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APPLIED SCIENCE AND TECHNOLOGY RESEARCH IN EGYPT

SEMIANNUAL REPORT

July - December 1980

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EXECUTIVE SUMMARY

The Joint Consultative Committee convened its sixth meeting in Cairo November 5-7, with Dr. Hassan Ismail presiding at the request of Dr. Ibrahim Badran, the new ASRT President. The meeting discussions focussed primarily on clarification of the new National Policy Measures for Science and Technology component and selection of new R&D projects for Phase II, although several site visits (November 3-4) and brief overviews of ongoing project activities were included as part of the JCC program.

The July-December reporting period was a full one, given the level of each project activity in the last six months of Phase I, which had been extended to December 31, 1980. Extensive training, observation and study visits to the U.S. occurred as part of individual project plans. The management training activities in Egypt with the Denver Research Institute did not take place because of unresolved funding and contractual questions.

The Phosphate Ores, Wool Scouring, and Corrosion R&D projects continued to exhibit strong linkages between research institutes and industrial and agricultural end-users, with the U.S. International Fertilizer Development Center and Amoco Research Center providing training for members of the Phosphate and Corrosion projects, respectively. In the Red Sea Fisheries project some initial survey work began, project team selection advanced, and plans for U.S. training for key personnel were proposed.

The More and Better Food demonstration project continues to show progress in linking applied R&D to end-user needs. Extensive training took place in U.S. universities, government laboratories and research centers, and a consortium of universities (CODOT) was subcontracted by the NAS to advise on development of the food technology component.

The Biogas Technology demonstration project continued to reveal solid evidence of good management, cooperation among personnel, and applied R&D methods; JCC members visited the digester prototypes at the NRC. The New Crops for Arid Zones project has begun to crystallize with studies of new crops underway and good cooperation through a steering committee of the NRC, Ain Shams and Al Azhar university project leaders. Initial planting at the site in Fayoum is envisaged early in 1981.

The new "National Policy Measures for Science and Technology" component slated to begin in Phase II was an important discussion item during JCC VI. Intended to build the ASRT's capacity for in-depth policy studies and issues in order to produce elements of a national S&T policy, the component was still in an early conceptual stage at JCC VI. Therefore, the JCC asked that the ASRT prepare a detailed plan outlining budgets, goals, and responsibilities, to be presented at JCC VII in April 1981.

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INTRODUCTION

The Applied Science and Technology Research Program is a joint endeavor by the Government of Egypt and the National Academy of Sciences/ National Research Council to strengthen Egyptian scientific and technical manpower resources and reorient Egyptian R&D. Funded by the U.S. Agency for International Development (AID) since 1978, the program is part of a broader effort by the United States and Egypt to couple science and technology to Egyptian development needs and to create a vigorous program applying research and development to Egypt's priority problems. These problems include a major food deficit, growing dependence on agricultural and industrial imports, rapid urbanization and urban crowding resulting from dwindling per capita land resources, a foreign debt greater than the GNP, extremely limited natural resources, high inflation, and a need for industrial initiatives and growth.

Although Egypt has developed a substantial scientific and technical community over the past 25 years, this community has not been adequately involved in Egypt's development process, and has traditionally focused on basic, university-oriented research rather than applied research. This point was made clear in a workshop convened in Cairo in May 1975 under the auspices of the NAS, the U.S. National Science Foundation (NSF), and the Egyptian Academy of Scientific Research (ASRT). The workshop on "Science and Technology Policy, Research Management, and Planning" and subsequent studies called for a reorientation toward applied research within the ASRT, which is the official coordinator of all Egyptian S&T efforts, as well as within its satellite research institutions. Also evident was the need for solid linkages between government, research institutions, and end-users in

industry and agriculture. The workshops and studies stressed that in order for applied S&T to address Egypt's economic and social problems, it must be indigenous and meet local needs.

From these workshops and studies a formal agreement emerged in March 1977 between the ASRT and AID for a five-year cooperative program to strengthen institutional and management capabilities in Egypt's science and technical community. The ASRT and AID invited the NAS and the National Science Foundation (NSF) to join in the activity, now known as the Applied Science and Technology Research Program. The Program contained five major components, each addressing problems in several development sectors and providing Egyptians with concrete managerial and R&D experiences. These five components include: (a) strengthening Egyptian institutional policy planning and management functions; (b) undertaking specific applied research projects using R&D planning and support methods relevant to Egypt; (c) undertaking broader demonstration projects exemplifying multidisciplinary management methods; (d) providing scientific equipment and building maintenance and repair capabilities into key institutions and the projects; and (e) expanding Egypt's S&T information resources and management capabilities. Key to the Program's success are the cohesive links developed between Egyptian research institutions, government, and end-users.

The NAS, through its Board on Science and Technology for International Development (BOSTID), assists the ASRT, its affiliate National Research Centre (NRC), and other institutions with policy planning and management functions and with R&D and demonstration project support. The program is guided by a high level U.S.-Egyptian Joint Consultative Committee (JCC).

A resident NAS/NRC representative in Cairo assists Egyptians with various R&D and demonstration projects and serves as the principal American link to the JCC or visiting U.S. consultants and panelists.

The NSF was responsible for strengthening Egypt's S&T information systems and for improving scientific equipment maintenance and repair capabilities in key research institutions and universities.

The first meeting of the Joint Consultative Committee (JCC) took place in May 1978 in Cairo. For purposes of administration, the Committee agreed to divide the program into two periods, Phase I from October 1978 to October 1980, and Phase II from October 1980 to October 1983. Recently, AID asked that the NAS agree to an extension of Phase I through March 1981.

This is the sixth semiannual activities report of the Program prepared by BOSTID staff under Contract AID/NE-C-1474. It covers the period July 1, 1980 through December 31, 1980 and describes the following activities for which the NAS is contractually responsible:

- policy planning and management;
- research project support;
- demonstration project support; and
- planning for Phase II.

Additional information for the July - December 1980 reporting period is found in the following annexes to this report:

Annex A: Staff Summary Report, covering Sixth Meeting, Joint Consultative Committee, Cairo, Egypt, November 5-7, 1980.

Annex B: Travel of Egyptian participants to United States.

Annex C: Travel of U.S. participants to Egypt

Annex D: Travel within United States by NAS/NRC Panelists and
Staff

III

PROGRAM HIGHLIGHTS

A. POLICY PLANNING AND MANAGEMENT

1. Joint Consultative Committee (JCC)

The JCC convened its sixth meeting November 5-7, 1980 at the ASRT headquarters in Cairo. Dr. Hassan Ismail was designated chairman by the new ASRT President, Dr. Ibrahim Badran. The JCC program included discussion and review of overall program progress during Phase I; clarification of the new S&T Policy Measures activity; and selection of proposed new projects for Phase II. One new and highly informative aspect of the JCC program was the opportunity for JCC members to visit project sites: a demonstration village, NRC laboratories, and local industry.

A summary of the sixth meeting and a list of participants is included in the "Staff Summary Report", under Annex A.

2. Research and Development Education

The Denver Research Institute was the industrial research organization under contract to the NAS to provide short-term management training courses to Egyptians in the Applied Science and Technology Research Program. Having completed four R&D workshops in Denver in 1979 and another high-level seminar in Cairo for Egyptian scientists, sub-ministers, and academics in February 1980, the Institute and BOSTID were planning four new courses in Cairo, between November and December 1980. These seminars were to cover technology assessment, R&D marketing, technical economics, and general R&D management. However, due to unresolved contractual questions and the need for additional funding, the workshops were delayed.

3. Resident Director: National Research Centre

Dr. Helmut Weldes, the NAS Resident Director stationed at the Egyptian NRC in Cairo, continued to function as coordinator between the NAS, Egyptian institutions, and AID/Cairo and as advisor to the NRC/Cairo staff.

Specifically, Dr. Weldes assisted the ASRT/NRC/Cairo Director and principal investigators with project activities; helped plan the DRI Cairo workshops; and coordinated arrangements for Egyptian project participants traveling to the U.S. and for U.S. panels and consultants traveling to Cairo.

As Phase I of the Program neared its end, Dr. Weldes assisted the NAS Washington staff with the numerous program planning activities which must be coordinated with AID/Cairo, the NSF, ASRT, and NRC/Cairo. These activities included preparation for Phase II contract extension, which was postponed to January 1, 1981 with a no-cost extension for the period October 1 through December 31, 1980. In September and October, 1980 Dr. Weldes participated in all aspects of preparations for the sixth JCC meeting, which convened in Cairo November 5-6, and for the R&D and Demonstration project site visits on November 3 and 4.

B. NATIONAL POLICY MEASURES FOR SCIENCE AND TECHNOLOGY

This new element, which will begin in Phase II, emerged as a recommendation from the JCC Program evaluation conducted in February 1980. At that time, the JCC determined that there should be an assessment of policy measures at Egypt's national level in science and technology so that individual Program projects could be closely linked to wider Egyptian national objectives. This idea was endorsed by AID officials, who were then conducting their own evaluation of all AID S&T activities in Egypt and recognized the need to relate the activities more closely to Egypt's total development picture. Thus, the JCC proposed a separate program category, "National Policy

Measures for Science and Technology" (S&T Policy Measures), to build a capacity within the ASRT for in-depth policy studies of issues the Egyptian S&T community faces as it addresses national development targets. Within the purview of the JCC, the S&T Policy Measures activity would involve U.S., Egyptian, or third-country experts in background studies and analyses on such topics as technology transfer; S&T policies in Egypt and other countries; and linkages with research institutions, government, and industry. During the November JCC meeting in Cairo, the Committee emphasized that the purpose of the new project was not to produce a comprehensive S&T policy or national strategy, but to produce elements of a policy in various sectors. A well defined project plan outlining budgets, goals, and specific activities and responsibilities was requested for the upcoming JCC meeting in April (JCC VII).

C. RESEARCH AND DEVELOPMENT (R&D) PROJECTS

Project progress for this reporting period is summarized below. More detailed reports of R&D projects prepared by project leaders are available in the BOSTID office, Joseph Henry Building Room 219, 2100 Pennsylvania Avenue, N.W., Washington, D.C., and at the NAS/NRC office in the National Research Centre, Cairo (Dokki), Egypt.

1. Evaluation of Egyptian Phosphate Ores

The project involves local industry and the NRC in an applied R&D study of low-grade Egyptian phosphate ores, and their beneficiation for production of phosphate fertilizer materials. Wet and dry bench-scale beneficiation studies of phosphate samples were completed from Abu Tartour. Two Egyptians, one from the NRC and one from a major Egyptian fertilizer manufacturer, completed two months of training in beneficiation and chemical processing methods at the International Fertilizer Development Center in

Alabama; they also visited representative U.S. fertilizer manufacturing operations in Florida. The project is meeting its time schedule, and problems resulting from equipment delays are being resolved even though equipment deliveries have not yet been completed.

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

This project provides R&D opportunities for scientists and technicians from the R&D and local industry to improve Egyptian processes for wool scouring and recovery of wool wax as a by-product. The project team has completed preliminary market studies and has studied wool scouring and wax recovery operations in the USA and United Kingdom. Team members have worked successfully with the Misr Beida Dyers Company to improve its present scouring process and wool tops output. The wax-like by-products are still of inferior quality. The project requires a special centrifuge with line separation equipment in order to proceed with plant modifications to reach its ultimate goal of improving the scouring and wax separation processes.

3. Corrosion Causes and Control in Petroleum Refining

This project provides opportunities for the NRC and end-users in the petroleum industry to conduct applied R&D of corrosion inhibitors. NAS advisors and U.S. institutions have assisted the NRC and the Suez Petroleum Company in adapting known technologies for monitoring and inhibiting corrosion. An Egyptian scientist from the NRC participated in a two-week program at Amoco Research Center in Illinois, working with an R&D group studying on-line corrosion in oil refineries, and also with Amoco's phenol extraction unit. Two Egyptian research workers are scheduled for training in the U.S. in conjunction with delivery of sophisticated surface corrosion research equipment ordered for the NRC's corrosion laboratory.

4. Red Sea Fisheries Development

The project's goal is to study the fisheries supply potential and marketability of species found in the Red Sea. The ASRT Institute of Oceanography and Fisheries and U.S. panelists have identified specific targets for research from deep water fish, reef fish, spiny lobster, and shrimp. They have targeted an area south of the Gulf of Suez for their initial research. Although arrangements for an Egyptian team leader to participate in a Caribbean Fisheries Institute meeting in Costa Rica in November 1980 were cancelled, plans are underway to train an Egyptian in the USA in fish biology/technology early in 1981. At the November meeting the JCC asked the team leaders of projects to initiate the studies and data collections in the Red Sea as soon as possible in order to regain some of the time lost during Phase I of this activity.

D. DEMONSTRATION PROJECTS

Project progress for this reporting period is summarized below. Again, more complete reports of all Demonstration projects are available from the BOSTID Office, Joseph Henry Building, Room 219, 2100 Pennsylvania Avenue, Washington, D.C., and from the NAS/NRC offices in Cairo.

1. More and Better Food

This demonstration project involves researchers and end-users from industry and villages in a multidisciplinary R&D effort related to Egypt's goal of greater food self sufficiency. Project activities in the two demonstration villages are divided into food quality and productivity for products used in local consumption and studies of the nutritional quality of foods eaten by the villagers themselves. Project scientists and technicians were commended by the JCC members who visited the villages for demonstrating successfully

their ability to work closely with local villagers and with industrial end-users in the food technology aspects of the program. During this reporting period, four Egyptian researchers in animal science and plant protection fields visited U.S. universities as well as the USDA, FDA, and NIH laboratories.

In November 1980, the NAS subcontracted with the Consortium for Development of Technology (CODOT) to assist in the food technology component; CODOT is a consortium of five universities organized to help developing countries solve problems in food industrialization. A CODOT team met with Egyptian officials in November and visited two universities and nine major food processing companies to assess Egypt's applied research needs for industry and develop a proposal for a food technology pilot plant at the National Research Centre.

2. Biogas Technology

This project is designed to assess production methods and social acceptability in Egyptian villages of methane as a renewable energy resource using human, agricultural, and animal wastes. The multidisciplinary team has undertaken an extensive survey of biogas digesters, the bench-scale feasibility of methane production from a variety of raw materials available in agricultural villages, and the building and operation of prototype biogas digester designs adapted to Egyptian conditions. JCC members observed three prototype biogas generator designs which were in operation at the NRC in November, noting good technical characteristics of those designs as well as effective management of the R&D program. In December, Dr. Adel Abd El Dayem, who is the Egyptian engineer responsible for prototype development at the NRC pilot plant laboratory, presented a paper on the biogas project at the International Conference on Alternative Energy Sources in Bal Harbour, Florida. While he was in the USA he also met with two members of the U.S. advisory panel for the project to

discuss Phase II plans for the demcnstration project.

3. New Crops for Arid and Semi-Arid Zones

This project proposes to expand Egypt's agricultural productive base by using lands presently unsuitable for conventional farming by introducing new (to Egypt) agricultural crops such as jojoba and guayule that can be grown under stress conditions. Although the project suffered from obstacles to planning and implementation in the early stages of Phase I, the project is now becoming operational. Teams from Al Azhar and Aim Shams Universities and the NRC are cooperating in studying innovative technologies and introducing a variety of stress resistant new crops (jojoba, guayule, winged bean, and milkweed). Equipment specifications have been submitted and training needs outlined. During its November meeting in Cairo, the JCC proposed that R&D be expanded to include crop tolerance in four ecological zones with marginal land and water resources. Therefore, additional plant species and sites have been identified and seed collection is in progress with plans for initial planting in 1981.

ANNEX "A"

STAFF SUMMARY REPORT

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

Cairo, Arab Republic of Egypt

November 3-6, 1980

Participating Groups:

Academy of Scientific Research and Technology (ASRT)
Arab Republic of Egypt

U.S. National Science Foundation (NSF)

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

Report prepared by

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Cairo, Arab Republic of Egypt

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SUMMARY RECOMMENDATIONS AND CONCLUSIONS

Introduction

The Joint Consultative Committee (JCC) for the Applied Science and Technology Research Program, sponsored by the Egyptian Academy of Scientific Research and Technology (ASRT) and the U.S. National Academy of Sciences-National Research Council (NAS/NRC), and funded by the U.S. Agency for International Development (AID), convened its sixth meeting November 5-7, 1980 at the ASRT headquarters in Cairo. Previous to the formal meeting, on November 3 the JCC visited Omar Makram Village, a demonstration site for the More and Better Food and Biogas Technology projects. On November 4 they visited the Wool Scouring research and development project site of the National Research Centre and Misr Beida Dyers Corporation near Alexandria. These field visits and discussions contributed to a review of overall program progress in Phase I. During the formal meeting there were discussions of progress and future plans of ongoing projects and an introduction of the "National Policy Measures for Science and Technology" activity, a new development to be initiated during Phase II. Finally, five new research and development (R&D) project proposals were reviewed.

National Policy Measures for S&T

"National Policy Measures for Science and Technology" is a new program activity designed to support the work of the ASRT Committee for Science and Technology Policies. It is basically designed to help build a capacity within the ASRT for in-depth policy studies of issues the Egyptian S&T community faces as it addresses development targets; it would help provide S&T policy inputs for national socio-economic planning. The ASRT stated that it has decided not to create a new unit or separate, self-contained program for policy studies. Rather, their goal is more modest, due in part to limited available resources. The ASRT Committee for Science and Technology Policies will be provided a small support staff and will be responsible for the following tasks:

- a. Commissioning several analytical and review studies on problems of technology transfer to Egypt, on development issues with a high S&T component, and on S&T policies and practices of other countries;
- b. Holding seminars and discussions on S&T policies with key Egyptian leaders from universities, research institutes, government ministries, and industry; and
- c. Financing a limited number of study visits for interaction with scientists and development planners involved in S&T policy planning in leading centers of other countries.

The JCC recognized the validity and relevance of this new activity, but also recognized that these supporting activities by themselves are not intended to, nor can they be expected to produce a comprehensive national S&T policy or overall S&T strategy for Egypt. These activities may produce elements of a policy in various sectors, and commissioned studies and seminar reports will provide a basis for more comprehensive S&T planning efforts in the future.

The JCC asked the ASRT Committee to draft a well-defined project plan, outlining specific activities, budgets, targets or goals, and management responsibilities and procedures.

The JCC also asked to be briefed on project progress at its semi-annual meetings. The ASRT in turn stated that it would welcome, whenever possible, participation and advice from the JCC when policy planning and analysis activities begin.

The JCC asked the AID Mission in Cairo to implement the recommendation of the AID evaluation report prepared by Princeton Lyman, that USAID provide funds specifically to strengthen Egypt's R&D capacity in its cooperative projects in agriculture, industry, and other sectors. The same recommendation was directed to the ASRT, with respect to the large number of R&D activities the Academy supports.

R&D Projects

The Phosphate Ores, Wool Scouring, and Corrosion projects continue to show progress toward their original goals. Strong links with industrial end users -- crucial for disseminating R&D results -- are increasingly evident. The JCC visit to the Mis: Beida Dyers textile complex, the site of the wool scouring project, was a highlight of the panel's field activities. JCC members asked that additional opportunities for on-site discussion and observation of project progress be included in future meetings in Egypt.

The slow progress of the Red Sea Fisheries project continued to concern the JCC. Egyptian project leaders were asked to develop both technical and market studies in order to maintain their goal of linking project R&D to end users.

Demonstration Projects

A. More and Better Food

The visit to Omar Makram village provided the JCC with new evidence of this project's sound design and significant progress during Phase I. Project leaders and participating scientists and workers were all commended for their excellent contribution to the success of this activity. The JCC discussed methods by which results of R&D work could be more widely disseminated and applied to villages in other areas. They recommended that case studies be prepared for use by development planners in Egypt and elsewhere. The JCC also suggested a modified program for Phase II, comprising four new Egyptian villages representing different socioeconomic lifestyles. An integrated approach to rural development would be developed to suit each village and R&D results would be evaluated and appraised for future application to villages with similar conditions. Results would also be made available for information and

coordination with other ongoing projects. A plan for this modified program will be drafted and presented to the next JCC meeting in April 1981.

B. Biogas Technology

The JCC observed operation of three designs of biogas generators at the NRC Pilot Plant Division site. The design and operation of these pilot-scale facilities support the progress revealed in periodic biogas reports, and provide strong evidence that the biogas project is progressing according to plan as it enters Phase II.

C. New Crops for Arid Zones

Following its review of the Arid Zones report, the JCC expressed satisfaction that some of the obstacles to implementation were being resolved. However, questions were raised regarding the relative emphasis of the kinds of crops included in this study (i.e., food versus cash crops). Therefore, a modified plan for Phase II was suggested, extending the study to encompass four ecological zones including the Sinai, Northwest Coast, Fayoum, and the New Valley. With a new emphasis on marginal land and water resources for Phase II, crop selection would be based on tolerance of such conditions and on comparative advantage under each site's unique ecological conditions. Results of these studies could then be extended to newly reclaimed lands. A detailed plan for this modified program must be drafted for presentation at the next JCC meeting.

New R&D Projects for Phase II

The following five proposals for R&D projects were presented to the JCC for consideration in Phase II:

1. A New Scheme for Better Land Use to Increase Food and Food Production in Egypt (oral presentation);
2. Preparation of Selected Pharmaceutical Chemicals;
3. Investigation and Evaluation of Egyptian Bantoites for Industrial Applications;

4. Local Production and Improvement of Ceramic Electric and Acoustic Insulators; and
5. Dynamic Stability Improvements for the Egyptian Power System.

The JCC recommended that the following proposals be initiated in Phase II, within the limited resources and time allocated for new projects:

1. A New Scheme for Better Land Use to Increase Food and Food Production in Egypt;
2. Preparation of Selected Pharmaceutical Chemicals; and
3. Investigation and Evaluation of Egyptian Bentonites for Industrial Application.

Project designs and implementation would follow the same guidelines used for Phase I R&D projects, with a management committee for each project and an Egyptian/U.S. technical panel appointed to provide additional inputs to each project plan. These plans will be presented at the next JCC meeting in April.

S&T Information

The JCC reviewed a comprehensive report of the Scientific and Technical Information Activity, noting the accelerated pace of all Phase I elements. The Committee expressed its expectation that the goals stated in this project report will be achieved on schedule.

Instrumentation Technology

The JCC noted that progress was evident since the previous JCC meeting in March 1980 in providing training opportunities and in creating Maintenance and Repair (M&R) centers. These centers will be housed at the Scientific Instruments Centre, five universities, and the National Research Centre (NRC). Establishment of a full-time resident advisor and a program liaison officer in Cairo has helped reduce the many equipment

delays which had previously plagued this activity and the basic scientific equipment for the M&R centers has been delivered. Although the time-consuming equipment procurement procedures continue to cause concern, efforts to shorten delivery times are underway.

Standards and Measurements

The JCC was presented with a report outlining progress in defining the parameters of the Standards and Measurements project. The JCC, reviewing this report, emphasized the importance of linkage development with appropriate institutions, universities, and ministries in Egypt. They also emphasized that the ultimate success of this project hinges on how well the recipient institutions internalize and build their capacities to insure that appropriate instruments are made available to end users and to provide adequate repair and maintenance to these instruments.

The next JCC meeting is scheduled to convene in Washington, D.C. April 1-3, 1981.

II. BACKGROUND

The Applied Science and Technology Program is a cooperative endeavor of the Government of Egypt, the National Academy of Sciences/National Research Council, and the U.S. National Science Foundation to develop Egypt's scientific and technical manpower resources and reorient Egyptian R&D. Funded by the U.S. Agency for International Development (AID), the program traces its origin to Egypt's desire to strengthen its R&D management capabilities and to link its R&D resources to critical economic and social problems. Initial program planning began in 1975 during a "Workshop on Science and Technology Policy, Research Management and Planning", sponsored by the Egyptian Academy of Scientific Research and Technology (ASRT), in conjunction with the NAS/NRC and the NSF. In March 1977, following intensive joint planning among these institutions, the governments of Egypt and the United States signed a formal agreement establishing the Applied Science and Technology Research Program.

Within the Program's projected five-year period, planners were to emphasize the use of new methodologies in managing science and technology (S&T) resources and in applying these resources to Egyptian development. Thus, individual projects have been designed to demonstrate good management practices as well as to help solve technical problems in agriculture, nutrition, health, employment generation, and other areas. A separate program component was to provide scientific equipment and instruments.

For purposes of AID funding and administration, the Program was divided into two time periods. Phase I (1978-1980) activities were to be directed toward research design, project startup, and training; Phase II (1981-83) is intended as a period where results will be demonstrated and applied in the field, illustrating how S&T can solve specific development problems. Phase I program elements were as follows:

1. A policy planning and R&D management training component;

2. Three demonstration projects, multidisciplinary in scope, with multi-institutional inputs, directed at priority targets in Egypt's national development plan;
3. R&D projects, more limited in scope than demonstration projects, but also addressing priority problems;
4. Planning of inputs and training of personnel to expand the S&T information system serving Egypt's S&T community;
5. Procurement, as well as training in the maintenance and repair, of scientific instruments and equipment; and
6. Planning for Phase II.

In December 1977 a formal contract was completed between AID and the NAS/NRC to help implement components 1, 2, and 3. An interagency agreement between AID and NSF for components 4 and 5 was signed in 1978. All Egyptian and American parties are jointly responsible for component 6. During Phase I a total of U.S. \$8.1 million and 895,000 Egyptian pounds were allocated by AID. During Phase II the available total is expected to reach U.S. \$16.3 million.

A Joint Consultative Committee (JCC) is the advisory body responsible for policy planning and management oversight of the Program. Composed of five members each from Egypt and the U.S., the JCC meets semiannually under the chairmanship of the ASRT President.

This report covers the activities of the sixth meeting of the JCC (JCC-VI) which convened in Cairo, Egypt, November 5-6, 1980.

III. REVIEW OF MEETING ACTIVITIES

A. Introduction

Summary reports were received well in advance of the sixth meeting from the More and Better Food and Biogas Demonstration Projects; the Wool Scouring, Phosphate and Corrosion R&D Projects; and the Instrumentation Technology Project. During the meeting reports were reviewed and additional presentations made by directors for the Arid Lands, Red Sea Fisheries, Scientific and Technical Information, and Standards and Measurements components. Although progress reports are not included in this document, they are available from the project offices in Cairo and Washington.

This document presents a status summary as of November 1980 for the proposed program activities which are expected to be incorporated in the Applied Science and Technology Research Program during Phase II. These activities are (a) National Policy Measures for Science and Technology, and (b) new initiatives under the R&D subcategory of the Program.

B. National Policy Measures for Science and Technology

During Phase II planning discussions at the 5th JCC meeting in Washington, D.C., February 25-27, 1980, the JCC proposed that a new program element be added, entitled "National Policy Measures for Science and Technology". The goal of this new activity would be to strengthen the ASRT's role in shaping science and technology decision making within the Egyptian government. The JCC recognized that technological changes currently being introduced by the Government, international donors, and private sector investors are so broad and potentially so pervasive that the changes present a challenge to the ongoing social and economic development processes within Egypt. Unless the people and institutions are able to accept and adapt rather

quickly to these largely imported technologies, there is serious concern for stability and growth within the society.

The many decisions which must be made by the Egyptian Government must rest on careful data collection, thorough analysis of alternative courses of action, full consideration of human and environmental stress, and availability of economic resources over extended time periods. In the end, decisions will be made primarily on social, cultural and political realities more than technological opportunities but constraints on decision making increasingly have formidable technological components. Thus, the ASRT has an important role -- now largely unfulfilled -- of informing, motivating, and mobilizing Egypt's S&T community to participate fully in the decision-making process that will occur.

In April 1980 the AID Mission in Egypt appointed a study team under Dr. Princeton Lyman, Special Assistant to the International Development Cooperation Agency, to assess the total impact of U.S. S&T cooperation with Egypt. The AID evaluation team recognized and profitted from the excellent studies available on Egypt's S&T policy, institutions, and human resources. The team's conclusions were as follows:

- (a) Egypt's S&T and industrial communities are largely isolated with little interdependence or interaction between groups;
- (b) S&T policy guidelines have been on a broad, generalized basis without the foundation of analytical studies on sectoral and sub-sectoral levels for shaping those guidelines; and
- (c) there have not been available adequate resources, both human and financial, over an uninterrupted time period for S&T policy planning.

The JCC initiative and the persuasive nature of the Lyman Report prompted the USAID Mission to include the National Policy Measures for Science and Technology activity in the Program's Phase II plan. Dr. Ibrahim Helmy Abdel Rahman, an Egyptian member of the JCC, prepared a concept paper (Appendix C) for consideration by the full JCC. Because

resources for this activity are limited to U.S.\$250,000 for the three year period (1981-83) of Phase II, the Abdel Rahman proposal involves no new structural units within the ASRT, but rather provides financial support on ongoing programs of the ASRT Committee on Scientific and Technological Policies, emphasizing three approaches:

- Analysis of policies of transfer, adaptation, and application of technology as they have affected Egypt. This involves studies of current technology transfer agreements to understand under what conditions foreign suppliers make technology available and how local users adapt the technology to the Egyptian scene; analyses will also suggest improvements to the overall technology transfer process.
- Analysis of policies for strengthening indigenous S&T capacities. This may involve monographs on Egyptian and other developing country methodologies, discussions, and meetings with groups within Egypt to share experiences.
- Examination of technological priorities at the national level, including analysis of advantages and disadvantages of introducing "new" technological choices as compared with investments in hardware or turn-key system; and provision of information sources on technologies available to management and decision-makers.

In addition to commissioning and overseeing study activities, the responsible group would organize cross-sectoral seminars and discussions and maintain liaisons with S&T policy studies groups in the U.S. and elsewhere.

The JCC specifically endorsed a suggestion in the Lyman Report calling for increases in both Egyptian and external donor funds that would be earmarked for individual projects to make greater use of Egyptian R&D capacity, within agricultural, industrial, and other sectors.

Finally, the JCC recommended that management of the new activity follow the guidelines used with demonstration, R&D, information technology, and other projects, and that plans provide for an Egyptian

policy committee (perhaps the ASRT Committee on S&T Policies), a clear designation of authority to a project director, and formation of an Egyptian-U.S. advisory panel.

C. New R&D Projects for Phase II

Five proposals for new R&D projects were presented to the JCC for review and comment. The following three were endorsed for further consideration at JCC VII:

1. A New Scheme for Better Land Use to Increase Food and Food Production in Egypt. (This proposal was presented orally to the JCC by Dr. Mostafa El-Gabaly, Counselor to the Minister of Agriculture and member of the JCC).
2. Preparation of Selected Pharmaceutical Chemicals. (This proposal was available for review and was presented by Dr. Mohamed B. El-Din Fayez, Vice President of the ASRT and co-principal investigator).
3. Investigation and Evaluation of Egyptian Bentonites for Industrial Applications. (This proposal was available for review and was presented by Dr. Adel A. Abdel Azim, Director of the Central Metallurgical Research and Development Institute, where the R&D work would take place).

The JCC reviewed two additional proposals but did not endorse them because they did not seem to meet all criteria for R&D proposals. (The criteria were adopted by the JCC at its first meeting in May 1978 and reaffirmed at JCC IV in November 1979). The proposals were: Local Production and Improvement of Ceramic Electric and Acoustic Insulators, and Dynamic Stability Improvements for the Egyptian Power System.

While endorsing the three selected projects, the JCC recognized that if the total available Phase II resources (approximately U.S.\$700,000)

were not sufficient, only two projects could be implemented. The JCC also reiterated that one of the selection criteria is that R&D projects could not duplicate other R&D activities funded by the Government of Egypt or USAID in an Egyptian ministry or another research organization. Additionally, project designs and implementation should follow those of Phase I R&D projects, with a management committee for each and an Egyptian-U.S. technical committee to provide additional inputs for each project's plan to be presented at the next JCC meeting.

The following is a summary of the three projects selected for further study at JCC VII:

1. A New Scheme for Better Land Use to Increase Food and Food Production in Egypt

A. Rationale: Egypt's rapid population growth and subsequent food demands are not being compensated by proportional increases in basic food production, due largely to very limited land resources and cultivation of late maturing crops. These crops create a relatively low land use intensity as compared to that of other areas in the world with favorable climate and good water resources. However, higher yields and early maturing varieties of food crops such as rice, wheat, corn, and soy beans can increase Egyptian land use ratios from the current value of 1.9 to approximately 3.0.

B. Project Approach:

- Introduce early maturing varieties of food crops into Egypt's crop rotation system to replace later maturing varieties in pilot areas representing different agro-climatic zones.
- Study the effects of inputs required (water use, labor requirements, machinery and mechanization,

pest control, weed control, etc.) for production of these varieties.

- Measure the output in terms of food production (quantity) and nutritive quality.

C. Plan:

- Select three representative agro-climatic zones in Egypt and identify one pilot area in each zone.
- Develop rotation plans in each zone to optimize the use of early maturing varieties and the requirements of other inputs.
- Analyze the results in terms of inputs and outputs.

D. Estimated Budget (3 years):

Field work	\$ 300,000
Management	<u>\$ 50,000</u>
Total	\$ 350,000

The local contribution is estimated to be U.S.\$1 million for the duration of the project.

2. Preparation of Selected Pharmaceutical Chemicals

A. Rationale: The Egyptian drug industry is essentially a formulation and/or blending operation dependent on materials imported from abroad. At the same time the industry has gained a reputation for preparation of natural drugs based upon locally grown materials. The goal of this project is to produce a larger number of fine pharmaceuticals and fine chemicals locally, thereby reducing dependence on foreign suppliers and helping Egypt achieve a more favorable trade balance.

B. Project Approach:

- Enlisting the aid and full participation of the pharmaceutical industry, compile a list of products with high demand in the Egyptian market which can be produced locally

by small-scale synthesis methods; the products should be those currently imported and for which foreign patent rights offer no obstacle.

- Within the National Research Centre, demonstrate feasibility of production of the selected materials. Industrial participation in this activity is crucial if techniques and methodologies demonstrated at the NRC are to be adopted by end users and given commercial trial.

C. Plan:

- Enlist the aid of Egypt's drug industry to compile a list of pharmaceuticals and fine chemicals currently needed and presently imported by the drug industry.
- Select those materials from the above-mentioned list that can be produced by relatively simple methods using multipurpose, batch-unit operations equipment.
- Review the open and patent literature to further refine the list of chemicals to be produced in the NRC laboratory.
- Conduct lab scale and thorough pilot plant scale R&D testing of production techniques for the chemicals selected.
- Prepare an extensive technical and marketing feasibility report on those chemicals showing the greatest promise for production and use in Egypt.

D. Esimated Budget (3 years):

	Egyptian Pounds
Equipment	20,000
Materials & Supplies	25,000
Training (includes symposia & conferences)	20,000
Consultants	15,000
Incentives	<u>90,000</u>
Total LE	170,000
Total US dollars	240,000 (rounded)

3. Investigation and Evaluation of Egyptian Bentonites for Industrial Applications

- A. Rationale: Bentonites are clay-like materials essential for industrial applications in foundry operations, drilling muds used for petroleum exploration, ceramics, agriculture, and building industries. Egypt currently imports bentonites in the form of directly activated materials and in drilling muds at an estimated annual cost of LE 29 million (approximately U.S.\$41 million). However, there are extensive bentonite deposits known to exist in commercially exploitable quantities in El Fayoum, the Delta, and Wadi El-Natroun. Therefore, the project goal is to scale-up activation tests of El Fayoum material at the National Research Centre, in conjunction with an industrial end-user, and to conduct technological tests on an industrial scale in cooperating companies representing foundries, oil drilling, edible oil producers, ceramic, and building materials, as well as in the Ministry of Agriculture for land reclamation and fertilizer applications.
- B. Project Approach: The Central Metallurgical Research and Development Institute (CMRDI) has already demonstrated the feasibility of activating bentonites on a laboratory scale. The project is primarily to enable CMRDI, its industrial, and Egyptian government counterparts initiate pilot scale development efforts and testing of these products with various end-users.
- C. Plan:
- Initiate pilot plant activation of Kasr El Sagha (El Fayoum) bentonites.
 - Initiate geological, mineralogical, and chemical characterization studies of bentonite materials from new locations (Delta and Western Desert).
 - Involve end users with industrial testing of activated bentonite samples and derivatives.

D. Budget (2 1/2 years):

	Egyptian Pounds
Equipment	45,000
Chemicals, local materials & equipment	20,000
Training, travel, consultants & local conferences	67,500
Incentives	<u>66,250</u>
Total LE	200,000 (rounded)
Total US dollars	280,000

APPENDIX A
ACADEMY OF SCIENTIFIC RESEARCH & TECHNOLOGY
NATIONAL RESEARCH CENTRE
NATIONAL ACADEMY OF SCIENCES/NATIONAL RESEARCH COUNCIL
NATIONAL SCIENCE FOUNDATION

Sixth Meeting, Joint Consultative Committee
Cairo, Egypt
November 5-6, 1980

AGENDA

Wednesday, November 5

ASRT Conference Room
2nd Floor, 101 Kasr El Aini Street

9:30 a.m.

OPENING SESSION

Welcome	I. Badran, President, ASRT H. Ismail, Chairman, JCC
Response & Remarks on Meeting Goals	H. Guyford Stever, Chairman, US JCC
NRC Role in Program	M. Kamel, Director, NRC
Phase II Features	A.S.El Nockrashy, Director, Applied Science & Technology Program, ASRT
Comments	D. Brown, Director, USAID/Cairo I. Badran, President, ASRT

11:00 a.m.

PHASE I ACHIEVEMENT & PHASE II PLANS

<u>National Policy for S&T</u>	I.H. Abdel Rahman, Councilor, Office of the Prime Minister
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Demonstration Projects & Discussion

- More & Better Food	O. Galal, Head, Child Health Division, NRC
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12:30

Luncheon Honoring the JCC

Wednesday, November 5 (continued)

2:00-3:00 p.m. Demonstration Projects & Discussion (continued)

- Biogas Technology M. El Halwagy, Principal Investigator
- New Crops for Arid Zones Adel El Beltagy, Principal Investigator

3:00-4:00 p.m. R&D Projects & Discussion

- Phosphate Fertilizers A. Yousef, Principal Investigator
- Wool Scouring A.A. Borai, Director, Misr Beida Dyers Company
- Corrosion A.M. Shams El Din, Director, Corrosion Laboratory, NRC
- Red Sea Fisheries M. Shahein, Principal Investigator

4:00-5:30 p.m. New R&D Projects & Discussion

Thursday, November 6

10:30 a.m. Support Systems & Discussion

- Scientific & Technical Information M. Madkour, Principal Investigator
- Instrumentation Technology M. Shaltoot, NSF Coordinator in Cairo
- Standards & Measurements A. Dawoud, Director, National Institute for Standards

12:30 p.m. Business Lunch F. Sobhy, Director, Egyptian Organization for Standardization and Quality Control

2:00 p.m. APPROVAL OF MEETING CONCLUSIONS AND RECOMMENDATIONS

4:00 p.m. ADJOURN

APPENDIX B

List of Participants, Invited Guests and Observers
Sixth Meeting
Joint Consultative Committee
APPLIED SCIENCE AND TECHNOLOGY PROGRAM

Cairo, Arab Republic of Egypt

November 5-6, 1980

Egyptian JCC Members

Dr. Ibrahim Badran
President, Academy of Scientific Research and Technology

Dr. Hassan Ismail
Counselor, Academy of Scientific Research and Technology

Dr. Ibrahim Abdel-Rahman
Counselor, Office of the Prime Minister

Dr. Mostafa El-Gabaly
Counselor, Ministry of Agriculture

U.S. JCC Members

Dr. H. Guyford Stever
International Consultant

Dr. George Bugliarello
President, New York Polytechnic Institute

Dr. Mary E. Carter
Associate Administrator, Science and Education Administration/Agricultural
Research, U.S. Department of Agriculture

Dr. James Hillier
International Consultant

Dr. Gilbert White
Institute of Behavioral Sciences, University of Colorado

Dr. Helmut Weldes (ex officio)
Senior Staff Officer, Board on Science and Technology for International
Development (BOSTID)
U.S. National Academy of Sciences Representative for the Egypt Program,
Cairo, Egypt

Egyptian Advisors

Dr. Mohamed Kamel
Director, National Research Centre

Dr. M.B. Fayez
Vice President, Academy of Scientific Research and Technology

Dr. Abou Abdel Latif
Secretary-General, Academy of Scientific Research and Technology

Dr. Moustafa Hafez
Consultant, Academy of Scientific Research and Technology

Egyptian Program Liaison Directors

Dr. A. S. El Nockrashy
Liaison, Academy of Scientific Research and Technology (ASRT)
with AID, NAS/NRC, and NSF

Dr. Osman Galal
Liaison, National Research Centre (NRC/Cairo)
with AID, NAS/NRC, and NSF

Egyptian Project Representatives

1. More and Better Food

Dr. Osman Galal
Head, Child Health Department, NRC/Cairo

2. Biogas Technology

Dr. M. M. El Halwagy (Principal Investigator)
Head, Pilot Plant Department, NRC/Cairo

3. New Crops for Arid and Semi-Arid Zones

Dr. Adel El Beltagy (Principal Investigator)
Faculty of Agriculture, Ain Shams University

4. Corrosion Research

Dr. M. Shams Al-Din (Principal Investigator)
Director, Corrosion Research Laboratory, NRC/Cairo

Dr. A. Abdel Azim (Co-Principal Investigator)
Head, Central Metallurgical Research and Development Institute,
NRC/Cairo

5. Phosphate Ores and Chemical Processing

Dr. Aziza Yousef (Principal Investigator)
Head, Ore Beneficiation and Chemical Processing Laboratory, NRC/Cairo

6. Wool Wax Recovery, Processing and Marketing

Dr. A. Kantouch (Principal Investigator)
Director, Textile Research Laboratory, NRC/Cairo

Dr. A.M. El Borai
Director, Misr Beida Dyers Company

7. Red Sea Fisheries

Dr. A. R. Bayoumi
Director, Institute of Oceanography and Fisheries

Mr. H. Shahin
Director, Al Gharadaqa Research Station
Institute of Oceanography and Fisheries

8. Scientific and Technical Information

Dr. A. M. Gad
Head, National Information and Documentation Centre (NIDOC), ASRT

Dr. M. Madkour (Principal Investigator)
National Information and Documentation Centre (NIDOC), ASRT

9. Instrumentation Technology

Eng. Ahmed El Alaily
Director, Scientific Instruments Centre (SIC), ASRT

Eng. M. Shaltoot
Program Liaison, Instrumentation Technology, ASRT

10. Standards and Measurements

Dr. A. Dawoud
Director, National Institute for Standards (NIS)

Dr. F. Sobhy
Egyptian Organization for Standardization and Quality Control (EOS),
Ministry of Industry

Egyptian Program Managers

Dr. M. H. Fadl
Applied Science and Technology Office, ASRT

Dr. Hatem Ali
Applied Science and Technology Office, ASRT

Dr. Sami Fayed
Applied Science and Technology Office

U.S. National Academy of Sciences

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

Mr. Jay Davenport
Board on Science and Technology for International Development
Staff Office for Program with ASRT and NRC/Cairo

Mrs. Maryalice Risdon
Board on Science and Technology for International Development

U.S. National Science Foundation

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

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

U.S. Agency for International Development

Mr. Don Brown
Mission Director, AID/Cairo

Mr. O. Cylke
Deputy Mission Director, AID/Cairo

Mr. James Riley
Head, Division of Urban Affairs, Science and Technology, AID/Cairo

Dr. E. McManus
Assistant Director for Technical Programs

Mr. Sherif Arif
Division of Urban Affairs, Science and Technology, AID/Cairo

Ms. Janice Weber
Science and Technology Officer, Division of Urban Affairs, Science and
Technology, AID/Cairo

U.S. Embassy - Cairo

Mr. Thomas Vrebalovich
Scientific Attache

National Bureau of Standards

Dr. Kurt Heinrich
Chief, Office of International Relations

National Institutes of Health

Mr. Murray Eden
Biomedical Engineering and Instrumentation Branch

Catholic University of America

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

Georgia Institute of Technology

Dr. Vladimir Slamecka
School of Information and Computer Science

University of Wisconsin

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

Mr. Edward Falk
Instrumentation Systems Center
College of Engineering

Mr. Neil Wolf
Instrumentation Systems Center
Cairo Representative

APPENDIX C

SCIENTIFIC AND TECHNOLOGICAL POLICIES:
AN OUTLINE OF POSSIBLE AREAS OF ACTION

By I. H. Abdel Rahman

June 15, 1980

- I. Action can be considered under three main headings:
 - A. Transfer, adaptation, and application of external technology;
 - B. Strengthening of indigenous scientific and technological capacities;
 - C. Identification of national technological priorities and sectors; assistance in programming to convert the "Technology Plan" into work programs.

- II. The three headings above are interrelated. Because the policy and sectoral authorities are closely involved in every step, there is a need to develop principles and policies minimizing new institution building aspects and emphasizing mobilization of existing resources. Thus, policies could emerge in the form of projects, reallocation of resources, and reorganization and definition of functions rather than as abstract principles. By this means both centralized and decentralized decision centers will be involved by choice and not by obligation.

- III. Some of these possibilities are actually under examination in the ASRT Committee of Scientific and Technological Policies. It is envisaged that, if conditions permit in the future, this voluntary cooperative and persuasive approach would be supplemented by centrally initiated and directed programs at the national level.

A. Technology Transfer. Three steps are considered at the moment:

1. Followup and analysis of technology transfer agreements currently concluded, both explicitly and implicitly within investment and other development activities. Although parties concerned are reluctant to release such information, ways will be found to enlist their cooperation;
2. Development, through such information and other means (training, of research, seminars), local capacity and expertise in providing services and advice on request to parties concerned in technology transfer and adaptation agreements. The accumulated expertise may be managed either privately or publicly;
3. Examination and proposal of gradual legislative and administrative changes to improve technology selection and introduction processes. A minimum institutional structure will be required, which has been formally approved by the ASRT. Financial and staff resources will be needed to develop the three above-mentioned steps in full cooperation with all concerned. The idea of creating a full-fledged "Institute of Technology" with wide functions has not been favored.

B. Strengthening the Indigenous Capacities

The Academy is developing programs to support the "infrastructure" for technology in the areas of information, equipment repair and design, and standards. The technology policy group suggests three additional approaches:

1. Review previous studies and experiments in specific areas and publish a series of monographs. It is hoped that publication of reviews and monographs will become routine in all research areas, thus avoiding duplication and aiding in the planning of new research activities;
2. Conduct in-depth studies of technological changes and evolution in specific sectors to identify the changes that took place, the forces of change, and the expected trends in the technology in each sector studied within the last 10-20 years, and for the foreseeable future;

3. Recognizing that S&T efforts in Egypt, though appreciable, are very isolated from one another, an attempt should be made to correlate these efforts, thereby producing a viable "dynamic system." Correlation methods will be identified and actions proposed.

Specific Project Approaches

Several areas will be chosen in which efforts for national studies planning are currently underway, in order to conduct parallel "technological" components to demonstrate the above mentioned three approaches. Such efforts may include:

1. the study on industrial sector planning by the Ministry of Industry (2-year efforts);
2. employment policies for the Ministries of Labor and Planning;
3. water master plan, nearing completion by Ministry of Irrigation;
4. land reclamation and urbanization: Several studies are completed and others are in process, subject to negotiation and approval with parties concerned; a number of technological studies will be conducted simultaneously and in cooperation with the main study groups. The purpose of these studies will be to analyze recent development history of land reclamation and urbanization in Egypt and to identify prospects for intensifying and improving the technological component of such efforts in the future.

C. Technological Priorities at the National Level

A number of priority areas will be identified and simplified so that actions would have a multiplying effect and provide leadership to other developments in the whole society. Development of selective aspects of human resources and skills may be one such priority area. Strengthening management and other "soft" inputs versus "hardware" (equipment and buildings) in investment projects is another possibility. A third area may be "emerging technologies", i.e., exploring the merits and

dangers of introducing such technologies. Technology for rural development, energy conservation, small industries, and information services may be other areas for examination.

As a result of such studies, a small number of priority approaches will be proposed in order to form the core of what may be called a "national technology plan". It is hoped that such priorities, if approved, will become an integral part of the national development effort and a guide for investment and social and economic management in Egypt.

The Outside Component in such Efforts: The above-mentioned steps must be undertaken by local authorities within the existing structures and policies. Yet a number of useful inputs can be obtained from the outside, especially in the form of information and exposure to similar experiences in the USA and other countries. If this idea is acceptable, specific proposals can be worked into the Applied Science and Technology Research Program.

ANNEX B
TRAVEL TO THE UNITED STATES
July-December 1980

NAME	DATE	PURPOSE	PLACE
1. A. S. El-Nockrashy	July 15-August 2	Program Planning	NAS, Washington, D.C. Instrumentation Systems Center, University of Wisconsin, Madison, WI Denver Research Institute, Denver, CO
2. Zebaa Motagally	August 10-22	Study/observation, More and Better Food project	USDA Agricultural Research Center, Beltsville, MD University of Nebraska, Dept. of Animal Sciences University of Minnesota, Dept. of Animal Sciences University of Wisconsin, Dept. of Animal Sciences Michigan State University, Dairy Science Dept.
3. S. El Afifi	September 6- November 8	Training, Phosphate Fertilizer project	International Fertilizer Development Center, Muscle Shoals, AL International Minerals & Chemical Corp., Lakeland, FL Gardinier, Inc., Tampa, FL U.S.S. Agrichemicals, Bartow, FL
4. A. Saber			
5. O. Metwalli	September 8-26	Study/observation, More and Better Food project	Food & Drug Administration, Division of Nutrition, Washington, D.C. USDA Human Nutrition Research Center, Beltsville, MD National Institutes of Health, Bethesda, MD: Center for Research for Mothers & Children National Institute of Arthritis, Metabolism, and Digestive Diseases National Institute of Allergy and Infectious Diseases University of North Carolina, Dept. of Nutrition USDA Northern Regional Research Center, Peoria, IL

NAME	DATE	PURPOSE	PLACE
6. H. Abdel Rahman Salama	September 8-26	Study-observation, More and Better Food project	<p>USDA Human Nutrition Research Laboratory, Grand Forks, ND Massachusetts Institute of Technology, Dept. of Nutrition and Food Science, Cambridge, MA</p> <p>USDA Science and Education Administration, Hyattsville, MD USDA Agricultural Research Center, Beltsville, MD USDA Insects Attractants Laboratory, Gainesville, FL USDA Insects Affecting Man and Animals Research Laboratory, Gainesville, FL University of Florida, Dept. of Entomology, Gainesville, FL USDA Agricultural Research and Education Center, Quincy, FL USDA Western Cotton Research Laboratory, Phoenix, AZ University of Arizona, Department of Entomology, Tucson, AZ USDA Cotton Insects Research Laboratory, College Station, TX Texas A&M University, Dept. of Entomology, College Station, TX</p>
7. A. F. Sabry	September 7-21	Fact finding, Phosphate Fertilizer project	<p>World Bank, Industrial Projects Dept., Washington, D.C. Tetra Tech International, Washington, D.C. Agrico International Co., Tulsa, OK International Fertilizer Development Center, Muscle Shoals, AL National Fertilizer Development Center, Muscle Shoals, AL Agrico Fort Green mine & chemical complex, South Pierce, FL</p>
8. S. M. Sayed	October 20- November 7	Training, Corrosion project	<p>Amoco Research Center, Naperville, IL Amoco Refinery, Whiting, IN</p>

NAME	DATE	PURPOSE	PLACE
9. M. Nawito	October 30- November 19	Study/observation, More and Better Food project	USDA Animal Science Institute, Beltsville, MD Michigan State University, Department of Dairy Science, East Lansing, MI University of Wisconsin, Meat and Animal Science Department, Madison, WI Iowa State University, Dept. of Animal Science, Ames, Iowa Iowa State University, Dept. of Veterinary Medicine, Ames, Iowa National Animal Disease Center, Ames, Iowa National Veterinary Services Laboratory, Ames, Iowa American Breeders Service, Ames, Iowa Cornell University, Dept. of Animal Science, Ithaca, NY Cornell University, College of Veterinary Medicine, Ithaca, NY Eastern Artificial Insemination Cooperative, Ithaca, NY
10. A El-Dayem	December 5-17	Participate in international meeting and confer with U.S. panel for Biogas project	Dr. T. B. S. Prakasam, Metropolitan Sanitary District of Greater Chicago, IL Dr. Philip Goodrich, Dept. of Agricultural Engineering, University of Minnesota, St. Paul, MN 3rd Miami International Conference on Alternative Energy Sources, Bal Harbour, FL

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ANNEX C
TRAVEL TO EGYPT
July-December 1980

NAME	DATES	PURPOSE
1. H. Guyford Stever	November 3-6	Joint Consultative Committee sixth meeting (JCC VI)
2. George Bugliarello	November 3-6	JCC VI
3. Mary E. Carter	November 3-6	JCC VI
4. James Hillier	November 3-6	JCC VI
5. Gilbert White	November 3-6	JCC VI
6. Victor Rabinowitch	November 3-6	JCC VI
7. Jay Davenport	November 3-21	JCC VI and Program Management
8. Maryalice Risdon	November 3-21	JCC VI and Program Management
9. C. O. Chichester	November 9-20	More and Better Food project
10. C. E. Johnson	November 9-20	More and Better Food project
11. George Pigott	November 9-20	More and Better Food project
12. Augustus Nasmith	November 30-December 16	Program management

ANNEX D
TRAVEL WITHIN THE U.S.A.
BY NAS/NRC PANELISTS AND STAFF

<u>NAME</u>	<u>DATES</u>	<u>PURPOSE</u>	<u>PLACE</u>
1. C. O. Chichester	July 29	More and Better Food	Washington, D.C.
2. C. E. Johnson	July 29	More and Better Food	Washington, D.C.
3. Martin Miller	July 29	More and Better Food	Washington, D.C.
4. John Liston	July 29	More and Better Food	Washington, D.C.
5. George Bugliarello	October 17	JCC VI Briefing*	Washington, D.C.
6. Mary E. Carter	October 17	JCC VI Briefing	Washington, D.C.
7. James Hillier	October 17	JCC VI Briefing	Washington, D.C.
8. Gilbert White	October 17	JCC VI Briefing	Washington, D.C.

* H. Guyford Stever, Chairman of the U.S. Panel, JCC, resides in Washington; thus no travel costs were incurred.