

PN-AA6-540

APPLIED SCIENCE AND TECHNOLOGY RESEARCH IN EGYPT

SEMIANNUAL REPORT

July 1978 - December 1978

Contract No. AID/NE-C-1474

Project No. 263-0016

Board on Science and Technology
For International Development

Commission on International Relations

National Academy of Sciences-National Research Council

NATIONAL ACADEMY OF SCIENCES

Washington, D.C.

This is the second semiannual report of Contract AID/NE-C-1474, Applied Science and Technology Research in Egypt, covering the period July 1978 - December 1978. The report has been prepared by the staff of the National Academy of Sciences-National Research Council for the Agency for International Development.

CONTENTS

	page
I Executive Summary	2
II Introduction	3
III Program Highlights	5
IV Proposed Calendar: January - June 1979	11

ANNEXES

A. Second Meeting, Joint Consultative Committee, Applied Science and Technology Program, Washington, D.C. November 1978	15
Appendix A	48
Appendix B	50
B. Second Report, Ad hoc Panel for the More and Better Food Demonstration Project, November 1978	54
C. Report of the National Academy of Sciences/ National Research Council ad hoc Panel on Nile Soil & Water Studies, September 1978	67
D. Cheese Production in Egypt (Report on a Food Technology Activity under the Demon- stration Project, 'More and Better Food'), Cairo, September 28, 1978	72
E. R&D Management Education Opportunities in the U.S.A.	79
F. Travel for Program Planning, R&D Management and Technical Consultation	83

EXECUTIVE SUMMARY

In early November, 1978 the Second Meeting of the Joint Consultative Committee for the Applied Science and Technology Program was held at the headquarters of the U.S. National Academy of Sciences/National Research Council (NAS/NRC), Washington, D.C. to review accomplishments in the program and to recommend initiatives for the future. Participating organizations in the meeting were the Egyptian Academy of Scientific Research and Technology (ASRT), the National Research Centre (NRC/Cairo), the U.S. National Science Foundation (NSF), and the NAS/NRC. The program is jointly funded by the Governments of the Arab Republic of Egypt and the United States of America. NAS/NRC participation is made possible under a contract (AID/NE-C-1474) with the U.S. Agency for International Development (AID), the responsible agency of the U.S. Government.

Major accomplishments for the reporting period include:

-Initiation of the More and Better Food Demonstration Project as recommended by the project advisory committee in May 1978,....

-Recruitment, selection and orientation in the United States of Dr. Helmut Weldes as NAS/NRC senior resident advisor to the Egyptian National Research Centre. Dr. Helmut Weldes takes up his assignment in Cairo on January 1, 1979,

-Recommendations by the JCC: (a) to implement a demonstration project on biogas technology and, (b) to proceed with more detailed planning for a third demonstration project on new crops for arid and semi-arid zones in Egypt.

-Recommendations to proceed with research and development projects (R&D) on: (a) development of Red Sea fisheries, (b) evaluation of Egyptian phosphate ores for fertilizer production, (c) corrosion causes and control in locally produced steel, and (d) refining and utilization of wool oils and waxes.

II

INTRODUCTION

In May 1975, the Academy of Scientific Research and Technology of the Arab Republic of Egypt (ASRT), the United States National Science Foundation (NSF), and the United States National Academy of Sciences - National Research Council (NAS/NRC), jointly conducted a workshop on science and technology policy, research management, and planning in Egypt. From that workshop came a series of recommendations which, as one point of reference, led the ASRT and the United States Agency for International Development (AID) in March, 1977 to enter upon a formal program agreement to strengthen the management of research and development (R&D) resources in science and technology directed toward Egyptian national development goals. Both ASRT and AID invited the NAS/NRC and the NSF to join with them in this endeavor. The joint task is identified as the "Applied Science and Technology Program." Activities began in May 1978 with the first meeting of a Joint Consultative Committee (JCC) in Cairo. For purposes of program funding and administration, the effort is divided into two periods, Phase I, which will run from October 1978 to October 1980 and, Phase II, which, if approved, is to continue until October 1983.

This is the second semi-annual report of the Applied Science and Technology Program and was prepared by the staff of the Board on Science and Technology for International Development (BOSTID), NAS/NRC under its contract AID/NE-C-1474; the report covers the period July 1 - December 31, 1978. It relates those activities for which NAS/NRC is contractually responsible under the program elements of:

- (a) Policy Planning and Management,
- (b) Research Project Support,
- (c) Demonstration Project Support, and
- (d) Planning for Phase II

Activities under the program elements of (a) science and technical information systems and (b) equipment procurement, including equipment maintenance and repair, are reported by NSF in a separate report governed by the terms of its participating agency agreement with AID. This report also summarizes program highlights and plans for the January-June 1979 period. A more complete description of the individual activities may be found in the following report annexes:

- Annex A: Second Meeting, Joint Consultative Committee, Applied Science and Technology Program. Washington, D.C. November 1978.
- Annex B: Second Report, Ad hoc Panel for the More and Better Food Demonstration Project, November 1978.
- Annex C: Report of the National Academy of Sciences/National Research Council ad hoc Panel on Nile Soil & Water Studies, September 1978.
- Annex D: Cheese Production in Egypt (Report on a Food Technology Activity under the Demonstration Project "More and Better Food") Cairo, September 28, 1978

PROGRAM HIGHLIGHTS

A. Policy Planning and Management1. Resident Advisor: National Research Centre (NRC)

After an intensive nation-wide search, the NAS/NRC on November 1, 1978, appointed Dr. Helmut H. Weldes of Philadelphia, Pennsylvania, as its senior resident advisor to the Egyptian National Research Centre (NRC) for the Applied Science and Technology Program. Dr. Weldes will work under Dr. Mohamed Kamel, NRC Director, and with the NRC senior staff in policy planning, R&D program monitoring and evaluation, and R&D market industrial sector. As an ex officio member of the Joint Consultative Committee for the Program he will be the NAS/NRC representative in Cairo for all projects under the program both with respect to technical and administrative matters. Thus, he is the link between NAS/NRC and the Egyptian counterpart organizations (NRC and ASRT) and between NAS/NRC and AID/Cairo.

Dr. Weldes brings a unique set of qualifications and experience to the position of NAS/NRC resident advisor at NRC. He was born in Germany, received the doctorate in chemistry from the University of Aachen, and engaged in research on coal derivatives at the Max Planck Institute in Dusseldorf before emigrating to the United States in 1957. From 1957 until 1978 Dr. Weldes was associated with P.Q. Industries, Inc. (a subsidiary of the Philadelphia Quartz Company), first as a research chemist, then Manager of its R&D division, director for international marketing and finally as Vice President. P.Q. Industries is a large manufacturer of soluble silicates, a chemical intermediate almost universally used by the manufacturing industries in such products as detergents, paints, plastics, lubricants and even in construction (as a soil stabilizer for deep foundations and in tunneling). As director for international marketing, Dr. Weldes travelled widely and was responsible for the negotiation of joint manufacturing ventures in developing countries including Pakistan, Nigeria, Colombia, Brazil, and Mexico. Thus he brings to the position direct experience in R&D, R&D management, R&D marketing, venture formation and senior corporate management.

Prior to his appointment, Dr. Weldes was interviewed by Dr. Kamel in the U.S.A. and in Cairo. He attended the Second Meeting of the JCC in early November, underwent AID orientation in Washington, visited Battelle and Denver Research Institutes, the University of Wisconsin, the U.S. National Bureau of Standards and participated in extensive Washington briefing meetings at the NAS/NRC, NSF and AID. He takes up residence in Cairo on January 1, 1979.

2. Second Meeting, Joint Consultative Committee

The Second Meeting of the Joint Consultative Committee was held in Washington, D.C., U.S.A., at the National Academy of Sciences on November 3-4, 1978. Dr. Abou El-Azm, President for the ASRT, and Dr. H. Guyford Stever, Chairman of the U.S. panel, shared the responsibility for leading the discussions. The report of the Second JCC Meeting is included as Annex A.

3. Research and Development (R&D) Management, Education

The goals of the management training program are (a) to provide senior officials of the ASRT and the NRC with an intensive review of contemporary R&D management practice; (b) to provide second echelon officials of the two institutions with practical training in management techniques of proposal writing, R&D planning, program evaluation, report writing, fiscal monitoring and control; (c) to provide an opportunity in Egypt for training in technology assessment; and (d) to offer courses at the NRC in R&D marketing and in technical-economic analyses.

Four specific types of training courses are to be offered in the United States and in Egypt to achieve the above goals:

- Research and Development (R&D) management methods. (Level: Senior ASRT & NRC management staff; R&D laboratory directors and R&D program coordinators).

- Technology assessment. (Level: Senior ASRT and NRC planning staff, deans of engineering from universities, and senior officials in science related ministries).

- Technical economics. (Level: Senior scientists and engineers from the major divisions and laboratories of the NRC and science related ministries).

- Research marketing methods. (Level: Senior scientists and engineers from major divisions and laboratories of the NRC).

After a review of various R&D management training alternatives (See Annex E), the Denver Research Institute (DRI) was recommended by the Egyptians as the contractor-of-choice to the Joint Consultative Committee (JCC). The JCC, in turn, concurred with the selection of DRI.

DRI's experience since 1972 in planning and conducting management training courses and seminars for participants from developing countries has included: a) 5 regional R&D management seminars held in Southeast Asia, the Middle East, North Africa, Central and South America which attracted directors and principal officers from 31 research institutions and related agencies; b) 6 country specific research management development programs (Brazil, Colombia, Dominican Republic, Indonesia, Pakistan and Venezuela); c) 2 specialized workshops on industrial information and extension services for the Latin American region; and d) numerous individual training programs at the Institute headquarters in Denver.

Planning for the R&D management courses is expected to be completed in January 1979 and lead to the first activity in management methods at DRI by March 1979 with the other courses to be held during calendar year 1979.

B. Research and Development (R&D) Projects

As a result of activities during the July-December 1978 period the status of R&D projects of the ASRT under the Applied Science and Technology Program is summarized below:

1. Consequences of the Loss of Nile Silt on the Properties and Microbiology of Soil as a Result of the High Dam

The proposed project was reviewed by an ad hoc technical panel that met in Egypt in September 1978. The report of the panel was reviewed by the JCC in November; the Committee requested a re-assessment of the project before its March 1979 meeting. (For additional details, see Annex C)

2. Development of Red Sea Fisheries

Because of the importance of fisheries as a protein-rich food source for Egypt, the JCC approved a project on Red Sea Fisheries for inclusion in the ASRT Program with NAS/NRC. Initially the Red Sea project is restricted for a pilot study for a limited geographical area, the Foul Bay-Berinice region near the Egyptian-Sudanese border. The JCC directed that the pilot study be carefully coordinated with the larger Food and Agriculture Organization (FAO) Red Sea Fisheries program. An ad hoc panel of experts from Egypt and the U.S.A. is scheduled to review the technical plan and report its conclusions to the JCC in March 1979.

3. Evaluation of Egyptian Phosphate Ores

Dr. Aziza Yousef, Chief of the Ore Beneficiation and Evaluation Laboratory, Central Metallurgical Research and Development Institute, NRC, visited the United States in October 1978 for discussions with industrial and government R&D specialists in phosphate ore preparation and in phosphate fertilizer manufacturing. Her presentation to the JCC resulted in formal approval of the project entitled, "Evaluation of Egyptian Phosphate Ores for Wet Process Phosphoric Acid and Phosphate Fertilizer Production" in the ASRT -NAS/NRC program. As in the case of the Red Sea fisheries project, a joint Egyptian-U.S. Panel will review the R&D plan as one step in the implementation of the phosphate ore evaluation project.

4. Projects with the American Chemical Society

In December 1977 the NRC and the American Chemical Society (ACS) held a joint workshop to explore specific R&D projects between U.S. and Egyptian scientists. A number of areas were recognized to be of high priority for food and fiber production and utilization in Egypt but lack of funding from the U.S. side prevented implementation. Dr. Kamel, NRC Director, therefore asked the JCC to include two of the projects identified during the 1977 ACS-NRC workshop in the ASRT-NAS/NRC program. The projects involve industrial research and development for: a) measuring the extent and inhibiting the consequences of corrosion in Egyptian steels used in the petroleum and construction industries; b) formulating a technique for recovery of lanolin and other valuable oils from Egyptian wool for use in pharmaceuticals, textiles and other consumer applications as substitutes for imported wool wax derivatives.

For additional details on items 2, 3 & 4, see Section V, Annex A.

C. Demonstration Projects

1. More and Better Food

The NAS/NRC ad hoc panelists from the More and Better Food demonstration project met with Drs. A.S. El-Nockrashy (ASRT) and Osman Galal (NRC) at the time of the Second JCC meeting in Washington. The U.S. panelists commended the Egyptian groups responsible for More and Better Food for the excellent manner in which that demonstration project has progressed since its approval by JCC in May 1978. There is every indication that the goals of the project can be achieved within the time schedule proposed during the first meeting of the panelists in Cairo. Details of the November 1978 meeting and comments from the group may be found in Annex B.

2. Other Projects

Two additional demonstration projects were proposed to, and approved by the JCC for definitive design under the program. They are: (a) Development and Application of Bio-Gas Technology in Rural Areas of Egypt, and (b) New Crops for Arid and Semi-Arid Zones. Design elaboration of these projects is to be continued by joint Egyptian American panels in January 1979 with results brought to the JCC once again in March 1979.

Details of the two projects are given in Section IV, Annex A.

D. Planning for Phase II

The responsibility for Phase II planning rests with each of the major institutional participants in the Applied Science and Technology Program - ASRT, NRC, NAS/NRC and NSF.

Section VI, Annex A, gives an overview of Phase II Planning as presented to the JCC in November 1978. For purposes of this report, perhaps the most important points to emphasize are that the JCC is developing a particular set of criteria for Phase II projects and that it has established the following time table for the Phase II planning process:

- March 1979: (Third JCC meeting) Approval of criteria for Phase II and preliminary ranking of proposed projects.
- October 1979: (Fourth JCC meeting) Review of Phase II plans, second discussion and evaluation of proposed projects; JCC decision on format for Phase II plan and method of presentation.
- March 1980: (Fifth JCC meeting) Final approval of the list of projects for Phase II; approval of format and content of Phase II planning document.
- April 1980: Completion of Phase II plan by joint staff group.
- May 1, 1980: Submission of Phase II plan to AID/Cairo
- May-June 1980: AID/Cairo review of Phase II plan.
- July-August 1980: Review of Phase II plan in AID/Washington.
- October 1, 1980: Phase II projects funded and activities begin.

PROPOSED CALENDAR - January - June 1979

January 1979

- | | |
|---|--|
| 1. Arrival on post (Cairo) | Dr. and Mrs. Helmut Weldes |
| 2. Program management visit to Cairo, January 6-30 | Mr. A. Nasmith, BOSTID/Washington |
| 3. Bio-gas Technology Project Design Panel
January 8-14 | Dr. Harold Capener, Cornell Univer.
Dr. Philip Goodrich, U of Minnesota
Dr. T.B.S. Prakasan, MSD of Greater Chicago |
| 4. New Crops for Arid and Semi-Arid Zones, Project Design Panel, January 17-23 | Dr. Cyrus M. McKell, Utah State U.
Dr. Theodore Hymowitz, Univ. of Illinois
Dr. Lowell Lewis, U. of California, Riverside
Dr. John P. Schaefer, U. of Arizona |
| 5. Corrosion and Wool Wax Project Design Panels
American Chemical Society
January 12-19 | Dr. Henry Leidheiser, Lehigh U.
Dr. Earl Snaevly, Mobil R&D Laboratories
Mr. Louis Mizell, Wool Bureau Tech. Center |

February 1979

- | | |
|---|--|
| 1. Red Sea Fisheries Project Panel
Late February, 1 week | Two persons to be determined. |
| 2. Sub-contract negotiated for R&D Management Education
Mid-February | Denver Research Institute
(Probable contractor) |
| 3. Program Management visit, sub-contractor R&D Management Education, Late February-Early March | Person to be determined. |

March 1979

- | | |
|---|---|
| 1. Phosphate Fertilizer Project Design Panel, Early March
1 week | Three persons to be determined. |
| 2. Program Management visit to Cairo March 9 - 31 | Mr. Jay Davenport, BOSTID, Washington |
| 3. Third Meeting, JCC (Cairo)
March 24-31 | H. Guyford Stever (Chairman)
G. Bugliarello, NY Polytechnic
M. Carter, USDA/New Orleans
J. Hillier, Princeton
G. White, Colorado U, Boulder
V. Rabinowitch, BOSTID, Washington |

PROPOSED CALENDAR: January - June 1979

March (continued)

- | | |
|--|------------------------------------|
| 4. Program Management visit to
Cairo, March 24- April 7 | Mr. A. Nasmith, BOSTID, Washington |
| 5. More and Better Food Panelist (1)
to Cairo, Late March, 1 week | Panelist to be determined. |

April 1979

- | | |
|---|----------------------------------|
| 1. First Management Education Course
Denver, 8 persons, 4 weeks each | Egyptian group to be determined. |
| 2. Program Management visit to USA,
1 person from Egypt, 3 weeks | Persons to be determined. |
| 3. Consultation, Resident Advisor (NRC)
to USA, 2 weeks | Dr. Helmut Weldes |

May 1979

- | | |
|--|---------------------------|
| 1. Consultant, More and Better Food,
to Egypt, 2 weeks | Person to be determined. |
| 2. Egyptian scientists to USA (from
R&D projects), 2 persons,
3 weeks each | Persons to be determined. |

June 1979

- | | |
|---|---------------------------------|
| 1. First Management Education Seminar
in Egypt, 3 contractor staff to
Egypt, 2 weeks each | Persons to be determined. |
| 2. Consultants to Egypt:
(a) Bio-gas technology, 1 person
2 weeks
(b) Red Sea Fisheries, 1 person,
2 weeks
(c) Phosphate fertilizers, 1 person,
2 weeks | Three persons to be determined. |

ANNEX A

STAFF SUMMARY REPORT

SECOND MEETING OF THE
JOINT CONSULTATIVE COMMITTEE
APPLIED SCIENCE AND TECHNOLOGY PROGRAM

Washington, D.C., USA

November 3-4, 1978

Participating Groups:

Academy of Scientific Research and Technology
Arab Republic of Egypt

U.S. National Academy of Sciences-National Research Council

U.S. National Science Foundation

Report prepared by:

U.S. National Academy of Sciences-
National Research Council
Washington, D.C., U.S.A.
December 1978

CONTENTS

	Page
I Background	15
II Members, Joint Consultative Committee	17
III Review of Activities	18
IV Proposed Demonstration Projects	23
V Research and Development Projects	27
VI Planning for Phase II	32
VII Conclusions and Recommendations	42
Appendix A: Agenda	48
Appendix B: Participants, Invited Guests and Observers	50

I

BACKGROUND

The Applied Science and Technology Program is an activity of the Egyptian Academy of Scientific Research and Technology (ASRT) with the assistance of the U.S. Agency for International Development (AID) designed to improve institutional capabilities of the Egyptian scientific and technical community in developing and managing research programs dealing with priority needs of Egypt. In Egypt the principal participating groups are the ASRT and the National Research Centre (NRC); in the United States the counterpart organizations are the National Science Foundation (NSF) and the National Academy of Sciences/National Research Council (NAS/NRC).

A formal program agreement for the cooperative activity, signed by the two governments in late March, 1977, provided a sum of US \$3.9 million and 895,000 Egyptian pounds (LE) from the U.S.A. and LE 1.495 million from the Government of Egypt. October 1, 1980 has been designated as the termination date for the initial activities (Phase I); an additional three years (Phase II) with new funds is contemplated if progress in the early years (1978-80) warrants that extension. The program has six components:

1. Strengthening policy planning and management of research and development (R&D) within the ASRT and NRC.
2. Joint U.S.-Egyptian cooperation in the support of up to five specific research and development projects, which must be related to the priority areas of development and "applied" rather than fundamental in their orientation.

3. Joint U.S.- Egyptian cooperation in at least two "demonstration" projects. Demonstration projects are multidisciplinary in nature and involve field trials under experimentally controlled conditions.
4. Provision of scientific equipment, including training in equipment maintenance and repair.
5. Strengthening of the Egyptian scientific and technical information base and its utilization throughout that country.
6. Planning for years 3-5. (Phase II).

The NAS/NRC is primarily responsible for items 1, 2 and 3 as well as the coordination of item 6. The NSF is responsible for items 4 and 5 while all organizations share in the Phase II planning.

One of the principal mechanisms for strengthening policy planning and management of R&D is the Joint Consultative Committee (JCC) composed of Egyptian and U.S. scientist-managers who meet twice each year. The First JCC meeting was held in Cairo, Egypt, in May 1973 (Summary Report available in English from NAS/NRC, Washington, D.C.). This document relates the events of the Second JCC meeting held in Washington, D.C., U.S.A., November 3-4, 1978.

II

MEMBERS

Joint Consultative Committee, (JCC)

The Second JCC Meeting was held November 3-4, 1978 at the Joseph Henry Building, U.S. National Academy of Sciences, Washington, D.C., U.S.A. An agenda for the meeting may be found in Appendix A; a list of participants, invited guests and observers in Appendix B.

The full membership of the JCC as of November, 1978 was as follows:

A. Egyptians

1. Dr. A. M. Abou El-Azm, President, ASRT
2. Dr. Mohammad H. El-Nashar, * President, Assiut University
3. Dr. Mostafa Hafez, Counselor, ASRT; Director, Nile River Water Quality Studies
4. Dr. Hassan Hamdi, * Vice President for Research, Cairo University
5. Dr. Mohmoud Riad, Secretary General, Arab Telecommunications Union
6. Dr. Yussuf Wally, Assistant to the Minister of Agriculture

B. Americans

1. Dr. H. Guyford Stever, International Consultant (Member, NAS and NAE)
2. Dr. George Bugliarello, President, New York Polytechnic Institute
3. Dr. Mary E. Carter, Director, Southern Regional Laboratory, US Department
of Agriculture
4. Dr. James E. Hillier, Vice President (retired) RCA Corporation (Member, NAE)
5. Dr. Gilbert F. White, * Institute of Behavioral Science, University
of Colorado (Member, NAE)

C. Staff

Staff coordinators for the JCC are Dr. A. S. El-Nockrashy, ASRT and Mr. and Mr. Jay Davenport, NAS/NRC.

* Unable to attend Second JCC Meeting.

III

REVIEW OF ACTIVITIES

A. More and Better Food

The More and Better Food demonstration project is a multidisciplinary activity of the National Research Centre consisting of three parallel lines of work:

- a). Farm Systems Related Project: Analysis of the agricultural base for a small Egyptian village in order to assist local farmers utilize inputs of seed, fertilizer and water more efficiently, increase productivity and improve the marketing of their produce.
- b). Nutrition Related Projects: Analysis of the diet for the villagers to determine nutritional deficiencies; formulation of a locally produced food supplement for primary school children and testing of the nutritious food for effectiveness and local acceptance.
- c). Food Technology Related Projects: Assistance to the Egyptian food industry in solving production and quality control problems.

During the period from May through October 1978 the principal activity has been preparation for field studies and selection of the pilot village. Among the important selection criteria are: (a) a total population of about 5,000 persons; (b) an agricultural base "typical" of Egypt; (c) availability of services of education, health and agricultural extension in the village; (d) accessibility by road; and (e) receptivity of villagers to participate in the program. By

late October the 4,142 villages had been screened first to 139 and then to 35; the choice of one village in the Delta and one in the New Valley was expected before the end of 1978.

Simultaneously with the village selection a second group in NRC was preparing for the nutrition feeding experiment. First, meetings were held with a wide cross-section of interested groups in Egypt such as the Ministries of Health, Education, Agriculture, the Organization for Reconstruction and Development of Egyptian Villages (ORDEV), representatives of the Governates and private groups active in health and nutrition such as UNICEF, the Catholic Relief Organization and others. Suggestions from these groups helped determine criteria for the food to be used in the proposed school-centered feeding program. A literature search of nutrition projects around the world and an intensive study of previous feeding experiments was undertaken at NRC. Samples of the actual foods used were collected wherever possible for laboratory analysis. Continuation of the studies into 1979 will lead to the final selection of the food supplement for the feeding experiments.

Two food technology related projects were carried on by the NRC:

- (a) Assistance to the cottonseed oil processing industry in Egypt specifically aimed at reducing oil losses in extrusion mills and simultaneously improving the quality of the product. The NRC Fats and Oils Laboratory has succeeded in identifying the basic problems and has developed laboratory-scale solutions. Techniques to optimize production are now being scaled-up for pilot plant testing prior to their final adaptation in the factory.

- (b) Assistance to the cheese making industry to improve production and consumer acceptability of locally produced Damietta cheese when low-fat dried milk is partially substituted for fluid milk. A consultant from Wisconsin assisted NRC dairy specialists in analyzing local production procedures and in outlining a series of remedial procedures. The effectiveness of the proposed solution must first be tested in a pilot-plant which is yet to be established at the NRC. It is anticipated that the new pilot plant may be installed by mid-1979.

B. Scientific and Technical Information Services

The Scientific and Technical Information (STI) component of the U.S.-Egypt Applied Science and Technology Program is jointly managed by the ASRT and the U.S. National Science Foundation (NSF). Its ultimate goal is to improve Egyptian capabilities in providing S&R information services to meet Egypt's needs. As in the other components of the overall program, the STI project is to be conducted in two phases. Phase I consists of:

- (a) a design study for an Egyptian system of S&R information services,
- (b) a planning study to identify documentary literature and associated equipment critical to Egyptian needs,
- (c) a pilot experiment with a computer accessed information service, and,
- (d) short-term, non-degree training for key personnel.

During 1978 detailed specifications for the STI projects were developed while AID and NSF negotiated a formal participating agency service agreement (a contractual document that was signed by NSF in September, 1978). At the same time two Egyptian information specialists spent three weeks each in the United States learning methods, operational philosophy and resources available at more than a dozen key information facilities. A deposit account was established at the U.S. National Technical Information Service (NTIS) so that its Egyptian counterpart organization, the National Information and Documentation Centre (NIDOC), could draw upon NTIS services. Late in 1978 the ASRT is expected to be served by a telex which will provide more direct and timely access to U.S. information services.

C. Instrumentation Technology

Another component of the U.S.-Egypt Applied Science and Technology Program jointly managed by the ASRT and NST is the Instrumentation Technology (IT) project. As in the STI component, the instrumentation technology project has antecedents in NSF-Egyptian bilateral activities dating back to the early 1970's.

The goals of the IT project are:

- (a) to improve maintenance and repair capabilities at the NRC, the Science Instrumentation Centre, Cairo University, Tanta University, Assuit and El-Minia Universities;

- (b) to train personnel in maintenance and repair skills; and
- (c) to assist the ASRT in the purchase of scientific equipment provided under the Applied Science and Technology Program.

During the negotiation of the formal AID-NSF participating agency service agreement, NSF and ASRT arranged for training in maintenance and repair (M&R) techniques of 127 Egyptian engineers and technicians in special courses at American University in Cairo. In addition, planning for activities and for installation of M&R facilities was undertaken at Egyptian institutions selected to participate in the program during Phase I. Also, specifications were developed and special equipment was ordered for the "More and Better Food" demonstration project. The cost of the first large equipment order is in excess of US \$ 1 million.

PROPOSED DEMONSTRATION PROJECTS

The Applied Science and Technology Program agreement contemplates two demonstration projects during Phase I; one to be managed by the NRC (More and Better Food) and one to be managed by ASRT. The ASRT demonstration project is considered to be a vehicle through which a new management control system will be implemented. It is for this reason that demonstration projects have special relevance to the overall goal of strengthening R&D management in Egyptian institutions. During the First JCC Meeting in Cairo the ASRT suggested that its demonstration project be a multidisciplinary study on the replacement of work animals by mechanical power in Egyptian agriculture. Since the proposed project relates to a similar, more comprehensive program in farm mechanization already in its early design phase between AID and the Ministry of Agriculture, ASRT substituted two proposals for JCC consideration at its Washington meeting. One proposal was "The Development and Application of Bio-Gas Technology in Rural Areas of Egypt" and the second was "New Crops for Arid and Semi-Arid Zones."

A. Development and Application of Bio-Gas Technology.

Because of rapidly increasing costs of petroleum derived fuels and the scarcity of traditional alternatives (principally charcoal), substitute fuel sources are being sought all over the world. Perhaps one of the more

promising approaches, consistent with good environmental management, is the bio-transformation of organic wastes into methane, a process widely referred to as "bio-gas technology."

Rural energy systems have been studied in many countries recently with the view toward developing "more appropriate technologies". (See especially: (1) Energy for Rural Development: Renewable Resources and Alternative Technologies for Developing Countries, U.S. National Academy of Sciences, 1976, and (2) Methane Generation from Human, Animal and Agricultural Wastes, NAS, 1977). In Egypt the ASRT assembled a study team covering the specialties of microbiology, biochemistry, hygiene, agriculture, engineering, and environmental and social sciences. The team reviewed experience and literature references on methane production from human and animal wastes and began a special study on the anaerobic digestion of cotton plant stalks and aquatic weeds as the primary raw materials. Each of these plant wastes is widely found in Egypt, and, under properly managed conditions, seems to be an attractive source of methane by fermentation processes. Furthermore, waste cotton stalks are hosts for cotton boll-worms, the principle plant pest in Egyptian cotton growing. Thus, the use of cotton plant wastes has an additional potential benefit, namely, possible reduction of boll-worm populations.

The Joint Consultative Committee agreed that the bio-gas technology project met criteria for demonstration projects, was feasible for implementation during Phase I, and recommended that a joint Egyptian-American panel be formed to elaborate a project design.

B. New Crops for Arid and Semi-Arid Zones

Egypt, with a total population greater than 40 million and an annual rate of increase of approximately 1 million persons, is constantly facing the need to increase productivity in its old agricultural lands and to extend the cultivated area into new lands. Because of extreme aridity the only highly productive lands have been those irrigated by the Nile. The Aswan High Dam has enabled the irrigated agricultural lands totaling 6 million feddans (1 feddan = 1.038 acres) to produce multiple crops as though 11 million feddans were under cultivation. But, when the balance is drawn, 97% of all Egyptian land is desert producing no appreciable amount of food for the people. Although Egyptian agriculture is among the most intensive in the world and is highly productive, leading agricultural specialists agree that still higher yields are possible through the use of new technologies. Nevertheless, a food deficit will ever be a reality unless arid zones can be brought into production.

The ASRT proposed a demonstration project for arid and semi-arid lands that would (a) require the careful selection of most promising sites west of Alexandria, near oases in the Western Desert, and possibly in the Sinai, (b) gather baseline data for the selected locations, and (c) select a site to cultivate carefully chosen plants as a pilot project.

The Joint Consultative Committee recognized the potential long-term importance of carefully designed arid land studies of the kind suggested. There are several resources in the U.S.A. and elsewhere which could be called upon to assist in such a project. The JCC asked, therefore, that a joint

Egyptian-U.S. panel be formed to consider the project design in greater detail, weigh priorities, and examine both costs and benefits of a long-term program. Attention was called to the possibility of participation from other countries, particularly in the coming peace era for the Middle East. A progress report is to be prepared for the Third JCC meeting in Cairo, March, 1979.

RESEARCH AND DEVELOPMENT (R&D) PROJECTS

At the first JCC meeting four R&D projects were proposed for support under the Applied Science and Technology Program. They were:

- (1) Consequences of the Loss of Nile Silt on the Properties and Microbiology of Soil as a Result of the High Dam,
- (2) Changes in Composition of Nile Water as a Result of Storage,
- (3) Evaluation of Egyptian Phosphate Ores for Wet Process Phosphoric Acid and Phosphate Fertilizer Production,
- (4) Development of Red Sea Fisheries.

All four were found by the JCC to meet the basic criteria for the program but none was specifically included for immediate implementation.

A. Nile Soil and Water Studies

A joint Egyptian-U.S. study panel met in Cairo in September 1978 to review the technical design of two projects concerned with change in soil and water properties as a result of the construction of the High Dam.

One observation by the American panelists was that the proposed measurement of changes in composition of Nile Water as a result of storage behind the High Dam was an exceedingly complex R&D task. In view of the time constraints for Phase I, the Americans felt that the proposed study could not be achieved with the time frame and with the resources currently available. Furthermore, an ongoing ASRT project on Nile River Water Quality perhaps would provide some of the needed information.

As to the changes in soil physical properties and soil micronutrients resulting from the loss of silt the JCC was told that some experimental data was available. Based upon the discussion at its second meeting, the JCC asked that a re-assessment of the proposals be made and reported at the March meeting.

B. Development of Red Sea Fisheries

Fish from the Mediterranean, the Red Sea and fresh water lakes are under-exploited protein sources for Egypt. Mediterranean fishing has long been important along the northern coast but does not offer significant opportunities for expansion as would be the case for fishing in inland lakes and the Red Sea.

At present, Egyptian Red Sea fisheries exist mainly within the Gulf of Suez. Other areas are potentially rich sources of sea food but the extent of those resources is largely unknown. A regional project of the Arab Development Fund and the U.N. Development Fund, managed by the Food and Agriculture Organization (FAO), was recently approved to determine the fisheries potential of the Red Sea. One region that shows considerable promise lies near the Egyptian-Sudanese border (Foul Bay-Berinine) but the FAO project is not scheduled to study the area for several years. Because of the need in Egypt to exploit marine resources for food in the immediate future, the Institute of Oceanography and Fisheries, which is affiliated with the ASRT, has been urged to gather data pertinent to Egyptian needs and at the same time cooperate with the longer-term FAO study. The Institute, therefore, has proposed as an R&D project an assessment of the stock of fish in the Foul Bay-Berinine area from both on site observation and remote sensing imagery.

If the initial results are as promising as the scattered information and occasional reports suggest, then a plan for rational exploitation will be prepared.

In approving the Red Sea Fisheries study, the JCC recommended that an ad hoc panel of experts from Egypt and the U.S.A. be appointed to review the technical plan, and that the R&D activities be coordinated with the larger FAO project.

C. Evaluation of Egyptian Phosphate Ores

With the need to increase agricultural production in Egypt the utilization of phosphate fertilizers will require parallel growth. Known phosphate rich ores are largely depleted but the country has extensive reserves of lower-grade phosphates in the Eastern and Western Deserts, the Nile Valley and the Sinai Peninsula. Utilization of the lower grade materials in phosphate production presents both a technical and an economic challenge which the NRC has been requested to address.

Briefly stated the Ore Beneficiation and Extraction Laboratory of the Central Metallurgical Research and Development Institute within the NRC will:

- (a) evaluate technological problems for beneficiation of low-grade Egyptian phosphate ores,
- (b) prepare flowsheet designs for separation processes,
- (c) conduct pilot-plant studies,
- (d) make provisions for utilization of wastes from the process, and
- (e) assist industry in adaptation of the pilot plant studies to production-size runs.

The JCC approved the project entitled "Evaluation of Egyptian Phosphate Ores for Wet Process Phosphoric Acid and Phosphate Fertilizer Production" for immediate implementation.

D. Projects with the American Chemical Society

In December 1977 the NRC and the American Chemical Society (ACS) held a two-week workshop in Egypt to explore possibilities for a cooperative, bilateral research and education program involving Egyptian and U.S. chemists and chemical engineers on topics of importance to Egyptian economic development. The following areas were selected:

- Pesticide analyses and syntheses,
- Mineral beneficiation and metallurgical waste processing,
- Corrosion and metallurgical analyses,
- Chemical modification of cotton, and
- Utilization of fibrous raw materials.

From the workshop there arose over a dozen specific proposals for joint R&D collaboration but there was no immediate funding source to bring the projects into being. Dr. Kamel, NRC Director, therefore suggested to the JCC that the Committee include within the Applied Science and Technology Program two projects in which the NRC itself would assume the major R&D responsibility. This suggestion was approved by the JCC; the NRC and ACS were asked to elaborate a design of two projects entitled:

- Corrosion Causes and Control, and
- Utilization of Wool Wax.

1. Corrosion Causes and Control

This project will utilize and adapt presently available information on corrosion control for Egyptian industrial applications in such specific areas as:

- (a) formulation of inhibitors to decrease corrosion problems occurring in the production, transport and refining of petroleum;

- (b) study of accelerated corrosion of Egyptian carbon steels and means to alleviate the problem;
- (c) studies of corrosion rate monitoring under industrial conditions; and
- (d) studies of pit corrosion under Egyptian climatic conditions.

2. Utilization of Wool Wax

Egypt exports approximately 700 metric tons of raw wool per year at low prices because there is no industry to process the wool for lanolin and other valuable oils. At the same time the country imports refined natural oil for pharmaceuticals, textiles, cosmetics and other uses. The project on wool wax utilization will adapt known processes for oil extraction from wool to Egyptian raw materials and simultaneously undertake market studies of the demand for high quality, locally produced lanolin and other oils. The work is to be done at the National Research Centre in cooperation with the Beida Dyers Company, Egypt's sole processor of raw wool.

PLANNING FOR PHASE II

A. Introduction

The inter-governmental agreement establishing the Applied Science and Technology Program requires that significant progress be demonstrated during the first two years of cooperative activities (Phase I) before funding can be made available for a continuation into Phase II (years 3, 4, and 5). The U.S.AID Mission in Cairo will conduct its own evaluation during the second year of Phase I before a commitment is made for continuation. Additionally, AID has included planning for Phase II as a component in the overall Applied Science and Technology Program.

During the Second JCC meeting the participants discussed Phase II planning and agreed to the following procedure for this aspect of the overall program:

- March 1979: (Third JCC meeting) Approval of criteria for Phase II and preliminary ranking of proposed projects.
- October 1979: (Fourth JCC meeting) Review of Phase II plans; second discussion and evaluation of proposed projects; JCC decision on format for Phase II plan and method of presentation.
- March 1980: (Fifth JCC meeting) Final approval of the list of projects for Phase II; approval of format and content of Phase II planning document.

- April 1980: Completion of Phase II plan by joint staff group.
- May 1, 1980: Submission of Phase II plan to AID/Cairo.
- May-June 1980: AID/Cairo review of Phase II plan.
- July-August 1980: Review of Phase II plan in AID/Washington.
- October 1, 1980: Phase II projects funded and activities begin.

B. Perspective for Phase I

Dr. A. S. El-Nockrashy, in his capacity as the ASRT coordinator for the overall program, presented a general framework for Phase II planning by the JCC. As a first approximation of the status of each program component at the end of Phase I, he offered the following estimates:

1. Policy Planning and Management - Completion of four intensive courses in the USA and four workshops in Egypt in the area of R&D management methods, technology assessment, technical economics and R&D marketing with 20-30 senior management level persons trained and 100-120 researchers or research managers given orientation and methods training in at least one of the four areas.

In addition to the courses, seminars, and workshops, the Policy Planning and Management component includes program policy oversight and evaluation by the JCC and the active collaboration of two resident advisors, one at the NRC and the second at the ASRT.

2. Demonstration Projects

a. More and Better Food

The farm systems related activities include selection of 2 villages, gathering of basic data on farm-level agriculture production in the village, testing of improved technology (seed and management improvements) and monitoring of new crops and/or technology. The food-nutrition related activities will include participation in the selection of the 2 villages, examination and evaluation of prototype products for the school feeding experiment, preparation of specifications for the prototype selected, and detailed planning of the feeding experiments. The food technology related projects should see (a) the testing of an improved cottonseed oil extraction procedure in at least one processing plant, and (b) the optimization in the factory of pilot plant data for cheese making using mixtures of fluid and reconstituted dried milk.

b. Bio-gas technology

Because this demonstration project was selected by the JCC at its Second meeting and an advisory panel had not yet been convened, the operational design of the project was not fully determined. As in the case of "More and Better Food" however, one would expect that field trials of bio-gas generators would continue into Phase II.

c. New Crops for Arid Zones

During Phase I only two demonstration projects were originally planned. However, the need to look ahead in Egypt to the settlement of new lands makes it prudent to proceed with the design of arid zone agricultural projects. Because of the priority of new lands settlement and the long lead times needed to demonstrate adequately the methodology and techniques of arid agriculture,

During Phase II the project will consolidate and extend services in training and access to computer based on-line information systems. It will also provide selected specialist equipment and materials for a new building of the National Information Services Centre which is now being designed and has already been authorized for construction by the ASRT.

5. Instrumentation Technology (IT)

In addition to assisting ASRT and NRC scientists in the purchase of scientific equipment for demonstration and R&D projects, the IT project is designed to improve maintenance and repair capabilities in six Egyptian institutions. These tasks are not readily separable into two phases. To have an optimum impact, the procurement and the maintenance and repair training activities should extend for the entire five year period of the Applied Science and Technology Program and, if possible, beyond.

C. Proposed New Projects for Phase II

Early in Year 2, Phase I, a review and assessment will be made by the ASRT, NRC, NAS/NRC and NSF of the status of ongoing projects to determine resources required for their continuation into Phase II. It is recognized that it would be desirable to add new projects in Phase II if resources are available. The ASRT Proposed the following examples of new projects to the JCC:

1. Geophysical Map for Egypt Using Radio Waves

For over 4 years the ASRT has been engaged in an extensive project using remote sensing by aircraft and satellite imagery for geographic, resource, and agricultural mapping. Remote sensing cannot, however, replace on-the-ground exploration techniques for more precise determination of underground water, minerals, natural gas, and petroleum resources.

planning for the demonstration project followed by field experiments should begin during year 2 of Phase I. It is anticipated that the project may enjoy multi-national support and could command resources that are not available under the original NAS/NRC contract with AID.

3. Research and Development Projects (R&D projects)

During the Second JCC meeting the R&D projects approved for implementation were: (a) evaluation of phosphate ores, (b) development of Red Sea fisheries, (c) corrosion studies, and (d) utilization of wool wax.

Perhaps the two projects which require the least development of "new" technologies are those on the evaluation of phosphate ores and the utilization of wool wax. These R&D projects should be essentially completed by year 3; i.e., the first year of Phase II. The remaining projects, and any others selected at the third JCC meeting, will likely continue until the end of Phase II.

4. Egyptian Scientific and Technical Information Services (STI)

The goal of the STI project during Phase I is to improve the basic structure and capability for providing scientific and technical information to the Egyptian scientific community. First, a design study for a nationwide system of STI services will be completed. In addition to this design activity Phase I will see the acquisition of journals, reports, and associated equipment based upon careful planning; a demonstration of computer accessed information delivery; and training in information processing of a selected group of Egyptian information and documentation specialists.

The proposed project would provide much of the data necessary for geophysical mapping of Egyptian ground resources and for radio wave propagation in the atmosphere. Geophysical data are needed to exploit potential mineral, petroleum and underground water resources more fully as settlement is pushed into arid zones; radio wave propagation data are needed to construct microwave communications systems in the Egyptian and Arab telecommunications network.

The project would require a minimum of 3 years, to collect, analyze, and publish data. A preliminary cost estimate indicates US \$3 million for equipment and \$2 million for staff salaries, consultants, training, and other expenses. About one-third (i.e., US \$ 1.67 million) could be furnished in Egyptian currency for local costs.

2. Establishment of a Computer Centre, Alexandria University

The University of Alexandria with an enrollment of more than 70,000 students is the second largest institution of higher education in Egypt. It is the only university which has a Computer Sciences Department offering under-graduate and graduate degrees in that discipline. Presently, 2,000 students, primarily from the Faculty of Engineering, utilize a PDP 11/40-RSTS computer system which is inadequate for even present needs. A modern facility serving up to 20,000 students from the Faculties of Engineering, Science, Medicine, Agriculture, and Commerce is urgently required. The Computer Centre, operating on a continuous, 24-hour schedule, would also be used for research projects, administrative and technical data processing for the university, and, under contract, for data processing in the public/private industrial sectors of the city and Governate of Alexandria.

A new Research Centre at the University of Alexandria is under construction and scheduled for completion before June 1979. Four floors, 1,500 square meters of space, have been allocated for the Computer Centre, which and includes air conditioned facilities for the computer hardware, terminals for access by students and staff, and administrative space for the Centre.

Costs for an optimum system including the computer hardware, software, maintenance, start-up and operations over a 3-year period are estimated to be US \$3.6 million; a more modest system with a small computer would be US \$ 2.4 million.

3. Upgrading the Capabilities of the Petroleum Research Institute

The Egyptian Petroleum Research Institute (EPRI), affiliated with the President of the Academy of Scientific Research and Technology, is charged with the responsibility for providing technical and applied research in all aspects needed by the national petroleum industry.

Two projects of cooperation under the Applied Science and Technology Program are proposed: (1) R&D for refining of petroleum crudes from the Egyptian Western desert region, and (2) establishment of an operations research centre within EPRI having strong computer services and broad information systems capabilities. Each of the projects would require a considerable investment in facilities -- for the R&D on Egyptian Western Desert crudes about US \$800,000 in equipment with another Egyptian Pounds 500,000 in building and construction; would be needed for the ^{new} operations research centre US \$1 million for equipment including a computer and

1 million Egyptian Pounds for building requirements would be necessary. In addition the ASRT would cover operational costs of staff, materials and supplies.

To proceed with the projects, design study teams for the R&D area and the operations research area are needed.

4. Measurement Science and Technology

With the coming peace era, the industrial sector in Egypt could develop rapidly to supply growing demands for capital and consumer goods locally, in the Middle East, and throughout Africa. To achieve acceptance in these markets all goods must meet efficient, uniform standards and pass stringent quality control criteria necessary for modern industrial mass production. This project is designed to strengthen Egyptian metrological services and the standardization infrastructure of the National Institute of Standards (NIS) by a close affiliation for training and planning purposes with the United States National Bureau of Standards (NBS).

The general objectives of the NIS-NBS cooperation would be: (a) strengthen NIS staff capabilities in the selection, use, and maintenance of precision measuring instruments; (b) to acquire in NIS greater team experience in the design and construction of specialized measuring apparatus; (c) to utilize the best methods of metrology for upgrading existing industrial standards in Egypt and extend their range of application; (d) to disseminate modern measurement science and technology to Egyptian industries; and (e) to train local specialists in standardization and quality control techniques.

A project with objectives as broad as those outlined above should have a minimum operational period of five years so that equipment can be purchased for the Egyptian NIS, staff trained in equipment design and maintenance, and an NIS extension service to industry developed. Such a project is estimated to cost US \$ 1.5 million over the 5 year period.

5. Water Quality Studies on the River Nile and Lake Nasser

With the completion of the Aswan High Dam and the cessation of annual flooding, the Nile River as it flows through Egypt is completely subject to control based upon water volume. The optimal use of this vital water resource, however, should not be solely a function of irrigation requirements but should be based upon an integrated river basin development system of multiple usages, water quality, ecological characteristics, public health and other socioeconomic aspects.

Beginning in 1975, the River Nile and Lake Nasser Water Quality Research Project was established to gather data for multiple use decision making for the Nile and its ecosystem. The main goals of the project which has enjoyed the cooperation of scientists from the ASRT, the United States Environmental Protection Administration, the University of Michigan and the Ford Foundation have been to: (a) strengthen and integrate R&D resources into multidisciplinary water resource problem-solving teams, and (b) utilize the teams and their data for better planning-decision making in Nile water management and use.

The project is currently scheduled to lose financial support from the Ford Foundation at the end of calendar year 1979. Three tasks remain to be accomplished during the period 1980-82 and these are:

- (a) creation of an Egyptian National Council for Water Quality as a research-advisory unit to the ASRT;
- (b) compilation of all R&D data into a Nile water quality data bank and information centre at ASRT ; and
- (c) completion of a quantitative assessment of the River and Lake studies, highlighting particularly the present and future water quality and ecosystem characteristics of the River Nile and High Dam reservoir in Egypt.

Estimated additional support needed for the project through 1982 is U.S. \$250,000 and Egyptian Pounds 95,000.

VII

Conclusions and Recommendations

1. Research and Development Management Training

The JCC accepted the basic plan for R&D management training, proposed by the Denver Research Institute (DRI), containing four elements: (a)

- (a) management methods
- (b) technology assessment
- (c) technical economics and,
- (d) research marketing.

The NAS is to negotiate a contract with DRI for implementation of the project coordinating all steps with the Director of the National Research Centre, Cairo.

2. Demonstration Projects

A. More and Better Food.

The JCC received a progress report from the scientific management staff and the U.S. ad hoc advisory panel of the More and Better Food Program. The Committee recommends that a joint Egyptian-U.S. advisory committee not exceeding 5 persons from each country be appointed for the Phase I period (ending September 30, 1980) which will meet periodically to offer guidance and report to the JCC on the progress of the program.

B. Second Demonstration Project.

The JCC received proposals for two demonstration projects from ASRT, entitled, "The Development and Application of Bio-Gas Technology in Rural Areas of Egypt" and "New Crops for Arid and Semi-Arid Zones."

Both are determined to meet criteria for demonstration projects and both were considered feasible to implement in the very near future.

The JCC approved the bio-gas demonstration project as presented and recommended that a joint panel be appointed as soon as possible to elaborate the design for immediate implementation.

The JCC recognized that the arid zones project also has high priority for Egypt and recommended that a joint panel be named to review the project design in the light of other activities in Egypt, the United States and elsewhere. The arid zone project appears to have special appeal for implementation in the Middle East in the coming peace era. A report of the joint panel should be presented to the JCC for its consideration at its Cairo meeting in March, 1979.

3. Research and Development Projects

A. Nile Soil and Water Study

The project entitled, "Studies on Soil Properties and Irrigation Water after the Construction of the High Dam" needs to be modified and strengthened by references to previous work and to on-going work involving micronutrient requirements for soils in Egyptian agriculture. Also, a search of the data bank of the ASRT studies of water quality on the River Nile and Lake Nasser and other information sources is to be undertaken. The U.S. panel that visited Egypt to assist in the project design

was asked to present its written comments on the proposed project as it was presented to the JCC. Based upon these inputs a new proposal will be brought to the JCC in March 1979.

B. Red Sea Fisheries Project.

The JCC approved the project as presented for Phase I implementation and recommended that an ad-hoc panel of experts be appointed to review the technical plan and to coordinate the R&D activities-with the UNDP project for Red Sea Fisheries development.

C. Phosphate Fertilizer Project

The JCC approved the project entitled "Evaluation of Egyptian Phosphate Ores for Wet Process Phosphoric Acid and Phosphatic Fertilizer Production" for immediate implementation.

D. Corrosion

The JCC approved the proposal arising from the National Research Centre-American Chemical Society (ACS) workshop entitled Corrosion Causes and Control and asked that a project design panel be appointed to submit the definitive plan to the Committee's third meeting in March, 1979.

E. Utilization of Wool Wax

The JCC approved the proposal entitled "Utilization of Wool Wax" which also came from the NRC-ACS workshop. As in the R&D project on corrosion, a project design panel is to be appointed that will submit its definitive plan to the JCC in March 1979.

F. Other Projects

Three additional proposals from the NRC-ACS workshop were submitted for JCC consideration. They were:

- Chemical modification of cotton
- Control of aquatic weeds
- Continuing education and interrelationships in subjects closely allied to chemical technology and management of chemical industries.

The JCC recognized that the above projects meet the criteria for the Applied Science and Technology Research Program, but in view of the current commitments these projects could not be included for financing in Phase I.

4. Instrumentation Technology

The JCC received a progress report on activities in the instrumentation technology and equipment purchase project from the NSF. The JCC recommended that:

- (a) The selection of a U.S. contractor be completed as quickly as possible in order to accelerate implementation and procurement of equipment,
- (b) Coordination in training programs be made between the U.S. contractor (when selected) and the National Institutes of Health.

5. Scientific Information Services

Activities under the element of scientific information services were reviewed. The JCC requested:

(a) At the earliest possible date that a more detailed review of architectural plans be undertaken by an expert, or group of experts, for the proposed information services complex being designed for the Egyptian National Information and Documentation Centre (NIDOC).

(b) That NSF review other aspects of the scientific information services plan with the goal of optimizing facilities and services before the third JCC meeting in March 1979.

(c) That NSF jointly with ASRT outline definitive activities for the period prior to the award of the contracts.

6. Phase II Planning

For purposes of program management, Phase I of the Applied Science and Technology Research Program extends from October 1, 1978 through September 30, 1980. Prior to the implementation of Phase II on October 1, 1980, the AID will, independently of any of the participating groups of the Program, evaluate the progress achieved during Phase I. In addition, AID requires by May 1, 1980, a Phase II plan elaborated by the JCC. Only if the evaluation and Phase II plans are approved will implementation of Phase II go forward.

The JCC received a report and planning document from the ASRT as a basis for discussion and preliminary preparations. The projected impact of Phase I projects in -

- (a) policy planning and management,
 - (b) demonstration sub-projects,
 - (c) research and development sub-projects,
 - (d) provision of scientific equipment, including equipment maintenance & repair and
 - (e) scientific and technical information services
- were outlined. Many of these will carry-over into Phase II.

Proposals for new initiatives in Phase II included:

1. Geographical mapping of Egypt using radio waves.
2. Establishment of a computer center at Alexandria University.
3. Upgrading the capabilities of the Petroleum Research Institute.
4. Upgrading the capabilities of the Egyptian National Institute of Standards.
5. Completing a major effort begun in 1975 on water quality studies on the River Nile and Lake Nasser.

The JCC established the following schedule for Phase II planning:

- (a) Third Meeting, March 1979. Receive a draft report for a Phase II plan for discussion and critical review of the planning process.
- (b) Fourth Meeting, October 1979. Continue the Phase II planning process with selection of criteria for choice of projects.
- (c) Fifth Meeting, Spring 1980. Approval of a Phase II plan.

7. Phase I Evaluation

At the March 1979 JCC meeting, proposed guidelines for evaluation of Phase I subprojects and activities will be discussed. Recommendations will be made to AID for evaluation guidelines to assist in the independent evaluation which that Agency will conduct on Phase I of the Applied Science and Technology Research Program.

8. Third Meeting of the JCC

The Third Meeting of the JCC will be held at the ASRT in Cairo, March 28 and 29, 1979.

APPENDIX A

Agenda Second Meeting
Joint Consultative Committee

APPLIED SCIENCE AND TECHNOLOGY PROGRAM

U.S. National Academy of
Sciences/National Research
Council (NAS/NRC)

Academy of Scientific
Research and Technology,
Arab Republic of Egypt

Room 200 (A), Joseph Henry Bldg.
2100 Pennsylvania Avenue, N.W.
Washington, D.C., U.S.A.

November 3-4, 1978

Friday, November 3, 1978

SESSION I

9:30-10:15 a.m.

Welcome by Dr. Thomas F. Malone, Foreign
Secretary, National Academy of Sciences

Remarks:

Dr. A.M. Abou El-Azm, President, Academy
of Scientific Research and Technology

Dr. H. Guyford Stever
Chairman, U.S. Panel

Mr. Roger W. Doyon
Division of International Programs
National Science Foundation

Mr. Joseph C. Wheeler, Assistant Administrator
Bureau for Near East
U.S. Agency for International Development

10:15-12:30

Progress Reports & Discussion

- A. Overview of the Program
Dr. Kamel, Director
National Research Centre, Cairo
- B. First Demonstration Project (More &
Better Food)
Dr. Osman Galal
Project Coordinator
National Research Centre, Cairo

- C. Second Demonstration Project
Dr. A.S. El-Nockrashy, Head
R&D Office, ASRT, Cairo

12:30 - 2:00 p.m.

Luncheon, Executive Dining Room
Main Building, National Academy of Sciences
2101 Constitution Avenue, N.W.

Friday, November 3, 1978

SESSION II

2:00 - 5:30 p.m.

A. Research and Development Projects & Discussions

- Nile Soil and Water
- Red Sea Fisheries
- Phosphate Fertilizer
- Proposed American Chemical Society Projects

Dr. A.S. El-Nockrashy, ASRT

B. Instrumentation Technology & Discussion

Dr. Lawrence Edwards
Division of International Programs
National Science Foundation, Washington

C. Scientific Information Services & Discussion

Mr. Eugene Pronko
Division of International Programs
National Science Foundation, Washington

7:30 - 9:30 p.m.

Reception for JCC (International Club)
Dr. A.M. Azzam
Cultural & Scientific Counselor
Embassy of the Arab Republic of Egypt
Washington, D.C.

Saturday, November 4, 1978

SESSION III

8:30 - 12:30

A. Phase II Planning & Discussion

- General Framework
Dr. A.S. El Nockrashy, ASRT
- AID Needs
Mr. James Riley
AID/Cairo

B. Final Conclusions and Recommendations

C. Closing Remarks

Dr. A.M. Abou El-Azm

APPENDIX B

List of Participants, Invited Guests and Observers

Second Meeting

Joint Consultative Committee

APPLIED SCIENCE AND TECHNOLOGY PROGRAM

EGYPTIAN JCC MEMBERS

Dr. A.M. Abou El-Azm
President, Academy of Scientific Research and Technology (ASRT)

Dr. Mostafa M. Hafez
Counsellor, Academy of Scientific Research and Technology

Dr. Mahmoud Riad
Secretary General, Arab Telecommunications Union

Dr. Yussuf Wally
Assistant to the Minister of Agriculture

U.S. JCC MEMBERS

Dr. H. Guyford Stever
International 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 Laboratory, U.S. Department of Agriculture

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

EGYPTIAN ADVISORS

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

Dr. Ahmed M. Azzam
Cultural and Scientific Counsellor,
Embassy of the Arab Republic of Egypt, Washington DC

Dr. A.S. El-Nockrashy
Director, Research and Development Office,
Academy of Scientific Research and Technology

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

Dr. Talat Rihan
Staff, Technical Office of the President,
Academy of Scientific Research and Technology

Dr. Abdel Fattah Rizk
Director, Technical Office of the President,
Academy of Scientific Research and Technology

Dr. Amin M. El-Gamassy
Agricultural Counsellor,
Embassy of the Arab Republic of Egypt, Washington DC

Dr. Aziza Yousef
Professor, Central Metallurgical Research Institute,
National Research Centre

NATIONAL ACADEMY OF SCIENCES

Dr. Thomas F. Malone
Foreign Secretary, National Academy of Sciences
Director, Holcomb Research Institute, Butler University

Mr. W. Murray Todd
Executive Director, Office of the Foreign Secretary

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

Dr. Harold Dregne
Texas Tech University
Chairman, NAS Panel, Nile Soil and Water Studies

Dr. Helmut Weldes
Senior Staff Officer, Board on Science and Technology for International Development
Advisor to the Director, National Research Centre, Cairo

Mrs. Rose Bannigan
Assistant to the Director, BOSTID

Ms. Tresa Bass
Staff Officer, BOSTID

Mr. Jay Davenport
Staff Officer, BOSTID

Mr. Augustus Nasmith
Staff Officer, BOSTID

Mrs. Maryalice Risdon
Staff Assistant, BOSTID

NATIONAL SCIENCE FOUNDATION

Mr. Roger Doyon, Head
Africa and Asia Section
Division of International Programs

Dr. Lawrence Edwards
Program Manager, Africa and Asia Section
Division of International Programs

Dr. Thomas C. Farrar
Program Director
Chemical Instrumentation Program
Division of Chemistry

Mr. Eugene Pronko
Program Manager, Africa and Asia Section
Division of International Programs

AGENCY FOR INTERNATIONAL DEVELOPMENT

Mr. Joseph C. Wheeler
Assistant Administrator
Bureau for Near East

Mr. William Gelabert
Director, Office of Technical Support,
Bureau for Near East

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

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

AMERICAN CHEMICAL SOCIETY

Mr. Gordon Bixler

NATIONAL BUREAU OF STANDARDS

Dr. Edward L. Brady
Associate Director for International Affairs

Dr. Samuel E. Chappell
Office of International Measurement Standards

ANNEX B

SECOND REPORT

Ad hoc Panel for the More and Better Food

Demonstration Project

Applied Science and Technology Program

of the
U.S. National Academy of Sciences/National Research Council (NAS/NRC)
and the
Academy of Scientific Research and Technology Arab Republic of Egypt (ASRT)
(Contract AID/NE-C-1474)

Summary

The More and Better Food Project is an element of the Applied Science and Technology Program provided under a joint agreement between the Government of Egypt and the United States Agency for International Development. It is a multidisciplinary effort of the Egyptian National Research Centre (NRC) designed: (a) to study food production, distribution and nutrition problems at the village level, and (b) to conduct a pilot feeding program for school age children using a locally produced high nutritious food made from indigenous products.

The More and Better Food Project consists of parallel activities for improving farm production methods and output for a sample village, conducting a nutrition improvement experiment in the village using local food inputs, and assisting the Egyptian food industry sector in solving production-quality control problems. The three activities are inter-related and designed to utilize the resources of the NRC for greater problem solving in the food sector of the economy.

The project was recommended for implementation by the Joint Consultative Committee of the Applied Science and Technology Program in May, 1978. The U.S. National Academy of Sciences/National Research Council cooperates with the Egyptian National Research Centre in this work.

During the period June-October 1978 the following activities were advanced:

1. Farm Systems Related Projects. Selection criteria were established for the choice of a village in the Nile Valley as the focus of the demonstration project. Of the over 4,000 Egyptian villages, the selection was narrowed first to 39 and then to 10 possible sites. A final choice of one village is expected in November, 1978.

2. Nutrition Related Projects. In addition to participating with the farm systems group in the village selection process, the nutrition group surveyed and analyzed data on more than 12 products which have been tested in previous nutrition programs in Egypt. Selection of one of these products, or an alternate which will be suitable for the village feeding experiment is proceeding.

3. Food Technology Related Projects. Two major food industry problems are being worked upon by NRC scientists and engineers:-

--Improvement of yields and quality of product from extrusion processing of Egyptian cottonseed to produce a vegetable oil for human consumption .

During the report period test runs on 1.5 kg. samples were successfully completed; scale-up to a 15 kg. semi-pilot plant is now being undertaken.

--Improvement of yields and quality of product for Egyptian Domiatta cheese was studied by a U.S. consultant. Together with dairy scientists from NRC a set of pilot plant experiments was designed to address the production and quality control problems of the industry. The experiments will require a pilot plant at the NRC which will approximate industrial cheese making operations but with careful control of variables. It is expected that this pilot plant can be built and begin operation during calendar year 1979.

II. Background

A. Scope

Food production in Egypt is falling behind the rate of population growth despite major national efforts to reverse the trend. Moreover, adequate protein in the diet of the most vulnerable group, young children and nursing mothers, constitutes a growing problem.

More and Better Food is a multidisciplinary, demonstration project, managed by the National Research Centre (NRC), designed to study food production, distribution and nutrition problems at the village level in Egypt and to conduct a pilot feeding program using local resources to a maximum extent to show how nutritional deficiencies of the target population may be solved.

Implementation of the More and Better Food project will be in two steps or phases:

- Phase I, 1978-1980, is a data collection, analysis and planning period, and
- Phase II, 1980-1983, will be a period of field testing of a nutritious food in a village of the Nile Valley

The demonstration project involves a team from divisions and laboratories of the NRC, cooperating with the Ministries of Agriculture, Irrigation, Land Reclamation, Health, Social Affairs and the Governates.

B. The Joint Panel

An ad hoc panel for the More and Better Food Project was formed to assist in setting project guidelines, review the progress of the work, and make suggestions for technical management. The U.S. Panel consists of three persons:

1. Dr. Donald Plucknett (Chairman), Professor of Agronomy and Soil Sciences, University of Hawaii. (Dr. Plucknett in 1978-79 is on leave to serve as Deputy Director, Board on International Food and Agricultural Development (Title XII), Department of State, Washington, D.C.).

2. Dr. Harold Calbert, Professor of Food Sciences, University of Wisconsin at Madison.

3. Dr. Kristen McNutt, Executive Officer, National Nutrition Consortium, Washington, D.C.

The Egyptian Panel is the ^{project} Steering Committee of the National Research Centre and includes the following:

1. Professor Dr. Bakr Ahman, (Chairman) former Egyptian Minister of Agriculture.

2. Professor Dr. Mahmoud Abdel-Akhar, former Egyptian Minister of Agriculture and former Governor of Fayoum Governate.

3. Professor Dr. Mahmoud Abdel-Kader, Head, Biochemistry and Nutrition Department, Cairo University.
4. Professor Dr. A. M. Gad, Head, Food Technology & Nutrition Department, NRC.
5. Professor Dr. H. S. Abdel-Rahman, Head, Agricultural Research Department, NRC.
6. Professor Dr. Madbouly, Head, Animal Sciences and Poultry Department, NRC.
7. Professor Dr. A. S. El-Nockrashy, Fats and Oils Laboratory, NRC, and Liaison Officer from ASRT for the Program with NAS/NRC.
8. Professor Dr. Osman Galal, Nutrition Laboratory, NRC, and Liaison Officer from the NRC for the Program with the NAS/NRC.

C. Status as of May 1978

More and Better Food was specifically included as a demonstration project in the 1977 agreement between the Government of Egypt and AID under the Applied Science and Technology Research Program.

Core equipment and specialized laboratory apparatus were specified for the R&D aspects of the project in 1977; orders were placed late in the same year.

The NAS/NRC was selected in December 1977 as the major U.S. contractor to work jointly with the ASRT on the demonstration project aspects of the Applied Science and Technology Research Program.

A Joint Consultative Committee for the overall Program was appointed early in 1978 and met in Cairo in May 1978. That Committee reviewed criteria for demonstration projects and determined that More and Better Food fulfilled those criteria. The project was then specifically incorporated for implementation into the overall program.

The U.S. members of the ad hoc panel on More and Better Food were named early in 1978 and went to Egypt in May for their first joint discussions with the Egyptian steering committee. In the report of that meeting all participants agreed that tangible benefits from the More and Better Food project can be attained by emphasizing the following philosophy:

1. There must be active coordination among the government agencies and groups in Egypt that are responsible for agriculture, food, health and nutrition. Coordination must include representatives from village and farm level groups.
2. There must be participation of recipients of the food in making program decisions.
3. The goal must be to improve good existing diet patterns and preferences without making radical changes in food habits and customs.

The U.S. ad hoc panelists and the representatives of the Egyptian steering committee for More and Better Food also agreed to focus upon three areas for implementation; namely,

- Farm systems related projects
- Nutrition related projects
- Food Technology related projects.

Although each may operate in parallel, there must be close coordination of activities to insure a successful pilot feeding experiment in years 3-5. Specific types of coordination and a time sequencing of activities were outlined in the First Report of the ad hoc panel.

III. Progress: June-October 1978.

A technical report for the Second Meeting of the Joint Coordinating Committee was prepared by the management and technical staffs of the More and Better Food Project. Briefly that report is summarized below:

A. Farm Systems Related Projects

1. In collaboration with the NRC group concerned with nutrition related projects, meetings were held in June, July and August, 1978 with representatives of the Ministries of Agriculture, Irrigation, Health, Social Affairs, Land Reclamation and the Governates to select a village in the Nile Valley as the "pilot" village for the More and Better Food project. First, the group designated the following criteria for selecting a representatives village: (a) size not over 5,000 inhabitants, (b) rural environment; i.e. not on the periphery of a large city, (c) access should be readily available by road, (d) social services such as health clinics, schools and an agricultural extension worker should be available, (e) public utilities should be present; i.e. electricity and water, (f) agricultural production should be representative of Egypt and not concentrated on cash crops such as vegetables and fruits grown for city markets, (g) size of land holdings should be representative of Egypt, generally 5 feddans or less, (h) villagers should be willing to participate in the pilot project and (i) the village should not exhibit to an exceptional degree either malnutrition or other diseases.

2. Egypt has a total of 4,142 villages; the selection process using criteria in (1) above narrowed the choice to 10 villages by late October 1978. The selection process is expected to be completed early in November 1978. The assistance of data and studies from the Organization for Reconstruction and Development of the Egyptian Villages (ORDEV) is specifically acknowledged.

3. The next stage is to collect base-line data on the village selected. Agricultural information to be gathered should give a profile of the farmers and their farming systems including major and minor crops, cropping patterns and rotations, water management, fertilization practices, pesticides or herbicides used and in what quantities, livestock numbers and use, major feedstuffs, etc.

4. The Governor of the New Valley has been extremely interested in including a village from his Governate in More and Better Food. He has offered to provide a building in one village for studies and to cooperate in other ways.

B. Nutrition Related Projects

1. The NRC nutrition group has collaborated with the agricultural group in the task of selecting a pilot village (see #1 under Farm Systems above).

2. The nutrition group has gathered a great deal of background data (technical formulation and organoleptic qualities) on 12 formulated foods that were produced in Egypt since 1960. Most of these food mixtures have been subject to trials but only supramine, consisting of wheat flour, chick peas, lentils, dried skim milk, sugar and minor additives has been introduced into the local market. Discussions with the groups that were responsible for formulated foods will continue. For those which were tested in Egyptian villages, consumer acceptability will be assessed.

3. In addition to the study of previously formulated foods, the NRC Nutrition Laboratories will consider such possibilities as a nutritious beverage of corn and rice, pastries and sausages incorporating soya beans, and the use of popular Egyptian dishes as a base food mixture.

C. Food Technology Related Projects

1. The cottonseed oil processing industry of Egypt is a major supplier of vegetable oil for the local market. Cottonseed oil is extracted by an extrusion process which has associated losses, some of which can be minimized. One of the major problems associated with the extrusion processing is discoloration and loss of clarity in the oil, resulting in poor consumer acceptability of the product.

Because of these problems only 50-60% of the oil available in cottonseed is extracted and marketed. Egypt produces about 100 thousand tons of cottonseed oil yearly but annual consumption of vegetable oils is 400 thousand tons. Thus, imports of edible oils are of the order of 180 million U.S. dollars/year.

The NRC Fats and Oils Laboratory is working with industrial oil processing representatives to increase yields and to produce a clearer, more desirable cottonseed oil. The scope of the NRC project includes: (a) prevention of coloration; (b) treatment (bleaching) of color fixed cottonseed oil and, (c) reducing processing losses. Good results have been obtained on 1.5 kg. batches in the laboratory by chemical treatment of the color fixed

oils and by more careful control of temperatures during extrusion. Scale-up to 15 kg batches will be made prior to testing at the Al-Badrachin processing factory. Chemists and engineers from the factory and from NRC are collaborating in this work.

2. Industry leaders from the cheese making sector have also requested NRC assistance in producing larger quantities of the local, soft, white cheese known as "Domiatta" for the Egyptian market. (Domiati is not similar to any of the popular cheese varieties in the U.S.A.; perhaps its nearest comparable type is "Feta", a Greek cheese.)

Domiatta cheese is traditionally made from a mixture of unpasteurized buffalo and cow milk and stored without refrigeration. Due to the shortage of milk for cheese making, Egypt's nine government cheese factories and many small, privately owned cheese making companies, use mixtures of local fluid milk plus imported nonfat dried milk and butter oil in the manufacture of Domiatta cheese. Beyond a level of 50% fluid milk and 50% nonfat dried milk, the product undergoes some taste alteration and has a "crumbly" consistency that is not desired by consumers. The problem presented to NRC is one of discovering techniques to increase production of Domiatta cheese at acceptable price levels using higher percentages of nonfat dried milk. (In the short run the supply of buffalo and cow milk for the cheese-making market will remain limited.)

In September the NRC received the visit of a cheese making specialist from the U.S.A. who, together with dairy industry specialists from the NRC, outlined a series of pilot plant experiments designed to increase Domiatia cheese production. To proceed with the semi-plant R&D the NRC must equip one of its dairy laboratories as a pilot plant. All equipment except for a small scale multi-stage homogenizer can be fabricated in Egypt. The work is expected to proceed over the next six months; i.e. by June 1979.

IV. Comments by the Panel

1. Village Selection Process. The ad hoc panel unanimously agreed that the criteria are excellent for choosing a village in which field work is to be done. The thorough work of the Egyptian team was impressive and the speed with which the selection has proceeded is most commendable. This aspect of the More and Better Food Project is basic to all the work to follow. The fact that it has proceeded so well should give all involved in the project a sense of accomplishment and pride.

2. Data Collection. Everyone agrees that the data collection on the village farm system and nutrition - health status is the next important step. There is always a tendency for social and natural scientists to want more data than they need or can use. The ad hoc panel had no "magic" solution to this problem beyond the cautionary note that a careful review of data and information requirements be made by project managers of More and Better Food.

3. Village Participation. Every effort must be made to insure that village leaders, and the people themselves, be involved in the project as it is planned, data are collected, the feeding experiment is designed, the nutritious food selected, and the work proceeds.

4. Liaison with NRC. An effort must be made to select a key representative from the NRC to the village chosen. He or she should be someone close to village life, and willing to become identified with the village itself. Perhaps it would be preferable to select a village leader as the liaison representative so the people would feel comfortable in discussing the project with that person.

5. Liaison with Egyptian Ministries and other Government Agencies. There may exist for the village chosen a considerable body of recent information on population demography, education and school attendance, health, soil types, crop yields, water use data, etc. Continued cooperation with the Ministries and other government agencies was urged. In this connection the Organization for Reconstruction and Development of the Villages (ORDEV) was cited as a particularly valuable information resource.

6. Selection of the Nutritious Food for the Feeding Experiment. Because of the number of "nutritious foods" which have been prepared in Egypt in recent years, there will be a tendency for each interested group to "push" for the acceptance of its particular formulation. In making a choice, very clear and objective criteria must be used. This will help overcome natural biases. The characteristics of the villagers, their food habits, and their

expressed wishes must be taken very seriously in making the choice. Ease of manufacture, shelf-life, unit cost, and origin of ingredients are other factors in addition to consumer preference that must be considered in making the choice.

7. Data Reduction. Because of the variety and quantity of data to be collected, the ad hoc panel inquired about computer storage and retrieval of these data. Although a large computer facility is not currently available at the NRC, serious consideration should be given to renting computer time (including data reduction) at the University of Cairo, American University in Cairo or another facility.

8. Food Technology. The production of a consistent product, in quantity for the village feeding trials may present some problems to the Egyptian food industry. NRC may have to consider establishing an in-house food technology laboratory (pilot plant scale) to assist the industry in solving the manufacturing problems.

9. Extraneous Questions. There will be a tendency in the village to want to focus on questions outside the scope of the More and Better Food Project. For example, farmers will be concerned with current prices for obligatory crops like cotton, rice, etc. Important as these issues are, the NRC group must work within the system as the "given" parameters and concentrate on the more limited goals of the project.

ANNEX C

APPLIED SCIENTIFIC AND TECHNOLOGY PROGRAM

(Contract AID/NE-C-1474)

Academy of Scientific Research and Technology, Arab Republic of Egypt
and

U.S. National Academy of Sciences - National Research Council

Report of the Ad hoc Panel on Nile Soil and Water Studies

by

H.E. Dregne (Chairman), Director, International Center for Arid
Land Studies, Texas Technological University, Lubbock.

C.C. Delwiche, Department of Land, Air and Water Resources,
University of California at Davis.

E.V. Richardson, Director, Engineering Research Center, Colorado
State University, Fort Collins.

I. Introduction

A National Academy of Sciences/National Research Council (NAS/NRC) panel, consisting of C.C. Delwiche, H.E. Dregne, and E.V. Richardson, met on September 19 and 20, 1978 at the Egyptian Academy of Scientific Research and Technology (ASRT) in Cairo to review two projects proposed for inclusion under the NAS/NRC-ASRT Applied Science and Technology Research Program. The two projects concerned the effects on irrigated soils of the reduction in suspended silt in the Nile River due to the construction of the Aswan High Dam and the storage of water above the dam in Lake Nasser. The leader for both proposed projects is Professor Hassan Hamdi of Ain Shams University.

The panel met with Professor Hamdi and other representatives of the ASRT and NAS/NRC on September 19 and with Professor Hamdi and five of his proposed co-investigators on September 20. A preliminary draft of the panel's report was reviewed and discussed with Professor Hamdi on September 21.

The major substance of the panel's report is presented in two parts. The first part gives the panel's assessment of the proposals and the second part sets forth suggestions for increasing effectiveness. Assessment of the proposals was based upon the preliminary drafts prepared by Professor Hamdi. The drafts did not include a review of literature, and related ongoing research. Upon completion of a comprehensive literature review, the present project proposals are to be revised, if necessary, to reflect the findings of the review. Most of the panel's comments refer to the soil study, since the project on Lake Nasser water quality was of such a magnitude that it, alone, could absorb the entire budget requested for the two projects.

II. Assessment of Project Proposal

The Egyptian scientists who are assigned to the proposed projects are very well trained and dedicated professionals. They represent the various scientific disciplines needed for the study. Discussions with them revealed their dedication and their many ideas of what should be studied. This broadness of the disciplines and the many ideas generated by the scientists probably have contributed to a problem perceived by the panel: the proposal attempts to do too much with the resources and time available.

In general, the proposal should clearly state objectives, cite previous work, review the available literature and evaluate current research being undertaken. It should be focussed more narrowly and should indicate the potential contributions to knowledge which will result, as well as the contributions to be made relative to helping solve Egypt's development problems. At present, the objectives are largely inferred, not explicitly stated. It would help if they were clearly identified.

The proposal does not cite any literature, either domestic or foreign. It does not review or cite the previous work which has been carried out by various ministries, universities and foundations. Nor does it cite current work that the above agencies are doing, with an indication that the proposed

work will not duplicate these efforts. Currently there are two projects proposed: (1) The consequences of the loss of Nile-silt as a result of the High Dam on the mechanical properties and microbiology of the soils; and, (2) Changes in composition of Nile water as a result of storage. Either project would take all of the resources that are cited in the proposal. In fact, the second project (composition of the Nile water) probably cannot be done correctly even if it utilized all the financial resources of both projects. With clear objectives and a sharper focus, the first project could make a significant contribution to knowledge and to Egypt's development. It would be well if the project were not limited to changes caused by the loss of Nile-silt only, but would include changes resulting from different crops, changes in farming methods, water distribution and irrigation practices, the effect of tile drainage or the lack thereof, sand encroachment, farm mechanization, etc.

III. Suggestions for Increasing Project Effectiveness

A. General

There are a number of preliminary steps which could be taken to strengthen the proposal (and the program). In logical sequence these would be:

(1) A comprehensive search of the literature dealing with work which has been accomplished in the past regarding the characterization of the soils, water and agricultural management of the delta and valley. Of particular interest is that work, published or unpublished, which has provided data on sites which could be used as control sites with which comparison could now be made to identify changes.

(2) A compilation of present efforts being made by other agencies or groups in order to determine where cooperative research efforts could be of value or where duplication of effort might be avoided.

(3) An identification of specific cases of detrimental results which may have come from the change in management practice caused by the construction of the High Dam. Suggested or assumed changes should be avoided unless there are sufficient indicators that such deterioration has occurred. Supportive quantitative data are preferred.

(4) Objectives indicated as a consequence of the above listed analysis of the problems involved should be listed in as specific terms as possible, and expressed in terms of questions to be answered or phenomena to be demonstrated.

Studies designed to "obtain data" should be avoided unless a clear need for these data is indicated.

(5) Priorities should be established for the various objectives and the time at which these objectives can be reasonably reached should be stated. In establishment of these priorities, due consideration should be given the cost/benefit ratio for a particular study, i.e. how much needed information will be gained for a given expenditure of time and funds.

B. Indicates Studies

As a result of information developed in the excellent briefing the panel received in plenary session, several problem areas appeared to be particularly likely to yield productive studies. Among these (but by no means an exclusive list), the following appear to the panel to have particular merit:

(1) There are indications (which probably will be further strengthened by the research analysis) that zinc and other micronutrient deficiencies may exist in the valley or delta (or both). If such is the case, a study to identify their location and intensity would be of great value. If these deficient areas do exist, it is unlikely that they are of recent (since the conversion to perennial irrigation) origin, but, regardless of their origin, the estimation of their extent and the development of means for dealing with them would appear to be of most value.

(2) Potential problems of salt accumulation and soil texture deterioration appear to be possible in the interference zone between terraces and the delta and valley and in other soils because of changed irrigation patterns. Determination of the extent of these problems, their causes, and means for their avoidance or correction are of priority interest. As a caution, any study of this nature should be carefully coordinated with related work which may be planned or under way by other agencies or groups.

(3) Questions relating to microbial activity have justifiably been considerable attention. Bacterial counts or estimates of bacterial activity potential are of limited value. The results of microbial activity are of use in some cases. Those processes having to do with the nitrogen budget are of particular interest. Since the direct measurement of nitrogen fixation, nitrification and denitrification are difficult at best, and integrated study of the nitrogen

budget in the river (inputs, outputs) would perhaps be the most direct approach. An evaluation of nutrient inputs at the head of Lake Nasser and outputs at the outflow (particularly nitrogen) would also be useful, provided it is not duplicative of other studies and not prohibitively expensive.

C. Application and Demonstration

Each phase of the program should be developed with a view of translating its results into field action as quickly as possible. It is suggested that the proposal include (with detailed specificity) an indication of the mechanisms by which the study results can be turned over to extension services and appropriate action agencies and brought to a demonstration phase. The extension of new information to field practice is of utmost importance.

IV. Equipment Requested

No attempt was made to evaluate the list of equipment needed for the project(s). Such an evaluation should be made after the literature review has been completed and the equipment requirements re-assessed by the research investigators.

V. Conclusion

The panel was favorably impressed by the competence of the project investigators and their obvious enthusiasm for conducting the studies. Their strong desire to make the project as productive as possible may lead them to undertake more than can be accomplished during the three year period of the project. Care should be taken to focus upon a set of objectives that will be narrow enough to provide a reasonable chance for success in achieving them. The panel is aware that the proposed projects have thus far been presented in preliminary terms only. The panel members will be glad to react to and comment on further drafts prepared by Professor Hamdi and the ASRT team, and the panel looks forward to learning of the team's determination of problem priorities following the reviews of literature and ongoing research activities.

Cairo, September 21, 1978

ANNEX D

APPLIED SCIENTIFIC AND TECHNOLOGY RESEARCH PROGRAM
(Contract AID/NE-C-1474)

Academy of Scientific Research and Technology, Arab Republic of Egypt

and

U.S. National Academy of Sciences - National Research Council

DEMONSTRATION PROJECT: MORE AND BETTER FOOD

Report on a Food Technology Activity

CHEESE PRODUCTION IN EGYPT

by

Professor Dr. M. H. Abd El-Salam, National Research Centre, Cairo

and

Mr. Wilmer A. Larson, Food Consultant, Madison, Wisconsin, U.S.A.

I. Background

This is a report relating to the ongoing going program established in March 1977 by the Academy of Scientific Research and Technology of the Arab Republic of Egypt (ASRT) and the U.S. Agency for International Development (AID). AID has contracted the National Academy of Sciences - National Research Council (NAS-NRC) to work with the ASRT. This phase of the program is entitled More and Better Food and provides an outline for a demonstration project which will provide the Egyptian food industry some much needed information.

II. Selection of Demonstration Project

Personnel from the ASRT queried Egyptian food industry leaders concerning practical problems having an economic and nutritional impact on the Egyptian food supply. Industry leaders requested that research be conducted on the fabrication of Egypt's most popular cheese, Domiatta, a white, pickled cheese extremely popular and very distinctive to Egypt and the neighboring Arab world. Domiatta cheese is not similar to any of the popular Western cheese varieties, perhaps its nearest comparable type would be "Feta", a Greek cheese.

Domiatta cheese is traditionally made from a mixture of unpasteurized buffalo and cow milk and stored without any refrigeration. Due to the shortage of milk for cheese making, Egypt's nine government cheese factories and many privately owned small cheese making companies use as much nonfat dried milk (NDM) and butter oil as commercially feasible to supplement the buffalo and cow milk for manufactured Domiatta cheese. Domiatta cheese manufactured by the 9 large producers is made from approximately 50% local milk with the balance of the solids derived from foreign NDM and butter oil. The major disadvantages of Domiatta cheese manufactured from reconstituted NDM and butter oil are a loss in yield and lower consumer preference than cheese made from all local milk. Butter oil is reconstituted by mixing with approximately half the reconstituted NDM and making a light cream which is then passed through a single stage homogenizer. Homogenizer pressures are not standardized and generally the exact pressures are not known. The balance

of the NDM is reconstituted and combined with the light cream and aged until the next day to make cheese.

Fresh Domiatta cheese has approximately 57 to 60 per cent moisture and is packaged in 20 kg tins to age. Seventeen kilograms of fresh cheese is placed in each tin and pickle (salted whey) is added to fill the tin. The tin is then sealed by soldering the lid. Domiatta cheese is usually consumed after ageing or pickling 3 months at ambient room temperature. Cheese made from local milk after pickling shrinks less than 20 per cent, contains 48 to 50 percent moisture and is preferred over the product made from blending with reconstituted milk. Domiatta cheese made from blending reconstituted milk with local milk shrinks about 30 per cent, contains approximately 45 per cent moisture, and has lower preference in the market.

III. Pilot Plant Studies

A small pilot plant whereby more exacting conditions of manufacture can be achieved is greatly needed at the National Research Centre. The manufacture of Domiatta cheese is relatively straight forward and requires little equipment when made from local milk. Reconstitution of milk for cheese manufacture from NDM and butter oil is not done anywhere else on the same scale as it is done in Egypt. In order to provide the Egyptian people with a better diet, industry leaders are expected to manufacture larger amounts of cheese. This increased production will rely heavily on the use of imported NDM and butter oil and a better understanding of the cheese manufacturing operations is imperative. In-plant studies are rarely ever as controlled as pilot-plant work. Further, in plant studies interrupt normal

production schedules. The acquisition of a small, two-stage, pilot-plant scale homogenizer could be a most useful tool in order to study the optimization of the cheese manufacturing process. All other equipment necessary for the pilot plant is easily obtainable and poses no problem. The facility to house the pilot plant need not be overly complicated. The pilot plant laboratory should be at least 6 x 5 meters, have a floor drain, electric service and water source.

IV. Experimental Design

A. Yield Improvement

1. Experiment with several homogenization pressures to obtain the optimum stability of a cream when reconstituted non fat dry milk (NFM) and butter oil are used.
2. Try varying concentrations of fat to determine the best cream composition.
3. When designing experiments strive to minimize homogenization of as much of the NFM mixture as possible.
4. Vary the ratio of local milk with reconstituted milk to determine the most economic use of milk ingredients. A typical series of experiments could be as follows:

<u>% local milk</u>	<u>% reconstituted milk</u>
100	0
75	25
50	50
25	75
0	100

5. Factories in Egypt are currently using a medium heat NDM procured from New Zealand because of its competitive price. Consider testing low heat powders, perhaps yields may be improved, and, depending upon price, may prove more economical than medium heat NDM for manufacturing Domiatte cheese.

B. Flavor Enhancement

1. Lipase enzymes

To obtain a product with more typical Domiatte cheese flavor various lipolytic enzymes derived from such sources as kid, lamb, and calf or mixtures of these may prove beneficial.

These experimental trials could be conducted with the yield improvement studies.

2. Starter cultures

Selected starter cultures may produce additional flavor enhancement and will be experimented with.

C. Feasibility Studies

Economic evaluation of experimental procedures for the manufacture of Domiatte cheese from different ingredients will be conducted.

D. General Comments

1. Pilot plant vs. in-plant experiments.

- (a) Experimental trials are very difficult to conduct at the factory level due to interruption of normal work-day activities.
- (b) Monitoring samples is much easier when working at the pilot plant level. Research samples tend to be confused with production items when doing in-plant tests.
- (c) It is not economical to experiment with large batches.

2. Scale-up from Pilot Plant to Plant Production

It will probably be necessary to test the best conditions as determined by pilot plant trials before adapting any new recommendations at the production level. The transition from pilot plant to plant production needs careful monitoring. Pilot plant production tests tend to be more exacting.

3. Acidity tests

Acidity levels of pilot plant samples should be monitored by measurement of pH in addition to titratable acidity whenever possible.

4. Cheddar Cheese

The widespread popularity and consumer preferences for Domiatto cheese would seem to indicate that no work should be conducted on cheddar cheese at this time. Two very serious conditions that

will confront researchers when working on cheddar will be the susceptibility of cultures to bacteriophage infection and the necessity of refrigerating products to prevent spoilage.

Cheddar cheese has a much higher water availability due to the very low salt content (about 1%).

NOTE: Original of this report signed by the authors, Dr. M. H. Abd El-Salam, National Research Centre, Cairo and Mr. Wilmer A. Larson, Food Consultant, Madison, Wisconsin, U.S.A..

ANNEX E

Research & Development Management Education
Opportunities in the U.S. A.

The following list of R&D management, or industrial management education opportunities is representative of offerings in the U.S.A.

1. American Chemical Society (ACS)

At its annual meetings the ACS offers 3 to 5 day intensive workshops on effective management techniques. These activities, open to ACS members and non-members alike, are specifically oriented toward the management of U.S. chemical and related industries rather than R&D management with a perspective from the developing countries. Cost per participant ranges from \$200 to about \$350.

2. American University (Washington, D.C.)

The Center for Technology and Administration of the American University offers a program leading to the master of business administration degree. Programs can be tailored to individuals who are concerned with the special problems of scientific and technical development. Because the program is part of a regular course of instruction, there are specific pre-requisites including 2 years residency and certain core curriculum requirements. The cost per participant currently runs about \$5,000 to \$6,000/ year exclusive of living expenses.

3. Battelle Memorial Institute (Columbus, Ohio)

The Battelle Memorial Institute (BMI) has not in the past offered specific courses in research institute management. The Institute's technique for providing this service is to form bilateral working relationships with another R&D institute over a 2-5 year period. Selected persons from the developing country institution are invited to Battelle in the U.S.A., are incorporated into divisions of Battelle and receive intensive on-the-job experience over 3-12 months. Specialists are also sent to the host institution as advisors and consultants from Battelle-Columbus or a branch laboratory in Europe for specific assignments (finance, technical economics, R&D marketing, information services, etc). An ongoing program with Taiwan following the above pattern costs about \$300,000 per year.

4. Carnegie-Mellon University (Pittsburgh, Pennsylvania)

As part of its ongoing post-university professional education program, the Carnegie-Mellon University offers each year a 4 week intensive program for technical managers designed to provide senior management officials with skills in technology assessment, technical-economic evaluation, and societal-technical interactions. The course is designed for the U.S. economy; U.S. industries provide the major source of participants although some foreign participants attend each session.

5. Denver Research Institute (Denver, Colorado)

Largely with funds from the U.S. Agency for International Development, the Denver Research Institute (DRJ) has for more than 7 years provided special R&D management training courses for participants from developing countries. Core courses and workshops in R&D management techniques have been held in Denver, on a regional basis in developing countries, and in specific third-world countries. These training activities use the case-study method based upon developing country experiences and are tailor-made for each situation.

6. Industrial Research Institute (New York)

The Industrial Research Institute (IRI) is a non-profit organization founded in 1938 under the auspices of the National Research Council. IRI's members number more than 245 industrial companies with technical research departments. Each year IRI conducts a series of training activities for R&D managers, first-line supervisors and corporate directors of research. The activities are:

- Management Study Groups (3 days) for first-line supervisors focusing upon common problems of: a) selection, control, evaluation and termination of projects; b) personnel appraisals, motivation and salary administration; and c) communications internal and external to R&D. Cost: Approximately \$260 plus per diem.
- Advanced Study Groups (3 days) for higher level technical managers of R&D focusing upon one topic in each seminar. Topics in 1978 include: a) motivation, performance, recognition and reward; b) project selection, control and termination; c) R&D interface with marketing/production; d) planning for R&D and e) role of R&D in environmental health and safety. Cost: Approximately \$260 plus per diem.

- Seminar for Managers of Industrial Research is a two-week intensive curriculum designed for R&D managers from U.S. industries open to participants from other countries and held each year in late June at the Harvard School of Business, Cambridge, Massachusetts. Enrollment is limited to 100 participants. Cost: Tuition, \$800, Board and Room, \$500.
- Advanced Seminar on the Management of Industrial Research is open only to senior-level research and development managers. It is held each year in June at the Lake Bluff Conference Center of Northwestern University, about 25 miles from Chicago, Illinois, and lasts 5 days. Cost: Tuition \$800; Room and Board \$375.

7. Arthur D. Little, Inc. (Cambridge, Massachusetts)

Arthur D. Little, Inc., is an international, industrial management consulting firm based in Cambridge, Massachusetts, that offers graduate-level training specifically designed for managers in the public and private sectors of developing countries. There are two formal programs offered.

- Master of Science Degree Program in Management. This is a full time, 10 1/2 month course to prepare managers for increased responsibilities in their companies, ministries, and government agencies for planning, administering and implementing agro-industrial operations and programs. The curriculum is a comprehensive one covering quantitative aspects of management, human resources direction, planning and evaluation of projects. A case study method based upon experience in developing countries is emphasized. Cost for the program is approximately U.S. \$8,000 per participant (tuition), \$6,500 living expenses in Cambridge and \$1,000 for field trips.
- The Petroleum Management Program is a six-month course specifically designed to assist national petroleum companies, government agencies and international petroleum companies in the development of managers and staff analysts for the administration of hydrocarbon resources and energy policy. The program gives emphasis to management, technology and economics.

Arthur D. Little also designs and conducts specific management courses for its clients. In the past this service has included programs in Iran and Brazil in both general management and the management of R&D.

8. Massachusetts Institute of Technology (Cambridge, Massachusetts)

The Massachusetts Institute of Technology through its Sloan School of Management offers 2-year master's degree programs in industrial management. An individual has the option to specialize in R&D management if he or she possesses the necessary prerequisites.

The Sloan School does not offer tailor-made courses for R&D managers from developing countries but several professors from that institution, in their capacity as management consultants, have given seminars, short-courses and workshops in Brazil, Iran, Israel, Japan and countries of Europe.

9. Northwestern University (Evanston, Illinois)

The Department of Industrial Engineering and Management Sciences, Northwestern University, offers degree programs for scientists, engineers and economists who plan to pursue careers in various aspects of industrial management, including the management of R&D. These require residence at Northwestern University and are structured for career goals of an individual rather than industrial clients.

Northwestern University both through its Technological Institute and through a consulting firm formed by members of the teaching staff, will design special short courses, seminars and workshops on the management of R&D. In the past courses have included:

- Management of R&D (for the Swedish Employers Federation and the Swedish Academy of Engineering Science).
- Economics of R&D (for the Japan Management Association).
- Management of R&D in Developing Countries (held in Brazil in cooperation with the Brazilian National Institute of Technology and the Department of Scientific Affairs, Organization of American States).

ANNEX F

Travel for
Program Planning, R&D Management, and Technical Consultation

VISITS TO THE U.S.A.

<u>NAME</u>	<u>DATES (1978)</u>	<u>PURPOSE</u>
1. Dr. M. Kamel, Director, NRC	July 1 - 27	Program Planning: NAS/NRC, NSF, AID, Un. Wisconsin, Denver Research Institute.
2. Dr. A.S. El-Nockrashy, ASRT	July 1 - Aug 15	Program Planning: NAS/NRC, NSF, AID, Un. Wisconsin, Texas A&M, USDA (New Orleans).
3. Dr. Osman A. Galal, NRC	Sep 2 - 15	More and Better Food: Un. North Dakota, Un. Oklahoma, White Plains (N.Y.), Cambridge (Ma.).
4. Dr. A.A. Abdel Azim, NRC	Aug 29 - Sep 14	R&D Management Education: Georgia Tech, U.S. Steel (Columbus), Denver Research Institute.
5. Dr. Aziza Yousef, NRC	Oct 22 - Nov 4	Phosphate Fertilizer Project: NAS/NRC, TVA, Bu. Mines (Alabama), International Minerals & Chem. (Florida), Fertilizer round table (Atlanta, Ga.).
6. Dr. A. M. Abou El-Azm, ASRT	Nov 1 - 4	Second Meeting, Joint Consultative Committee (JCC).
7. Dr. A.S. El-Nockrashy, ASRT	Oct 26 - Nov 10	More and Better Food: Washington, Battelle (Columbus), Second Meeting JCC.
8. Dr. M. Kamel, Director, NRC	Oct 26 - Nov 5	Second Meeting, JCC. Battelle (Columbus).
9. Dr. Osman A. Galal, NRC	Oct 26 - Nov 10	Same as 7

NAME	DATES (1978)	PURPOSE
10. Dr. Abdel Fattah Rizk, ASRT	Oct 26 - Nov 10	Second Meeting JCC
11. Dr. Moustafa Hafez	Nov 1 - Nov 6	Second Meeting JCC
12. Dr. Mahmoud Riad, JCC Member	Oct 31 - Nov 5	Second Meeting JCC
13. Dr. Yusef Wally, JCC Member	Nov 1 - Nov 5	Second Meeting JCC
14. Dr. Talat Rihan, ASRT	Nov 1 - Nov 4	Second Meeting JCC

VISITS TO EGYPT

Period

Nile Soil & Water Panel

- | | |
|---|-----------------------|
| 1. Dr. Harold E. Dregne (Chairman)
Director, International Center for Arid &
Semi-Arid Land Studies
Texas Technological University
Lubbock, Texas | September 8-13, 1978* |
| 2. Dr. Constant C. Delwiche
Department of Land, Air & Water Resources
University of California at Davis
Davis, California | September 7-14, 1978 |
| 3. Dr. E. V. Richardson, Director
Engineering Research Center
Colorado State University
Fort Collins, Colorado | September 8-13, 1978* |

Program paid per diem only; panelist travelled to Egypt on non-program funds.

Consultants

- | | |
|---|-----------------------|
| 1. More and Better Food: Cheese Production
Mr. Wilmer Larson
Food Technology Consultant
(Dairy Industries)
Madison, Wisconsin | September 22-29, 1978 |
|---|-----------------------|

Travel within the U.S.A. by NAS/NRC Panelists

	Date	Date	
Dr. Mary Carter, Director Southern Regional Research Laboratory New Orleans, LA	Nov	2-4	Washington D.C. to attend JCC Meeting at NAS
Dr. James Hillier Princeton, NJ	Nov	2-4	" " "
Dr. George Bugliarello President, NY Polytechnic Institute Brooklyn, NY	Nov	3-4	" " "
Dr. Harold E. Dregne, Director Internat'l Centre for Arid & Semi-Arid Land Studies, Texas Tech University Lubbock, Texas	Nov	3-4	" " "
Dr. Harold Calbert University of Wisconsin Madison, Wisconsin	Nov	7-8	Meeting: More & Better Food Washington, D.C. NAS*
Dr. Cyrus M. McKell Institute of Land Rehabilitation Utah State University, Logan, Utah	Nov	13	To confer on Arid Lands project, Washington NAS
Dr. Harold Capener Dept of Rural Sociology Cornell University, Ithaca, NY	Nov	14	To confer on Bio-gas project Washington NAS
Dr. Philip Goodrich Dept. of Agric. Engineering University of Minnesota St. Paul, Minn.	Nov	14	" " "
Dr. T.B.S. Prakasam MSD of Greater Chicago R&C Lab, Cicero, Illinois	Nov	14	" " "

* Dr. Kristen McNutt, Executive Director, National Nutrition Consortium and Dr. D. Plucknett, Deputy Director, BIFAD, Agency for International Development are both based in Washington, D.C. and thus no travel was necessitated for them to attend the Nov. 7-8 meeting of the More and Better Food Panel.

Travel undertaken by Dr. Helmut Weldes, resident advisor to the Director (Dr. M. Kamel) National Research Centre, Cairo, Egypt prior to departure for Egypt to take up his position on January 1st, 1979.

			Purpose
From Philadelphia (home)	Nov 2-4	to Washington D.C.	Attend JCC Meeting
	Nov 13-22	to Washington D.C.	AID Orientation
	Nov 28-30	to Madison, Wisc. Colombus, Ohio	Instrumentation technology R&D Program orientation
	Dec 4-8	to Washington D.C.	Appointments NAS, NSF, NBS, ACS, AID, World Bank
	Dec 18-19	to Denver, Colo	Denver Research Institute
	Dec 21	to Washington D.C.	Final departure orientation NAS

Travel within the U.S.A. by NAS/NRC Panelists

	Date	Date	
Dr. Mary Carter, Director Southern Regional Research Laboratory New Orleans, LA	Nov 2-4		Washington D.C. to attend JCC Meeting at NAS
Dr. James Hillier Princeton, NJ	Nov 2-4	"	" " "
Dr. George Bugliarelli President, NY Polytechnic Institute Brooklyn, NY	Nov 3-4	"	" " "
Dr. Harold E. Dregne, Director Internat'l Centre for Arid & Semi-Arid Land Studies, Texas Tech University Lubbock, Texas	Nov 3-4	"	" " "
Dr. Harold Calbert University of Wisconsin Madison, Wisconsin	Nov 7-8		Meeting: More & Better Food Washington, D.C. NAS*
Dr. Cyrus M. McKell Institute of Land Rehabilitation Utah State University, Logan, Utah	Nov 13		To confer on Arid Lands project, Washington NAS
Dr. Harold Capener Dept of Rural Sociology Cornell University, Ithaca, NY	Nov 14		To confer on Bio-gas project Washington NAS
Dr. Philip Goodrich Dept. of Agric. Engineering University of Minnesota St. Paul, Minn.	Nov 14	"	" " "
Dr. T.B.S. Prakasam MSD of Greater Chicago R&C Lab, Cicero, Illinois	Nov 14	"	" " "

* Dr. Kristen McNutt, Executive Director, National Nutrition Consortium and Dr. D. Plucknett, Deputy Director, BIFAD, Agency for International Development are both based in Washington, D.C. and thus no travel was necessitated for them to attend the Nov. 7-8 meeting of the More and Better Food Panel.