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APPLIED SCIENCE AND TECHNOLOGY PROGRAM IN EGYPT

OVERVIEW AND INPUTS FOR EVALUATION

PROJECT 263-0016

Prepared by

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FORWARD

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

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

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

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INTRODUCTION

I. Background

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

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

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

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

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

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

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

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

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

II. Evaluation

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

EVALUATION OF DEMONSTRATION PROJECTS

I. More and Better Food

A. Background

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

B. Key Questions

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

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

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

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

National Research Centre (Management Institution)

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

Cairo University, Faculty of Medicine

Organization for the Development of the Villages

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Note: This is a topic for JCC discussion.

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

A. Background

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

B. Key Questions

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

III. New Crops for Arid and Semi-Arid Zones

A. Background

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

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

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

B. Key Questions

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

EVALUATION OF RESEARCH AND

DEVELOPMENT (R&D) PROJECTS

I. Background

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

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

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

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

--- Phosphate Ore Beneficiation and Phosphate Fertilizer Production

--- Improving Wool Scouring and Wool Wax Recovery

--- Corrosion Monitoring and Control in the Petroleum Industry

--- Development of Red Sea Fisheries

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

II. Phosphate Ore Beneficiation and Phosphate Fertilizer Production

Key Questions

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

III. Wool Scouring and Wool Wax Recovery

Key Questions

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

IV. Corrosion Monitoring and Control in the Petroleum Industry

Key Questions

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

V. Red Sea Fisheries Development

A. Background

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

B. Key Questions

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

EVALUATION OF POLICY PLANNING, MANAGEMENT AND CONTROL

I. Background

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

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

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

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

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

II. Research & Development Management Education

(Sub-contract of the Denver Research Institute)

Key Questions

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Note: This is a topic for JCC discussion.