APPLIED SCIENCE AND TECHNOLOGY RESEARCH IN EGYPT

Quarterly Report Number 5: Phase II

October - December 1982

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Introduction

This is the fifth quarterly report, Phase II, of the Applied Science and Technology Research Program in Egypt and covers the period October - December 1982. The program is under Contract NEB-0016-C-00-1058-00 of the United States Agency for International Development (AID) with the National Academy of Sciences/National Research Council (NAS/NRC).

For a background description of all elements of the Applied Science and Technology Research Program during Phase I (1978 - 1981), see the report prepared by the NAS/NRC staff dated June 1982.

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MAJOR ACTIVITIES

I. Policy Planning and Management

A. Tenth Meeting, Joint Consultative Committee (JCC)

The tenth semi-annual meeting of the JCC (JCC-X) was held in Cairo, Egypt, at the Academy of Scientific Research and Technology, November 27-29, 1982. For the first time since Phase II formally began in October 1981, all contractual elements for the Applied Science and Technology Research Program in Egypt were "in place." Those program elements are given in Table I.

Although all contractual activities except those of the Scientific and Technical Information Project (STI) are expected to be completed during 1984, AID in Cairo has authority to extend the project completion date to September 30, 1985.

Recommendations of JCC-X are included in Annex A to this report. Issues which were stressed in the JCC discussions were:

o Institutionalization of program elements. Dr. Ibrahim Badran once again stressed the importance of continuation of programming for those activities of demonstrated merit after Phase II of the Applied Science and Technology Research Program is completed. This speaks to the desirability of incorporating management system changes in the ASRT and NRC/Cairo where change has been shown to be desirable and successful in the R&D management subprojects. Dr. Badran has also underlined the need to initiate "frontier areas" of research relevant to the Egyptian economic and social development process.

o Reorientation of the New Crops for Arid Zones Demonstration Project. Because the New Crops Project has taken on a long-term character, and because there seems to be no immediate "end-user" identified, Dr. Badran recommended that the New Crops Project be transferred to a more basic R&D activity and funded from a different source. In its place he advocated a study and evaluation of new technologies used for reclamation of desert areas of Egypt since 1954. The Ministry of Land Reclamation would join with the ASRT in the study which is of vital importance in Egypt's long-range development strategy. It is known, for example, that nearly 1,000,000 feddans (1 feddan = 1,038 acres) were reclaimed between 1953 and 1975, but approximately 40 percent of that reclaimed land is not presently in production. Furthermore, the rate of urbanization, especially around Alexandria and Cairo, has removed thousands of additional feddans from agricultural use. Thus the combined factors of poor technology for the

TABLE 1. Principal elements Applied Science and Technology Research Program in Egypt.

Activity	Partners		Contract Period: Phase II		USAID Funding x 10^3	
	Egypt	USA	Begin	End	US$	$ as L.E.*
Standards & Measurements Project	(a) Nat'l Inst for Standards (NIS) (b) Egyptian Org. for Standardization & Quality Control (EOS)	U.S. Nat'l Bureau of Standards	July '81	Oct '83	684.7	222.0
Policy Planning, Mgt. Systems, and R&D/Demonstration Projects	(a) ASRT (b) NRC/Cairo	NAS/NRC	Aug '81	Oct '83	2,015	906.7
Instrumentation Technology Maintenance & Repair Project	(a) Sci. Instruments Centre (SIC) (b) Universities: Alexandria, Assuit, Cairo, El Minia, Tanta	Nat'l Inst. of Health (NIH)	May '82	Oct '83	1,156	143.0
Instrumentation:Mgt. Development & Procurement Project	(a) SIC (b) NCR/Cairo	Un. of Wisconsin (Madison)	June '82	June '84	3,407.0	110.2
Sci. and Tech. Information Services Project (STI)	(a) ASRT (b) Nat'l Infor. and Documentation Centre (NIDOC)	Georgia Inst. of Technology	Nov '82	May '85	3,056.4	1,162.0
Local Supplies and Materials Fund	(a) ASRT (b) NRC/Cairo	Not applicable	June '82--		None	1,202.4 as LE

settlement and utilization of reclaimed lands and urban growth have placed additional stress upon scarce agricultural land resources. The analytical study and evaluative conclusions would provide guidelines for policy makers who are responsible for land reclamation strategies in Egypt.

o Strengthening the Program of S&T Policy Studies. The JCC recommended that technology policy studies and analyses be undertaken immediately in one or two well targeted areas. Manpower studies for technology development in Egypt with particular reference to engineering education was cited as one important area. Dr. I. H. Abdel Rahman cited the "packaging" of technologies and equipment, patented industrial and managerial programs and restrictions placed upon access to "know-how" in individuals or firms as major barriers to more rapid technological development in Egypt. He suggested that Egypt might need a "technology transfer" clearing house with well defined authority as one mechanism to guide conditions under which technology may be imported. The mechanism, based upon a clearly enunciated technology transfer policy, could also serve to reinforce the 1980-84 National Development Plan by offering greater incentives in those areas given priority by the government.

o Other Program Activities

The JCC members welcomed a visit from the new AID Mission Director, Mr. Michael Stone. In his address Mr. Stone stressed evaluation of programs for quality as a necessary operational strategy when resources are scarce and time is of the essence. Technology transfer and institutional development were cited as worthy goals but always within the framework of "evaluation for quality."

A summary report on administrative management of the Applied Science and Technology Research Program was given by Dr. A. S. El Nockrashy, ASRT general coordinator for the program. His remarks are included as Annex B to this quarterly report.

B. R&D Management Project

An oral report of R&D Management activities was given to JCC members. The mission of the consultant Mr. James Blackledge was brought to the attention of the group and his report "Strategies for Implementation of a Phase II R&D Management Program" was discussed. (See Quarterly Report No. 3, April-June 1982.) The Blackledge report is the framework document for the Phase II action plan, R&D Management Project.

In December 1982, an Executive Advisory Committee of the National Research Centre (NRC/Cairo) prepared a Phase II project plan for R&D management activities at the Centre. Basically the plan calls for:

o Immediate establishment of fully staffed, full-time offices at the NRC for: (a) Monitoring, Control and Evaluation of R&D, (b) Techno-economic studies, and (c) Marketing studies,

o Establishment of a Central Secretariat Office under the direction of a full-time executive director to coordinate the work of the three substantive activities as outlined above,

o Recruitment under contract of new junior personnel to carry out planning, studies, and liaison with industries under the supervision of senior management and technical personnel of the NRC,

o Training of junior and senior staff by carefully selected consultants who would work within the new institutional structures on a contractual basis. The training could consist of formal seminars and/or courses as well as on-the-job instruction.

The report "Research and Development Management Project at the National Research Centre" as prepared by Dr. Nabiel A. Saleh is included as Annex C.

C. Science and Technology (S&T) Policy Measures

The second in the series of annual seminars during Phase II on S&T Policy Measures was held immediately prior to the JCC meeting on November 24-25, 1982. As in the case of Seminar I which was held in November 1981, this seminar had the general theme "Towards a Technology Policy for Egypt," and was preceded by an all-Egyptian meeting on October 30-31 conducted in Arabic. More than 140 Egyptian leaders from institutions involved in the generation, transmission, and utilization of technology participated in the October national seminar. Among those present were government ministers, university presidents, members of the Egyptian People's Assembly, representatives of the cabinet planning secretariat, and industry leaders.

Key documents included a background paper and general framework for discussions by Dr. I. H. Abdel Rahman, Counselor to the Prime Minister and JCC Member. Dr. M. B. E. Fayez, Vice President of the ASRT, contributed a background paper giving an approach to the formulation of a national technology policy and the identification of a methodology to implement the policy. Terms of reference for sectoral studies were prepared by an NRC/Cairo team led by Dr. M. Kamel, Director of the National Research Centre.

The international seminar of November 24-25, 1982, was attended by the JCC members and a small group of internationally recognized S&T leaders from Egypt and elsewhere. Invited participants who were asked to intervene in the discussions included Dr. Miguel S. Wionczek of Mexico who is known for his contributions both to the technology planning process of his country and to similar activities within the United Nations (UNESCO, UNU, UNITAR, etc.); Dr. G. S. Gouri a special assistant for policy planning in UNIDO, Vienna; and Dr. Fred Moavenzadeh of the Cairo University-MIT Program, Cambridge, Massachusette, USA.

During 1983, the process of policy planning and analysis will continue, largely directed by Dr. I. H. Abdel Rahman, who in addition to his other duties serves as chairman for the ASRT Committee on

Science Policy and Planning. The JCC during its tenth meeting asked that the preparations for the November 1983 Seminar III be advanced as expeditiously as possible, so that an agenda and terms of reference could be discussed at the May 1983 JCC meeting in Washington at the National Academy of Sciences.

II. Demonstration Projects

A. More and Better Food (including Food Technology Pilot Plant)

During the early weeks of October the corn and peanut harvests in the demonstration villages Kafr Al Khadra and Omar Makram were completed for the 1982 season. Peanut production in Omar Makram for the two seasons in which NRC agricultural scientists have been associated with the project are given in Table 2.

The area of corn (maize) production in Kafr Al Khadra village was 65 feddans in 1982. In the 1983 corn season, the entire normal corn growing area is expected to be planted with hybrid, high-yielding varieties because the Ministry of Supply is now guaranteeing a favorable return on the total crop grown in Egypt. Thus the stimulation of domestic production which has been fostered by the ASRT through projects such as More and Better Food is already having a marked effect upon the national plan for food security by reducing corn (maize) imports.

TABLE 2 Peanut Production In Omar Makram

	1981	1982
Area cultivated (Feddans)	64.0	255.0
Highest production (1)	36.8	42.0
Minimum production (1)	24.3	24.0
Mean production (1)	31.3	32.0
Average production in plots outside NRC program (1)	10.0	10.0

(1) Ardab/Feddan
(Note: 1 Ardab = 5.62 U.S. bushels; 1 Feddan = 1.038 acres)

Additional villages are to be included in the More and Better Food Demonstration project in 1983. The Faculty of Agriculture, University of Assuit is expected to send a representative to the Steering Committee and to assume responsibility for activities in a village in Upper Egypt.

Financing for the construction of the proposed food technology pilot plant at the National Research Centre is being sought. A site has been selected within the NRC complex and detailed architectural-engineering plans are under way. Funds for construction have not been assured but the ASRT is planning to include the basic construction costs (building foundation and main floor of a proposed four-story structure having 600 meters^2/story) in the budget for the year beginning in July 1983. (Estimated cost LE300,000.) Dr. Khayria Naguib, dairy biochemistry laboratory of the NRC/Cairo, is the general coordinator for the project. A general schematic drawing for the facility is shown in Figure 1.

B. Biogas Technology in Rural Areas of Egypt

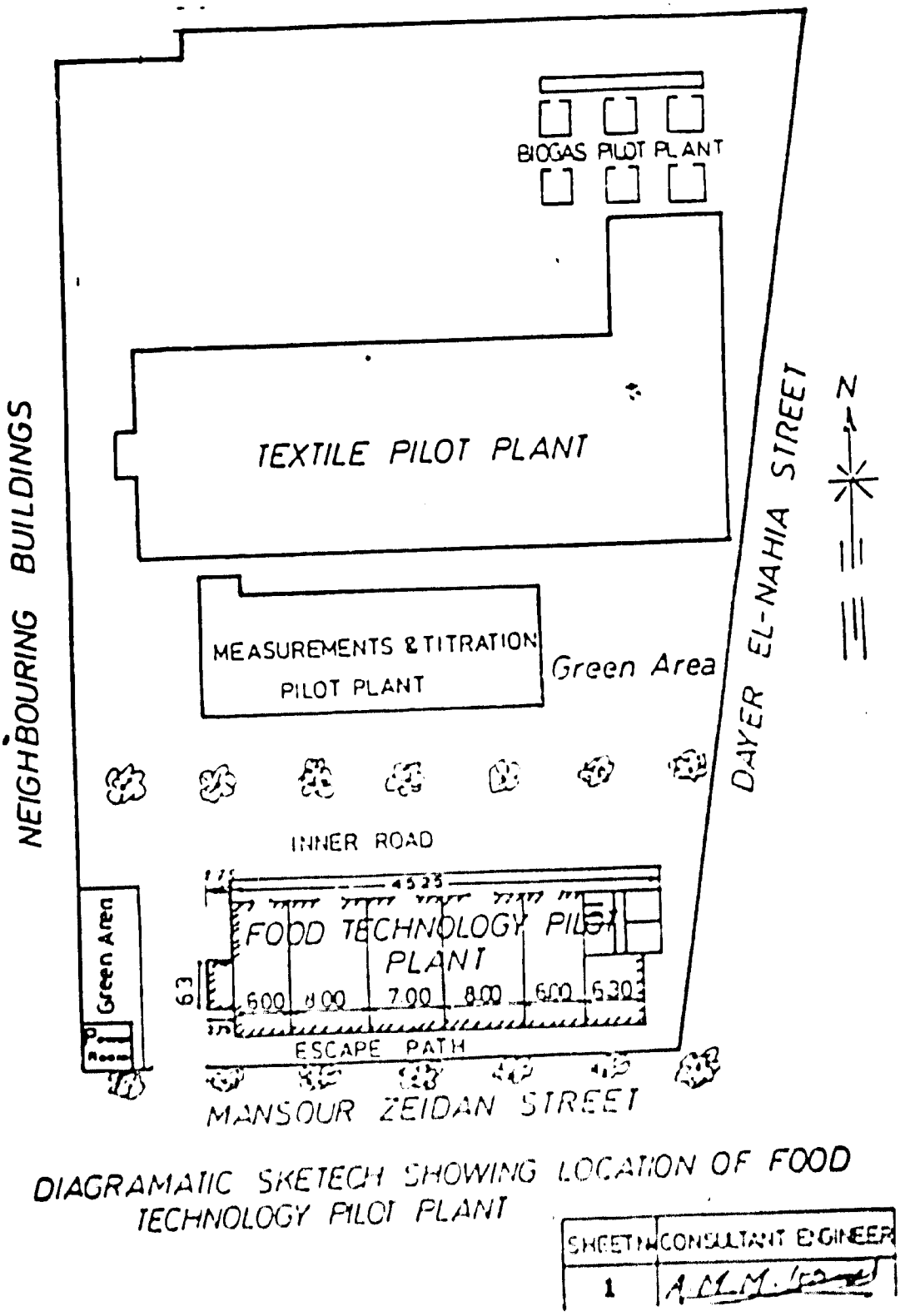
A comprehensive technical progress report of the biogas project was issued for members of the JCC and for the U.S. advisory panel (Reference: El Halwagi, M. M. "The Development and Application of Brogas Technolgoy in Rural Areas of Egypt: Seventh Progress Report." PR/7, October 1982, pp. 117.) The report is available from Dr. El Halwagi through the National Research Centre, Cairo.

In a separate summary report to the JCC, Dr. El Halwagi, project principal investigator, discussed the technical adaptation of biogas systems and their social acceptance in Egyptian rural areas.

In 1981 the Minister of Electricity and Energy asked Dr. El Halwagi to assume responsibiity for the preparation of the biogas aspects of the National Renewable Energy Strategy. A report in Arabic entitled "Towards a National Strategy for Optimum Biomass Energy Utilization" was submitted to the Minister. It is estimated that 400,000 biogas units could be built and effectively utilized in Egypt during the twenty year period of 1980-2000. The strategy considers traditional and new villages taking into account both space limitations and groundwater conditions that make construction impractical at many sites in the Nile Valley and Delta.

As a short-term plan of action, the proposed strategy recommends construction of 1,000 demonstration units over a period of 3 to 5 years. NRC/Cairo has, in fact, been asked by the Organization for the Development of Egyptian Villages (ORDEV) to construct 1,000 biogas generators as demonstration units in 15 Governorates of Egypt with partial funding under a USAID program to support village infrastructure services. Basically the plan calls for the following:

1. Creation of a biogas training center at NRC/Cairo to train in the first year 100 persons for the Governorates (engineers, technicians and skilled construction laborers). These persons would be the nuclei for a biogas services corps who, under the supervision of NRC/Cairo personnel, would construct 50 demonstration units in the Governorates.



DIAGRAMATIC SKETECH SHOWING LOCATION OF FOOD TECHNOLOGY PILOT PLANT

FIGURE 1 Proposed Food Technology Pilot Plant New Campus Area, Dokki National Research Center

2. During the following two years, the 100 person biogas services corps with NRC/Cairo personnel as consultants, would build 950 family size units throughout the participating Governorates.

3. Because of the Government of Egypt policy to subsidize kerosene and bottled natural gas (buta-gas) to consumers, the 1000 demonstration biogas digesters would also require subsidies for their construction. NRC/Cairo has suggested the formula be 25% of cost paid locally and 75% provided as a grant by ORDEV.

An extensive program of the type described above would demonstrate biogas technology in a wide variety of locations and under different operating conditions, would build up experience in biogas digester design and operation in a large cadre of personnel, and would test the social acceptability of the biogas generating system throughout Egypt. As petroleum-based conventional energy sources become more expensive in Egypt, one renewable energy system would then be readily available, fully tested both technically and socially for widespread adoption in the villages.

In addition to the specific project which is being planned with ORDEV, the NRC/Cairo biogas team has:

o Engaged in a widespread popular educational and promotional effort to help government decision makers, the media, and the general public aware of biogas technology as a renewable energy option in Egypt. This effort has engaged nearly 50% of the time of the team leaders (Drs. El Halwagi, Abdel Dayem and Hamad).

o Contracted with the U.S. sponsored group Volunteers in Technical Assistance (VITA) to assist them in building two large scale biogas generators in conjunction with a poultry production demonstration project in a delta village near Tanta.

o Consulted with the Egyptian Ministry of Defense for a biogas generation project in conjunction with its cattle raising operations.

o Consulted with ORDEV in their proposed biogas demonstration projects and with the Ministry for Rural Development for a biogas demonstration unit at its Mariut International Centre.

o Participated in international meetings, conferences and seminars and hosted visitors to NRC/Cairo and the demonstration sites throughout the calendar year 1982 to exchange technical design and operating information on biogas systems with similar groups from India, China, Thailand, the U.K., the United States and elsewhere.

C. <u>New Crops for Arid and Semi Arid Zones</u>

Prior to the meeting of the JCC in November, Dr. Ibrahim Badran asked Dr. Said Galal, emeritus professor of agronomy from Cairo University, to head a review committee for the New Crops demonstration

project. Dr. Galal met with the principal investigators from the three groups operating in the project: (a) Dr. M. H. El Barkouki, Dean of Agriculture, Al Azhar University; (b) Dr. Adel El Beltagy, Faculty of Agriculture, Ain Shams University; and (c) Dr. H. Abdel Rahman Salama, Head of the Pest Control Laboratory, NRC/Cairo. His report to Dr. Badran recommended an extensive re-orientation of the project and the transferring of many of the activities to a longer term, education-basic research program. Dr. Said Galal favored stronger emphasis upon field studies at one or two sites with a fully integrated team. Although the concept of the re-orientation was discussed at JCC-X, a specific proposal was not presented for review and consideration.

Dr. Badran introduced to the JCC a substitute project for the New Crops activity which he explained arose out of his concerns, those of the ASRT Food and Agricultural Council, and those of Dr. Kafrowi, the Minister of Housing, Construction and Land Reclamation. The project would be a study of land reclamation experience in Egypt over the past twenty years to evaluate the technologies used, identify the major successes and failures and offer guidance for future policy making. Because of limited long term results in land reclamation projects in the past and the determination by the Government of Egypt to accelerate land reclamation/resettlement away from the Valley and Delta, a study of past experience is an urgent priority need.

U.S. AID representatives suggested that reclamation experience studies of the kind discussed may already exist and the need for additional work would thereby be less urgent. Furthermore, the proposed study would be one which AID would prefer to take under advisement as an element of the Applied Science and Research Program at this late date in Phase II. Mr. James Riley asked that the ASRT submit to him a brief conceptual plan in the form of a letter which he could discuss internally with those offices of the U.S. AID Mission responsible for agriculture, irrigation and land use planning.

Dr. Badran entrusted the preliminary aspects of the proposed study project on land reclamation experience to the ASRT Council on Food and Agriculture with a request to report again to the JCC at the earliest date possible.

III. Research and Development (R&D) Projects

A. Evaluation of Egyptian Phosphate Ores

The goals of the project are to evaluate the composition of low phosphorus ores found in Egypt, to conduct beneficiation tests to raise phosphate concentrations economically to levels suitable for commercial use as fertilizer starting materials, and to convert those materials to suitable phosphate fertilizer products. Low phosphate ores are found in the Western desert (Abu Tartur), the Nile Valley (El-Sebaia) and the Red Sea (El-Hamrawein) regions of Egypt. By December 1982 laboratory evaluation and characterization for each of the three ore types had been completed as well as beneficiation (bench scale) by wet and dry methods. Batch scale conversion of beneficiated materials proved the

technical feasibility of conversion to useable phosphate fertilizer compounds such as concentrated super phosphate and mono ammonium phosphate. Fairly extensive pilot plant scale, wet beneficiation tests have also been completed but bench scale transformation of these materials to phosphate fertilizer compounds must await the completion of the experimental equipment. Elements of this chemical conversion apparatus were still in transit from the suppliers in the USA to Egypt in December 1982. Only when the bench scale conversion testing of beneficiated ores to fertilizer end products is completed will the flow sheets with material and energy balances be calculated to ascertain economic recovery.

It is now estimated that the project will require an extension of 6 to 9 months in 1984 to complete the final laboratory and pilot plant experiments, techno-economic studies, and preliminary agro-economic studies.

B. Corrosion Causes and Control

The goals of the corrosion R&D project are:

(a) Recording, analysis and evaluation of the causes of corrosion failure in the Suez refinery; the continuous monitoring of the major corrosion sites; and the design of an economically efficient system to minimize further corrosion, and

(b) Strengthening the electro-chemical and corrosion laboratory at NRC/Cairo to serve Egyptian industries in the analysis and solution of corrosion problems.

By the end of 1981 the analysis of the major causes of corrosion in the Suez oil refinery had been completed. A desalter apparatus was found to be by far the most serious area where corrosion occurred and the solution required taking that piece of equipment out of operation for major modification followed by a change in refinery operating procedures. This necessitates taking the refinery off-stream for 4-6 weeks and thereby losing production for the entire period. Management, however, has elected to "live" with the corrosion problems introduced by the desalter in order to maintain yearly production quotas. The economic cost of this decision has not been fully ascertained but its effect compared to other corrosion causes in the refinery is such that that their contributions are secondary. Thus until the desalter apparatus is modified corrosion inhibitors introduced into refinery operating procedures are of little value. Management is fully aware of the consequences in terms of corrosion rates but has the responsibility to weigh these factors against that of maintaining production at higher unit operating and maintenance costs.

During 1982 the corrosion team concentrated its efforts on the study of corrosion behavior in Egyptian steels, particularly corrosion characteristics of reinforcing steel bars used in the construction industry. An extensive analysis and testing program is in process but it is too early to suggest modifications in steel making procedures

which would eliminate, or reduce to a minimum the high incidence of corrosion failures in Egyptian structural steel elements.

A major addition to the analytical facilities of the laboratory is the Perkin-Elmer x-ray photoelectron spectroscopy and scanning auger microscope. (This is identified by the shorthand designation "ESCA/SAM" unit, System 550 or more simply "ESCA"). The instrument is a highly technical apparatus for measuring chemical changes in metal surfaces.

Its use requires a considerable learning period not only for operation and maintenance but also for data interpretation. The apparatus has been a powerful tool in research laboratories throughout the world to elucidate surface chemical reactions. Applications of these techniques to industrial corrosion are only now becoming evident. Thus, the NRC has a truly "front line" R&D opportunity with ESCA to become a major consulting and problem solving laboratory in industrial corrosion. The first basic investigation undertaken was a study of a chromium-cobalt alloy used in orthopaedic applications. Results of this study are being prepared for publication in 1983.

C. Improving Wool Scouring and Wool Wax Recovery

The goal of the wool scouring-wool wax R&D project is to adapt new technology to the production facility of the Misr Beida Dyers Company in its commercial wool operations. The improved scouring/recovery techniques are equipment centered, i.e., changing the scouring/recovery process from a traditional acid wash process using large volumes of chemicals with imprecise controls to one that is more highly controlled. The new equipment utilizes specially designed stainless steel centrifuges which have been adapted to increase wool fiber recovery as well as separate the wool-wax by-product.

The system design is one developed by the International Wool Secretariat (UK and Australia) based upon equipment from the European manufacturer Alfa-Laval, Inc. NRC scientists and engineers together with technical representatives of the Misr Beida Dyers Company have adapted a design of Alfa Laval for use in Egypt. By autumn of 1982 about $350,000 in equipment had been ordered for the scouring/recovery line and modifications of the plant to accommodate the new equipment were underway. The plan calls for the installation and testing of the line during the first six months of 1983. Techno economic studies are so favorable that Misr Beida Dyers is already planning to convert its other scouring/recovery lines to the new design. The original investment of $350,000 in equipment was shared approximately 60/40 by the project and Misr Beida Dyers. In addition the company paid all installation and plant modification costs. Conversion of the remainder of the system, if the in-plant tests are as favorable as anticipated, would be the responsibility of the Misr Beida Dyers Company.

A secondary benefit of the new scouring/recovery method is the production of lanolin as a marketable by-product. Under the old method the lanolins and other wax-like products were lost as wastes. Furthermore the new process reduces waste discharge by a factor of approximately 90% and thereby solves an environmental pollution problem

by eliminating the high volume discharge of liquid waste materials to the environment.

D. Red Sea Fisheries

The overall goal of the Red Sea Fisheries R&D project has been to assess the potential of that body of water, known to be rich in marine life, as a source of high quality protein food for Egyptian markets. This implies both a knowledge of the sustainable yield and their costs of recovery and marketing. Because the Red Sea area is far too large to survey or assess within the terms of reference of the Applied Science and Technology Research Program, a portion in the extreme south in the region of Foul Bay was selected for the study.

Over the years in Phase I and during 1982 the project was delayed partially because the site is remote from manned facilities of the Institute of Oceanography and Fisheries and because there has been no vessel, equipped and available, for the assessment. In 1981 and again 1982 limited catch data for the Foul Bay area were gathered by assigning personnel to commercial fishing vessels. No data on lobsters or deep shrimp are available.

An agreement has been concluded with the Red Sea Governorate to charter a boat in March 1983 specifically for the project. Equipment purchased during Phase I will be utilized in the work. The JCC has requested that a report be presented at its May 1983 meeting detailing the field work that has been accomplished.

E. Preparation of Selected Pharmaceutical Chemicals

The specific goal of the project is to characterize technologies that could be recommended to local Egyptian industries for commercial production and marketing of a limited number of pharmaceutical chemicals. The project draws upon the experience and capabilities of the National Research Centre's Division of Pharmaceutical Industries in partnership with major public sector pharmaceutical companies, with the broader goal of achieving a greater degree of self-sufficiency in fine chemical and drug manufacturing in Egypt.

In Quarterly Report IV the constraints to more efficient R&D were listed as equipment iter[illegible] and key intermediate chemicals. Approximately twenty intermediate chemical compounds (in one kilogram quantities) were obtained from U.S. suppliers and air shipped to Egypt in November 1982.. Equipment items are in the normal procurement process and expected to be delivered by mid 1983.

Thirteen chemical compounds are being investigated for possible manufacture in Egypt. The list was compiled by the drug industry advisory group which is working with scientists from the National Research Centre. Each compound represents a material having a significant market in Egypt and which can be prepared by a manufacturing process in the public domain. Approximately 4 to 6 are to be selected by the industry for local manufacture after the technical work is completed and economic studies made. The thirteen chemicals are:

Generic Name	Common Usage
1 - Acetazolamide	diuretic
2 - Ampicillin	antibiotic
3 - Chloroquine phosphate	anti-malarial agent
4 - Ethambutol	anti-tubercular agent
5 - Ethamsylate	hemostatic agent (surgical)
6 - Furosemide	diuretic
7 - Ibuprofen	anti-inflammatory (rheumatic disorders)
8 - Isoniazid	anti-tubercular agent
9 - Mebendazole	anti-infection agent
10 - Naphazoline	nasal decongestant
11 - Piperazine	anthelmentic
12 - Sulphamethoxazole	anti-bacterial agent
13 - Trimenthoprim	anti-bacterial agent

F. Egyptian Bentonite Clays for Industrial Applications

Bentonite clays are a class of naturally occurring compounds which absorb many times their own weight of water and are then nearly impervious to further passage of liquids. This property is useful in land reclamation where bentonites can act as a barrier below sandy soils to prevent the escape of irrigation water and soluble fertilizers. Bentonites can also be modified by treatment with acids to produce bleaching materials suitable for decolorization of vegetable and mineral oils and with bases for use as drilling muds in oil well exploration or binders in foundry practice. Bentonite clays also find application as carriers for catalysts in chemical industries, extenders for insecticides, and finishing materials in pulp and paper making.

Bentonite clays are found in a number of locations in Egypt, always with other substances which can limit their economically useful application to industry. During 1982 only the bentonite deposits located in the Fayoum region were tested. Separation of gage materials by beneficiation is best accomplished by wet processing methods; both laboratory and pilot plant studies have been completed. The resultant material is high in gypsum which limits its application. Thus it is most important that the additional bentonite deposits be evaluated.

Perhaps the largest potential use for Egyptian bentonites is as soil conditioners and stabilizers for land development. If economically recoverable amounts of bentonite clays are available and transportation costs can be minimized, very large quantities will be needed for this all important use.

The bentonite project at the NRC is managed within the Central Metallurgical Research and Development Institute (CMRDI) where very close working ties with end users are maintained.

PROBLEMS AND THEIR RESOLUTION

Rather than a discussion of the status of each project this section of the quarterly report focuses upon an assessment or review of program goals and program management which arose during discussions at JCC-X (November 27-29, 1983). The agenda did not explicitly include program assessment; the discussions arose as part of Dr. Badran's opening remarks to JCC members and the document presented by Dr. A.S. El Nockrasky. These presentations stimulated a review of program activities at the level of S&T strategy for development in Egypt. In the future JCC is expected to turn more formally to assessment and evaluation as a prelude to recommendations which may be made to USAID and to the Government of Egypt prior to the conclusion of Phase II.

I Program Assessment: Overview

In his opening remarks to JCC members, Dr. Ibrahum Badran set the stage for a future self-assessment of the Applied Science and Technology Research program by asking each one to consider:

- What are the tangible results from the various projects,
- How have end-users been brought effectively into the program,
- Have inputs such as training, consultants, and equipment been utilized effectively in the pursuit of project goals,
- Do projects address problems of priority national interest in Egypt, and
- In what ways , and by how much has productivity been increased as a result of this cooperative R&D effort.

These are difficult questions which JCC members agreed must be addressed, particularly as Phase II progresses and formal end-of-project reports are prepared for the AID and the Government of Egypt. The assessment process is one that begins with a re-examination of original objectives and goals for the program and each of its elements, but gives recognition to the dynamic aspects of the program which modified those objectives and goals over time. Factors to consider in the review include:

- The complex mixture of projects and subprojects in the Applied Science and Technology Research Program, their management and coordination,

- o Opportunities which arose to alter the direction of the work,
- o Obstacles which could not be anticipated at the beginning of the program,
- o Institutional factors affecting availability of personnel, contracting, and mobilization of resources, and
- o Economic and/or social factors which always condition the feasibility or acceptance of technical changes.

As one step in the review and assessment process, Dr. Gilbert White informed the JCC of the program review of NAS/NRC inputs and procedures to be conducted by the NAS/NRC Board on Science and Technology for International Development (BOSTID), the parent organization within which the Egypt program is managed on the American side of the partnership. Two BOSTID members, Mr. William Krebs (Vice President, Arthur D. Little, Inc, Cambridge, Massachusetts) and Dr. Ralph Smuckler (Director of International Programs, Michigan State University) will undertake a review of the NAS/NAC management and coordination. It is expected that the JCC itself, as it did during Phase I, will undertake a broad, overall assessment or formal evaluation of the entire program as Phase II nears its completion in 1984.

II Program Assessment: Management

In remarks prepared for the JCC by Dr. A.S. El Nockrasky, attention was focused upon program administration and management with stress upon the following:

o The Applied Science and Technology Research program launched new experiments in multi-disciplinary and multi-institutional R&D within the ASRT and NRC, with emphasis upon problems important to Egyptian economic development. Among examples cited was that of the More and Better Food demonstration project where strong ties of cooperation were fostered between the villagers (end-users) in Omar Makram and Kafr Al Khadra and National Research Centre scientists in agriculture, nutrition and health. The results in terms of improved agricultural productivity were immediately evident and led the Giza Governorate, which was not included in the More and Better Food program as one of the experimental sites to request a similar project, emphasing corn (maize) and soybean production.

o The international cooperation between Egypt and the United States which was a primary aspect of the Applied Science and Technology Research Program was designed to foster institutional change and technology transfer. This requires a learning process within the differing cultural traditions and management systems of both partners. Each of the partners underestimated the time, effort and degree of inter-action required to achieve the goals. Thus, delay in contractual arrangements on the American side as well as delay in approval for incentive payments on the Egyptian side were time consuming and resulted in the loss of momentum in project implementation.

o An important lesson learned is that technical competence on the part of project teams and advisory panels is a necessary, but not sufficient criterion for success. Active participation of end-users in planning implementation and evaluation is essential. Good management, with its corollary of good communication, is fundamental to success in a cooperative partnership.

o Finally, the result of the cooperation must always aim toward demonstrable utility for the end-users. Ingredients for that goal are technical feasibility, economic possibility, social compatibility and political acceptability.

III Program Assessment: New Directions

A major portion of the JCC discussions during the tenth meeting was given to three project areas: (a) New-Crops for Arid Zones, (b) Science and Technology Policy Planning, and (c) Red Sea Fisheries.

A. New Crops for Arid Zones

In reviewing the demonstration project "New Crops for Arid Zones" the conclusion of the special panel under Dr. Said Galal which was convened by Dr. Badran was that the emphasis had taken on a long term, perhaps excessively academic aspect. Field work, mainly for logistic reasons, had not received the emphasis that was required and time remaining in Phase II would be insufficient to achieve the original goals. Dr. Badran therefore requested that a re-orientation be made with a more concentrated focus upon one or two aspects of the project. While the exact nature of the reorientation was under consideration, the ASRT and the Ministry of Land Development would also initiate a study of Egyptian land reclamation experience to identify those factors which were successful. The study would also ascertain the causes of failures. Identification of the most productive and successful reclamation actions was recognized to be of great importance because of the national goal to increase the total area of reclaimed lands and place greater emphasis upon resettlement during the coming decade.

B. Science and Technology Policy Planning

The JCC meeting occurred just after the conclusion of the second S&T policy seminar. Each of the two seminars had been organized with an initial all-Egyptian discussion meeting followed by an international meeting with JCC members plus invited foreign participants. The initial reactions to both Seminar I (1981) and Seminar II (1982) were:

o Each had given attention to the developmental aspects of S&T policy planning in Egypt. The historical setting, changing institutional patterns and interactions with other areas of government planning had been covered. These were largely descriptive in their

nature but were important as a basis in the analysis and assessment process.

o Less emphasis was given to "S&T demand" from industry. This emphasis was also reflected in the participation - most of those attending were representatives of research and development producing institutions, although there was some representation from industry, the central planning sector of the government, and from the legislative branch (Peoples Assembly).

o In Seminar II differences between a "science policy" and a "technology policy" were discussed. Emphasis upon the latter was considered to be of greater priority for the third and final year of the S&T Policy Planning project. Remarks by Leo S. Packer, NAS/NRC Resident Program Director in Cairo, contrasting differences between "science" and "technology" as applied to problems solving situations and their relationships to the economic development process are given in Annex D.

o Recognition was given to the importance to Egypt of monitoring and assessing international technology developments to determine which areas are important for Egyptian economic development goals. There is no place where this is done systematically within Egypt at the present time.

o At the present time the relationships among technology policy, foreign trade, financing and investment for development, and education are not well integrated. Harmonization of policy planning needs much greater emphasis.

o Finally, recognition was given to the fact that Egyptian initiatives toward technology policy planning need long term attention. Although the 1981-1983 series of seminars are helpful, they must not be looked upon as a sufficient effort. The work needs to be properly broadened and institutionalized if its impact is to be productive.

C. Red Sea Fisheries

Once again the JCC expressed its concern for the Red Sea Fisheries activity. Although consideration was given to re-orientation as in the case of the Arid Lands Demonstration project, Dr. Badran stated that he had personally intervened to strengthen communications, coordination, and overall project management. Since personnel changes had been made and since contract negotiations with the Red Sea Governorate to rent a vessel suitable for the field trials were well advanced, Dr. Badran assured the JCC members that activities would be greatly accelerated in 1983.

ANNEX A

TENTH MEETING

JOINT CONSULTATIVE COMMITTEE

APPLIED SCIENCE AND TECHNOLOGY RESEARCH PROGRAM

Cairo, Arab Republic of Egypt

November 27-29, 1982

Report prepared by:

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

Board on Science and Technology for International Development
Office of International Affiars
National Academy of Sciences/National Research Council
Washington, D.C. 20418, U.S.A.

INTRODUCTORY NOTE

The Applied Science and Technology Research Program is a joint endeavor of the Egyptian Academy of Scientific Research and Technology (ASRT) and representatives of the United States scientific and technological community to strengthen linkages among Egyptian scientific and technological research and development activities in agriculture, health and nutrition, natural resources utilization, industrial productivity and other priority areas. Its aim is to help direct research toward applied problems and to improve the management of scientific and technological resources within the ASRT and its affiliated research institutes. Policy planning and management oversight for the program are the responsibility of a Joint Consultative Committee (JCC), composed of six members from Egypt and five from the United States. The President of the ASRT presides at the semiannual meeting of the JCC.

The tenth meeting of the JCC (JCC-X) was held at the Academy of Scientific Research and Technology, Cairo, November 27-29, 1982. Summary recommendations and conclusions of the meeting, the final agenda and the list of participants and observers are included in this document.

The organizations participating in the Tenth JCC meeting were:

- Egyptian Academy of Scientific Research
- Institute of Oceanography and Fisheries
- National Information and Documentation Centre
- National Institute for Standardization
- Egyptian Organization for Standardization and Quality Control
- Scientific Instruments Centre
- U.S. National Academy of Sciences/National Research Council
- U.S. National Bureau of Standards
- U.S. National Institutes of Health
- The Georgia Institute of Technology
- The University of Wisconsin

I. General

At the tenth regular meeting of the Joint Consultative Committee (JCC) for the Applied Science and Technology Program, the group conducted its review of the program elements, implicitly addressing four important questions:

- What is the evidence that the program is achieving its stated objectives for each major element,
- What were the major problems encountered during the course of implementation,
- What experience was gained and what specific lessons were learned, and
- How can the elements of success be maximized and continuity be maintained, particularly whenever the present joint program is terminated.

The review was conducted to analyze results of: (a) Science and Technology Policy Measures activities, (b) the institutional development activities, and (c) the individual demonstration and research and development (R&D) projects, recognizing that most of these elements were initiated during the Phase I period (1978-1981) and therefore have a history, or maturity which now permits valid assessment. Furthermore, the JCC can draw upon its own perspective gained from a continuity of 5 years of working together; from reports furnished by the principal investigators, project leaders, consultants and staff; from occasional visits to the laboratories, villages and places of project implementation; and from comparing the Applied Science and Technology Research Program to other institution building activities carried on under other sponsorship of the ASRT and its associated research institutes.

II. Science and Technology Policy Measures

The discussions on the Science and Technology Policy Measures Project were held immediately after the policy measures seminar entitled "Towards a Technology Policy for Egypt: Seminar II" held on November 24 and 25, 1982 in which eight of the ten JCC members plus its chairman, Dr. Ibrahim Badran, ASRT President, were participants.

The JCC recognized that a technology policy planning process must be a continuous one and is inherently difficult because it should be both responsive to, as well as implicitly directive of, major elements of the Egyptian national development plan.

In order to advance the process of technology policy planning for Egypt in the ASRT, the JCC recommended that:

- One or two well-targeted policy studies be selected and implemented immediately.

- o The policy studies be chosen after consultation with appropriate authorities.

- o Overall guidance to the studies be given by the JCC itself, recognizing that an appropriate full-time, experienced team needs to be contracted using project funds.

- o A goal of 100 days be set for completion of the first study so that the JCC may give it critical review at the May 1983 JCC meeting in Washington.

- o Other activities envisioned under the plan for the S&T Policy Measures Project need to be undertaken immediately, always with full knowledge and involvement by JCC members themselves.

III. Institutional Development Activities

A. Scientific and Technical Information System (STI)

The JCC received a report from the project manager and from the contractor representative of the STI project which highlighted the following:

- o The contract with the Georgia Institute of Technology has been formally signed and will continue until May, 1985.

- o During the contract negotiation period the ASRT financed continuing activities which permitted the recruiting of the project manager, completion of the project plan, and presentation of the project plan to a panel of ministers whose organizations will be among the principal clients of the information services.

The JCC recorded its appreciation to the Georgia Institute of Technology for reducing its overhead on the STI project.

The JCC noted the importance of including the user community actively in the development process for the STI system. It is urgent that representatives of users, including policy-level representatives of the relevant ministries, industry, universities and institutes be identified to meet regularly with the contractor and the project manager. The importance of full time representation (6 months/year) of Dr. Slameka for the project was emphasized by the committee chairman and the Egyptian panel.

B. Instrumentation Technology

The JCC received from the NIH an evaluative report on the status of repair and maintenance (R&M) centers for scientific equipment at Alexandria, Tanta, Cairo, El-Minia and Assiut Universities as well as a planning report on the development of the R&D training program of the Instrument Technology Unit of the Scientific Instrumentation Centre.

The JCC also received a report from the University of Wisconsin on the status of equipment procurement activities. At this time final procurement is in process at a level of about 20 percent of the equipment budget. Progress in sub-contracting logistic arrangements for equipment delivery was also reviewed as well as early stages of establishing the information center for the Cairo based procurement function and the management plan with related training activities for the Instrumentation Training Unit (ITC) of the Scientific Instruments Centre. The importance of the presence of Mr. Falk in Egypt for a significant period was emphasized.

C. Standards and Measurements

The JCC received a report from the U.S. National Bureau of Standards, the Egyptian National Institute of Standardization and from the Egyptian Organization for Standardization and Quality Control which are the principal cooperating organizations* for the standards and measurements project noting that implementation is following the original management plan for a three year (1982-1983-1984) cooperative effort.

Training of individuals at the NBS in the United States is proceeding according to the plan; procurement of major equipment items is also proceeding as planned and the effort to involve end-users in Egyptian industry and the appropriate ministries will follow in 1983. If success is ultimately to be achieved, it must be in terms of standards and measurements services to Egyptian industries. Therefore, this program element must be directed toward obtaining continuity of support from Egyptian institutions, the Egyptian Government, and from the industrial sector after the completion of the Applied Science and Technology Research Program.

IV. Demonstration and R&D Activities

A. More and Better Food

The Joint Consultative Committee appreciated the progress made in the two villages of the project and stressed the importance of:

- Coordination of efforts with the Food and Agriculture Research Council of the Academy of Scientific Research and Technology.

- Planning efforts through the Council for the initiation of integrated rural development activities.

*One project element involves the Assay and Weights Department of the Ministry of Supply and Internal Trade.

- o Cooperation of the Council in the selection of additional demonstration villages as proposed during the ninth JCC meeting.

- o Work toward the institutionalization of experience gained through this project and on similar projects, and applying the results to a national program for rural development.

- o Work toward continuity of activities at the village level to maintain services to the farmer using appropriate Egyptian agencies and ministries when the Applied Science and Technology Program and its More and Better Food Project are terminated.

B. Biogas

The JCC received the report of the Biogas project and

- o Approved the extension of the project for one additional year (through December 1984) within the limits of the budget currently allocated, and

- o Endorsed the current plan for large-scale digestor R&D activities with the objective of enhancing engineering design to minimize technological and socio-economic constraints.

C. New Crops

The JCC realized the need to reorient the action program of the New Crops for Arid Zones project with consideration for:

- o Appraisal of the scientific grounds for policy development of marginal quality land and water resources in different areas of Egypt,

- o Incorporating principles of rational land and water use, management and conservation into appropriate resource legislation, and

- o Providing a sound scientific basis, with full consideration given to prevailing socio-economic conditions, for practical soil improvement and conservation measures.

The JCC recommended that a proposal be developed for canvassing and appraising the available scientific information and methodology as a basis for demonstration in an area designated by the Minister of Land Reclamation in Egypt in the past few decades.

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D. Bentonite Clays and Phosphate Ores

The JCC received reports from the principal investigators of the bentonite clays and phosphate ores R&D projects. In each case the technical content and reporting were recognized to be very good. A point of concern of one JCC member is that of full utilization of information and other resources of the Mineral Resources and the Egyptian Geological survey. The JCC was informed that data and contacts with officials from those agencies were utilized when the bentonite and phosphate projects were planned and that formal mechanisms for coordination and information gathering continue during the implementation of activities.

E. Corrosion

The JCC received the report of the Corrosion R&D group noting their activities relating to corrosion failure in Egyptian steels, preparation of corrosion inhibitors, corrosion monitoring at the Suez Oil Refinery, and operation of the ESCA equipment.

Concern was expressed that the project adhere very closely to the objective of assistance to the petroleum industry.

F. Wool Scouring and Wool Wax Recovery

The JCC received a report from the Wool Scouring and Wool Wax group noting that the project has transferred and adapted a process technology utilized extensively elsewhere and is about to begin testing of that process at the Misr Beida Dyers Factory near Alexandria. Full scale tests are expected to be completed prior to the meeting of JCC-XI.

With the remaining resources and time available the project will investigate recovery methods for lanolin as originally outlined in the project plan.

Following the review of the Wool Scouring and Wool Wax Recovery project the JCC discussed opportunities for adaptive R&D in cotton textile technology and mixtures of cotton-polyester blends. This area of R&D was recognized to be one of great interest to the Egyptian textile industry.

The JCC recommended that a proposal be developed for its review of activities which might require adaptive R&D, consultation, and marketing studies. Two proposals dealing with cotton textile technology were distributed during the meeting for the review process by JCC.

G. Pharmaceuticals

The JCC received the report of the Pharmaceuticals R&D project noting that its implementation is at an early stage and that the absence of key chemical intermediates and equipment have delayed project implementation.

H. Red Sea Fisheries

Notwithstanding strong reservations expressed by some JCC members, it was decided to continue the Red Sea Fisheries project for one additional year provided the ASRT President received assurances of its feasibility by the princial investigator within 15 days of the JCC-X meeting.

The JCC also asked that by their next meeting (May 1983) a detailed administrative and technical progress report be submitted for its review. The report should include information gathered from work at the site as well as manpower inputs (time spent on the project by the principal investigator, scientific and support staff, time on site at the Red Sea, time at sea, etc.)

I. Research and Development Management

The JCC realizing the importance of having an overall scheduled R&D management program within the ASRT and the NRC received an oral report on that program and recommended that:

- The Blackledge report be used as a frame of reference for the action program.
- Program elements should include:
  - -- Expansion of management capability
  - -- Training and Internships
  - -- Workshops and Seminars
  - -- Management offices
  - -- Case studies on local problems
- The R&D management training be directed to all levels of management: top-management leaders, professional program managers, technical staff, and council and committee personnel of ASRT.
- The R&D management activity should focus on strategies or mechanisms to:
  - -- Improve organizational structure and function,
  - -- Make effective utilization and development of human resources,
  - -- Demonstrate coordination with other institutes and sectors.

- o One representative each from the American and Egyptian JCC panels be informed of program status prior to the May 1983 meeting.

V. JCC Meeting

The date and site for the next JCC meeting have been set for May 9-11, 1983, in Washington, D.C.

Final Agenda

TENTH MEETING, JOINT CONSULTATIVE COMMITTEE
Applied Science and Technology Research Program
Egyptian Academy of Scientific Research and Technology (ASRT)
National Research Centre (NRC/Cairo)
U.S. National Academy of Sciences/
National Research Council (NAS/NRC)

Cairo, Egypt
November 27-29, 1982

Saturday, November 27, 1982

Second Floor, Meeting Room
ASRT
101 Kasr El-Aini Street

Morning Session

9:00 a.m.	Executive Session	Egyptian and U.S. Panel Members Joint Consultative Committee
10:00 a.m.	Opening Session	Ibrahim Badran
	Welcome	Chairman, JCC
	Response	Gilbert White U.S. Panel, JCC
	Remarks	Michael Stone Director, U.S. AID Missio/Cairo
	NRC Status Report	Mohamed Kamel Director, NRC
	Administrative and Management Report	A.S. El-Nockrashy General Coordinator Applied S&T Research Program
	NAS/NRC Report	Leo Packer NAS/NRC Resident Program Manager
11:15 a.m.	(Break)	
11:30 a.m.	"TOWARDS A TECHNOLOGY POLICY FOR EGYPT" - Seminar II	I. H. Abdel Rahman JCC Member
11:50 a.m.	DISCUSSION	

1:00 p.m. Luncheon, honoring JCC Members

Afternoon Session

INSTITUTIONAL DEVELOPMENT PROJECTS

3:00 p.m.	Scientific and Technical Information System	V. Slamecka Program Director, Georgia Inst. Tech. N. Aly Program Manager, Georgia Inst. Tech.
3:30 p.m.	Instrumentation Technology	M. Eden Program Director, NIH M. Shalcoot Program Manager, NIH N. Huston Dir., Instrumentation System Center, U. Wisconsin
4:00 p.m.	Standards and Measurements	K. Heinrich Program Director, NBS
4:30 p.m.	Discussion	A. Dawoud Director, National Inst. of Standardization F. Sobhy Director, Egyptian Org. for Standardization and Quality Control

SUNDAY, NOVEMBER 28, 1982

Morning Session

9:00 a.m.	More and Better Food	O. Galal, NRC
	New Crops for Arid Zones	A. El-Beltagy, Ain Shams. Un.
	Bio-Gas	M. El-Halwagy, NRC
10:00 a.m.	Wool Scouring	A. Kantoush, NRC
	Phosphate Ores	A. Yousef, NRC

	Corrosion	T. Saber, NRC
	Fisheries	H. Shaheen, Inst. Oceanography and Fisheries
10:45 a.m.	Bentonite Clays	A. Abdel-Azim, Central Metallurgical Research & Dev. Inst.
	Pharmaceuticals	E. Abdel-Hamid, NRC
11:20 a.m.	Discussion	
12:30 a.m.	Executive Session	Egyptian and U.S. Panel Members Joint Consultative Committee
1:30 p.m.	Lunch	
3:30 p.m.	Final Report and Recommendations.	

MONDAY, NOVEMBER 29, 1982

Visit to Village of Kafr El Khadra
(More and Better Food)

List of Participants, Invited Guests and Observers

Tenth Meeting
Joint Consultative Committee
Applied Science and Technology Program

Cairo, Arab Republic of Egypt November 27-28, 1982

Egyptian JCC Members

- Dr. Ibrahim Badran
  President, Adademy of Scientific Research and Technology

-Dr. Abdel Aziz Hegazy
Ex-prime Minister and President, Commerce Sindicate

-Dr. Ibrahim Helmy Abdel Rahman
Counsellor, Prime Minister

-Dr. Hassan Ismail
Ex-President, Academy of Scientific Research and Technology

-Dr. Moustafa El-Gabaly
Ex-Minister of Agriculture and Land Reclamation

-Dr. Mohamed El-Kassas
Professor of Botany, Cairo University

U.S. JCC Members

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

-Dr. George Bugliarello
President, New York Polytechnic Institute

-Dr. Mary E. Carter
Associate Administrator, Agriculture Research Service
U.S. Department of Agriculture

-Dr. James Hillier
International Consultant

-Dr. F. Karl Willenbrock
School of Engineering and Applied Science
Southern Methodist University

-Dr. Leo S. Packer (ex officio)
NAS/NRC Resident Program Representative

Egyptian Advisors

-Dr. Mohamed Kamel
Director, National Research Centre

-Gen. Dr. Mokhtar Hallouda
President, Central Agency for Public Mobilization and Statistics

-Dr. A. Abdel-Latif
Vice President, Academy of Scientific Research and Technology

-Dr. Yehia Kabil
Cultural Counselor
Director, Education Bureau, Embassy of Egypt
Washington, D. C.

-Dr. A. S. El-Nockrashy
Director, International Secretariat, ASRT and
General Coordinator, Applied S&T Research Program

-Dr. Osman Galal
Head, Child Health Laboratory, National Research Centre
Director, National Institute of Nutrition and
General Coordinator at NRC for technical aspects of the Program

National Academy of Sciences

-Mr. Jay Davenport
Senior Staff Officer, Egypt Program, BOSTID
NAS/NRC Washington

-Mrs. Maryalice Risdon
Staff Assistant, Egypt Program, BOSTID
NAS/NRC, Washington

Egyptian Program Managers: Academy of Scientific Research & Technology

-Dr. Hatem Ali, Food & Agriculture (Animal Sciences)

-Dr. M. H. Fadl, Technology Transfer & Natural Resources

-Dr. S. Fayed, Health & Environment

National Bureau of Standards

-Dr. Kurt Heinrich
Head, Office of International Programs

National Institutes of Health

-Dr. Murray Eden
Head, Biomedical Engineering and Instrumentation Branch

-Mr. Howard Metz
Biomedical Engineering and Instrumentation Branch

Georgia Institute of Technology

-Dr. Nabil Ali, Program Manager,
Science & Technology Information Systems Project

-Dr. Vladimir Slamecka
School of Information in Computer Science

University of Wisconsin

-Dr. Norman Huston
Director, Instrumentation Systems Center

-Mr. Edward Falk
Executive Director, Instrumentation Systems Center

U. S. Embassy, Cairo

-Dr. Thomas Vbrebolavich
Science Counsellor

Agency for International Development

-Mr. Michael Stone
Director, USAID Mission in Cairo

-Mr. Owen Cylke
Deputy Director, USAID Mission in Cairo

-Dr. Howard Lusk
Asst. Director, USAID Mission in Cairo

-Mr. James Riley
Head, Science and Technology Division
USAID Mission in Cairo

-Mr. Bert Porter
Asst. Egypt Desk Office, Bureau for the Near East,
AID, Washington, D. C.

-Ms. Carolyn Coleman
Project Officer, Science and Technology
Bureau for the Near East
AID, Washington, D.C.

-Ms. Nadia Henein
Project Assistant, Science and Technology
USAID Mission in Cairo

-Ms. Janice Weber
Project Officer, Science and Technology
USAID Mission in Cairo

-Dr. Sherif Arif
Project Officer
Science and Technology
USAID Mission in Cairo

Egyptian Project Representatives

1. More and Better Food
   Dr. Osman Galal, Head Child Health Department, National Research Centre/Cairo

2. Bio-gas Technology

   Dr. M.M. El-Halwagy (Principal Investigator)
   Head, Pilot Plant Department, National Research Centre/Cairo

3. New Crops for Arid and Semi-Arid Zones

   Dr. H.S. Abd-El Rahman, Head Division of Plant Pathology and Pest Control, National Research Centre/Cairo

   Dr. A. El-Beltagy, Faculty of Agriculture, Ain Shams University

4. Bentonite Research

   Dr. A.A. Abdel Azim
   Head, Central Metallurgical Research & Development Institute,
   National Research Centre/Cairo

5. Phosphate Ores and Chemical Processing

   Dr. Aziza Yousef (Principal Investigator)
   Head, Ore Benefication & Chemical Processing Laboratory
   National Research Centre/Cairo

6. Wool Scouring and Wool-wax Recovery

Dr. A.M. El-Borai (Project Manager)
Manager, Misr Beida Dyers Processing Company

Dr. A.A.M. Kantoush (Principal Investigator)
Head, Division of Textile Research, National Research Centre/Cairo

7. Corrosion Research

Dr. Talaat Saber (Acting Principal Investigator)
NRC, Cairo

Dr. Abdel Ghani El-Hosary
NRC, Cairo

8. Pharmaceutical Research

Dr. Effat Abdel Hamid, NRC

9. Red Sea Fisheries

Mr. Hamdy Shahin, Institute of Oceanography and Fisheries

10. Information

Dr. A.M. Gad
Head, National Information & Documentation Centre

11. Instrumentation

Eng. M. Shaltoot, Program Director (NIH)

Eng. Ahmed El-Alaily, Director, Scientific Instruments Centre

Dr. Mahfooz Kasem, NRC

Dr. Nabil M. Saleh, Division of Chemical Industry Research, NRC

12. Standards and Measurements

Dr. Abdel Fatah Dawoud
Director, National Institute for Standards

Dr. Fouad Sobhy, Director Organization for Standardization and Quality Control, Ministry of Industry

Mr. Saad Zaghlool, Director Assay and Weights Dept., Ministry of Supply and Internal Trade.

ANNEX B

SUMMARY REPORT ON ADMINISTRATIVE MANAGEMENT

APPLIED SCIENCE AND TECHNOLOGY RESEARCH PROGRAM

Remarks by Dr. A. S. El-Nockrashy
Director, International Secretariat, ASRT, and
General Coordinator, Applied S&T Research Program

Tenth Meeting, Joint Consultative Committee

Cairo, Egypt

November 27-29, 1983

Mr. Chairman
Distinguished Members of the J.C.C.
Ladies and Gentlement

The tenth meeting of the Joint Consultative Committee marks five years of joint cooperation in the Applied Science and Tecnology Program. When I started to prepare the elements of by talk, I felt it important to present an analytical view of the overall activity. In doing so my aim is:

- o To give to the JCC background information that might be of value in setting their conclusions and recommendations.

- o To help the Academy in setting strategies and plans for coordination of efforts with similar programs in other ministries, and to work towards insititutional of activities.

- o To have some guidelines for future US-Egyptian cooperation, especially in areas of S&T.

Ladies and Gentlemen

In my presentation I will address four questions.

(1) How far did the Applied Science and Technology Project achieved its stated goal?

(2) What were the major problems encountered in the course of action?

(3) What are the lessons learned, and the experience gained?

(4) How can we maximize the elements of success and work towards the continuity of efforts beyond the termination of the project?

Certainly I am not going to cover everything. This would have taken 3 months full time preparation and would require 3 hours presentation. However, I will try to emphasize in a summary form major issues giving some example..

FIRST: PROGRAM GOALS AND STATUS AS TO DATE

The Applied Science and Technology Project was established to:

- o Strengthen the role of the Academy and the NRC in organizing and executing applied research directed to national needs, and initiate broad institutional and attitudinal changes toward applied R & D in Egypt's scientific community.

- o Established linkages between research institutions and user groups in industry and agriculture.

- o Support institutes with equipment and instrumentation facilities, develop skills for repair and maintenance of scientific equipment and design a national scientific and technical information network.

To affect organization and institutional change the program gave priority to R&D and institutional management. Training programs on R&D management, R&D marketing, technoeconomics and technology assessment, productive R&D, contracting and contract negotiations were undertaken.

Participants trained	122
No. of institutes	15
Total man days Mgt. Training	1400

Last year the academy restructured its organization. The new structure gives priority to two major functions:

- o Integration of efforts of the scientific community at large to work on projects serving national development priorities with actual involvement of the concerned sectors and users in program executions. Here I would refer to programs initiated by the Academy and adopted by the government and the public and private sectors in:
  - -- Fish farming
  - -- Hybrid Corn
  - -- Rice

- o Institutionalization of activities as a guarantee of continuity, especially in training and functions of multi-institutional interests.

As mentioned before, the fundamental goal of the program is to link research institutes more closely with end users so that sponsored R&D become major and growing functions of research centres.

Here I would give few examples:

- o Ore Beneficiation and Chemical Processing

  The project brought the NRC in close collaboration with the Egyptian phosphate producers. Contracts totaling LE 45,000 have been fulfilled during the period 1980-82. The same group signed contracts with the iron & steel industry totaling about LE 120,000.

- o Bio-Gas

  The team has received a number of inquiries from private and public sectors, which indicate the broad appreciation for the development of a renewable energy resource in Egypt. Contacts were made with

-- VITA "Volunteers in Technical Assistance"
-- ORDEV "Organization for Development of Egyptian Village"
-- Ministries of Defense and Energy
-- 2 - 3 private farms

o Pharmaceutical Industry
The project is executed with seven Egyptian pharmaceutical companies.

o Bentonite
More than six industries are involved, in such areas as foundries, construction, petroleum, and vegetable oil manufacturing.

o Wool Scouring and Wool Wax Recovery
This is a joint activity with Misr Beida Dyers Company. The project supplied equipment to the company at a cost of $220 thousand the balance of $130 thousand has been paid by the company to complete operation lines. The project provides a scouring line for pilot plant testing.

o More and Better Food
This project marks the first move for the NRC to village with multidisciplinary teams. It provides an excellent example for interaction between practical farmer villagers and NRC scientists. Aside from the success achieved in the many projects the overall activity was of great importance in enabling the NRC to practice management of large programs and to gain confidence as it moves forward towards implementation at a governorate level.

Equipment support and services through the project include:

o Equipment Purchase:
Phase I: $4.5 million out of $8.1 million
Phase II: $5.95 million and LE 1.03 million out of 16.3 million.

o Material testing laboratory was established at the NRC and equipped to serve industries of textile, ceramics, polymers, paper, and pharmaceuticals.

o All phase I equipment was delivered and installed. Equipment orders for 9 out of the 12 projects of phase II are presently procured.

o Training on repair and maintenance that took place in the University of Wisconsin and the NIH was limited to small numbers. Workshops were established in the NRC and 5 universities.

Scientific and technical information received top priority in Academy plans. The Academy with the support of all concerned ministries is presently leading a national campaign to unify and strengthen information systems. The design stage of the S & T information system network provided through the project is now being revised for implementation.

SECOND: PROBLEMS ENCOUNTERED IN THE COURSE OF ACTION

Problems of General Nature

Until recently the project faced problems of:

- o Delay in contractual agreements
- o Local materials and supplies funds (LMS)
- o Salary incentives
- o Equipment procurement procedure

All four constriants have been solved:

- o With the signature of STI contract a couple weeks ago all projects have been contracted for.
- o LMS was approved and put in place in June 1982. The total expenditure since then is 110,000.
- o Salary incentives were approved August 1982 and payments were authorized on a quarterly basis. The first payment was released last September.
- o A new procedure was jointly instituted by U. W., -ASRT, -AID, and -NAS for equipment procurement and delivery. Certainly, great improvement is being achieved, yet further efforts can be made to shorten the decision process.

Management Problems

Here I am citing three examples:

- o Management of multi-institutional programs. The three demonstration projects: (1) More and Better Food; (2) Biogas Technology; and (3) New Crops for Arid Zones. Though all three are multi-institutional, Arid Lands Project required a consortium-type management committee among three participating institutions, which was difficult to coordinate their efforts and plan activities together.

- o The More and Better Food that is presently implemented in two villages included some 20 projects directed to improve production. Though all projects succeeded and found great application both in the two villages and spread to include other villages, the NRC lacks experience in putting together comprehensive plan for rural development making use of collected baseline data.

- o The "diffusion problems". Where does the role of the R&D sector end and where does the sector involved take over especially in demonstration projects? This is an important question that both sectors have to solve.

Technical Problems

I am going to leave it to team leaders but I will mention three problems of general nature:

- o Repair and maintenance of sophisticated equipment that must be done by technicians with special training, e.g. the ESCA instrument for the corrosion project (a contract with the manufacturer has been signed) and equipment that will be purchased for the Standards and Measurements Project.

- o Delay in action by the user sector. For examples, to fulfill the plan of action for the corrosion project, the deslater unit in the petroleum refinery must be taken off-line and modified. The management at the refinery must arrange so that overall down-time in operation is minimized, a similar problem exists in the wool scouring project. Both problems were solved recently.

- o Problems of transferred technologies when adapted to environment Biogas and Egyptian village structure increased productivity of tomato crop and problems of marketing.

THIRD: LEARNED LESSIONS AND EXPERIENCE GAINED

1. The success of multi-institutional, multidisciplinary programs depends to a great extent on an efficient management control system. Experience through the More and Better Food and the Biogas projects may reveal the following as criteria for success of similar programs:

   - o Having one organization contracted for implementation. The organization can in turn subcontract for activities with other organizations.

- o How strong the management role of the steering committee and the leadership quality.
- o Starting implementation only after having well defined studied, and tested plans.
- o Giving priority to simple and appropriate technologies that can be absorbed by the user.
- o User participation in all project activity, if not complete involvement.
- o Easy diffusion of information
- o Economic and social aspects have to be assessed before project implementation.

2. Institutes like the NRC should consider work on productive R&D Projects as a major function. Here supporting managerial systems to plan, organize, direct, control and evaluate projects should be established in R&D institutes to enhance the request for services by the user sectors.

3. Establish an effective and active feed-back mechanism that takes the problems from the site of implementation to the institute. Here is a good example: El-Tahady district neighbouring Omar Makram, Behara Governorate, has 6500 feddans growing peanuts, which makes it a major peanut cultivating area. For the last four year, the croppage has been dropping tremendously from an average of 11 to 3-5 Ardab/feddan. Watching the achievement of the peanut project in Omar Makram (255 acres producing average 37 Ardab/feddan) the farmers contacted the NRC for help. A team was assigned to study the case. Working on 5 feddans the problem was diagnosed and treatment with nematicide (Furidan) and fungicide (Daconil) raised the production to 34 Ardab/feddan. Next year implementation on an area of 500 feddan is considered.

4. Good interaction between the Egyptian team and the U.S. advisory panel, especially when the panel has broad application experience, is generally reflected in the performance and project achievements (e.g., the Biogas and Phosphate projects).

5. Motivation, career development, and participative management are important humanistic factors.

FOURTH: MAXIMIZING SUCCESS & CONTINUITY

The elements of success can be summarized as follows:

- Move from laboratory to site of implementation in all projects (More & Better Food in Omar Makram & Kafr Al-Khadra; New Crops in Bahria Oasis & Mariot; Phosphate in Kafr El-Zyat Fertilizer; Wool Wax in Kafr Al-Dawar Beida Dyers)

- Experience gained in management of multidisciplinary multisectorial projects

  e.g. More and Better Food

	Number
Personnel (Technical)	200
Specialities	11
Institutes/Organizations	7

- Coordinating effort with U.S. scientific and technical organizations and other international agencies.

Total number of personnel in the project	over 600
Number of institutes	25
Number of U.S. organizations involved	Phase I:6 Phase II:5
Number of U.S. organizations contacted or offered facilities through training	
Universities	33
U.S. Federal & State Gov. Agencies	32
Private Ind. & Corporations	31
Other Organizations	13
Meetings	9

Visits to countries other than the U.S.A.:
China
Thailand
India
U.K.

- User request for services
  Examples:
  -- Biogas: more than eight requests including VITA, ORDEV, Ministries of Defense and Energy, private farms.

  -- More and Better Food: Al-Tahady district and villages neighbouring Omar Makram and Kafr Al-Khadra, Kafr Al-Ziat Salt and Soda Company.

  -- Phosphate: New contracts with Phosphate industry and iron and steel industry.
  Management training requests.
  Repair and maintenance training requests.
  Integration of efforts in unifying information systems.

Maximizing success and plans for continuity of effort should consider the following elements:

- o Institutional reorganizations to allow more appropriate managerial system that can activate requests of users for research services and act effectively in meeting users needs.

- o Management of multi-institutional program is an area that needs further training and consultancy.

- o Expansion in the cooperation between the research teams and the industries where the R&D projects took place.

- o Search for new joint R&D activity with other industries, considering that one of the key elements in the success of a project is the participation and te involvement of the user.

- o Special emphasis on techno-economic aspects and cost benefit ratio related to R&D projects.

- o Institutionalization of activities, especially training, as a guarantee to continuity.

- o Priority should be given to the establishment of a strong scientific and technical information system.

- o More support to the feedback of problems from the field to the research organizations.

- o Coordination of efforts with ministries of production and services together with the establishment of a system that helps the easy flow of information and guidance.

- o The methodology for fostering strong programs of integrated rural development is so imperfectly understood workshops and consultants that focus on multidisciplinary activities of integrated rural development are needed. The experience gained through the More and Better Food Project and similar projects nation wide should be incorporated into a national effort.

ANNEX C

PHASE II

Research and Development Management Project

at

The National Research Centre

APPLIED SCIENCE AND TECHNOLOGY
RESEARCH PROGRAM

Prepared by
Dr. Nabiel A. Saleh
NRC

Cairo, Egypt
December, 1982

CONTENTS

I. Background

In accordance with instructions of the Joint Consultative Committee, during its 9th meeting an Ad-Hoc committee was assigned the responsibility to design the R & D Management Project. This was to be implemented during Phase II of the Applied Science and Technology Program (No. 263-0016).

According to the report prepared by Mr. J. P. Blackledge which was based on the study of the Ad-Hoc planning committee, the objective of the Phase II R & D Management Project is "To strengthen existing R & D management capabilities in Egyptian Science and Technology organization at the national, institutional and project levels, and to institutionalize elements of R & D management and training in Egypt."

With this report in mind, and considering the existing R & D Management capabilities, the Director of the National Research Centre assigned the responsibility of planning the Phase II R & D Management Project for the NRC to the Executive Advisory Committee, Dr. Osman Galal and Dr. Nabiel Saleh. Dr. Saleh will act as the coordinator for the R & D Management Project at the NRC.

The present R & D Management Project represents the net result of a number of memos by Dr. O. Galal (October 15, November 9th, 1981 and October 30th, 1982) as well as inputs by the Executive Advisory Committee, comments on the Blackledge report and the Blackledge report itself.

It is hoped that the planned activities hereby presented will provide a mechanism for directing the efforts of the NRC science and technology infrastructure towards increased utilization of R & D management skills, which in turn would lead to improvement in interaction between the NRC and end-users. Furthermore, the number of researchers are expected to increase their involvement in R & D management.

II. Present Capabilities at the NRC in R & D Management

The NRC is a multidisciplinary research centre, a feature which made it unique among other institutes in the country. During the last decade it became clear that a new management system was needed to direct its scientific infrastructure to be geared to the national developmental plan. To carry this out, a gradual turn from "self-oriented" to "client-oriented" research was started late in 1975.

This re-orientation included the establishment of five multidisciplinary programs which focused on priority developmental areas:

1. Technology Transfer,
2. Agriculture and Nutrition,
3. Health and Environment,
4. Natural Resources,
5. Energy

Recently, two new programs were also developed:

6. Rural Development,
7. Basic Sciences

These programs are not developed to replace the administrative structure of divisions and laboratories, but rather to provide an integrated network to foster multidisciplinary collaboration. This was followed by a number of changes in the management structure at the NRC summarized as follows:

a) Since late 1975, the NRC institutionalized a formal system for project proposal submission, review, approval and control. This system was developed to implement and monitor in-house projects through the Programming Office. Recently, this office has also been given the responsibility of reviewing and approving local and foreign projects in addition to the in-house ones.

b) A marketing activity was started at the NRC in the form of a marketing committee to undertake the systematic marketing of the NRC R & D activities. This committee was developed into a Marketing Office with representatives of the NRC research programs.

c) Since 1977, a techno-economic studies group has been established at the NRC, Pilot Plant Laboratory. This group undertook several pre-feasibility studies both for in-house projects as well as outside clients.

d) In 1981, a four-member Executive Advisory Committee was established to assist the Director of the NRC in aspects related to R & D Management. One of the major efforts of this committee is to institutionalize a sound "Project Oriented Management System."

e) During the period from 1980-1982, senior researchers of the NRC conducted a series of training courses for representatives of Egyptian science and technology organizations. Thirteen researchers presented two courses during the three-year period to 127 participants from 37 organizations, including 25 from the NRC.

The above management changes thus represent a sound base for R & D Management. However, to improve the existing system, the present proposal is the first step towards the building of a strong R & D Management capability at the NRC. This will improve and up-grade the performance of the existing offices mentioned above, as well as the additional ones proposed below. It is planned to up-grade the scientific infrastructure, through a definite plan for training courses, seminars and workshops.

III. Objectives

A) R & D Management Offices

Figure I represents the organizational structure of the R & D Management structure at the NRC as envisaged, based on existing activities and new proposed areas. The structure will include five specialized offices: 1) Monitoring, evaluation and control, 2) Programming, 3) Marketing, 4) Techno-Economics, 5) Foreign Research Contracting. A Central Secretarial Office will be affiliated to the first office to serve all five offices. The role of each office is given below in detail in the form of objectives and duties. The interaction of the offices is planned as follows: The Marketing Office would make the initial contacts with the NRC Science and Technology capabilities and end-users to probe the possibilities and prospects of project ideas. If prospects are favourable, the Programming Office would make the preliminary checks, nominate a tenative team and supervise the formulation of a preliminary proposal. This is then referred to the Techno-Economics Office for evaluation. Based on criteria set by the Programming Office, the project proposal is rated to allow a final decision for approval or rejection. Contractual arrangements would then be finalized through the Foreign Contracting Office. The project will then be executed by the research team. Through a project review system, the Programming Office will follow the project through progress reports. Once the results to be achieved from the project are finalized, they are referred to the Techno-Economics Office to undertake a pre-feasibility study, based on which, decisions on the direction and future of the project can be taken. The resulting package would then be transferred to the Marketing Office to communicate it to the end-user and follow-up its implementation.

The role of each of the five offices is given below:

1) Monitoring, Evaluation and Control

- -- Participation in the formulation of the R & D policy of the NRC.
- -- Coordination and approval of strategies of all R & D offices.
- -- Collection and analysis of data and information concerning the Science and Technology infrastructure.
- -- Participation in the evaluation process of organization and management of the NRC.
- -- Participation and follow-up of the relationship between the R & D policy of the NRC and the national science and technology policy.
- -- Participation and follow-up of the relationship between the R & D policy of the NRC and that of the Academy of Scientific Research and Technology.
- -- Preparation of follow-up quarterly, semi-annual and annual reports.

2) Marketing Office

-- Marketing of the R & D results achieved by the NRC.
-- Promotion of interactions between the NRC scientific community and various end-users and relevant organizations.
-- Identification of R & D activities needed by productive and service sectors.
-- Publicizing the NRC science and technology capabilities and accomplishments.
-- Communication of R & D results and follow-up of applications.
-- Cooperation with local and foreign agencies and organizations in joint R & D projects that serve the NRC research and support of mutual relations between them within the framework of R & D marketing.
-- Additional activities to include marketing forecasting and investigation of new technologies, national needs, and new fields of research.

3) Techno-Economics Office

-- Conducting opportunity studies for R & D projects at an early stage of development for preliminary screening. Only viable projects are to be subjected to succeeding stages.
-- Conducting prefeasibility studies at intermediate stages of laboratory and bench-scale experiments and before executing the pilot-scale experiments.
-- Conducting full-fledged feasibility studies at the last stage of R & D project.
-- Participating with the executing team in the preparation of the technology package.
-- Conducting feasibility studies on contractual basis for projects of interest to end-users (other than R & D).
-- Assisting the Programming Office in the evaluation of R & D programs.
-- Assisting the Contracting Office in formulation of projects' financial requirements.
-- Additional activities to include market analysis (in conjunction with the Marketing Office), preliminary engineering designs, technology forecasting, economic forecasting (in conjunction with the Contracting Office), financial and economic analysis and documentation of above mentioned activities.

4) Programming Office

-- Planning of R & D programs.
-- Follow-up of R & D programs implementation.

-- Scientific evaluation of R & D results and their applications.
-- Support and improvement of R & D project performance.
-- Project proposals submission, review, approval and control.
-- Follow-up of project progress reports.
-- Assistance in preparation in the form needed by the end-users.
-- Directing NRC scientific and technological infrastructure to correct proposal and report formulation and submission.
-- Additional activities to include project writing, project evaluation, negotiations, interdisciplinary programs and national needs.

5) Foreign Research Contracting Office

-- Fulfillment of formal contracting requirements.
-- Responsibility for all financial and legal aspects of the approved projects.
-- Responsibility for all aspects of equipment procurement especially those related to projects with foreign scientific agencies.
-- Control and follow-up of project progress reports in conjunction with Programming Office.
-- Assistance in compiling information on contractual procedures, financial and legal aspects of foreign agencies. This activity would be carried out in conjunction with the Central Secretarial Office.
-- Additional activities to include budget analysis, financial sources both local and foreign, and legal aspects of contracts.

6) Central Secretarial Office

-- Responsibility for all secretarial aspects related to R & D Management through the NRC Director, Executive Advisory Committee and Heads of five Offices.
-- Editing and typing of materials and reports in Arabic and English languages.
-- Maintenance of filing system.
-- Translation from Arabic into Englis
-- Collection of all relevant reports such a annual reports of different local scientific organizations, national plans, national and regional studies, reports of foreign scientific organizations (e.g. UNIDO, FAO, UNISCO, NAS, U.S.A.I.D., etc.).
-- Handling of all in-coming and out-going mail, cables, telexes, memoranda, reports and telephone contacts.
-- Handling and proper usage of photo-copy machines.
-- Responsibility for scheduling appointments.

B) R & D Management Training

As outlined under NRC capabilities, a number of training courses have already been carried out in the area of R & D Management during the last three years. It has been pointed out in the "Blackledge report" that emphasis is required on management training of young scientists who are just beginning their careers. This should be taken into consideration during the selection of future trainees. In planning for Phase II training, a number of training courses are suggested:

1) Courses in principles of R & D Management: these courses are expected to be similar in nature to the Denver and Cairo workshops and to take place in Cairo. These workshops being of a general management scope should be carried out in collaboration with the ASRT. Participation of NRC staff in these courses could be considered in specific areas, such as those mentioned below.

2) Specialized workshops: It has been suggested that four workshops should be carried out, which would serve the following four areas: marketing, techno-economic, programming and contracting. These four areas would also coincide with these four main offices described in Section A. Each workshop would be expected to be carried out as a part of the up-grading of the scientific infrastructure at the NRC, as well as a tool for selection of young scientists interested in R & D Management. It is expected that staff members of the four offices would participate in the proposed workshops as well as on-the-job training.

It is proposed that a specialist from the U.S. in each of the four areas be invited to discuss methods of running each office, as well as finalizing curriculae for each area.

IV. Plan of Action

As explained under part II, several aspects of the R & D Management structure already exist at the NRC. However, the existingfaciities should be up-graded both in personnel as well as physical requirements. It is envisaged that the plan of action to fulfill the objectives previously outlined would be as follows:

1) The immediate establishment of the Monitoring, Control and Evaluation Office. This would include the Director of the NRC, Executive Advisory Committee, Heads of the four Offices and Head of the Technical Secretariate.

2) The immediate establishment of a Central Secretarial Office. This would involve hiring an executive secretary to undertake the responsibility of running the office. A number of secretaries would also be hired to assist in typing and filing, etc.

3) The immediate establishment of the Techno-economics Office. This would include the already existing group at the Pilot Plant Laboratory, as well as member(s) of the Agro-economics group.

4) The appointment of young university graduates with a good knowledge of English language. Fields of speciality would be science, engineering, agriculture and economics. These would best be hired through the project on a contractual basis.

5) The physical up-grading of the existing and newly established offices.

It is suggested that four U.S. experts visit the NRC in the areas of marketing, techno-economics, programming and contracting. These specialists are expected to stay for a period of 2-4 weeks, preferably at the same time to carry out the following tasks:

a) To work with each office and afford on-the-job training for staff members of each office.
b) To review curricual for the workshops of each of the four areas.
c) To establishing working linkages between activities of the different offices.

In the meantime, the five offices and the Central Secretarial Office would already be active, except the Monitoring, Control and Evaluation Office, which would proceed after the termination of the visits of the U.S. experts.

A second visit by the U.S. experts could be planned 9-10 months after their initial visit. This would enable them to assess the degree of success, and carry out on-the-job training, if redirection is needed.

The workshops would proceed as normal at the NRC in the existing areas previously offered during the three last years. Upon the recommendations of the visiting specialists, and after their discussions with the NRC staff, more specialized workships in the four suggested areas would be developed.

V. Requirements

In view of the objectives and plan of action afore-mentioned the following project requirements are outlined:

A. Personnel

1) By the NRC

It is expected that within the short time before the arrival of the U.S. experts, Heads of the Offices would be appointed and the minimal staffing would be available to start their active role. At present Heads of the Marketing, Programming and Contracting Offices already exist. Appointment of Head of the Techno-economics Office is expected to take place shortly.

2) By the Project

a) It is expected that as of 1st January 1983 an executive secretary and assisting secretary would be appointed on a contractual base through the project and for the duration of the project.

b) A number of young university graduates with good knowledge of English language are to be appointed on a contractual base before the arrival of the U.S. experts. The requirements are as follows:

Office	University Degree	No.
Marketing	Science	1
	Agriculture	1
Techno-Economics	Economics	1
	Engineering	1
Programming	Science	1
	Engineering	1
Contracting	Economics	1
	Science	1
Monitoring	Science	1
TOTAL		9

Physical Requirements

1) By the NRC

The NRC is expected to provide the physical space for the offices, and the minimal requirements for their establishment.

2) By the Project

The following list represents the requirements which are expected to compliment those furnished by the NRC:

Item	No.
Desk	10
Chairs	10
Typewriters:	
English	2
Arabic	1
Copying machine	2
Conference table and chairs	1
Filing cabinets	10
Stationery	

BUDGET (Egyptian pounds)

A. Personnel (Salaries)	1st Year	2nd Year
University graduates (10)*	19800	21780
Executive secretary (1)*	3960	4290
Secretary/typist (1)*	1980	2244
Per diem for U.S. exerts (4) (3 weeks each)	7560	7560
Air Travel for U.S experts (4)@ (2 trips each)	6000	6000
Driver (1)*	2376	2640
Cleaners (4)*	2640	2880
Sub-total	44316	47394
Total Salaries		91710
B. Equipment		
Desk	2500	
Chairs (10)	1000	
Typewriters		
English (2)	3800	
Arabic (1)	1700	
Copying machines (2)	8000	
Conference table and chairs (10)	2000	
Filing cabinets (10)	2500	
Stationery	2000	
Air conditioners (6)	4200	
Floor rugs (4)	2000	
Total Equipment	29700	
Total requested		121410

*Including 10% bonuses and overtime
@Travel for Egyptian to U.S. to be included in ASRT budget

ANNEX D

1. Differences between "Science" and "Technology"
2. JCC Evaluation of the Applied Science and Technology Research Program

Remarks of Dr. Leo S. Packer

Remarks of Dr. Leo S. Packer, Tenth Meeting of the Joint Consultative Committee November 27, 1982, Cairo, Egypt.

I would like to comment briefly on two questions that seem to be relevant for the current discussion. The first one is stimulated by Science and Technology Policy Seminar II and specifically, the remarks of Dr. Helmi Abdel Rahman on the nuances of the term "R. and D." and on the differences between science and technology. The second question addresses the realistic evaluation of the current Applied Science and Technology program, which is the responsibility of the JCC.

I would like to suggest that the terms "R. and D." and "S. and T." are used mostly for convenience, but they obscure very meaningful differences which need to be understood better. Those persons who engage in "science" and those who work in "technology" participate in totally different activities. The education, training, temperament, methodology, working environment, objectives and human motivation for each are vastly different.

The scientist is interested in doing research in a field of science, usually defined by the Ph.D. dissertation, the prior education, and the training and experience category of pervious years. To do this, the scientist needs appropriate laboratories, equipment and instrumentation, funding, and graduate students who are replicas of the scientist as he was when he was younger. The intent is to publish research results, train graduate students, and acquire an increasing body of knowledge that may be useful in solving a certain class of problems. If people concerned with these problems come to consult the scientist, he will usually be glad to be helpful in any way he can. The scientist will also respond to a third party intermediary, such as a marketing function, to bring together the potential beneficiary of his research and the scientists, but he does not see that as his primary job, especially if he does not see immediate advantages to his scientific work.

The technologist is motivated in quite a different way. He sees an opportunity to solve certain concrete problems or to perform a certain function in a more effective way, or to conserve resources, or to produce a new or better product or service. He is familiar with the people and organizations that would benefit from the changes visualized and he would like to work with them to test his ideas. To do this, he thinks in terms of an interdisciplinary team, perhaps a team of physicists, mathematicians, geologists, mechanical engineers, systems analysts, and computer specialists. In addition, the technologist may need a few technicians, a laboratory or a field base, equipment instruments, and supporting staff and funding. He develops a technical approach and a plan of action, including schedules of work and budgets. He has a contingent plan of action prepared if the original one is not successful. He involves the user as early as possible. If the work is successful, he has definite ideas on how to implement the results in a specific place to do the job in a specific way, to satisfy the need or opportunity that stimulated the work originally. He knows

how to evaluate the usefulness of the results in a rigorous, self-critical way, from the technical point of view as well as the user's requirements.

We must conclude that the human motivation, approach and methodology are quite different for the scientist and for the technologist. I have worked in both environments; they are two different worlds, two different cultures, and they have very little in common. They are equally valid and deserving of respect, understanding and legitimacy. They represent two different ways of being creative but each one is directed to a different set of purposes. Each one contributes to society in a different way, but they are not interchangeable.

Expecting scientists or scientific organizations to generate and manage technology transfer is analogous to asking a sanitary engineer to do cosmological research, or using a screwdriver to do the job of a hammer. The NRC, where I work, has the rules and regulations, working environment, and culture of a scientific institution on the whole, along with aspects of an academic enterprise. Although it is slowly moving in that direction, it should not be expected to do the work of technology generation and application for which it is not equipped by tradition, personnel, organization and management style.

I have seen many examples in high technology private industry where the top management was temporarily seduced by the glamor and fascination of science and invested tens of millions of dollars in laboratory campuses, brilliant young Ph.D.'s continuing their doctoral research with more generous support than they ever had at the university, and a permissive intellectually open atmosphere in the best traditions of science. This was very admirable but it contributed only to prestige and little or nothing to the competitiveness and profitability of the company. It did not solve problems of design, production, cost control, reliability, and market needs. An industrial firm and a developing country need to solve problems to survive and prosper. If they are rich enough to contribute to science and to human knowledge, that is fine but it does not carry the highest priority. The focus should be on technology. Good science will in the long term support and strengthen technology if it is properly channeled and managed. But expecting scientists to do the work of technologists is unrealistic and leads to disappointment. Egypt has an impressive scientific capability but it needs more technologists and more problem solvers. And that suggests that perhaps we should turn our attention to the engineering faculties of universities, in terms of the reprogramming and restructuring that Dr. Abdel Rahman advocates.

Now a few words about our current Applied Science and Technology program and the JCC responsibility to make judgments and recommendations on current status and future directions.

Overall, I believe that the program concept is sound and valid. We have a diverse, well balanced program in which substantial progress has been made. Funding for local materials and supplies and for incentive payments is now flowing smoothly to the projects. Considerable progress is evident in the STI and Instrumentation projects. Thus far, we have handled all the requests for training, consultants, guidance

from panels, and professional travel. Procurement of equipment is still too slow, but it is being streamlined with the cooperation of all concerned. The recent National and International S. and T. Policy Seminars show a decided momentum and widespread interest in this area. The R. and D. Management project is off to a slow start but we expect to see considerable activity before JCC XI. Most of our projects show an intimate working relationship with the users. Several projects show strong and effective leadership and tedly be discussed during this meeting, and corrective measures will be carried out. On the whole, we have a meritorious program which deserves the support of JCC and renewed efforts by all participants to improve performance in the time that remains.

I would like to suggest several criteria that might be used to evaluate the status and prospects of our projects. These might also be used to estimate the investment value of proposed projects for the future. In working closely with our projects during the past year, these seem to me to be the important qualifications for success:

- o Leadership that is structured, technically competent, firm, responsible and that requires accountability for performance.
- o Close User Relationships: well-defined objectives, schedules, plans, budgets and expectations that are flexible and realistic.
- o Firm Objectives: well-defined objectives, schedules, plans, budgets and expectations that are flexible and realistic.
- o Full-time Researchers: R and D is demanding working and requires total intellectual commitment by principal contributors.
- o Effective teamwork: direct, informal interdisciplinary relationships with minimum bureaucratic barriers.
- o Adequate Physical Facilities: well maintained laboratories, equipment and instrumentation.
- o Good Communication: systematic formal and informal exchange of information and experience and evaluation of progress and problems.
- o Plan for Application of results: looking ahead and making provisions for applying the results to understood purposes.
- o Capacity for Objective Self-Evaluation: internal standards of professional performance and ability to take corrective steps to improve it.
- o Well-balanced Competent Project Workers: training and experience compatible with the needs of the project.

Although other observers may have their own preferred list of criteria, I belive that the above list can give a useful indication of the prospects of success of an applied research project. When these criteria are applied to our portfolio of projects in the Applied Science and Technology Research program they yield a valid profile of the comparative value and achievement of the projects. In other words, those projects that satisfy most of the criteria are indeed our most promising and productive projects. Those that do not are the weakest projects.

In addition, when considering proposals for new projects, one could rank them in terms of the satisfaction of the above ten criteria. Thus it would be wise to invest in those projects that show good leadership, internal and external research discipline, applied point of view, well-understood user entity and needs, sound project planning, demonstrated record of achievement, committed workers, effective controls, adequate facilities, and existing infrastructure to apply the successful results. Some element of risk in involved in all R and D, since we are dealing in future events, uncertainties, faith in people and institutions, and the exploration of unknown areas. Nevertheless, there are indicators that increase the probability of success and they should be used in the exercise of management judgement. When a project is functioning, the indicators can be used as evaluation and diagnostic tools to determine the necessary measures to correct problems and increase the productivity of the project. Most experienced R and D managers perform this process intuitively rather than analytically. Failure to do it at all can lead to wasting of valuable resources and lowering of performance standards.

Thank you for your attention.

ANNEX E

TRAVEL TO THE UNITED STATES

October 1 - December 31, 1982

NAME	DATE	PURPOSE	PLACE
DEVELOPMENT & APPLICATION OF BIOGAS TECHNOLOGY			
1. Shawky El-Hawary Walter Pollution Control Laboratory, National Research Centre (NRC)/Cairo	Oct. 21-Nov. 10	Detection of pathogenic bacteria & viruses in waste water & sludges	Dr.T.B.S.Prakasam (NAS advisor), Metropolitan Sanitary District of Greater Chicago U.S. EPA Health Effects Research Laboratories, Cincinnati, Ohio Dept. of Virology & Epidemiology Baylor University College of Medicine, Houston, Texas
2. Said Mahmoud Badr El-Din Soil Microbiology Unit Soil Laboratory, NRC/Cairo	Oct. 29-Nov. 19	Soil microbiology, organic manuring, biological nitrogen fixaction	U.S.Department of Agriculture Agricultural Research Center Beltsville, MD Dr. T.B.S. Prakasam (NAS advisor) Met. Sanitary District of Greater Chicago Department of Agronomy University of Illinois, Urbana Department of Soil Science University of Minnesota St. Paul Soil Science Department Univ. of California at Davis U.S.Department of Agriculture Soil Conservation Service Washington, DC
MORE AND BETTER FOOD			
3. Osman Galal* Child Health Laboratory NRC/Cairo	Nov. 1-4	More & Better Food Program discussions	Nutrition Foundation Washington, NAS, Washington,DC Cornell University, Ithaca, NY World Bank, Population, Health, and Nutrition Department Washington, DC AID, Bureau of S&T, Office of Nutrition, Washington, D.C.

* Transportation to the United States provided by other sources

TRAVEL TO THE UNITED STATES

October 1 - December 31, 1982

NAME	DATE	PURPOSE	PLACE
BENTONITES			
4. Adel Abdul-Azim * Director, Central Metallurgical R&D Institute (CMRDI), NRC/Cairo	Nov. 8	Bentonites R&D Project	Dr. Haydn Murray, Department of Geology, Indiana University, Bloomington, Indiana

* Transportation to the United States provided by other sources

ANNEX D

TRAVEL TO EGYPT

October 1 - December 31, 1982

NAME	DATE	PURPOSE
1. Gilbert White Institute of Behavioral Science University of Colorado	Nov. 23-30	National Science & Technology Policy Seminar and 10th semi-annual Joint Consultative Committee Meeting
2. George Bugliarello, President New York Polytechnic Institute Brooklyn, N. Y.	Nov. 25-30	"
3. Mary E. Carter Assoc. Administrator, USDA Agricultural Research Service Washington, D. C.	Nov. 22-30	"
4. F. Karl Willenbrock Dean, School of Engineering and Applied Science, Southern Methodist University Dallas, Texas	Nov. 24-30	"
5. James Hillier Consultant, Princeton, N.J.	Nov. 21-30	"
6. Jay Davenport Staff Officer, Board on Science and Technology for International Development (BOSTID), National Academy of Sciences Washington, D. C.	Nov. 19-Dec. 9	"
7. Maryalice Risdon Staff Assistant, BOSTID	Nov. 22-Dec. 3	"

TRAVEL TO EGYPT

October 1 - December 31, 1982

NAME	DATE	PURPOSE	PLACE
8. Miguel Wionczek Director, Energy Research Programs El Colegio de Mexico, Mexico, D.F.	Nov. 23-28	National Science & Technology Policy Seminar	
9. G. S. Couri UNIDO, Vienna, Austria	Nov. 22-27	"	
10. Osama Al Kholy Advisor, Kuwait Institute for Scientific Research Kuwait	Oct. 27-Nov. 2	National S&T Policy Seminar (All-Egyptian session)	