EVALUATION REPORT

APPLIED SCIENCE AND TECHNOLOGY RESEARCH

AID Project 263-0016

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by

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PREFACE

The Applied Science and Technology Research Program* has a broad and ambitious pu pose -- "To improve the institutional capability of the Egyptian science and technology community to develop and manage research programs to solve priority development problems." The program seeks to achieve that purpose largely through a set of research, development and demonstration projects each a learning device with specific goals and objectives. Overlying these projects is a management structure which views both the broad program purpose and the components which comprise the program.

The evaluation team (Attachment B) wishes to acknowledge with deep thanks the many Egyptians who responded openly and patiently to the numerous questions posed by the team. We would like especially to recognize the time made available by Dr. Hassan Ismail, Dr. Mohamed Kamel, Dr. A. S. El-Nockrashy and Dr. Osman Galal. Project personnel participating in our discussions are noted in the project reviews. Our task would have been impossible without their support and contributions. The USAID/Cairo Science and Technology Office has generously provided information and assistance for which the team is duly grateful.

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* The organizational descriptors program, project and sub-project, as used herein, are not consistent with AID terminology but provide a useful hierarchy for this report. Attachment A provides definitions and a glossary of acronyms.

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APPLIED SCIENCE AND TECHNOLOGY RESEARCH

EVALUATION REPORT

Introduction

This report is addressed to five audiences, each having a particular frame of reference and set of interests in the program; USAID/Cairo and AID/W, the Joint Consultative Committee which has had a key role in shaping the program, the Academy for Scientific Research and Technology and the Egyptian program managers, the National Research Center, and finally the project directors and staff from whom the research results must flow. This introduction points up some important features of applied science and technology, the institutional setting for applied research and development, program goals, factors and criteria used in this evaluation and the relationship of program phasing to the evaluation. The report then discusses, in turn, issues, recommendations for Phase II and major observations. A final section discusses each project and sub-project including points emerging from the review. Attachment C is an overview of Phase II budgets.

Science and technology (S&T) share characteristics with other development sectors. The societal and economic impact of S&T, both basic and applied, results largely from incremental and often interconnected advances in knowledge and practice. The cumulative, longer term effects, either good or bad, of S&T programs are not easily forecast quantitatively. This is due, in great measure, to the unpredictable nature of the interchange and use of knowledge and of the applications which may result. The choice of and support for specific research and development (R&D) sectors, provision for an active interchange of knowledge, ideas and experience, objective evaluations of progress, and a setting which encourages and rewards success are tools available to manage investments in S&T. Steps can also be taken to enhance the likelihood for adoption of applied research results. Careful selection and definition of the problem to be solved, analysis of the constraints and economic/social returns accompanying successful implementation and design of projects to minimize user risk are among the steps which, done in concert with the intended user, are very important to research utilization.

The Project Paper states that Phase I is intended to provide measurable impact on the solution of key development problems and to design a long-term project aimed at improving the institutional capability to develop and manage research on priority development problems. Project documents suggest that participants did not always share this view. An implicit objective was an evaluation of the effectiveness of the Academy for Scientific Research and Technology (ASRT) and the National Research Center (NRC) in organizing, managing and implementing an applied research program. Delays in the development and approval of project plans and in the delivery of supporting materials and services have restricted program progress. This evaluation attempts to view the achievements to date in the context of those restrictions.

The major factors/criteria used to judge both program and project progress were the;

- o Clarity of concept, sense of purpose and relevance to Egyptian development.
- o Effectiveness of organization and the management of resources and problems.
- o Appropriateness of the institutional settings to applied science and technology.
- o Technical quality of the human and material resources employed.
- o Degree of interaction with the intended users and beneficiaries of research as well as among research colleagues.
- o Quantitative and qualitative progress to date.

Phase I and Phase II are useful distinctions for AID programming but they do not coincide with decision points in the progress of individual projects or sub-projects. The team has assumed that the commitment implied by the approval of three and five year project plans will be honored unless project performance falls below acceptable standards.

Issues

Issues which should be addressed in the design of Phase II and in consideration of the relationship of this program to national science and technology policy are:

- o Is the proper focus for Phase II a continuation of the program as presently implemented with emphasis on one institution and two broad sectors or should the program broaden the institutional base and/or the sectoral coverage?

- Should the AID/S&T strategy be to support a larger, more diffuse and widespread effort to introduce effective applied research or to limit support to a more narrowly targeted demonstration?

- What should be the role of the S&T projects and institutions in large scale implementation of successful research? The relationship between projects and anticipated users has evolved satisfactorily in the early stages of research. The transition to implementation on a larger scale is a major task and the program should seek to better define the role(s) it intends to play in this transition.

- Do mechanisms exists for the support of projects with planned duration beyond Phase II? Project starts make little sense if there is no prospect for completion. New crops for Arid and Semi-Arid Lands is an illustrative example.

- Do project leaders have sufficient knowledge and control of project resources (tangible equipment, facilities, personnel and finances; and intangible concepts and ideas, relationships with ASRT, and relationships with outside organizations) to fulfill their responsibilities under the project?

- Is the present AID position on incentive payments consistent with its expectations for end of program status? Mechanisms for multiple sources of compensation are an integral part of Egyptian society and the S&T community in particular and unlikely to change within program time frames. Transfer of the salary incentive burden to Egypt without compensatory adjustments in the fraction of resources which flow to ASRT should be regarded as a negative input.

Recommendations

The evaluation team wishes to make the following recommendations to AID and to ASRT:

- The program has established a pattern of progress and should be extended with the addition of adequate resources for the future expansion of successful projects. Wool scouring, cottonseed oil, cheese manufacture and biogas are examples of projects which show promise of early positive returns.

- The program continues its focus on the sectors and institutions presently involved with the judicious addition within these sectors and institutions of projects with prospect either for completion within the program time frame or continued support beyond the life of program.

- Program and project management be strengthened by: clarifying individual responsibilities for project performance, supervision, reporting and resource management; increasing opportunities for professional interchange and the cross fertilization of ideas among individual project leaders; and increasing the awareness and use of relevant management principles and practices, perhaps by appropriate and carefully focused training.

- o Greater attention be given to the inclusion of social science analyses in projects which now have a predominantly technological orientation.

Evaluation Observations

Increased Egyptian capability to develop and manage applied research programs is already observable and this program has the potential for continued and greater contributions to that goal. Program progress is commendable. Ten projects (Including seven sub-projects) have been identified and all but two have been underway for some time. The effort expended in clarifying and improving the project designs has been an educational investment important to the program purpose. The evidence is that applied research is increasingly understood and is gaining acceptance as an institutional and personal goal. Project and sub-project performance, although variable, must be considered excellent given the delays both in project initiation and in the provision of certain inputs. There has been active interaction with the users and potential benficiaries of research. However, the truly difficult challenges lie ahead for all projects.

The technical competence and commitment of the project staff is generally high and has contributed greatly to the rate of progress. The number of experienced and highly trained scientists or engineers may, in some cases be larger than necessary with the potential for underutilization and decreased job satisfaction, however. Most projects are making good use of existing equipment and facilities in the absence of the new items to be provided by the program.

Presently approved projects have often been the subject of prior Egyptian research and/or some form of Egyptian/U.S. collaboration. The current investigations can be broadly classified as industrial or food related. The selection appears to have been based upon probable success as well as developmental significance; wisely so since early project success is important to institutional and attitudinal change. The mechanism for soliciting and choosing future (Phase II) projects needs a more directed approach which recognizes the goals and objectives of Phase II. The role of this program and of ASRT in addressing development problems which affect multiple sectors and which cross organizational lines deserves continued attention and emphasis.

The majority of Phase I projects and inputs were designed to involve primarily the NRC. Ain Shams University, the National Information and Documentation Center (NIDOC), Cairo University and the Institute of Oceans and Fisheries each lead a project or sub-project activity. In addition, as shown in Table 1, there are 21 cooperating institutions ranging from villages to industries and include associated organizations such as the Scientific Instrumentation Center (SIC). The concentration of activities at NRC provides an institutional recognition and focus for applied research which may initially facilitate the spread of the philosophy of relevant research. The applied projects at NRC have also benefited from strong, top management support which seems to be reflected in staff attitudes toward applied research. By the same token, emphasis on NRC has served to limit the number of institutions influenced by the program.

The U.S. advisors to the program have consistently been of high quality and their contributions to Egyptian awareness of current technical practice, to project design and to equipment selection is judged valuable by the Egyptians and the evaluation team. The timely availability of advisors and the continuity of their participation could have been improved in a number of cases. The National Academy of Sciences (NAS) may wish to consider rejuvenating some advisory groups and assessing group composition as projects enter the implementation or technology transfer phase. A few projects could benefit from skills and experience not resident in the U.S. Access to this expertise through travel of Egyptian scientists and in-country visits by third country experts on a selected basis is encouraged.

The ability of AID, NAS and NSF to deal with the contractual, procurement and decision processes has been disappointing in the short term. Steps have been taken to remedy some of these shortcomings but a much closer examination of both U.S. and Egyptian decision and approval chains is in order. A more effective system with maximum delegation should be possible within the procedural and legal constraints and is an opportunity to teach management by example. It is unfortunate that this program, a major S&T effort, has had to be an educational experience for the assisting agencies and institutions.

TABLE 1

STRUCTURE OF THE APPLIED SCIENCE AND TECHNOLOGY RESEARCH PROGRAM

(SUB)PROJECT	LEAD INSTITUTION/PROJECT LEADER	COOPERATORS
Instrumentation	NRC/M. Kassem; SIC/Eng. El-Alaily	Cairo, Assiut, Tanta, El-Minya and Alexandria Universities
S&T Information	NIDOC/A. Gad	
Management Training	ASRT/A. El-Nockrashy	
Phosphate Ore Utilization	NRC/A. Yousef	Societe Financere et Industrielle d'Egypte; Kafr El-Zayat Fertilizer Company
Wool Scouring	NRC/A. Kantouch	Misr Beida Dyers
Corrosion	NRC/A. El-Azim	Petroleum Institute; C.M.R.D.I.; Suez Petroleum Company
Red Seas Fisheries	Inst. Ocean.&Fisheries/A. Bayoumi	
Biogas Technology	NRC/M. El-Halwagi	Soc.&Criminological R&D Center
More & Better Foods-Exec.Comm.	Cairo University/B. Ahmed	
Cottonseed Oil	NRC/A. El-Nockrashy, F. Osman	Al-Badrasheen Company
Cheese Making	NRC/M. Husseiny	Misr Milk & Food Company
Supramine	NRC/S. Hegazi	El-Nil Pharmaceutical Company
Nutritional Monitoring	NRC/O. Galal	Villages of Kafr Al-Khadra & Omar Makram; Org. for Recon. & Devel. of Egyptian Villages; Ministries of Land Reclamation, Agriculture & Social Affairs; Local Health Boards
Food Processing, Villages	NRC/I. Rifaat	
Livestock & Poultry	NRC/M. Nawato, H. Ali	
Plant Production, Protect.	NRC/H.S. Abdel Rahman	
New Crops	Ain Shams University/A. El-Beltagy	Al-Azhar University

Linkages among the projects are weak. The team often observed a vague understanding of the other projects by staff members. While the projects differ in topic and scope there are many opportunities for useful interchange. For example, commonalities exist in pilot plant problems, in problems of effluent reduction, in industrial interactions and in techno-economic analysis. Technical seminars, problem discussion groups and other interactive mechanisms could help to stimulate the flow of ideas and expand the use of available information from other research and demonstration organizations.

The inclusion of the cottonseed oil, cheese making and Supramine subprojects in More and Better Foods is puzzling. These activities do not have the diffuse user groups which characterize the village efforts, rather the interface is with industries. The work being carried out seems nearer to R&D than demonstration. Management may wish to review this organization.

Additional efforts should be devoted to "marketing" the information coming out of project activities through farmers' associations, industrial associations, professional societies, local government councils, rural and commercial banks, cooperatives, and formal extension services as appropriate. Brochures, periodical documents summarizing program achievements, popular articles, seminars and short training courses are mechanisms that come to mind. Program funds should be made available to assist these activities.

If a portion of the science and technology community is to engage in applied research programs for development, the personal and institutional rewards both psychic and monetary must compete with alternative career choices. One stimulus which this program can provide is the reward of success in achieving project goals and objectives. Recognition, project expansion, and greater responsibility should accrue to groups and individuals which perform above standard. Younger staff members should be encouraged to actively participate and be given outlets for their opinions and creative ideas. The change which this program seeks to accomplish must involve all levels within an institution or societal group if it is to become widespread and lasting.

INSTRUMENTATION TECHNOLOGY

Introduction

The Instrumentation Technology project is an infrastructure activity aimed at 1) building up the capacity within Egyptian institutions for the repair and maintenance (R&M) of scientific equipment; and 2) providing advisory services for the procurement of equipment under the overall Applied Science and Technology Program.

The National Science Foundation (NSF) in under a Participating Agency Service Agreement (PASA) with the Agency for International Development (AID) for the management and implementation of the Instrumentation Technology project. NSF has sub-contracted with the University of Wisconsin and the U.S. National Institutes of Health within this project. The Scientific Instrumentation Center (SIC), the NRC and other units of ASRT, the universities of Alexandria, Assiut, Cairo, El-Minya, and Tanta; and several participating industrial corporations are involved in either the repair and maintenance aspects or the equipment procurement aspects of this project.

Representatives of the evaluation team met with Engineer M. El-Alaily and Dr. M. Ghobashy of the SIC, with Dr. S. El-Sobky of Cairo University, with Drs. F. Hanna, M. Kassim and N. Saleh of the NRC, for specific discussions on this project. Additional general discussions were held with Eugene Pronko, NSF, with Drs. M. Kamel and O. Galal of NRC, and with Dr. S. Arif of USAID/Cairo. Project files and documents were made availability by all participating parties. In addition, the analyses of other project instrumentation requests provided a further base of information.

Project Summary

On the Egyptian side, SIC was established as a national level organization for the repair and maintenance of scientific equipment. Its emphasis is on major repairs, calibration and standardization. It is said that SIC is the only Egyptian institution with capabilities for R&M in optics, and one of the few in glass blowing and fine mechanics. So-called "satellite" R&M centers (R&MCs) are being established and/or developed at NRC and at the universities of Alexandria, Assiut, Cairo,

El-Minya and Tanta. These satellite R&MCs are intended to deal with (all but major repairs in) the electronic aspects of scientific instruments, although Alexandria and Cairo Universities are said to have a capacity in fine mechanics, and some are said also to have a capacity in glass blowing.

On the U.S. side, NSF manages the Instrumentation Technology project. Under sub-contract with NSF, the University of Wisconsin's Instrumentation Systems Center trains the R&M personnel of SIC and NRC, and also helps develop the R&M capability of these organizations. Under its sub-contract with NSF, the Biomedical Engineering and Instrumentation Branch of the National Institutes of Health performs comparable services for the five universities. The University of Wisconsin participates in the procurement of R&M equipment for SIC and the satellite R&MCs, although initial emphasis in procurement was on units at NRC and Assiut, Cairo, EL-Minya and Tanta universities.

A several-stage procedure has been established and justified for the procurement of scientifi instruments and equipment under all projects (research and development, demonstration, and infrastructure) of the overall Applied Science and Technology Program. It typically goes as follows (quoted from an AID document entitled "Mechanism for the Selection and Procurement of Equipment for Projects in 263-0016 Applied Science and Technology Project" dated June 27, 1979):

1. Egyptian project scientists prepare a list of equipment to accomplish the objectives of a particular research project.
2. Equipment list sent to the University of Wisconsin/ISC, after approval by ASRT/NRC/Cairo and a copy of the same sent to NAS, NSF and AID/Cairo.
3. University of Wisconsin prepares specifications and estimated prices and sends to ASRT/NRC/Cairo, AID/Cairo and AID/Washington.
4. ASRT/NRC approves and contacts AID/Cairo for concurrence.
5. AID/Cairo authorizes AID/Washington to amend or issue new PIO/C for procurement of equipment making AAPC the authorized agent for procurement. A copy of procurement order sent to University of Wisconsin/ISC.
6. AAPC contacts University of Wisconsin when needed during procurement process."

Because of the warranty terms of much, if not most of the equipment procured, it is project practice that the items received in Egypt be

unpacked, examined and tested under the supervision of a University of Wisconsin staff member. Occasionally, a manufacturer's representative performs this function. Damages and deficiencies are reported and corrected under pre-negotiated terms of the procurements, in most cases.

The ASRT has established an Instrumentation Committee chaired by the head of SIC and made up of nine other personnel, two others from SIC, three from NRC, and four from universities. There is an effort to strengthen the role of the committee. Under this effort, the committee may hold monthly meetings, add a fifth university to its membership, and possibly play a part in instrument specification for the procurement process. In the past, U.S. advisors often assisted in the initial specification of requested project instruments.

The NRC has established a Core Equipment Laboratory which exists, organizationally, in addition to its R&MC. This laboratory is comprised of materials testing equipment for pharmaceuticals, textiles, paper and pulp, ceramics and polymers. It is said that the Core Equipment Laboratory will become the principal medium for the NRC's services to industry, and possibly universities, in instrumentation training, materials testing, and the like. NRC's interest in up-grading the equipment of its physics laboratory is tied to this orientation towards industrial service.

Following a relatively long period of discussion, negotiation and deliberation, the NSF and other interested parties apparently have agreed to place a resident expatriate specialist, with an Egyptian technical counterpart, in Cairo to serve as a focal point for this project.

Conclusions and Points for Consideration

- Initially, there seem to have been problems in the selection and preparation of candidates for training as repair and maintenance technicians, but this appears to have been improved.
- Apparently there is difficulty in getting trainees to follow through over the long term on the objectives of the training program. Once trained, viable employment alternatives exist and may be taken advantage of by trainees following their return to Egypt.
- One result of the lengthy equipment procurement process is a distinct time lag in the arrival of necessary equipment for the start-up of individual projects. Many projects are now

well into Phase I without the tools with which to work.

- It is evident that the general procurement process can be shortened. The project files contain some examples. Further, the proposal that the Instrumentation Committee play an early positive role in assisting Egyptian scientists to be more precise and specific in their equipment requests does not appear to have been seriously considered and evaluated.

- It would appear to be a valuable step to combine the NRC physics laboratory directly with the NRC Core Equipment Laboratory, rather than to upgrade it is an semi-detached unit.

- Egyptian authorities appear to be responding actively and positively to earlier questions raised about the means by which procured equipment and trained personnel are to be placed and used within the organizations participating in the Applied Science and Technology Program.

- The U.S. side of the Instrumentation Technology project, after some delays, appears to have made significant progress in organizing improved communication and coordination of the project, particularly through the placement of personnel on site. The communication between the sub-contractors and the Egyptian participating organizations in the two separate areas of responsibility is improving, it seems, but could be improved further.

SCIENCE AND TECHNOLOGY INFORMATION

Introduction

The Science and Technology Information Project is an infrastructure component of the Applied Science and Technology program. It has two major components: 1) a design study for a national system of science and technology information services (which is envisioned to include a computer-accessed information delivery service and a more traditional service for the supply of journals, reports and other documents); and 2) the training of information specialists in a selection of skills important to the process of information handling.

NSF is under a PASA with AID for the management and implementation of the Science and Technology Information Project. NSF has sub-contracted with the Georgia Institute of Technology for the design study and with Catholic University for the training of information specialists. On the Egyptian side, NIDOC of the ASRT is the principal organization involved.

Representatives of the evaluation team met with Dr. B. El-Hadidy at Catholic University; with Dr. A.M. Gad and Mr. A. El-Dewany at NIDOC; and with Dr. M. Madkour at the Microfilming and Documentation Center at Al-Ahram for specific discussions on this project. Additional general discussions were held with Eugene Pronk of NSF. NSF and USAID/Cairo documentation and project files were made available to the evaluation team.

Project Summary

An eight-person steering committee, chaired by the NIDOC Director has been organized, including membership from NRC, Cairo University and other external organizations. Four task groups have been organized 1) to collect information on pertinent past surveys; 2) to compile a descriptive assessment of NIDOC itself; 3) to inventory personnel resources; and 4) to begin identifying issues in need of resolution before a national information policy and plan can be formulated. Informal indications are that several other similar preparatory studies are also under way. Three of the four identified studies were said to be in draft form at the time of the evaluation team's visit.

A major survey of 1) on-going research on the topic of "information"; 2) the available information resources and services; and 3) the information requirements of Egyptian specialists in all scientific and technical fields had just gotten under way during the period of the evaluation team's visit. Some 400 organizations and 1,200 professionals (academic, scientific, governmental, and industrial) are being involved in the second and third parts of the survey (being conducted on contract by an experienced Egyptian organization). The survey should be completed within approximately three months. NIDOC with the help of additional statistical resources is conducting the inventory of on-going research. Two NIDOC staff members have beeen sent to the U.S. for a four-week program focused on the preparation of profiles of information user needs. They will train some 150 others in the technique following their return to Egypt.

Twelve specialists were to have received a specialized training program in indexing and abstracting, duplication and reproduction, and other related information skills. Five were screened initially and sent to Catholic University. Skepticism on the Egyptian side led to a delay in selecting, preparing and sending the remaining seven until the first five had returned and their experience could be evaluated. Language ability, the complexities of arrangements for specially designed programs conducted partly in different locations, and costs per trainee (approximately U.S. $30,000 each for nine months) all seem to have entered the decision to hold back on the group of seven.

Initially, technical and coordinative inputs stemmed from what appears to have been a careful program plan prepared by the U.S. sub-contractor in the design study components. The in-service training aspect was a single free-standing component that was not programmatically coordinated with the design study. The steering committee's role was adjudged by project personnel to be fairly well completed by early 1980 when the work plan had won approval, the identified reports were being prepared, the major survey of resources and needs was negotiated, and electronic processing of the data had been arranged. However, a need for an on-site coordinator was generally perceived. Negotiations were conducted to recruit a qualified Egyptian specialist for that role.

Conclusions and Points for Consideration

- Active, positive steps are being taken to fulfill sub-project objectives even though there have been a number of problems and delays during the initial stages.
- Project personnel mention a lack of sensitivity to information among Egyptian scientists and other specialists, and attribute this to deficiencies in the educational system, or in the system of motivations and rewards for scientific and technical personnel. While this may be true, project leaders may also want to examine the accuracy, rigor, relevance and utility of information being put into the system.
- As a national information policy is developed, it will be important to take into account the non-information factors that will help promote the implementation of the policy.
- A number of the delays in the early phases of this project and some of its continuing problems may be attributable to the inexperience of some U.S. institutions in overseas operations in developing countries.

MANAGEMENT TRAINING

Introduction

The management training courses conducted by Denver Research Institute (DRI) under a subcontract from the National Academy of Sciences (NAS) were particularly difficult to evaluate. No training was in progress during the evaluation period nor was there adequate time to survey participants in the four courses given at Denver and the survey course presented in Cairo.

The evaluation team reviewed prior monitoring and assessment reports by John Hurley (NAS Memorandum 2/25/80) and Dr. A. S. El-Nockrashy (ASRT Report 2/6/80), considered the background and responsibilities of the 111 attendees, discussed the utility of the training with a small number of participants, and assessed the management needs of ongoing research and demonstration projects. The following discussion should be read with these limitations in mind.

Project Summary

The management of science, technology, applied research and development is a matter of importance to industrial and developing countries alike. As with other forms of management, the practice is a mixture of art and science not easily conveyed through written materials alone. Applied R&D has special management considerations which distinguish it from more basic science. Economic concerns, shorter time horizons, linkages with users, the interdependence between project elements, and often the scale of activities require systems of organization, information flow, direction and dynamic response designed to meet individual project needs. The DRI in-service courses covered topics important to institutions engaged in or making the transition to applied research. Case studies using developing country information and settings were an important but under-utilized tool. The participants expressed a desire for greater use of cases relevant to their situations. Problems of scheduling, support facilities and time for interaction which were encountered have been noted in the reports referenced above.

Careful definition of the research problem and a work plan calculated to maximize success probabilities within constraints of time and money are key to effective applied research. Flexible response to new information and

to unpredicted opportunities is also important. The evaluation team believes that increased emphasis on technoeconomics and project feasibility analysis would be of benefit to staff members of ongoing and future projects. The team recognizes the desire to introduce management principles to NRC broadly and to the larger Egyptian S&T community. However, success of the initial projects is vital to the program goals and the team feels that a larger number of project persons should have attended the courses given in Denver. The translation of management principles into practice is not always easy for technically trained people and the team suggests that mechanisms are needed to assist this process until effective R&D management is well established both in the program and its projects.

The plans to establish management courses within NRC merit program support. The intent regarding additional DRI inputs is not clear. However, careful coordination between the NRC and DRI would be beneficial to both if a DRI continuation is implemented. Short term improvement in project management should be a priority objective of all subsequent management training and a subject included in project monitoring.

Summation

The evaluation team believes that:

- The Applied Science and Technology Program has recognized the value of effective R&D management and taken steps to introduce and implement appropriate management techniques.
- The important role of management in the success of initial and future projects warrants additional training inputs.

Program leadership may wish to consider:

- Additional management training for several levels of personnel within the existing program and projects. Greater emphasis should be placed on feasibility and economic analyses as guides to project design, evaluating tradeoffs and decision making.
- Expanding use of case studies and practical excercises with consideration given to use of ongoing projects as the basis for some case material and group study.
- Including relevant practical experience from Egypt and other countries in the Egyptian course being developed.
- Providing project and sub-project managers with guidance and assistance, as required, to help implement management principles and techniques in their R&D activities.

PHOSPHATE ORE UTILIZATION

Introduction

Egypt possesses large reserves of low-grade phosphate ores containing types and forms of impurities not easily removed. These are used to produce marketable phosphate for fertilizers and industrial chemicals. A project was initiated in November 1978 with three sub-topics; pilot plant studies of ore beneficiation, laboratory and pilot scale studies on the chemical processing of phosphoconcentrates to produce fertilizers and chemicals, and agronomic assessments of fertilizers. Phase I of the project is a three-year effort. A letter offering industrial cooperation was received from Societe Financiere et Industrielle d'Egypte in late September 1979.

Interviews were held with Dr. A. Yousef, Dr. S. El-Nizahi and Eng. R. Salama. A visit was made to the beneficiation pilot plant at El-Tibbeen, not yet in operation due to construction delays. As with all projects, the NRC/NAS and AID files were examined.

Project Summary

The International Fertilizer Development Center and the Tennessee Valley Authority have provided extended training on chemical processing for two NRC staff members and have assisted in formulating equipment lists for bench scale processing. The final list was submitted in March, 1980. Substantive further progress in this area awaits receipt of the equipment.

Ore beneficiation studies have been carried out by NRC for some time and equipment is available to devote to phosphate beneficiation work. The pilot plant equipment is located in a new facility still under construction and has been arranged to accommodate process flow schemes for the three ore types prevalent in Egypt. Startup awaits completion of electrical service to the pilot plant bay. Testing should be able to begin no later than May 1980.

Agronomic studies are planned using small test plots but data from these studies are not yet available. Similar studies are being carried out as part of the biogas project and both activities might benefit from the sharing of methodologies, data and conclusions.

The project has proceeded through the early formative stage but an additional 12-18 months of effort seems necessary to see whether substantial progress toward better utilization of Egyptian phosphate ores can take place.

Summary

The evaluation team feels that:

- The project addresses an important subject and is proceeding well at this early point in the research plan.
- More attention should be given to the water and energy costs of process schemes under study as well as the costs of environmentally sound handling of effluents. In addition, there is an expressed need for increased capabilities in technoeconomics, agronomy, and marketing.
- A review of progress, future plans and resource requirements will be needed in 1981.

WOOL SCOURING AND WAX RECOVERY

Introduction

Misr Beida Dyers Company, Alexandria is the only Egyptian firm currently processing raw wool for domestic and export markets. The company scours, cards and strands imported wool into tops for sale to textile firms. The value added is in the range LE 5-7 million per year. The objective of the joint NRC/Beida Dyers R&D project is the improvement of the classical scouring and wool wax (lanolin) recovery processes now employed. This is likely to lead to increased economic return to the company.

Members of the evaluation team reviewed NRC/NAS and AID project files, discussed the project with Drs. M. Kantouch and A. Bendak, toured the NRC textile laboratories and visited the Beida Dyers plant in Alexandria. More general discussions with Drs. N. Saleh, M. Kassem and S. Harif included equipment and instrumentation for this project.

Project Summary

The wool project had its genesis in the December 1977 American Chemical Society meeting with Egyptian scientists and engineers in Cairo and was one of two projects selected by the JCC in March 1979 from a larger list of Society suggestions. Work began April 1 on a three-year project plan. Dr. A. Borai, Chairman of Beida Dyers, was officially requested, in a June 2 letter, to approve company participation in the R&D project and to head a project steering committee. His acceptance is dated July 5, 1979.

The first project year just ended has resulted in measurable progress. A literature search was conducted as preparation for a subsequent trip to the U.S. and the U.K. The two-person trip provided a general view of modern, commercial wool processing and, importantly, knowledge of specific processes which could be incorporated in the Beida Dyers scouring system with nominal investment.

A small laboratory performing routine production line measurements has been established at the Alexandria plant. The result has been better understanding of the existing scouring process which already has led to improved process control, reduced chemical consumption and increased wool

quality. Simultaneously, laboratory work at NRC has provided evidence that centrifugation can be a practical approach to improving both the fraction and quality of wax recovered. This appears to be superior to the alternative process of solvent extraction. Work at NRC continues on wax extraction and purification methods to obtain the high quality which is in international demand according to the market survey carried out by the project. The evaluation team noted the close working relationship between the NRC and Beida Dyers in the execution of this project.

The original project plan called for pilot tests of centrifugal wax separation of a scale larger than possible with existing laboratory equipment but smaller than production quantities. It has become evident that the requested centrifuge would have to be specially manufactured with an inherent delay and added expense. The decision has been made to order a larger, standard unit which can be incorporated in one of the four Beida Dyer production lines. This entails a programmed shutdown of the line, alteration of the system piping and installation of the new equipment; clearly a major input on the part of the company. These changes could be initiated after the equipment has arrived to ensure minimum downtime and lost production but this would add measurably to the delay in pilot testing.

The order for this equipment is being held by USAID/Cairo pending resolution of legitimate questions about a major instrument included in the same total order but for another project. The scheduling of equipment delivery apparently cannot be made with sufficient reliable, prior notice to permit the start of plant modifications in advance of centrifuge availability. The unavoidable delays already incurred are likely to be extended with probable loss of project momemtum.

The original economic justification for this project was based upon an increase in the amount and the quality of wool wax recovered from the scouring process. It appears that the prospects for reasonable return on investment through wool wax recovery remain good. However, it has become evident that incremental gains in wool quality, decreases in inputs of process chemicals and de-ionized water, reductions in effluent pollution factors, dryer efficiencies and other as yet unspecified areas may yield economic returns in excess of those forecast for wax recovery alone. The project staff is aware of these possibilities and expressed a willingness to

pursue them over time. The team did not see evidence that alternative project plans were being considered on the basis of a technoeconomic analysis of the tradeoffs among the opportunities which accompany a broader view of wool scouring economics.

Summation

The evaluation team concludes that:

- The wool scouring and wax recovery project has established an effective working relationship between NRC and Beida Dyers Company and that measurable progress toward the project goals has been made.
- Opportunities for unforeseen benefits exist which could greatly increase the resultant economic return and foreign exchange earnings.

It is suggested that:

- AID and NSF make a special effort to facilitate equipment procurement and delivery for this project.
- Provisions be made for the appropriate use of third country advisors to take advantage of expertise not available in the U.S.
- Application of return on investment, present cash value of future benefits, least cost and/or similar project evaluation technique could be very useful in guiding both shorter term and long range project activities.

CORROSION IN THE PETROLEUM INDUSTRY

Introduction

Corrosion research was one of the topics suggested for implementation during the 1977 American Chemical Society meeting and approved by the JCC in November 1978. There had been a prior collaborative program between NRC and Ohio State University supported by NSF. A preliminary NRC proposal on corrosion was reviewed by a U.S. advisory panel January 1979 and after further discussions with the NAS/NRC advisor, the three-year project was initiated in August 1979. A letter had been sent to the Suez Petroleum Company in May of that year requesting company participation and cooperation. This resulted in an affirmative response dated September 6, 1979.

In reviewing the corrosion project, member of the evaluation team met with Drs. A. Azim, V. Gouda, F. Saad, T. Saber, F. El-Wahab, M. Khedr, T. Hanna, S. Mustafa, M. Badran, A. El-Hosary, and R. Saleh. The project files, including Dr. Snavely's report on his February 1980 visit to Cairo, were also of assistance to the team.

Project Summary

The Egyptian petroleum refining industry, along with other industrial sectors, continues to have serious corrosion problems with frequent shutdowns from corrosion-induced failures. The Suez Refinery, refurbished in 1977 after a ten-year shutdown, has been selected as the site for cooperative activities. Other petroleum companies were to be invited to observe project progress and results. Travel time to the Suez facility (1.5 hours) has led to a 2 day bi-weekly interaction schedule.

The project has six elements. Corrosion monitoring and corrosion protection are directed to shorter term solutions of industry problems. Research on corrosion inhibitors derived from indigenous plants and materials might produce results in the 2-5 year time frame. Studies of galvanic and pitting corrosion, problems common to industry, are more fundamental efforts to increase understanding of the phenomena. Establishing a well-equipped corrosion laboratory is the final element of the project. This stratified approach provides a solid foundation for continued corrosion research but the team wonders if the resource allocation to the individual elements is consistent with the program goals.

Progress on corrosion monitoring is inhibited by lack of instrumentation and the need for staff training in techniques for in-plant monitoring. Procurement procedures and unbudgeted training expense issues appear likely to delay monitoring activities by six or more months. Timely corrosion monitoring is important to the NRC linkage with the Suez Petroleum Company.

Conclusions

The evaluation team believes that:

- Staff capability and interest are high and, as the February 1980 advisory report points out, progress has been made toward project objectives. The return of the original project leader may further stimulate the rate of progress.
- Some combination of NAS, NSF and AID should act to shortcut procurement procedures for the few items of monitoring equipment requested.
- Action should also be taken to select a training mechanism and provide timely funding.
- A review of the emphasis on and support for the project elements should be made in the fall of 1980.

RED SEA FISHERIES

Introduction

In 1976 the total fisheries production of Egypt was 158 thousand metric tons. Fish consumption in Egypt is said to average about half of world levels on a per person basis. The major aquatic food sources in Egypt include the northern delta lakes (34 percent), the inland lakes (11 percent), the Nile River (17 percent), the Mediterranean coastal zone (13 per-cent), the high seas (10 percent), fish farming (7 percent) and the Red Sea (8 percent). Specialists in the subject feel that the Red Sea fisheries resources need to be better understood, and that their output on a sustained basis could be more than doubled over the next several years. Other significant efforts, such as in aquaculture and mariculture are being made in Egypt to develop the other aquatic food resources.

Members of the evaluation team reviewed NRC/NAS and USAID/Cairo files, and discussed the details of the Red Sea Fisheries R&D project principally with Dr. A. R. Bayoumi of the Institute of Oceanography and Fisheries of ASRT. More general discussions were conducted with other staff.

Project Summary

Project documents indicate that the Red Sea Fisheries project was originally proposed in May 1978 and tentatively approved (in revised form) in November of that year. As of April 1980, the project was still in a state of planning, consultation and review, although the deliberations at the fifth meeting of the JCC seem to have resolved many of the previously unsettled points that had held up implementation. These points appeared to relate mostly to the need for greater specificity in the project's four components.

The Red Sea Fisheries R&D project has four components: 1) pelagic schooled fish; 2) deep water shrimp; 3) reef fishes; and 4) lobster. Six months of preparation time is envisioned for the first year of research work for a total of 18 months. Emphasis is on the collection of statistics on species' availability and distribution; and on the development of improved equipment and techniques for commercial exploitation.

A proposal has been made for the use of remote sensing to prepare topographic charts of the coastal area south of the Gulf of Suez, and to test and demonstrate low light level fish detection. This is under active discussion with the Remote Sensing Center of the ASRT.

Conclusions and Points for Consideration

- Because the Red Sea fisheries R&D project's first phase is on the threshhold of being carried out and has been the subject of extended review by Egyptian and U.S. specialists, the evaluation team supports the launching of this work. The first phase is projected for an 18 month period, and the second phase for 2-3 years (for a total of 3.5 - 4.5 years from the point of initiation). The evaluation team believes that the impact of this R&D project on the availability of total food supplies from aquatic resources may be quite modest, although positive.

- The project documents indicate that numerous questions and issues have been raised and responses seem adequate at the planning level.

- There seems to be little attention given to studying the institutional aspects of fisheries exploitation. This includes the organization, functioning and management of harvesting enterprises; the storage, processing, transportation and other aspects of output distribution; and the economic management of such inputs as labor force, production equipment and supplies.

- Project documents seem to make assumptions or assertions about the probable impact of the R&D work in areas such as the growth of the fishing industry in the Red Sea area, the growth in employment, and the improvement in individual levels of fish consumption that are apparently not being monitored or tested by project activities. The importance of responsibilities for organization, leadership, communication, and coordination are recognized in the project documents but it is not clear to whom they are eventually to be allocated.

- In addition to the scientific and technical emphasis being given to varying aspects of the Red Sea Fisheries R&D project, the evaluation team feels the project leadership may wish to consider further attention be given to the population dynamics of aquatic species, the technology and economics of production enterprise management (especially where sizeable units of equipment are involved), and market institutions and economics. Although commendable attention is given to the need for data, careful attention will have to be given to the accuracy and relevance of the information collected.

BIOGAS TECHNOLOGY

Introduction

Early Egyptian interest in energy from biomass was further stimulated in 1978 by a Canadian sponsored workshop. NRC proposed a five-year biogas project in late 1978 and a revised proposal was the basis for project initiation in March 1979. Comments by U.S. advisors emphasized the need for sociological analyses and careful planning for village demonstrations.

Members of the evaluation team met with Drs. M. El-Helwagi, A. El-Dayem, and H. Megahed for project discussions and visited the prototype biogas digester facility on the NRC campus. The project files were reviewed and, during village visits to Omar Makram and Kafr Al-Khadra, impressions were formed on some factors pertinent to biogas implementation.

Report Summary

The project has made substantial progress in the first year and is organized for information exchange among the many staff members. A notable achievement has been the successful transfer of Chinese technology for the construction of domed, underground biogas digesters. The supportive laboratory studies underway and planned appear to be carefully thought out and will be essential to successful demonstration and large scale implementation of biogas technology in Egypt. Similarly, the engineering studies and prototype construction of various system designs should provide valuable input to the project.

Preliminary surveys of physical conditions in four villages have been completed but the report was not available for review. The project staff indicated an awareness of the many factors impinging on village biogas demonstrations and the complex interactions among these factors. Social and economic considerations are thought to underlie the limited acceptance of biogas technology to date. Economics, waste availability, digester siting, gas utilization appliances, ownership, and manure/slurry handling problems are a few of the numerous topics which should be understood and incorporated into the demonstration design.

Biogas demonstrations have often failed to document carefully the setting and the externalities which accompanied the project. Understanding of the biogas role in energy generation for Egypt and elsewhere could benefit from carefully designed and documented pre-demonstration activities, data acquisition, analysis and evaluation that have not characterized biogas programs elsewhere.

Conclusions

Our review has led to the conclusions that:

- o There is reasonable prospect for the application of biogas technology in Egypt.
- o The project has made substantial progress to date and has a sound technical plan.
- o Successful demonstration of biogas technology in Egypt could be jeopardized without early attention to, analysis of and planning for all aspects of the demonstration.

The evaluation team suggests that the project staff evaluate the desirability of:

- o Convening with an advisory group of U.S. and third country experts to develop a detailed schedule of pre-demonstration activities and demonstration plan. The project might wish to accelerate the acquisition of background data to better support such an advisory group.
- o Increasing the number of demonstration villages (presuming the existence of an adequate plan) to three or four of those identified, adding to the key variables to be tested and the confidence level of results.
- o Holding seminars and discussions with interested community groups not directly involved in the demonstration to increase interest in biogas and to obtain an understanding of attitudes toward the technology.

MORE AND BETTER FOODS

Project Overview

The More and Better Foods Project is made up of three components: food technology, nutrition : farm systems. The components include application of research data to food plants and village level activities. The village level activities (touching on food processing, livestock productivity and crop management, and nutritional monitoring) are led by a coordinated team of NRC specialists. They apparently have maintained effective communications with each other, with participating farmers and with members of the village council as well as other local leaders. There was some evidence of interaction with other activities being carried out in the villages by the governate and the Ministry of Agriculture. The NRC team generally makes weekly visits to Kafr al-Khadra and Omar Makram, the two villages involved in this work. Additional workers are brought in as needed.

The provision of economic incentives in the form of materials, equipment or seed, for example, combined with reasonably consistent repayment or cost sharing by the villagers from realized profits seems to have been useful in achieving effective participation. A portion of increased profits are returned to the village council to be used in stimulating broader participation. Efforts to engage a larger fraction of the local population merit close attention since they bear heavily on questions of larger scale implementation.

In many respects, the various village activities (sub-projects) are sufficiently well coordinated that they, in fact, constitute a definable, single sub-project. More formal recognition of this de facto organization might assist linkages with village socio-economic data gathering, the documentation of successes and failures with their causes, the improved targeting of new interventions and the planning of similar projects at new locations.

The industrial demonstrations (Cottonseed Oil Refining, Industrial Cheese Making and Supramine) are undertaken separately from the village demonstrations and from each other. These are discussed one-by-one in the following sub-project analyses.

The evaluation team spent considerable time with the More and Better Foods Project because of the extensive network of sub-projects, personnel and cooperators. Files were reviewed at USAID/Cairo and NAS/NRC. Visits were made to the old village, Kafr al-Khadra and the new village, Omar Makram, which were chosen for this demonstration. Local personnel cooperating with this program were interviewed and farmer meetings attended in both villages. Work underway in each village was inspected.

Interviews were held with Drs. M. Kamal, A. El-Nockrashy, and N. Saleh, and the following investigators: Drs. O. Galal, F. Osman, N. Ahmed, M. Abd El-Salam, I. Rifat, A. Abdel-Dayem, H. Salama, H. Al-Nomany, H. Ali, M. Effat, A. El-Nimr, M. El-Beltagy and B. Ahmed. An evaluation report on More and Better Foods by Dr. C. O. Chichester dated 2/27/80 was noted by the evaluation team.

Cottonseed Oil Refining

Introduction

Cotton is the most important agricultural crop for export in Egypt. By-products of cotton production are edible oil and cottonseed cake or meal. Of the 950,000 tons of cotton seed produced annually, 700,000 tons are expelled or extracted, producing about 90,000 tons of edible oil.

The extraction process by which oil is separated from gossypol-containing seed results in a crude oil that is highly colored and difficult to process or refine.

This food technology sub-project has been designed to prevent color fixation of cottonseed oil and to improve refinement procedures for oil already color-fixed. The sub-project goal is to produce high quality refined oil with minimum oil loss and a low processing costs.

Researchers at NRC have joined with personnel from the Al-Badrasheen Oil and Soap Factory to design and conduct laboratory and pilot scale studies on processing treatments to accomplish the above objectives. Pilot scale kettles were designed, built, installed at NRC, and used for the study. Research started June 1978.

Sub-Project Review

A number of experimental treatments have been tried in order to improve oil quality and yield. Some of these are applicable as improved processing steps for industrial use. It is apparent that both NRC and industry have provided inputs to planning, research, sample and data analysis, and establishing a scenario to apply results at a factory level. Pilot scale studies were done on oil from the factory in quantities from 1 to 50 kilograms. Remaining steps are to finish in exact detail all process changes and transfer the technology to a plant scale with batch quantities of 16 tons.

The prospect of industry adapting process treatments developed under this project appear to be good. The treatments reduce costs and improve product quality, possibly to the extent of eliminating an oil bleaching step which is now routine in edible oil refineries. It is important that NRC personnel adhere to present plans of making process changes in Al-Badrasheen factory within 3-6 months.

The sub-project leader attended a marketing seminar under the training program and one team member visited plants in the U.S. Team work with industry representatives is evident among NRC workers. Also encouraging is associated research on other problems in edible oils not directly supported by this project. Work is being done on the quality of hexane (used for solvent extraction), the quality of soybean cake for feeding purposes, stabilization of rice bran oil, and deodorization of soybean oil.

This sub-project has the capability of contributing to the expansion of edible oil processing within Egypt so that an increasing percentage of the 400,000 tons of edible oil imported annually might be refined domestically. If so, added product value, along with equipment, personnel and supply costs, could accrue to Egypt.

Conclusions and Recommendations

The evaluation team concludes that:

- Researchers at NRC have made measurable progress in improving cottonseed oil quality by changes in processing steps at laboratory and pilot scale levels.

- Participation by industry personnel is evident and indications are that process improvements will be incorporated into industry practice.
- This sub-project has potential for providing a data base needed for expansion of refining capacity of crude edible oil.

We recommend that:

- Full support of this sub-project continue and that results be applied at an industry level very soon.
- Processing studies related to refining such as extraction, expelling, and quality of hexane be kept as a part of this study.
- Personnel widen industry contacts, particularly in other countries.

Industrial Cheese Making

Introduction

The production of soft white cheese, Domiati, consumes over one-third of the milk produced in Egypt. Domiati cheese is produced by a number of dairy plants. Only the production of butter oil (ghee) consumes more milk than the cheese process. As milk production and demand change, fluid milk is either less available or more expensive for use in the production of cheese. Milk costs, as a percent of cheese production costs, have been increasing for the past few years and now constitute 75-80 percent of the cost of producing cheese.

The volume of dairy products imported into Egypt is increasing each year, including both white cheese and dried skim milk (DSM). A study was approved, as part of the More and Better Foods Project, on the use of DSM as a partial replacement for milk in cheese production. This has been expanded to study a number of ingredients that could decrease production costs by reducing whole milk requirements.

Sub-Project Review and Evaluation

Work conducted under this sub-project includes an extensive literature review, laboratory-scale formulations and analysis at NRC, pilot-scale production at Misr Milk and Food Company in Domiati, and evaluation of formulation changes by research and industry personnel.

Product formulation changes included substitution of DSM for whole milk, adding lipase enzyme for flavor development, and adding butter milk poweder and milk fat. After assessing the acceptability of these formula changes, data were subjected to economic evaluation to determine the effect of formula changes on product cost. Although cheese produced by substitution of DSM for whole milk altered product quality, ethods were studied to correct any quality problems and the final product was fairly similar to that produced by whole milk.

Apparently a working relationship exists between NRC and personnel in the cheese industry in preparing and evaluating alternate formulations. The continued cooperation of companies such as Misr Milk and Food Company will ensure both technicsal input by industry and acceptqnce of research results.

Since DSM and butter oil are products of the dairy industry, world prices on these items eventually follow milk prices and these products may not remain as viable substitutes for milk in soft cheese manufacture. If other items such as vegetable proteins could be used that are native to Egypt, or could be produced domestically, cash flow for inputs could be reduced.

Of particular interest to the evaluation team was reference to studies being started on growing single cell proteins (SCP) from high-salt whey which is a by-product of soft cheese manufacture. SCP will then be dried and used as an ingredient in poultry feeds. About one million tons of high-salt whey is presently produced each year in Egypt, and the SCP produced has a ready market in poultry and livestock feeds.

Conclusions and Recommendations

The evaluation team concludes and recommends that:

- Considerable progress has been made on studying alternate formulas for making Domiati cheese and that savings could be affected by instituting these formula changes.
- Adequate attention has been given to economic impact of cheese formula changes but attention could be directed toward market acceptability of products with different formulas.
- Further work is warranted on this sub-project particularly in view of village level milk processing studies that could conceivably reduce milk available for Domiati cheese production.

- Market acceptability tests shold be conducted on new cheese formulations so that results are readily applicable in industry.
- Continued research on formulation for soft cheese is desirable, possibly looking toward the use of vegetable proteins that possess the needed nutritional and functional properties.

Supramine

Introduction

Supramine, a weaning food for infants, is produced by the El-Nil Pharmaceutical Company in Cairo. Ingredients used are chick peas (38 percent), hard wheat (28 percent), lentils (18 perent), skim milk (10 perent), sucrose (5 percent), and a mixture of calcium carbonate and vitamins A, E and B (1 percent).

This food was developed about 18 years ago for use in Algeria and was based on fairly cheap ingredients. It has been used in Egypt for about ten years but with limited success. Ingredients are now more expensive, acceptability is poor even though price is cheap, equipment to produce the product is fairly old and worn, and problems exist with shelf life, package quality and insect infestation. Research is aimed at improving formulation, processing, and packaging in order to obtain a cheaper and more acceptable product.

Sub-Project Review and Evaluation

Reports covered, and interviews with sub-project leaders, confirmed that different formulations have been made on a laboratory scale, and that a cheaper and more acceptable product will be produced in pilot scale quantities. Part of the acceptability and quality related problems have been solved by use of enzymes and pre-cooking some of the major ingredients such as chick peas and lentils, and them mixing the final product in dry form. One cause for alarm in adapting this process was that microbial analysis of ingredients showed some dried milk samples to be contaminated with *Salmonella*. Perhaps closer attention to overall packaging methodology and ingredient quality will need to be considered if dry mixing is adapted as a commercial practice.

Products sold in competition with Supramine are apparently well accepted even at much higher prices and with much less nutrition. Perhaps a study of these formulas would be useful in order to determine their overall acceptability.

The distribution and utilization of foods for weaning infants and growing children is of concern particularly with families in outlying villages. Maybe a marketing specialist would be of benefit in determining the best methods for distributing and utilizing Supramine.

The possibility was mentioned of producing products for infants and young children from locally grown items incorporated into foods acceptable to particular rural populations. If this idea is pursued further, an important goal of researchers is to ensure that adequate nutrition, safety, and quality are built into the products.

Nutritional data indicate the need for more effective nutritional programs from the time of weaning to at least six year of age. Considerable technical progress has been made to improve Supramine for this purpose. If these improvements can be incorporated into a weaning and child food that can be distributed and utilized successfully, this technical progress will be worthwhile and should serve as a base for improving overall nutritional levels. Certainly the interface for adopting new ideas and practices has been established in the two villages. Hopefully this can be expanded to other villages and used as a base for effective distribution of Supramine type products.

Conclusions and Recommendations

The evaluation team concludes that:

- There is a definite need for improvements in weaning and child foods in Egypt in order to obtain acceptability, quality and nutrition, and definite progress has been made in improving Supramine for this purpose.
- Research and development efforts should continue on infant and child foods, and more attention needs to be given to marketing and other aspects of product distribution systems and training methods to obtain product acceptance.
- Production on pilot scale levels be instituted with improved formulations, and data on acceptability collected from mothers purchasing the product.

- Data from other countries on similar products be reviewed, related to Egyptian conditions, and additional related sociological data gathered as needed.

Nutritional Monitoring

Introduction

Nutritional Monitoring is associated with the village demonstration activities of the More and Better Foods Project. It is a straight-forward attempt to obtain inexpensive, easy-to-administer measures of trends in nutritional status. It is the belief of the sub-project leaders that body weight (in relation to age) is a logically dependable index of about 80 percent of the information needed by the project regarding the status of individual health with respect to protein-energy nutrition. The reasoning is that the food and agriculture demonstration activities in the village are likely to have an impact on the nutritional status of its population. It is expected that the year-to-year trends in average body weight for different age groups will reflect this impact.

Sub-Project Summary

Birth weights of children born in the village are taken by the official health worker attending the delivery. An information sheet with the identification of the child, its weight and its date of birth (among other information) is prepared and kept on file at the village health unit. Sub-project personnel indicated that a duplicate of this information was prepared and retained at NRC. The "Gomez Classification" is used which separates weight/age ratios into categories of first, second and third degree malnutrition. If shifts occur over time in the distribution of new born children among these categories, sub-project leaders believe that this will be (at least to some significant degree) due to changes induced in the village by the sub-project.

Weight measures are also taken of children at other ages (predominantly in the pre-school years). These occur as opportunities permit (such as a visit to the village health center for other reasons) and records are maintained on each.

Anemia is another nutritional status index which is the subject of testing and development at the village level. A simple color comparison method is used in which a drop of blood drawn from a subject's finger is compared with a standardized color chart.

Additional measures such as breast feeding time, infant mortality rates, and height are also being explored for use as inexpensive and effective indicators of physical quality of life with a demonstrable connection to nutrition.

Conclusions and Points for Consideration

- The measures being used and tested are admittedly rough approximations. However, this is in keeping with the diffuse nature of the sub-project's intervention in the two villages. The sub-project is not targeted on any defined segment of the village population, nor is it calibrated for a specific nutritional impact.
- Village-level nutritional monitoring is still in the development stages and should be further refined. Some of the problems appear to include winning the support and commitment of village level staff, and maintaining the continuity and intensity of personnel application.
- Possibly at a later stage, when and if the sub-projects of the More and Better Foods Project become more finely tuned to the needs of specific segments within the populations of the two villages, it might become important to refine the sensitivity of measures of nutritional status to these differences.

Village Food Processing

Introduction

The objective of this sub-project is to extend and improve preservation, processing, packaging and marketing methodology for agricultural products at the village level.

Review and Evaluation

Products mentioned for preservation studies include vegetables such as turnips, carrots, peppers, tomatoes, and cucumbers, apricots, citrus, fish and peanuts. Solar drying and pickling were mentioned as preservation methods as well as expelling oil from peanuts to produce a cocoa butter

substitute. The expeller cake would be used for feed purposes. To our knowledge, only pickling has been done thus far but with success at the village level.

Two associated studies were mentioned under this topic, one on producing butter and low fat cheese (qareesh) from locally produced milk, and the other on the culture of fish in a lake formed from canals. The cheese and butter study was underway, and plans were being made for the fish production study in the old village.

This sub-project has potential for helping villages to utilize foods more efficiently, waste less food, extend the food supply over more months of the year, and to generate extra income. However, close attention must be given to the safety of preservation methods, and full consideration must be given to processes and products that are familiar and acceptable to villagers. In the case of peanuts, establishing an orderly marketing system to existing industries expelling and extracting oil might be preferable to small-scale processing at the village level.

Conclusions and Recommendations

The evaluation team feels that:

- This sub-project is fairly broad and too general in nature, but progress is being made in specific areas such as pickling and cheese making. Considerable feedback from villagers on product ideas would be desirable.
- Oportunity exists for local processing of agricultural products, but payback, improved nutrition, and better utilization of local products must be realized.
- Adequate attention be given to safety and acceptability of products and processes, and more consideration be given to centralized processing facilities at the village level where villagers could process their own products under the direction of trained technicians.

Livestock and Poultry

Introduction

The purpose of this sub-project is to demonstrate the production of meat, poultry, milk and eggs; to conduct studies where necessary to provide

solutions to relevant problems; and most importantly, to help apply existing knowledge in poultry and livestock production at the village level in order to increase productivity.

Sub-Project Review and Evaluation

Recognition of the problems facing expanded numbers and/or productivity of livestock seems to be apparent among all personnel contributing to this sub-project. Sub-project leaders listed the following problems that exist at the village level: drain on feedstuffs to sustain livestock, unevenness of feed supply and imbalance of nutrition during each year, low productivity of meat and milk by native breeds, use of animals for draught purposes, and problems with disease, parasites and reproduction. Also, the lack of a solid data base on actual production of meat and milk, the economy of this production, and composition of products being produced are recognized as problems and are being addressed. These data are useful in this sub-project as well as in contributing to a nutritional data base for villages.

Research reported on prevalent diseases and parasites affecting livestock seems to be complete and thorough. The information should be used as quickly as possible to correct problems and increase productivity. Progress is being made on detection, condemnation and destruction of animals affected with tuberculosis and brucellosis. However, in the treatment of controllable diseases, storage of vaccines requiring refrigeration is a problem in villages as interruption of electrical service is frequent and unpredictable.

A number of ideas for improvement of animal nutrition were discussed, part of which are already being implemented. Examples are extending protein available during the winter from berseem clover by interplanting winter annuals such as ryegrass and elephant grass, and weaning and fattening of young calves on a cooperative basis. Also, the use of artificial insemination is being practiced and superior meat and milk breeds are being introduced in cooperation with an existing breed evaluation program of the Ministry of Agriculture and Cairo University.

Programs to improve and expand production of poultry meat and eggs are underway. Villagers have been selected for demonstration programs in

chicken broiler growing with the program supplying baby chicks, feed, equipment, medication and technical advice. Cost will generally be borne by the grower and marketing will be locally in the villages. Expertise is available to ensure success of the first stages of this program but expansion will require coordination through an extension service, cooperative or commercial company

An overriding problem common to livestock and poultry production is the availability to farmers of bette balanced feeds, particularly concentrates for use with locally grown feed ingredients, and the maintenance of an analysis and feed formulation program to allow preparation of balanced diets throughout the year. Consideration should be given to provide grinding, chopping and mixing equipment to both villages for the purpose of providing feeds or concentrates for demonstration projects in livestock and poultry. If provided by outside funds, repayment should be required, as is done with the poultry program.

Conclusions and Recommendations

The evaluation team feels that:

- This sub-project has the potential of improving livestock, poultry and associated cropping practices in the demonstration villages, and should be continued.
- Considerable "extension-type" effort and service work by vetenarians, researchers and technicians is required to improve livestock and poultry productivity.
- Attention be directed toward specifying and purchasing equipment for village use to grind, chop and mix locally produced feed ingredients.
- Special attention be given to effective storage and use of vaccine and medicines for disease and parasite control of livestock and poultry.
- Maximum use be made of existing genetic stock at the village level.

Plant Production, Protection and Soil Analysis

Introduction

The purpose of this sub-project is the demonstration in the two villages of new technology aimed at increasing food production, and evaluating

its success by the degree of farmer acceptance, increased farm income, increased food supply, and improved human and animal nutrition. These objectives would be reached by new crop variety introduction, new cropping practices, improved control of pests and improved soil fertility management.

Sub-Project Summary

The adoption of a system of growing tomatoes on wires gave a yield increase up to 15 tons per acre in the villages, with a low cost investment. Nearby markets are said to be able to absorb up to ten times the present production if it were available, especially if a redder tomato variety was used.

A start has been made in the introduction of improved crop varieties. Examples include a new export onion variety, Giza 20, and two new varieties of wheat (Giza 155 and Giza 157) which show promise of superior yields. We believe there is need to introduce or develop still more improved crops.

A new practice introduced was the intercropping of onions with soybeans, thus saving land preparation costs. Other new cropping practices initiated in the villages include: 1) innoculation of clover seed with nitrogen-fixing bacteria; 2) planting a mixture of berseem clover and ryegrass thus giving an improved balance of protein and carbohydrates for livestock feeding; 3) increasing the planting of potatoes, a crop which gives the highest yields of food calories per acre among all agricultural crops; and 4) foliar feeding of wheat. The team noted the acceptance by the villagers of these new and improved methods and techniques. As inducements to the farmers, NRC supplied the necessary seed, plants, wire and chemicals with the understanding that repayment would be made from increased profits. In addition, the village council retains a small amount of the profits to be used for adding more farmers to the program.

Progress has been made in the identification and characterization of an unusually large number of plant pests. Personnel in the sub-project are now planning to add new methods of practical pest and disease control, especially by non-chemical means.

It was found that Oronbanche, a plant parasitic on broad beans, did not grow near fennugreek plants. Using this observation, the project has introduced

the practice of mixed plantings of broad beans and fennugreek. When this is done, Oronbanche is controlled and both plants mature normal crops. Research is planned to isolate, characterize, and eventually synthesize the root exudate which inhibits germination of Oronbanche seed as a means of control. Evidence was seen of losses of crops to plant pathogens.

Soil samples have been taken, and analyzed. The initial findings should now be used to develop useful fertilizer recommendations in the village. Consideration has already been given to plant tissue analysis which provides even more specific information on plant nutrient needs. Some of the soils in the village are becoming water logged because of improper water management.

Honey production and silk production are being introduced as auxiliary programs to augment income, making use of more or less spare time and otherwise unused land.

Conclusions

The evaluation team concludes and suggests that:

- This sub-project appears to be making a start in providing a valuable link in agricultural extension. Therefore, the team believes the project should continue along these same lines, but should increase the number of farmers involved.
- That an evaluation be made for expanded research opportunities to develop research programs in non-chemical methods of pest control, especially in control of soil-borne pests. Crop improvement and crop nutrition efforts shold be expanded, and that steps be taken to transfer presently-known technology to correct improper irrigation practices now being used.
- Soil test results and other findings should be reported to the villagers as soon as practicable.

NEW CROPS FOR ARID AND SEMI-ARID LANDS

Introduction

Members of the evaluation team reviewed the NAS files on this project and discussed the project with Dr. El-Beltagy the principal investigator. No site visit was made because the site has not been developed.

Project Summary

Although this project was given favorable consideration by the JCC in November 1978, it has been slow in developing since that time. The delay came as a result of a disagreement on the nature and scope of the project. We understand the problem has now been resolved. However, as a result of this problem progress was slowed. A final project plan was approved in January 1980.

Soil and water surveys have been done on the site for the project at Kom Oshein in Fayoum Governorate. Site preparation has been delayed because of the lack of field equipment. Another constraint on progress in the project has been the lack of seed in sufficient quantity to start initial nursery plantings.

Some progress has been made in growing about 400 seedlings of jojoba at Al-Azhar University (seed sent by a cooperator in the U.S.) and a start was made on determining cultural needs of lima beans and winged bean at Ain Shams University. The principal investigator on a trip to the U.S. has developed the possibility of future cooperation with the Firestone Rubber Company.

Observations

- The present plan has been carefully worked out and the project has made a start in its implementation. However, given current progress, it is unlikely the planned objectives can be reached by 1983. The team believes the mid-range (5-years) and long range (10-years) objectives of the project are valid, but special consideration must be given to the means by which this project could be continued beyond Phase II.
- Steps should be taken to speed up procurement of the critical equipment needed to start work on site preparation and crop establishment on the site. Specifically, arrangements should be made to provide a system of seed procurement which would ensure delivery at the earliest possible time.
- An economic feasibility study should be made of this propject to estimate its potential for bringing desert land into profitable agricultural use and in developing new industrial enterprises.

ATTACHMENT A

Definitions and Acronyms

Program - The totality of activities under Applied Science and Technology Research - AID Project No. 263-0016.

Project - An infrastructure, research or demonstration effort approved and funded under the program.

Sub-Project - A separately managed activity within a project.

AID	Agency for International Development
AID/W	Agency for International Development - Washington
ASRT	Academy of Scientific Research and Technology
DRI	Denver Research Institute
DSM	Dried Skim Milk
JCC	Joint Consulative Committee
NAS	National Academy of Sciences
NIDOC	National Information Documentation Center
NSF	National Science Foundation
NRC	National Research Center
PASA	Participating Agency Service Agreement
R&D	Research and Development
R&M	Repair and Maintenance
R&MC	Repair and Maintenance Center
SIC	Scientific Information Center
USAID	AID Field Mission

ATTACHMENT B

EVALUATION TEAM

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Received doctorate at Cornell University of Genetics, plant pathology and cytology. Formerly in charge of a national program in crops research in the U.S. Department of Agriculture. Participated in 1975 U.S.D.A. Ministry of Agriculture study of Constraints to Agriculture Production in Egypt. Presently retired.

Nicolaas Luykx

Ph.D. agricultural economics (Cornell 1962). Served since July 1978 as the senior specialist for agriculture, food and rural development in the planning of the Institute for Scientific and Technological Cooperation (ISTC). Served previously in AID's Washington-based Bureau for Development Support as Deputy Director for Title XII and University Coordination, and as Director of the Office of Development Administration. Was previously (1970-76) founding Director of the Food Institute at the East-West Center in Hawaii, and (1966-68) Senior Advisor to the Academy for Rural Development in Comilla (Bangladesh). Has served on the faculties at the University of Hawaii (1970-76), Michigan State University (1966-70) and Cornell (1961-66).

James E. Marion

Ph.D. in Nutrition and Biochemistry, Director of Research, Gold Kist Inc., Atlanta, Georgia. Formerly Head of Food Sience Department, Georgia Agricultural Experiment Station at Griffin. Background in research administration and research studies related to the food technology aspects of agricultural comodities produced in the southeast section of the United States.

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ATTACHMENT C

Phase II Budgeting

The evaluation team was not able to make a detailed review of each line item in the maintenance and optimum phase II budgets considered by JCC-5. There are several general observations which can be made, however.

This evaluation report recommends that the demonstration projects devote more effort to data acquisition, sociological studies, economics and planning for new demonstrations as well as for the transition to wider scale implementation. If implemented, the recommendation would require added project funding. We estimate that $0.5 million would provide the necessary supplies, services and technical assistance.

Neither budget allows for the expansion of successful ongoing projects. This perhaps could be achieved by adjustments between line items which reflect the progress and potential for each project. Project evaluations over the coming nine to 18 months could provide the basis for such adjustments. Another alternative is the setting of more modest goals for the Scientific and Technical Information Project. Parenthetically, the team was not able to rationalize the proposed Scientific and Technical Information expenditures for consultants/educators given the suggested training investment. Further discussions on this point seem advisable.

The suggested $4 million increase in equipment expenditures in an optimum budget seems out of proportion. New projects, including Standards and Measurements, total only $3.3 million which includes some provisions for equipment. The nature of the new projects will, to some degree, determine the necessary equipment. However, one would hope that Phase II maintenance budget for instrumentation could support more new project activity than envisioned.

In summary, the maintenance budget seems barely adequate with the proviso that line item adjustments are possible. An additional $0.5 million should be made available for sociological, economic and planning inputs to demonstration projects either through item adjustments or added funding. The distribution of funds in the optimum budget merits further discussion and justification.