

d) the Egyptian participation should be maximized.

4. An innovative incentive scheme should be developed to ensure the recruitment of highly competent full-time project staff willing to provide long-term dedicated service to the project. Appropriate incentives should also be provided to ensure effective cooperation among the participating organizations.

5. The Academy for Scientific Research and Technology (ASRT) and the USAID should finalize the specific allocation of all funds needed in the next phases as specified in the Implementation study. The budget breakdown proposed should be reviewed and adjusted at an early stage of the implementation phase after a detailed analysis of the allocation of responsibilities between the Egyptian project staff and the US contractor has been made. An appropriate balance between staff, material, and ancillary expenditures should be maintained.

APPENDIX A

LIST OF PERSONNEL

EVALUATION TEAM

Egyptian Members

Dr. Nabil Aly
Consultant
Egypt Air

Dr. Aly Fahmy
Faculty of Engineering
Cairo University

Dr. Farag Sedky
National Computing
Central Agency for Public
Mobilization & Statistics

Dr. Nadia Hegazi
Electronics Research Institute
National Research Center

International Members

Dr. Jacques Michel
Director of Center for Scientific
and Technical Documentation C.N.R.S.
Paris, France

Dr. F. Karl Willenbrock, Chairman
Cecil H. Green Professor of Engineering
Southern Methodist University
Dallas, Texas U.S.A.

Dr. A. Neelameghan
Project Coordinator
UNDP Program
Manila, Phillippines

Egyptian Observers

Dr. Samir Rashad
Operation Research Center
Armed Forces

Mr. Osama El-Said
Faculty of Arts
Cairo University

Dr. Naghah Elewa
National Information and Documentation
Centre

Eng. Sayed Hathout
Central Agency for Public
Mobilization & Statistics

TASK FORCES

Information Resources and Services

Dr. Jacques Michel - Chairman
Ms. Nagah Habit
Mr. Osama El-Sayed

Manpower Development

Dr. Neelamegan - Chairman
Dr. Mohamad Madkour
Dr. Farag Sedky
Mr. Samir Rashad

Management and Governance

Dr. Neelamegan - Co-chairman
Dr. Mohamad Madkour - Co-chairman
Dr. Farag Sedky
Dr. Samir Rashad

Technological Aspects

Dr. Nabil Aly - Chairman
Dr. Aly Fahmy

Training Program Evaluation

Dr. F.K. Willenbrock, Chairman
Dr. Nabil Ali
Dr. Mohamad Madkour
Dr. Nadia Hegazi

EXECUTIVE COMMITTEE FOR STI SYSTEM PROJECT

Dr. Awad Muktar Hallouda, Chairman
President, Central Agency for
Public Mobilization & Statistics

Dr. Ahmad Aziz Kamal
Dean, Faculty of Engineering
Cairo University

Dr. Ahmad Mohamad Gad
Director
National Information and
Documentation Centre

Dr. Mohamad Madkour
Director-General
Al-Ahram Organization
and Microfilming Centre

Dr. Aziz Morsi El-Kholi
Associate Chairman
Medical Research Council

* Dr. Ali El-Selmi
Professor, Faculty of Commerce
Cairo University

Dr. Mohamad Younis
Head Information Systems
Academy of Scientific Research
and Technology

* Did not attend Roundtable on fourth working day.

276

APPENDIX B

DETAILED BREAKDOWN OF THE GENERIC EVALUATION CRITERIA FROM A TECHNOLOGICAL VIEWPOINT

This detailed breakdown of the technological aspects of the STI System design with respect to the generic criteria served as the basis of the analysis of the task force on technological aspects. It will be beneficial as guidance for the detailed design stage and as a checklist in assessing the overall design.

I. Compatibility with the Egyptian Environment

I.1 Overall System Architecture-related Issues
- Suitability of the network topology
- Sharability of critical and expensive resources
- Ability to interface with local databases

I.2 Hardware-related Issues
- Transparency to end-users
- Commonality of hardware and software
- Maintainability
- Utilization of existing resources

I.3 Database-related Issues
- Database maintainability
- Natural language interface

I.4 Data Communications-related Issues
- Coping with the modest quality of the Egyptian public telecommunication network
- Node location considerations
- Interface with international packet-switching networks
- Coordinating considerations with the Egyptian Telecommunications Agency

I.5 Arabization-related Issues
- Utilization of local efforts in Arabic Informatics

I.6 Applications Development Considerations
- Extent of analysis of the "Acquire or Develop" issue

II. Completeness

II.1 Overall System Architecture-related Issues
- II.1.1 Inclusion of alternatives
- II.1.2 Validity of the estimating techniques
- II.1.3 Clarity of the system hierarchical structure

II.2 Hardware-related Issues
- II.2.1 Completeness of the major hardware requirements
- II.2.2 Completeness of the software requirements

II.3 Database-related Issues
- II.3.1 Presentation of the conceptual databases

II.4 Data Communications-related Issues
- II.4.1 Utilization of the local experience gained in establishment of data communication networks

II.5 Arabization-related Issues
- II.5.1 Long-term view of the Arabization efforts

II.6 Applications Development-related Issues
- II.6.1 Outlining of types of applications
- II.6.2 Clarity of the structure of applications development process

III. Continuity Beyond the Implementation Phase

III.1 Overall System Architecture-related Issues
- III.1.1 System expendability considerations
- III.1.2 Building-in of "true" user participation
- III.1.3 Highlighting of anticipated difficulties and pitfalls

III.2 Hardware-related Issues
- III.2.1 Continuity of supply
- III.2.2 Provison of guidelines on how to cope with unpredictable workload and storage requirements

III.3 Database-related Issues
- Not applicable

III.4 Data Communication-related Issues
- III.4.1 Degree of participation of the Egyptian Telecommunication Agency

III.5 Arabization-related Aspects
- III.5.1 Organizational aspects of the Arabization activities

IV. Utilization of International Experience and Resources

IV.1 Overall System Architecture-related Issues
- IV.1.1 Consideration of international and regional STI-related studies and experience
- IV.1.2 The orientation of the STI System to national development

IV.2 Hardware-related Issues
- Not applicable

IV.3 Database-related Issues
- Not applicable

IV.4 Data Communications-related Aspects
- Not applicable

272

IV.5 Arabization Aspects
- Utilization of the experience of non-Latin countries and Arab regional efforts

V. System Adaptability and Robustness

V.1 Overall System Structure-related Issues
V.1.1 Inclusion of system monitoring capability
V.1.2 Consideration of fail-safe characteristics

V.2 Hardware-related Issues
V.2.1 Consideration of performance-monitoring issues
V.2.2 Consideration of system-tuning and diagnostic tools

V.3 Database-related Issues
- Emphasis on database integrity
- Consideration of database activity monitoring

V.4 Data Communications-related Issues
V.4.1 Reconfigurability of the network
V.4.2 Considering the line control functions

V.5 Arabization-related Issues
- Not applicable

V.6 Applications Development-related Issues
V.6.1 Consideration of applications maintainability

APPENDIX C

COORDINATING AGENCY FOR THE NATIONAL STI SYSTEM

A. NEELAMEGHAN

INTRODUCTION:

It would be helpful to establish a national agency (called the national focal point) to facilitate the implementation of the national STI plan, for resource mobilisation, for co-ordination and monitoring of programme activities, and for assessment of system performance. Although socio-political factors and the character of the government structure would influence the choice of the national focal point (NFP) and its functions, there are several common features among existing NFPs in different countries. The UNESCO Guidelines provide useful ideas on the structure and functions of NFP. In order to ensure the effective functioning of a NFP, the following aspects should be given attention from the outset:

1. Position of the NFP in the national government structure;
2. Objectives and terms of reference;
3. Functions and activities;
4. Organisational and management aspects;
5. Financial resources.

These aspects are considered in the succeeding sections.

1. Position of the NFP:

It is desirable to have a single NFP placed as high as possible in the government hierarchy, for example, in the Prime Minister's Office or Ministry of Education, Science, Planning, Industry, etc., so as to secure adequate support to the STI system development. The Ministry of Education or Science is the usual focus. The NFP should be endowed with adequate policy making, financial and executive powers. Table (1) indicates the location (or proposed location) of the NFP in several countries.

Table (1) Location of NFP in Government Structure

Country	Prime Minister's Office	Ministry of Education	Ministry of Industry Eco. Affairs
BELGIUM.....	X		
DENMARK.....		X	
FINLAND.....		X	
FRANCE.....		X	
GERMANY.....		X	
HOLLAND.....		X	
INDIA.....		X	
IRAN.....	X		
ISRAEL.....	X		
MEXICO.....		X	
NORWAY.....		X	
PHILIPPINES.....		X	
POLAND.....		X	
SWEDEN.....			X
TURKEY.....		X	
U.K.....		X	

Location of Management (N F P) directorate in government structure in 16 countries (develop 11 developing 5)

Ministry of Education/Science.....	12
Prime Minister's Office.....	3
Ministry of Industry/Econo. Affairs.....	1

2. Terms of Reference:

Existing models indicate a possible choice between a NFP with only an advisory role to one with policy making, advisor, planning, and operational functions. The choice would depend upon:

+ How large the community to be served is,

+ Financial resources of the NFP,

+ The state of development of the existing information services in the country, and

+ The extent of the coordination and extent of centralisation or decentralisation of information activities.

The terms of reference of the NFP could be drawn up from the objective formulated and the study of the existing national infrastructure. The proposed or anticipated improvement in the STI infrastructure should have a relation to the changes in the information environment. The statement of the policy objectives should be clear, precise and unambiguous.

Table (2) indicates the terms of reference of NFPs in several countries.

Table (2) Terms of Reference of NFP

Tasks	Belgium	Denmark	Finland	France	Holland	India	Israel	Norway	Poland	Sweden	Turkey	U.K.
National STI Network development	x		x	x	x	x	x		x			
National STI Network Coordination	x	x		x	x	x	x	x	x	x		
STI Services Development	x		x	x	x	x	x	x			x	x
Promotion of User Education			x	x		x	x			x		
Promotion of Information specialist training			x	x		x	x			x		
R&D in information promotion	x	x	x	x	x	x	x	x	x	x	x	
Financial support	x		x	x	x	x	x	x		x		
International responsibilities in STI	x	x	x	x	x	x	x	x	x	x	x	x
Function as UNISIST national focus	x	x	x	x	x	x	x	x	x	x	x	x
Long-range planning of STI objectives				x	x	x		x	x			
Development of national STI policy	x		x	x	x	x	x					x
Advice and guidance to national institutions on information systems planning and development		x	x		x	x				x	x	x
Involvement in STI at operational level					x						x	x
Promotion of standards in information handling	x	x	x	x	x			x	x	x		x

TERMS OF REFERENCE OF NATIONAL FOCAL POINTS

(14 COUNTRIES)

STI NETWORK DEVELOPMENT 9

STI NETWORK COORDINATION.....11

STI SERVICES DEVELOPMENT.....11

PROMOTION OF USER EDUCATION..... 7

PROMOTION/SUPPORT MANPOWER DEV. 7

PROMOTION/SUPPORT R AND D IN INF. 12

INTERNATIONAL RELATIONS 14

LONG RANGE PLANNING OF STI 9

ASSESSMENT AND MONITORING OF STI DEV. .....

DEVELOPMENT OF STI POLICY 10

ADVICE TO INF. CENTERS/SYSTEMS 9

PROMOTION OF STANDARDS IN STI 11

PROVISION OF STI SERVICES 3

Table 3. Operational procedure of NFP in Carrying out Tasks

Procedures	Belgium	Denmark	Finland	France	Holland	India	Israel	Norway	Poland	Sweden	Turkey	U.K.
Publicity of STI services.			x	x	x		x	x	x		x	x
Promotion of use of STI.	x	x	x	x	x	x	x	x	x		x	x
Advisory functions	x	x	x	x	x	x	x	x	x	x	x	x
Solution to sectoral needs.	x	x	x	x	x	x	x	x	x	x	x	x
Liaison operation .							x				x	
Publishing operations.							x		x			
Rl. and activities in information												
--advisory		x	x					x			x	
--support/management	x			x	x	x	x		x	x	x	x
Education and training in information												
--General advice	x	x	x	x	x	x	x	x	x	x	x	x
--Coordination of STI education	x	x	x				x		x			
--Management of education schemes			x			x					x	
--Financial support	x	x	x			x						x
--Promotion of user education	x		x	x	x	x	x		x		x	x
--Promotion of information education	x		x	x	x	x	x		x		x	x
--In house training, postgraduates			x				x					
--In hous training, other			x				x				x	

OPERATIONAL PRODCEDURES
OF NATIONAL FOCAL POINT IN CARRYING OUT TASKS

PUBLICITY/PROMOTION OF STI SERVICES 14

ADVISORY FUNCTIONS TO INFO. CENTERS/SYSTEMS 14

PROMOTION/SUPPORT RESEARCH IN SECTORAL NEEDS 14

EDUCATION AND TRAINING (MANPOWER) :

- ADVICE AND MANAGEMENT 14
- FINANCIAL SUPPORT 7
- IN-HOUSE TRAINING 2

PROMOTION OF USER EDUCATION 11

PUBLISHING 2

3. Functions:

The functions of the NFP would include:

+ Advising the government in the formulation of the national STI policy and on the methods for its implementation.

+ Ensuring that the national STI policy and plan are incorporated into the national development policy and plan documents.

+ Developing mechanisms to ensure adequate inputs of manpower, finance, and facilities to the STI systems.

+ Co-ordinating, stimulating and promoting information activities in collaboration with other organizations within and outside the country.

+ Allocation of finances for projects and monitoring and evaluation of the projects.

+ Encouraging and supporting research and development in information and related areas.

+ Promoting and supporting education and training programmes in information and in user education.

+ Developing co-operative and collaborative operations with regional and international STI systems and programmes.

+ Formulating criteria, guidelines and standards for the planning, developing, financing and assessing the performance of the STI systems.

Table (3) indicates the usual operational procedures of NFP in carrying out task.

4. Organization and Management:

4.1. COVERAGE

It is desirable to determine at the outset whether the national information policy, plan and programmes would cover science and technology only (cf. France, India) or the social sciences and humanities as well (cf. Great Britain). The scale of organization and networking will differ depending upon the extent of sectoral/disciplinary coverage. Perhaps, initially the plan and programme may be limited to STI in which there may be the greater demand for information and subsequently extended to other areas on the basis of experience, needs and demands.

4.2. STEERING COMMITTEE

A Steering Committee of 10-15 persons should be constituted to provide the political linkages to the government structure. The Steering Committees should have representation from appropriate government departments and private sectors, should represent a cross-section of the different disciplines, and be able to accommodate minority interests.

For example, representatives of the:

+ R and D Organizations,

+ Industry,

+ Government departments — education, sciences, planning, finance, industry, communications, etc.

+ Academic and professional organizations representing user agencies and information bases.

+ National libraries, information and documentation centres, etc.

+ Information experts in personal capacity.

Table (4) indicates composition of the steering committee of NFP* in several countries.

Table (4) Composition of Steering Committee of the NFP

Representation from	Belgium	Denmark	Finland	France	Holland	India	Israel	Norway	Poland	Sweden	Turkey	U.K.
National R & D organizations		x		x	x	x	x	x		x		x
Currrnment Ministries	x		x	x	x	x	x	x			x	x
Industry		x	x	x	x	x				x		x
Libraries-Genl				x	x	x						x
-Spl/Res		x	x			x		x				x
Information centres			x	x	x	x		x		x		
Higher Edn-Staff ...			x	x			x			x	x	x
-Students				x								
Information users ..			x			x		x				
Publishing organizations				x	x							
Statistical organizations				x								
Technological services			x									
Information specialists				x		x		x				

COMPOSITION OF STEERING COMMITTEE

(14 COUNTRIES)

REPRESENTING

NATIONAL R & D ORGANIZATIONS	10
GOVT. MINISTRIES	11
INDUSTRY	9
LIBRARIES	
• GENERAL	4
• SPECIAL LIBRARIES/INTO CENTERS	9
HIGHER EDUCATION	7
PUBLISHING ORGANIZATION	2

4.3. ADVISORY COMMITTEE

It is helpful to constitute an Advisory Committee with representation from the sectoral information systems, the library and information professions, etc. The membership may go by rotation between the sectors. The disciplinary/sectoral emphasis will depend upon national priorities (cf. the academic advisory group in Netherlands, industrial advisory in Sweden). The Advisory Committee may have about ten members at any one time. The members serve in a personal rather than organizational capacity providing specialized expertise and sectoral interest support to the NFP.

4.4. SECRETARIAT

There should be a secretariat of 10-15 persons including professional information as well as administrative/secretarial personnel headed by a director.

4.5. AD HOC WORKING GROUPS

The NFP should have powers and resources to constitute ad hoc working groups as and when required to carry out special studies, surveys, or other tasks.

4.6. PERFORMANCE ASSESSMENT

There should be provision for feedback and periodic evaluation of the work of the NFP.

5. Financial Resources:

The annual expenditure on the national STI programme should be about 5 per cent of the national R and D expenditure. It may be up to 10-15 per cent in the initial stages. The operating cost of a sectoral center is of the order of $200,000 (US) a year in developing countries. In most countries, that budget of the NFP is in the range of $500,000 to $1.0 million (US) a year. The major items of expenditure are usually network development, support for education and training, R and D projects in the information area. These account for 90 to 95% of the budget with 5 to 10% for the directorate staff. Some NFPs having information service functions recover at least part of the expenditure, especially on mechanised information systems, through charges and subscriptions for the service.

10

EVALUATION AND RECOMMENDATIONS FOR CONTINUED SUPPORT OF THE REPAIR AND MAINTENANCE CENTERS FOR SCIENTIFIC EQUIPMENT AT ALEXANDRIA, TANTA, CAIRO, EL-MINIA AND ASSUIT UNIVERSITIES

Prepared by:

Howard Metz Mohamed Shaltoot Roland Corsey

283

INTRODUCTION

The purpose of this report is to assess the operation of the repair and maintenance centers at Alexandria, Tanta, Cairo, El-Minia and Assuit Universities which were developed during Phase I of the Instrument Technology Project. This evaluation is based on information obtained during numerous visits to these universities during the course of Phase I, evaluations of trainees at NIH, and a final site visit made in May 1982.

During Phase I of the project, BEIB worked with these universities to establish repair and maintenance centers for scientific eqiupment. This work fell into three major areas:

1. Development of physical plant-establishment of the necessary facilities for the centers and equiping them with tools, test equipment, replacement parts and technical literature.

2. Implementation of Center Management - development of a management manual for the operation of the centers, training of a center management personnel and establishment of a charter for the center.

3. Training of repair personnel.

Early in Phase I BEIB personnel evaluated the repair requirements of each university and purchased the necessary tools, test equipment, replacement parts and technical library. This material is presently in place at each university. BEIB also developed an administrative manual for the management of a repair and maintenance center, provided training in the management of the centers and worked with center and university administration in the development and implementation of a charter for the centers. Personnel from each of the centers traveled to BEIB and were trained in the repair and maintenance of scientific equipment. Of the twelve people trained at BEIB, only five are presently working in their university repair and maintenance centers. The remainder either did not return to their centers or left shortly after returning.

An overall evaluation of the program indicates that the centers are presently well equipped, have a management plan with varying support from the university administration, and with the exception of Assuit University do not have sufficient staff or meet even the minimum repair needs of their university.

Because of the lack of qualified repair specialists to staff these centers we would recommend as a priority goal of Phase II the development of a training center in Egypt for scientific equipment repair personnel. This center would provide training at a lower cost than training in the United States and would eliminate the temptation to trainees of not returning to Egypt after completing their training.

285

EVALUATION OF INDIVIDUAL CENTERS

In reviewing the operation of the individual centers and evaluating their potential for successfully meeting the repair needs of their universities, the following factors were considered:

1. Administrative support: Does the Center receive the necessary administrative support from the University to assure its proper operation? Examples of administrative support are evidenced by interest in and an understanding of the function of the center by university officials; approval of a charter for the center by the university; and the development of an incentive program for Center employees.

2. Faculty support: Is the faculty in favor of the establishment of a Repair and Maintenance Center and will they make use of the Center?

3. Center staffing: Does the Center have reasonably qualified repair personnel or is there a reasonable expectation of recruiting such personnel?

4. Technical assistance: The major portion of personnel available to staff the Centers are junior engineers who will require technical assistance in performing more difficult repairs. Does the Center have an experienced repair engineer available to provide technical assistance to junior personnel?

Alexandria University: The Center at Alexandria University is headed by Professor Hamdi. The Center presently has no full time staff. Two people were trained at NIH for the Center, one did not return to the University and the other returned to the university but was not assigned to the Center. Professor Hamdi is presently recruiting staff to work in the Center on a part-time basis. Full-time positions will be offered to those employees who prove themselves capable of successfully repairing scientific equipment. It is estimated that the center will require the equivalent of three full time electronic and two full-time electro-mechanical journeymen repair specialists.

Professor Hamdi has developed and is implementing a well thought out program for the development of the Alexandria Repair and Maintenance Center. This program has been approved by the university administration. During his stay at NIH, Professor Hamdi has demonstrated his capability to quickly and efficiently repair a wide variety of scientific instruments. This capability will permit him to both train new center personnel and provide technical assistance to the center staff. Because of his position in the faculty of Engineering and his history of previously providing repair assistance to faculty members, we feel that the center will be accepted and used by the university faculty. We recommend full support of the Alexandria center in Phase II of the project.

Tanta University: The Center at Tanta University is presently managed by Engineer Mohamed Abdu and is meeting about 15% of the repair and maintenance needs of the university. It is estimated that the center will need the equivalent of three full-time journeymen electronic repair specialists and two full-time journeymen electro-mechanical repair specialist.

Tanta University (cont): As with Alexandria Univeristy, Tanta University appears to have the necessary conditions for the development of a successful center. During his visit to NIH, Dr. Hassan Mustafa, the Vice-President of Tanta, met with Mr. Metz to discuss the operation of the center and expressed his desire to assist in the development of the Center. A separate budget and an incentive plan for Center employees has been established by the University.

During a previous visit to the University, Mr. Metz met with the chairmen of a number of departments to discuss the operation of the Repair and Maintenance Center and how it could best meet their needs. During these meetings they showed Mr. Metz numerous pieces of equipment in need of repair which they would like to have repaired by the Repair and Maintenance Center.

Engineer Mohamed Abdu, the Chief Engineer for the Center, demonstrated a potential to become a well qualified repair engineer during his training at NIH. Prior to coming to NIH he performed repairs in the faculty of Science and is known to many faculty members. In addition to Engineer Abdu, the center has a number of other technicians and engineers who have elementary to intermediate levels of repair skills.

Tanta University (cont): Based on the universities support of the Center, the willingness of faculty members to use the Center, Engineer Abdu's technical and administrative skills and the potential of the other Center personnel, we recommend continued full support of the Tanta University Center. Due to the fact that none of the members of the Center staff have extensive experience in the repair of scientific equipment, we would recommend that the University arrange for a consultant to be available to the center on a weekly basis to provide assistance in complex repairs.

Cairo University: The Repair and Maintenance Center at Cairo University is headed by Professor El-Sobki of the Faculty of Engineering, Electrical Department. Three engineers from the Repair and Maintenance Center were trained at NIH, one did not return to Egypt and the other two returned to the center but have subsequently left. The Repair and Maintenance Center presently has no experienced electronic repair personnel, one experienced electrical engineer (power) and no mechanical personnel. It is estimated that the Repair and Maintenance Center is capable of meeting little or none of the demand for electronic or mechanical repair and about 10% of the demand for electrical repair. The Repair and Maintenance Center would require the equivalent of about seven full time journeymen electronic repair specialists and four full time journeymen mechanical repair specialists to meet the repair needs of the university.

Cairo University (cont): The Center has been given a charter and a procedure has been established for paying incentives to its employees. Center employees have often been unsuccessful when attempting to solicit repair work from faculty members. These faculty members appear to prefer to have their repairs contracted out by the University to private sector companies. The Center does not have anyone available to provide technical assistance for difficult electronic repairs on a regular basis. We feel that part of the problem of attracting and keeping qualified personnel is the availability of numerous higher paying positions in the private sector in Cairo.

Based on our review of the Repair and Maintenance Center, we would recommend that the Center initially recruit and hire a senior repair engineer; two electronics engineer; and a mechanical engineer to be at the ITU. As the Center has received significant tools, test equipment, replacement parts during Phase I, it could become operational with a minimum cost of hiring those personnel. We believe that recruiting the senior repair engineer is essential to the operation of the Center and that no significant additional resources be allocated to the center until he is hired.

Cairo University Repair and Fabrication Center: A repair and fabrication center managed by Engineer Hussein Eissa, is located in the Physics Department of the Faculty of Science. The Repair and Fabrication Center appears to be operating very successfully with a very minimal amount of resources and is well thought of by members of the faculty of Science.

Cairo University Repair and Fabrication Center (cont): Based on this Center's success, we would recommend supporting it immediately during Phase II with test equipment, supplies, training and technical assistance. After a period of one year both centers at Cairo University would be evaluated and a decision be made by the Academy as to which, if any, of the centers should continue to receive support.

El-Minia University: The center at El-Minia is directed by Dr. Kamal Abdul Hadi, Dean of the Faculty of Science. The one engineer trained at NIH has left the center. There were no other engineers other than Rokaya at the center, leaving the center without a staff. The Center will require the equivalent of two full time journeymen electronic repair specialists and two full time journeymen electro-mechanical repair specialists to meet the repair needs of the University.

During previous visits of BEIB personnel to El-Minia, the University administration voiced support for the center. The faculty has also indicated a need for the Center during these visits and has sent equipment to the Center for repair. The Center was staffed by one engineer who has been trained at NIH and it appears unlikely that the University will be able to recruit experienced repair personnel. It is our opinion that if a center director with a background in equipment repair could be recruited, there is a chance of the Center becoming functional. Allocation of additional resources to this center should be held in abeyance until a suitable center director and engineers have been recruited.

Assuit University: The Center at Assuit University is headed by Professor Abdul Karim of the Electrical Engineering Department. Professor Karim is well versed in all aspects of scientific equipment repair and for many years prior to the establishment of the Center, he repaired equipment both at Assuit and El-Minia Universities.

Professor Karim is presently on a leave of absence and the Center is being managed by Mohamed Abd El-Wahab. The Center has a staff of three technicians and one engineer and is meeting about 60% of the repair needs of the University. We would recommend that the Center hire two additional electronic repair specialists and one electro-mechanical repair specialist.

The Assuit Repair and Maintenance Center is by far the most successful of the five centers and will probably be able to fully meet the repair and maintenance needs of the University within a few years. The success of the Center is directly attributable to the support given to it by the University's administration and the fact that it has its director and assistant director a highly qualified electronics repair engineer and a highly qualified mechanical technician who can provide technical support and training to the Center staff. We would recommend continuing full support for this Center and using it as a model for the other centers to emulate.

APPENDIX

TITLE	APPENDIX
Evaluation of Repair and Maintenance Centers based on Site Visit	I
List of Trainees	II
Cost of Training	III
Training of Egyptian Engineers	IV
Equipment and Supplies for the Universities	V

Evaluation of the repair and maintenance centers of Cairo, Tanta, Alexandria, Assiut and El-Minia Universities as of May 1982.

This evaluation is the result of on-site visits to the facilities listed. The amounts of repairs per month given in the text are based on verbal estimates supplied by the directors and chief engineers of the Repair and Maintenance Centers. In no case were documents produced to substantiate the claims made, except for the Assuit Center. In a more established center, this would lead to questions regarding the reliability of the data. However in a relatively new center, there is a natural reluctance to take the additional time required for burdensome paper work. Therefore, it is not surprising that the paperwork normally associated with a repair and maintenance center has been deferred for a future stage of development.

It was not possible to inventory all of the equipment at each site because some of the laboratories had been closed down. To get an idea of the types of equipmenodels recorded. While it would be desirable to have a complete inventory of equipment for purposes of estimating repair needs, such a list might generate misleading conclusions. At several universities the utilization of equipment was found to be variable, with muc gathering dust on shelves and other laboratories actively using all the equipment they owned. This uneven utilization would make any funding estimates based on inventory value inaccurate. A better method might be to require that a repair order be drawn up for each piece of equipment delivered for repair. The number of repair orders per year and the growth rate could be used to predict future needs. Of course this would mandate that more resources be devoted to paperwork.

CAIRO UNIVERSITY

The Cairo University Repair and Maintenance Center (R&M Center) is repairing equipment at the rate of 20/month. The R&M Center also provides repair service for the Faculty of Medicine for Monsoura, Zagazig, Tanta and Einshams Universities. The director of the center is Dr. El Sobki, who has a background in electrical power engineering. The staff is composed of the following engineers:

1. Mohammed Hamza, electrical engineer (power), chief engineer
2. Wafaa Abbasi, Electronic Engineer for electronic repairs
3. Ibrahim Iskaros, Electrical Engineer (power) for electrical repairs
4. Ibtesam Mohamed, Electronic Engineer for electronic repairs

Two pieces of equipment were observed to be idle because of the lack of troubleshooting expertise by staff and management. They were a solid state oscilloscope and a vacuum tube audio amplifier. The R&M Center is in dire need of an experienced electronics troubleshooter. Interviews with staff members confirmed the fact that this deficiency is a serious drawback because most equipment contains electronic circuitry.

A Repair and Fabrication Center (R&F Center) is located in the Physics Department, of the Faculty of Science. This center, completely independent of the R&M Center, has been repairing and fabricating instruments for several years. It is headed by Hussein Eissa who is an experienced designer and is well versed in electronic repair. He and his staff of 3 engineers were able to display numerous examples of equipment they had fabricated. Interviews with professors in the Faculty of Science, attest to the high regard for which his work is held. It would appear that Hussein Eissa, with a Masters Degree in EE would be a good choice to head the R&M Center in addition to the R&F Center he presently supervises.

Additional components needed by the R&M Center are:

comparators (IC)

photocells

electrodes for pH meters

contact thermometers

transformers (various types)

transistors (BF258 & BD259).

An incentive program is in effect for the R&M Center in the amount of 50% to 60% of the repair labor charges being returned to the engineers. This has helped recruiting and staff retention.

The following is a sample of the equipment found at Cairo University:

audio-amplifier

electronic balance

35mm SLR camera

colorimeter

liquid scintillation counter

radiation counter

incubator

LASER

mass spectrometer

microtome

oscilloscope

oven

pH meter

power supply

pulse generator

spectrophotometer

stimulator

temperature controller

vacuum system

water bath

TANTA UNIVERSITY

The R & M Center at Tanta University had only been operating for a period of three weeks when this evaluation was performed. A total of 8 repairs had been performed and several memoranda listing equipment needing repairs had been received. The director of the Center is Dr. Tayser El Shamy, a chemist with the Faculty of Science. The staff of the Center is composed of the following enginers and technicians:

1. Mohammed Abdu, an electrical engineer, is the chief engineer.
2. Helen Rezk, a chemist, does electronic repairs.
3. Sosan El Shafei, a biomedical engineer, does electronic and biomedical repairs but has no experience.
4. Layla Fared Shenashen, an electronic engineer, does electronic repairs but has no experience.
5. Hasan El Medany, a technician, does general repairs.
6. Azhar El Zeftawy, a technician, does general repairs.
7. Ahmed Badawy, a technician, does general repairs.
8. Abd El Lateef, a technician, does general repairs.

The R & M Center is located in a building used for central research laboratories with a common budget for both. Dr. Mustafa, a Vice President of the University, initiated a memorandum during the evaluation to separate the two budgets. As part of this action, an incentive program is planned which would return 50 to 60% of the repair

labor charges to the engineers. However Tanta University has not finished the approval process for incentives as have the other universities. Tanta University also provides repair ser-vices for the research center at Alexandria University. Mohammed Abdu spends one day per week every two weeks and Helen Rezk spends one day in Alexandria for this purpose.

Interviews with faculty members of the Faculty of Science revealed that some of the professors were familiar with the R & M Center and others were not. Interviews with the staff revealed optimism and enthusiasm for the center with the acquisition of the new facilities and equipment. A need was expressed for 2 portable oscilloscopes with basic functions only, and 2 portable multimeters suitable for use in the field. Additionally 2 portable tool kits are needed to supply the expanded staff.

The following is a sample of the equipment found at Tanta University:

spectrophotometer, Varian

oscilloscope, Polish

oscilloscope, Gould

oscilloscope, Heathkit

function generator, Heathkit

power supply, East German

UV spectrophotometer, Shimadza

spectrophotometer, Pye Unicam (3)

colorimeter, Zeiss

spectrophotometer, atomic absorption, Shimadza

centrifuge, Heraeus Christ

gas chromatograph, Micro Cab

cooling centrifuge, Sigma

centrifuge, Pegasus

electronic balance, Polish

pH meter, Chinese

mass spectrometer, Varian

fluorometer, Corning

microcomputer, Commodore

nuclear magnetic resonance apparatus, Varian

pH meter, Radiometer

voltage regulator, Amir

flame photometer, Corning

spectrophotometer, atomic absorption, Dupont

4x5 camera, Zeiss

glucose analyzer, Beckman

photocopier, Xerox

vacuum chamber, Deton

oscilloscope, Telequipment

pulse generator, Continental Specialties (2)

sweep generator, B & K

voltmeter, Marconi

multimeter, Metrix (3)

tape recorder, Hewlett Packard

multimeter, Kyorissu

oscilloscope, Tektronix

x-y recorder, Frenck

power supply, French

voltage compensator, Phonovox

power supply, Polish

vacuum pump, Edwards (6)

null detector, Tunsley

programmable temperature regulator, French

recorder, Houston Instruments

voltage stablilzer, Poland

current stabilizer, British

oscilloscope, Hungarian

Q meter, Marconi

oscilloscope, Phillips

VTVM, Heath

VTVM, East German

electronic thermometer, Polish

pyrometer, Polish

oscilloscope, Scopex

oscilloscope, Hungarian

ALEXANDRIA UNIVERSITY

The R & M Center is presently in the implementation stages. A memorandum has been routed to all deans announcing the mission and availability of the facility. The concept and budget have been approved by the University administration. Dr. Hamdi, the director of the Center, plans to start by utilizing part-time engineers and technicians until the center is self-sufficient. It will be housed in the mechanical engineering building and has enough space for more than 4 benches. The work force will be recruited from technicians already working for the Faculty of Engineering and from graduate students. Since those already working for the University normally finish work in the early afternoon, it is felt that part time workers could easily be recruited from the regular work force. This would give management an opportunity to evaluate the staff before offering them full time employment. Since Egyptian workers are rarely fired, even if they posess less than desirable competency, Dr. Hamdi feels this cautious approach will assure a good permanent staff.

A sample of the equipment found at Alexandria is as follows:

oscilloscope, Metrix

oscilloscope, Telequipment

pulse generator, Continental Specialities

sweep generator, B&K

voltmeter, Marconi

sound level meter, B&K

multimeter, Metrix

multimeter, Polish

oscilloscope, Tektronix

oscilloscope, Hungarian

oscilloscope, East German

Q meter, Marconi

DVM, Phillips

x-y recorder, French

power supply, French

thermometer calibrator, Aois

voltage compensator, Phonovox

power supply, ZRK

vacuum pump, Edwards (4)

null detector, English

temperature regulator, French

voltage stabilizer, Poland

DVM, English

null bridge, English

Voltmeter, Heath

function generator, Heath

VTVM, German

power supply, Heath

thermocouple thermometer, Poland

pyrometer, Polish

DMM, Heath

counter/timer, English

power supply, Heath

recorder, Heath

audio generator, Heath

frequency counter, Heath

oscilloscope, Tektronix

EMG counter, Orion

ASSIUT UNIVERSITY

The R & M Center at Assiut University is the most impressive of the 5 centers evaluated. This is borne out by the numbers of repairs performed, 50 to 70 per month. This is further evidenced by the work experience of the staff, and the access the chief technician, Mohamed Abd Elwahab, has to the president of the University. The Center is quite similar to its counterpart in the U. S. in that both the first line supervisor and the staff are technicians rather than engineers. This has apparently occured because the technicians at Assiut are far more capable than those found at the other universities. The chief technician also serves as the director of the center.

The following is a list of the staff:

1. Mohamed Abd Elwahab, chief technician and director, does fine mechanical and electronic repairs.
2. Ramadan Abd Elmabood, a technician, does electronic repairs.
3. Ahmed Ezat, an engineer, does electrical repairs.
4. Shereef Ahmed Hamza, a technician does fine mechanical repairs.
5. Gamal Essa, a secretary, issues stock and equipment.

Professors in the Faculty of Medicine indicated they were aware of the capabilities of the R & M Center and many of them had made extensive use of it. The staff members seemed to be quite satisfied with their working conditions and were observed to be busy repairing equipment at the time of the visit. This represented a contrast to many of the other

centers. The incentive program (60% of the labor charges for the repairs) seemed to be working well. There is a need for 3 additional tool kits and 3 portable oscilloscopes with basic functions. The library is in need of up-to-date cross references for semiconductors. There is a need for 3 portable digital multimeters. Special supplies needed are microscope lubricant and lens polish.

The following is an example of the equipment found at Assuit:

scaning electron microscope, Juiel

scintillation counter, Nuclear Chicago

blood gas analyzer, Searle

pH meter, Wild Heerbrugg

water bath, GFL (2)

microtome, Reichert-Jung

conditioning oven, Heraeus

microscope, wild Heerbrugg

pH meter, Prolabo

pH meter, Orion

microscope, Meopta

Centrifuge, Janelski

microtome, Leitz

incubator, Genman (CO_2)

vacuum oven, Heraeus

freeze dryer, English

conditioning oven, Heraeus

incubator, German

centrifuge MSE (2)

balance, Sartorius (3)

digital ion analyzer, Orion

spectrophotometer, Jasco

colorimeter, English

stimulator, Nihon Kohnder

flurometer, German

scintillation counter, HP

portable computer, HP

electronic balance, English

oscilloscope, Marconi

vibration meter, B&K

oscilloscope, Trio (3)

function generator, Heathkit

vacuum tube voltmeter, Advance

frequency meter, Marconi

oscilloscope, Russian

power supply, Trio (2)

power supply, Trio (2)

oscilloscope, Advance

R C oscillator, Marconi

oscilloscope, Tektronic

DVM, HP

oscilloscope, low frequency, Hungarian

function generator, B&K

power supply, Trio (2)

oscilloscope, Trio

frequency counter B&K

voltmeter, Univolt

water bath, German

electronic balance, Satorius

EI-MINIA UNIVERSITY

The R & M Center at El-Minia University is presently repairing equipment at the rate of 4 per month. The director of the Center is Dr. Kamal Abdul Hadi, Dean of the Faculty of Science. The most serious problem is the impending loss of the only staff member this summer.

The only staff member of the center is:

Rokaya Zakaria Hassan, does electronic repairs, leaving the summer of 1982.

The Center at El-Minia has had serious growing pains. Rokaya Hassan, trained at NIH could not devote all her time to repair and maintenance due to time spent performing her former job with the Engineering Department. Efforts to recruit engineers to replace those leaving have not been fruitful. It does not appear favorable that El-Minia will be able to overcome the recruitment obstacle to develop a viable program.

A sample of the equipment found at El-Minia is as follows:

flame ionization amplifier, English

gas chromatograph, Pye Unicam

recorder, LN

bridge, General Radio

vacuum pump, Edwards

thermal analyzer, Japanese

pH meter, Cambridge

electronic balance, Polish

voltage stabilizer, Zenith

laboratory shaker, English

centrifuge, Heraeus Christ

pH meter, Sargent Welch

laboratory dryer, Chriss

electronic balance, Satorious

incubator, Lotis

thermal oven, Heraeus

water bath, GFL

electronic balance, Sartorious

microtome, Bright

UV spectrophotometer, English

conditioning oven, Heraeus

incubator, Heraeus

IR spectrophotometer, Japanese

UV spectrophotometer, Japanese

incubator, Heraeus

Directorate questions regarding the R & M Centers

The main thrust of this assignment was to answer several questions for each center. This report will use a format which first states the questions and gives a reply for each center for which the question is applicable.

1. How much equipment is being repaired? Are other University facilities used to repair equipment?

   Cairo University-20 per month

   Tanta University-8 repairs total as of May, 1982

   Alexandria University-none

   Assiut University-50 to 70 per month

   El-Minia University-4 per month

   Cairo University is the only repair and maintenance center which has a significant number of repairs performed in other university facilities.

   At Cairo University, a repair and fabrication facility is maintained in the Physics Department of the Faculty of Science. It is completely independent of the R&M Center. The staff is composed of 3 engineers who design and construct equipment and do a small amount of repair. The scope of work performed is limited to the equipment owned by the Faculty of Science.

None of the universities provided numerical figures for repairs performed outside their universities, except Assuit. In the majority of cases, equipment is not repaired if it cannot be repaired locally.

2. How well are these sources presently meeting the needs of the University?

Interviews with Faculty of Science personnel in Cairo University, indicated most of the needs of the university were being met by either the R&M Center or the R&F Center in the Physics Department. Outside sources (manufacturers mostly) were used for some electronic equipment. At Assiut University most of the needs of the University were being met however, a substantial amount of equipment was on a list for repair. At Tanta and El-Minia Universities the programs were not at the level of fully meeting the needs of the staffs. Alexandria University had not yet gotten started.

3. How much equipment is idle because there is no source of repair or for any other reason?

At Cairo University, an oscilloscope and an audio amplifier could not be repaired because of the lack of an experienced trouble-shooter (electronics).

All other repair centers stated they had no equipment for which they could not find a source of repair. Since it was not practical to turn all the equipment on for a test, this could not be verified.

4. Are the owners of the equipment satisfied with the repair services they are receiving from these services? If not, what improvements would they like to see?

None of the owners of the equipment at the centers expressed dissatisfaction with the repair services, however there is obvious room for improvement at Cairo University (electronic troubleshooting) and El Minia (personnel).

5. How does the university recruit staff? How sucessful have they been in the past? Are there plans to improve recruitment procedures? Is there presently an operating incentive program? If not what plans are there for establishing an incentive program? Status of present and future in-house training programs for Center employees?

Staffing for all the University Centers is done on a local basis using the incentive program. The incentive program consists of returning 50 to 60 % of the labor costs of a repair job to the engineer who performs the work. The

incentive program has been approved by management of all the Universities except Tanta. At Tanta the approval process has not been completed but approval seems favorable. None of the University Centers has a formal training program and all anticipate using the training center being set up in Cairo.

6. Management of the center--Does the center have a manager? What is his technical background? If the center does not have a manager what plans are there for hiring one? Does the center have a management plan? How does it operate? What plans are there for any changes in the operation of the center?

One center has an unusual management plan, Alexandria University. Dr. Hamdi has decided to start the Center with part time and student workers. This way he proposes to evaluate their performance before hiring them full time. He believes this will work because of the tradition in Egypt of personnel working both a full time and a part time job due to the high cost of living. None of the centers has a formal management plan, as evidenced by the lack of paperwork to document repairs. The establishment of a management plan containing numerical goals should be a high priority for the future at each center. El-Minia is in serious need of a viable recruitment plan to fill its engineering positions. No formal program has been developed to accomplish this goal.

The managers of each center are as follows:

Cairo University-Dr. El. Sobki, electrical (power) engineer

Tanta University-Dr.Tayser El Shamy, chemist

Alexandria University-Dr. Hamdi,engineer (control)

Assuit University-Mohamed Abd Elwahab, technician (fine mech and electronics)

El-Minia-Dr. Kamal Abdel-Hadi, physicist

7. Support to staff members--Is technical assistance available to repair engineers? Are there plans for providing technical assistance if it is not available? Is there an operating system for obtaining replacement parts? If so, how does it work and how effective is it? Are there plans for modifying the procurement system?

At Cairo University electronic trouble-shooting assistance is not available, and at El-Minia neither assistance nor working engineers are available. None of the centers have a formal system for obtaining replacement parts, they either get them through manufacturers or from NIH on an as needed basis. The ground work needs to be laid for a procurement system but only after sufficient number of repairs are performed per month to support such an effort. Tanta University and Assuit University both have sufficient technical assistance. The director of the Alexandria University Center also has the technical competence necessary, however there is some question of his daily availability since he also has teaching and administrative responsibilities.

LIST OF TRAINEES

ACADEMY TRAINEES

Name	University	Training Period
ABBASSI, Wafaa A.	Cairo	3/1/80 - 8/1/80
AHMED, Samir Anwar	Assuit	3/1/80 - 8/1/80
AHMED, Mohamed Abd El Wahab	Assuit	3/1/80 - 4/1/80
BANAWAN, Ahmed Samir	Alexandria	3/1/80 - 8/1/80
FAWZI, Madiha	Assuit	6/17/81 - 11/17/81
HAMDI, Dr. Aly R.	Alexandria	8/17/81 - 9/30/81
HASSAN, Rokaya Zakaria	El-Minia	5/1/79 - 10/1/79
LATIF, Ahmed Nabil Abdel Latif	Cairo	5/1/7 - 10/1/79
MAHMOUD, Mohamed Abdou	Tanta	7/7/81 - 12/7/81
MAHMOUD, Yoursri Amin	Alexandria	2/16/81 - 7/16/81
MAKKY, Mohamed Youseff	Assuit	5/1/79 - 10/1/79
MOHAMED, E. Khalid	Cairo	3/1/80 - 8/1/80
RISK, Helen Farid	Tanta	5/1/79 - 12/1/79

COST OF TRAINING FOR ACADEMY TRAINEES

	$	LE
Contracted Training	14,000	
BEIB Salary	45,000	
BEIB Travel		
Per Diem		10,000
International Travel, baggage	4,000	20,000
Trainees Travel		
Per Diem		40,000
International Travel, baggage		10,000
TOTAL	63,000	80,000

Chapter III

Training of University Personnel in the Repair and Maintenance of Scientific Equipment

From the beginning of the project we realized that the training of repair personnel would be the most important aspect of the project. With this in mind we placed considerable effort both into the selection and training of repair personnel.

Selection of Engineers for Training

Most of the personnel proposed for training in the United States did not have previous repair and maintenance experience or significant laboratory experience during their university training which we could use to evaluate their potential to effectively learn to repair scientific instrumentation. Because of the high cost both in project funds and personnel time in providing training in the United States, it was decided to extensively evaluate potential trainees in Cairo.

Potential trainees were given a three to four week course in Applied Electronics. The course consisted of a one hour lecture followed by a three hour laboratory session. During this laboratory session students would design, build and evaluate basic circuits typically found in scientific instrumention. These laboratory sessions permitted the instructors to evaluate the student's manual and analytical skills which they would also use in troubleshooting scientific equipment. In addition to providing a mechanism for evaluating the potential trainees, this course familiarized them with typical circuits found in scientific instrumentation. We have found this type of evaluation to be very effective and plan to continue using it.

Training of Engineers at NIH

The training program at NIH began with a review of the use of test equipment and a short period of training in the use of hand tools. This training was usually completed within one week. Following this training the majority of the students participated in a 14 session course in troubleshooting, calibration, maintenance, repair, and safety of scientific instrumentation.

The course began with lectures on the general theory, orientation, and importance of instrumentation calibration, servicing, cleaning, preventative maintenance, and repair. This was followed by lectures in the following areas:

1. The safe, proper, and effective use of hand tools and test equipment.
2. Identification, analysis of operation, and troubleshooting of typical analog and digital electronic circuits.
3. Descriptions of techniques for identifying, treating, and discovering typical faults in scientific instrumentation.

The main thrust of the course involved the concepts of logical troubleshooting, organization, and use of operation and service manuals, documents, operation,

Training of Engineers at NIH (cont)

...installation, assembly, modification, calibration, troubleshooting, maintenance and repair of scientific instrumentation.

Following this introductory training the students began their on-the-job training in our repair facility. Each student was given a work bench and complete set of tools and electronic test equipment. The remainder of his or her training was provided on an individual basis geared to the students skills and rate of progress. The goal of the training was to train the students to repair a variety of the basic scientific instruments such as PH meters, power supplies, spectrophotometers, and fraction collectors. The training format was as follows:

1. Introduction to the instrument - the student would read the service manual followed by a discussion of the instrument with a senior repair specialist. These discussions included theory of operation, typical faults associated with the instrument, and techniques for troubleshooting and repairing the instrument.

2. Controlled repairs on the instruments - The student would perform repairs on instruments modified to simulate actual faults. He would attempt to find the cause of failure and "repair" the instrument.

Training of Engineers at NIH (cont.)

3. Repair - the student would repair instruments sent to our facility for repair. When possible he would also either independently or in the company of one of our repair specialists respond to requests for repair from various laboratories at NIH. He would then either make the repair in the field or if needed return the instrument to our facility for repair.

The major portion of the training at NIH was as a member of a large repair and maintenace facility. The students worked along side our employees who were available to provide technical assistance when needed. This practical hands-on training permitted the students to return to their university and immediately begin functioning with a minimum amount of supervision.

During the course of the project, we send a few trainees to manufacturer's training courses but found that the training provided was usually not effective. In general most of these courses assume that the student is familiar with and has worked on the instrumentation in question. The courses move at too rapid a pace for our students and generally they would not be able to follow the course after the first day.

THE EGYPTIAN MORE AND BETTER FOOD PROJECT: NUTRITION IN INTEGRATED RURAL DEVELOPMENT

A Thesis

Presented to the Faculty of the Graduate School

of Cornell University

in Partial Fulfillment of the Requirements for the Degree of

Master of Regional Planning

by

Rebecca Miles Doan

May 29, 1983

THE EGYPTIAN MORE AND BETTER FOOD PROJECT: NUTRITION IN INTEGRATED RURAL DEVELOPMENT

Rebecca Miles Doan, Master of Regional Planning
Cornell University, 1983

The aim of this thesis is to examine the role of nutrition in Integrated Rural Development (IRD) strategies, both as a goal, and as a measure of their impact. The thesis explores the proposition that by orienting project resources explicitly towards improving the living conditions of the rural poor, nutritional objectives may increase the likelihood that the equity goals of IRD are met. Several studies have suggested that such considerations as who benefits from project resources, expressed in nutritional and socio-economic terms, and how those benefits accrue, may give IRD an orientation towards poverty alleviation it might otherwise have lacked.

To explore the proposition, the researcher spent three months in Cairo, Egypt at the National Research Center, studying the potential nutritional impact of the More and Better Food (MBF) Project. This project is one of the few IRD projects that has incorporated explicit nutritional objectives into project design and evaluation. It began in 1978 in two villages in Lower Egypt, and included a variety of agriculture-related income-generation components. The researcher reviewed project documents and background papers on

rural Egypt, and interviewed the various professionals involved in the project since its inception. She had however only limited opportunity for discussion with project participants, due to logistical and time constraints.

The findings suggest that if malnourished subgroups of the population are to benefit from an IRD project, components must be specifically designed to fit their needs. Information is therefore needed on their nutritional and socio-economic status, their main sources of livelihood, and their perception of their problems. The analysis also suggests that unless the processes set in motion by the project are self-sustaining, they will not have a long-term impact on nutritional status or on living conditions of the rural poor in general. A long-term impact depends on malnourished groups achieving greater access to productive resources and thus gaining more control over their lives.

ACKNOWLEDGEMENTS

Many people helped to inspire and shape this thesis by facilitating my stay in Cairo, and by sharing their insights and time. I am grateful to them all for the caring and the learning.

I wish to express special thanks to Professor David Lewis, my Committee Chairman, for making this whole thing possible; to my husband and colleague Peter Doan, for being an inexhaustible source of support and inspiration throughout the study; to Dr. Osman Galal and Dr. Samieh Nockrashy for their generous hospitality and guidance of the research; and to Dr. Amin Abdou and Dr. Nagwa Abdallah for their assistance in locating and interpreting available information on food and nutrition in the villages.

I wish also to express my gratitude to all of the staff at the NRC who assisted me in my study; to Dr. John Mason of the Cornell Nutritional Surveillance Project for his support and guidance; and to Jay Davenport and Dr. Leo Packer of the U.S. National Academy of Sciences for their assistance and interest.

I owe special thanks to Professors Paul Brandford and Frank Young for willingly accepting to join my Committee part way through the study, and generously giving of their time to help shape and carry out the final write-up.

I also wish to acknowledge the Cornell Nutritional Surveillance Project, the Cornell Center for International Studies, and the Egyptian/U.S. Applied Science and Technology Project, for their financial assistance which made possible my stay in Egypt.

BIOGRAPHICAL SKETCH

Rebecca Miles Doan was born in 1955 in Bryn Mawr, Pennsylvania. She grew up in Venezuela, Northern France, and Tunisia, where her father worked for Firestone Tire and Rubber Company. She graduated from Harvard University in 1977 with a B.A. in History and Science. The topic of her thesis was an historical analysis of the rise of clinical medicine in the Byzantine and Islamic Empires.

She worked and travelled in the Middle East for three years after graduating from college. For a year, she taught in a private school on the West Bank of the Jordan, and for two years helped to administer the American Friends Service Committee Pre-School Project in the Gaza Strip. She then returned to the U.S. to work in Washington D.C. as an educational counselor for Palestinian fellowship students in the U.S.

In August 1981, she married Peter Doan and they both entered the Cornell Department of City and Regional Planning in September. Her program at Cornell focussed on policy and project analysis for international development, with a particular emphasis on social policy and nutrition. She completed the requirements for the degree and graduated in May 1983.

CONTENTS

ACKNOWLEDGEMENTS ii

BIOGRAPHICAL SKETCH iv

Chapter page

I. INTRODUCTION 1

The More and Better Food Project 3
Main Parameters of Rural Development in Egypt . . 8

II. NUTRITION IN INTEGRATED RURAL DEVELOPMENT: AN APPROACH TO EQUITABLE CHANGE 17

Introduction 17
IRD: A Controversial Concept 18
Integration of Design and Evaluation 18
Causal vs. Supportive Linkages 20
Integration of the Implementation Process . . . 24
Basic Needs vs. Structural Change 27
Simple vs. Comprehensive 31
Small vs. Large 33
New vs. Old 36
Blueprint vs. Process 40
Why Nutrition in the More and Better Food Project?. 47
An Indicator of Change in Household Welfare . . 49
A Focus on Poverty Alleviation in IRD 54
Integrating Nutritional Considerations into IRD. 55
Conclusion 62

III. THE MORE AND BETTER FOOD PROJECT: A CASE STUDY . . . 66

Introduction 66
Two Different Project Environments 70
Small Land-holdings and Non-farm Income 74
Differential Reliance on Agricultural Income . 76
Main Cropping Patterns and Production Quotas . 77
Nutritional and Social Status 79
Underlying Assumptions 82
Comprehensive Approach to the Food Issue . . . 82
Forum for Learning on a Small Scale 85
Farmer Participation in Research 86
Assessing the Reasonableness of Project Assumptions 87

Involving Village Producers: Successes and Failures 87
Subproject Agreements with Farmers 88
Cooperation with Local Agricultural Officials 90
Less Cooperation in Kafr el Khadra 92
Research May Not Be Key Constraint 94
Project Impact on the Communities 97
Self-sustainability 97
Participation by Groups with Low Socio-economic Status 101
Project Effect on Food Consumption and Nutrition 107
Conclusion 111

IV. IMPLICATIONS FOR NUTRITION IN THE MORE AND BETTER FOOD PROJECT 115

Introduction 115
Data Needs for Reaching Malnourished Groups . . 119
Design Alternatives for Achieving Equity Goals . 125
Conclusion 131

BIBLIOGRAPHY 135

330

LIST OF TABLES

Table		page
1.	Significance of Anthropometric Measures	50
2.	Kafr el Khadra: Household Classification by Main Source of Income	72
3.	Omar Makram: Household Classification by Main Source of Income	73
4.	General Socio-economic Indicators	74
5.	Agricultural Families and their Land-Holdings	76
6.	Profile of Nutritional and Social Status in the Two Villages	80
7.	Number of Farmers in MBF Subprojects	92
8.	Socio-economic and Nutritional Classification of the Two Villages	104

931

LIST OF FIGURES

Figure		page
1.	Causal Linkage IRD Model	22
2.	Supportive Linkage IRD Model	24
3.	Sequence of Project Objectives	46
4.	MBF Project Rationale	48
5.	Schematic Overview of the Principal Links Between Food-Related Policies and Programs, and Nutrition	59

Chapter I

INTRODUCTION

The More and Better Food Project, implemented to date in two Egyptian villages by the Egyptian National Research Center, embodies an innovative and promising approach to achieving the equity goals of Integrated Rural Development. The project design explicitly identifies the improvement of nutritional status as one of the main objectives of the agriculture-related components. The project rationale assumes that improved farm productivity in a broad sense will increase the real incomes of families dependent on agriculture which will in turn lead to an improvement in nutritional status. The latter is assumed to be brought about either through an enhanced ability to purchase food in the market, or through an increase in consumption of home grown produce. Nutrition is incorporated into the project both as a goal and a measure of development processes oriented towards the rural poor.

The objective of the present analysis is to assess the likelihood that the More and Better Food (MBF) Project, as designed and implemented, will have a positive impact on the populations of the two pilot villages, and to suggest ways to enhance its potential impact. It is based on the researcher's three-month stay at the National Research Center in Cairo in

333

the summer of 1982. There, she had the opportunity to interview many of the NRC scientists who have been involved in the project from its inception. She also met with the U.S. National Academy of Sciences (NAS) and the U.S. Agency for International Development (USAID) representatives who have supported and worked with the project over the years. Unfortunately, she had only limited opportunity to interview the intended beneficiaries of the project: the villagers in the two pilot areas, Omar Makram and Kafr el Khadra. Any further study of the impact of the MBF Project should include a more systematic investigation of the experiences and views of the villagers.

The analysis that follows therefore depends heavily on the impressions of NRC scientists, on studies of conditions in rural Egypt in general, and on reports of similar projects in other countries. It is not intended to be a definitive statement of the nutritional impact of the project. Indeed, since the project began only four years ago, it would be too early to expect a measurable impact on village living conditions. Instead, this assessment is intended to review the project rationale in light of experience to date, and to provide reinforcement for those self-sustaining processes which the project might set in motion to improve the status of the malnourished groups in the villages.

Following is a brief description of the project and of the main parameters of rural development in Egypt. These are

intended to set the stage for a conceptual discussion of nutrition in Integrated Rural Development (IRD) in Chapter 2, followed by an analysis of the nutritional considerations in the MBF Project in Chapter 3. Chapter 4 completes the discussion with suggestions for improving the contribution of the project to better nutrition for the village populations, and a summary of problems and opportunities for nutrition in IRD.

THE MORE AND BETTER FOOD PROJECT

The MBF Project has three main goals for its village-level activities: (1) to increase agricultural productivity , (2) to increase farm-related income-generation possibilities , and (3), to improve the nutritional status and general welfare of the village populations. The rationale implicit in the design assumes that families with increased income would purchase more food and thereby improve the nutritional status of members of the household. In addition, it assumes that increased agricultural productivity, in particular of food crop, livestock, or poultry production, or of food processing, would increase the total supply available for home consumption, thereby also increasing the opportunity for improved nutritional status without the mediation of the market.

The opportunity to implement this project arose in March 1977, as a part of the broader Applied Science and Technology

Program, funded by USAID. The Executive Committee of the More and Better Food Project decided to begin its work in two rural Egyptian villages: Omar Makram whose land was reclaimed thirty years ago from the Western Desert, and Kafr el Khadra, a traditional agricultural village in Menourieh Province in the Nile Delta region. Omar Makram is in an isolated area at a distance of 130 km. from Cairo, whereas Kafr el Khadra is only 50 km. away. The project design provided for interdisciplinary teams of NRC scientists to initially review the agricultural, nutritional, and socio-economic conditions in the two villages and recommend various sub-projects. To date, those implemented have included mainly field and vegetable crop activities as well as several demonstration centers aimed at providing increased food supply and/or income-generating opportunities for agricultural families.

The field and vegetable crop sub-components have involved at different times the main crops in the two villages: peanuts, wheat, and maize in Omar Makram, and maize in Kafr el Khadra, as well as experiments with growing tomatoes on stakes and wires, potatoes, onions and beans. In each case, the NRC entered into a cooperative agreement with several farmers to try out an improved "package" determined on the basis of research and discussion with the farmer. This usually included a new, high-yielding seed variety, new fertilizers and/or pesticides, as well as different cultivation techniques when these were appropriate. The NRC subsidized the costs

incurred by the first participating farmers, i.e. those taking the initial risk. Once a new technique had proven itself, the NRC continued to accept new participants in the project but did not subsidize them. The NRC did however continue to procure inputs unavailable locally, and to advise farmers as they tried the new methods.

The sub-projects involving demonstration centers were of a different nature. Model apiaries, poultry confinement areas, and dairy processing centers were set up in both villages. In Kafr el Khadra, a center for raising silk worms, a traditional activity that had almost died out, was also established. Each center was centrally located, and provided training and assistance to any villager who requested it. In some cases, the NRC provided loans to help the producers get started. Therefore, many villagers potentially had access to project benefits in the way of information and training, and a smaller number actually received subsidized inputs over the experimental period.

Which sub-projects were implemented mainly depended on the organizational ability of the NRC teams and their success in identifying with the farmers, a problem to which a solution could be found. Once interest in the project was confirmed and the initial agreement defined, a Principal Investigator and his research team submitted their proposal to the More and Better Food Executive Committee. Subprojects were therefore implemented at different intervals, depending on the interest

of the villagers , the availability of funds, and the ability of the scientists to effectively organize any sub-project. The Project faced many logistical difficulties trying to run projects in the two villages, from the NRC in Cairo. The poor road conditions, and the lack of NRC facilities -- office, field testing sites, guest house -- in the rural areas, all presented obstacles. Unlike the Nutrition Institute of the Ministry of Health or the Irrigation Research Institute of the Ministry of Agriculture, the NRC does not have established linkages with the governorate-level infrastructure such as the extension service, the health clinics, or regional research centers. Building effective working relationships with government officials at the local and national levels was therefore an integral part of project activity.

Despite the difficulties and constraints, the project has, over the past four years, offered technical assistance to several hundred agricultural producers in the two villages. To date sub-projects have sought to deal mainly with the first two goals of the project: increasing food production and helping to build income-generating opportunities in the villages. The third goal, improving nutrition, has not yet been explicitly addressed in program implementation. Options for direct nutritional interventions have been considered and tested at various levels; thus far, the NRC has carried out small-scale interventions to combat some immediate health problems, and tested the acceptability of high-protein snacks

for school children. These activities have not been widely implemented since it is not clear that they are either the most appropriate or the most cost-effective uses for project funds. Research efforts, of which this one is a part, have been carried out to assess the nature of the nutritional problems in the villages, and to examine the likelihood that the income-generating projects will modify these conditions.

As will become apparent, the MBF Project is similar in design to other projects referred to as Integrated Rural Development projects. It differs primarily in that it attempts to incorporate an explicit concern for nutrition into a project that mainly stresses agricultural production and farm-related income generation. The MBF Project grows out of Egypt's long experience with rural development but represents the NRC's first attempt at pilot efforts in the rural areas. It reflects the NRC's growing concern for orienting its research agenda towards problems of relevance to the socio-economic development of Egypt. Indeed, over the past ten years, NRC managers have been increasingly concerned about the mainly academic nature of its scientific research. Not unlike their colleagues around the world, NRC scientists have tended to do research that would win them international recognition through articles published in international journals. This sort of incentive system brings into question the appropriate orientation of public research and raises the issue of whose demands it should be responsive to. NRC

managers have tried to reorient the reward system such that it is not only basic research publishable in journals that is recognized but also applied work of use to the nation.[1] The Applied Science and Technology Project of which MBF is a part, provided the NRC with the funding to support and reward applied research. It is funded by USAID and coordinated by the NAS.

MAIN PARAMETERS OF RURAL DEVELOPMENT IN EGYPT

Egypt has had a long history of policies and programs aimed at improving living conditions in the rural areas. With only 4% of total land area usable for agriculture, a population estimated to have doubled since 1947, and an alarming dependence on food imports, Egypt has consistently encouraged investment in food production. Unlike many other countries, it has also carried out redistributive policies along with programs to increase national productivity.

Indeed, the land reforms of 1952, the government support for agriculture through the cooperative movement, and the vast food subsidy programs, reflect the government's ongoing concern for social welfare and for protecting the incomes of small farmers. One writer suggests that the concern for the welfare of the rural areas comes from the fact that many

---

[1] For more information on the efforts of the NRC to orient its research towards national development issues, see Lewis, D. et al., The Technical Challenge of Development: Managing Research in Egypt (forthcoming), and Doan, P. L. End-User Participation in Research in Egypt (forthcoming).

policy-makers are themselves from the countryside.

> A large proportion of the present technical, intellectual, and political leadership of Egypt consists of 'sons of the soil' without whose migration national political development would have suffered, and without whose pressures for rural land reform and development the villages of Egypt would have remained as ignored and ignorant as they have been for centuries.[2]

The redistributive policies also reflect the government's orientation towards central planning and a development strategy that requires the agricultural surplus to subsidize a nascent industrial sector. Rural development policies have therefore often been implemented to decrease the rate of rural-to-urban migration, to keep urban wages low, and to hold down domestic food prices. Direct government intervention in these areas has had and continues to have major implications for rural development in Egypt. A brief discussion of these in the introduction should help to clarify the issues to be raised in the context of the MBF Case Study in Chapter 3. The discussion will not attempt a thorough analysis of the Egyptian situation but rather will outline the major factors affecting food production and consumption in the rural areas. For greater detail, the interested reader should refer to the wealth of writings by Egyptian scholars and others, tracing the history of agricultural development, the impact of land reform policies and the cooperative movement, and present day rural development.[3]

---

[2] Abu Lughod (1972), p.317.

[3] See Abdel-Fadil (1975), Radwan and Lee (1977), Harik (1979),

Egyptian farmers and their families have been employed for generations on the 4% of Egypt's land area that is cultivable, located in a narrow strip along the Nile and in the Nile Delta. This land is highly productive.

> The soils are mostly riparian silts and clays of great depth, fertility, and uniformity. The topography is such that erosion is not a problem and land is well suited to irrigation. Abundant water of good quality flows down the Nile and is distributed to farms through a well-developed storage and distribution system... Such a mixture allows cropping intensities of 190 percent, with higher yields than many other countries, in a complex rotation of crops developed over many generations.[4]

It is not surprising then that Egypt is still so dependent on the agricultural sector. Within the agricultural sector, production is characterized by a majority of small land-holders and a minority of larger farmers.

> About 85 percent of the farmers, using bullock and human labor, work their three feddans or less for both the marketplace and their own consumption. The other 15 percent use varying amounts of machine technology to produce single-purpose crops specifically for off-farm sale.[5]

Since 1952 when Nasser came to power, the government has introduced a variety of measures to overcome the problems of small-ness of land-holdings and poverty and to maintain farmers' incomes. At about the same time, the government began a food subsidy system as a means towards greater equality between rural and urban areas.

Ikram (1980), and Richards (1982).

[4] Ikram (1980), p.169.

[5] Ibid, p.170.

Most writers agree that the land reforms of 1952 and the cooperative movement were successful in weakening the traditional power structure in the rural provinces, but only temporarily slowed the pace of fragmentation of land-holdings and rural poverty. In 1952, land-holdings in excess of 200 feddans, then 100 and then 50, were "requisitioned by the government for distribution to tenants in plots of at least two, and not more than five, feddans per family."[6] Concurrently, the government initiated the multi-purpose cooperative system "which enabled groups of small farmers to pool their work on fragmented parcels of land and provided a reliable channel of credit from the banks."[7] They provided seeds and fertilizer on credit, and were reimbursed by sale of the produce. Members were responsible for cultivating their private plots but the cooperative retained responsibility for pesticide praying and sale of the produce.[8] They were jointly run by officials from the Ministry of Agrarian Reform and at least initially, by a board elected by reform peasants. This reflected the views of Nasser, the country's leader from 1952 to 1970, that the bureaucracy and not the official political party should be relied on to implement national goals.[9]

---

[6] Ikram (1980), p.211.

[7] Ibid, p.212.

[8] Harik (1972), p.295.

[9] Ibid, p.301.

The effects of government intervention in agriculture have been mixed. On the one hand, the cooperative system allowed fragmented land-holdings to be farmed in large, contiguous areas with machinery and services provided to groups of farmers. The experiment with consolidated crop rotation and application of pesticides, in particular to the cotton crop, had proved successful.[10] In addition, land consolidation and the cooperative system at least initially, seems to have kept the fragmentation of land-holdings from having adverse effects on the economy.[11] Furthermore, public investment in agriculture has been considerable: the Aswan High Dam for example has allowed for intensification of farming.

However, the solutions of the 50's and 60's have created their own set of problems, only a few of which will be mentioned here. The cooperative system gave the government control over the agricultural surplus; the latter often left the rural areas to pay for economic development in other sectors. Furthermore, land reform only temporarily slowed the decrease in size of land-holdings and the poverty associated with small holdings. Inheritance customs and rapid population growth contributed to renewed fragmentation. Since the 1952 revolution, the population of Egypt has doubled. "In spite of increases in irrigated land area, improved cropping intensity, and gains from research, the pressure of population on a

---

[10] Richards (1982), p.18.

[11] Harik (1972), p.310.

relatively fixed area of land already intensively farmed has resulted in declining per capita performance."[12] The inflexible and frequently conflicting price controls imposed by the government through the cooperatives, undermined the profitability of government-controlled crops (fruits and vegetables have not been thus far subjected to controls and so are currently among the few highly lucrative crops for farmers who have the capacity to market them); the heavy implicit taxation of agriculture that this represents has depressed rural incomes to perhaps half the level of urban incomes.[13] Government control of agriculture has therefore worked to the disadvantage of the cultivators and has contributed to the decline in agricultural productivity.

The inability of the agricultural sector to keep up with the rising demand for food, coupled with sustained pressure on the urban areas due to high rates of rural-to-urban migration, have had major repercussions for the government's consumer subsidies program. As mentioned earlier, the Egyptian government maintains a vast subsidy program in order to ensure that the prices of essential commodities are kept at affordable levels for all. These subsidies are particularly crucial for the poor as a protection from major deprivation.[14] Vast quantities of imported foods, along with goods procured

[12] Ikram (1980), p.172.

[13] Ibid, p.205.

[14] See Alderman (1982) for a comprehensive description of Egypt's food subsidy program and its effects.

from domestic producers, are distributed in the urban areas and in most rural areas, at subsidized prices. They include wheat bread, various qualities of wheat flour, meats, lentils, beans, rice, sugar, cooking oil and tea. The latter four are sold through a ration card system based on family size, whereas the former are sold at government cooperative stores. The subsidies represent a significant portion of many people's real incomes.

Although many analysts deplore the strain that such high levels of subsidies places on the national economy, it is not likely that the government will consider any major restructuring in the near future. Indeed, any attempts to eliminate the subsidies "could trigger major social tensions and lead to disturbances, as occurred in January 1977."[15] At that time, mass riots occurred as a result of the government's attempts to reduce subsidy levels. Thus, the political investment in these programs is high, making them difficult to change. Nonetheless, the government is concerned about the fact that a large proportion of the subsidies are dependent on imported foods or food aid from the U.S. Therefore, one of its main priorities is to encourage greater food production within Egypt to reduce dependence on imports and increase food security.

---

[15] Ikram (1980), p.50.

Although agricultural policies in Egypt are set at the national level, implementation at the regional and local levels varies significantly. Indeed, not all areas are subject to the same crop rotations, nor are all subsidized foods equally available in all areas at all times. The MBF Project therefore has had to take into consideration the effect of government intervention in agriculture, and the extent to which the project beneficiaries depend on government subsidies since both are likely to influence production and consumption decisions at the household level. In addition, questions have arisen with regards to the effect of migration, remittances and fragmented land-holdings on income and employment patterns in the project areas. The literature suggests that employment rather than productive assets, may be the main source of income given the rapidly growing population and a fixed supply of arable land.[16] As will be discussed at greater length in Chapter 3, given its small scale and the flexibility of its design, the MBF Project has been able to effectively overcome some of the constraints to increased production for small farmers; other obstacles however are more difficult for an isolated project to rise above.

As will become apparent in Chapter 2, although the national context is unique, the MBF Project has many elements in common with Integrated Rural Development projects in general: an emphasis on the agricultural sector including non-farm sources

---

[16] Radwan (1977), p.56.

of income, as well as a comprehensive approach to improving rural living conditions. It also shares many of the difficulties faced in implementing a multi-disciplinary project oriented towards benefitting small producers. It differs primarily in that it incorporates the special interests and orientation of the implementing institution: an explicit concern for nutrition, an emphasis on research, and an organizational structure based in Cairo rather than in the field.

It is the innovative idea of including nutrition as the main component addressing rural living conditions, that is of interest in this thesis. Therefore, Chapter 2 introduces the theoretical guidelines for including nutritional considerations in Integrated Rural Development, beginning with an analysis of the IRD concept as it appears in the literature, and culminating in a discussion of how nutrition might contribute to the success of IRD strategies in reaching their stated objectives. It combines concerns both for appropriate action and for reflection through data collection and analysis, such that larger problems and potential structural obstacles, such as those discussed in this chapter, are not overlooked.

Chapter II

NUTRITION IN INTEGRATED RURAL DEVELOPMENT: AN APPROACH TO EQUITABLE CHANGE

INTRODUCTION

Integrated Rural Development is a concept that has intrigued experts from a variety of disciplines and perspectives as they search for alternatives to the growth policies characteristic of the first half of this century.[17] The result is a very colorful, innovative but disjointed array of projects, all referred to at some point or another as Integrated Rural Development (IRD). The More and Better Food Project then is but one of many, sharing with others some of the core elements of IRD, but incorporating an innovative approach: the integration of nutritional considerations.

As background for the detailed analysis of the More and Better Food Project in Chapter 3, Chapter 2 introduces in the first section the three core elements of an IRD strategy: the simultaneous attack on the causes of rural poverty, a coherent rationale for design and evaluation, and an overall objective of reaching the rural poor. It points out that integration refers both to a characteristic of project design and

[17] For analysis of the experience of donor agencies in IRD see the USAID study Development Information on IRD (1978), and USAID (1980); for a critical perspective, see DeJanvry (1981) especially pp. 224-252.

349

organizational structure. The first section goes on to review the main controversies that enliven debates on IRD: Basic Needs vs. Structural Change, Simple vs. Comprehensive, Small vs. Large, New vs. Old, Blueprint vs. Process.[18]

The second section of Chapter 2 addresses the question often asked of people associated with the More and Better Food Project: why nutrition? Both the advantages and disadvantages of a focus on nutrition are addressed in the second part of the chapter. The reader is then left with some reflections on how theory and experience to date might guide t incorporation of nutritional considerations into a project such as MBF which is explicitly oriented towards the rural poor.

IRD: A CONTROVERSIAL CONCEPT

Integration of Design and Evaluation

IRD grew out of a major shift in development theory beginning in the mid-1960's. John Conen , in his article entitled "Integrated Rural Development: Clearing Out the Underbrush", briefly summarizes the transition.

> Widespread acceptance was given to the view that for many less developed countries agriculture can be the major engine for growth... and increased recognition was extended to arguments that small scale farms can play a major role in agriculture-led development... Moscher's pragmatic conception of the interrelated components necessary to create a progressive rural structure, and new theoretical guidelines developed by social scientists and donor

---

[18] The latter four labels have been borrowed from USAID (1980).

> policy-makers for making the rural sector a key to development, have led to the emergence of complex, well-funded programmatic efforts in the countryside, the most visible of which tend to be labelled "integrated rural development" projects.[19]

Since then, a great variety of IRD projects and programs were tried, all of which addressed a set of issues left out of previous growth-oriented sectoral strategies. IRD projects have ranged from area-wide government programs to village-level projects, from large, multiple-component projects to small, simple ones, from efforts dominated by physical infrastructure to those stressing local participation and control. These have given rise to a variety of working definitions.

There is little agreement in the literature as to the meaning of the concept Integrated Rural Development or as to its operationalization. The lack of conceptual clarity has meant that IRD models e' . y widely divergent development philosophies, although all share a common orientation towards agriculture and towards the rural poor. As the concept gained the attention of development agencies, "academics promoting increased emphasis on the rural poor were supported by politicians and policy-makers who were aware of the revolutionary potential of poor peasants."[20] This basic philosophical difference permeates most discussions of IRD and ensures that "experts" are often talking past each other.

---

[19] Cohen (1980), p.197.

[20] Ibid, p.200.

For the purposes of an overview of IRD such as this one, it seems useful to adopt a comprehensive but general definition of the concept -- one around which there is consensus in the literature -- and then turn to a discussion of the controversies surrounding specific aspects of IRD design and implementation. In the following pages, Integrated Rural Development will therefore be defined as the process of combining multiple development services into a coherent effort to improve the living conditions of rural populations .[21] This definition highlights the core elements of most IRD strategies: (a) that IRD includes project components simultaneously addressing the various causes of rural poverty; (b) that these components are combined according to a coherent rationale whereby the whole is expected to have a greater impact than the sum of the parts; (c) that the main goal of IRD is to improve the economic and social conditions of the poorest among those who seek a livelihood in the rural areas.

Causal vs. Supportive Linkages

In theory, these three factors provide the basis for achieving integration of project design and evaluation, i.e. for providing a rationale whereby each subcomponent or a strategy enhances the impact of the other, and all are supportive of the final objective: improving living conditions in the rural areas. The United Nations Department of Economic and Social

---

[21] USAID, (1980).

Affairs suggests two models for IRD projects, one representing a design whose subcomponents are all linearly related, and the other representing a design with two program objectives that are mutually supportive but not linked.

An example of the first model is the IRD project that was run by the Chilalo Agricultural Development Unit in Ethiopia (1968); it was designed to increase the incomes of small producers and motivate "the local people to assume increased responsibility for the development work by helping them to learn to help themselves, in order to make development a self-sustaining process."[22] It may be modelled as shown in Figure 1 since it assumes that greater participation of small producers in the development process through the formation of cooperatives (a), leads to improved productivity (b) which in turn causes their incomes to increase (c). Increased incomes then directly affect rural living conditions (d). The model suggests that (a), (b), and (c) are causally linked to (d), i.e. that greater participation, through the influence of higher productivity and incomes, is the main determinant of living conditions. In other words, the relationship is expected to be linear.

Short-run direct interventions are not included in this model. The final outcome is to improve rural living conditions, as measured by an increase in real income, an improvement in people's access to services, and an increase in

---

[22] United Nations Dept. of Economic and Social Affairs (1978).

Formation of coops(a) --→ Improved productivity(b) --→ Increased incomes(c) --→ Improved rural living conditions(d)

Figure 1: Causal Linkage IRD Model

Source: Adapted from UN (1978), p.4.

their ability to provide for their basic needs. "Basic needs" is usually defined to include two components.

> First, they include certain minimum requirements of a family for private consumption: adequate food, shelter, and clothing are obviously included, as would be certain household equipment and furniture. Second, they include essential services provided by and for the community at large, such as safe drinking water, sanitation, public transport, and health and educational facilities.[23]

In this model, the project is designed to provide the means whereby a family may enjoy a minimum level of requirements as referred to in the first component of the definition. The next model reflects projects that are designed to directly provide for community-level services, also a component of basic needs.

The Matourkou program in Upper Volta provides a good illustration of the Supportive Linkage model; it included the continual direct provision of services such as health and

[23] ILO (1976), p.32.

education to maintain adequate levels of living. It incorporated two program objectives: raising farm and off-farm productivity and providing for community-level basic needs. The productivity and basic needs objectives were mutually supportive rather than causal, because they were the outcome of two different processes: one was self-sustaining whereas the other required the ongoing delivery of goods and services. The project components causing the two outcomes were functionally separate. Technical assistance for improved cultivation(a), training of extension workers(b), and the establishment of demonstration centers for livestock breeding(c), were all designed to increase agricultural productivity while health and educational assistance(d) was designed to directly provide for the basic needs of the population. The model might appear as in Figure 2 shown below.

Implicit in the model is the assumption that the two program objectives, if implemented simultaneously, will be mutually reinforcing. This sort of strategy attempts to meet both short and long-run objectives. Since it assumes that improved living conditions are necessary for development, the provision of basic needs is built into the model as a parallel component to the production-oriented components.

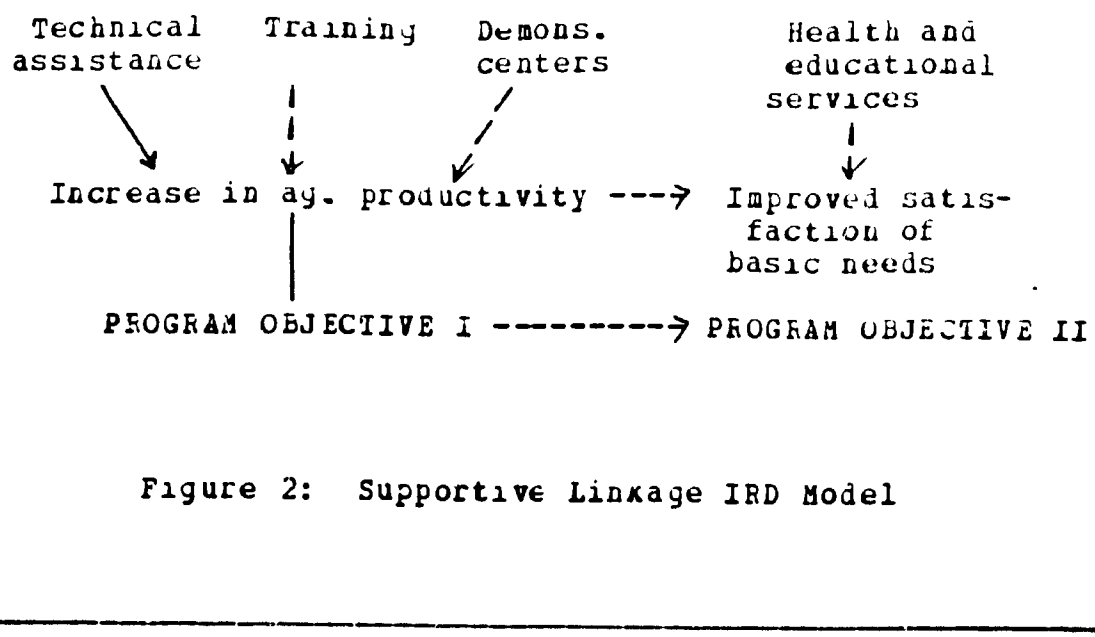


Figure 2: Supportive Linkage IRD Model

Source: Adapted from UN 1978, p.4.

Integration of the Implementation Process

Integration must not only characterize project design but also the implementation process. A good project design does not guarantee that the poor will be brought into the development process. The desired impact depends heavily on a successful project implementation, just as an effective implementation process depends on a sound project design. Integration therefore also refers to the structure of the organization actually in charge of the particular IRD effort in question: the level at which decisions are made, the lines of accountability, the degree of coordination, and the degree of local participation and control.

The clear definition of the terms "integration" and "coordination" provided by a Development Alternatives Inc. (DAI) study, help to separate out the various levels of organization crucial to a successful implementation of IRD.

> Integration denotes structure and implies comprehensiveness (a multi-sectoral focus) and control (direct lines of authority). Coordination on the other hand, describes the type of managerial behavior required to produce the results visualized by the designers of an integrated project. The word itself provides a clue to the behavior it describes: "co-" suggests joint or shared activities, while "-ordination" implies the ranking or the establishment of priorities. Establishing priorities includes consideration of the timing, type, quality and services produced. It also includes the distribution of implementation responsibility. The joint effort refers to sharing resources and information to guarantee the needed mix of goods and services.[24]

In an integrated organization, people from different disciplines are all accountable to the same project manager who ensures the appropriateness of the opportunities being offered to the participating populations.

Effective integration and coordination appear to be crucial determinants of project success. Indeed, most IRD projects involve at least two institutions and often more; these may be ministries, universities, research institutes, or local organizations from a wide variety of sectors. Many times, the fragmentation of the public sector and the sharp division of responsibility among different parts create a major stumbling block to IRD.

---

[24] USAID (1980), pp.28,31.

Moreover, many of the activities promoted by IRD strategists, namely a meaningful redistribution of resources, run counter to vested interests. For example, land reform inevitably involves taking from the more wealthy and giving to the resource-poor. It is not surprising then that in many countries there is strong political resistance to a full-scale land reform. And yet land reform may be the key to the ability of the small farmers to make use of the improved technologies introduced by IRD strategies. In a slightly different way, promoting participation by those without power in decision-making processes also runs counter to the perceived interests of those in power. To promote participation through existing institutions is likely to evoke resistance, but is also crucial to the effectiveness of efforts to assist low-income farmers in gaining access to productive resources.

Furthermore, researchers from most of the pure and applied sciences and at least recently, all of the social sciences, are usually involved in any IRD project. Sometimes the researchers are actually located in different places or institutions: government departments, universities, research institutes, and scattered field situations.

> The researchers involved, like their colleagues throughout the world, have territorial tendancies, are independent of mind, resent a directing authority, and are partly motivated by a desire for professional recognition and advancement quite largely through publications which lead to acclaim by their peers, preferably on an international

level.[25]

It therefore becomes difficult to achieve enough communication and common ground so that experience can feedback into ongoing project management, and adjustments in project processes can be made that will help achieve project goals more effectively.

These difficulties and others contribute to the controversies surrounding discussions of IRD implementation. Is it enough to provide adequate levels of basic needs or must a meaningful change be brought about in the structure of resource allocation before IRD efforts can be successful in improving living conditions over the long term? Is comprehensiveness necessarily an asset for IRD projects? Must IRD projects be large to be effective? Should IRD projects work through established institutions or should new ones with more autonomy be set up? Should a project design outline in detail the project processes or should more flexibility be built in? As experience accumulates, the relative advantages of different approaches become more clear.

Basic Needs vs. Structural Change

Although there is general agreement in the literature as to the objective of improving the living conditions of the rural poor, there is little consensus as to the underlying goal of such a strategy. Is it merely to keep the rural masses satisfied or to meaningfully integrate them into the

---

[25] Chambers (1974), p.130.

development process? For an agency such as the World Bank, the fulfillment of basic needs is perceived to be a necessary ingredient for national development, rather than a way for people to gain greater control over productive resources.

> Rural development recognizes ... that improved food supplies and nutrition, together with basic services such as health and education, cannot only directly improve the physical well-being and quality-of-life of the rural poor, but can also indirectly enhance their productivity and their ability to contribute to the national economy.[26]

Indeed, the World Bank is mainly concerned with "the modernization and monetization of rural society, and its transition from traditional isolation to integration with the national economy."[27]

There seemed to be evidence to show that an orientation towards smallholders would actually benefit national economic development by increasing productivity and increasing the effective demand for food and other goods. Indeed. USAID for one, found that capital-intensive growth-oriented strategies did not produce optimal growth because income effects tended to favor the wealthy, food production was less than optimal, employment creation was limited and the potential effective demand for food and other basic products was inhibited. They thererfore assumed that under appropriate conditions of organization and access to credit, technology and the market, such as those envisioned in IRD strategies, small farm units

---

[26] World Bank (1975), p.3.

[27] Ibid, p.3.

would be more productive per acre than large farm units, and investment in high yield labor-intensive farming would be more productive than capital-intensive farming. According to this rationale, development strategies oriented to the small producers would redress the inequalities in income distribution by enabling the poor to create their own wealth.[28]

Although some proponents of this view acknowledge that such redistributive policies as land and credit reform would facilitate the improvement of rural welfare, they assume "effective land tenure and credit reforms, an increase in government-peasant dialogue, and greater participation by and benefits for small producers and landless laborers,"[29] but do not explicitly advocate them. It is generally assumed that local or international agencies carrying out IRD projects are not in a position to influence policies which affect the overall redistribution of national resources. Therefore, although much has been written about the importance of institutional reform in the rural areas, a true shift in resources and power towards the poor has often been assumed but seldom achieved.

The opposing view, such as that held by De Janvry, considers the transformation of the rural power structure as the ultimate goal of IRD. He warns against a basic needs

---

[28] USAID (1978), p.75.

[29] Ibid (1978), p.9.

approach "whereby minimum income levels have to be ensured for all via the distribution of public amenities while growth is stimulated."[30] With the latter approach, there is the danger that the provision of basic needs will become merely a palliative to satisfy the rural poor.

> [A basic needs approach] should be understood as an effort to achieve the structural changes needed to reconcile growth and distribution and to make the satisfaction of basic needs the essential purpose of economic growth. As growth occurs and personal incomes increase, basic needs are continuously redefined beyond mere subsistence and are met in accordance with the rising productivity of labor.[31]

DeJanvry therefore promotes programs that are instruments of social change, that are conducted by peasants and raise their class consciousness rather than merely programs for the diffusion of technology.[32]

Few IRD projects actually emphasize rural transformation. John Cohen points out that if it was agreed that such an emphasis was essential, "it would exclude many of the more well known IRD projects, primarily because they lack the programmatic components necessary to promote social change in an explicit way."[33] He concludes however that it is possible to promote improvements in the productivity and income of the rural poor without considering the ultimate effect on political and economic institutions. Indeed, there is some

[30] DeJanvry (1981), p.264.

[31] Ibid, p.264.

[32] Ibid, p.268.

[33] Cohen (1980), p.204.

evidence that progress can be made in meeting basic needs in this way but the results will most often be specific to an individual project or program.[34]

Simple vs. Comprehensive

Some analysts feel that simplicity is the key to the success of IRD whereas others claim that a comprehensive approach, although more difficult to implement, is more likely to provide a long-term solution to the root causes of poverty. The former claim that simple projects are more appropriate for resource-scarce rural areas; they do not require high-cost technology and outside experts and therefore have a greater chance of fostering beneficiary participation. Proponents of this view suggest that by attempting to do too much too quickly, high expectations are often raised and then disappointed.[35] Chambers in particular warns against the assumption that integration and coordination are automatic benefits. Unconnected projects, he claims, may be best implemented in an unconnected fashion in order to avoid the potential waste and inequity when scarce resources are concentrated in one area. Chambers pushes the point further and suggests that "even when projects are connected, the costs as well as the benefits of whatever procedures are proposed for relating them together have to be weighed in assessing

---

[34] See discussion in Mason et al. (forthcoming), pp. I.21-25D.

[35] See summary of this position in USAID (1980), p.39.

whether they would better continue independently."[36]

Opponents of the "simple is optimal" school contend that the simultaneous implementation of mutually-supportive or functionally-related project components leads to a more effective and more equitable development process.

> Since there is an intricate web of constraints which suppresses rural development, solutions must focus on the entire web rather than just individual strands... Ignoring any one strand can negate the entire effort and may even cause damages that result in conditions worse than the original situation.[37]

Whether simple or comprehensive is the better approach probably depends a great deal on the area in consideration and the nature of the problem to be solved. However, since the negative side effects may be more important than the intended positive effects,[38] it is suggested that a willingness to deal with the complexity of rural areas at the design stage, at least decreases the chances for destructive impacts. In project implementation it is then crucial to narrow down to those components that are functionally related and supportive of the same overall goals.

One of the keys to the effectiveness of a more complex IRD strategy is an understanding of the dynamics of rural poverty such that an accurate assessment can be made of its causes. In addition, such an understanding would help identify those

---

[36] Chambers, p.25.

[37] USAID (1980), p.40.

[38] USAID (1980), p.173; also mentioned in Chambers(1974), p.122.

factors, if any, open to change, and the appropriate mix of goods and services . The United Nations Department of Economic and Social Affairs describes this level of integration as follows:

> Development programmes and the strategies from which they are derived, can be said to be integrated if they take full account of the close interrelationship between economic and social factors and the interdependence between the various sectoral subprocesses of development in: (a) analyzing the existing impediments to socio-economic change and progress; (b) formulating development goals and objectives; and (c) planning practical measures needed for promoting developmental change. Owing to their multi-faceted approach to development analysis and planning, integrated development programmes typically comprise several sectoral project components designed to be mutually supportive and/or functionally interrelated.[39]

True integration in the project design and evaluation therefore depends on a conceptualization of the determinants of rural poverty in all of their complexity, and theoretical guidelines on which to base trade-offs and the setting of priorities for the subcomponents.

Small vs. Large

The argument for smallness is similar to that for simplicity. "Just as simple programs are more fitted to areas with low absorptive capacity, so too, programs with small budgets may be more easily absorbed by rural government structures and user associations."[40] Proponents of large programs however

---

[39] UN(1978), pp.2-3.

[40] USAID (1980), p.41.

argue that small projects are not efficient enough in reaching large numbers of people.

Those who support small projects claim that they are more likely to provide the flexibility and localized knowledge to successfully adapt technologies to complex environments. Small efforts often include several cycles of testing, evaluation and modification before deciding on replicating or abandoning the project. They are also more likely to be flexible enough to allow meaningful participation by potential beneficiaries.

Proponents of large programs on the other hand, touch on issues of budget, area and administrative hierarchy. First, operations with small budgets are seen as administratively inefficient, "since the bureaucratic energy required to plan, approve, and implement multiple low cost projects exceeds that needed to launch a few high cost ones."[41] Large programs are more visible and therefore more likely to get political support. In addition, some have argued, the pilot project experimental approach may require such an intense human and financial effort, that even if it is determined that the project should be replicated, it will not be possible to do so. IRD pilot projects are particularly vulnerable to this difficulty because of their emphasis on adapting technologies to local conditions. IRD pilot projects usually require concentrated human and financial inputs to adapt technical

---

[41] USAID (1980), p.41.

packages to a number of areas, encourage participation in decision-making by local producers and to organize, manage and train human resources so that the project becomes self-sustaining. One writer warns that such intensity can probably not be sustained at a national or even a regional level, and that such projects are often too costly and too demanding of trained manpower to be effectively replicated.[42]

Secondly, projects must be large enough to encompass the crucial rural-urban links and to take into consideration such factors as migration, transportation, revenue-generation and resource transfers between marketing centers and intermediate cities.[43] And thirdly, those advocating larger programs favor "national or subnational agencies with a broad enough coverage to encompass the important areas."[44] If the area targetted for IRD does not correspond to administrative boundaries, then new agencies, focussing for example on a river basin, may be warranted.[45]

The evidence is not yet in to determine whether small or large programs are more effective. If the latter can be made to work, they will undoubtedly reach more people, but it may be impossible to reach low-income producers except through small-scale participatory efforts at the village level.

---

[42] Ruttan in USAID (1978), p.10

[43] USAID (1980), p.42.

[44] Ibid, p.42.

[45] Ibid, p.42.

New vs. Old

There seems to be an ongoing debate as to the trade-offs between setting up new, autonomous organizations to run IRD -- thus creating dependency on a temporary institution -- and relying on existing agencies that are tied up in power struggles and inefficiencies, but have the potential for coordinating an IRD effort over the long term. The main argument of those who support creating new organizations to implement IRD is that "cumbersome bureaucracies can make it very difficult to deliver services to rural inhabitants or to obtain their participation in program decisions or benefits."[46] Since many IRD projects are heavily weighted towards the agricultural sector, direct contact between extension workers and small farmers is usually the main vehicle for information dissemination. In some areas, this approach has been a major obstacle to achieving rural equity because of the "tendency for extension workers, whether in agriculture, health, home economics or community development, to concentrate their attention on those who were already better off."[47] In agriculture in many countries, it was official policy to seek out innovators and let them set the example for others. While this approach may have been justified under some circumstances, "it did tend to widen the gap between the 'progressive' farmers and the rest", since it

---

[46] Ibid, p.37.

[47] Chambers (1974), p.79.

is the first ones to innovate who gain the highest profit margins. Moreover, Chambers claims,

> It legitimated what the extension worker was anyway inclined to do: to associate with and reciprocate services with those who were better off, who were more prepared to adopt new practices, who had resources and power and who could bestow benefits. [Extension workers] are powerfully locked in socially and economically with those who are already better off. It is also professionally natural for them to concentrate on those who have cash crops, if it is only for cash crops that they have advice or services to offer. They also often need to have a number of docile good farmers who are prepared to allow demonstrations on their farms, and to be on show to visiting dignitaries. The extension worker is caught in an administrative, social and economic network in which he trades his resources (loans, subsidized equipment, privileged access to inputs, information) for reciprocal benefits which he is most likely to secure from the richer member of the community.[48]

Proponents of side-stepping permanent agencies or local organizations are both interested in supporting the participation of rural people and in reinforcing donor control over the project.[49]

Opponents of this model support the use of existing governmental bodies to implement rural development programs. They focus on "the need to build local capabilities so that development can become a self-sustaining enterprise."[50] They reject the introduction of new agencies because they are temporary, they divert scarce resources from existing institutions thereby weakening them, and they perpetuate a

[48] Ibid, p.80.

[49] USAID (1980), p.37.

[50] Ibid, p.38.

dependence on outsiders.[51]

Admittedly, the difficulties of working through the government extension service are many in most countries. It may be however, the only way to ensure the self-sustainability of the benefits of a given change in the agricultural sector, mainly because farmers, in most countries, depend on the support of a variety of government agencies: credit institutions, agencies providing subsidized inputs, marketing cooperatives, extension services. Thus, it has been argued that IRD projects should include a commitment to building the organizational capacity to carry on once the project itself is terminated. The challenge for project managers working in cooperation with the agricultural extension service for example seems to be in reorienting their training and routines such that they may help the "invisible and disadvantaged" people who most need their assistance.

More conventional training is probably not a solution to the problem of reaching the poor since it generally stresses the skills that can best be exercised with more progressive farmers.[52] Some general recommendations regarding how best to reach small producers have been made in the literature, only a few of which will be mentioned here because of their relevance to later discussions. It has been suggested that "if organizational units are based on clients with common economic

---

[51] This section draws on USAID (1980), pp.37-38.

[52] Chambers (1974), p.83.

interests, rather than geographic interests, they will be more effective at delivering services."[53] For example, if one agricultural extension team could concentrate on small holders with scattered plots while a second team could serve farmers with larger holdings and the possibility to grow for the market, the conflicting demands on the extension team would be minimized and the needs of the poor better served. Furthermore, if the agricultural extension service included more women, or increased their outreach to women farmers in particular, they would reach a group of agricultural producers who have often been by-passed. Indeed, there is some evidence to show that, at least in Africa, as more men migrate to the cities to find work, women are taking over the management of farms. These female-headed households are not yet recognized in many areas by the institutions they depend on.[54]

Another management technique which may increase the accountability of extension workers to less well-off farmers is one that phases out regular services to farmers and concentrates attention on "those who are at an adoption or capital threshold and who are then increasingly left on their own."[55] Since in many IRD projects, the welfare benefits depend on the adoption of new technology by low-income farmers, such a system would increase the likelihood of the

---

[53] USAID (1980), p.58.

[54] Bahemuka (1976); see also Staudt (1976).

[55] Chambers (1974), p.82

project having a positive effect on general living conditions.

It seems that working through existing structures, whether governmental or non-governmental, agencies or cooperatives, is more likely to increase the potential for self-sustaining development. Such an approach depends heavily on the meaningful participation of potential beneficiaries in project decision-making, and on training project staff in organization and outreach skills.

Blueprint vs. Process

In the past, a rural development project design was regarded as a blueprint to be followed by those implementing the project. It was perceived to be an authoritative document, laying out what was possible given the available information and the circumstances of the project. The design also functioned as a negotiating instrument and a basis for accountability. The advantages of this approach were several. First, when technologies were tried and certain, a blueprint approach improved the likelihood of successful, efficient implementation. Secondly, if the design was carefully developed and all alternatives weighed, it allowed donor agencies to make the best choices in allocating their scarce resources. And thirdy, when designs were elaborated in detail, it was easier to hold management accountable for the proper spending of project resources.[56]

---

[56] USAID (1980), p.43.

Many situations facing development practitioners today however, do not have tried and certain solutions. Therefore, it has been argued that a more flexible, 'process' approach is more appropriate for IRD. The blueprint approach may have been successful for large-scale infrastructure projects, but has not been as effective for IRD programs. Although a technology may appear to be appropriate in one environment, it may be found to be completely inappropriate in another, for economic, political, social or ecological reasons. Furthermore, conditions may change during the life of the project; a rigid design may then prevent management from responding effectively and re-orienting the project accordingly.

Too often it is assumed that only local adaptation of knowledge is needed to make new technologcal packages available for use by small producers in the villages. There is a growing literature suggesting that this is not so and exploring such questions as why peasants insist on inter-cropping despite the advice of "experts", why they do not give up scattered plots, and what their marketing constraints are. For example, in reviewing several IRD projects in Latin America, DeJanvry noted one project in which access to credit was the real bottleneck to farmer adoption, not the availability or knowledge of the new technology. The agricultural research institute, CIMMYT, that was running the project, withdrew its support when it recognized that the

problem was not one needing research, but rather institutional change.[57] Researchers in general need to become more familiar with the environment in which innovation is to take place. Several ways have been suggested for achieving such an understanding: a systems approach to farm-related research,[58] the use of field trials to bridge the gap between research stations and the farmer, more effective communication between research and extension staff, and a deliberate policy that would require research staff to spend substantial periods in the field.[59]

A better understanding of a rural household's decision-making parameters is also crucial in helping to shape a dissemination process that reaches the most risk-averse farmer. Indeed the increased element of risk involved in adopting new technologies promoted under an IRD project, is often mentioned as a factor limiting the widespread success of the strategy.

> While new technology may significantly increase output and net income, the risks inevitably go up -- not only because of increased cash and labor commitments, but also because of the small farmer's increased dependence on alien institutions or individuals (input suppliers, extensionists, marketers) over which he has no control.[60]

---

[57] DeJanvry(1981), p.248.

[58] See Gilbert,E.H., D.W.Norman, and F.E.Winch (1979).

[59] Chambers (1974), p.133.

[60] USAID (1978), p.107.

Because their resource base is not sufficient to make technological change economically meaningful, peasants may adopt recommended packages only partially, settling for levels of factor use slightly better than the traditional levels but far from what they might achieve.[61] Or perhaps of greater concern, is the fact that low-income farmers may resort to self-exploitation of family labor within the farm to offset the higher production costs implicit in many new technological packages.[62] In either case, the goal of achieving increased rural welfare is distorted by a lack of understanding of the decision-making parameters of the low-income farmer.

The achievement of project goals may also be inhibited by a lack of consideration to peasants' off-farm sources of income. Indeed, in the three IRD projects in Latin America studied by DeJanvry, he found that the assumption that increasing agricultural yields was the key to alleviating rural poverty, was ill-founded. "The bulk of the rural poor" he reports, "control a resource base that is so small and of such poor quality that agriculture can only ensure a fraction of subsistence needs."[63] They depend heavily on money wages derived from non-farming activities. Therefore, employment availability and wage levels are more important determinants of welfare for these farmers than is agricultural

---

[61] DeJanvry (1981), p.250.

[62] Ibid, p.228.

[63] Ibid, p.242.

productivity.[64] DeJanvry's findings point to the importance of advocating, in many circumstances, more non-farm opportunities and better rural wages.

Therefore, to better address the complexity of IRD, some development analysts promote what is referred to as a "process model". Such an approach incorporates a learning-oriented perspective and a capacity-building view of rural development, based on a clear recognition of the uncertainty of social technologies and the complexity of rural environments. Uma Lele for example acknowledges that IRD programs should be a part of an ongoing, dynamic process. She suggests however, that there is a necessary sequence which is more-or-less generalizable. A minimum level of institutional development must preceed mass participation if the latter is to be effective. She suggests that the first phase be an institution- building one, the second one include service delivery such as potable water supply and health clinics; the latter should not be implemented however until there is an effective demand for them, and until there is a local capacity to manage them.[65]

Another approach, proposed by Honadle et al., includes the following general characteristics:

1. A design broken into <u>discrete phases</u> ;

---

[64] Ibid, p.246.

[65] Lele (1976).

2. A large amount of short-term technical assistance ;

3. An emphasis on action-oriented training among both staff and beneficiaries;

4. A use of temporary task forces ;

5. A reward system consistent with a learning orientation;

6. An applied research component ;

7. A learning component, such as a rolling regional plan; and

8. A redesign orientation, such as periodic revision of project organization, project objectives and job descriptions of project personnel.[66]

Process appoaches have the potential for greater flexibility and therefore for adapting to the realities of reaching subsets of the target population. They also have the potential for more meaningful involvement by local people in project decision-making and implementation. This appears to be a key determinant of project success. A team of consultants from DAI found that "those development projects which took the time and effort necessary to build an active and cooperating role for small farmers were significantly more successful than those projects which followed more traditional (externally-dominated) development approaches."[67] Some projects have used small farmers as para-professionals to help in teaching new husbandry practices to other farmers; this has

---

[66] USAID (1980), pp.44-45.

[67] USAID (1978), p.101.

proved to be a cost-effective way to spread new technology.[68]

Experience with such approaches is not yet very extensive but holds great promise, in particular for dealing with the many conditions affecting the connection between delivery of goods and services, and increasing welfare. "Each linkage in the sequence of objectives is only an intention -- numerous conditions affect them and some critical factors must be identified and managed if resources are to lead to welfare."[69] Figure 3 illustrates the process. Obviously, not all conditions affecting project objectives can be managed, but at least if the constraints can be identified, those open to change may be worked with.

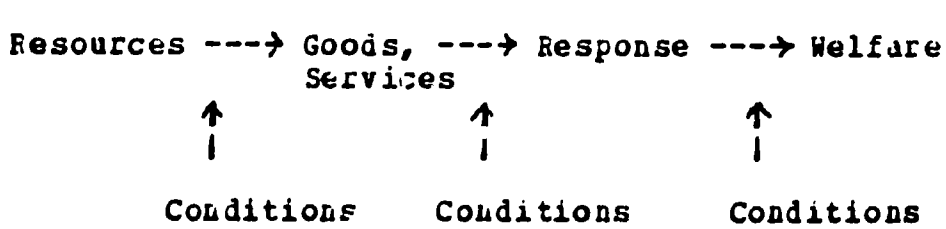


Figure 3: Sequence or Project Objectives

Source: USAID (1980), p.19.

---

[68] Ibid, p.17.

[69] USAID (1980), p.22.

WHY NUTRITION IN THE MORE AND BETTER FOOD PROJECT?

In some respects, the MBF Project is similar to a small-scale, agriculturally-oriented IRD project that stresses a close working relationship between researcher and farmer as they adapt new technologies to the local conditions. In other respects, the project is quite innovative. Firstly, it identifies nutrition as the overall, long-term goal of the project; indeed nutritional status clearly reflects the living conditions of groups of people and therefore rural welfare in general. Secondly, the main components of the program expected to influence nutrition, are not traditional nutrition interventions (e.g. programs that give out supplementary foods, or provide information) but income and employment-generation projects. Direct nutrition interventions were only considered in the project as a means of remedying certain micronutrient deficiencies. The appropriate model might therefore appear as a slight variation of Figure 2 described earlier. Rather than two supportive but separate program objectives, the MBF Project identifies two objectives that are causally linked: raising incomes and improving nutritional status. A variety of project components, some of which are functionally interrelated and some or which are not, were designed to raise incomes; small-scale nutrition interventions were included to directly affect nutritional status. The model might appear as in Figure 4 below.

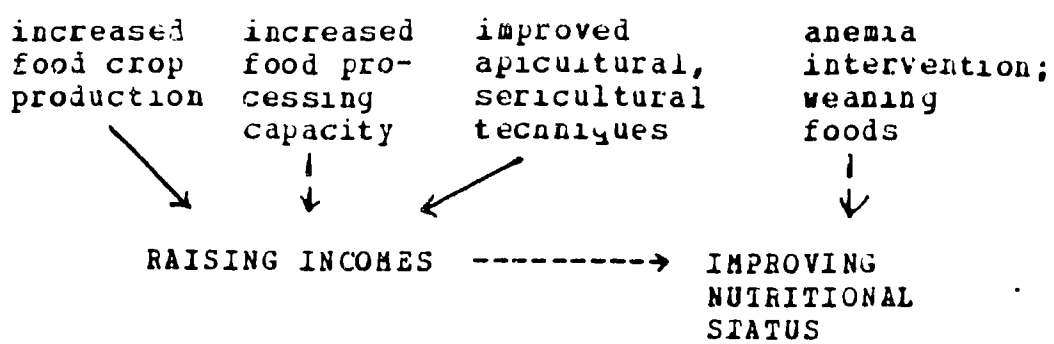


Figure 4: MBF Project Rationale

There is a growing body of literature which supports the More and Better Food Project rationale. It has been argued by some that nutritional status is a reliable indicator of the impact of agricultural and rural development on general welfare.[70] In particular, it may be a relatively efficient and effective way to measure the side-effects, both positive and negative, that inevitably accompany IRD efforts. The information gained may then be fed back into planning and management processes such that the needs of the poor are better met.

---

[70] See Mason et al. (forthcoming), Pinstrup-Andersen (1981), and FAO papers on the subject.

The same literature also suggests that strategies such as IRD that promote the integration of income-generation and welfare concerns, may be the best way to attack the root cause of malnutrition: poverty. These ideas have seldom actually been incorporated into IRD programs or projects; the MEF Project is therefore somewhat of a pioneer effort. Outlined below are some of the theoretical propositions and lessons from experience related to incorporating nutritional status as a measure of development and as a goal for development. These will provide the framework for assessing the potential impact of the MEF Project on nutrition.

An Indicator of Change in Household Welfare

Measures of nutritional status can be useful in planning for IRD, and in evaluating the impact of IRD. It has been argued that if data collection is being considered, the nutritional status of the child is a relatively easy, reliable measure of household nutritional status.[71] This is not to say however that there are no ambiguities. Indeed, as will be discussed below, there are many different factors relevant to integrated rural development projects, which contribute to a determination of nutritional status: health, sanitation, purchasing power, food supply, as well as intra-household factors. These relationships are not yet well understood, but it is clear that nutritional status, compared to other

---

[71] Mason (1983), pp. 15-16.

measures of welfare, is relatively quantifiable and clearly reflects the living conditions of groups of people.

The most widely used measures of nutritional status as an indicator of socio-economic status, are anthropometric measures of a young child's weight, height and age. Various ratios of these measures, as well as measures of head circumference, arm circumference, and triceps skinfold, reflect both chronic and acute, past and present, malnutrition, as indicated in Table 1 below.

TABLE 1

Significance of Anthropometric Measures

Measure	Significance
Weight for Age	Reflects growth: both stature and fatness
Height for Age	Reflects growth: long-term measure of nutritional status
Weight for Height	Reflects fatness: current nutritional status
Head circumference	Reflects growth up to age 3
Arm circumference	Reflects growth and fatness
Triceps skinfold	Reflects fatness

Source: Dewey (1980), Table 1.

Children aged 2-4 are most often surveyed because they are most susceptible to malnutrition and indices of their growth can therefore be easily measured as a reflection of

nutritional condition.[72] In conjunction with other key household socio-economic and environmental indicators, the nutritional status of the child can provide a useful summary of a household's situation which may then be applied to identifying the nature of the nutritional problem and its socio-economic determinants.[73] Indeed, if the children, who are particularly vulnerable to malnutrition, in a certain household are healthy, then it is reasonable to assume that the household is doing fairly well. If however the children are found to be malnourished, there is reason to question that household's welfare. It may be a problem of access to food, either specific to the child or for the household in general; it may be a problem of poor sanitation or a lack of availability of food.

The indicators suggested for inclusion in a series are measures of quality-of-life such as indicators of the nutritional status of children, infant and child mortality indicators, housing and possessions (to measure wealth and environment), and sanitation (water supply and toilet facilities).[74] It has been argued that a series of indicators is more effective in pointing out a problem than one indicator alone. A group of people showing high prevalence of child

[72] Dewey (1980).

[73] Food consumption measures could also be used if available, but the difficulties of obtaining adequate recalls make such figures less reliable than measures of a child's weight and height.

[74] Mason (1983), p.15.

malnutrition, high infant mortality, poor housing and so on, is clearly in need of assistance. If the indicators are not consistent with one another, then a different sort of problem is evidenced.[75] It is argued that this kind of functional classification flags a particular socio-economic group for attention by development project managers.

Furthermore, nutritional status, along with a few other key indicators of level-of-living such as food expenditure patterns, housing quality, water source and sanitation, might also be effective as a measure of the impact of IRD projects on communities. Too often such projects are only evaluated in terms of their physical and financial progress in delivering services to the intended recipients. In IRD projects this may involve simple questions to a reasonable number of farmers and a review of whether the project is participatory enough and sensitive enough to local conditions. Such appraisals tend to involve rapid and relatively inexpensive reviews of project processes and problems but do not try to evaluate the overall impacts on the local residents and on levels of poverty.[76]

An assessment of potential impact at different points in the project may however be essential to avoid negative effects of IRD on nutritional status. Indeed, as will be discussed below, agricultural and rural development projects do not necessarily lead to improved nutritional status or improved

---

[75] Ibid, p.16.

[76] Young (1982), p.292.

general welfare. For example, a few studies have suggested that a change to cash cropping is often accompanied by increased malnutrition due mainly to the decrease in food grown for home consumption and to the timing of cash receipts.[77] Clearly an assessment of nutritional impact should anticipate such negative side effects, incorporate some way to measure them into the evaluation plan, and suggest ways in which the design might be changed to avoid the recurrence of similar problems.

It has been suggested that an adaptation of one of the quasi-experimental designs described by Cook and Campbell (1979) might be an effective framework for incorporating nutritional considerations into IRD projects. Which design was chosen would depend on the objectives of the evaluation and the resources to be put towards its implementation. The issues involved have been well covered elsewhere in all of their complexity so will not be discussed here.[78] Suffice it

[77] See Dewey (1980) and (1981); Fleuret and Fleuret (1980).

[78] The principles of quasi-experimental designs are laid out by Cook and Campbell (1979). The various designs incorporate ways to explore causal relationships between project and outcome variables, and control for rival outcomes, in cases where randomization, the establishment of control groups, and manipulation of the "treatment", are not possible. Due to the many unanticipated side effects accompanying IRD projects, some experts have suggested supplementing the various forms of quasi- experimental survey designs with causality-oriented case studies, assuming the resources are available to carry them out (see Casley and Lury (1982), p.29; Chambers (1974), p.122).

See Habicht, Mason, and Tabatabai (forthcoming) for detailed discussion of research design and methods of analysis specific to projects with a focus on nutrition.

to say that a carefully designed evaluation, planned at the beginning of the project, can be extremely useful to project managers as they seek to learn from experience the ways in which IRD may be guided to improve rural living conditions.

A Focus on Poverty Alleviation in IRD

The advantages of a focus on nutrition in IRD are several. When addressing the lack of success of many IRD projects in reaching the poor, designing and managing for nutritional concerns might clarify the overall objectives of the project, particularly in terms of determining who should and will benefit from it and how these benefits will accrue. A focus on the nutritional impact of an IRD project, in the planning, implementation and evaluation phases, might provide multi-disciplinary teams with the common goal they often seem to lack, and a common set of criteria by which to measure ultimate success. Such an approach would presumably hold project managers accountable for the positive, or at least non-negative effect of their activity on the nutritional status of the community. This would give the project a practical poverty orientation it might not otherwise have had.

When addressing the problem of malnutrition, broader development efforts may be the best way to achieve a long-term solution to the problem of the world's malnourished people. Although direct intervention programs may be effective in reducing micronutrient deficiencies, they tend to be costly

and require continual disbursements of funds to maintain their effectiveness, and they seldom significantly address the main cause of malnutrition: poverty. In contrast, agricultural and rural development programs aimed at income and employment generation can be self-sustaining. They have the potential of reducing poverty if correctly designed and implemented, and at least in principle reduce the need for direct intervention. At least, a focus on nutrition might help to avoid the possible negative effects of rural development on the poor.

It should be noted however that this kind of approach per se does not guarantee that the implicit redistributive goals of IRD are met. A study of the dynamics and determinants of malnutrition in a given area would provide the information necessary to identify the poor and diagnose the problems open to intervention, but only political will on the part of those with power to re-allocate resources will ensure that the redistributive goals are actually met.

Integrating Nutritional Considerations into IRD

In order to effectively integrate nutritional considerations into IRD, two factors are essential. First, there must be a consensus on the part of project managers as to what is meant by the objective of improving nutritional status, i.e. what problem do they hope to solve. Is it closing the "protein gap"? increasing the consumption of leafy vegetables? delivering nutrition education and health

services? providing enough calories to the household? or is it changing the parameters of poverty? And secondly, data must be obtained at high levels of disaggregation such that the nutritional problems and their determinants, as well as the main socio-economic groups affected, may be identified.

A concern for consensus is not a trivial matter. Looking at nutrition as an indicator of equitable development requires that "experts" step outside narrow disciplinary perspectives and look at the total picture, i.e. the way in which nutrition affects and is affected by processes occurring in other sectors or within households. It also requires rejecting some propositions that had been widely accepted in the past. For example, in the MBF Project, the role that nutrition is expected to play is not clear although nutritional objectives are explicitly stated in project documents. In informal discussions with the researcher, it became clear that there is no consensus on what problem is to be solved.

Many of the agriculturalists involved in the project, if they had thought about the issue at all, expressed the futility of expecting increased incomes to improve nutrition; they generally felt that people would not spend the increased income on food, but rather would buy luxuries that they covet. Others, more familiar with nutrition, saw agriculture's only role in improving nutritional status as increasing the available supply of protein-rich foods, or foods rich in a particular deficient mineral. Likewise, many nutritionists

saw little hope that agricultural projects would improve nutrition; their more traditional nutrition and pediatrics training led them to focus almost exclusively on mothers and their children -- the group considered to be the most at risk of malnutrition -- and from a health/curative point of view.

All of these views can be argued to be either erroneous or incomplete. In response to the first concern, it should be noted that economists have consistently shown that low-income households will spend some proportion of increased income on food.[79] As for emphasis only on protein-rich food, or only on curative responses to malnutrition, there have been a variety of studies recently that strongly advocate a broader view of the problem.[80] As mentioned earlier, it is more and more widely accepted that malnutrition is a symptom of poverty and can only be solved in the long run by attacking the root causes of poverty: inequitable allocation of resources. For a consensus to emerge, a multi-disciplinary view needs to be taken, and the rationale linking nutrition to other project processes needs to be clearly spelled out.

In addition, in order for a focus on nutrition to lead to a greater understanding of the environment in which the project is intervening, there must be a commitment on the part of the management to set aside resources for fairly detailed data collection, from either primary or secondary sources. Indeed,

[79] See discussion of Engel's Law in any beginning micro-economic textbook.

[80] See for example Murdoch (1980) and Berg (1981).

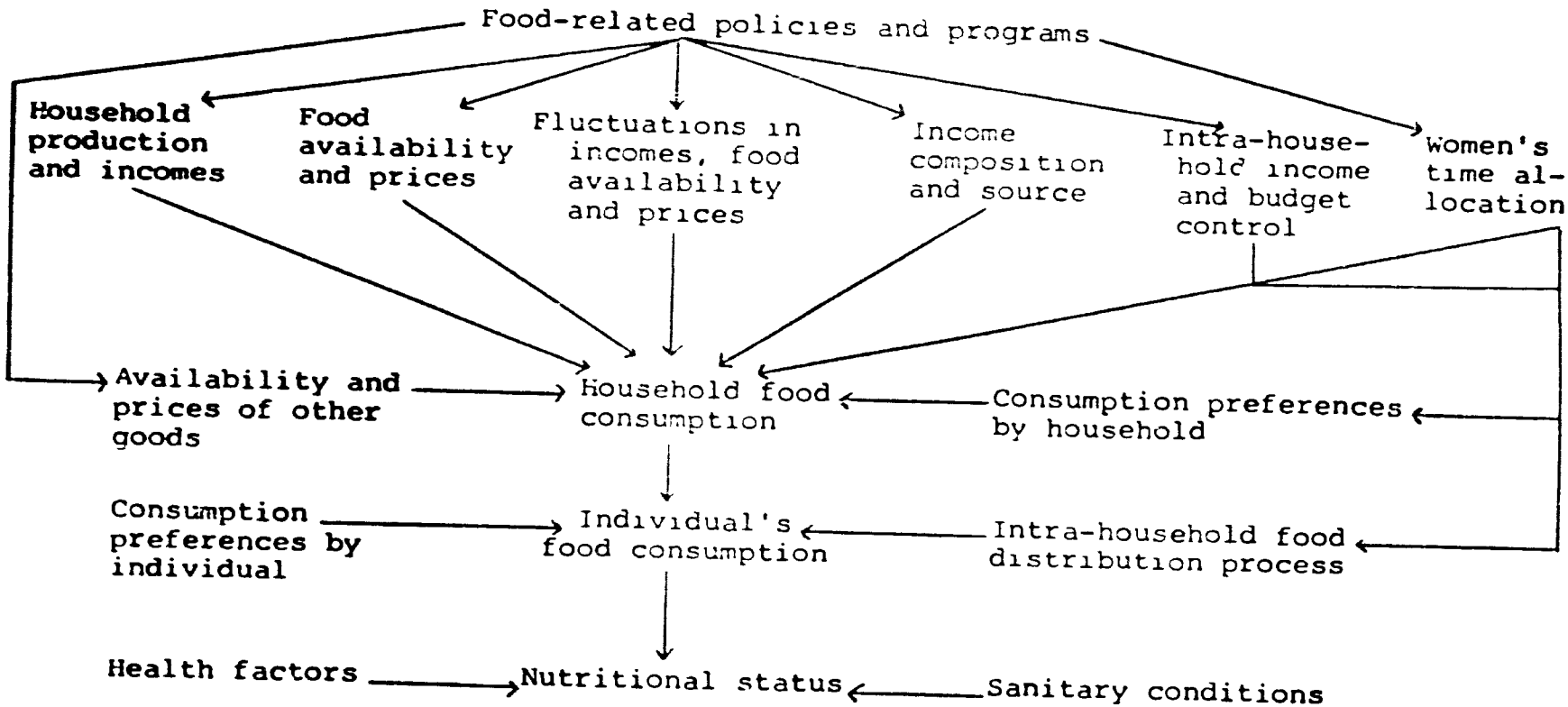
the influences on nutritional status are many. The analytic framework laid out by Per Pinstrup-Andersen of the International Food Policy Research Institute (IFPRI) describes the various means by which increased income might affect nutrition. A positive nutritional impact would be expected to come about if increased incomes led to increased food intake by members of the household. However, Pinstrup-Andersen also stresses the other influences that intervene in the relationship between income and nutritional status. Such factors as access to markets, source of household income, an individual's health status, as well as various intra-household factors such as control of the household budget, tastes and preferences of individuals within the household, and allocation of the woman's time,[81] may influence the nutritional status of household members such that the improvement expected due to increased incomes is not evident. The schematic overview illustrated in Figure 5 shows the relationships which have been found to be important in determining nutritional status.

For a variety of reasons, increased incomes may not lead to increased household food consumption. Firstly, nutrition is only one consideration entering into household decision-making. Needs other than nutritional ones may receive higher priority: non-nutritious foods may be preferred or non-foods may be purchased. Secondly, the

---

[81] Pinstrup-Andersen (1981).

Figure 5. SCHEMATIC OVERVIEW OF THE PRINCIPAL LINKS BETWEEN FOOD-RELATED POLICIES AND PROGRAMS, AND NUTRITION



Source: Adapted from Pinstrup-Andersen (1982), p.5.

individual's food consumption depends on the distribution of food within the household, which depends in turn on who controls the income. What is a rational choice for the head of household may not be the best one for other members. For example, for social or economic reasons, the men or working members of the household may be given priority with respect to food distribution. Therefore, if the distribution of food within the household worsens, the nutritional status of the child may not improve even though increased incomes has made more food available to the household as a whole.

Thirdly, the spending and consumption patterns may depend on the source and composition of the income. If income sources change, a shift towards or away from subsistence farming, or a change in frequency and/or regularity of income flows,[82] may cause a worsening of the household's nutritional status and particularly that of the children. The importance of looking at both men's and women's income has often been overlooked due to the assumption made by traditional economic analysis that a household is a single, unified decision-making unit. For example, Jane Guyer observes that in the African context, "the impact of conditions in the national and regional economies on indigenous domestic structures can only be understood when the structural positions and economic

[82] See Dewey (1980) and (1981); Fleuret and Fleuret (1980).

interests of both men and women are equally represented in the data collected."[83] She points out that only with information disaggregated by sex is it possible to see the conflicting interests, and the separate spheres of decision-making. Several studies have suggested that the income controlled by women goes toward maintaining the level of nutrition and standard of living in the household.[84] It might therefore be expected that greater income-generation opportunities for women would have a more immediate impact on the nutritional status of household members. Consideration would however need to be given to the allocation of the woman's time and the possible changes due to technologies introduced.

Thirdly, one of the main intervening factors and one that influences the nutritional status of the individual directly, is poor sanitation and the resulting health problems. The synergism between malnutrition and infection seriously weakens the child and inhibits proper absorption and utilization of the food ingested. Indeed "the simultaneous presence of both malnutrition and infection will result in an interaction with consequences for the host more serious than the additive effect of the two working independently. Infections make malnutrition worse and poor nutrition increases the severity of infectious diseases."[85] If poor sanitation is widespread in

---

[83] Guyer (1980).

[84] See for example Guyer (1980) and Tinker (1979).

[85] Latham (1975), p.561.

an area being considered for IRD, a component designed to improve the quality of the water supply and sanitation system would be appropriate, in conjunction with other components, or if irrigation schemes are being considered, information would be needed on the prevalence of water-borne diseases and their transmission.[86]

And finally, the diagram also points out several factors operating at the regional or national level, that affect the nutritional status of rural households: seasonal or irregular fluctuations in food prices, wages earned by the malnourished, and food supply. Policies which affect these fluctuations: pricing policies, storage and transportation of commodities, foreign trade, and crop insurance policies, may significantly influence nutritional status.

CONCLUSION

The concept of IRD, although still somewhat general, has been more carefully specified through experience such that implementation mechanisms are at least better understood. However, many IRD designs still seem to lack a focal point around which to build the project rationale, and a clear sense of how the equity goals will be achieved.

Based on experience to date, the success of a comprehensive approach in meeting its goals seems to depend on an implementation process explicitly geared towards the small

---

[86] Mason (1983), p.23.

producers, the landless, or other resource-poor groups. An effective format might include an extension component oriented towards working with certain socio-economic groups to overcome their production and income-generation constraints. An effective implementation arrangement should also allow for a central project decision-making position close to the actual project activity such that meaningful participation by potential project beneficiaries is possible. Secondly, the success of a comprehensive approach seems also to depend on a project rationale that makes sense from a theoretical point of view and clearly lays out the transformations that must occur in order for the living conditions of the poor to improve. It is important that there be a consensus among all those involved in project management, to do something about reaching the resource-poor. This includes providing common standards with respect to the goal of improving living conditions, by which performance in all project activities is measured.

It is argued that nutritional status as a part of a series of quality-of-life indicators could be both an effective planning tool and a yardstick on which to measure project impact on participating communities. The theoretical construct that can be built around nutritional status would provide guidelines as to identifying the malnourished groups, assessing those factors that influence their poverty and are open to intervention, selecting the appropriate timing and mix of goods and services, designing for beneficiary response and achieving self-sustainability of development efforts.

There are however certain constraints to effectively integrating nutritional considerations in IRD, that need to be overcome. First, although substantive research is beginning to accumulate, there is still a lack of understanding of the exact relationship between nutritional status and other determinants of poverty; the degree to which they are sensitive to socio-economic changes also remains unclear. Continued research is needed to substantiate the basis for effective policy recommendations in the area of nutrition in IRD.

Secondly, although reliable measures of nutritional status are easier to obtain than measures of income, they nonetheless may involve a larger data collection effort than can be justified by the use to which the data would be put. Part of the need for such extensive data collection is due to the lack of work on the subject to date and the need to convince others of the validity of the conceptualization. Indeed, nutrition is still seen by many to be exclusively concerned with the health of mothers and children. It is therefore not easy to build a project around nutrition as a goal of development.

Regardless of whether nutrition is being looked at or not, obtaining a meaningful picture of the dynamics of poverty in a given area requires a significant amount of data.

There are many advantages to facing the dynamics of productivity and poverty in all of their complexity, not least

of which is that ultimate success is more likely. But the intermediate pathways are only partly known; to fill in the gaps is the challenge of ongoing and future IRD programs.

Chapter III

THE MORE AND BETTER FOOD PROJECT: A CASE STUDY

INTRODUCTION

The objective of the case study presented in this chapter is to analyze the More and Better Food (MBF) Project achievements to date in light of their potential impact on the nutritional status of the village populations. An assessment of the impact of the MBF Project at this point represents not a definitive statement but rather an opportunity to review, in light of experience to date, the project rationale, and to reinforce those self-sustaining processes that may be set in motion to improve the status of the malnourished groups in the villages.

The assessment reflects the views of the author and is based on information made available to her during her stay at the National Research Center (NRC) in Cairo, from June to August 1982. The assessment suffers from limited information on the views of participant and non-participant village producers. Material in this discussion has been shaped primarily by discussions with the NRC staff. They shared openly their communications with participating farmers. Other information on the participant farmer's point of view was obtained from a series of group interviews, discussions with

agricultural cooperative officials , and a tour of project activities in Omar Makram. In Kafr el Khadra where the project was no longer very active, only informal discussions with villagers were possible. Any further study of the impact of the MBF Project on the two villages should include a more systematic investigation of the experiences and views of the villagers.

The project-specific goals of the MBF Project are two-fold: to increase village productivity, both on and off-farm, and to improve village nutritional status. The specific subcomponents that have been implemented involve a variety of activities. The NRC introduced technical packages to improve several field and vegetable crops: wheat, maize, peanuts, tomatoes, potatoes, onions, and broad beans. They set up demonstration centers to train villagers in bee-keeping, sericulture, and dairy processing. One NRC team built model poultry confinement areas and provided assistance to villagers who wanted to build their own.

Implicit in the overall design is an assumption that these improvements will influence living conditions in the village by increasing the food supply in the market and raising the incomes and levels of home consumption of the participating producers. The improved living conditions are assumed to include an improvement in the nutritional status of the project villagers. Thus, the goals of the More and Better Food (MBF) Project and the assumptions implicit in its design

reflect to some extent the primary characteristics of Integrated Rural Development (IRD) strategies: (1) a coherent approach, (2) the delivery of multiple development services, and (3) a focus on improving the general living conditions of the rural poor. They also reflect the institutional objectives and limitations of the NRC, its principal implementing agency.

The objectives that the NRC as an institution is pursuing through the MBF Project relate to the role the NRC sees itself playing in Egyptian socio-economic development. These institutional objectives may be summarized as follows.

1. The development of NRC managerial capacity to respond to multi-disciplinary and multi-institutional projects;
2. The provision of opportunities for staff to participate in applied research and to receive recognition for their achievements.
3. The demonstration to potential end-users of research, in this case the farmers, that science and technology can be pressed into service to meet their needs.
4. The investigation of impacts associated with integrated food production programs and the development of the NRC's capacity to conduct IRD programs.[87]

Indeed, to date, an important constraint on applied research at the NRC has been its lack of adequate field support facilities to reduce the physical and psychological distance

---

[87] MBF Project correspondance (November 1982).

between its staff and the people they are trying to assist. Involvement in the MBF Project represents a first step towards achieving a greater responsiveness on the part of the scientific community to the needs of Egypt's rural inhabitants.

Trade-offs between these two sets of goals for the MBF Project are reflected in the design components discussed in Chapter 2. First, the NRC chose for the project a comprehensive approach to rural development, including agricultural and non-farm activities as well as a nutritional objective. Although such an approach is probably more effective than a single-sector project, it is more difficult to implement because the interrelationships between sectors are not always well understood.

Second, the project was designed to be tested on a small scale because of the NRC's limited resources, then expanded if it proved successful. The small scale was also intended to foster an environment conducive to meaningful participation by potential beneficiaries. The trade-off in this case is that a small project concentrates resources in one area and reaches only a limited number of people.

Thirdly, the NRC chose to administer the project itself, rather than to work through an existing institution, private or public. The advantage of such an arrangement is that the NRC has direct control over the project so can guide it in the way that it feels is best. The disadvantage is that project

innovations may be abandoned when the NRC terminates its involvement because the project never "belonged to" the village community.

And finally, the NRC chose a learning process approach rather than a "blueprint" in order to allow itself flexibility in incorporating lessons from experience as they were learned. Given the lack of experience with incorporating nutrition into IRD, the learning process approach was probably the best way to ensure that both productivity and equity goals were met. Each of these trade-offs will be further discussed below.

Chapter 3 proceeds to analyze the underlying assumptions of the project and their reasonableness in light of project experience to date. It begins with a description of the two pilot villages and of the basis for their selection. Two sections then follow. One outlines the assumptions implicit in the project design and implementation. The second assesses their validity in terms of the equity goal of the project -- improving nutritional status -- given the available information on the two village environments and the constraints under which the NRC functions.

TWO DIFFERENT PROJECT ENVIRONMENTS

At the beginning of the More and Better Food Project, the Executive Committee decided to choose two villages whose inhabitants relied mainly on agriculture for a living, but that were in other respects as different as possible. One was

selected from the traditional Delta area, and the other from the reclaimed desert lands. Practical considerations such as accessibility by road, availability of a minimum level of social services and public utilities, helped to limit the choices. The most important consideration was an expression by village leaders of a willingness to participate in the NRC project. The two villages selected, Omar Makram and Kafr el Khadra, met these requirements. As shown in tables 2 and 3, both have significant agricultural subcommunities. Within the subcommunities however, the reliance on agriculture as a main source of income varies.

These two villages, in almost all respects, serve to represent two very different characteristic types of Egyptian villages. Omar Makram is fairly isolated from the Cairo metropolitan area. It is located in the Western Desert, 130 Km from the city, in South Tahrir Province which is sometimes considered part of the Beheira Governorate. Administratively it is under the supervision of the Ministry of Agrarian Reform and Land Reclamation, a ministry created in 1956 "to attend especially to the needs of cultivators receiving land from the government and to administer land reclamation projects."[88]

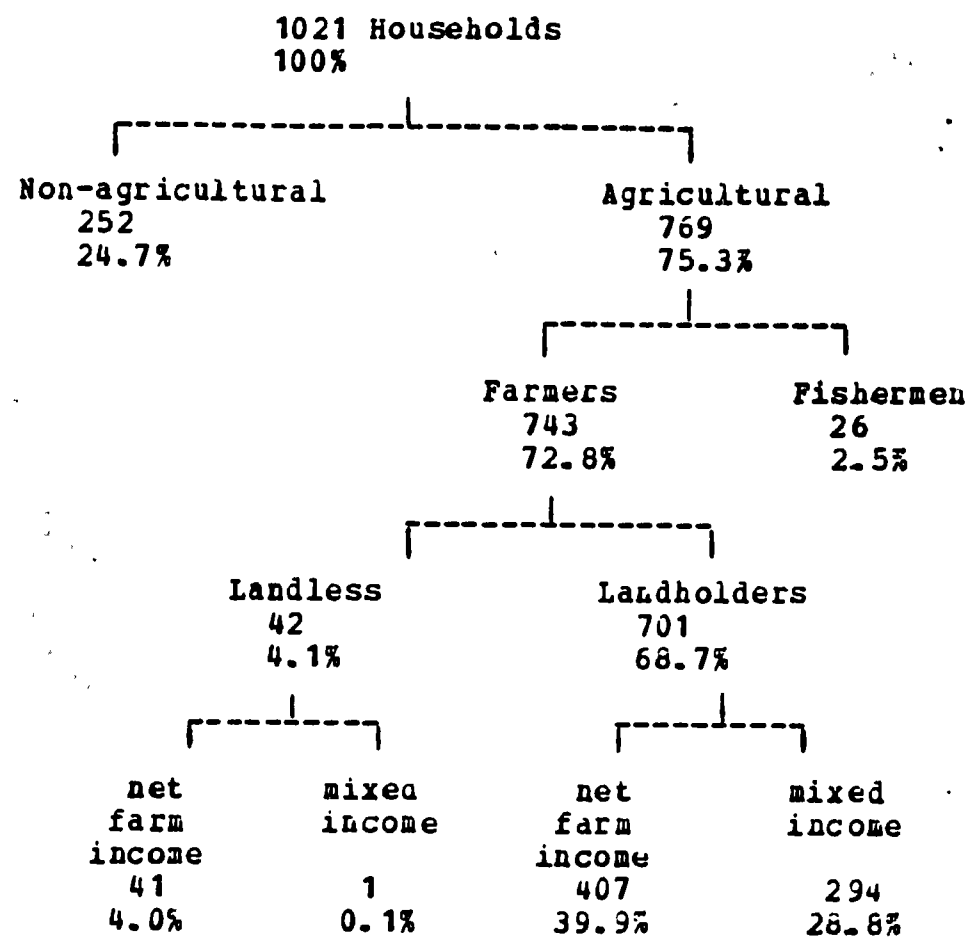
Kafr el Khadra on the other hand, is located in the densely populated Nile Delta only 50 Km from Cairo; it is administered by the Egyptian system of local government -- a two-track system including local representatives of the central

---

[88] Harik (1972), p.294.

TABLE 2

Kafr el Khadra: Household Classification by Main Source of Income

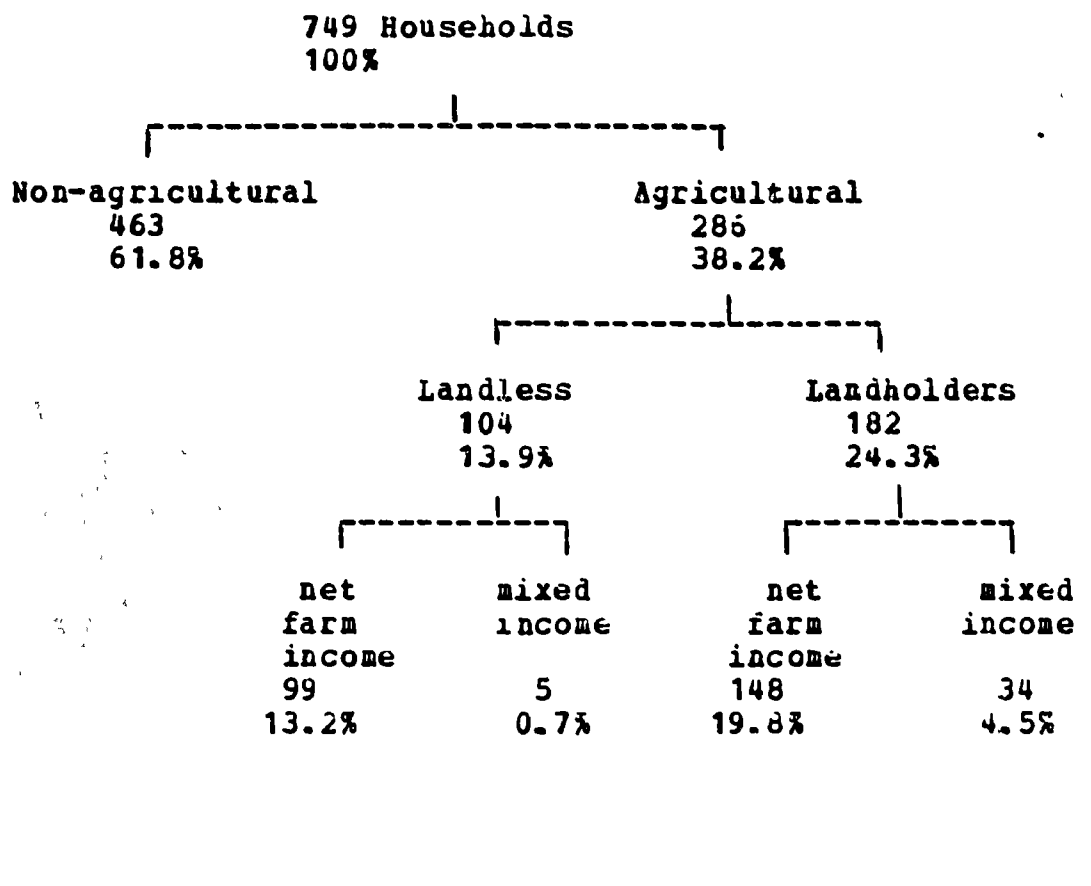


Source: Adapted from NRC (1980a), Village Demographic Survey, p.8.

ministries as well as locally elected village officials -- and is a part of the Baghour District of Menoufieh Governorate.

TABLE 3

Omar Makram: Household Classification by Main Source of Income



Source: Adapted from NRC (1980a), Village Demographic Survey, p.37.

The two villages differ in physical environment, in administrative structure, and also in socio-economic profile.

Table 4 below provides an overview of the general socio-economic conditions in the two villages. A comparison of the two villages in terms of project-relevant variables then follows, to emphasize the main differences relevant to the MBF Project.

TABLE 4

General Socio-economic Indicators

	OMAR MAKRAM	KAFR EL KHADRA
Total population	4,860	5,630
Average land-holding size	3-5fd.*	< 1fd.
Percent agric. households depending on farm income only	86%	58%
Average children per household		
agric. households	4	4
non-agric. households	4	3
Annual per capita income	LE 149**	LE 208
Illiteracy rate	36.5%	36.2%
Infant mortality	93/thous.	112.6/thous.

* one feddan (fd.) is approximately equal to one acre
** 1 Egyptian pound (LE) = $1.20.

Small Land-holdings and Non-farm Income

As can be seen in Table 4, the average land-holding size in Kafr el Khadra is less than one feddan. This is slightly less than the national average of under three feddans.[89] In Omar Makram, the average land-holding size is slightly above the national average. The difference between the two villages is due mainly to the fact that the people of Omar Makram are beneficiaries of a government resettlement scheme. As a part of the strategy, each farmer was allocated 5 feddans, a larger

---

[89] Ikram (1980), p.213.

land-holding than most Egypian farmers own in the traditional villages.

In an attempt to increase Egypt's cultivable land, since the 1960's the government has invested heavily in reclaiming land from the desert. The land was then sold at a low price to those willing to take on the challenge. The Ministry of Agrarian Reform and Land Reclamation provided these settlements with basic infrastructure including field irrigation systems for field crops. The World Bank found that "investment in extending irrigation and service infrastructure into marginal soils on the desert fringes had by mid-1976 added 0.9 million feddans of "new land" to the existing 5.6 million feddans of old land."[90]

Omar Makram lies in one of the earliest land reclamation areas: Tahrir Province. It was first settled about 30 years ago. Each farmer was originally allocated separate parcels located in different parts of the village.[91] Since then about 79 feddans have been auctioned off to others.[92] As illustrated in Table 5 below, in Omar Makram, only eight families reported owning more than five feddans of land, and 39 reported working plots of less than 3 feddans; 22 out of the 39 were renting the land they cultivated. In contrast, only 1 family in Kafr el Khadra reported having more than 5 feddans, 16 families had

[90] Ibid, p.171.

[91] Interview with farmers and agricultural engineers at the Agriculturel Cooperative.

[92] NRC (1980c) MBF Project Progress Report (1979-80).

3 to 5 feddans, 198 had 1 to 3, and the rest had less than 1 feddan.

TABLE 5

Agricultural Families and their Land-Holdings

	OMAR MAKRAM			KAFR EL KHADRA		
Acreage	own	rent	total	own	rent	total
less than 1	5	3	8	424	349	773
1-3	12	19	31	139	59	198
3-5	155	9	164	16	--	16
5-10	6	--	6	--	--	--
more than 10	2	--	2	1	--	1
TOTAL FAMILIES	180	21	211	580	408	988

Source: NRC (1980), Village Demographic Survey, pp.26 and 55.

Differential Reliance on Agricultural Income

For small-scale farmers such as those of Kafr el Khadra, the land reform of the 1950's only temporarily slowed the long-run increase in the smallness and poverty of farms. This was inevitable, given the inheritance customs that led to continual subdivision of the plots, and a farm population that

was growing faster than the farmed area.[93] With the average land-holding size in Kafr el Khadra of less than one feddan, it is not surprising that more people are taking jobs off the farm to supplement the family's income. The baseline survey found that only 58% of agricultural households in Kafr el Khadra depended solely on farm income (see Table 4). It is not surprising either to find that most of the children are either working in non-agricultural professions or are in school.[94]

In contrast, the commitment to agriculture is strong in Omar Makram where 86% of the agricultural households depend solely on farm income (see Table 4), and 42% of the children help their fathers in the fields.[95] The field crop bias that the MBF Project has developed in practice therefore fits the needs of Omar Makram farmers better than it does those of the agricultural subcommunity in Kafr el Khadra.

Main Cropping Patterns and Production Quotas

Kafr el Khadra farmers practice a two-fold crop rotation: they plant maize in the summer and alternate between wheat and berseem (Egyptian clover used for animal fodder) in the winter. The use of machines is not widespread and few wage

---

[93] Ikram (1980), p.213.

[94] NRC (1980c) More and Better Food Project Progress Report (1979-1980).

[95] Ibid.

laborers are hired.[96] In addition, Kafr el Khadra is in the unusual position of being one of the only villages in Menoufieh Governorate with no crops subject to governmental cooperative marketing.[97] According to one of the NRC scientists, they achieved this priviledged status through well-organized, political action several decades ago. As will be discussed later, this resistance to interference by outsiders, particularly if there is seen to be a government connection, appears to have affected the attitude of Kafr el Khadra farmers towards the MBF Project.

In contrast, Omar Makram's major crop, peanuts, is marketed in totality by the government through the agricultural cooperatives. Due to the different environment and the imposed government quotas, the cropping pattern in Omar Makram differs somewhat from that in Kafr el Khadra. Omar Makram farmers also alternate between wheat and berseem in the winter, but peanuts are the main summer crop; farmers only plant enough maize for home consumption. Agriculture in Omar Makram depends completely on the irrigation pump stations and their furrow-basin irrigation system. Machines for field management and threshing are widely used.[98] Omar Makram farmers appear to use more hired labor than those in Kafr el

---

[96] Ibid.

[97] NRC (1980b), Village Socio-Economic Baseline, Volume II, p.2.

[98] NRC (1980c) More and Better Food Project Progress Report (1979-1980).

Khadra, in particular for work in maize and peanuts.[99]

Nutritional and Social Status

The series of indicators presented in Table 6 below illustrates at a glance the main differences in nutritional and social status between the two villages, with the national average given for reference when available.[100]

As the table suggests, neither village has an alarmingly high prevalence of malnutrition; however, the differences between the two villages point out the different nature of the nutritional problems that are apparent. Kafr el Khadra has a higher infant mortality rate (IMR) and higher prevalence of acute malnutrition (wasting); whereas Omar Makram has a lower IMR and higher chronic malnutrition (stunting). The results of a small nutrition survey carried out in the villages suggest that the nutritional problems in Kafr el Khadra may be more closely related to infection, whereas those in Omar Makram have more to do with poor infant feeding practices.

In Kafr el Khadra, undernutrition was found to be more prevalent in children with a history of diarrhea. 22.2% of the children with a history of recent diarrhea and 30% of the

---

[99] NRC (1980b), Village Socio-Economic Baseline Volume II .

[100] For more detailed information on nutritional status in Egypt, see USAID/CDC Arab Republic of Egypt National Nutrition Survey, 1978 and 1980, and the Proceedings of the Workshop on Nutrition and Health in Egypt, Cairo, October 20-22, 1979; for more information on population in Egypt, see Some Issues in Population and Human Resource Development in Egypt, World Bank Document, 1981.

Table 6. PROFILE OF NUTRITIONAL AND SOCIAL STATUS IN THE TWO VILLAGES

	Stunting 90% H/A (a)(b)	Wasting 80% W/H (a)(b)	Infant Mortality Rate (per thousand) (a)(b)	Poor dwellings (c)	Dwellings without latrines (c)	Dwellings without private water source (c)
Kafr el Khadra	12.3% n=146*	8.2% n=146	112.6 n=4,572	23.2% n=4,572	50 % n=4,572	86.2% n=4,572
Omar Makram	28.6 n=126	2.4 n=126	93.0 n=2,141	50.0 n=2,141	27.4 n=2,141	48.0 n=2,141
National Average	20.8	0.3	119.0	n.a.	n.a.	n.a.

* sample size

Sources: (a) Abdallah (1980).
(b) NRC (1980), Village Demographic Survey.
(c) USAID/CDC (1978, 1980).

children with a history of recent or recurrent diarrhea were undernourished. Since wasting is also fairly significant in Kafr el Khadra, the survey suggests that in that village, malnutrition may be more of a health problem than a problem of inadequate food intake.[101]

In Omar Makram, the occurence of diarrhea among the children sampled was much lower; NRC nutritionists have hypothesized that this may be due to the fact that Omar Makram has better health services.[102] They suggest that the higher prevalence of chronic malnutrition in Omar Makram may be due to poor infant feeding practices. Most of the children were still being breast-fed without proper supplementation up to two years of age.[103]

The IMR in Kafr el Khadra is high compared to the national average, but it is even high compared to the 1974-1975 figure for Rural Lower Egypt: 103 per thousand.[104] This supports the hypothesis that Kafr el Khadra has a severe health problem, probably related to sanitation and the quality of water supply. Indeed, only 5.3 % of the Kafr el Khadra respondents reported having a private tap, 64.1 % use the public pump, 18.1 % reported using a public tap, 10.9 % have a private

---

[101] Abdalla (1981).

[102] Ibid, p.63.

[103] Ibid, p.52.

[104] World Bank Document (1981) p.71. This is significant because the IMR is higher for Upper Egypt which has a tendency to shift the national average for the worse.

pump, and 2.3 % use the irrigation canals as a water source. In Omar Makram on the other hand, 41.9 % of the respondents reported having a private tap, 35.6 % use a public tap, 9.8 % have a private pump, and 13 % use the public pump.[105]

Thus, clearly the two villages differ significantly on factors relevant to the project. As will be discussed below, these factors help to explain the different project experiences in the two villages to date.

UNDERLYING ASSUMPTIONS

Comprehensive Approach to the Food Issue

Rather than trying to simplify the national government's concept of food security, the NRC decided to address the issue in all of its complexity. This meant including components dealing with the supply of food crops and of foods and meats high in protein, activities promoting improved food processing methods in order to increase the villagers' ability to preserve and store food, and components increasing income and employment-generation opportunities such that food needs could better be met in the market. The design therefore included activities in all of these areas.

The components designed for field and vegetable crops involved advice on better cultivation practices and recommendations for a technical package including new seed varieties, new types of fertilizers and pesticides. The

---

[105] NRC (1980a), Village Demographic Survey.

poultry project, as mentioned before, introduced the idea of building a confinement area for chickens such that infections and nutrition could be better controlled; this made raising chickens for the market more attractive, thus providing an added source of income for farm families.[106] The dairy processing, apiary, and sericulture subprojects consisted of demonstration centers in which people were trained either to improve their production methods, or, in the case of sericulture, to pick up a traditional activity that had once been widely practiced (this was only in Kafr el Khadra).

The implicit assumption was that an increase in real incomes would accrue to village households as a result of project activities. The effect could be direct, such as a rise in cash income due to a greater proportion of production being available for marketing, or an increase in real income since more home production of food would reduce the amount a household must purchase in the market. The effect could also be indirect, such as a rise in income due to increased employment opportunities, or a decline in agricultural produce prices.

A comprehensive approach to the food security issue also meant dealing with the quality-of-life in rural areas. MBF Project designers chose to focus on nutrition as a component of quality-of-life because of its sensitivity to changes in food supply and income levels. To study the effect of the MBF

---

[106] Ali (1982).

Project activities on nutrition, a monitoring and evaluation system was proposed using indicators such as birthweights, anthropometric indices, IMR, infant feeding practices and hemoglobin concentration of pregnant women.[107] In addition, several direct intervention programs were also proposed: nutrition education, an infant feeding program, a school feeding program and a program to combat iron-deficiency.[108] It was expected that the latter would enhance the effect of the projects on nutrition by directly alleviating micronutrient deficiencies that were not likely to be solved by raising incomes.

As stated in an early project paper, "the overall approach and objective of this Project relies on the principle that improvement of nutritional conditions of a population affects productivity and raises health standards which is an important factor for raising the physical quality of life."[109] The design of the project therefore takes into consideration the social, economic, and health factors which interact to produce levels of welfare, and adopts at least in principle, a comprehensive approach to the problem.

---

[107] Galal (1980).

[108] NRC (1980c) MBF Project Progress Report (1979-80).

[109] Galal (1980), p.5.

Forum for Learning on a Small Scale

As do many other IRD projects of an experimental nature, the MBF Project opted for the pilot project approach to allow for learning from experience and for close cooperation between researchers and farmers in adapting new technologies to local conditions. There appear to be two main reasons for taking this approach. Firstly, pilot projects lend themselves to more flexibility and therefore allow staff and participants to learn as the project unfolds. This seems to have been a particularly appropriate format for the More and Better Food Project since it represented for the NRC a first attempt at IRD, and since introducing nutritional considerations into an IRD project has seldom been tried.

Secondly, it was assumed that innovative research was the key to development in Egyptian rural areas. Since local adaptation and dissemination of new technologies are time-consuming and require a fair amount of detailed information-gathering, the NRC could not realistically consider large-scale IRD strategies given its limited staff, resources, and support facilities in the rural areas. NRC project leaders therefore chose to adopt an extension model, characterized by the close linkage between research and extension.[110] The plan was to begin work in two villages, with the idea that if the model made sense, it would subsequently be applied to other villages. In the latter case, the NRC

---

[110] De Janvry (1981), pp.250-251.

would seek to cooperate either with the governorate administration or a local university to complement its own resources.

Farmer Participation in Research

Implicit in the MBF Project is the assumption that if farmers themselves are brought into the project from the start, they are more likely to work with it and ensure its success. Therefore, in both Omar Makram and Kafr el Khadra, bringing the local people into project decision-making was a high priority. A general meeting was held to introduce the project, at which the mayor, local officials, and village inhabitants were present. During the course of the meeting, NRC project leaders described the philosophy of the project and suggested ways in which their expertise might benefit the villagers. After this formal communication, NRC teams of scientists were able to establish their own contacts and conduct studies of the local conditions.

NRC project managers also recognized that the villagers would be more receptive to the detailed information gathering activities of the project if they were given reason to believe that the NRC scientists truly intended to help them with their problems. Therefore, the NRC launched the project activities on two fronts from the start. While initial data collection was being carried out, several demonstration projects were started in both villages. They were chosen to be highly

visible and likely to increase farm or farm-related productivity. The stake-and-wire method of growing tomatoes was therefore chosen to get the project off to a good start. It was a technique which had gained widespread recognition in the Fayoum Governorate for its higher yields. At about the same time, NRC poultry specialists designed and set up a model confinement area to demonstrate improved poultry-raising techniques. By proving their ability in a few areas, NRC scientists hoped to stimulate greater cooperation among village producers.

ASSESSING THE REASONABLENESS OF PROJECT ASSUMPTIONS

Involving Village Producers: Successes and Failures

Starting on a small scale and managing the project autonomously have given the NRC greater control over processes that were left flexible by design, and allowed greater participation by village producers in the research process. Lines of accountability were clear: the NRC had overall decision-making and coordinating responsibilities. Indeed, it would have been difficult for the local agricultural cooperative officials, or any other extension service, to provide the integrating function for this multi-disciplinary project. But a concern for the self-sustainability of the processes set in motion by the project seems to have been left out. The design did not provide for a mechanism whereby the NRC could withdraw its involvement without thereby making it

difficult for producers to continue practicing the improved techniques.

Subproject Agreements with Farmers

Informal discussions with NRC scientists and national officials involved in overseeing the project, as well as interviews with farmers and village agricultural cooperative officials, suggest that an effective working relationship was achieved in most instances, between the village participants and those scientists who visited the project areas regularly. Agreements between the Project and village producers were worked out individually as interest was expressed and funding became available.

As knowledge and experience accumulated, from informal talks over coffee as well as from the more formal baseline studies, scientists were able to determine the main problems faced by farmers and choose the ones in which the NRC research capability could be of some assistance. Delicate negotiations then took place between the NRC project staff and the villagers, ressembling a bargaining process in which each side looked out for its own interests. The scientists wanted the producers themselves to participate in the demonstration projects as much as possible in order to increase their stake in the success of the experiment. They insisted therefore, that the demonstrations take place on the farmer's land, or in his household, whenever possible. In return, the NRC provided

the farmer with a guarantee that he would not lose money as long as he followed the advice of the scientists.

Various oral agreements were reached between the NRC and the farmer, all of which represented some form of crop insurance. Some of the subsidies were provided as outright grants to the farmers, whereas others were given as loans. For example, the agreement reached with two farmers in Omar Makram stipulated that they would lease one half of a feddan each to the NRC for the tomato experiment. The farmers would care for the land according to NRC instructions, and the NRC would bear all of the expenses as well as pay rent, and would take all of the yield. (In Kafr el Khadra, the experiment had to be on government land the first year; but the second year, once the high yield had been demonstrated, a farmer agreed to cooperate with the project).

Similarly, in its first year, the peanut project provided the 35 producers with the cost of extra land preparation, as well as seeds of a new variety, and special fertilizers and pesticides. The maize, wheat and other vegetable crops projects reached similar agreements. The poultry project however, only subsidized the one-day-old chicks, the feed, and the antiseptics and vaccinations. The project then provided the producers a loan with which to buy the necessary equipment.

Subsequent expansion benefitted from the initial successes and increased trust between scientists and farmers. In 1982,

there were 70 poultry producers in Omar Makram using the techniques introduced by the NRC, but only the first 12 had been subsidized. In Kafr el Khadra, there were 40. Likewise, the peanut project began with 35 participants in Omar Makram, all of whom received the subsidies. In 1982, there were 118 participants, even though only the highly specialized fertilizers and pesticides were being provided by the NRC.

Other teams reached a satisfactory agreement only after several attempts. The team working with broad beans originally agreed to pay for the seeds, pesticides, and fertilizers, in return for one third of the farmer's yield. However, due to a lack of communication and trust, this led to misunderstandings over the actual size of the yield. The scientists decided in the next season, to continue subsidizing inputs but not to claim any share of the crop. This ensured them the opportunity to accurately measure the yields and therefore increase the scientific validity of the experiments.

Cooperation with Local Agricultural Officials

Although it was originally thought that the participation of the farmers directly with the researchers was the key to effective implementation, it was soon realized that the cooperation of the agricultural cooperative officials, who lived and worked in the village, was also crucial to project success. The NRC therefore learned to rely on them to ensure effective ongoing communication between project participants

and NRC project managers. From one planting season to the next, different techniques and/or seed varieties were tried, adapted, and either accepted or rejected for future use. Several scientists, in cooperation with the agricultural cooperative workers, supervised the fields regularly during the growing season, but were also available for advice on crops not dealt with by the project, or for assistance to producers not participating in the project.

Such a concentrated effort was particularly useful in Omar Makram where agriculture faces many difficulties and unknowns. Indeed, in Omar Makram there has been widespread participation in the NRC projects, as indicated in Table 7 below.
To date, 118 farmers have participated in the peanut project, 200 in the small-scale dairy production project and 70 in the poultry project, to mention only the largest ones. It should be noted however, that there is probably significant overlap in these numbers of project participants. Indeed, it seems that many of the farmers who were willing to cooperate participated in all of the sub-components that they could.

TABLE 7

Number of Farmers in MBF Subprojects

	1979	1980	1981	1982
POULTRY				
Omar Makram	30	57	70	70
Kafr el Khadra	8	20	40	40
TOMATOES				
Omar Makram	2	1	0	0
Kafr el Khadra	1	1	0	0
MAIZE				
Omar Makram	--	3	60	11
Kafr el Khadra	--	1	4	N.A.
PEANUTS				
Omar Makram	--	--	35	118
Kafr el Khadra	(peanuts not grown)			
WHEAT				
Omar Makram	--	--	58	N.A.
Kafr el Khadra	(no wheat subproject)			

N.b. All of these figures represent those available to the researcher as of August 1982 so are subject to revision as new information is collected.

Less Cooperation in Kafr el Khadra

However, it soon became clear that the small-ness of the project and close communication between researchers and farmers did not guarantee success. According to NRC project managers, not many producers in Kafr el Khadra showed an interest in participating in the sub-projects, especially

those involving field crops (see Table 7). Some Kafr el Khadra producers benefitted from the MBF Project's subsidies of poultry confinement areas. Traditionally, small farmers had kept chickens as a side activity, raising them under poor conditions, and generally leaving their care to the women. The improvements introduced by the NRC: hanging feeders, gas stove for heating and lighting, semi-automatic drinkers, as well as training programs on feed formulation and vaccination, increased the production of chickens fourfold.[111] The project also allowed producers to raise poultry for the market, whereas previously, they raised chickens mainly for the eggs. But none of the other production-oriented projects seems to have addressed problems that are priorities for Kafr el Khadra producers.

When asked why they thought the farmers in Kafr el Khadra were often unwilling to participate in the field crop activities of the MBF Project, some project scientists responded that Kafr el Khadra farmers placed unreasonable demands on the project. For example, because it reminded them of earlier government attempts to consolidate their landholdings as a part of the land reform movement, Kafr el Khadra farmers were apparently not willing to accept the project on NRC terms. The NRC wheat team had insisted that they could not provide proper supervision of project activities unless the individual plots of the farmers were

---

[111] Ali (1982).

consolidated in one area. Similarly, the maize team received full cooperation as long as the village council leader interceded but when the latter was away at the time of maize planting, few farmers proceeded to plant improved varieties.

Despite the small scale of the project and the close contact of scientists with the villagers, NRC staff were not always willing or able to accomodate the needs of the people they were trying to help. In part, this seemed to be because in general, the interest of scientists in rural development seldom goes beyond the research aspects of the project; indeed, some of the NRC scientists involved in the MBF Project seemed mostly interested in carrying out quality agricultural research to achieve optimal yields under the physical conditions characteristic of the two villages. Others were only interested in the lab work to be carried out at the NRC in support of the project.

Research May Not Be Key Constraint

A number of scientists however visited the villages regularly and assisted the villagers with all aspects of their production problems. As it turned out, much of the work involved facilitating institutional linkages for the farmers and other producers, and in training the agricultural extension workers and staff of the demonstration centers in how best to spread information on new techniques. These activities were ones for which the scientists were not

prepared and which the project had not anticipated in the design.

As will be discussed further in the next section, research may not be the main constraint to increasing productivity in the two villages. Farmers pointed out in interviews that the availability of the proper pesticides and fertilizers on a timely basis may be a problem in the long run since the new varieties recommended by the NRC are not currently available through the agricultural cooperatives. Egypt's system of agricultural cooperatives -- which are essentially government institutions controlling the supply of inputs and the marketing of outputs-- is not set up to be responsive to the unique needs of the different regions.

In addition,, although the demonstration centers were intended to create additional sources of income for farmers and landless workers, their impact appears to be fairly limited. NRC input into the centers was temporary; project assistance was mainly mobilized to set up the centers. It is unclear to what extent the communities are making use of them, or to what extent their organizational structure is effective in carrying out its mandate. This is something NRC project managers might want to follow up on since these demonstration centers are the only components which potentially address the needs of the landless laborers in the villages.

To date, the question of how to spread project benefits beyond the direct participants has not been systematically

addressed. If innovations are judged by other producers to be profitable then it may be reasonable to assume that an informal information exchange would take place among them to spread the new technologies. Wherever possible, the project demonstration plots or land and demonstration centers (apiaries, sericulture, dairy processing) were centrally located near a village thoroughfare. In addition, some of the sub-project managers prepared informational pamphlets to be distributed through the extension service.

However, not unexpectedly, the first farmers to cooperate with the scientists were also the more wealthy, progressive ones. As often happens in demonstration projects such as the ones in which the NRC is engaged , the main thrust of the effort was to gain visibility through clear, impressive successes. It was assumed that dissemination of the new techniques to the other village farmers then would occur without the need for further NRC input. Given this assumption, the best strategy was clearly to work with those farmers who were more wealthy and more educated. Presumably, these farmers would be more willing to take risks and more able to properly follow the advice of scientists. However, as will be discussed later, this strategy is inconsistent with the goal of improving the general living conditions and nutritional status of the village populations. If the goal of the project is to benefit the entire village, additional efforts may be necessary in order to encourage participation

by those households that are found to be most needy. This may require that the NRC seek a cooperative agreement with a local organization or government agency that has better field support systems than does the NRC.

Project Impact on the Communities

The long-term impact of the project on village welfare, and on nutrition in particular, depends largely on three different factors. Firstly, appropriate improvements in self-sustainable income-generating opportunities must be achieved. Secondly, low-income groups need to be brought into the project. And thirdly, the income must be spent in such a way that all household members are actually better off. Each of these factors will be discussed in turn.

Self-sustainability

As mentioned earlier, the NRC seems to have come up with a variety of appropriate methods for increasing village income-generation opportunities, appropriate because they provide a simple technical solution to what seem to be technical problems: poor seed varieties, pests, low soil fertility. Appropriate, however, is a concept strongly bound by cultural and environmental factors. The constraints faced by Omar Makram and Kafr el Khadra producers may make the simplest technologies inappropriate unless some of the structural constraints they face are alleviated. Indeed,

several indications suggest that the main constraint to the increase in agricultural productivity may not be technical knowledge.

In Kafr el Khadra, the fact that many of the land-holdings are very small and scattered may explain the lack of cooperation on the part of Kafr el Khadra farmers. Theirs may have been a rational response given the fact that they depend mainly on off-farm sources of income and only work the land for subsistence needs. In addition, even for small farmers, one of the main constraints in the choice of cropping pattern is the production of animal fodder: berseem in the winter and maize in the summer.[112] The price of meat and dairy products on the market are still unregulated by the government so that livestock are given high priority in a household's distribution of resources. Because the average land-holding size in Kafr el Khadra is too small to provide subsistence for an agricultural family,[113] it may therefore not be worth it to them to invest any further in agriculture. The farmers of Kafr el Khadra in general might be better perceived as wage earners as well as producers, since employment availability and wage levels may be more important determinants of their welfare than is agricultural productivity.[114]

---

[112] Maize stalks are used as animal fodder.

[113] Ilya Harik writes that an agricultural family in Egypt needs at least 2-3 feddans, planted with traditional crops, to provide for its subsistence needs; see Harik (1979).

[114] DeJanvry (1982), p.246.

In Omar Makram, knowledge of the optimal technology may not be the key constraint either. Apparently, institutional and environmental factors loom large. The logistical constraints of farming on land reclaimed from the desert are severe and may not warrant further investment in cultivation practices. In informal interviews with the researcher, Omar Makram farmers discussed the constraints they face. One of their main concerns was the rising cost of the inputs recommended by the NRC scientists. In 1981, the cost to the NRC per feddan of peanuts was about 33 Egyptian pounds (L.E.1= $1.20); this included the increased cost of improved land preparation, and the cost of specialized pesticides and fertilizers not generally used by the farmers or provided by the agricultural cooperatives. In 1982, the farmers who were participating for the second season, by agreement with the project did so at their own expense; they claimed that in the second year of the project, the same package of technologies cost them about L.E.50 per feddan.

More importantly, some farmers are not sure that it is worth investing more in peanut production, even though the yields and returns are highly profitable if all goes well; too often they have lost a whole crop because the electricity that runs their irrigation pumps has been cut off for a period of days. The farmers' ability to continue using the improved technological package therefore depends on the relative cost of inputs, their availability in time for planting, and the reliability of the electrical system.

Farmers in both villages appear to be reluctant to adopt more labor-intensive technologies because the relative cost of agricultural wages in the Egyptian rural areas is high. This appears to be one of the main reasons for the rejection of the stake-and-wire method of growing tomatoes . Insofar as possible, all but the large farmers rely mainly on family labor, exchanging with neighbors if they have an urgent job to be done. In informal discussions with the researcher, farmers indicated that competition from job opportunities in the growing urban areas other than Cairo, and in other Arab countries, as well as availability of farmland in other Arab nations,[115] has raised agricultural wages to unacceptably high levels. An Egyptian scholar points to two other reasons for the high wage levels, both of them having to do with the decline in labor availability.

> The fragmentation of landholdings has reinforced the household mode of production and absorbed large numbers of workers who used to be available for hire during the peak seasons... By employing their women and children on their own farms, and by increasing their own numbers, small operators have drained the labor pool available in peak seasons and pushed labor wages up. To replace them, other farmers have to hire workers in the regular labor force at much higher wages, who are also often unavailable.[116]

---

[115] The Christian Science Monitor reports that in Iraq, "to encourage private farming, Egyptian and Morroccan peasants are being given land grants to cultivate private plots in the Tigris and Euphrates Valley", 8/26/81.

[116] Harik (1974), pp.72,75.

He also suggests that labor availability has decreased because more children are in school, and women and some children are putting more hours into animal husbandry.[117]

It is probable that all of these factors help to explain the high cost of labor faced by Omar Makram and Kafr el Khadra farmers. Since family labor is probably already fully employed, either on or off farm, farmers wishing to adopt improved but more labor-intensive technologies must be willing and able to pay hired labor.

Participation by Groups with Low Socio-economic Status

Assuming that appropriate techniques are found for increasing village productivity, and that they are widely adopted, it would be fair to assume that the village populations would be generally better off in economic terms. Benefits would accrue to malnourished households, i.e. to households with members at risk of or suffering from malnutrition, only to the extent that they adopted the new technologies. It is therefore worth identifying the target groups for the MBF Project in terms of socio-economic and nutritional status as a way of determining whether or not project benefits can accrue to those groups that have been found to be the worst off.

It is not easy to define target groups for an IRD project such as MBF. The activities were designed to serve as demonstrations of improved techniques and therefore involve

---

[117] Ibid, p.72.

relatively few project participants , i.e. those that were subsidized. However, other producers may benefit by observing the new techniques being used by the participants themselves or by receiving training through some kind of an extension system. In a sense then, any villager engaging in the activity being improved becomes a part of the target group. According to this rationale, all of the land-holding families in Omar Makram are potential beneficiaries of the sub-projects involving field crops since all plant peanuts and at least some wheat and maize; 64 families might benefit from sub-projects dealing with vegetable crops.[118]

In Kafr el Khadra, the figures are larger because land-holdings are much smaller. About 672 of the 701 land-owners in that village stand to gain from field crop improvement projects. An activity involving vegetable crops would potentially benefit 53 farmers.[119]

As for the demonstration projects such as those dealing with poultry confinements, apiaries, and sericulture, their target group is the agricultural subcommunity as a whole in each village since they represent activities that could potentially provide a second source of household income for the landless and land-holders alike.

---

[118] NRC (1980b), Village Socio-Economic Baseline, Volume I, p.58.

[119] Ibid, p.29.

To find out the extent to which the target groups represent households vulnerable to malnutrition, a comparison can be made based on a socio-economic classification including food consumption as an indicator of nutritional status.

The figures in Table 8 for average per capita caloric intake, obtained by the NRC baseline survey, are probably not very reliable since they reflect the respondent's estimate of how much his family consumed of given foodstuffs during the previous twelve months. Therefore, they should not be read as absolutes but rather as general indicators of relative differences in food consumption between socio-economic groups. Indeed, these figures support the other findings of the socio-economic baseline. Table 8 classifies the populations of Omar Makram and Kafr el Khadra according to their socio-economic status and the average per capita daily caloric intake for that group. Those households whose main source of income is on-farm are referred to as "net agricultural income -- land-holders" or "net agricultural income -- landless"; those who also derive income from off-farm sources are referred to as "mixed agricultural income" groups. (See Tables 2 and 3 for a breakdown of the populations by main source of income).

Because of the field crop bias that has evolved in practice, it is the landless and fishermen who are least likely to benefit from the project unless they are able to take advantage of the activities of the demonstration centers.

TABLE 8

Socio-economic and Nutritional Classification of the Two Villages

SOCIO-ECONOMIC STATUS	AVERAGE PER CAPITA DAILY CALORIC INTAKE: OMAR MAKRAM	AVERAGE PER CAPITA DAILY CALORIC INTAKE: KAFR EL KHADRA
Agric.sub-community		
net ag-landholders	2453 kcal/day	3299 kcal/day
mixed-landholders	3064	3135
net ag-landless	4212	----
mixed-landless	4664	2482
fishermen	----	1641
Non-agric. subcommunity		
non-subsidized	3370	3282
subsidized	2356	2907

Source: NRC (1980b), Village Socio-Economic Baseline, Vols. I and I.

Table 8 suggests however, that in Kafr el Khadra, it is these two groups that are worst off in terms of caloric consumption. They would also therefore be the ones most likely to show improvement if the project addressed their needs.

It could be argued that because the landless and the fishermen represent a small proportion of the total village population, 4.1% and 2.5% respectively, it is not worth developing subcomponents just for them. However, since even the project activities oriented towards landholders are not

meeting with much success in Kafr el Khadra, a completely different approach may be warranted. For example, the project might support existing small-scale rural industries or provide subsidies to new ones, as already suggested by several project managers for the new villages. The increase in incomes and employment for low-income groups would probably be more significant than can be expected through the project as it stands.

In contrast, the project appears to be targetted to the appropriate groups in Omar Makram since the land-holding households are the ones with the least adequate level of food consumption.[120] They are also the most likely to benefit from the NRC projects.

Talks with NRC scientists working in Omar Makram, the agricultural engineers in charge there, and some of the farmers, indicate that increases in yields of peanuts, poultry, potatoes and onions represent the most substantial cash gains to the farmers. All of these are assured a good market. Peanuts are sold at a fixed price (L.E.20 per ardab, 1 ardab is equal to 150 Kg) to the agricultural cooperative; vegetables and poultry are sold locally at good prices; farmers say they get 240 piastres (1000 piastres = L.E.1) per chicken; vegetables sell for about 20 to 25 piastres per Kg. Thus an increase in production of these foods would bring in cash that would help to cover the high costs of production

[120] The subsidized group is also poorly off but only represents 8% of the population.

characteristic of Omar Makram, as long as problems of input availability and electrical current cuts were not overwhelming. Furthermore, if the new technologies are widely adopted, the peanut project could potentially benefit a large group since it involves a crop which all Omar Makram farmers grow in the summer (many plant as much as two thirds of their land in peanuts).

The wheat project also has broad potential although the best and least-cost husbandry techniques for the particular village environments are still being researched. Since all farmers suffer heavy storage losses in wheat of up to 50%, they welcome new technologies. In the winter of 1981, the wheat project assisted 55 Omar Makram farmers. Increased wheat yields would not usually translate into an increase in cash income since most farmers in Kafr el Khadra and Omar Makram do not sell wheat on the market. Most wheat is ground for bread baking or fed to livestock if it has begun to spoil in storage. Rather, higher yields would cause an increase in real incomes since it would reduce the amount of wheat that a household would need to purchase from the market.

NRC scientists are still experimenting with different maize seed varieties to find the one best adapted for local needs in Omar Makram. Maize serves a dual purpose: it is used in bread-baking, but also its stalks are the main source of livestock feed in the summer. If a suitable variety is found, the maize component may benefit a large number of farmers

since most farmers plant one third of their land in maize in the summer. Therefore, in Omar Makram, a majority of the agricultural sub-community could benefit from the project if the information reached them and institutional constraints were dealt with on a collective basis.[121]

Project Effect on Food Consumption and Nutrition

Although a rise in household real income would generally be expected to lead to an increase in food consumption, there are situations, such as those discussed in Chapter 2, in which no such change occurs or a deterioration may become evident. Situations in which negative effects may outweigh any benefits include those in which agricultural produce prices change as a result of the project, marketing patterns are changed, control over income is shifted, labor patterns are altered, or the vulnerability of a household, due to dependence on institutions and factors beyond its control, is increased. The following discussion examines each of these relative to the MBF Project.

It is unlikely that agricultural produce prices will change significantly as a result of project activities unless the vegetable crops improvements are widely adopted.[122]

---

[121] It has been estimated that the increased income to be derived from improvements due to the project is 36 L.E. per feddan for wheat, 174 L.E. per feddan for peanuts, and 121 L.E. per feddan for maize. See NRC (1980b), Village Socio-Economic Baseline, Vol. II.

[122] Harik points out that fruits and vegetables are still exempt from government control and are therefore

Otherwise, the project is mainly dealing with crops whose price is controlled by the goverment (peanuts) and crops which are mainly kept for home consumption (wheat, maize).

However, improvements introduced by the project may significantly affect the producers' marketing pattern and therefore affect the likely impact of the project on household food consumption. It cannot be assumed that the additional produce will be kept for home consumption with only the excess being marketed, even if that was the traditional pattern.

For example, the study done by the NRC team of poultry specialists found that increased poultry production did not result in any increase in home consumption of chicken, but rather allowed the households to market chickens when they had not previously done so.[123] Indeed, producers may prefer to increase their cash income and keep less of their own produce. This could be because they prefer the bought commodity (for example, an Omar Makram farmer said in an interview that he bought flour and sold his wheat or used it for feed because his family prefers the taste of the purchased flour). It could also be that selling goods which command a high price on the market, such as vegetables and poultry, allows them to buy relatively more of a government-subsidized commodity such as wheat flour, lentils, or sugar. Producers may also prefer to

---

lucrative; see Harik (1979), p.29. Prices would therefore be expected to vary greatly according to supply and demand.

[123] Ali (1982).

sell their produce so that they may buy non-food items, or improve their living conditions. Increasing incomes therefore may or may not improve household food consumption, depending on outside factors as well as choices made by the person in the household who controls the additional income.[124]

The effect of the project on food consumption may be complicated by a resulting change in labor patterns. Some of the new technologies being introduced by the NRC require additional labour, particularly in land preparation and in the application of fertilizers and pest controls. Since insofar as possible, farmers seem to avoid hiring labor it may be that family members are forced to spend more time in the fields at certain times of the year. The change in allocation of the woman's time in particular may adversely affect infant feeding practices and the nutritional status of the family as a whole.

Of concern too in the MBF Project, is the increased vulnerability of farmers in Omar Makram who, having invested more heavily into crop production, stand to lose much more in the case of events such as electrical failure that are beyond

---

[124] It may be that the change in poultry-raising methods and marketing represents a shift in control of income from women to men in Omar Makram and Kafr el Khadra. Traditionally, women and children raised the poultry, mainly for the eggs; most eggs were kept for home consumption or bartered, and some were marketed. With the change to well-equipped confinement areas, households were able to raise poultry for the meat and sell them for good prices. It may be that raising poultry therefore becomes a man's job and that he gains control over the additional income. This might be worth exploring further since it has been found elsewhere that women are more likely to have food and nutrition as a priority for household expenditure (see Chapter 2).

their control. If the farmer is likely to be more vulnerable because he is more dependent on irrigation, the new technology may cause his economic situation to deteriorate, thereby inhibiting any increase in food consumption for the household.

A variety of health and environmental factors may influence the nutritional status of individuals within the household such that an increase in food available to the household as a whole does not result in improved nutritional status. Indeed, the nutrition survey carried out in the two villages pointed to infection and infant weaning practices as factors that might inhibit the positive effect of increased incomes on nutritional status. In Kafr el Khadra, the high Infant Mortality Rate of 112.6 per thousand, and the relatively high prevalence of acute malnutrition, suggest that infection may be an important factor not taken into consideration by the project. Providing new income-generation opportunities for a broad range of villagers may increase living conditions for some, but will not improve the nutritional status of those whose problem is more health-related.

In addition, due to poor infant feeding practices, the nutritional status of children in Omar Makram in particular, but also to some extent in Kafr el Khadra, may deteriorate despite rising incomes and increased food availability to the household as a whole. In both villages, 90% of the children sampled were breast fed in the first year of life. 38% of the children in each village were receiving a food supplement by

the ages of 6 to 11 months. In Kafr el Khadra, 25% of the children between 16-17 months of age were still being breast-fed only, while 67% received a supplement. Of the children over 18 months of age, only 4 were still breast-feeding at all. In contrast, in Omar Makram, 42% of the 12-17-month-old babies were still being breast fed only, and 50% were breast feeding with supplement. Most of the children were not completely weaned until 2 years of age.[125] Therefore, even if the project has a positive effect on Omar Makram agricultural households by increasing their incomes, the change may not be reflected in measures of the child's nutritional status because of the stronger influence of infant feeding practices.

CONCLUSION

The success scientists were able to demonstrate in helping participating farmers to increase the yields of their main crops has gained recognition for the NRC and increased the demand for its services. Indeed, as discussed in Chapter 4, the NRC involvement in the Ministry of Agriculture Middle Egypt Project was a direct outgrowth of their experience in Omar Makram and Kafr el Khadra; in addition, one of the villages near Omar Makram has requested the assistance of the NRC in improving the productivity of their peanut fields. Furthermore, a core group of scientists -- both physical and

---

[125] Abdalla (1981), p.52.

social -- have gained tremendously valuable experience through their work at the village level, including a better understanding of rural problems and opportunities as rural people themselves see them. This core group has already strengthened the NBC's capacity to design aand manage IRD. Thus the institutional goals embodied in the MBF Project have been largely fulfilled.

But progress towards the equity goals remains unclear. The analysis in Chapter 2 suggests that if project innovations are widely disseminated in Omar Makram, it seems likely that farmers will obtain self-sustainable increases in real income. However, it also identifies several key constraints to widespread adoption of innovations. First, the agricultural cooperative system on which Omar Makram farmers depend, may not be flexible enough to accomodate the changes brought about by the MBF Project. Secondly, it is not clear that appropriate technologies , from the point of view of village producers , have indeed been found, except in the case of peanut production in Omar Makram.

In addition, whether this change is reflected in an improvement in nutritional status depends on several key factors such as the amount that is actually spent on food as opposed to other goods, the intra-household distribution of food, any changes that may have occured in control over income or in labor patterns, as well as health and environmental factors that may inhibit the proper utilization of the food

ingested by an individual household member. Increasing agricultural productivity in the village is a necessary but not sufficient condition for improving the nutritional status of land-holding families. More data would be necessary to identify which of these factors are most important in determining nutritional status in the Omar Makram context.

As for Kafr el Khadra, the More and Better Food Project as currently designed and implemented, will probably not affect the two groups whose nutritional status is the lowest: the landless and the fishermen. Consideration might therefore be given to adding other components oriented towards their needs. Furthermore, it seems that health and sanitary conditions are strong determinants of nutritional status in Kafr el Khadra and thus may inhibit improvements even if the project succeeds in raising incomes for a wide variety of villagers.

Assessing project impact in terms of nutrition as has been done above, is likely to paint a discouraging picture. IRD strategies are designed to set in motion processes that may not yield measurable changes in nutrition -- if at all -- for over ten years. During that time, changes may occur that will affect nutritional status, either positively or negatively. Even if all of the data were available for a comprehensive analysis, it would be difficult to show with any assurance that a project per se had a positive impact on nutritional status. The information about the other factors that influence nutritional status and living conditions may however

be equally important for management and evaluation decisions. This reinforces the importance of adopting a comprehensive approach to rural poverty; development strategies do not affect communities in isolation but rather complement the processes already at work. The findings of the analysis thus lend support to the process approach to IRD that allows for changes to be made in design and implementation as experience accumulates, and stresses the importance of ongoing monitoring such that information is available to assist decision-makers as the project progresresses. Chapter 4 outlines the implications of the preceeding analysis for nutrition in the MBF Project and for nutrition in IRD in general.

Chapter IV

IMPLICATIONS FOR NUTRITION IN THE MORE AND BETTER FOOD PROJECT

INTRODUCTION

An assessment mid-way through the project of its potential impact on nutrition can provide the opportunity to review the rationale for incorporating nutritional considerations, and to propose changes in project implementation that would enhance its impact on nutrition. This chapter therefore is oriented towards decisions that might be made to increase the likelihood that the project will achieve its equity goals. Indeed, the MBF Project goal of increasing the productivity of certain crops through demonstration efforts in the villages seems to have been achieved. Opportunities for the village as a whole however have been largely neglected.

Although nutritional objectives are explicitly stated in the More and Better Food (MBF) Project, the project design does not reflect a clear consensus on what form they should take. On the one hand, the design includes agriculture-related income and employment generation components under the assumption that these are most likely to provide a long-term solution to problems of malnutrition and poverty. On the other hand, the design includes direct interventions under the assumption that improving nutrition

means solving immediate health-related problems. Indeed, as mentioned earlier, anemia intervention trials have been carried out in Karr el Khadra through the health clinic with the help of a dedicated doctor and his staff. Discussions have taken place regarding the nutritious snacks program for elementary schools but a format has not yet been decided upon. In addition, the Nutritional Status Survey was conducted in both villages, but separately from the Village Socio-Economic Baseline Survey.

The inclusion of direct nutrition interventions such as the distribution of iron pills to anemic children and the promotion of nutritious snacks in schools represent different way of achieving an improvement in nutritional status than that promoted by the agriculture-related subcomponents. Whereas the principle of the MBF Project is to introduce self-sustaining changes in the villagers' income-generation potential, direct nutrition interventions would require an ongoing commitment of personnel and finances. The implementation of such interventions would therefore require quite different organizational and financial arrangements than do the other project components.

These two approaches incorporate different, but not necessarily mutually exclusive ways of looking at nutritional problems as measured in young children. One looks at the problems in their own right, and the other looks at nutrition as an indicator of development. They can be complementary if

integration into the same project makes sense. For example, since it appears that sanitation is a crucial problem in Kafr el Khadra, and one that will probably inhibit any nutritional improvement through increased incomes and food consumption, it may be advisable to add on a component that deals directly with village sanitation. To complement this activity, the project might support existing small-scale rural industries or provide subsidies to new ones, in order to address the needs of some of those whose main source of income is non-farm.

Similarly, since infant feeding practices have been found to be one of the main causes of malnutrition in both Omar Makram and Kafr el Khadra, it might be highly effective to combine a nutrition education program with an income-generation project that helps women improve their productivity.[126] In the context of the two villages, NRC teams preferably of women, might induce improvements in livestock and poultry-keeping that would improve the women's productivity without reducing their control over the produce. As they gain the means to better provide for their families and themselves, the women may be more receptive to advice on infant-feeding and nutrition in general.

The main difference between projects such as those just mentioned and those proposed in the MBF Project design, is that the former are intended to be merely catalysts for change in the processes that determine malnutrition. The latter

---

[126] See Hart (1975).

create a dependency on hand-outs and institutions which runs counter to the emphasis in IRD on self-sustaining development.

Project implementation has also not yet dealt systematically with reaching those households that are the worst off in nutritional and socio-economic terms. Part of the constraint is the lack of data relating nutrition to socio-economic status in the villages. This makes it difficult to identify those whom the project should reach and the problems they share. Part of the constraint is also the lack of an explicit strategy for disseminating information once initial experiments have proven successful. Indeed, no clear guidelines exist as to when the NRC has fulfilled its commitment to the villages: when productivity has increased for project participants (i.e. those involved in the experimental stages of the demonstration projects and receiving subsidies) or when they have benefitted the resource-poor groups.

If the equity goal of the project, i.e. the improvement of nutritional status as a proxy for village living conditions, is not explicitly planned for, it is unlikely that it will be met. Indeed, as suggested in Chapter 3, income due to project innovations may not be accruing in ways that favor nutritional improvement in the villages. New technologies may be increasing the vulnerability of producers to large losses. They may be decreasing women's control over production processes and thereby decreasing their role in family food

purchasing and consumption. Or the project may be increasing the gap between those with high real incomes and those with low incomes. Clearly, further consideration should be given to identifying the malnourished and determining those problems they have in common that the NRC can help to solve. The following discussion lays out several possible alternatives for improving nutrition and general living conditions in the villages.

DATA NEEDS FOR REACHING MALNOURISHED GROUPS

In order for project resources to help solve the problems of the malnourished groups, information is needed on who these people are and what their needs are. If a sample of Omar Makram and Kafr el Khadra households could be obtained and classified according to a series of nutritional status and socio-economic indicators, it would be possible to identify the vulnerable groups in terms relevant to the MBF Project. Socio-economic and nutritional considerations could then be integrated into the project design such that the components were tailored to the opportunities and constraints of these groups. For this type of analysis, an integrated data set is most effective, i.e. one that groups households according to a series of socio-economic classification variables and a series of nutrition and quality-of-life variables. Which ones are chosen would depend on the project and the environment in which it is being implemented.

To compare different groups of project beneficiaries for the purposes of improving targetting, it is useful to have a set of indicators that appropriately summarizes the nutritional status of the household. Food consumption indicators and/or anthropometric measurements using heights, weights, and age, are the ones most commonly used. Both have advantages and disadvantages when used separately, and are most reliable when used together. Indicators of food consumption are more sensitive than measures of nutritional status to changes in income, if they can be accurately measured. Indeed, there is a general relationship between income and food consumption which can be measured by the economic technique of income elasticities. These are based on the theory that an increase in income generally leads to some increase in food consumption. The proportion of the income increment spent on food depends on a variety of factors such as prices, tastes and preferances, and income control within the household. This proportion is reflected in a measure of income elasticity . Therefore, food consumption measures are easier to interpret in terms of changes in income.

The most common technique for collecting food consumption data is the twenty-four-hour recall. Estimates of domestic food production and food purchases through expenditure surveys may also be used as proxies for food consumption; repeated measures may be needed to get the appropriate recall

period.[127] Such data are difficult and expensive to collect, and are fairly unreliable.

Conversely, indicators of nutritional status such as weights and heights of children are easy to obtain but their relationship to income is not as well-understood as that of accurately measured food consumption data. In theory, the nutritional status of the child may serve as a proxy for the nutritional status of the household: if the child is well-fed then it is highly probable that the other members of the household are also well-nourished and fairly well-off in general. In contrast, a household in which there are malnourished children does not necessarily indicate that all members are malnourished since working members of the household will often be fed at the expense of others. However, the household probably has other problems : inadequate income, illiteracy, inadequate sanitation, all of which have been shown to contribute directly or indirectly to malnutrition. It is therefore preferable to supplement indicators of nutritional status with indicators either of food expenditure or food consumption.

To summarize, anthropometric measurements should probably be included since they are easy to collect and accurate, and, in conjunction with food expenditure data and indicators of socio-economic status, provide a good picture of the associations between nutrition and rural development. If the

---

[127] Casley and Lury (1982),p.43; see also pp.197-199.

resources are available, it is advisable to include measures of food consumption to help ascribe changes in nutritional status to changes in income.

For the purposes of MBF Project managers, it may be possible to use existing data to put together the kind of functional classification described above. The NRC has three main sources of information on Omar Makram and Kafr el Khadra that would be useful; these could be supplemented with data available in the clinics (birth and death registration, data on mothers, on immunizations), the agricultural cooperatives, and other local government institutions. The first NRC source is a summary of the census survey taken of the two villages by an NRC team in 1980; it includes a series of demographic indicators for all village households and institutional profiles of the villages.[128] The second is the NRC Village Socio-Economic Baseline, a sample survey using a Proportional Stratified Clustered (Nested) Random Sampling Design.[129] The strata used were defined by the household's main source of income, its land-holding size and family size. The report includes a wide variety of information on the farming systems in the two villages: data on cropping patterns, livestock production, household food industry, farm profitability, as well as information for the village in general on household characteristics and conditions, and food consumption. The

[128] NRC (1980a), Village Demographic Survey.

[129] NRC (1980b), Village Socio-Economic Baseline, Vols. II-III

latter however are too general to serve as proxies for nutritional status (see discussion in Chapter 2).

The third is the write-up of a small NRC nutrition survey which sampled children coming to the health centers for vaccination. It includes information on weights, heights and ages of the children, infant-feeding practices, as well as indicators of diseases that are associated with malnutrition; it does not however include any information on the household to which the child belongs.[130]

If the children screened by the nutrition survey could be matched up with their households, presumably with the help of the clinic staff, the information from the NRC Census Survey could be used to draw up a profile such as the one in Figure 6 For each socio-economic stratum in the village, the profile might include the prevalence of wasting (<80% Weight-for-Height) and stunting (<90% Height-for-Age), the percentage of poor dwellings, the percentage of dwellings without latrines, and the percentage without a private water source. If enough children covered by the nutrition survey could be matched up with households sampled by the baseline, further project-relevant classifications could be drawn up based on the farming systems characteristics of the two villages.

---

[130] Abdalla (1981).

The main decision to be made based on these classifications would be whether or not the project, as designed and implemented, is likely to benefit those groups identified as poorly-off, and to what extent the project could meet their needs if changes in design and implementation were instituted. Therefore, it is crucial that information also be available on project participants and extent of dissemination to non-project participants.

Using one of the Cook and Campbell (1979) designs mentioned in Chapter 2, the survey could be designed to provide before- and after-project data. These might include not only measures of the dependent variable, nutritional status, and of the independent variable, the project, but also of those variables that are likely to influence the relationship between the two. For Omar Makram and Kafr el Khadra, these should probably include land-holding size, main source of income, amount of produce marketed, household labor patterns, some measure of sanitation and some measure of intra-household food distribution. Statistical manipulation through multiple regression analysis would then be possible to isolate the effect of the project on nutrition. The behavior of the interfering factors themselves would also be of interest to help identify the most significant determinants of nutritional status, and to find out which factors, if any, might be open to intervention.

When dealing with a theoretical construct as complex as that which places nutrition in the poverty "web", it may be advisable to supplement general survey data with a case study that examines in detail the project impact on a small number of beneficiaries.[131] This may be the best way to estimate the causes of the various observed effects. Indeed, even if data is available for a comprehensive analysis of nutritional status, it is difficult to find significant relationships. It has been suggested that it is not unusual for only 10% of the variance of the dependent variable to be explained by the independent variables included in the model.[132]

DESIGN ALTERNATIVES FOR ACHIEVING EQUITY GOALS

If the evaluation of the MBF Project shows that the technologies are being widely adopted, it would be important to find out the extent to which the beneficiaries represent households with malnourished members. If however, the evaluation shows that few farmers are adopting or continuing to use the new technologies at all, it may be important to find out why (qualitative judgements based on discussions with participants would suffice) and find ways to better adapt the technologies to local conditions.

---

[131] Casley and Lury (1982), p.52.

[132] Mason (1983), p.43.

If only a few project sub-components seem to have an impact on households with malnourished members, the activities of those sub-projects could be expanded and others reduced. For example, it is likely that the evaluation will find that in Kafr el Khadra, the project is not affecting either the landless workers or the fishermen, two of the groups whose caloric intake appears to be inadequate. If that is the case, it might be recommended that some of the sub-projects, such as poultry, be expanded and implemented with an orientation towards those groups. Indeed, the baseline data shows that some landless households and some fishermen's households own and raise poultry. Of the four landless households sampled in the socio-economic survey, three owned poultry: two families owned twelve chickens each and one family had four. None of the households however sold any poultry and they all reported a high mortality rate. Of the five fishermen's households sampled, only two own poultry; both had six chickens. Some of them did report selling poultry although the information is incomplete.[133] It is conceivable that with proper subsidies to begin with, these households could be equipped with the confinement areas that worked so well for others in the village, and could produce chickens to be sold for meat in the market, thereby increasing their income-generation potential.

---

133 NRC (1980b), Village Socio-economic Baseline Survey, Vol.II.

Likewise, the dairy processing project might help the landless in Kafr el Khadra since the ones in the sample reported producing a variety of dairy products, all from buffalo's milk. They also report selling some (about one half of their production). If these households could also be equipped with bee-hives and sericulture frames, and trained to use them, their income-generation potential would be substantially increased.

If the evaluation shows that the agricultural projects are not likely to have an adequate impact on nutrition, and it was determined that certain groups of malnourished villagers could not be brought into the project, then additional project components might be considered . The choice of alternatives should involve the opinions of the potential beneficiaries and their participation in design, as was done for the subcomponents already implemented. This may involve more time and outreach than was necessary for the demonstration projects because typically, those families that are less well-off have had little contact with extension workers of any kind, much less with researchers. Once needs have been identified, then a decision can be made as to whether intervention can effectively address them, and as to which alternatives are the most cost-effective.[134]

---

[134] Some alternatives have already been mentioned: subprojects dealing with sanitation, programs addressing the needs of non-agricultural producers, programs oriented towards women as producers and combined with nutrition and health education .

Clearly, effective information channels, including both qualitative and quantitative data flows, are crucial to ensuring that the project achieves the expected impact on general welfare and nutritional status. At least, the information mentioned above may help project managers to avoid possible negative side-effects. It may also help achieve positive effects by identifying those groups most in need and clarifying the determinants of their poverty. However, accurate information per se will not guarantee that the overall goals of improving general welfare and nutritional status are actually met. The ability of the project staff to develop technologies that lead to self-sustainable increases in income, and their sucess in ensuring that the innovations are accessible even to the worse-off groups, are also necessary steps along the way.

To this end, two additional components might be considered. One might be referred to as an institution-building component, and the other as a training component. An institution-building component -- assistance in organizing producer cooperatives, working with the agricultural extension service to provide new services -- might ensure that the demonstration centers became an integral part of the community and that the farmers were able to continue using the new techniques after the MBF Project subsidies were withdrawn and the NRC no longer delivered inputs unavailable locally. Such an approach might include in the design a strategy for

dissemination , i.e. an explicit process whereby the results of applied scientific trials would be "translated" and disseminated, either to individual villagers or to local government personnel and organizations responsible for programs with a broad outreach. This would include funding proposals if necessary, and a plan for assessing the impact of the project on the villages. An approach such as this one would most likely involve establishing effective linkages with the various government bodies that have an extension capability (Agriculture, Health, Education, Social Affairs) at the governorate or district level as well as village leaders and local organizations.

In order to better reach low-income producers, it might also be advisable to build into the project a training component in which researchers, extension workers, and the innovating farmers work together to determine the best way to institutionalize the new agricultural practices and the spreading of information to other producers. The latter component would presumbly address the question of how best to bring the locus of project decision-making closer to the field in order to ensure the true integration of the multi-disciplinary activities.

In the long run, it seems that the best way for the NRC to reconcile its institutional goals and the personal goals of its staff, with the objectives of IRD, is for it to join forces with one or several other organizations that have

supportive facilities in the rural areas and the extension capability that the NRC lacks. In the Egyptian context, one possibility is to collaborate with one of the nation's provincial universities. These are mandated to train scientific and technological personnel for service in Egypt, and in the rural areas in particular. This is the approach being considered currently by MBF Project managers as they contemplate including two new villages in the project.[135]

Another possibility is to collaborate with national and governorate-level institutions with infrastructure and personnel in the rural areas. The Middle Egypt Project, a venture jointly funded by the Academy for Scientific Research and Technology, and the Ministry of Agriculture, has adopted this approach. It involves NRC scientists working with the Organization for Reconstruction and Development of Egyptian Villages (ORDEV) and the extension service of the Ministry of Agriculture, to teach farmers the use of new seed varieties and cultivation techniques for maize and tomatoes respectively. It is currently working with 12,500 feddans of maize and 7,500 feddans of tomatoes in the governorates of Giza, Beni Sweif, and Fayoum.[136] Collaborating with other institutions in the implementation of the MBF Project would allow it to impact a much larger number of people and in a

[135] The NRC is discussing collaborating with Assiut University in Upper Egypt to implement the MBF concept in surrounding areas. The division of responsibilities is yet to be worked out.

[136] Interviews with NRC scientists involved in the project.

sustained manner over time. However, if upscaling the project is a high priority, it will be important for the NRC to decide how and if nutrition will be integrated into the activities, and if indeed Integrated Rural Development is the appropriate model for the project.

CONCLUSION

The experience of the MBF Project with introducing nutrition as a measure and a goal for development, highlights opportunities and problems that need further study. First, nutritional status is a fairly sensitive indicator of the living conditions of the rural poor. If a certain group of people have low purchasing power, poor sanitary conditions, or an intra-household decision-making process biased against nutritional considerations, it will show up in measures of the nutritional status of women and children. Indeed, these groups have been found to be most at risk of malnutrition. If conditions improve, the changes will be reflected in measures of nutritional status, and in particular in the growth of children aged 2 to 4.

Second, measurement and surveys can greatly help in the management of the various factors influencing nutritional status. As a part of project design, information on nutrition and socio-economic status can identify those groups most in need, and help determine the nature of their problems. In a mid-term assessment, measures of nutritional status can help

determine whether or not the project is effectively reaching the intended beneficiaries, and whether unintended side-effects may be inhibiting any improvement in living conditions. As a part of project evaluation, measures of nutritional status may be compared with baseline measures to see whether the project had a lasting impact on living conditions.

Third, as a goal for IRD projects, nutrition may help to clarify the kind of development that is being promoted, i.e. self-sustaining development that improves the living conditions of the rural poor. An analysis such as the one presented here, points to the importance of identifying the structural constraints to innovation and actively promoting the wide-scale dissemination of improved technologies, in particular to those socio-economic groups who for various reasons are often left out of the development process. Indeed, although information is crucial in ensuring that project resources are oriented towards the needs of malnourished groups, the implementation processes are equally important, i.e. project initiatives in the delivery of goods and services, and the response of rural populations to those initiatives. In addition, an analysis that explicitly considers nutritional status and its determinants, suggests that an integrated approach would ensure greater project effectiveness in reaching the equity goals of IRD.

The preceeding analysis has identified opportunities for introducing nutritional considerations into IRD, but also problems. The lack of consensus on the design characteristics needed for a self-sustaining program, the lack of unambiguous measures of nutritional status, and a poor understanding of the process by which income is translated into food consumption and to the nutritional status of individuals, all represent areas needing further research.

As more experience with IRD accumulates, it may be possible to identify those program components most likely to ensure the self-sustainability of development processes set in motion. The MBF Project suggests that participation by potential beneficiaries appears to be essential, as is the location of project activity and decision-making near the population it is intended to benefit. In addition, some kind of training/extension component designed to work with groups of low-income producers seems advisable. Although the autonomy and small scale of the project were helpful at the experimental stage, they concentrated resources in two small areas and limited the number of people who could be reached. It remains to be seen whether the lessons learned in the MBF Project can be generalized and effectively upscaled to the governorate level.

However, it should be noted that the problems of measuring and interpreting nutritional status as a proxy for general living conditions are not any greater than those accompanying

other indicators of equitable development such as income or expenditure. If the interrelationships with other determinants of poverty were better understood, nutritional status would be relatively easier to measure because it can be summarized by a series of physical indicators: anthropometrics, infant mortality rates, and other measures such as birth weights. Therefore, more research is needed to specify those factors which are the strongest determinants of nutritional status as an indicator of poverty, and to explain the process at work.

In summary, explicit considerations of nutritional status as a proxy for changes in general living conditions may help to clarify the goals of IRD projects. Such concerns as who will benefit from the project activities and to what extent these will be self-sustaining improvements, might provide a common goal for such diverse activities as pest control, water quality improvement, and small-scale food processing. A design that clearly lays out the transformations that must occur in order for project processes to bring about positive changes in nutrition, or at least to avoid negative ones, would provide a common set of objectives for professionals from widely divergent fields and backgrounds, and might ensure that the needy do indeed benefit from Integrated Rural Development .

BIBLIOGRAPHY

Abdallah, Nagwa. 1981. Prevalence of PEM in a Village in the New Settlement. Master's Thesis, Cairo Univ. Dept. of Pediatrics.

Abdel-Fadil, Mahmoud. 1975. Development, Income Distribution, and Social Change in Rural Egypt: A Study of the Political Economy of Agrarian Transition. Cambridge: Cambridge Univ. Press.

Alderman, H., von Braun, J., Sakr, A.S. 1982. Egypt's Food Subsidy and Rationing System: A Description. Research Report 34, Washington, D.C.: IFPRI.

Ali, Hatem M. 1982. "Impact of Small-Scale Poultry Farms on the Nutritional Status of Inhabitants: A Case Study". Unpublished paper, National Research Center, Cairo.

Banemuka, Judith. 1982. "Female-Headed Farms in Kenya". Unpublished paper, Cornell University.

Berg, Alan. 1981. Malnourished People: A Policy View. Poverty and Basic Needs Series, Washington, D.C.:World Bank.

Casley, D.J. and Lury, D.A. 1982. Monitoring and Evaluation of Agricultural and Rural Development Projects. Baltimore and London: Johns Hopkins Univ. Press.

Chambers, Robert. 1974. Managing Rural Development: Ideas and Experience from East Africa. Uppsala: the Scandinavian Institute of African Studies.

Cohen, J.M. 1980. "Integrated Rural Development: Cleaning Out the Underbrush". Sociologia Ruralis. v.20, 196-211.

Cook, T.D., and Campbell, D.T. 1979. Quasi-Experimentation: Design and Analysis Issues for Field Settings. Chicago: Rand McNally College Publishing Co.

DeJanvry, Alain. 1981. The Agrarian Question and Reformism in Latin America Baltimore and London: Johns Hopkins Univ. Press.

Dewey, Kathryn G. 1980. "The Impact of Agricultural Development on Child Nutrition in Tabasco, Mexico". Medical Anthropology. 4(1):21-54.

Dewey, Kathryn G. 1981. "Nutritional Consequences of the Transformation from Subsistence to Commercial Agriculture in Tabasco, Mexico". Human Ecology. 9(2):151-87.

Doan, P.L. forthcoming. End-User Participation in Research in Egypt. Master's Thesis, Cornell Univ. Dept. of City and Regional Planning.

Fleuret, P. and Fleuret, A. 1980. "Nutrition, Consumption and Agricultural Change". Human Organization. 39(3):250-60.

FAO. 1980. "Report on Review Discussions of FAO Methods for Introducing Nutritional Considerations into Agricultural and Rural Development Projects". Rome: FAO.

FAO. 1981. "Introducing Nutrition in Agricultural and Rural Development". Report of the Sixth Session, Committee on Agriculture, Rome: the Food and Agriculture Organization of the U.N.

Galal, Osman. 1980. "More and Better Food: The Role of Nutrition in Village-Related Projects". Unpublished paper, National Research Center, Cairo.

Gilbert, E.H., Norman, D.W., Winch, F.E. 1979. Farming Systems Research: A Critical Appraisal. Michigan State Univ. Rural Development Papers, Dept. of Agricultural Economics.

Guyer, Jane. 1980. Household Budgets and Women's Incomes. Working Paper no.28, Boston University African Studies Center.

Habicht, J-P., Mason, J.B., and Tabatabai, H. forthcoming. "Principles for Evaluation of Ongoing Programs" in Methods for Evaluating the Impact of Food and Nutrition Programs. eds. Sahn, Lockwood, and Scrimshaw, chapters 1 and 2. Tokyo: United Nations Univ.

Harik, Iliya. 1972. "Mobilization Policy and Political Change in Rural Egypt", in Rural Politics and Social Change in the Middle East. eds. Antoun, R. and Harik, I. Bloomington, IN: Indiana Univ. Press.

Harik, Iliya. 1974. The Political Mobilization of Peasants. Bloomington, IN: Indiana Univ. Press.

Harik, Iliya. 1979. "Socio-Economic Profile of Rural Egypt". Unpublished paper, The International Islamic Center for Population Studies and Research and the Rural Development Committee of Cornell University, Cairo.

Hart, Gillian. 1975. Women's Participation in the Labor Force: Implications for Employment and Health/Nutrition Programs. Dept. of Agricultural Economics, Cornell Univ.

Honadle, G. and VanSant, J. forthcoming. Implementation and Sustainability: Lessons from IRD. West Hartford, CT: Kumarian Press.

Ikram, Khalid. 1980. Egypt: Economic Management in a Period of Transition. Baltimore and London: published for the World Bank by the Johns Hopkins Univ. Press.

ILO. 1977. Employment, Growth and Basic Needs: A One-World Problem. Geneva: International Labor Office.

Latham, Michael. 1975. "Nutrition and Infection in National Development", SCIENCE. v.188, 9 May 1975.

Lele, Uma. 1976. "Designing Rural Development Programs: Lessons from Past Experience in Africa", in Economic Development and Cultural Change. vol. 24, no.2, January 1976, pp.309-263.

Lewis, D.B. et al. forthcoming. The Technical Challenge of Development: Managing Research in Egypt. International Studies in Planning, Cornell Univ.

Mason, J.B. 1983. "Minimum Data Needs for Assessing the Nutritional Effects of Agricultural and Rural Development Projects". Paper presented to ACC-SCN Working Group on Nutrition in Agricultural Development, Castelgandolfo, Italy, February 1983, forthcoming in FAO "Nutrition in Agriculture" Series.

Mason, J.B., Habicht, J-P., Tabatabai, H., Valverde, V. forthcoming. Nutritional Surveillance - Theory and Practice. Geneva: WHO.

Murdoch, William W. 1980. The Poverty of Nations: The Political Economy of Hunger and Population. Baltimore and London: the Johns Hopkins Univ. Press.

NRC. 1980a. Village Demographic Survey. Applied Science and Technology Project, the Agricultural Economics Research Group, The National Research Center, Cairo.

NRC. 1980b. Village Socio-Economic Baseline Data, Vols. II, III. Applied Science and Technology Project, the Agricultural Economics Research Group, The National Research Center, Cairo.

NRC. 1980c. "Human Nutrition". MBF Project Progress Report, National Research Center, Cairo, October 1979-March 1980.

Pinstrup-Andersen, Per. 1981. Nutritional Consequences of Agricultural Projects: Conceptual Relationships and Assessment Approaches. World Bank Staff Working Paper no. 456.

Pinstrup-Andersen, Per. 1982. "Food Policy and Human Nutrition". Unpublished paper, IFPRI.

Radwan, Samir. 1977. Agrarian Reform and Rural Poverty: Egypt, 1952-75. Geneva: ILO.

Radwan, S., and Lee, Eddy. 1977. The Anatomy of Rural Poverty: Egypt 1977. Geneva: ILO.

Richards, Alan. 1982. Egypt's Agricultural Development, 1800-1980: Technical and Social Changes. Boulder, CO: Westview Press.

Staudt, Kathleen. 1976. "Women Farmers and Inequities in Agricultural Services". Rural Africana. No. 29, African Studies Center, Michigan State Univ., 1975-76.

UN. 1978. Systematic Monitoring and Evaluation of Integrated Development Programmes: A Source-Book. New York: UN Dept. of Economic and Social Affairs.

USAID. 1978. Development Information on Integrated Rural Development. Office of Information and Utilization, Development Support Bureau, USAID.

USAID. 1980. Integrated Rural Development: Making It Work? A Preliminary Report of the State of the Art. Office of Rural Development and Development Administration, USAID.

USAID/CDC. 1978. Arab Republic of Egypt, National Nutrition Survey - 1978 and 1980. Office of Nutrition, Development Support Bureau.

USAID/CDC. 1979. Workshop on Nutrition and Health in Egypt, Cairo 1979. Office of Nutrition, Development Support Bureau.

World Bank. 1975. Rural Development Sector Policy Paper. Washington, D.C.: The World Bank.

World Bank. 1981. Some Issues in Population and Human Resource Development in Egypt. Washington, D.C.: the World Bank.

Young, Frank W. 1982. "A Practical Methodology for Evaluating Integrated Rural Development". Sociologia Ruralis. 22(3/4):293-304.

APC

12

A REVIEW

OF

BOSTID'S PARTICIPATION IN THE APPLIED SCIENCE

AND TECHNOLOGY RESEARCH PROGRAM,

EGYPT

1978 - 1983

September 16, 1983

CONTENTS

		Page No.
I.	INTRODUCTION	1
II.	BACKGROUND	1
III.	PRINCIPAL FINDINGS	4
IV.	LOOKING AHEAD: OBSERVATIONS AND ISSUES FOR THE FUTURE	9
ANNEX A:	THE APPLIED SCIENCE AND TECHNOLOGY RESEARCH PROGRAM IN EGYPT	15
ANNEX B:	U.S. INDIVIDUALS AND INSTITUTIONS WHOSE SERVICES HAVE BEEN PROVIDED TO THE ASTRP UNDER BOSTID AUSPICES	24

472

I. INTRODUCTION

In the fall of 1982 the Chairman of the Board on Science and Technology for International Development (BOSTID), Dr. George Bugliarello, asked two members of the Board's Committee on Evaluation, Mr. William A. W. Krebs and Dr. Ralph Smuckler, to undertake a review and analysis of the BOSTID role in the Applied Science and Technology Research Program (ASTRP) in Egypt. Since that time, one or both members of the review team have talked with a wide range of participants in the program, both in the United States and in Egypt, read the voluminous reports and related material, met on several occasions with members of the BOSTID staff most intimately involved in the program, and sat in on a number of meetings which were directly related to the ASTRP. On June 25, 1983, Messrs. Krebs and Smuckler presented orally to BOSTID members and staff a range of observations and tentative conclusions derived from the review process. This report grows out of these activities and is intended for the use of members of the Board and leaders of the National Research Council concerned with the effective performance of BOSTID as it contributes to international development processes.

II. BACKGROUND

The Applied Science and Technology Research Program in Egypt is a bilateral effort, underway since 1978, between the Government of Egypt, represented by the Egyptian Academy of Scientific Research and Technology (ASRT) and the United States Government, represented by the Agency for International Development (AID). It is broadly aimed at shifting the emphasis in Egypt's science and technology toward applied research in industry and agriculture and focusing it more sharply on problems related to Egypt's social and economic development. The National Academy of Sciences/National Research Council (NAS/NRC) has been one of the American organizations contracted by AID to assist in this program.

The elements of the ASTRP for which NAS/NRC has responsibility for providing technical assistance are:

- The Policy Planning and Management Element
  - Activities of a continuing, bi-national, 11-person ASRT-NAS/NRC committee: the "Joint Consultative Committee" (JCC)
  - A "Science and Technology Policy Measures" activity
  - R&D management training
- The Demonstration Project Element
  - The More and Better Food Project
  - Development of Applications of Biogas Technology in Rural Areas Egypt
  - New Crops for Arid and Semi-Arid Zones/Land Reclamation and Use

- The Research and Development Project Element

  - Evaluation of Egyptian Phosphate Ores for Wet Process Phosphoric Acid and Phosphate Fertilizer Production

  - Study of Corrosion Causes and Control

  - Improving the Processing of Wool Scouring and Wool Wax Recovery

  - Development of Red Sea Fisheries

  - Investigation of Egyptian Bentonites for Industrial Applications

  - Preparation of Selected Pharmaceutical Chemicals

Related but separate activities in the ASTRP--purchasing of scientific equipment in the U.S., strengthening maintenance and repair of scientific instrumentation and equipment, and help with development of a stronger scientific information system--have been undertaken, also under AID financing, by the University of Wisconsin, the National Institutes of Health, the Georgia Institute of Technology, and the Catholic University of America, all of which were initially brought into the program through the U.S. National Science Foundation. Later, AID invited the U.S. National Bureau of Standards to participate in a project in the ASTRP concerned with strengthening Egyptian institutional resources in standards and measurements for industry.

Annex A describes the ASTRP, as well as the NAS/NRC program elements, in more detail.

The Executive Director and staff of BOSTID have been responsible since 1978 for carrying out NAS/NRC's part of the ASTRP, an effort budgeted for eight years through October 1985 at $4.1-million in a total ASTRP budget of $25.6-million.

The role of BOSTID, i.e. the Board specifically, in this setting has some unusual characteristics. In strictly legal terms NAS/NRC is simply an AID contractor, in parallel with other AID contractors, executing a specified portion of those obligations assumed by the U.S. Government under the bilateral program agreement with the Government of Egypt which established the ASTRP. The contract between NAS/NRC and AID is administered formally by the Executive Director of the BOSTID staff, an employee of the NRC, acting through members of his professional and support staff. The Board itself appears to have at most an advisory role in this process and it neither employs the Executive Director nor elects its own Chairman, both of whom (like members of the Board themselves) are appointees of the NRC management. This somewhat anomalous responsibility is qualified by the fact that NRC participation in this program (but not the contract) is subject to formal Board approval under prevailing NRC practices. The Board is kept informed of the progress of the Egyptian program by periodic written reports prepared by the staff, supplemented occasionally by oral comments at Board meetings. Issues which arise in the course of contract administration are not brought to the Board for resolution but are handled

by the staff and Executive Director, supervised by senior NRC management in consultation with the BOSTID Chairman.

Overlaid on these arrangements are the activities of the 11-member Joint Consultative Committee which, under the terms of the NRC-AID contract and the bilateral program agreement, has oversight of the ASTRP as a whole and not only the NAS/NRC portion of it. The bilateral program agreement specifies that the JCC is to act in an advisory capacity to the President of the ASRT. The five U.S. members of the JCC are appointed for fixed terms by the NRC management, following approval by the Chairman of BOSTID and the Chairman of the Office of International Affairs Executive Committee (the NAS Foreign Secretary). There has been substantial continuity in the U.S. membership of the JCC over the five-year period since 1978. In fact, only one member has rotated off the U.S. panel--the first Chairman, who served until 1981. Most U.S. members have also been members of BOSTID.

The JCC meets twice yearly, alternatively in Cairo and Washington, for two or three days, covering a formal agenda, supplemented by field visits and informal social gatherings.

Five Egyptian members of the JCC are appointed by the President of ASRT and serve at his pleasure. The President of ASRT is also a member and is Chairman of the JCC. There has been considerable continuity in the Egyptian membership of the JCC, particularly in recent years. There is also a chairman of the U.S. panel, designated as such by senior NRC management; by courtesy he presides at JCC meetings when they occur in the U.S. The surrent U.S. panel chairman is a BOSTID member.

Because of its critical importance and unique nature, this review has paid special attention to the structure and function of the JCC in this program and--because the review is undertaken on behalf of BOSTID--to how the JCC's responsibilities relate to those of the Board.

This review, however, is concerned primarily with BOSTID's participation in the ASTRP. Even within that limited scope it has not considered the technical content of projects. Rather, it has focused on methodology, organizational structure, strategies, administrative policies, staff relationships and overall management procedures; it is intended to generate knowledge which is needed for BOSTID itself, functioning within the Office of International Affairs of the National Research Council. It is expected, however, that this review will contribute to the broader program evaluations which are being or will be carried out by the Egyptian and the United States Governments, the ultimate sponsors of the ASTRP.

The program in which BOSTID has been engaged grew out of a series of meetings beginning in 1975 with a bilateral conference sponsored on the U.S. side by NAS/NRC. The report of this 1975 conference, a subsequent study by the Research Triangle Institute, and a 1980 evaluation report by an AID team headed by Princeton Lyman describe in detail the Egyptian context for this effort. These reports make it clear that Egypt stands out among developing countries in displaying a very high regard for science and a very sizeable and well-trained science community. For example, two-thirds of all graduate degrees granted in Egypt are in the pure and applied

sciences. There are over 22,500 holders of the Master of Science or Ph.D. degrees working in more than 260 research institutes. Although there are gaps in expertise and problems in institutional orientation which inhibit the organized and systematic application of knowledge to development problems, there are also examples of institutional as well as individual research excellence.

III. PRINCIPAL FINDINGS

A. The overall effect of the BOSTID/NAS/NRC effort in Egypt has been positive.

Interviews, personal observation and a review of reports all support this broad conclusion. Furthermore, the review suggests that the BOSTID/NAS/NRC style and prestige have been important factors in the progress that is being made through the ASTRP. Talented people have been attracted to work as members of the JCC, on projects and in other capacities; in addition, many U.S. institutions have been involved[1]. The program has also been able to gain the attention of scientific, educational and political leaders in Egypt. The effort appears to be valued by all of those interviewed, including Egyptians and AID officials, in spite of observed difficulties.

B. The BOSTID/NAS/NRC effort should be viewed primarily in institution-building terms.

In this light, the years elapsed since the program began in 1978 represent a minimum, not to be expected to yield miraculous change. In this relatively short time, however, a number of the generally recognized ingredients of an institution-building effort have been put in place. Both the Academy for Scientific Research and Technology and the National Research Centre are being strengthened through this project. The institution-building effort also involves focusing the attention of the broader science community in Egypt on the importance to the nation of well-planned applied R&D, with leadership from the ASRT and NRC. An institutional doctrine and purpose along these lines have been gradually taking shape. A growing number of key persons are being involved and oriented. A set of processes related to the application of science, the review of research projects, and the planning of research objectives are being worked out. Linkages with key supporting elements in the Egyptian scientific community have been strengthened. The central importance of linkages with the user community is recognized and these linkages too are growing.

Full institutionalization of these processes and organizational efforts, of course, requires still more time and a continuing institution-building effort. This should not be surprising nor should it be viewed as impugning our overall evaluation of the relative success of this effort to date. Moreover, such an evaluation does not imply that all problems have been solved, as the next section of this review makes clear.

---

[1] See lists of individuals and institutions in Annex B.

C. <u>There are still substantial challenges to be met.</u>

The most central of these challenges arises from the fact that there are cultural factors at work in Egypt which are difficult for Americans to understand and to deal with in a productive and effective manner. On the other hand observers note the sensitivity of some Egyptians to acceptance of American approaches both to process and to organization. While recognizing many of the advantages to be gained through a close cooperative effort, limited professional experience in applied R&D, coupled with deeply rooted cultural practices, makes it difficult to apply concepts such as planning, management by objective, performance evaluation, open dialogue, teamwork, submergence of personal feelings, and risk taking, in the way that such concepts are generally understood by U.S. participants. Frustrations arising from these circumstances sometimes lead to Egyptians questioning whether the benefits of American programs are worth the problems that they cause, whether U.S. help may be primarily for the benefit of highly-paid American experts, consultants and U.S. industry. (Fortunately the BOSTID effort is exceptional in this respect since most of the talent supplied serves without compensation.) Successful institution-building efforts rest in part on developing greater understanding of these cultural divergences, and this is not easily achieved.

D. <u>There are unique aspects to the Egyptian setting for BOSTID's program which differentiate it from other BOSTID opportunities to strengthen applied science and technology in the LDCs.</u>

Some of these aspects are:

- The magnitude of the AID funds available, derived from the critical role of Egypt in U.S. Middle-Eastern foreign policy

- The fact that these AID funds come from the Economic Support Program rather than through regular development assistance channels, with resulting profound differences in administration

- The prestige of the scientific community in Egypt and its strong influence on social and political trends, including its influence on education and attitudes toward modernization

- The relatively large numbers of sophisticated Egyptian scientists available

- The positive outreach for U.S. technical and managerial assistance exhibited by the leadership of the Egyptian S&T community

- The unusually complex institutional and organizational problems facing Egyptian science and technology, including

  - large numbers of research institutes--poorly financed, managed and integrated--scattered among government ministries and large public sector companies

  - the preference of many users of S&T for foreign sourcing

  - high concentration on academic values and rewards

4712

- low economic motivation and incentives for applied research

- limited cooperation in exchange of data, joint or multi-disciplinary research, and inter-institutional collaboration

- strong financial incentives for out-migration of Egyptian scientists to lucrative employment elsewhere

These unique conditions suggest the appropriateness of a unique response in BOSTID programming.

E. <u>There are also unique aspects to BOSTID's response to the Egyptian opportunity which differentiate this program from other BOSTID activities.</u>

- This is the only BOSTID program with an overseas resident component

- With a budget of $4.1-million this is the largest BOSTID program to date

- It is the longest running continuing project

- It is the only project having dual, overlapping oversight--that of the bi-national JCC and of the Board itself (although the recently established Research Grants Program has some organizational similarities in this respect)

- It places demands on the contracting and procurement system of the NAS/NRC in a way in which no other project does--e.g., in subcontracting, maintenance of overseas benefits and payroll, recruitment of field representatives

- It brings BOSTID more nearly into a competitive position with U.S. universities, research institutes, and consulting firms than do other BOSTID programs

F. <u>The structure, functions, and roles of the Joint Consultative Committee are crucial to the success of BOSTID's Egyptian program.</u>

At the very heart of the BOSTID effort is the participation of BOSTID representatives on the Joint Consultative Committee. The role and structure of the JCC is briefly described in Section II. In practice, the JCC was observed to perform the following functions:

- <u>Information exchange</u>

  Meetings, minutes and reports of the JCC provide the principal channel for sharing information about the progress of the program, both with respect to technical substance and management.

- <u>Project approval</u>

  The JCC serves as the vehicle for approving projects to be financed by the ASTRP, including their funding levels. The JCC legitimizes

4'18

or, conversely, vetoes projects. This is the case despite the formal limitation, referred to above, which literally gives the JCC only an advisory role.

- Technical review and project monitoring

  JCC provides expert counsel and scientific insight in the review of projects; it follows and monitors their progress and problems.

- Policy development

  JCC influences policy. Some such influence is exercised directly in project review. In addition to discussions, the papers of the JCC as well as its selection and rejection of program activities, tend to establish policies and processes which affect the direction of science and technology across the board within Egypt, including the establishment of priorities.

- Issue formulation

  Above all, the JCC operates to raise questions and probe issues of science and technology application in Egypt. It tends to broaden the horizons of those participating and to add a range of considerations which might not otherwise come into focus.

It is helpful in understanding the way in which the JCC operates in this program to take note of a basic asymmetry in its structure:

- The Egyptian members bring to the table a depth of exposure and a range of roles within the Egyptian society and political system which are beyond the experience of even the most sophisticated American members.

- On the other hand the American members have broad experience in the U.S. scientific and technical community and contact with applications of science and technology here and abroad which have not been available to the Egyptian members.

- The Egyptians have been deeply involved in national policymaking, frequently as high government officials (one, for example, is a former Prime Minister), and the range of responsibilities which individual Egyptian members have held within their own society is not matched by that of the Americans.

- The Egyptians are necessarily involved on an intimate and sometimes daily basis within their society with the decision-makers and the policies which come under discussion at JCC meetings, while the Americans move in to intensive concern with the project for relatively brief periods, and then become much less involved.

- The personal stake of the Egyptian members in the overall success of the program--its impact on their careers and commitments--is much greater than that of their American counterparts.

- Finally, as good as the American staffing has been for the JCC enterprise, it is of necessity much thinner than that which exists on the Egyptian side.

Since the JCC is only advisory to the Chairman of the ASRT (who, as noted earlier is also Chairman of the JCC), the impact of the basic asymmetry just described is enhanced. One result is that some U.S. members have expressed discomfort with the limitations on their role even though there is ample evidence that they have quite effectively influenced decisions of the JCC in many instances. There has also been some frustration over their difficulties in influencing in a measurable way the efficiency and speed with which the ASTRP operates overall. Asymmetry may in part account for these feelings as may some of the fundamental environmental and cultural factors which necessarily condition the program. A further source of frustration to some U.S. JCC panel members is the relatively easy access which the ASRT has both to U.S. and foreign funding outside the scope of the ASTRP to finance activities thought to be low priority or of doubtful value.

On the whole, however, JCC seems to perform its multiple roles increasingly well and with diminishing tensions[1].

G. <u>The Egyptian project has put heavy demands on the BOSTID staff and the NAS/NRC contract administration system.</u>

There has been high praise for the persons who have carried responsibilities at both ends of the project and ample indication that individuals in these roles are well appreciated--by the Egyptians, Americans, and BOSTID colleagues. However, the staff members in both locations have had to exert almost superhuman efforts at times to cope with the range and complexity of the project management function for which they are responsible. Although there has been insufficient time and opportunity for the review team to perform a realistic management appraisal, a firm impression has been gained that the operation is understaffed. This seems especially true of the present one-man operation in Cairo. Illness, accident, or the possibility of the appearance of a more attractive opportunity make such a staffing pattern hazardous. For some individuals (although apparently not to the incumbent) the intellectual isolation of such a post can be discomfiting and limiting. It is also apparent that the NAS/NRC has rarely been responsible for support of a continuing foreign operation. This seems to be a source of some management difficulty. It may in fact have contributed to the slow pace in the start-up of the project--the subject of some criticism of the U.S. effort--but this seems attributable as much or more to factors outside NAS/NRC control. There is evidence of tension over such matters as appropriate salary levels, living allowances, vacation and leave

[1] It should be noted that our review did not explore the experience of U.S. technical advisors working on specific projects with their Egyptian counterparts. There are indications that these experiences may not have been as stressful as those of U.S. JCC panel members and staff who are concerned primarily with overall project management.

480

policies and similar matters that seem to be essentially keyed to domestic U.S. rather than overseas operations. This is exacerbated by the nature of USAID policies toward contractor employees abroad, the severity of which is normally tempered by personnel practices of experienced overseas operating companies and universities--which may be in a position to absorb in overhead or fees some of the costs of employee benefits denied by USAID policy. The programmatic importance of these otherwise minor annoyances lies in the difficulties they pose for recruiting and maintaining in place high-quality overseas staff.

H. <u>There are risks for BOSTID, NAS and NRC in a program of this kind which may be greater than in other lines of activity.</u>

- NAS/NRC apparently has incurred from time to time some necessary costs which are not allowed under USAID policies. In a no-fee, cost-reimbursement contract this is a drain on scarce discretionary funds at NRC's disposal. So far these costs seem to have been minor, but under some circumstances they could rise to a serious level.

- In the past year the Egyptian press has carried heavy criticism of a number of research projects sponsored by AID and other foreign agencies. This criticism, whether well-founded or not, has been a matter of concern to the Egyptian members of the JCC and others interested in the development of science and technology in Egypt with foreign assistance. Fortunately, the BOSTID effort itself does not appear to have been subject to overt criticism. While the NAS is not unaccustomed to controversy within the United States, criticism in the foreign press is a risk which the NAS/NRC and BOSTID may incur in Egypt where there is substantial involvement in a sensitive area and, to some extent, a high NAS profile exists.

- A third area of risk to BOSTID arises from the fact that the success of the ASTRP as a whole involves other contractors, over whose operations BOSTID has no legal control. In Egyptian eyes, on the other hand, BOSTID/NAS/NRC appear to be in charge; moreover, the JCC (but not BOSTID) has formally accepted oversight of the other contractual operations.

IV. <u>LOOKING AHEAD: OBSERVATIONS AND ISSUES FOR THE FUTURE</u>

This review evidences that BOSTID is fulfilling in a positive way the obligations taken on under the present contract. Phase II will be completed by October 1985, but there is already considerable speculation about a continuation beyond the present phase.

There will be a comprehensive assessment of the future role of S&T in Egypt as a result of the new leadership within the AID/Cairo Mission. At present, all signs point to a broadened S&T program and, it is reasonable to expect, a broadened role for NAS/NRC/BOSTID if BOSTID wishes to undertake it.

There is not much question about the need to continue such effort and about AID's desire to make its science and technology assistance as effective as possible within a complicated Egyptian setting. There may well be some question whether the National Research Council through BOSTID is the most effective means of providing assistance, whether such activity is consistent with the role of BOSTID as envisioned by its organizers, and whether, if it does continue, modifications should be made in the program.

Bearing in mind that the overall appraisal of the BOSTID effort to date is positive, that the NAS/NRC as represented by BOSTID (and the U.S. membership of the JCC) is respected within Egypt, and that this eminently worthwhile task will certainly not have been completed by 1985, the central question to be answered by BOSTID itself is whether the type of activities, many of them unique to Egypt, into which this program has evolved are in fact appropriate activities to be undertaken by BOSTID. Do the longer-term commitments of staff in an overseas setting suggest a role too involved in one foreign country? Are the potential costs to BOSTID in terms of opportunities foregone and possible criticism in being heavily committed to an S&T support arrangement in Egypt, more than should be borne by the NAS? Is the pace of progress sufficient to justify the expenditure of American scientific talent in Egypt under this program? Does the program tend to unbalance the traditional mix of activities within BOSTID which, in general, are more exploratory, more oriented towards state-of-the-art science, shorter-term in nature?

The judgment of the authors of this review, after considering such questions and others implied or expressed in the presentation of findings above in Section III, is that BOSTID should positively consider continuing in this program (or one evolving out of it) if invited to do so. This judgment grows out of the following reasoning:

- NAS/NRC participation, through BOSTID, is of critical importance to the effort being made by the ASRT in Egypt to consolidate a leadership role in changing the emphasis in Egyptian S&T toward applied R&D related to economic and social development. This is in part linked to the unique prestige of NAS/NRC in the eyes of Egypt's leaders, in part to the outreach to talent (usually uncompensated) in the U.S. S&T community which is available through NAS/NRC/BOSTID, and in part to the value of continuity in what has to be a long-range, institution-building effort. Going forward from what has been created already--in personal relationships and shared insights, growing mutual confidence, and operating facility seems eminently sensible and preferable to a new beginning with new partners.

- The risks to BOSTID seem manageable, or if not completely manageable, acceptable whether in the financial area, the public relations area, or in program balance.

- There is no evidence to date of concern from potentially competitive U.S. institutions (e.g. universities, research institutes, or consulting firms) that NAS/NRC/BOSTID is seen as taking on a role that they should have an opportunity to perform.

The time is right, therefore, for BOSTID to take advantage of the experience gained since 1978 and be ready to shape any future Egyptian program and a BOSTID role in it, to optimal form. Among important issues to be thought about are:

- BOSTID's role in AID's formulation of a successor S&T program

  Definition of the scope of such a program is, of course, an AID prerogative in cooperation with the Egyptian Government. Nonetheless BOSTID is in a strong position to contribute to the definition process if it decides to do so and it has a large stake in the outcome. At the time the current program was being formulated, BOSTID chose to stand back. With the experience since gained this does not seem either appropriate or wise. A proactive rather than a reactive stance should be taken, beginning soon.

- The scope of the next S&T development program in Egypt

  There is some evidence that constructive U.S. leverage on the development of S&T capacity in Egypt is constrained by the limited ability of the ASRT to compete successfully for leadership with other strong governmental units having extensive R&D budgets. If this condition continues to prevail despite stout efforts by ASRT to alter it, the issue for BOSTID may be whether continued efforts to work through ASRT only are desirable, or whether a broader relationship with the whole range of S&T activities in Egypt, including those of the Ministries and principal universities, is called for--if it could be worked out. Since this is a key issue for AID also, it may be seen as an example of the need for BOSTID to stay in close touch with the process of program formulation in order to have an acceptable option to consider in 1984-1985.

- The structure and functions of the JCC

  The anomalies and asymmetry in this area have been described and it has been noted that, despite them, the JCC as an instituion seems to be performing its multiple roles increasingly well with diminishing tensions. An orderly review of the functioning of the JCC with an eye to defining improvements might, however, well lead to increasing effectiveness and further diminished frustrations. To this end a suggestion could be made from BOSTID, through its members on the JCC, that a special workshop involving both the Egyptian and U.S. membership be organized to explore these issues on the basis of JCC's experience to date. Such a workshop could fruitfully reexamine for example:

  - structure and membership

  - authority

  - agenda formulation and content

4:32

- procedural matters, e.g. style of meetings, standing or special committees, methods for obtaining consensus, length and periodicity of meetings, use of executive sessions, inter-meeting consultations

- nature of staff support, e.g. use of outside expertise to prepare in-depth issue papers

A related possibility, for U.S. panel members only, could be a well-planned effort to prepare U.S. JCC members for their demanding intercultural roles--e.g. one or more seminars conducted by social scientists familiar with Egyptian mores and the incentive systems prevalent in modern Egyptian society, a reading program, commissioned papers by specialists in key policy areas likely to be relevant to JCC functions.

- Administration and management

If there were to be an expanded program and an expanded role for BOSTID, it would be desirable to look carefully at whether criteria and procedures within NRC can be devised, or altered, which will minimize some of the strains on administration encountered under the present contract.

AID, in turn, should be assisted to recognize more fully the special legal status, capabilities and needs of the NRC in a program of this kind. For example, thought could be given to use of the grant as opposed to the contract mechanism in the interest of enhancing the quality of the program by providing greater flexibility, less administrative cost and reduced financial risk. Understaffing, already chronic, would be an especially critical problem in a broadened program and particular attention should be paid to the risks of having a solo representative in the field.

- Relationships between BOSTID, i.e. the Board itself, and the JCC: a microcosm of a general BOSTID issue

The relatively loose direct ties between the Board and the JCC have already been described. The principal strand in that relationship is the fact that two current BOSTID members (one of them the Chairman of the U.S. panel) and one former member are simultaneously members of the JCC. Also, the Board's own Chairman--whose present term as such is ending soon--is one of them. This relatively satisfactory situation seems to be the result of thoughtful exercise of senior NRC management's appointive powers in the case of both the Board and the JCC; it is reasonable to expect something of the kind to continue. So long as it does there appear to be no compelling reasons to make more formal arrangements.

Nonetheless this form of relationship rests on some fairly basic assumptions about the Board's own responsibility for oversight and the success or failure of major, continuing BOSTID programs:

481

- Do the BOSTID members who hold joint appointments recognize a specific responsibility for monitoring and reporting to the Board on the Egyptian program? Or is their responsibility to the Board seen as the same as that of any other Board member with respect to all programs? What is that responsibility?

- Would there be value to the Board in having one or more members who are not JCC U.S. panel members specifically charged with monitoring the Board's interest in this large program?

- Should such assignment of oversight responsibility to individual Board members be considered for other major BOSTID programs?

- Just how far does a Board member's personal responsibility for program oversight go? Does it (should it) reach beyond the annual or other periodic vote to approve each program? Should members have any formal influence over key appointments, e.g. that of the Chairman and the Executive Director? Are issues affecting important programs brought to the Board in a form and on a schedule that facilitates more than nominal exercise of oversight responsibility?

It can quickly be seen that these kinds of questions, even though relevant to the review of BOSTID's role in the ASTRP in Egypt, go far beyond the scope of such a review. They are raised here, not because of any fundamental dissatisfaction with the status quo, but as logically demanded by the scope of the review assignment--and because consideration of them may be useful to the Board in a larger context.

At a minimum they should receive thoughtful and thorough discussion at some future meeting of the Board, preceded by solid staff working papers perhaps monitored by a special committee of the Board appointed for this purpose.

****

Returning to the case in hand, a basic recommendation of this review is that, without waiting for resolution of the broader issues just referred to, the Board should take the proactive stance called for earlier and establish some special mechanism to maintain close liaison on behalf of the Board with the evolving Egyptian program as it moves through the process leading to an AID decision on continuing and/or extending an invitation to NAS/NRC/BOSTID to participate. There are numerous options. For example, the U.S. JCC Panel Chairman might be requested to develop this additional responsibility, possibly with the assistance of one or two other Board members. Whatever mechanism is established, however, it should recognize that there are interests of the Board itself which are not necessarily synonomous with the appropriate concerns of the U.S. panel of the JCC and which may have significance for BOSTID going beyond the Egyptian program.

ANNEX A

THE APPLIED SCIENCE AND TECHNOLOGY
RESEARCH PROGRAM IN EGYPT

1156

ANNEX A

The Applied Science and Technology Research Program in Egypt

I. Introduction

Early in 1978 the Governments of Egypt and the United States of American entered into a cooperative agreement known as the "Applied Science and Technology Research Program" designed to:

- Encourage broad institutional and attitudinal changes toward applied R&D in Egypt's scientific community
- Give greater recognition and reward to scientists and engineers engaged in applied, practical, problem-solving research in Egypt
- Establish new linkages between research institutions and "end-user" groups in industry and in agriculture
- Provide more up-to-date equipment and instrumentation facilities for applied research
- Upgrade skills for repair and maintenance of scientific equipment and instrumentation
- Strengthen R&D management systems in Egyptian scientific institutions

Overall responsibility for the Applied Science and Technology Research Program was assigned to the U.S. Agency for International Development (AID) and to the Egyptian Academy for Scientific Research and Technology (ASRT) by the two governments. AID, in turn, contracted with the U.S. National Academy of Sciences/National Research Council (NAS/NRC) for those program elements involving: (a) policy planning and management, and (b) technical assistance for applied research and development (R&D). Activities for the purchasing of scientific equipment, strengthening Egyptian institutional abilities for maintenance and repair of scientific instrumentation and equipment, and for instituting a greatly strengthened scientific information system in Egypt were undertaken by the University of Wisconsin, the National Institutes of Health, the Georgia Institute of Technology, and the Catholic University of America, all of which were initially brought into the program through the U.S. National Science Foundation. Later the U.S. National Bureau of Standards was also invited to participate and the Bureau undertook a partnership role to strengthen Egyptian institutional resources in standards and measurements for industry.

This short document is a description of the activities for which the NAS/NRC has contractual responsibilities. Further details about each project may be found in a 1978-81 (Phase I) status report and in quarterly progress reports for the years 1982 and 1983.

II. Overview of the NAS/NRC Role

In partnership with the ASRT and with its principal associated research institute, the National Research Center (NRC/Cairo), the NAS/NRC has undertaken a series of activities for policy planning and management and technical assistance for applied research and development.

The policy planning and management program element relates the ASRT and the NAS/NRC in a series of continuing seminars and workshops on science and technology policy issues as well as participation in a more specific training project for Egyptians engaged in R&D management.

The technical assistance program element is designed to help the ASRT orient a portion of its ongoing R&D effort to projects identified with national economic development goals, and to utilize improved management systems in the implementation of those projects. Activities may be described as:

(a) Demonstration Projects which are large multidisciplinary, generally multi-institutional efforts involving field trials and aimed at improving rural productivity, nutrition and well being.

(b) Research and Development (R&D) Projects which are also multidisciplinary in nature and aimed at well-defined problems, generally within the industrial sector.

In outline form the NAS/NRC program with the ASRT may be classified as follows:

A. Policy Planning and Management

- Joint ASRT-NAS/NRC Consultative Committee (JCC)
- Science and Technology (S&T) Policy Measures
- Research and Development (R&D) Management Training

B. Demonstration Projects

- More and Better Food
- Development and Application of Biogas Technology in Rural Areas of Egypt
- New Crops for Arid and Semi-Arid Zones/Land Reclamation and Use

C. Research and Development Projects

- Evaluation of Egyptian Phosphate Ores for Wet Process Phosphoric Acid and Phosphate Fertilizer Production
- Corrosion Causes and Control
- Improving the Processing of Wool Scouring and Wool Wax Recovery
- Development of Red Sea Fisheries
- Investigation of Egyptian Bentonites for Industrial Applications
- Preparation of Selected Pharmaceutical Chemicals

III. Financial Overview

For administrative convenience AID divided funding for the Applied Science and Technology Research Program into two phases:

- Phase I (1978-1981; 4 years) with a total AID budget of $9.3 million, roughly allocated as follows:

  - Equipment/instrumentation purchases $4.5 million
  - Information/repair & maintenance (NSF) $3.2 million
  - Demonstration and R&D projects/Management training/General planning (NAS/NRC) $1.6 million

- Phase II (1982-1985; 4 years) with a total AID budget of $16.3 million, roughly allocated as follows:

  - Equipment/instrumentation, including repair and maintenance $4.2 million
  - Scientific and Technical Information $4.3 million
  - Standards and Measures $2.0 million
  - Food Technology pilot plant $1.2 million
  - Direct funding of local supplies and materials through ASRT $2.1 million
  - NAS/NRC managed projects: Policy & Planning; Demonstration/R&D $2.5 million

IV. Policy Planning and Management

A. Joint ASRT-NAS/NRC Consultative Committee (JCC)

The JCC is a panel composed of 5 Egyptian and 5 American members under the chairmanship of the President of the Egyptian Academy of Scientific Research and Technology which meets once each year in Cairo and once in Washington. Its role is an advisory one to the ASRT President, partially with respect to the planning and policy management for the entire range of activities in the Applied Science and Technology Research Program. Over the years it has

also become a significant policy discussion forum, a binational board or resource panel to which the ASRT President may turn on questions of Egyptian scientific and technological manpower development and utilization, on key issues of S&T as they affect Egyptian economic development, and on science policy options for the future.

The JCC has had distinguished representation both in its Egyptian and American membership. It has included a former Egyptian prime minister; former ministers of agriculture, education, and health; a former science advisor to a U.S. president; as well as university presidents and professors and R&D managers from industry and government. All have served on a pro bono basis and, increasingly, have become active in the S&T Policy Measures Project.

B. S&T Policy Measures Project

Because the social and economic development process increasingly requires the prudent application of S&T in agriculture, nutrition, health, family planning, and industrialization, it is essential that Egypt's S&T manpower and institutional resources be more optimally utilized to achieve its stated goals. The Science and Technology Policy Measures Project is an activity of the ASRT to link the Egyptian S&T community with the national goal-setting and planning efforts of its government.

The major program mechanism has been a bringing together of the scientific, technological, economic, and political leadership of Egypt in a process of defining S&T policy alternatives for development. Typically study/discussion groups have been formed with representatives from the ASRT and its advisory councils, ministries in which R&D plays a major role (agriculture, health, energy, etc.), universities, industries, the planning office of the Prime Minister, and the Shura Council (legislative branch of the government). The study/discussion groups organized national seminars on S&T policy issues in 1981 and 1982. A third and final national seminar is planned for 1983. From these efforts ASRT is expected to issue a report in 1984 guiding Egypt toward a greater institutionalization of national technological policy planning.

C. Research and Development Management Training Project

Of the three elements under the broad heading of "Policy Planning and Management," the R&D Management Training Project has the most specific operational focus. It is designed to assist the ASRT and NRC/Cairo to achieve:

- Improved organization and management systems within those two institutions

496

- More effective and rational development of human resources for management
- Institutionalization of R&D marketing and techno-economic functions in NRC/Cairo
- Increased interactions between ASRT and R&D institutes of ministries and of the industrial sector

The project includes specific opportunities for training in the United States and in Egypt of a cadre of R&D leaders and managers. Special workshops have been organized on principles of financial management, project and program evaluation and administration, and institutional development.

V. Demonstration Projects

More and Better Food

The More and Better Food Project brings to bear talents, resources and experiences from a wide variety of Egyptian sources on food and nutrition related problems of Egyptian villages and the Egyptian food industry. Participating groups -- in addition to ASRT and NRC/Cairo -- are the governorates (states) of Menoufia (Kafr El Khadra village); Beheria (Oma Makram village); the Ministries of Social Affairs, of Agriculture, and of Land Reclamation; the Nutrition Institute; the Organization for Reconstruction and Development of Egyptian Villages; and several public sector industrial companies. Major elements of the program are:

- Farm-related activities involving agricultural and animal studies and extension in the two demonstration villages to improve productivity and quality of food and to supplement farm income. Subprojects have included livestock and poultry raising, crop production (corn, peanuts, soya, tomatoes, onions) soil fertility, plant protection, beekeeping, raising of silk worms, and village dairy production (yogurt and cheese).

- Nutrition-related activities designed to improve the diet of nursing mothers, preschool and school children through supplemental feeding and comprehensive education. Subprojects have included medical assessment of children and mothers; determination of nutritional deficiences; testing of locally produced, protein-rich weaning foods for use in Egypt; and nutrition education.

- Food technology-related activities directed toward problems of specific food industries (oilseeds, cheese making, etc.) to help make Egyptian food products more competitive in local and international markets. Also included in this category is the design of a food technology pilot plant facility at NRC/Cairo.

491

B. Development and Application of Biogas Technology in Rural Areas of Egypt

The Biogas Technology Demonstration Project is designed to examine the technical, economic and social feasibility of producing biogas (methane) from renewable, plant, animal, and human wastes at the village-user scale in Egypt. The project is managed by the NRC for the ASRT. In addition to generating the gas itself, major considerations include applying the technology to improving the village environment, producing useable fertilizer, enhancing waste treatment, and improving public health and sanitation.

C. New Crops for Arid and Semi Arid Zones/Land Reclamation and Use

The Arid Zones Demonstration Project was designed to find practical means to exploit new, or reclaimed agricultural lands of marginal productive capacity for the supply of food or the production of cash crops. The original participating groups were Al Azhar University (Department of Horticulture) which took responsibility for plant propagation and for field studies of cash crops; Ain Shams University (Department of Horticulture) which was responsible for studies of plant stress (aridity and salinity) and non-conventional legumes; and NRC/Cairo (Plant Protection Laboratory) which was responsible for insect and plant disease studies.

In 1983 the Project underwent a change in emphasis. After discussion within the JCC, the focus was shifted to one of the study and analysis of Egyptian land reclamation experience to determine those factors which have contributed most significantly to programs of economic and social benefit. On the basis of the analysis of the field work from arid land productivity studies in Egypt and elsewhere, and on experience in using new agricultural technologies a more rational plan for further investment in land reclamation can be made.

VI. Research and Development Projects

A. Evaluation of Egyptian Phosphate Ores for Wet Process Phosphoric Acid and Phosphate Feritizer Production

With the cessation of the annual flooding of the Nile after the completion of the high dam at Aswan, maintenance of soil fertility took on new importance for Egyptian agriculture. Nitrogen, phosphorus, potassium and trace elements are all of importance. Fortunately, Egypt has extensive deposits of

low-grade phosphate ores in the Nile Valley, the Western Desert, and the Red Sea areas. The Ore Beneficiation and Chemical Processing Laboratory of the Central Metallurgical Research and Development Institute (National Research Centre) initiated the project of technical and economic studies on Egyptian ores to determine the feasibility of producing high-grade phosphate fertilizer materials for domestic agriculture and for export markets.

In this R&D project one of the benefits to Egypt has been the creation at NRC/Cairo of a well equipped facility and of a cadre of scientists and technicians skilled in the analysis of natural phosphate minerals, their technical characterization and potential for economic conversion to phosphate fertilizers. The laboratory has established good links with phosphate ore producers in Egypt and, as another output of the project, has become a consultant to the phosphate industry on a fee basis.

B. Corrosion Causes and Control

Recognizing the need to reduce corrosion costs in Egyptian industry, the Laboratory of Electro-Chemistry and Corrosion of the National Research Centre in 1979 began the special R&D project with two principal goals:

- Development of corrosion inhibitors based upon domestic raw materials and tailored to reduce corrosion in Egyptian industries, and
- Establishment of a modern, well-equipped corrosion laboratory capable of dealing with the practical problems of providing technical services to industries.

The principal "client" of the NRC/Cairo corrosion laboratory is the Suez Oil Refining Company, a government sector industry. Work at the refinery has focused upon identification of the major corrosion sources, determining corrosion causes and most appropriate remedial actions, and training refinery personnel to monitor and control corrosion to reduce its effect upon production efficiency and product quality.

C. Improving the Processing of Wool Scouring and Wool Wax Recovery

The wool scouring and wool wax recovery R&D project is designed to link the National Research Centre's Textiles Research Laboratory with the management of the Misr Beida Dyers Company in a joint problem-solving activity with the following goals:

- Improve the economic efficiency of wool scouring
- Improve the quality of wool top
- Recover high-quality wool wax by-products for local and export markets
- Reduce consumption of heat, water, and chemicals in the scouring and de-waxing process
- Reduce amount of waste that is discharged to the environment

The importance of the project also lies in the working association that has been forged between the NRC Textile Research Laboratory and the textiles industry. Previously Egyptian textiles producers have gone to foreign consultants for problem solving. A recognized, local consultant group is now available for the problem solving situations.

D. Development of Red Sea Fisheries

The Institute of Oceanography and Fisheries of the ASRT, under the Applied Science and Technology Research Program proposed the Red Sea Fisheries study project to develop a better knowledge of fisheries resources in one area of the Red Sea (Foul Bay region), to ascertain the technical and economic inputs required to expand commercial fishing in that area, to improve the understanding of the biological productivity of the Red Sea and to recommend whether commercial exploitation is feasible. Because of the remoteness of the site and the logistics of working in that area, progress was difficult. Unlike the other R&D projects, the Red Sea fisheries activity has not had a clearly identifiable "end-user" as a partner. This lack of R&D "pull" has also had a deterring effect upon the work even in the face of the obvious need for Egypt to find high quality protein sources which can be economically exploited for human consumption.

E. Investigation and Evaluation of Egyptian Bentonite Clays for Industrial Applications

The project deals with the industrial application of bentonite clays, a class of naturally occurring mineral compounds capable of absorbing many times their own weight of water. This property is useful in land reclamation where bentonites can act as a basic barrier below sandy soils to prevent the escape of irrigation water and soluble fertilizers. Bentonites can also be changed by chemical modification, either acidic or basic, to provide binders in foundries, bleaching materials in the decolorization of vegetable and minerals oils, drilling fluids in oil exploration, catalyst carriers in chemical reactions, extenders for insecticides, and for other chemical products used in relatively high volume such as soil stabilizers in the construction industry.

Bentonite clays occur in potentially exploitable quantities in several areas of Egypt. The R&D team is located within the Central Metallurgical Research and Development Institute of the National Research Centre and has industrial links with the foundry industries, oil exploration companies, food industries, and construction industries.

F. Preparation of Selected Pharmaceutical Chemicals

By far the majority of the pharmaceutical products marketed in Egypt, both of biological and of chemical origin, are manufactured abroad even though they may be packaged within the country. Within the pharmaceutical companies (public sector) and the Division of Pharmaceutical Industries, NRC/Cairo, exist the experience and skilled manpower resources to achieve a high degree of self sufficiency in drug manufacturing.

The specific goal of this R&D project is to characterize the scientific and techno-economic feasibility for commercial production and marketing within Egypt of a limited number (4 to 6) of pharmaceutical chemicals.

JD
07/27/83

49

ANNEX B

INDIVIDUALS AND INSTITUTIONS WHOSE SERVICES HAVE BEEN PROVIDED TO THE ASTRP UNDER BOSTID AUSPICES

	Page No.
• Individuals	25
• Universities	31
• U.S. Federal and State Government Agencies and Laboratories	35
• Private Industries and Corporations	38
• Other Organizations	40

4 16

INDIVIDUALS WHO HAVE SERVED THE APPLIED SCIENCE AND TECHNOLOGY RESEARCH PROGRAM UNDER BOSTID AUSPICES

JOINT CONSULTATIVE COMMITTEE - U.S. PANEL

George Bugliarello
President, New York Polytechnic Institute

Mary E. Carter
Associate Administrator, Agricultural Research Service
U.S. Department of Agriculture

James Hillier
International Consultant

Guyford Stever (Chairman, 1978-80)
International Consultant

F. Karl Willenbrock
School of Engineering and Applied Science
Southern Methodist University

Gilbert White (Chairman 1981--)
Institute of Behavioral Sciences
University of Colorado

NAS/NRC RESIDENT ADVISORS IN EGYPT

Leo S. Packer (1982-)
Helmut Weldes (1979-1981)

ADVISORY COMMITTEES/PANELS

More and Better Food

Harold Calbert
Department of Food Science
University of Wisconsin

Kristen McNutt
Executive Officer
National Nutrition Consortium

Donald Plucknett (Chairman)
Board on International Food and Agricultural Development
U.S. Department of State

497

More and Better Food - Food Technology Pilot Plant Project

C. O. Chichester
Vice President
Nutrition Foundation

C. E. Johnson
Department of Food Science
University of Wisconsin

John Liston
Director, Institute for Food Science and Technology
University of Washington

Martin Miller
Department of Food Technology
University of California, Davis

George Pigott
Institute for Food Science and Technology
University of Washington

Development and Application of Biogas Technology in Rural Areas of Egypt

Harold Capener
Department of Rural Sociology
Cornell University

Philip R.Goodrich (Chairman)
Department of Agricultural Engineering
University of Minnesota

T.B.S. Prakasam
Metropolitan Sanitary District of Greater Chicago
Cicero, Illinois

New Crops for Arid and Semi-arid Zones of Egypt

Joe R. Goodin
International Center for Arid and Semi-Arid Land Studies
Texas Tech University

Theodore Hymowitz
Department of Agronomy
University of Illinois

Lowell Lewis
College of Natural and Agricultural Sciences
University of California, Riverside

Cyrus McKell (Chairman)
Native Plants Incorporated
Salt Lake City, Utah

Darrel S. Metcalfe
Dean, College of Agriculture
University of Arizona

John P. Schaefer
President
University of Arizona

Evaluation of Egyptian Phosphate Ores and Phosphate Fertilizer Production

Douglas W. Fuerstenau (Chairman)
Department of Materials Science and Mineral Engineering
University of California, Berkeley

James E. Lawver
International Minerals and Chemicals Corporation
Bartow, Florida

James R. Lehr
National Fertilizer Development Center
Tennessee Valley Authority

Owen W. Livingston
Director of Chemical Engineering
International Fertilizer Development Center

Corrosion Causes and Control

Joerg Gutzeit
Amoco Research Center
Naperville, Illinois

Earl S. Snavely Jr.
Mobil Research and Development Corporation
Dallas, Texas

Wool Scouring and Wool Wax

Louis Mizell
The Wool Bureau, Inc.
Woodbury, Long Island, New York

499

Development of Red Sea Fisheries

Harvey R. Bullis (Chairman)
Private Consultant
Princeton, Florida

Benjamin Jones
Northwest and Alaska Fisheries Center
National Marine Fisheries Service
Seattle, Washington

Bentonite Clays for Industrial Application

Haydn H. Murray
Chairman, Department of Geology
Indiana University

Preparation of Selected Pharmaceutical Chemicals

William N. Hubbard Jr.
President
The Upjohn Company
Kalamazoo, Michigan

Nile Soil and Water

Constant C. Delwiche
Department of Land, Air, and Water Resources
University of California, Davis

Harold E. Dregne (Chairman)
International Center for Arid and Semi-Arid Land Studies
Texas Tech University

E. V. Richardson
Director, Engineering Research Cente
Colorado State University

CONSULTANTS

More and Better Food

Wilmer Larsen
Private Consultant
Madison, Wisconsin

James Fitch
Agri-Management Corporation
Yakima, Washington

500

More and Better Food - Food Technology Pilot Plant Project

Edmund Lusas
Director, Food Protein Research and Development Center
Texas A&M University

Soliman Shenouda
General Foods Inc.
Tarrytown, New York

Development of Red Sea Fisheries

Alonzo T. Pruter
Private Consultant
Seattle, Washington

Harvey Bullis
Private Consultant
Princeton, Florida

Corrosion Causes and Control

M. Tom Thomas
Battelle Pacific Northwest Laboratories
Richland, Washington

Bentonite Clays for Industrial Applications

Donald Weintritt
Weintritt Testing Laboratories
Lafayette, Louisiana

R&D Management Systems

James Blackledge
Private Consultant
Denver, Colorado

National Policies for Science and Technology

Hyung Sup Choi
National Academy of Science
Seoul, Korea

Gilbert Devey
Private Consultant
Washington, D.C.

G. S. Gouri
UNIDO
Vienna, Austria

501

David Lewis
Department of City and Regional Planning
Cornell University

Miguel Wionczek
Director, Energy Research Programs
El Colegio de Mexico
Mexico D.F.

INTERNS

Rebecca and Peter Doan
Department of City and Regional Planning
Cornell University

502

UNIVERSITIES

American University
Center for Technology and Administration
Washington, D.C.

Colorado School of Mines Research Institute
Golden, Colorado

Concordia University
Montreal, Quebec, Canada

Cornell University
Ithaca, New York
- Department of Food Science
- Department of Animal Science
- Vegetable Crops Department
- Division of Nutritional Sciences
- Department of Agronomy

Duke University
Marine Laboratory
Beaufort, North Carolina

George Washington University
Program on Science, Technology, and Public Policy
Washington, D.C.

Georgia Institute of Technology
Atlanta, Georgia
- Office of International Programs
- Engineering Experiment Station
- School of Information and Computer Science

Harvard University
Program for Science and International Affairs
Kennedy School of Government
Cambridge, Massachusetts

Iowa State University
Ames, Iowa
- Department of Animal Science
- College of Veterinary Medicine

Massachusetts Institute of Technology (MIT)
Cambridge, Massachusetts
- Center for the Study of Policy Alternatives
- Technology Adaptation Program
- Energy Laboratory
- Department of Nutrition and Food Science

503

Michigan State University
East Lansing, Michigan
Department of Food Science and Human Nutrition
Department of Dairy Science

North Carolina State University
Asheville, North Carolina
Minerals Research Laboratory
Textile Chemistry Department, School of Textiles

Texas Tech University
Lubbock, Texas
Department of Chemical Engineering

Texas A&M University
College Station, Texas
Food Protein Research and Development Center
Department of Entomology
Plant Science Department

Tufts University
Nutrition Institute
Medford, Massachusetts

Tulane University
New Orleans, Louisiana
Nutrition Department
Tropical Medicine Department
School of Public Health

University of Arizona
Tucson, Arizona
Office of Arid Land Studies
Department of Plant Science
Environmental Research Laboratory
Department of Soils, Water, and Engineering

University of British Columbia
Vancouver, British Columbia, Canada

University of California at Davis
Davis, California
College of Agriculture
Vegetable Crops Department
Agronomy and Range Science Department
Department of Food Science

University of California, Berkeley
Berkeley, California
Department of Chemical Engineering
Department of Nutrition Sciences
Department of Soil and Plant Nutrition

504

University of California at Los Angeles
School of Public Health
West Los Angeles, California

University of California at Riverside
College of Natural and Agricultural Sciences
Riverside, California

University of Florida
Gainesville, Florida
Department of Entomology
Fruit Crops Department
Vegetable Crops Department

University of Illinois
Department of Microbiology, Urbana, Illinois
Department of Pharmacognosy and Pharmacology, Chicago, Illinois

University of Iowa
Department of Botany
Iowa City, Iowa

University of Miami
Clean Energy Research Institute
Coral Gables, Florida

University of Minnesota
Department of Animal Sciences
St. Paul, Minnesota

University of Nebraska
Department of Animal Sciences
Lincoln, Nebraska

University of North Carolina
School of Public Health
Department of Nutrition
Chapel Hill, North Carolina

University of Oklahoma
Pediatric Department
Oklahoma City, Oklahoma

University of Southern California
School of Pharmacy
Los Angeles, California

University of Utah
Department of Metallurgy
Salt Lake City, Utah

505

University of Wisconsin
Madison, Wisconsin
Department of Food Science
Department of Dairy Science
Department of Bacteriology

51.6

FEDERAL AND STATE GOVERNMENT AGENCIES/LABORATORIES

Environmental Protection Agency
- Washington, D.C.
- Denver, Colorado
- Gulf Breeze, Florida
- Athens, Georgia

Florida Department of Natural Resources
Marine Research Laboratory
- St. Petersburg, Florida
- Marathon, Florida

Food and Drug Administration
Washington, D.C.
- Division of Nutrition
- Division of Chemistry and Physics
- Epidemiology Unit

National Fertilizer Development Center
Tennessee Valley Authority (TVA)
- Muscle Shoals, Alabama

National Institutes of Health (NIH)
Bethesda, Maryland
- National Institute of Child Health and Human Development
- National Institute of Arthritis, Metabolism, and Digestive Diseases
- National Institute of Allergy and Infectious Diseases

National Oceanic and Atmospheric Administration (NOAA)
National Marine Fisheries Service (NMFS)
- Northeast Fisheries Center
  - Highlands, New Jersey
- Southeast Fisheries Center
  - Miami, Florida
  - Panama City, Florida
  - Gulf Breeze, Florida
  - Beaufort, North Carolina

National Technical Information System (NTIS)
Springfield, Virginia

Office of Science and Technology Policy
Executive Office of the President
Washington, D.C.

Office of Technology Assessment (OTA)
U.S. Congress
Washington, D.C.

50

Smithsonian Institution
National Museum of Natural History
Washington, D.C.

Smithsonian Science Information Exchange (SSIE)
Washington, D.C.

U.S. Bureau of Mines
Salt Lake City, Utah

U.S. Department of Agriculture
Beltsville Agricultural Research Center
Beltsville, Maryland

Cotton Insects Research Laboratory
College Station, Texas

Eastern Regional Research Center
Philadelphia, Pennyslvania

Forest Products Laboratory
Madison, Wisconsin

Human Nutrition Research Laboratories
Grand Forks, North Dakota

Insects Attractants Laboratory
Gainesville, Florida

Insects Affecting Man and Animals Research Laboratory
Gainesville, Florida

Lake Alfred Agricultural Research and Education Center
Lake Alfred, Florida

National Animal Disease Center (NADC)
Ames, Iowa

National Veterinary Services Laboratory
Ames, Iowa

Northern Regional Research Center
Peoria, Illinois

Quincy Agricultural Research and Education Center
Quincy, Florida

Science and Education Administration (SEA)
Hyattsville, Maryland

Soil Conservation Service
Washington, D.C.
Phoenix, Arizona

Southern Regional Research Laboratory
New Orleans, Louisiana

U.S. Salinity Laboratory
Riverside, California

U.S. Water Conservation Laboratory
Phoenix, Arizona

Western Cotton Research Laboratory
Phoenix, Arizona

U.S. Department of State
Office of the Coordinator for the U.N. Conference on Science and Technology for Development
Washington, D.C.

Virgin Islands Department of Conservation and Cultural Affairs
Division of Fish and Wildlife
Charlotte Amalie, Virgin Islands

PRIVATE INDUSTRIES/CORPORATIONS

Agrico International
Tulsa, Oklahoma
- Urea ammonium nitrate solutions plant, Verdigris, Oklahoma
- Faustina fertilizer production complex, Donaldsonville, Louisiana
- Fort Green mine and plant, South Pierce, Florida

Amerchol Company
Edison, New Jersey

Amoco Research Center
Naperville, Illinois

Aquafine Corporation
Brunswick, Georgia

Burlington Industries
Clarksville, Virginia

Carnation Research Corporation
Van Nuys, California

Cargill Inc.
Wayzata, Minnesota
- Flax Sunflower Department
- Domestic Soybean Processing Division

Cotton Inc.
Technical Research Services Department
Raleigh, North Carolina

Davy McKee Engineering Design Co.
Lakeland, Florida

Del Monte Research Center
Walnut Creek, California

Denver Equipment Division
Joy Manufacturing Company
Colorado Springs, Colorado

Eastern Artificial Insemination Cooperative
Ithaca, New York

Farmland Industries Inc.
Bartow, Florida

Foremost-McKesson Company
Gilroy, California

510X

Gardinier Inc.
(formerly U.S. Phosphoric Products)
Tampa, Florida

General Foods Corporation
Tarrytown, New York

Gerber Products
Fremont, Michigan

Grande Cheese Co.
Brownsville, Wisconsin

Hazen Research
Golden, Colorado

Hunt-Wesson Foods
Research and Development Department
Fullerton, California

International Minerals and Chemicals Corporation
Lakeland, Florida

Mobil Research and Development Corporation
Materials Engineering Section, Paulsboro, New Jersey
Mobil Field Research Laboratory, Dallas, Texas

Pfizer Genetics
Doniphan, Nebraska

Plains Cooperative Oil Mill
Lubbock, Texas

Ranchers Oil Company
Fresno, California

Stauffer Chemical Company
Vernal, Utah

Tetra Tech International
Arlington, Virginia

Unichem International
Hobbs, New Mexico

U.S.S. Agrichemicals
Bartow, Florida

U.S. Steel Corporation
Engineers and Consultants, Pittsburgh, Pennsylvania
Research Laboratory, Monroeville, Pennsylvania

Webster International
Los Angeles, California

311

OTHER ORGANIZATIONS VISITED

American Chemical Society
Washington, D.C.

Battelle Memorial Institute
Columbus, Ohio

The Bio-Energy Council
Washington, D.C.

Burke Rehabilitation Center
Nutrition and Metabolic Research Division
White Plains, New York

Denver Research Institute
Office of International Programs
Denver, Colorado

Fertilizer Institute
Washington, D.C.

Institute of Gas Technology
Chicago, Illinois

International Bank for Reconstruction and Development
Washington, D.C.

International Center for Arid and SemiArid Land Studies
Lubbock, Texas

International Fertilizer Development Center
Muscle Shoals, Alabama

Nutrition Foundation
New York, New York

Volunteers in Technical Assistance (VITA)
Mt. Rainier, Maryland

The Wool Bureau
Woodbury, Long Island, New York

512